

Decarbonizing Road Transport to Zero-Emission

Pathways for Electric Vehicle

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Session 3: Environmental related Transportation on Decarbonization Issues

The 14th ATRANS Annual Conference

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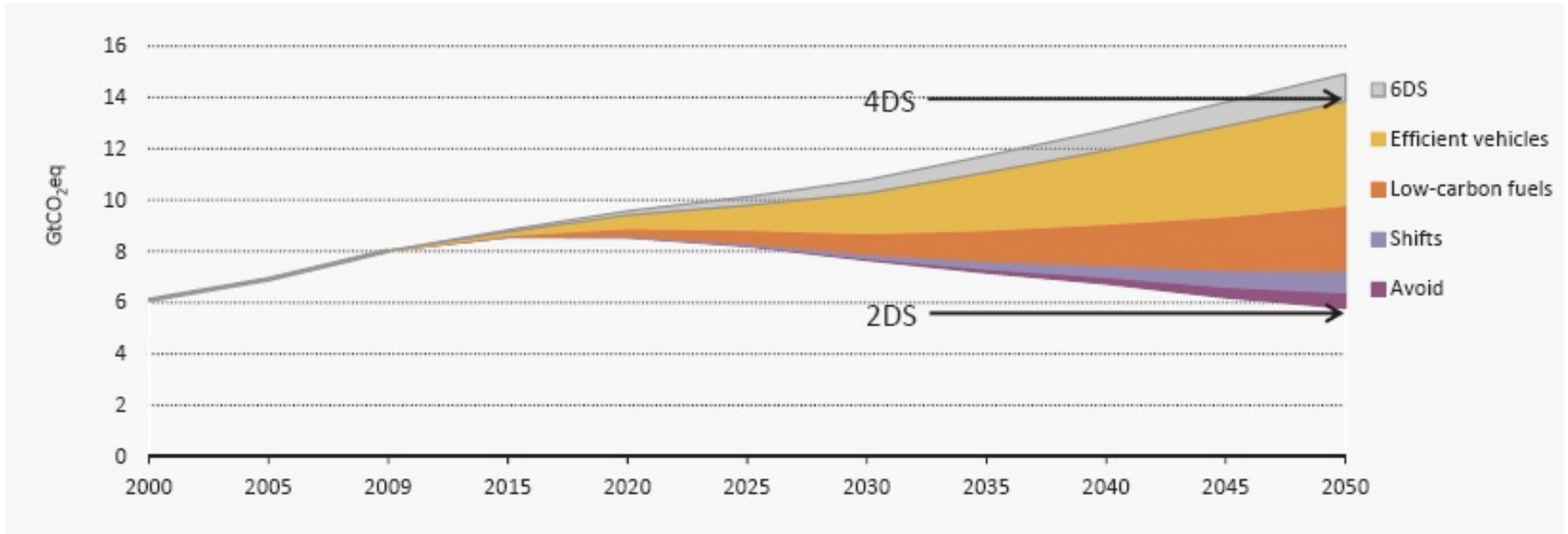
Key Drivers for Next Generation Mobility

Air Pollution and Climate Change



Key Drivers for Next Generation Mobility

2 degree scenario by International Energy Agency (IEA)



Source: IEA (2012) Energy Technology Perspective

Note: 2DS/4DS or 2°C/4°C Scenario describes an energy system consistent with an emission trajectory that recent climate science research indicates would give an 80% chance of limiting average global temperature increase to 2°C/4°C.

