

New Energy Transport Fund

Final Report

On

Trial of Electric Light Goods Vehicles for

Container Terminal Operation

(Asia Container Terminals Limited)

(28 August 2025)

PREPARED BY:

Dr. Rick MO

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.

List of Monitoring and Evaluation Team Members

Dr. Rick MO (Team Leader)

Smart City Division
Hong Kong Productivity Council

Ms. Rachel CHAN

Smart City Division
Hong Kong Productivity Council

Mr. Miracle SUN

Smart City Division
Hong Kong Productivity Council

Mr. Sam SHAN

Smart City Division
Hong Kong Productivity Council

**New Energy Transport Fund
Trial of Electric Light Goods Vehicles for Container Terminal Operation
(Asia Container Terminals Limited)**

**Final Report
(Reporting Period: 1 May 2023 – 30 April 2024)**

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. Asia Container Terminals Limited (ACT) was approved under the Fund for trial of two electric light goods vehicles for container terminal operation. ACT, through the tendering procedures stipulated in the Agreement entered into with the Government, procured two BYD T3 electric light goods vehicles (EV) for trial.

1.2 Hong Kong Productivity Council has been commissioned by the Environment and Ecology Bureau (Environment Branch) (EEB) as an independent third-party assessor (the Assessor) to monitor the trial and evaluate the performance of the trial vehicle. ACT assigned a Toyota Hiace KDH201RSSPDY diesel light goods vehicle (DV) and a Hyundai H-1 A/T Euro 6 diesel light goods vehicle providing same services as the conventional counterparts for comparison.

1.3 This Final Report summarises the performance of the EVs in the 12 months of the trial as compared with their conventional counterparts, i.e. the DVs.

2. Trial and Conventional Vehicles

2.1 The trial EV model, BYD T3 electric light goods vehicle, has a gross vehicle weight of 2,420 kg capable of carrying a driver with four passengers and goods. It has a 44.9 kWh lithium iron phosphate battery pack and a driving range of 300 km under NEDC conditions. The DVs, a Toyota Hiace KDH201RSSPDY, with a GVW of 2,800 kg and a cylinder capacity of 2,982 c.c. and a Hyundai H-1 A/T Euro 6, with a GVW of 3,200 kg and a cylinder capacity of 2,497 c.c. were assigned for comparison in this trial. Both the EVs and the DVs were used for patrolling within the Container Terminal 8 (West). There was no designated driver assigned to drive the EVs or the DVs.

2.2 Since DV-1 reached its 15-year service life and was phase out on 12 July 2023, the historical data of DV-1 (1 April 2022 – 31 March 2023) would be used for the comparison.

2.3 ACT installed a 21 kW three-phase AC charging facility at its own cost at the office in Container Terminal 8, Kwai Chung for charging and recording the amount of electricity charged. Key features of the EVs, the charging facility and the DVs 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 May 2023 and lasted for 12 months. ACT 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 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 and ACT were collected to reflect any problems of the EVs.

4. Findings of Trial

4.1 The following table summarises the statistical data of the EVs and the DVs. The fleet average fuel cost of the EVs was HK\$5.19/km (about 91%) lower than that of the DVs. Taking the maintenance fee and other costs into account, the fleet average total operating cost of the EVs was HK\$6.28/km (about 92%) lower than that of the DVs in the 12 months of the trial.

Table 1: Key operation statistics of each vehicle (1 May 2023 – 30 April 2024)

		EV		DV	
		EV-1	EV-2	DV-1 (historical data) ^[1]	DV-2
Total distance travelled (km)		2,760	14,599	2,171	19,310
Average daily mileage (km/working day)		8	41	6	57
Average fuel economy	(km/kWh)	3.83	2.28	-	-
	(km/litre)	-	-	6.81	2.77
	(km/MJ)	1.06	0.63	0.19 ^[2]	0.08 ^[2]
Average fuel cost (HK\$/km)		0.39 ^[3]	0.66 ^[3]	3.31 ^[4]	8.12 ^[4]
Fleet average fuel cost (HK\$/km)		0.53		5.72	
Average total operating cost (HK\$/km) ^[4]		0.39	0.66	5.01	8.61
Fleet average total operating cost (HK\$/km) ^[4]		0.53		6.81	
Downtime (working day) ^{[4][5]}		1	9	15	19

^[1] Based on the historical data from 1 April 2022 to 31 March 2023.

^[2] The electricity cost was calculated using average residential electricity tariff rates in 2023 and non-residential electricity tariff rates in 2024, which are HK\$1.565/kWh (May-23); HK\$1.559/kWh (Jun-23); HK\$1.535/kWh (Jul-23); HK\$1.508/kWh (Aug-23); HK\$1.482/kWh (Sep-23); HK\$1.459/kWh (Oct-23); HK\$1.442/kWh (Nov-23); HK\$1.431/kWh (Dec-23); HK\$1.523/kWh (Jan-24 – Feb-24); HK\$1.513/kWh (Mar-24) and; HK\$1.507/kWh (Apr-24) as reported by CLP.

