Malaysia Low Carbon Cities Conference

Promoting Low Carbon Mobility in Malaysia through Development of Electric Mobility

Jeh Haur Chan
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Agenda

1) Electric mobility and Low carbon cities

1) International experience to initiate Electric Mobility

1) Current Electric Mobility initiatives in Malaysia

1) How should we start

1) Case study
Electric Mobility and Low Carbon
Global CO₂ emissions from transport will grow steeply; 40% from light vehicles

Fig 1: Global projected growth in annual CO₂ emissions from transportation

Fig 2: Global well-to-wheel CO₂ emissions from transportation (2020)

Source: https://theicct.org/publications/vision2050
Transport is one of the largest GHG emitting sectors in Malaysia

- Malaysia pledges/targets
  - reduce GHG emissions intensity of GDP by 45% by 2030 (relative to 2005)
  - 31% renewable energy by 2025
  - Transport is the second fastest growing sector in energy consumption.
  - Road transport = 90% of transport sector emission
  - Malaysia has one of the highest vehicle ownership in South-East Asia. Car ownership and per capita emission is comparable with developed nations
  - A holistic and integrated approach is needed for transport sectors
    - Increase adoption of energy efficient vehicles (EEVs) as a preferred mode of transport
    - Increase utilisation of public transport and non-motorised transport

Source: Carbon capture and storage in Southeast Asia (2016)
Electric cars, on average, emit 3 times less CO2 than equivalent petrol cars

Tank-to-Wheel (TTW) refers to the use of fuel in the vehicle and emissions during driving,

Well-to-Tank (WTT) from production of the energy source (petrol, diesel, electricity, natural gas) to fuel supply (transport to the charging point or fuel pump).

Well-to-Wheel (WTW) includes all emissions from WTT and TTW.

Source: https://www.gmobility.eu/
International experience to initiate Electric Mobility
### International experience overview

<table>
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<tr>
<th>Countries</th>
<th>Local Automotive industry</th>
<th>EV segment prioritised by Government</th>
<th>Clear Institutional structure exists</th>
<th>Maturity of e-Mobility development</th>
<th>Private sector participation</th>
</tr>
</thead>
</table>
| China     | • largest automotive manufacturing country and automotive market 10% of the country's GDP | • All passenger vehicle segments (2W, 3W, 4W and Buses) Government Vehicles | • State Council of the PRC and the National Development and Reform Commission responsible for industry policies and framework  
• The Ministry of Transport and The Ministry of Industry and Information Technology (MIIT) responsible for market access of manufacturers, quality and safety control of EVs | • Well ahead in terms of e-Mobility adoption and started the e-Mobility development plan in 2009.  
• Have carved the way in developing Infrastructure, mandating NEV to OEMs  
• Achieved a 100% e-Bus and taxi fleet in Shenzhen | • Private players have been working and showing interest across the EV value chain  
• Exports Li-ion battery worth $344.1 Mn, making China one of the largest exporters |
| India     | • 6.4% of country's GDP | • All passenger vehicle segments  
• Total 7,090 e-Buses are to be supported under the FAME II scheme across India | • Does not have a single Ministry responsible for driving e-Mobility.  
• Different Ministries are involved in setting up policies, standards and regulations | • The e-Mobility market is in early stage and gaining momentum in the last ~3-5 years | • Across EV value chain a number of players including Vehicle manufacturer, EVSE manufacturers, Energy Operators, etc. |
| South Korea | • 5th largest Automobile manufacturing countries in 2020.  
• 10% of country’s GDP. | • 2W, 4W, Buses, Trucks, taxi | • Does not have a single Ministry responsible for driving e-Mobility  
• Different Ministries are involved in setting up policies, standards and regulations | • In 2019, ~134 thousand EVs (across vehicle segments) were registered in South Korea | • Hyundai Motor Kona and Kia Motors Niro are amongst the top EV producers in South Korea, owing a subsidy upto 19 Mn won for producing EVs |
| Thailand  | • 10-12% of country's GDP | • 4W, Taxis and Buses | • Ministry of Energy is the National agency is responsible for EV related policy development | • The city started planning for electrification in the last 2-3 years and is early stage. In the year 2020, Thailand registered 2,854 only EVs. | • There is limited private sector participation, however, as the market matures it is expected to increase |
## Electric mobility policies comparison across countries

<table>
<thead>
<tr>
<th></th>
<th>USA</th>
<th>China</th>
<th>Norway</th>
<th>India</th>
<th>Malaysia*</th>
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</thead>
<tbody>
<tr>
<td><strong>Electric Vehicles</strong></td>
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<tr>
<td><strong>EV Targets</strong></td>
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<tr>
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<tr>
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<tr>
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<tr>
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<tr>
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<td>Special registration plates (green, series no.)</td>
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<td>Special tariffs for charging</td>
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<tr>
<td><strong>Electric Vehicle Supply Equipment (EVSE)</strong></td>
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<td><strong>EVSE Targets</strong></td>
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<td><strong>Fiscal Incentives</strong></td>
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</tbody>
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*As proposed in Low Carbon Mobility Blueprint 2021-2030
Current Electric Mobility initiatives in Malaysia
Transport policy and automotive plan include measures to accelerate implementation of electric mobility initiatives

The National Transport Policy 2019-2030
- Review Road Transport Act 1987 to support growth and the use of EEV/ EV in Malaysia
- Encourage use of different models of EEV
- Formulate and implement fuel economy policy
- Develop green index and incentives to encourage transport operators to go green

The National Automotive Plan 2020
- Outline specific measures to support the growth of electric vehicles including
  - promoting manufacturing and application of local battery and battery pack,
  - develop standards to encourage battery swapping and wireless charging, recycling and disposal of battery,
  - develop EV smart grid interoperability centre and apply well-to-wheel concept in the calculation of emission from EV
Low carbon cities master plan and mobility blueprint to support the growth of energy efficient vehicles

The National Low Carbon Cities Masterplan (NLCCMP)

- A total of 33 local and regional government has been selected as Target Cities
- Consolidate and streamline related national policies to provide clarity for cities to mainstream low carbon urban planning and development; promote awareness and institutional capacity development; provide funding and financing to facilitate low carbon development in cities.
- Develop sectoral strategies that cities need to act upon: Spatial Planning and Development, Energy, Transportation and Waste.