Key Drivers for Next Generation Mobility

Sustainable Mobility

3P toward Sustainability



Avoid-Shift-Improve

Avoid/Reduce



System
Efficiency

Shift



Travel
Efficiency

Improve



Vehicle
Efficiency

Next Generation Mobility Technology

CASE



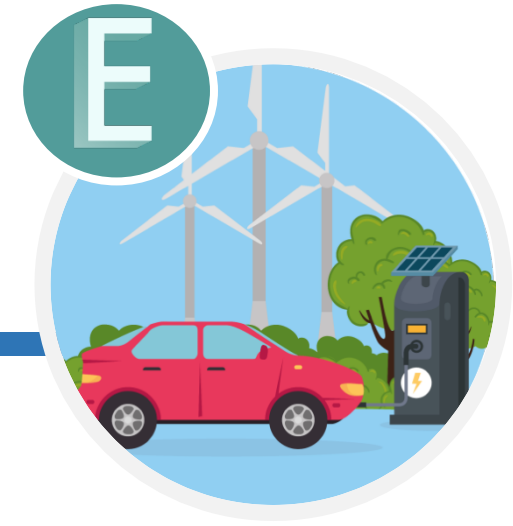
Connected Vehicle



Autonomous Vehicle



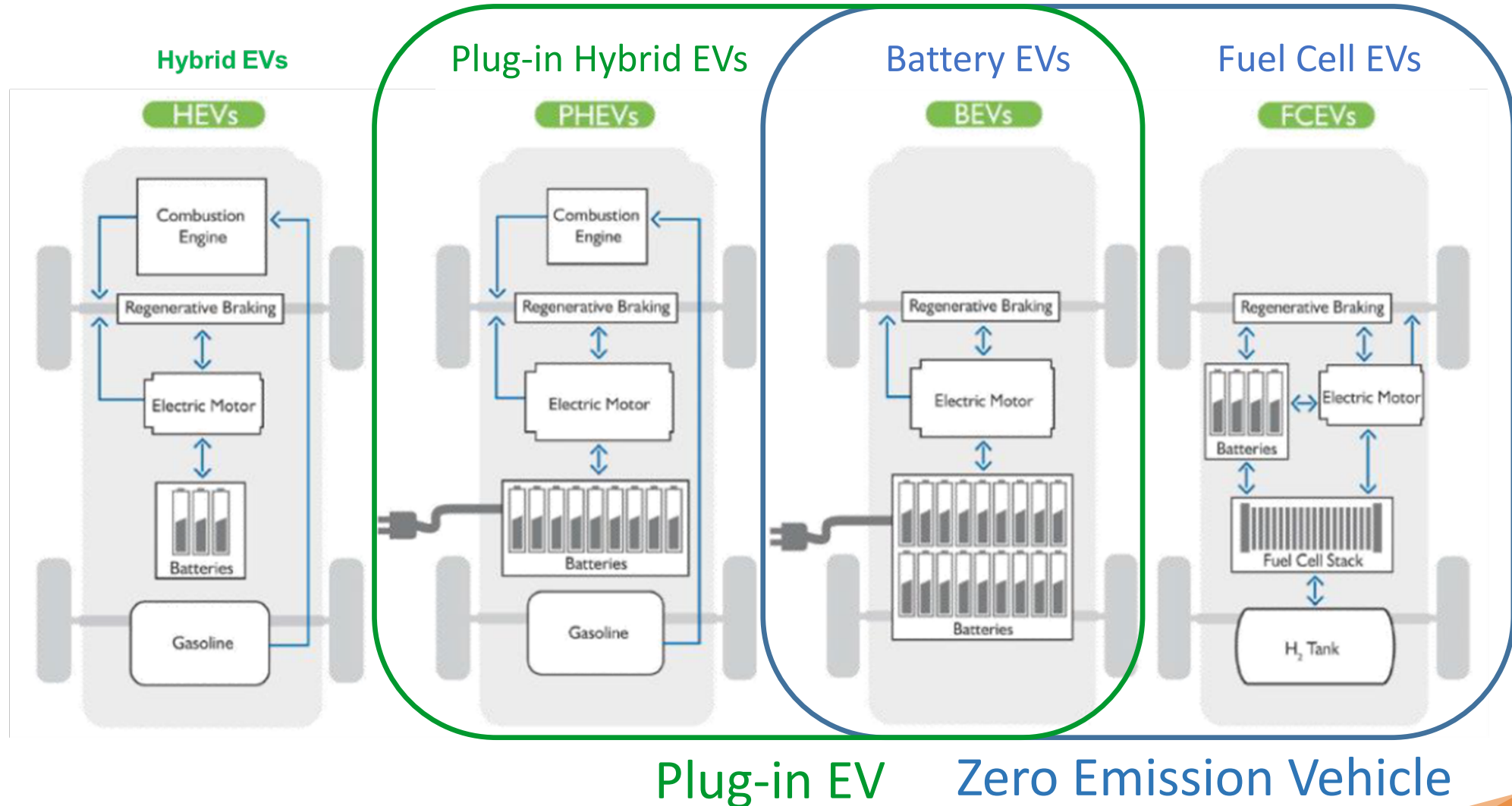
Shared Mobility



Electric Vehicle










Electric Vehicle Technology

Type of Electric Vehicles



Electric Vehicle Technology

Type of Electric Vehicles

	 BEV	 PHEV	 HEV	 ICE
 ชาร์จไฟฟ้า (Charging)	✓	✓	—	—
 มอเตอร์ (Motor)	✓	✓	✓	—
 แบตเตอรี่ (Battery)	✓	✓	✓	—
 ถังน้ำมัน (Fuel Tank)	—	✓	✓	✓
 เครื่องยนต์ (Engine)	—	✓	✓	✓

Electric Vehicle Technology

Battery Electric Vehicle

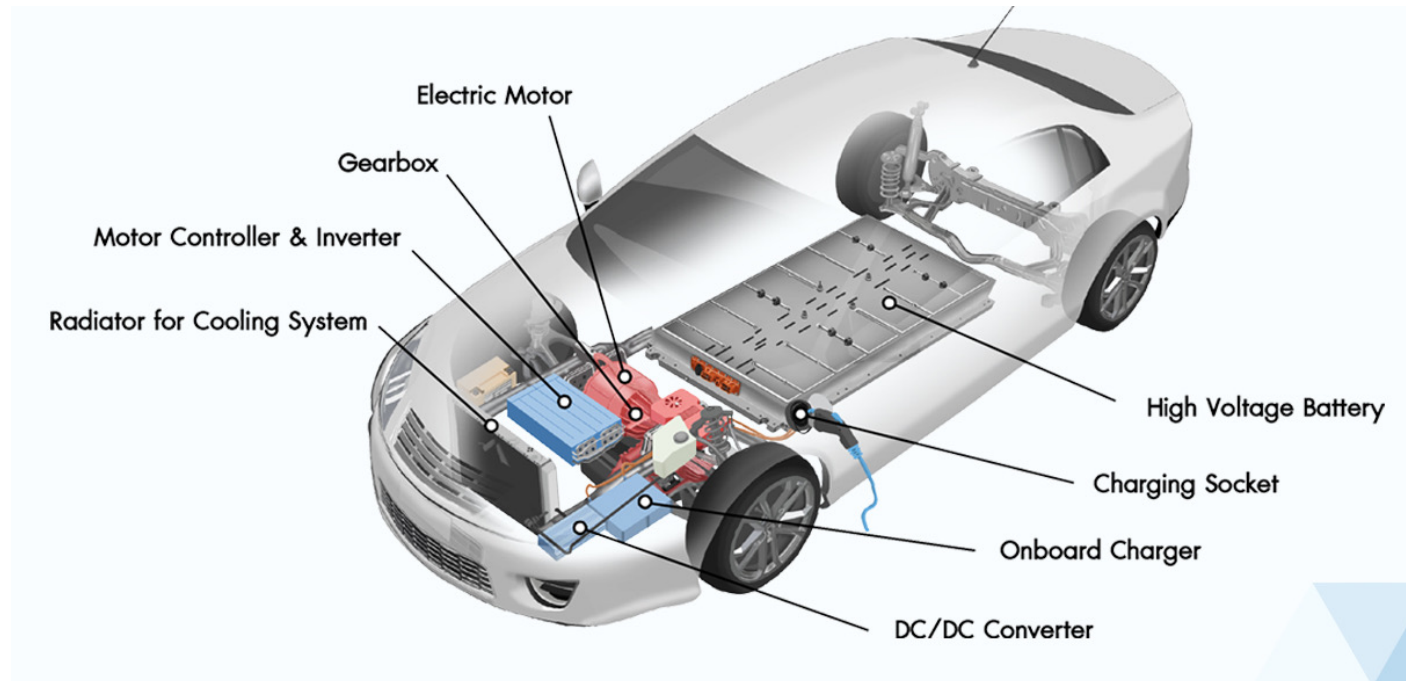
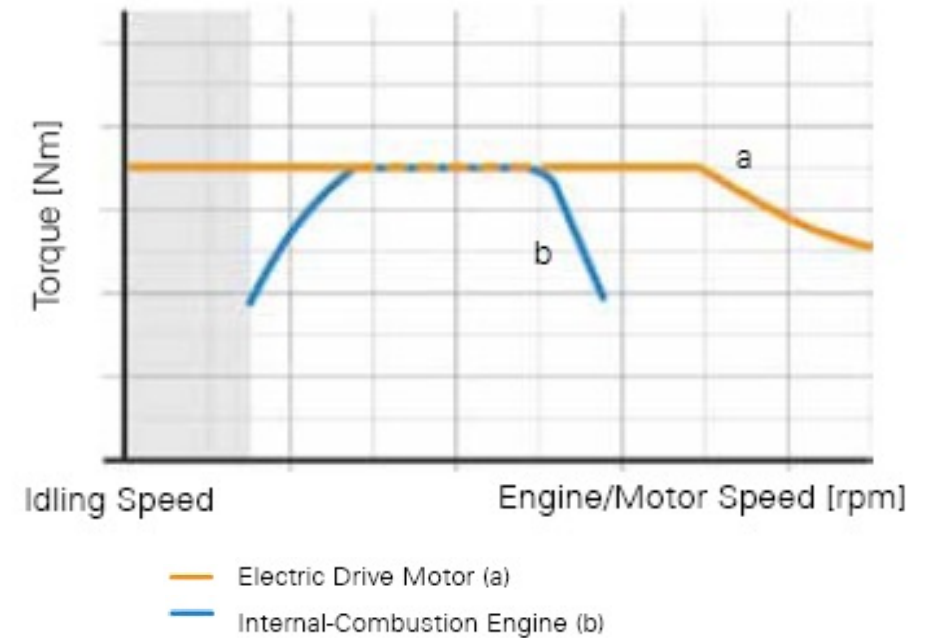


