Electrification of Public Transport and Mobility: Experience from Thailand

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Organized by UN ESCAP
Colombo, Sri Lanka
Contents

1. Current status of public bus in Thailand and Bangkok
2. Current national EV policy and strategies in Thailand
3. E-bus technology
4. Summary and recommendations
Current status of vehicle registration in Thailand

Source: Department of Land Transport
Current status of public bus in Thailand

Accumulative Bus Registration in Thailand by Fuel Types

**Bus Accumulative Registration (2017-2022)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Other</th>
<th>E20</th>
<th>Diesel-Electric</th>
<th>BEV</th>
<th>CNG</th>
<th>LPG</th>
<th>Diesel</th>
<th>Petrol</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>117,785</td>
<td>4909</td>
<td>4737</td>
<td>4695</td>
<td>4437</td>
<td>4133</td>
<td>104,681</td>
<td>189,736</td>
</tr>
<tr>
<td>2018</td>
<td>122,466</td>
<td>4136</td>
<td>4136</td>
<td>4010</td>
<td>3605</td>
<td>3276</td>
<td>109,762</td>
<td>189,736</td>
</tr>
<tr>
<td>2019</td>
<td>126,342</td>
<td>4010</td>
<td>5018</td>
<td>3605</td>
<td>3276</td>
<td>3334</td>
<td>109,762</td>
<td>189,736</td>
</tr>
<tr>
<td>2020</td>
<td>117,666</td>
<td>4437</td>
<td>5018</td>
<td>3605</td>
<td>3276</td>
<td>3334</td>
<td>109,762</td>
<td>189,736</td>
</tr>
<tr>
<td>2021</td>
<td>109,762</td>
<td>4133</td>
<td>5018</td>
<td>3605</td>
<td>3276</td>
<td>3334</td>
<td>109,762</td>
<td>189,736</td>
</tr>
<tr>
<td>2022</td>
<td>132,806</td>
<td>3913</td>
<td>3913</td>
<td>3913</td>
<td>3913</td>
<td>3913</td>
<td>3913</td>
<td>3913</td>
</tr>
</tbody>
</table>

**Number of Bus Registration in 2022**

- Petrol: 104,681 (79%)
- Diesel: 3913 (3%)
- LPG: 3334 (2%)
- CNG: 18,973 (14%)
- BEV: 1212 (1%)
- Diesel-Electric: 691 (1%)
- E20: 3913 (3%)

Source: Department of Land Transport
Current status of public bus in Thailand

Accumulative Bus Registration in Thailand by Service Types

Source: Department of Land Transport
Current status of public bus in Thailand

Accumulative Fixed Route Buses in Thailand by categories

<table>
<thead>
<tr>
<th>Categories of Fixed Route Buses in Thailand</th>
<th>Year</th>
<th>Number of Buses (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>City bus</td>
<td>2017</td>
<td>20,060</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>19,519</td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>18,618</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>17,035</td>
</tr>
<tr>
<td></td>
<td>2021</td>
<td>16,209</td>
</tr>
<tr>
<td></td>
<td>2022</td>
<td>15,473</td>
</tr>
<tr>
<td>Bangkok intercity bus</td>
<td>2017</td>
<td>12,188</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>9,514</td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>8,739</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>7,919</td>
</tr>
<tr>
<td></td>
<td>2021</td>
<td>7,143</td>
</tr>
<tr>
<td></td>
<td>2022</td>
<td>6,349</td>
</tr>
<tr>
<td>Provincial intercity bus</td>
<td>2017</td>
<td>34,869</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>33,592</td>
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<tr>
<td></td>
<td>2019</td>
<td>32,627</td>
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<td>2020</td>
<td>31,035</td>
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<td></td>
<td>2021</td>
<td>29,506</td>
</tr>
<tr>
<td></td>
<td>2022</td>
<td>27,606</td>
</tr>
<tr>
<td>Local bus</td>
<td>2017</td>
<td>10,317</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>9,514</td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>8,739</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>7,919</td>
</tr>
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<td></td>
<td>2021</td>
<td>7,143</td>
</tr>
<tr>
<td></td>
<td>2022</td>
<td>6,349</td>
</tr>
<tr>
<td>Others</td>
<td>2017</td>
<td>20,060</td>
</tr>
<tr>
<td></td>
<td>2018</td>
<td>19,519</td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>18,618</td>
</tr>
<tr>
<td></td>
<td>2020</td>
<td>17,035</td>
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<tr>
<td></td>
<td>2021</td>
<td>16,209</td>
</tr>
<tr>
<td></td>
<td>2022</td>
<td>15,473</td>
</tr>
</tbody>
</table>

