

Transition to Electric Mobility in Public Transport: Insights from Thailand and Bangkok

Yossapong Laonual, PhD

Mobility & Vehicle Technology Research Center (MOVE)

King Mongkut's University of Technology Thonburi (KMUTT)

3 June 2022

EV Forum: National Workshop on Transitioning to Electric Mobility in Lao People's Democratic Republic

Organized by UN ESCAP

Crowne Plaza Hotel, Vientiane, Lao PDR

1 Current status of public bus in Bangkok Metropolitan

2 Current national EV policy and strategies in Thailand

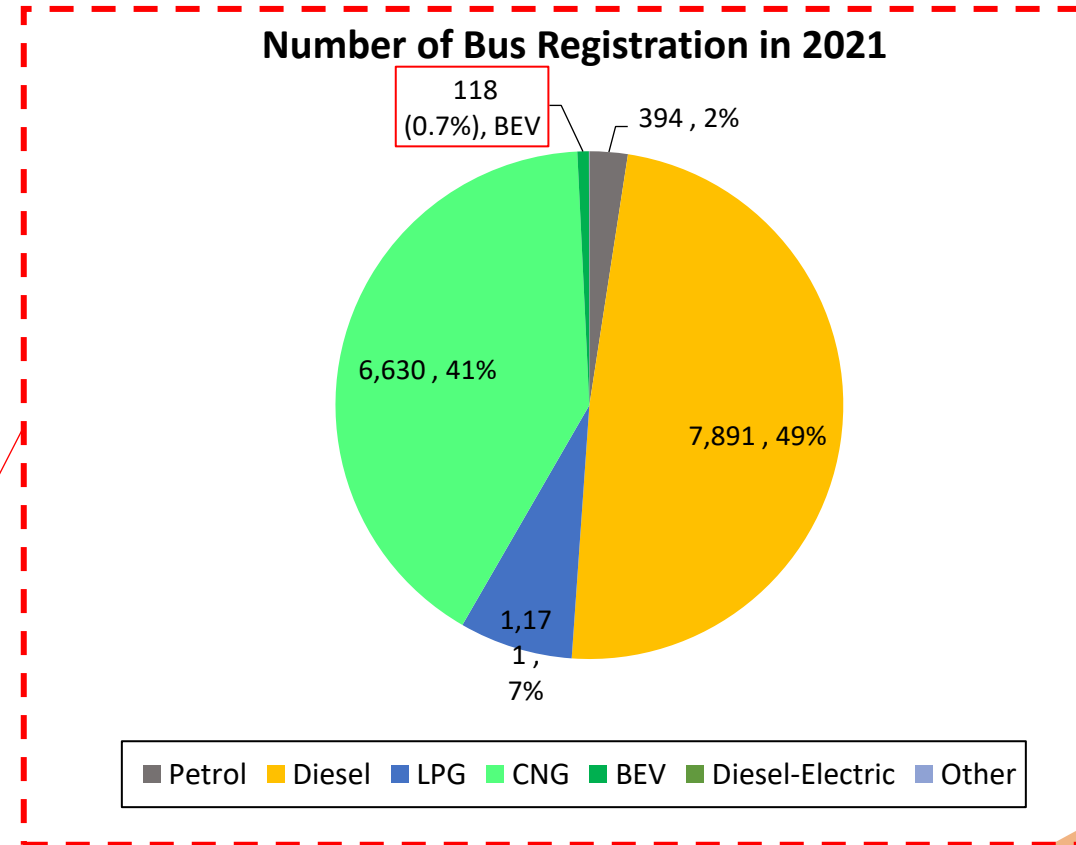
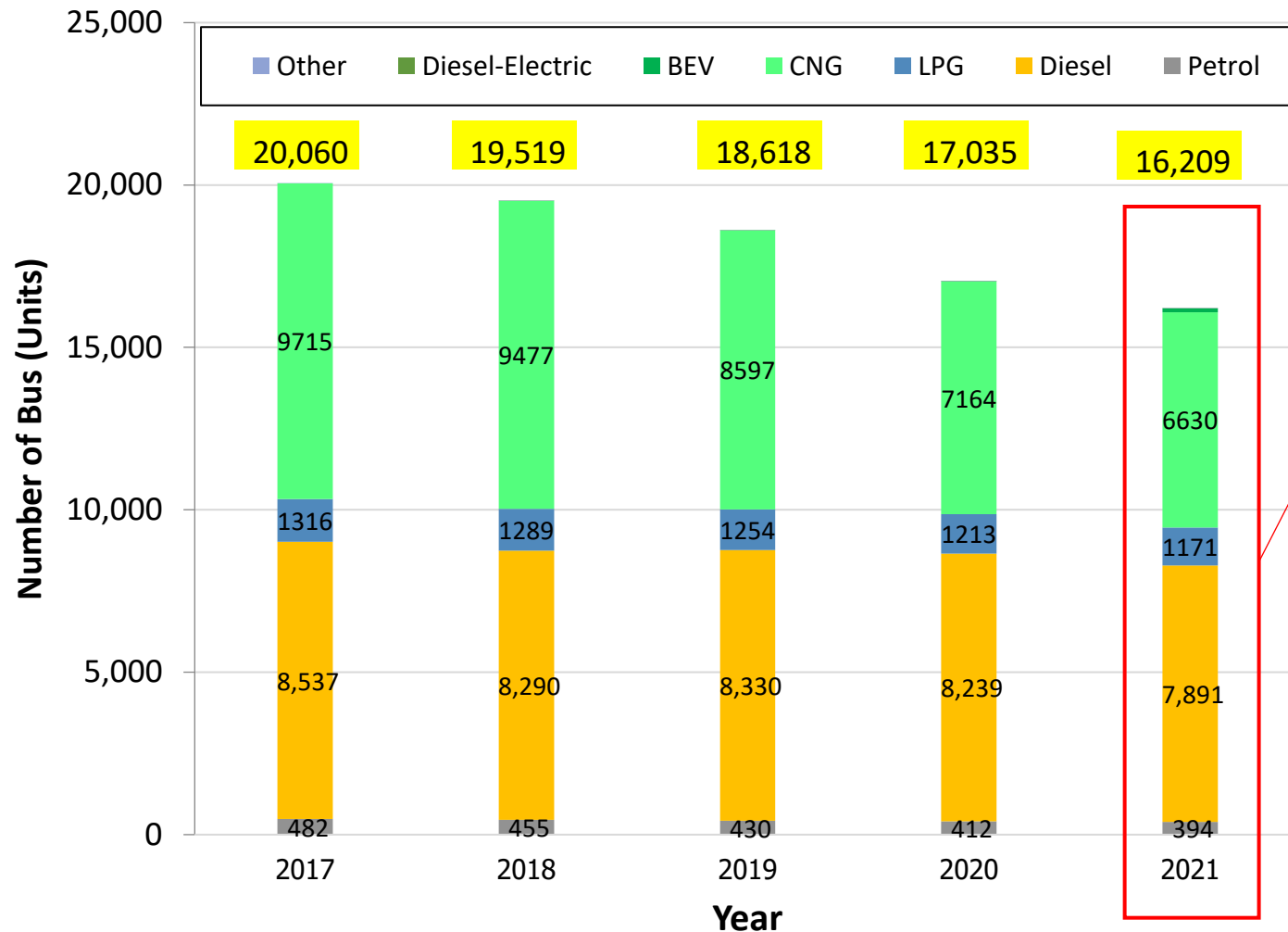
3 E-bus technology