Photo Source: afdc.energy.gov

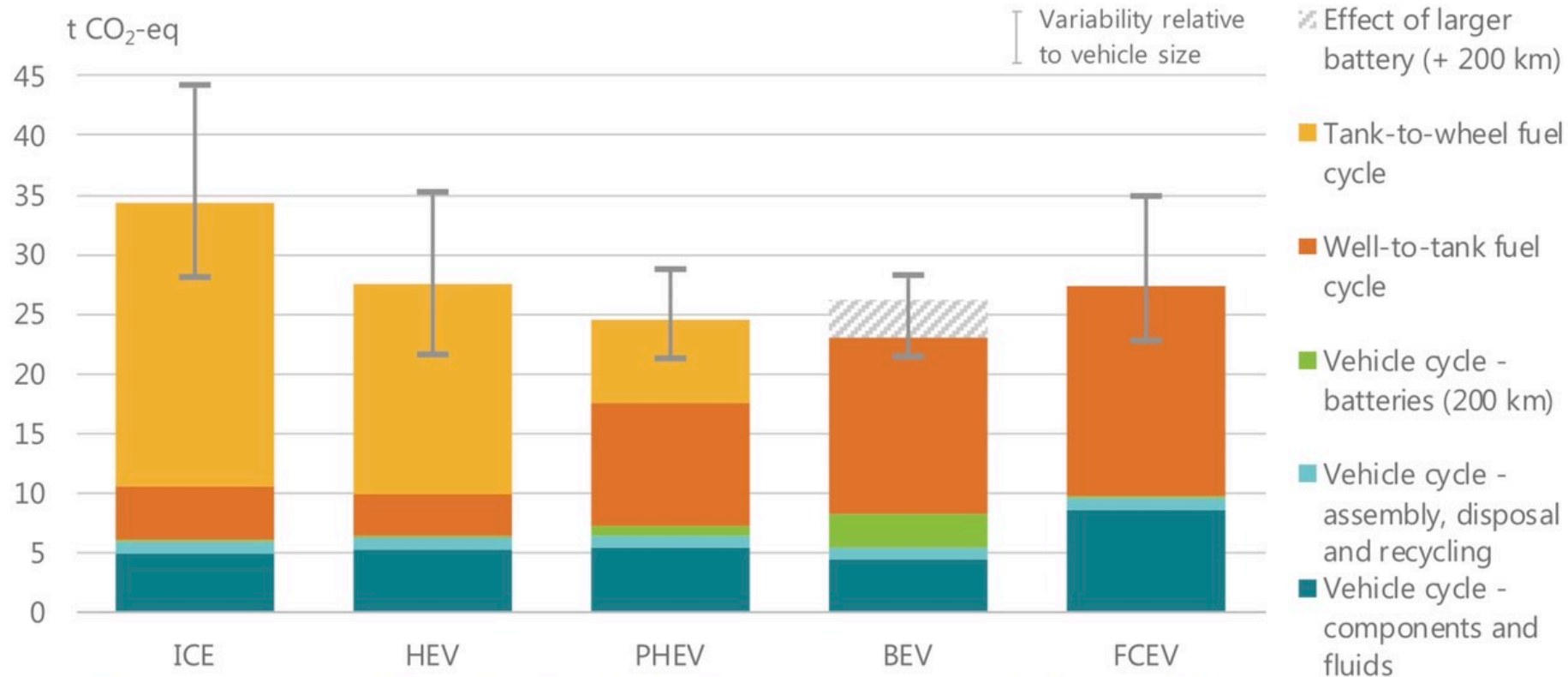


Source: NATEF-Basics of Electric Vehicles

<http://www.natef.org/>

Electric Vehicle Technology

Comparative life-cycle GHG emissions of a global average mid-size car by powertrain, 2018