^[3] The market fuel prices from 1 April 2023 to 31 March 2024 were 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 that 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. In the 12 months of the trial period, EV-1 had one scheduled maintenance while EV-2 had one scheduled maintenance and one unscheduled maintenance. For the DVs, DV-1 had one scheduled maintenance, DV-2 had three scheduled maintenances and one unscheduled maintenance.

4.3 There were 366 working days in the 12 months of the trial period. The number of days of downtime was 1 day for EV-1, 9 days for EV-2, 15 days for DV-1 and 19 days for DV-2. Therefore, the utilisation rates were 99.7% for EV-1 and 97.5% for EV-2, compared with 95.9% for DV-1 and 94.8% for DV-2. Based on the above, the average daily mileage of EV-1, EV-2, DV-1 and DV-2 were 8 km, 41 km, 6 km and 57 km.

4.4 The drivers of the EVs had no operation difficulties in driving the EVs. Overall, they were satisfied with the performance of the EV. ACT was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. However, ACT expressed their concern about the operational impact of the longer charging time of the EV. Given the opportunity, ACT would encourage other transport operators to try the EVs.

4.5 It is observed that the amount of electricity stored in the battery of both EVs after a full charging operation could be maintained at the level of 44.9 kWh after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant, if any.

4.6 In the 12 months of the trial period, the total equivalent carbon dioxide (CO₂e) emission from the EVs was 2,753 kg. For comparison purpose, based on the mileage of the EVs and the fuel economy of the DVs, the total CO₂e emission from the DVs was 15,754 kg. Hence, there was a 13,001 kg (about 83%) reduction of CO₂e, with the replacement of two DVs by two EVs in the trial.

5. Summary

5.1 The fleet average fuel cost of the EVs was HK\$5.19/km (about 91%) lower than that of the DVs. Taking the maintenance fee and other costs into account, the fleet average total operating cost of the EVs was HK\$6.28/km (about 92%) lower than that of the DVs. The utilisation rates were 99.7% for EV-1, 97.5% for EV-2, 95.9% for DV-1 and 94.8% for DV-2. There was a 13,001 kg (about 83%) reduction of CO₂e, with the replacement of two DVs by two EVs in the trial.

5.2 It is observed that the amount of electricity stored in the battery of both EVs after a full charging operation could be maintained at the level of 44.9 kWh after the 12-month trial period. Thus, the deterioration in battery capacity within the 12-month trial period was insignificant, if any.

5.3 The drivers of the EV had no operation difficulties in driving the EV. Overall, they were satisfied with the performance of the EV. ACT was satisfied with the EV since the EV could meet the operational requirements and save the operation cost. However, ACT expressed their concern about the operational impact of the longer charging time of the EV. Given the opportunity, ACT would encourage other transport operators to try the 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 CO₂e emissions, provided that the vehicles can get easy access to charging facilities.

Appendix 1: Key Features of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

(a) EVs

Registration mark:	YK3770 (EV-1), OPS10 (EV-2)
Make:	BYD
Model:	T3
Class:	Light goods vehicle
Gross vehicle weight:	2,420 kg
Payload:	711 kg
Seating capacity:	Driver + 4 passengers
Rated power:	35 kW
Driving range:	300 km (under NEDC conditions)
Battery material:	Lithium iron phosphate
Battery capacity:	44.9 kWh
Year of manufacture:	2022

(b) EV Charging Facility (at Recipient's own cost)

Make:	EV Power
Model:	EVC-32NTK
Power:	21 kW, 380V AC / max. 32A three-phase
Charging standard:	IEC 62196-2 Type 2

2. DVs Used for Comparison

Registration mark:	MY9023 (DV-2)
Make:	Toyota
Model:	Hiace KDH201RSSPDY
Class:	Light goods vehicle
Gross vehicle weight:	2,800 kg
Payload:	850 kg
Seating capacity:	Driver + 5 passengers
Cylinder capacity:	2,982 c.c.
Year of manufacture:	2007

Registration mark:	OPS09 (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:	2020

Appendix 2: Photos of Vehicles and Charging Facility

1. Trial EVs and Charging Facility

(a) Trial EVs

EV-1 (YK3770)

	
Front view	Rear view
	
Left side view	Right side view

EV-2 (OPS10)

	
Front view	Rear view
	
Left side view	Right side view

(b) Charging Facility (at Recipient's own cost)

	
21 kW three-phase AC charging facility (at Recipient's own cost)	

2. DVs Used for Comparison

DV-1 (MY9023)



Front view



Rear view



Left side view



Right side view

DV-2 (OPS09)



Front view



Rear view



Left side view



Right side view