Source: Department of Land Transport
Current status of public city bus in Thailand

Accumulative Fixed Route City Bus Registration in Thailand by Fuel Types

Source: Department of Land Transport
Current status of public city bus in Bangkok

Accumulative Fixed Route City Bus Registration in Bangkok by Fuel Types

Source: Department of Land Transport
Current status of public city bus in Bangkok

Bangkok City Bus Landscape in 2022

Accumulated Number of Fixed Route Bus (Bus Category 1) in 2022 (9,053 buses)

Bangkok Mass Transit Authority (4,652 buses)
- BMTA (2,885 buses)
- Private partners (1,767 buses)

Private Operators (4,401 buses)

Number of BMTA Passengers
- 2014: 864,005 person-round per day
- 2019: 1,062,947 person-round per day
- 2022: 586,550 person-round per day

Source: Department of Land Transport, BMTA rehabilitation plan 2020, Ministry of Transport (MOT) EV plan (2022-2037)
Current national EV policy and strategies in Thailand

Thailand Net Zero GHG Emission Pathway

Source: TGO (2023) Government Policy on Climate Actions & Decarbonization in Thailand, 30 March 2023
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

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.

Latest meeting on 12 May 2021
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 2030: 30@30 Thailand towards 30% Zero Emission Vehicle (ZEV) Production by 2030

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

xEV New Registration

New Number of xEV Registration

Between 2018-2023

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Vehicles (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>13,172</td>
</tr>
<tr>
<td>2020</td>
<td>24,484</td>
</tr>
<tr>
<td>2021</td>
<td>35,740</td>
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<tr>
<td>2022</td>
<td>64,035</td>
</tr>
<tr>
<td>2023</td>
<td>48,140</td>
</tr>
</tbody>
</table>

Between 30 June 2023

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
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</thead>
<tbody>
<tr>
<td>BEV</td>
<td>43,047</td>
</tr>
<tr>
<td>PHEV</td>
<td>6,272</td>
</tr>
<tr>
<td>HEV</td>
<td>46,140</td>
</tr>
</tbody>
</table>

Source: Electric Vehicle Association of Thailand (EVAT) with data source from the Department of Land Transport.
Current national EV policy and strategies in Thailand

xEV Accumulative Registration

Accumulated Number of xEV Registration

<table>
<thead>
<tr>
<th>Year</th>
<th>PHEV</th>
<th>BEV</th>
<th>HEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>2,854</td>
<td>153,184</td>
<td>162,081</td>
</tr>
<tr>
<td>2020</td>
<td>24,191</td>
<td>695</td>
<td>33,145</td>
</tr>
<tr>
<td>2021</td>
<td>33,145</td>
<td>359,582</td>
<td>228,081</td>
</tr>
<tr>
<td>2022</td>
<td>42,415</td>
<td>75,146</td>
<td>48,812</td>
</tr>
<tr>
<td>30 June 2023</td>
<td>359,582</td>
<td>75,146</td>
<td>306,667</td>
</tr>
</tbody>
</table>

Source: Electric Vehicle Association of Thailand (EVAT) with data source from the Department of Land Transport.
# Battery Electric Vehicles (BEV)

**BEV Models in Thailand**

- 21 Brands
- 38 Models

(As of May 2023)

*Source: Electric Vehicle Association of Thailand (EVAT)*
## Current national EV policy and strategies in Thailand