4 Summary and recommendations

Current status of public bus in Bangkok Metropolitan

Accumulative Bus Registration in Bangkok Metropolitan

Accumulative Bus Registration (2017-2021)



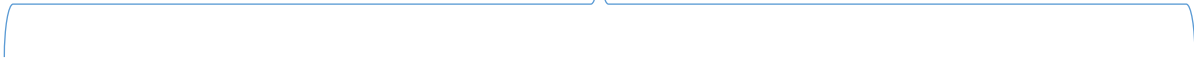
Current status of public bus in Bangkok Metropolitan

City Bus Landscape

Demand Side of Bus Users (2014-2019)
 Total Number = 864,005-1,062,947 person-round per day



Supply Side of Buses in 2020
 Total Number = 17,035 buses



- BMTA Fixed Route Buses: 3,005 buses
 - Private joint Fixed Route Buses: 6,094 buses
- BMTA: Total City buses = 9,099 buses, Total Route 397 routes**

- Others
- Private Fixed Route Buses
 - Private Non-Fixed Route Buses
 - **Total = 7,936 buses**

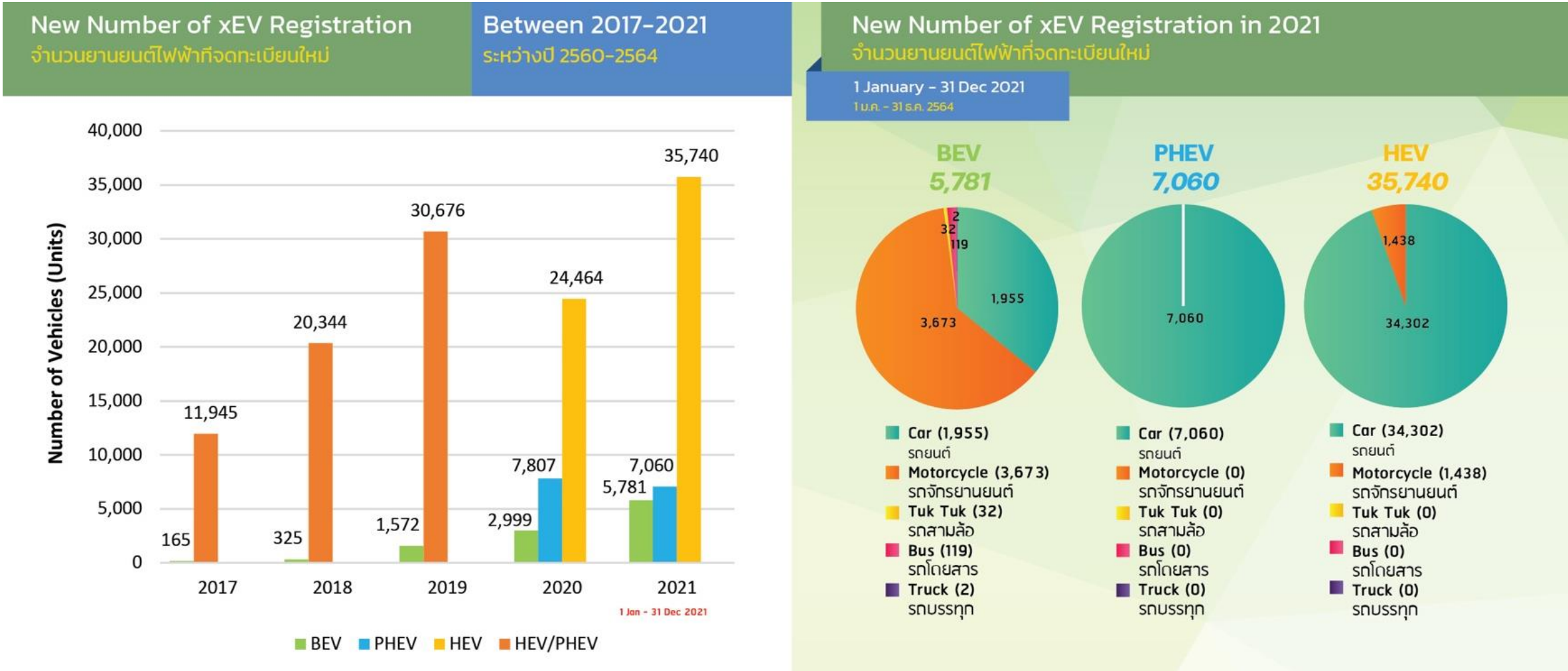
Ministry of Transport (MOT) EV plan (2022-2037)



- BMTA of 2,511 buses
- Public-Private Partnership (PPP) operators with BMTA of 1,500 buses (Clean energy EV/NGV/LNG)

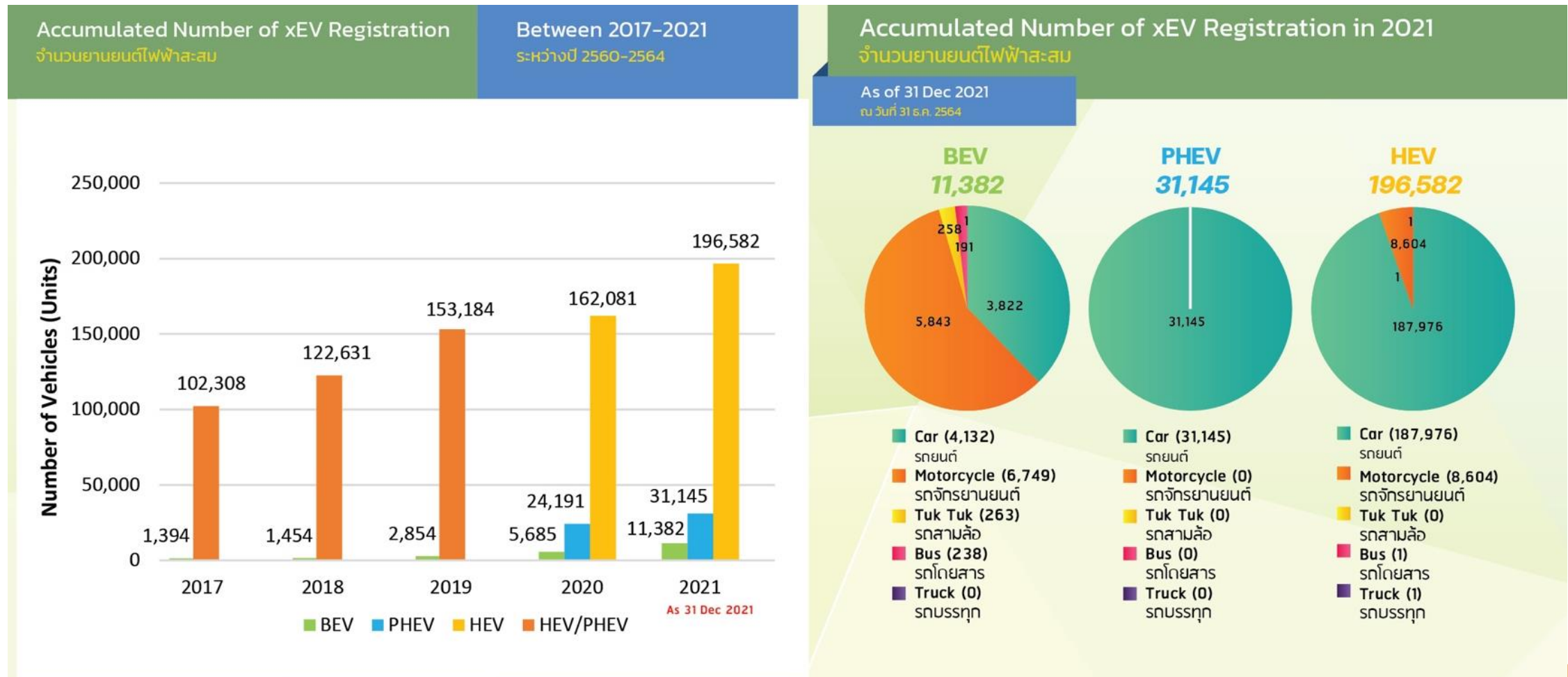
Current national EV policy and strategies in Thailand