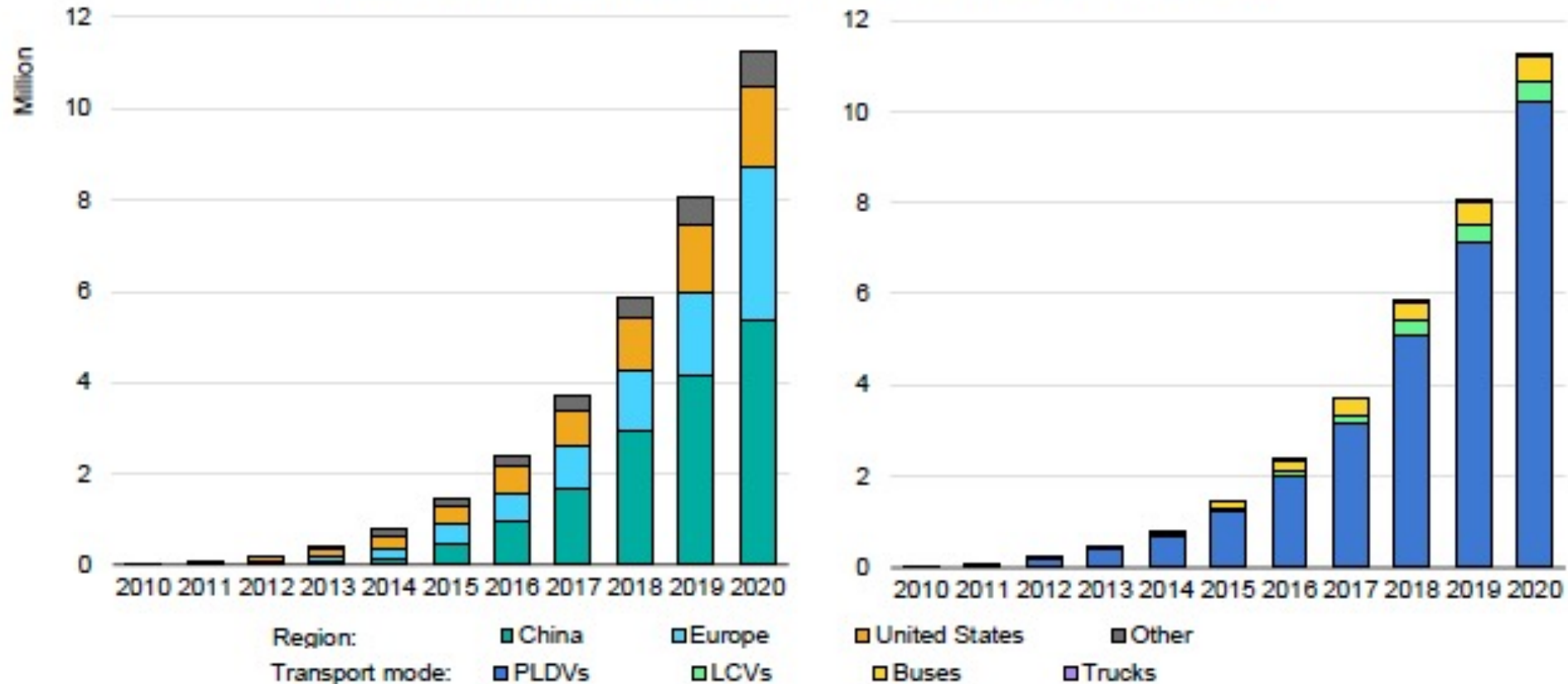


Notes: All ICE powertrains (i.e. including in the HEV and the PHEV categories) are assumed to be powered by gasoline. Vehicle assumptions: vehicle power 110 kW, battery size 38 kWh (BEV with a range of 200 km) or 10.5 kWh (PHEV with a range of 55 km); battery chemistry NMC111; annual mileage 15 000 km; vehicle lifetime ten years. (Assumptions applicable to all powertrains unless otherwise stated). Fuel economy assumptions (WLTP values): ICE - 6.8 litres of gasoline equivalent per 100 kilometres (Lge/100 km); HEV - 5.1 Lge/100 km; BEV - (200 km range) 19.0 kWh/100 km (2.1 Lge/100 km), BEV (4,00 km range) 19.4 kWh/100 km (2.1 Lge/100 km); FCEV 3.7 Lge/100 km. PHEV is a combination of ICE and BEV fuel economies, with 40% total mileage driven on gasoline and 60% on electricity (this utility factor is in line with WLTP provisions). The fuel economy of BEVs and PHEVs (for the electric powertrain) include a 5% penalty for charging losses. Power supply CO₂ intensity in the fuel cycle is 518 g CO₂-eq/kWh. This is representative of the 2018 global average and includes transmission and distribution system losses.

The hydrogen production pathway considered here is steam methane reforming from natural gas (well-to-wheel emissions intensity of 3.2 kg CO₂-eq/Lge), which is representative of the majority of current hydrogen production. The ranges suggested by the sensitivity bars represent the case of small cars (lower bound) and of large cars (upper bound) – for BEVs, the lower bound of the sensitivity bar represents a small car with a 200 km range, and the upper bound represents a large car with a 4,00 km range. All parameters relative to small and large cars are detailed in the notes to Figure 4.4. Sources: IEA analysis based on ANL (2018); IEA (2019a),(2019b).

Global Electric Vehicle Stock

Global electric vehicle stock by region (left) and transport mode (right), 2010-2020



IEA. All rights reserved.

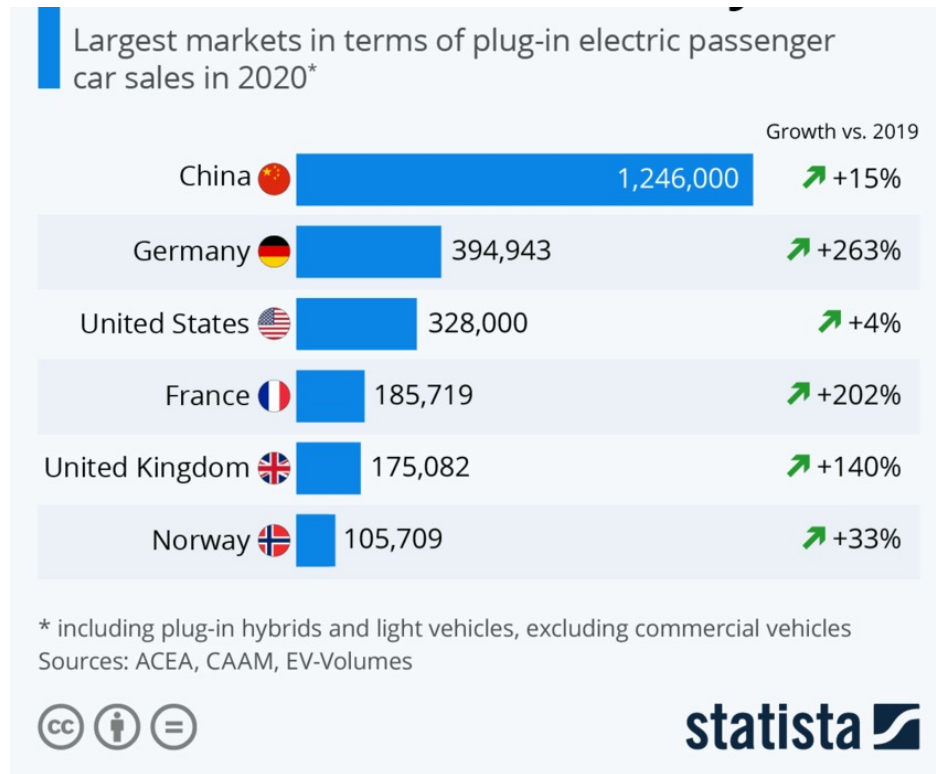
Notes: PLDVs = passenger light-duty vehicles, LCVs = light-commercial vehicles. Electric vehicles include battery electric and plug-in hybrid electric vehicles. Europe includes EU27, Norway, Iceland, Switzerland and United Kingdom. Other includes Australia, Brazil, Canada, Chile, India, Japan, Korea, Malaysia, Mexico, New Zealand, South Africa and Thailand.

Sources: IEA analysis based on country submissions, complemented by [ACEA \(2021\)](#); [CAAM \(2021\)](#); [EAFQ \(2021\)](#); [EV Volumes \(2021\)](#) and [Marklines \(2021\)](#).