### Number of Charging Outlets and Charging Operators in Thailand

<table>
<thead>
<tr>
<th>Service Provider</th>
<th>Number of Locations (Worldwide)</th>
<th>DC</th>
<th>DC CHAN</th>
<th>AC</th>
<th>AC TYPE 2</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV</td>
<td>400</td>
<td>576</td>
<td>-</td>
<td>579</td>
<td>1,155</td>
<td></td>
</tr>
<tr>
<td>Evolt</td>
<td>252</td>
<td>390</td>
<td>78</td>
<td>320</td>
<td>788</td>
<td></td>
</tr>
<tr>
<td>Charge</td>
<td>186</td>
<td>45</td>
<td>13</td>
<td>421</td>
<td>479</td>
<td></td>
</tr>
<tr>
<td>PEA</td>
<td>184</td>
<td>56</td>
<td>1</td>
<td>489</td>
<td>546</td>
<td></td>
</tr>
<tr>
<td>Elex</td>
<td>164</td>
<td>272</td>
<td>215</td>
<td>112</td>
<td>599</td>
<td></td>
</tr>
<tr>
<td>Noodoe EV</td>
<td>84</td>
<td>98</td>
<td>5</td>
<td>165</td>
<td>268</td>
<td></td>
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<tr>
<td>SHAUP</td>
<td>59</td>
<td>-</td>
<td>-</td>
<td>132</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td>Onion</td>
<td>57</td>
<td>3</td>
<td>1</td>
<td>415</td>
<td>419</td>
<td></td>
</tr>
<tr>
<td>STATION FLUX</td>
<td>38</td>
<td>2</td>
<td>2</td>
<td>51</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>PUMP CHARGE</td>
<td>33</td>
<td>13</td>
<td>9</td>
<td>124</td>
<td>146</td>
<td></td>
</tr>
<tr>
<td>Evolt</td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Noodoe EV</td>
<td>6</td>
<td>16</td>
<td>-</td>
<td>-</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>SHAUP</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>7</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>1,482</td>
<td>1,471</td>
<td>324</td>
<td>2,833</td>
<td>4,628</td>
<td></td>
</tr>
</tbody>
</table>

**Data as of 22 May 2023**

**Source:** Electric Vehicle Association of Thailand (EVAT).
National Incentive Schemes

Usage Promotion

• Public transport policy
• Cheaper annual vehicle registration fee
• Government EV fleet policy
• User subsidy

Infrastructure Preparation

• Special electricity price for public charging operators
• Planning public charging station locations

Local Production Promotion

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

*Source: EVAT*
Current national EV policy and strategies in Thailand

MOU with Excise Department to Promote EV Production and Usage

Battery Electric Passenger Cars

8 Brands

- Great Wall Motor Co., Ltd.
- SAIC Motor – CP Co., Ltd.
- MG Sales (Thailand) Co., Ltd.
- Toyota Motor Thailand Co., Ltd.
- Green Filter Co., Ltd.
- BYD Auto (Thailand) Co., Ltd.
- MINE Mobility Corporation Co., Ltd.
- NETA Auto (Thailand) Co., Ltd.
- Mercedes-Benz Manufacturing (Thailand) Co., Ltd.

Electric Motorcycles

3 Companies

- Deco Green Energy Co., Ltd.
- H SEM Motor Co., Ltd.
- Thai Honda Co., Ltd.
Ministry of Transport EV Development Plan (2022 – 2037)

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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Quantity (Veh)</th>
<th>Energy Reduction (ktoe/yr)</th>
<th>GHG Reduction (MtCO₂eq/yr)</th>
<th>Total Energy Reduction (ktoe)</th>
<th>Total GHG Reduction (MtCO₂eq)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EV Bus</td>
<td>4,412</td>
<td>164</td>
<td>0.305</td>
<td>492</td>
<td>0.915</td>
</tr>
<tr>
<td>EV on Train</td>
<td>50</td>
<td>3.5</td>
<td>0.010</td>
<td>10.5</td>
<td>0.030</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>167.5</strong></td>
<td><strong>0.315</strong></td>
<td></td>
<td><strong>502.5</strong></td>
<td><strong>0.945</strong></td>
</tr>
</tbody>
</table>

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).