Current EV Status in Thailand



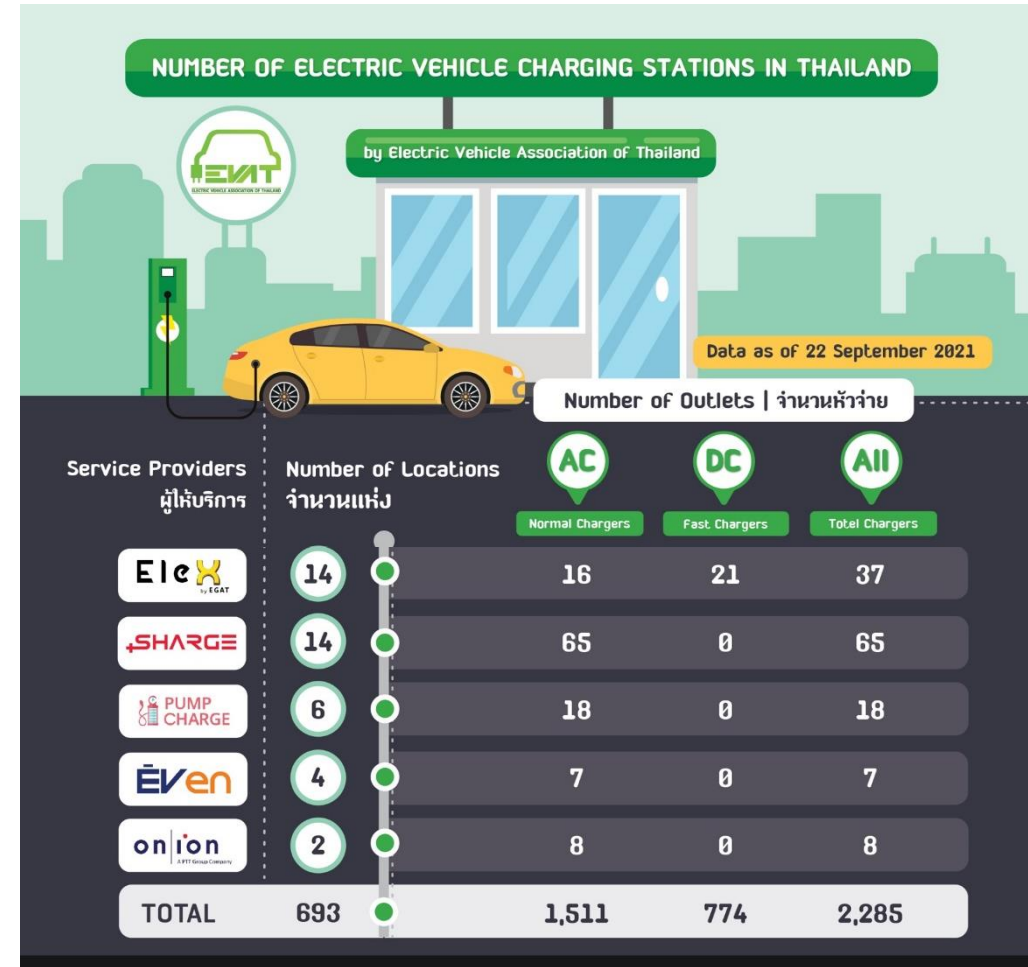
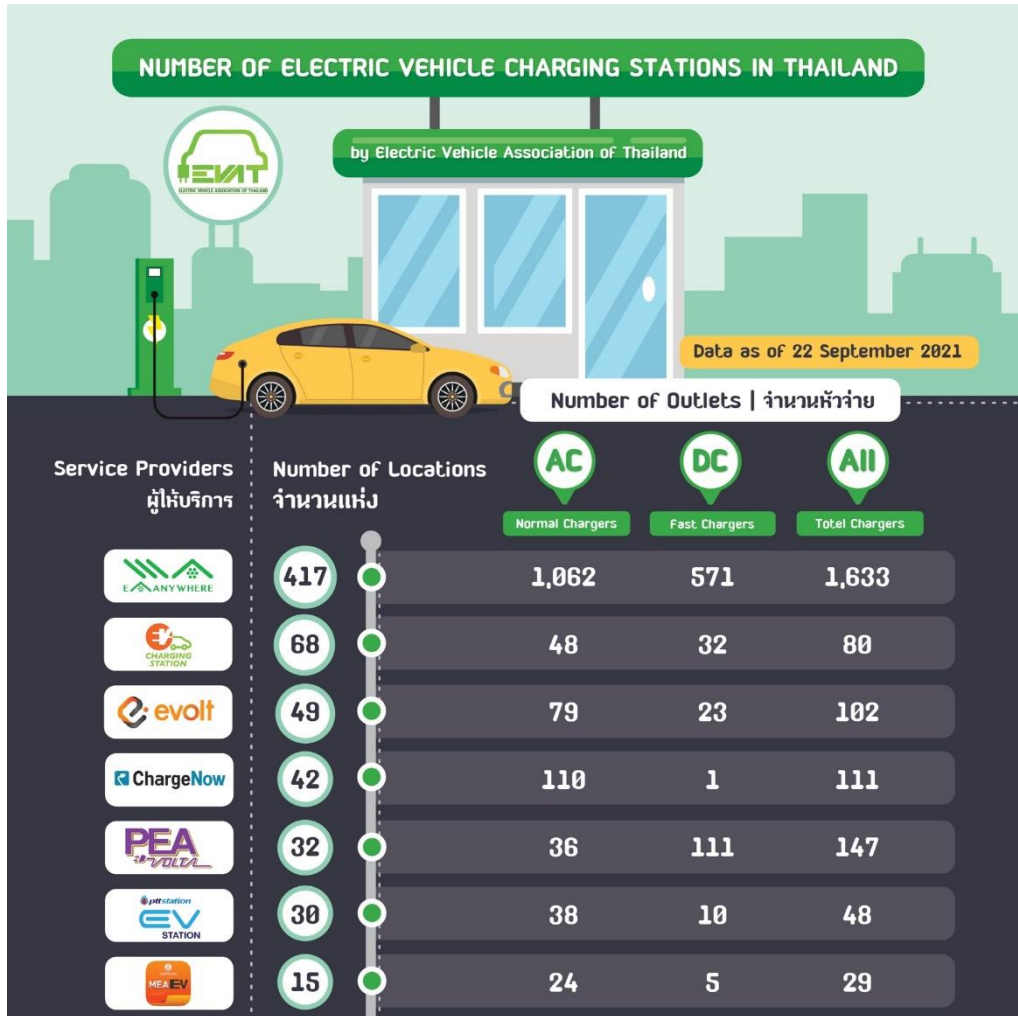
Current national EV policy and strategies in Thailand