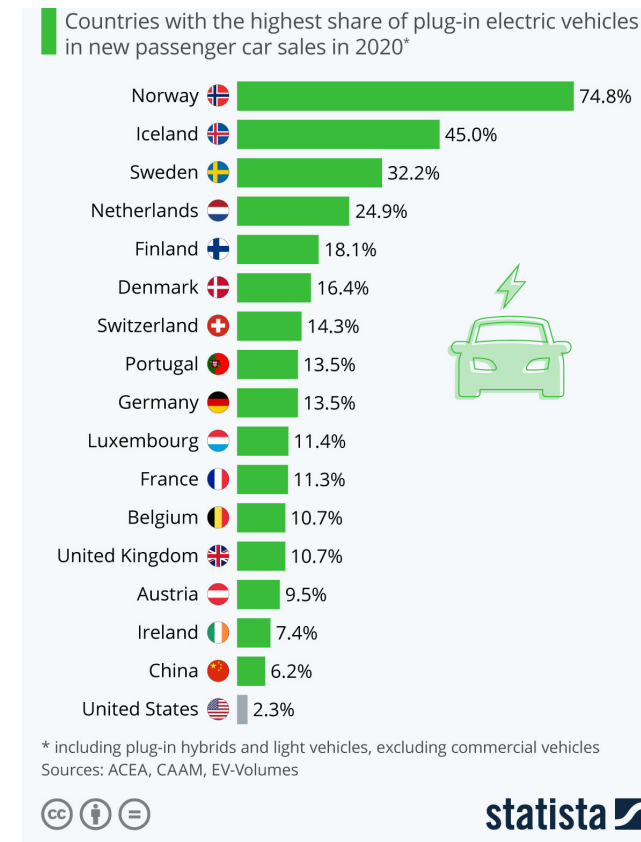
Electric Vehicle Technology

Global Electric Vehicle Markets

2020 plug-in electric passenger sales by country



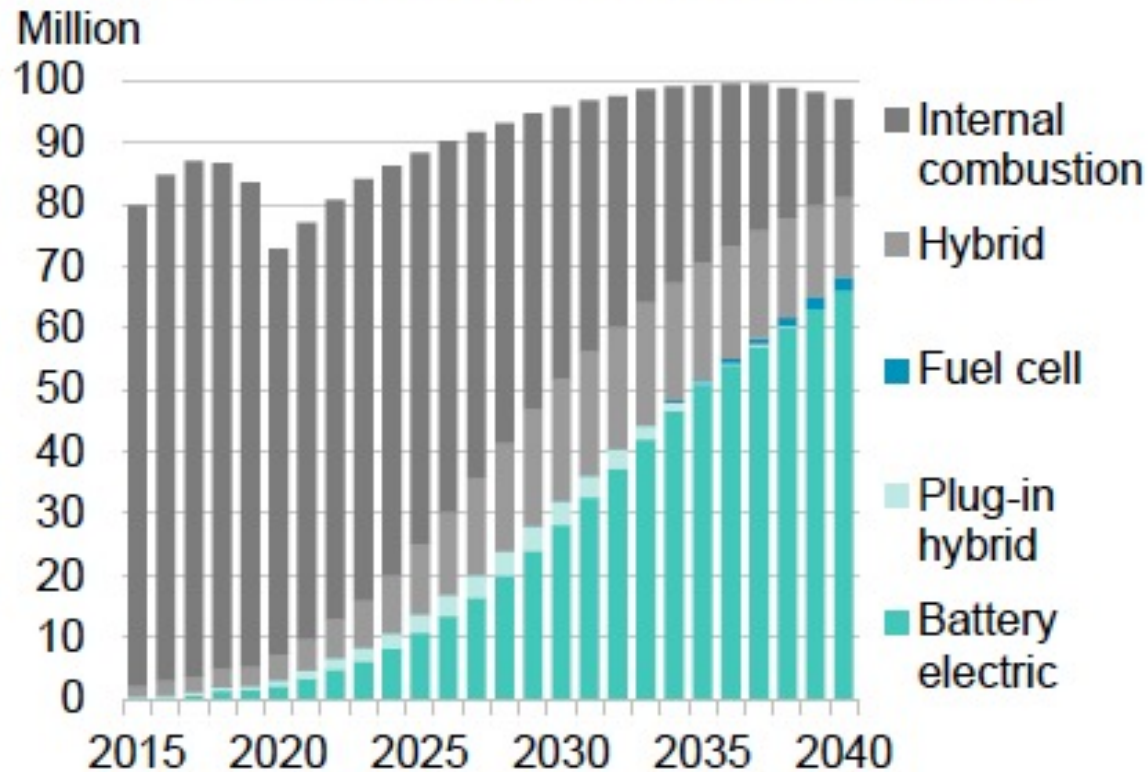
2020 share of plug-in electric passenger sales by country



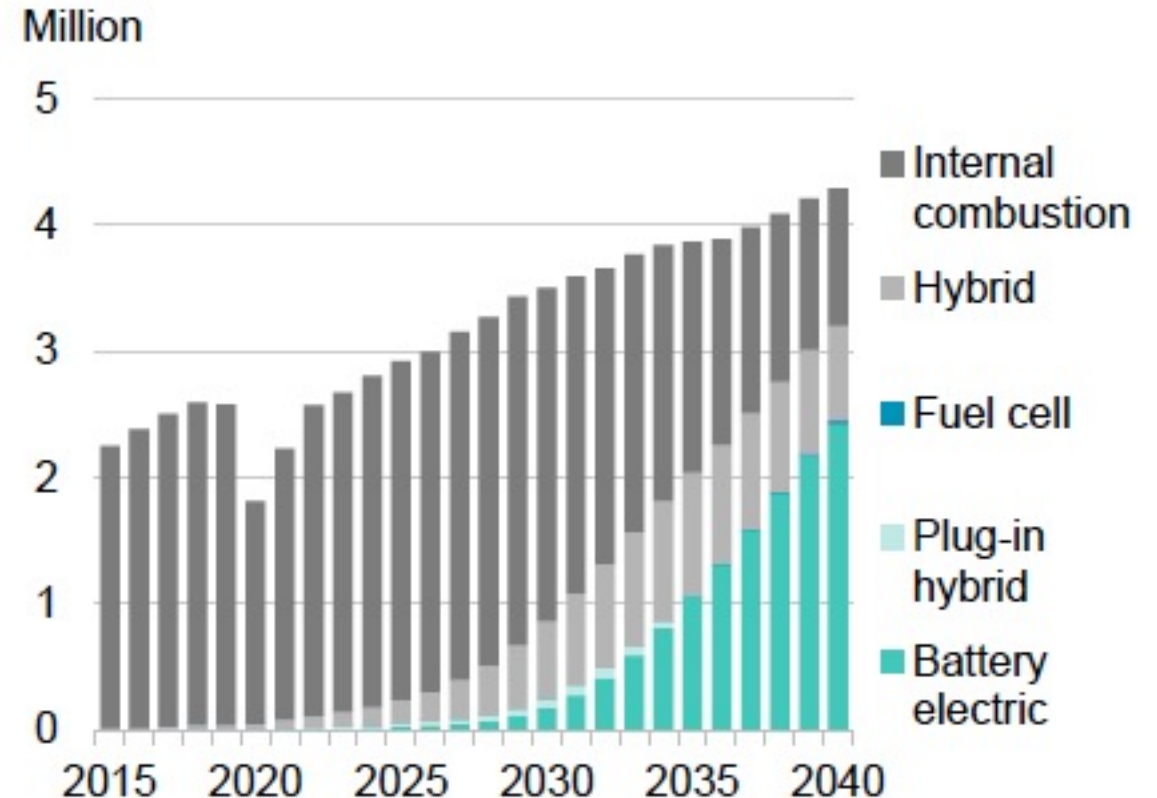
Electric Vehicle Technology

Global Electric Vehicle Markets

Global passenger vehicle sales outlook by drivetrain – Economic Transition Scenario



Southeast Asia passenger vehicle sales by drivetrain



Source:

