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

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Organized by UN ESCAP
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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)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Bus (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>20,060</td>
</tr>
<tr>
<td>2018</td>
<td>19,519</td>
</tr>
<tr>
<td>2019</td>
<td>18,618</td>
</tr>
<tr>
<td>2020</td>
<td>17,035</td>
</tr>
<tr>
<td>2021</td>
<td>16,209</td>
</tr>
</tbody>
</table>

Other | Diesel-Electric | BEV | CNG | LPG | Diesel | Petrol |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9715</td>
<td>1316</td>
<td>8597</td>
<td>7164</td>
<td>6630</td>
<td>1171</td>
<td></td>
</tr>
</tbody>
</table>

Other: 118 (0.7%), BEV: 394, 2%

Number of Bus Registration in 2021

- Petrol: 7,891, 49%
- Diesel: 6,630, 41%
- LPG: 118, 0.7%
- CNG: 394, 2%
- BEV: 118, 0.7%
- Diesel-Electric: 118, 0.7%
- Other: 118, 0.7%

Source: Department of Land Transport
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

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)

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

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

Current EV Status in Thailand

New Number of xEV Registration Between 2017–2021

<table>
<thead>
<tr>
<th>Year</th>
<th>BEV</th>
<th>PHEV</th>
<th>HEV/PHEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>165</td>
<td>325</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>325</td>
<td>2,999</td>
<td>5,781</td>
</tr>
<tr>
<td>2019</td>
<td>1,572</td>
<td>30,676</td>
<td>30,676</td>
</tr>
<tr>
<td>2020</td>
<td>7,807</td>
<td>24,464</td>
<td>35,740</td>
</tr>
</tbody>
</table>

New Number of xEV Registration in 2021

<table>
<thead>
<tr>
<th>Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEV</td>
<td>5,781</td>
</tr>
<tr>
<td>PHEV</td>
<td>7,060</td>
</tr>
<tr>
<td>HEV</td>
<td>35,740</td>
</tr>
<tr>
<td>Total</td>
<td>48,581</td>
</tr>
</tbody>
</table>

1 January – 31 Dec 2021

BEV: Battery Electric Vehicle
PHEV: Plug-in Hybrid Electric Vehicle
HEV: Hybrid Electric Vehicle
Current EV Status in Thailand

Accumulated Number of xEV Registration in 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>BEV</th>
<th>PHEV</th>
<th>HEV</th>
<th>HEV/PHEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>102,308</td>
<td>1,394</td>
<td>1,454</td>
<td>2,854</td>
</tr>
<tr>
<td>2018</td>
<td>122,631</td>
<td>153,184</td>
<td>162,081</td>
<td>196,582</td>
</tr>
</tbody>
</table>

Source: Department of Land Transport
Current national EV policy and strategies in Thailand

Number of EV Charging Stations

![Diagram showing the number of EV charging stations in Thailand by service providers as of 22 September 2021. The data is broken down by service providers and the number of outlets for DC, AC, and total chargers.]
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.
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

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
</table>
| **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 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

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

Source: BOI
Current national EV policy and strategies in Thailand

BOI Promotion Package for Electric Bus

**Conditions:**

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.)

   In case of domestic sale, the products must receive stipulated standards, i.e. UN R100.

**Incentives:**

**3-Year CIT Exemption**

+ 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.

**No** additional exemption in case situated in the industrial area or estate.
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

<table>
<thead>
<tr>
<th>Mode</th>
<th>Quantity (Veh)</th>
<th>Energy Reduction (ktoe/yr)</th>
<th>GHG Reduction (MtCO₂eq/yr)</th>
<th>2030 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>

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).

**Source**: Office of Transport and Traffic Policy and Planning (OTP).
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**
## E-bus technology

### Sockets and Inlet Standard

<table>
<thead>
<tr>
<th>Vehicles</th>
<th>AC Charger</th>
<th>DC Charger</th>
<th>Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric Bus</td>
<td>IEC 62196-2 Configuration Type 2</td>
<td>IEC 62196-3 Configuration FF</td>
<td>Electric Bus</td>
</tr>
<tr>
<td></td>
<td>Rated Current: 70A (Single phase) / 63A (Three phase)</td>
<td>Rated Voltage: 480 V</td>
<td>Rated Voltage: 480 V</td>
</tr>
<tr>
<td></td>
<td>Rated Voltage: 480 V</td>
<td>Capacity: Up to 22 kW (Mode 2)</td>
<td>Capacity: Up to 43 kW (maximum)</td>
</tr>
<tr>
<td></td>
<td>Capacity: Up to 22 kW (Mode 2)</td>
<td>Up to 43 kW (maximum)</td>
<td></td>
</tr>
</tbody>
</table>

### Thailand Industrial Standards Institute

- **Sockets and Inlet Standard**
- **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)

- **IEC 62196-3 Configuration FF**
  - **Rated Current:** Up to 200 A
  - **Rated Voltage:** ≥ 500 V DC
  - **Communication Protocol:** PLC

- **System A (CHAdeMO, Japan)**
- **System B (GB/T, PRC)**
- **System C (COMBO, US)**
- **System D (COMBO2, DE)**

<table>
<thead>
<tr>
<th>System</th>
<th>Connector</th>
<th>Vehicle Inlet</th>
<th>Communication Protocol</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td>CAN</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td>PLC</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E-bus technology

Example of E-bus charging infrastructure in Thailand

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

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

Source: Thai Smile Bus
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

Government
- Policy
- Regulation
- Financial Support

Academic
- Research & Development
- Human Resource Development

Corporate

Community
- Public Awareness & Consumer Behavior

Start UP

Affordable Product and Service

move forward for the better breath