Current EV Status in Thailand



Current national EV policy and strategies in Thailand

Number of EV Charging Stations



Current national EV policy and strategies in Thailand

National Electric Vehicle Policy Committee

Chaired by Deputy Prime Minister

Official order by office of Prime Minister on 7 Feb 2020



Latest meeting on 12 May 2021

Key Drivers

- Air Pollution Reduction
- Greenhouse Gases Reduction
- New Industry Creation

 Visions : Thailand becomes the global production and supplier hub for electric vehicles and automotive parts.

Current national EV policy and strategies in Thailand

Visions : Thailand will become the global production and supplier hub for electric vehicles and automotive parts.

Goal at 2035 : Thailand towards 100% Zero Emission Vehicle (ZEV) Sale by 2035



30@30 Target at 2030

Electric Passenger & Pickup Car

Fast Charging : 12,000 Outlets
 Annual ZEV sale : 440,000 units (50% of Total Sale)
 Annual ZEV production : 725,000 units (30% of Total Production)



Bus & Truck

Annual ZEV sale : 33,000 units (35% of Total Sale)
 Annual ZEV production : 34,000 units (50% of Total Production)

Electric Motorcycle

Swapping Station : 1,450 Stations
 Annual ZEV sale : 650,000 units (40% of Total Sale)
 Annual ZEV production : 675,000 units (30% of Total Production)



Electric Tuk Tuk

Annual ZEV sale : 2,200 units (100% of Total Sale)
 Annual ZEV production : 2,200 units (100% of Total Production)

Current national EV policy and strategies in Thailand

National Incentive Schemes

Local Production Promotion

- EV Investment Scheme by Board of Investment
- *Reduce Import Tax/ Excise Tax for vehicles and auto parts*

Infrastructure Preparation

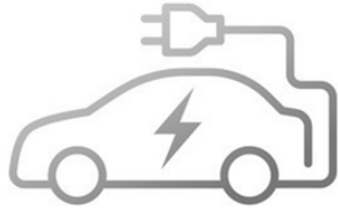
- Special electricity price for public charging operators
- *Planning public charging station locations (under planning)*