BloombergNEF, iEVTech 2021, 14 October, Bangkok

Electric Vehicle Technology

EV & Battery Price Outlook

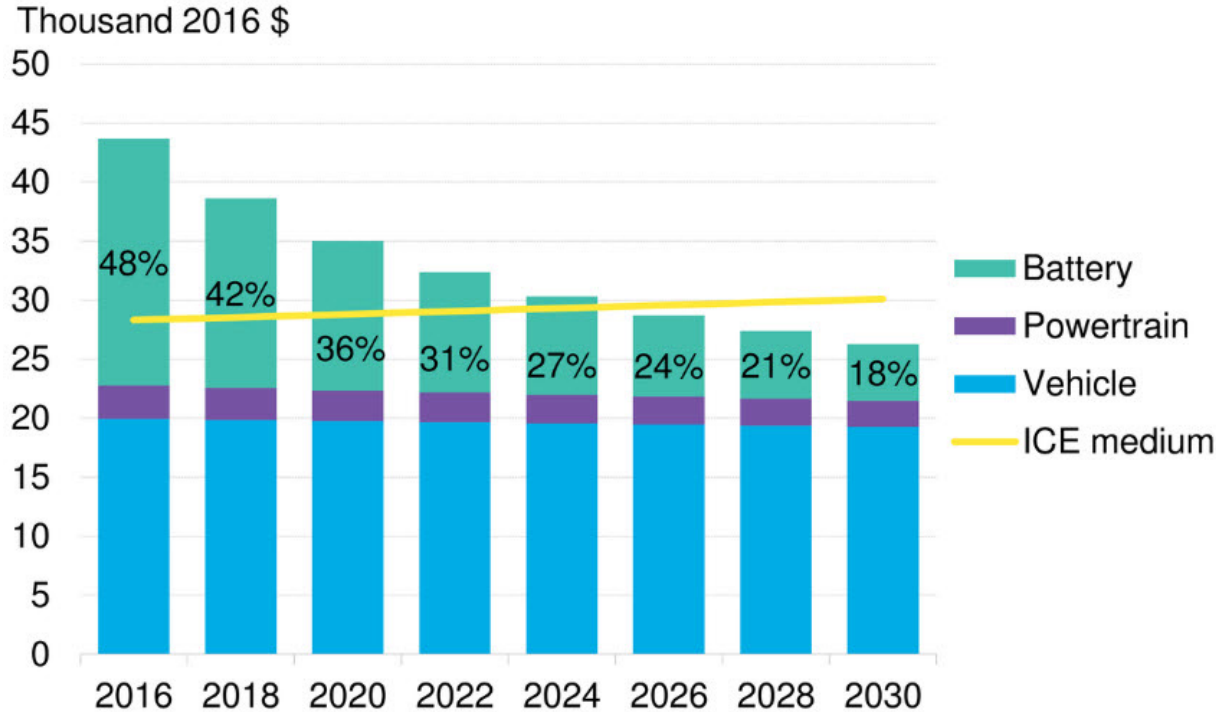
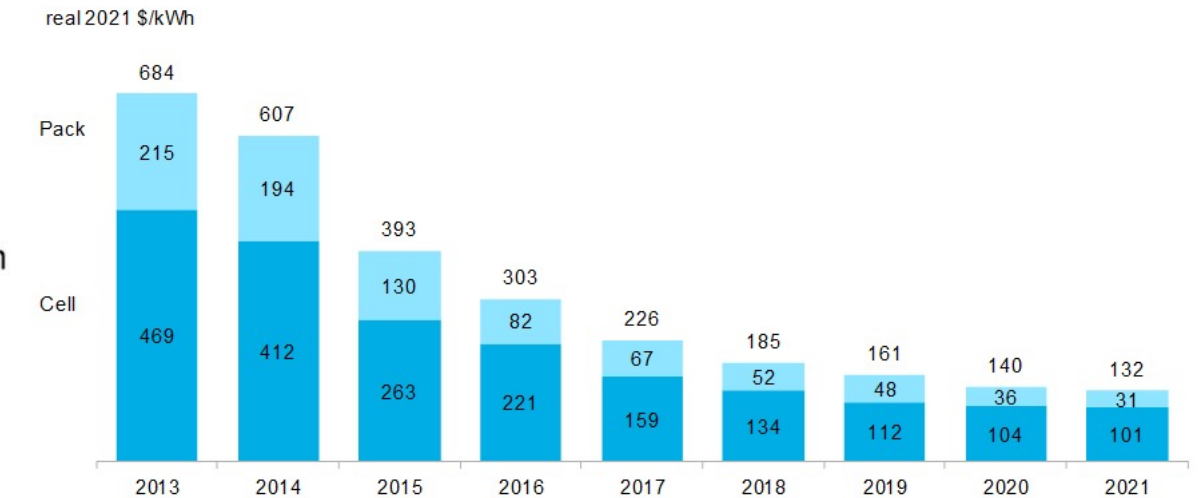


Figure 1: Volume-weighted average pack and cell price split



Source: BloombergNEF.

Source:

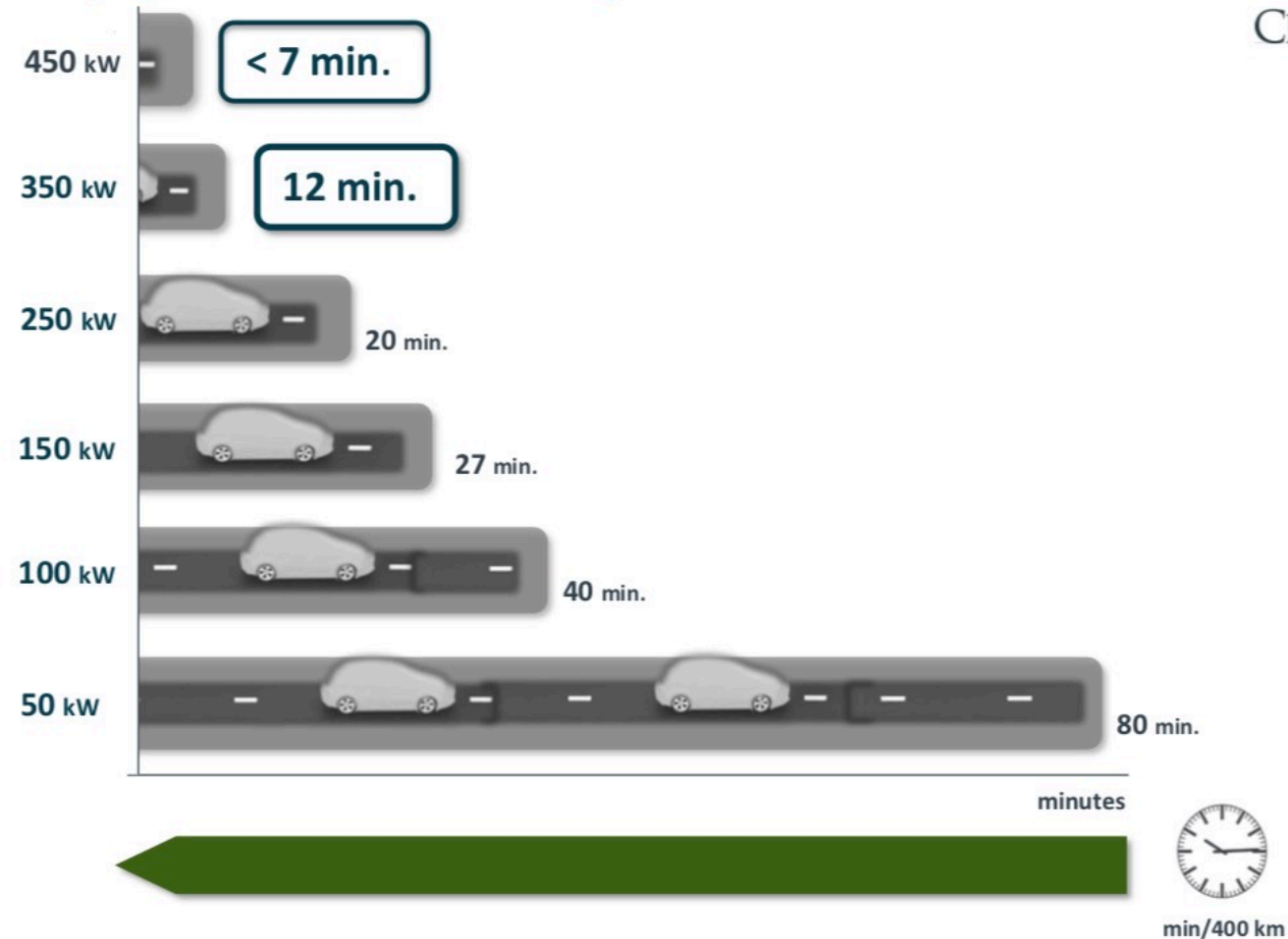
<https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/>