Current national EV policy and strategies in Thailand

Main Bus Operators in Thailand

**Bangkok Mass Transit Authority (BMTA)**
- In 2023, Planning 224 rental EV buses instead of contracting
- In 2024-2025, Additional 1,789 rental EV buses

**Transport company Limited (TCL)**
- In 2023
  - Purchasing 21 Large buses (travel distance within 400 km)
  - Purchasing 54 Small buses (travel distance within 300 km)

**The Plan of EV Buses (Private Company)**
- **2022**: 1,250 veh
- **2023**: 1,850 veh
- **Total**: 3,100 veh

Source: Chayatan Phromsorn (2023) Next-Gen Automotive: Acceleration Thailand as an EV Hub, 26 April 2023
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**
### Vehicles

**Electric Bus**

- **AC Charger**: IEC 62196-2 Configuration Type 2
- **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)

**DC Charger**: IEC 62196-3 Configuration FF

- **Rated Current**: Up to 200 A
- **Rated Voltage**: ≥ 500 V DC
- **Communication Protocol**: PLC

### Electric Passenger Car

- **AC Charger**: IEC 62196-2 Configuration Type 2
- **Rated Current**: 70A (Single phase) / 63A (Three phase)
- **Rated Voltage**: 480 V
- **Capacity**: Up to 22 kW (Mode 2) / Up to 43 kW (maximum)

### Sockets and Inlet Standard

<table>
<thead>
<tr>
<th>System</th>
<th>Connector</th>
<th>Vehicle Inlet</th>
<th>Communication Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>System A</td>
<td>CHAdemo (Japan)</td>
<td></td>
<td>CAN</td>
</tr>
<tr>
<td>System B</td>
<td>GB/T (PRC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>System C</td>
<td>COMBO1 (US)</td>
<td>COMBO2 (DE)</td>
<td>PLC</td>
</tr>
</tbody>
</table>
E-bus technology

Example of Local E-Bus Companies in Thailand

Source: Public Announcement & Website
Example of E-bus charging infrastructure in Thailand

- Conductive charging
- Slow/Overnight charge
E-bus technology

Public E-Bus Service

Thai Smile Bus Co.Ltd.
Start of Operation: 19 September 2021
Service Areas: Bangkok Metropolitan

Bus Model: NexPoint EV City bus 11 meter
Peak Motor Power: 260 kW
EV Range: 300 km
Battery Capacity: 300 kWh
Charging: DC Fast Charging 30 min
Price: 6.5 Million Baht

Source: Thai Smile Bus
MÜVMI is the first ride hailing of “electric tuk tuk” in Bangkok and Thailand. The first service area is located at Chulalongkon University which has expanded to several areas in Bangkok.

Source: http://www.facebook.com/muvmi
Summary and recommendations

Summary

• In 2022, 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.

• In 2022, the accumulative registration for fixed route city buses (15,473 buses) in Thailand consists of 7,408 diesel buses, 5,621 CNG buses, and 953 battery-electric buses, increasing -6.1% (YoY), -15.2% (YoY), 707.6% (YoY), respectively.

• In 2022, the accumulative registration for fixed route city buses (9,053 buses) in Bangkok consists of 2,794 diesel buses, 5,308 CNG buses, and 950 battery-electric buses, increasing -4.7% (YoY), -15.4 (YoY), 726.1% (YoY), respectively.
Summary

• 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 has adopted due to the convenience and cost. The charge is conducted overnight and mostly planned to charge once a day.

• 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.
Summary and recommendations

E-Bus Good Practice 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 (if apply)
- Support electric bus and part manufacturers
- Waive (temporary) import tax for battery cells to support domestic battery assemblers
Summary and recommendations

Collaborative Solutions

Government
- Policy
- Regulation
- Financial Support

Academic
- Research & Development
- Human Resource Development
- Public Awareness & Consumer Behavior

Start UP

Affordable Product and Service

Corporate

Community
EVAT – Electric Vehicle Association of Thailand.

Established: Nov. 2015

Goals: To promote the usage of EV in Thailand, to reduce air pollution, and to improve energy efficiency in the Transport sector.
Thank you

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E-mail: yossapong.lao@kmutt.ac.th