Usage Promotion

- Cheaper annual vehicle registration fee
- Government EV fleet policy
- *User subsidy*

Current national EV policy and strategies in Thailand

Local Production Promotion and User Subsidy



BEV car with price < 2.0 million THB

- Import duty reduction for CBU BEV cars up to 40% (2022-2023)
- Excise tax reduction from 8% to 2% (2022-2025)
- Monetary support at THB 70,000/unit for BEV with < 30 kWh battery and THB 150,000/unit for BEV with > 30 kWh battery (2022-2025)

BEV car with price 2.0-7.0 million THB

- Import duty reduction for CBU BEV cars up to 20% (2022-2023)
- Excise tax reduction from 8% to 2% (2022-2025).



BEV pick-up truck

- Excise tax reduction to 0% (2022-2025)
- Monetary support at THB 150,000/unit for BEV pick-up truck with > 30 kWh battery (2022-2025)



BEV motorcycle < 150,000 THB

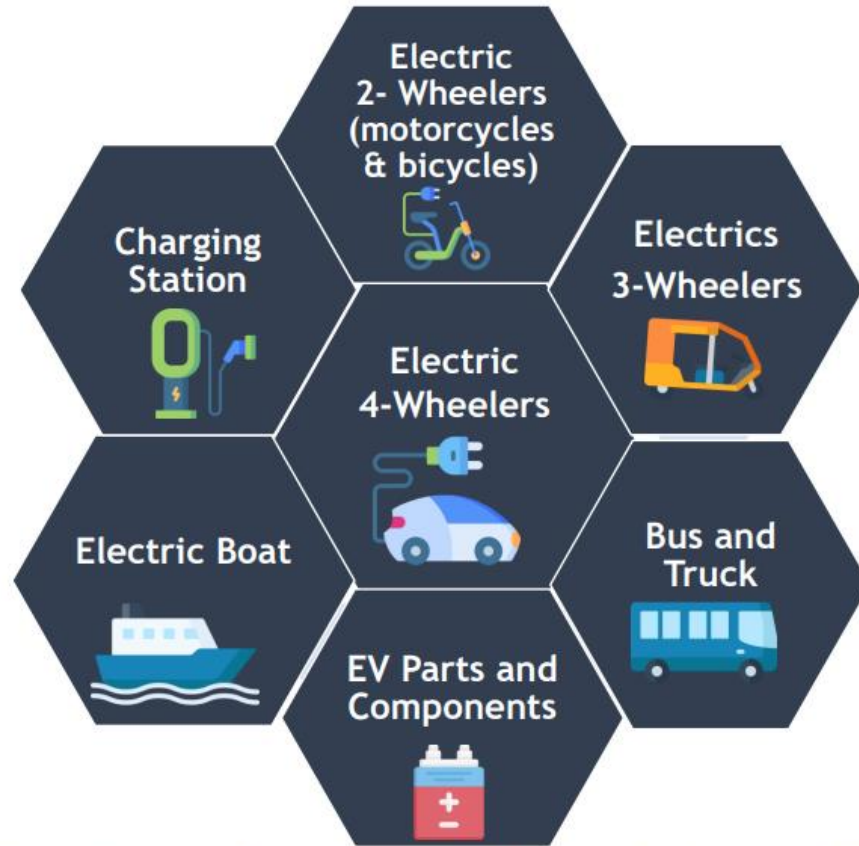
- Monetary support at THB 18,000 for BEV motorcycle, both CBU and CKD (2022-2025)

General Conditions

- Must be committed to local assembly / production of BEV.
- By 2024, locally assembly / production of BEV cars / motorcycles must be equal to CBU units which are imported during 2022-2023.
- In case of local assembly / production of BEV cars/motorcycles extension until 2025, the number of locally production must be at least 1.5x of CBU units during 2022-2023.
- For locally assembly / production of BEV, key components such as battery, PCU inverter, Traction Motor, etc. must be sourced locally.

Current national EV policy and strategies in Thailand

BOI Promotion Package for EV



BOI promotes every various types of battery electric vehicles (BEV), including BEV platforms.

3 - 11 Years of
CIT exemption

Import duty exemption for Machine

Import Duty Exemption for Raw
Material / Parts of export products

Condition: Must manufacture the vehicles and the battery within 3 years from the issuance of promotion certificate

Current national EV policy and strategies in Thailand

BOI Promotion Package for Electric Bus

<p>Conditions:</p>	<ol style="list-style-type: none"> 1. Must propose the plans in package. 2. Must manufacture battery electric bus or truck and electric battery within 3 years as from the date of promotion certificate issuance. (Machinery importing time shall not be allowed to extend, except for justified reasons.) <p>In case of domestic sale, the products must receive stipulated standards, i.e. UN R100.</p>
<p>Incentives:</p>	<p>3-Year CIT Exemption</p> <ul style="list-style-type: none"> + 1-year exemption if battery manufacture starts from the module production process within 3 years as from the promotion certificate issuance date. + 1-year exemption per part in case other key part (BMS Motor, or DCU) is additionally manufactured within 3 years as from the promotion certificate issuance date. + 1 to 3-year exemption in case of R&D. <p><u>No</u> additional exemption in case situated in the industrial area or estate</p>