<https://about.bnef.com/blog/electric-cars-reach-price-parity-2025/>

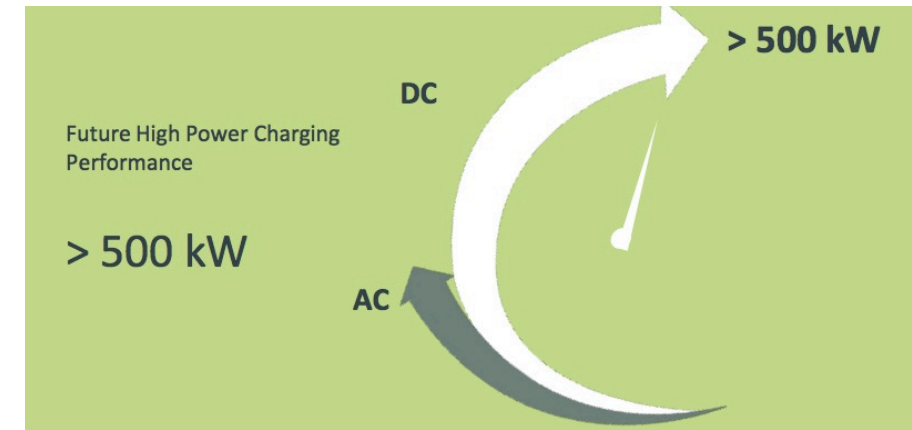
Electric Vehicle Technology

Standardization – perspectives for CSS

Charging times for about 400 km range



High Power Charging

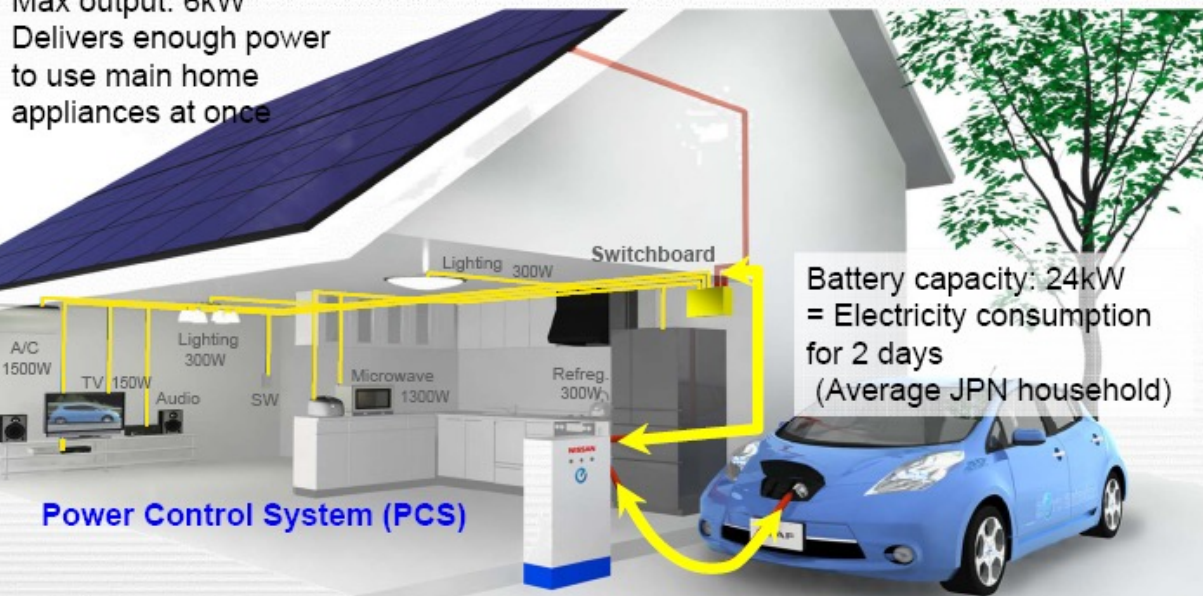


Connected EV Vehicle

Vehicle to Home (V2H) & Vehicle to Grid (V2G)

Electricity Supply System from Battery "LEAF to Home" V2H (Vehicle to Home)

Max output: 6kW
Delivers enough power
to use main home
appliances at once



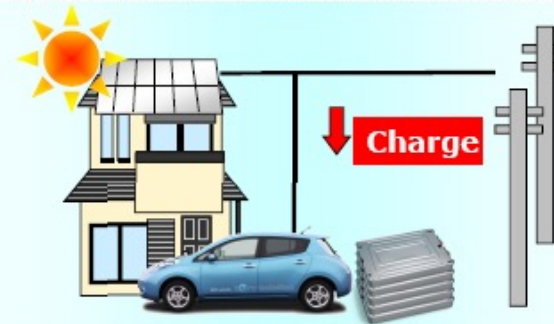
Battery capacity: 24kW
= Electricity consumption
for 2 days
(Average JPN household)

Power Control System (PCS)

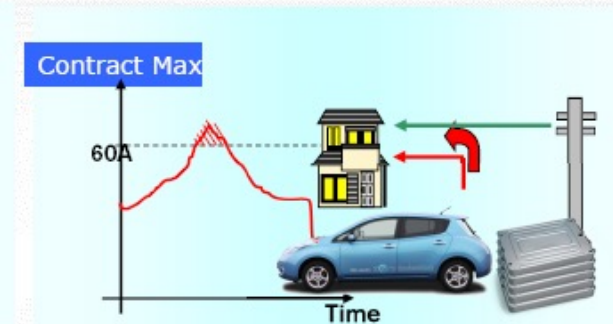
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Optimizing electricity usage (LEAF to Home)

Storage Solar Energy



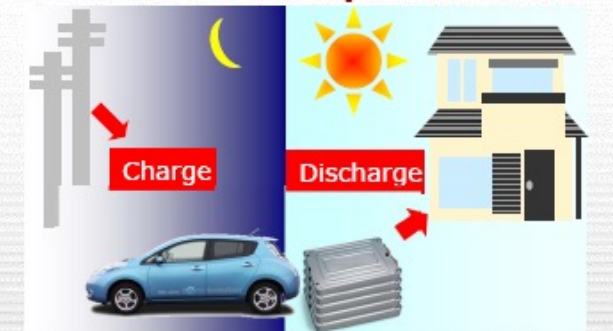
Peak-cut



Backup in black out



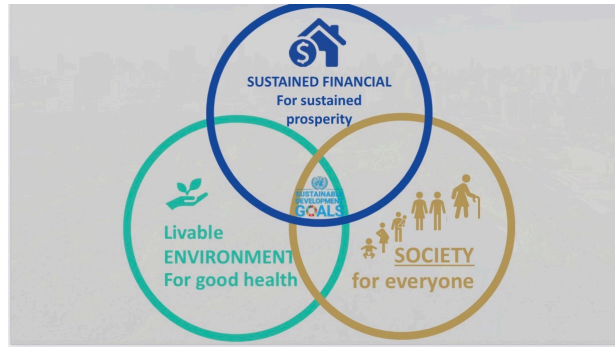
Demand Optimization



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HAUP The first EV sharing in Thailand

Hauptcar is the first service provider of “carshare” mobility platform including “electric vehicle” in Thailand to enable individuals to travel seamlessly without the hassle that comes with car-ownership.