The National Low Carbon Mobility Blueprint 2021-2030

- Avoid-Shift-Improve strategy to decarbonise road transport sector in Malaysia
- Four focus areas
  - Vehicle Fuel Economy and Emission Improvement
  - Electric Mobility Adoption (car, bus and motorcycle)
  - Alternative Fuel Adoption
  - Mode Shift
How should we start
Why Electric Bus

Global
- Public transport reduces vehicle-km travelled
- 58% of municipal bus fleets will become electric by 2030* – the highest on-road EV adoption across any vehicle segments
- Energy consumption per person per km for bus is 3 times less than private vehicle

For a 100 km Range...

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>Battery Size</th>
<th>Energy Consumption per Person-km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorcycle</td>
<td>3-5 kWh</td>
<td>0.05 kWh</td>
</tr>
<tr>
<td>Public Bus</td>
<td>10-15 kWh</td>
<td>0.14 kWh</td>
</tr>
<tr>
<td>Private Car</td>
<td>50-60 kWh</td>
<td>0.04 kWh</td>
</tr>
</tbody>
</table>

*Source: pManifold
Development of electric bus in Malaysia

Recent initiatives
- Putra NEDO EV Bus Project (4 e-buses in Putrajaya)
- BRT Sunway Line (15 e-buses by BYD),
- Trials at University Tenaga Nasional, and planned trials with public transit operators,

Next
- Iskandar BRT system with a target start date in 2023

Low Carbon Mobility Blueprint
- Electric bus adoption
  - Government led procurement for EV bus fleet
  - Electric buses as stage buses, feeder buses, communal service by municipalities, shuttle services by company, shopping complex, hotels, etc.
  - Supporting manufacturers of local EV bus
- Mode shift
  - Shifting private to public transport
  - Promoting public transport through land use development

Development of National Electric Bus Roadmap

- Establish a roadmap for nationwide implementation of 6,000 e-buses by 2030
- In line with the National Transport Policy 2019-2030 and Low Carbon Mobility Blueprint
- Action plan for expansion of electric bus adoption
  - Propose institutional framework to facilitate the development and monitoring of business models and planning of electric bus adoption
  - Establish mechanism for implementation of strategies and enabling framework

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How can we start - An example of approach and methodology

E-Mobility Development

Work Stream 1
- Global Best practices
  - Policy
  - Tech., Business Models
  - Scale-up
- As-Is data collection
- Scenarios Modeling and To-be Projections
  - Supply side
  - Demand side
  - Chargers
- Impact (Grid, Environ, Govt. budget)

Work Stream 2
- Top-to-Bottom National EV Road Map
  - EVs
  - Targets and rationale
  - Strategy map & changes
  - Impact (Grid, Environ, Govt. budget)

Work Stream 3
- Bottom-to-Top City level EV Road Map
  - Chargers
  - Scoping of Pilot Implementation
  - Implementation Options of e-Bus fleet

Work Stream 4
- Dissemination
  - Technical Workshops
  - Final Dissemination Event
Challenges with E-buses

- Lack of systematic planning of e-bus fleet, infra, systems and operations

Source: pManifold
Systematic planning for e-buses
Case Study
Case study: Shenzhen E-bus development roadmap

- **2007**
  - City and National government started integration of several private bus operators into 3 large bus companies (namely Shenzhen Eastern Bus Company Ltd., Shenzhen Bus Group, Shenzhen Western Bus Company Ltd.)

- **2009**
  - This policy announced 50% subsidy

- **2011**
  - With extensive planning, adopted first e-Bus fleet which included 101 large e-Buses and 26 medium e-Buses

- **2012**
  - Issued Shenzhen Urban Transport White Paper with a target of 7200 e-Buses stock by 2015
  - Reduced target to 4500 due to technology immaturity

- **2015**
  - Total 4877 e-Buses were adopted.

- **2016**
  - Targeted 7700 e-Buses by end of 2016, and 100% e-Buses in three years

- **2017**
  - Targeted 100% e-Buses by end of 2017
  - Achieved 100% bus electrification with total of 16,359 e-Buses

- **2018 / 2019**
  - Providing regular training to industry professionals sharing their e-Bus experience (4-5 training sessions completed of typical 3-4 days duration)

- **2018**
  - Providing regular training to industry professionals sharing their e-Bus experience (4-5 training sessions completed of typical 3-4 days duration)
Business model for promoting e-bus adoption in Shenzhen
Happy to assist!

Jeh Chan
Technical director
Jeh.Chan@itpworld.net
+44 7383 05 4555
Elements of E-bus System

1. Route Network
2. Depot and Terminal
3. Bus stops/shelters

Source: pManifold
Charging strategy

- **When?**
  - Time of Charge:
    - Day/night
    - Peak / Off-peak
  - Charging time (fast/slow)

- **Where?**
  - On route
  - On depot/terminal

- **How?**
  - With opportunity charging
  - Without opportunity charging
  - Type of Charging
    - Charging
    - Swap

- **Costs**
  - Meet Operational requirements
    - Energy
    - Range (km/day)
  - Minimize Operational cost
    - Manpower ($/person/year)
    - Electricity cost/Tariff ($/kWh)

Source: pManifold