Current national EV policy and strategies in Thailand

(Draft) Ministry of Transport EV Development Plan (2022 – 2037)

Roadmap to transition public transport to electric vehicle (Road Water and Rail)



MOT Transition Plan to EV					
Mode	Quantity (Veh)	Energy Reduction (ktoe/yr)	GHG Reduction (MtCO ₂ eq/yr)	2030	
				Total Energy Reduction (ktoe)	Total GHG Reduction (MtCO ₂ eq)
EV Bus	4,412	164	0.305	492	0.915
EV on Train	50	3.5	0.010	10.5	0.030
Total		167.5	0.315	502.5	0.945

Promoting Electric Technology for Bus

DLT has updated and drafted related EV regulations and registration.

DLT has approved EV bus route concession in 13 routes (BKK + province)

BMTA has a plan to replace conventional buses to EV buses (2,511 units) and, in addition, plan to announce a hired contract for EV service (1,500 units).

The Transport Co., Ltd. has a plan to replace old conventional bus to a new EV bus (401 units).

E-bus technology

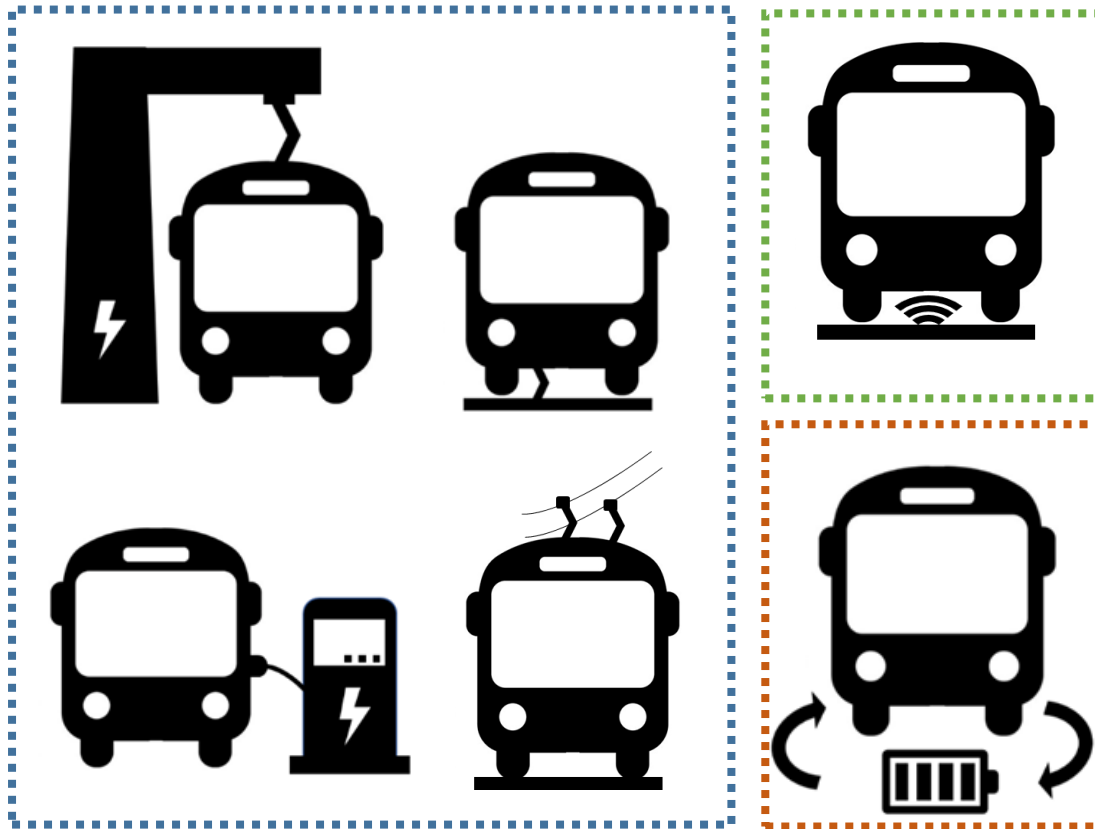
Example of Local E-Bus Companies in Thailand



Source: Public Announcement & Website

E-bus technology

E-bus and charging station technology



Conductive charging

- Pantograph charging
- Ground-based charging
- **Plug-in charging**
- Wire charging (Trolley bus)