- Economic**
 - Reduce debt: No need to buy cars
 - Efficiency: High utilization rate
- Environment**
 - Reduce waste: 1 car for 7 people
 - Clean energy: No Co2 emission from EV cars
- Equity**
 - Affordable price: Start at 99 THB/hr
 - Available anywhere: Station nationwide

ค่าใช้จ่าง่าย รถอ้อป กับ รถส่วนตัว

รถอ้อป

ค่าเช่ารถ

ชั่วโมงละ **89** บาท

วันละ **719** บาท

รถส่วนตัว

- ค่าผ่อนรถ เดือนละ **12,000** บาท
- ค่าประกันภัยชั้น 1 ปีละ **20,000** บาท
- ค่าพรบ. ภาษี ปีละ **2,500** บาท
- ถ่ายน้ำมันเครื่อง ครั้งละ **2,500** บาท
- เปลี่ยนยางรถยนต์ ครั้งละ **10,000** บาท
- ยังไม่รวมค่าบำรุงรักษาอื่นๆ



Access to variety of cars 24/7



Reduce parking congestion

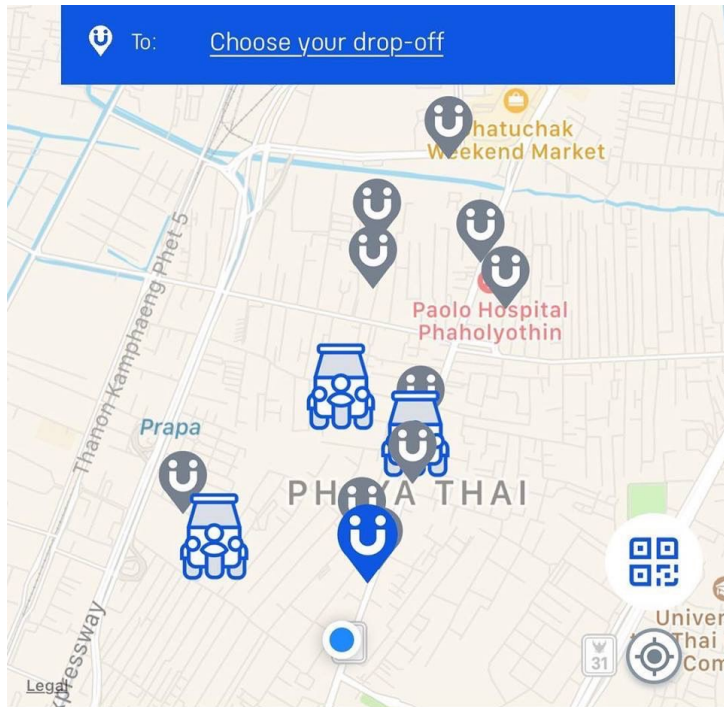
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Slow down car-ownership

müvmi e-Tuk Tuk on Demand

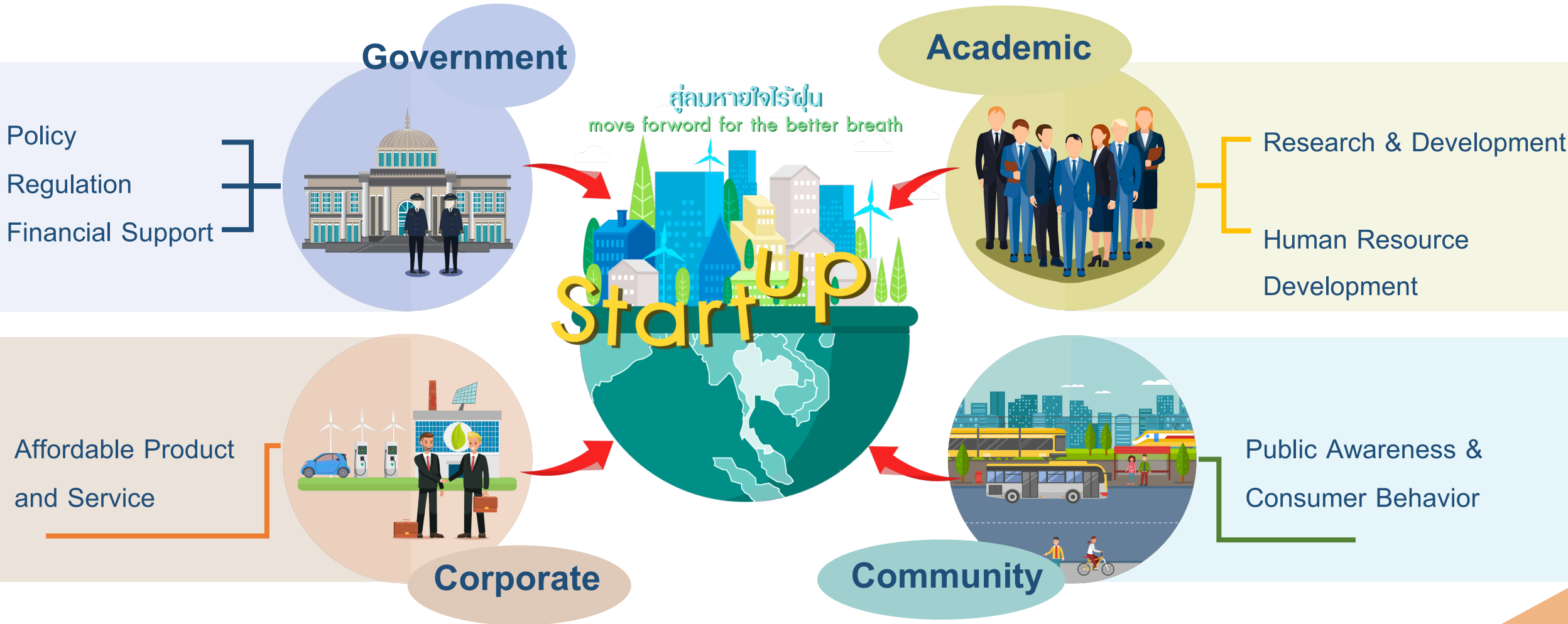


MÜVMI is the first ride hailing of “electric tuk tuk” in Bangkok and Thailand. The first service area is located at Chulalongkon University which now expand to several area in Bangkok.



Source: <http://www.facebook.com/muvmi>

Collaborative Solutions



Thank you

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