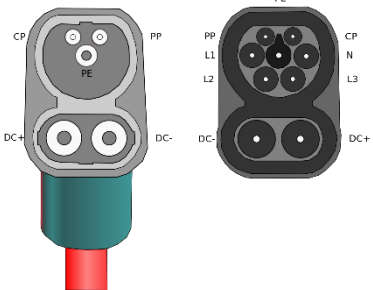
























Inductive charging

- Wireless charging

Battery swapping system



Sockets and Inlet Standard

Vehicles	AC Charger	DC Charger	Vehicles																									
Electric Bus	<p>IEC 62196-2 Configuration Type 2</p>  <p>Type 2 Female Plug Pinout: CP, PE, PP, N, L1, L2, L3</p> <p>Type 2 Male Plug Pinout: PP, PE, CP, L1, L2, L3</p>	<p>IEC 62196-3 Configuration FF</p>  <p>Rated Current: Up to 200 A Rated Voltage: ≥ 500 V DC Communication Protocol: PLC</p>	Electric Bus																									
Electric Passenger Car	<p>Phase: Single / Three Rated Current: 70A (Single phase) / 63A (Three phase) Rated Voltage: 480 V Capacity: Up to 22 kW (Mode 2) Up to 43 kW (maximum)</p>	<table border="1"> <thead> <tr> <th></th> <th>System A CHAdeMO (Japan)</th> <th>System B GB/T (PRC)</th> <th colspan="2">System C</th> </tr> <tr> <th></th> <th></th> <th></th> <th>COMBO1 (US)</th> <th>COMBO2 (DE)</th> </tr> </thead> <tbody> <tr> <td>Connector</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Vehicle Inlet</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Communication Protocol</td> <td colspan="2">CAN</td> <td colspan="2">PLC</td> </tr> </tbody> </table>		System A CHAdeMO (Japan)	System B GB/T (PRC)	System C					COMBO1 (US)	COMBO2 (DE)	Connector					Vehicle Inlet					Communication Protocol	CAN		PLC		Electric Passenger Car
	System A CHAdeMO (Japan)	System B GB/T (PRC)	System C																									
			COMBO1 (US)	COMBO2 (DE)																								
Connector																												
Vehicle Inlet																												
Communication Protocol	CAN		PLC																									

E-bus technology

Example of E-bus charging infrastructure in Thailand



- Conductive charging
- Slow/Overnight charge

E-bus technology

Public E-Bus Service



Start of Operation: 19 September 2021

Target : 500 buses (now 27 buses)

Number of routes: 10 routes

Service Areas: Bangkok Metropolitan

Operated by: Thai Smile Bus Co.Ltd.

Bus Model: MINEbus EV-X12

EV Range: 280 km

Battery Capacity : 300 kWh

Charging: DC Fast Charging 30 min

E-bus technology

Modification of Used Bus of Bangkok Mass Transit Authority as Electric Bus



Target bus: > 20-year-old bus

Battery type: LFP and NMC

Battery energy capacity: 180-207 kWh

Driving range: 80-200 km

Continuous motor power: 110-260 kW

Cost: 7-8.5M Baht (\$US 205k-250k)*

* BMTA provides the chassis of the used bus

Summary and recommendations

Summary

- From 2014-2019, Bangkok bus commuters have increased from 864,005 to 1,062,947 person-round per day. In 2021, the accumulative registration for total buses (16,209 buses) in Bangkok Metropolitan consists of 7,891 diesel buses, 6,630 CNG buses, and 118 battery-electric buses, increasing -4.2% (YoY), -7.5 % (YoY), 99.2 % (YoY), respectively.
- In 2020, Bangkok Mass Transit Authority (BMTA), the government agency of Bangkok metropolitan bus operators under the Ministry of Transport, operated the 9,099 city buses with 397 routes.
- Ministry of Transport (MOT) EV plan has set a target to replace 4,412 ICE buses with EV buses in 2027 (BMTA of 2,511 buses, Public-Private Partnership (PPP) operators with BMTA of 1,500 buses, and the transport company limited of 401 buses.

Summary and recommendations

Summary

- Thailand has focused on local EV production and usage through investment incentives, tax reduction and exemption, and monetary support to EV users.
- For electric bus, BOI has announced promotion packages, which includes a 3-year corporate income tax exemption. This package attracts local electric bus manufacturers and, potentially, help reduce electric bus price and increase local supply to match demands from bus operators.
- There are many types of charging technology available in the market such as pantograph, plug-in, and wireless charging. In Thailand, only plug-in charging was adopted due to the convenience and cost. The charge was conducted overnight and mostly planned to charge once a day.

Summary and recommendations

E-Bus Recommendations

For Standardization and Pilot Projects

- Draft and enforce standards for electric buses and their components
- Set criteria for private electric bus operator
- Support electric bus operations in pilot areas or cities

For Infrastructure

- Set competitive charging fee for electric bus fleet
- Support installation of EV chargers in the electric bus depot
- Build or refurbish bus stops and public transport hubs

For Local Electric Bus Manufacturing

- Support electric bus and part manufacturers
- Waive (temporary) import tax for battery cells to support domestic battery assemblers

Summary and recommendations

Collaborative Solutions

