การพัฒนาเทคโนโลยีที่เกี่ยวกับ EV ในปัจจุบันและการต่อยอดในอนาคต

ดร. นุวงศ์ ชลคุป
ผู้อำนวยการกลุ่มวิจัยพลังงานคาร์บอนต่ำ ศูนย์เทคโนโลยีพลังงานแห่งชาติ (ENTEC)
กรรมการ สมาคมยานยนต์ไฟฟ้าไทย (EVAT)
nuwong.cho@entec.or.th

Tokyo-Thailand the Business Connecting 2024

Carlton Hotel Bangkok Sukhumvit

21 February 2024 (12:00 - 19:00)

Outline

- Introduction of ENTEC / EVAT
- Global Trend Affecting Domestic EV
- EV Technology
- Example from NSTDA Startup
- Q & A

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National Energy Technology Center (ENTEC)

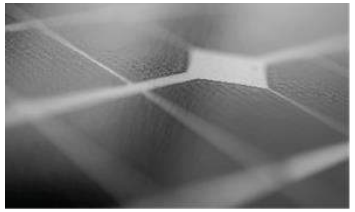
The New Member of NSTDA

National Energy Technology Center (ENTEC) was formally established on June 9, 2020
when it was approved by the Thai Cabinet.
It becomes the fifth national center under the National Science and Technology Development Agency (NSTDA).

https://www.entec.or.th/aboutus/vision-and-mission/

National Energy Technology Center (ENTEC)

Research and Development



Solar (PV, Thermal), Bioenergy, Wind, Artificial photosynthesis, perovskite solar cell, Hybrid tandem PV, Digital PV

Renewable Energy

High energy density & low cost battery (Li-ion and beyond) Supercap. H2 storage/fuel cell

Energy Storage

Oil, Natural Gas, Coal

Conventional Energy

RE integrationDistributed energy system, Flexible grid, Smart/Microgrid Blockchain, IoT

System Integration & Energy Management

Thermal, Electrical Zero energy bldg./ factory [Transport | Power | Industry | Household | Agriculture]

Energy Efficiency

Energy Policy/Resilience

https://www.entec.or.th/rd/

EVAT – Electric Vehicle Association of Thailand

Established:	Nov. 2015
Goal:	Promote the usage of EV in Thailand • Reduce air pollution • Improve energy efficiency in the Transport sector
Supports:	Industrial Manufacturing, R&D on EV technologies

EVAT Membership

Corporate Member

256
Members

Individual Member

114
Members

Updated October 2023

Asian Federation of Electric Vehicle Associations (AFEVA) Overview

Main Activities

- Encourage and facilitate the exchange of information.
- Promote the transfer of new technology.
- Collaborate and cooperate with other international bodies.
- Collectively represent industry players' views to the government.
- Support regulatory alignment on EV standards.
- Foster cooperation by forging possible joint ventures.
- Help EV industry players in ASEAN to explore market opportunities.
- Carry out training, education and publicity programs.
- Act as a source of relevant information.

MOA to Establish AFEVA Signing Ceremony
1st ASEAN EV & Hybrid Summit 2017
Manila, The Philippines

MOU Signing Ceremony
iEVTech 2019, Bangkok, Thailand

Note: AFEVA is non-profit organization under the process of registration in the Securities and Exchange Commission, the Philippines.

EVAT's Signature Events

19-21 May 2023

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Thailand: SDG (COP21) → Carbon Neutrality (COP26)

Statement by PM

at COP26

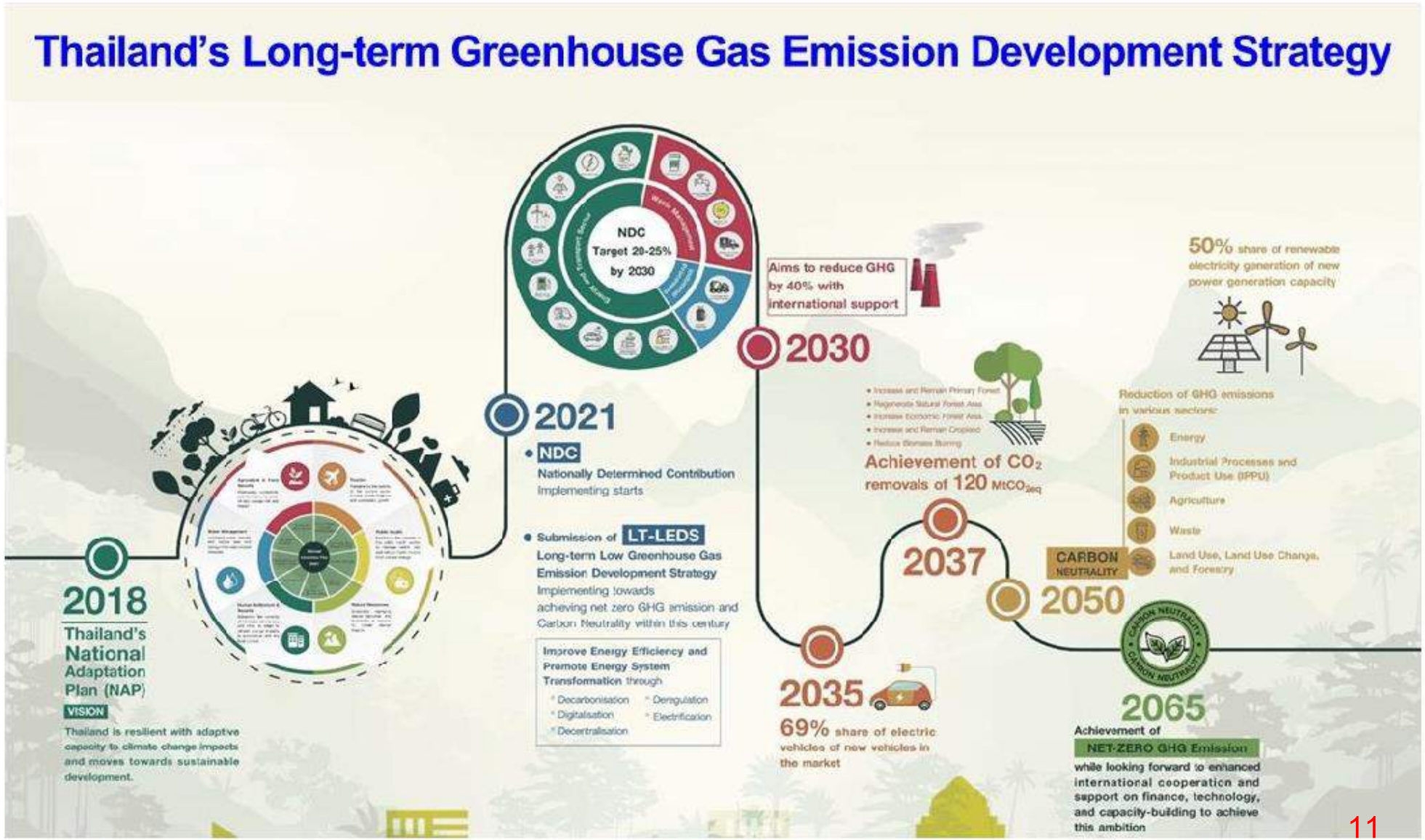
in Glasgow, Scotland

1 November 2021

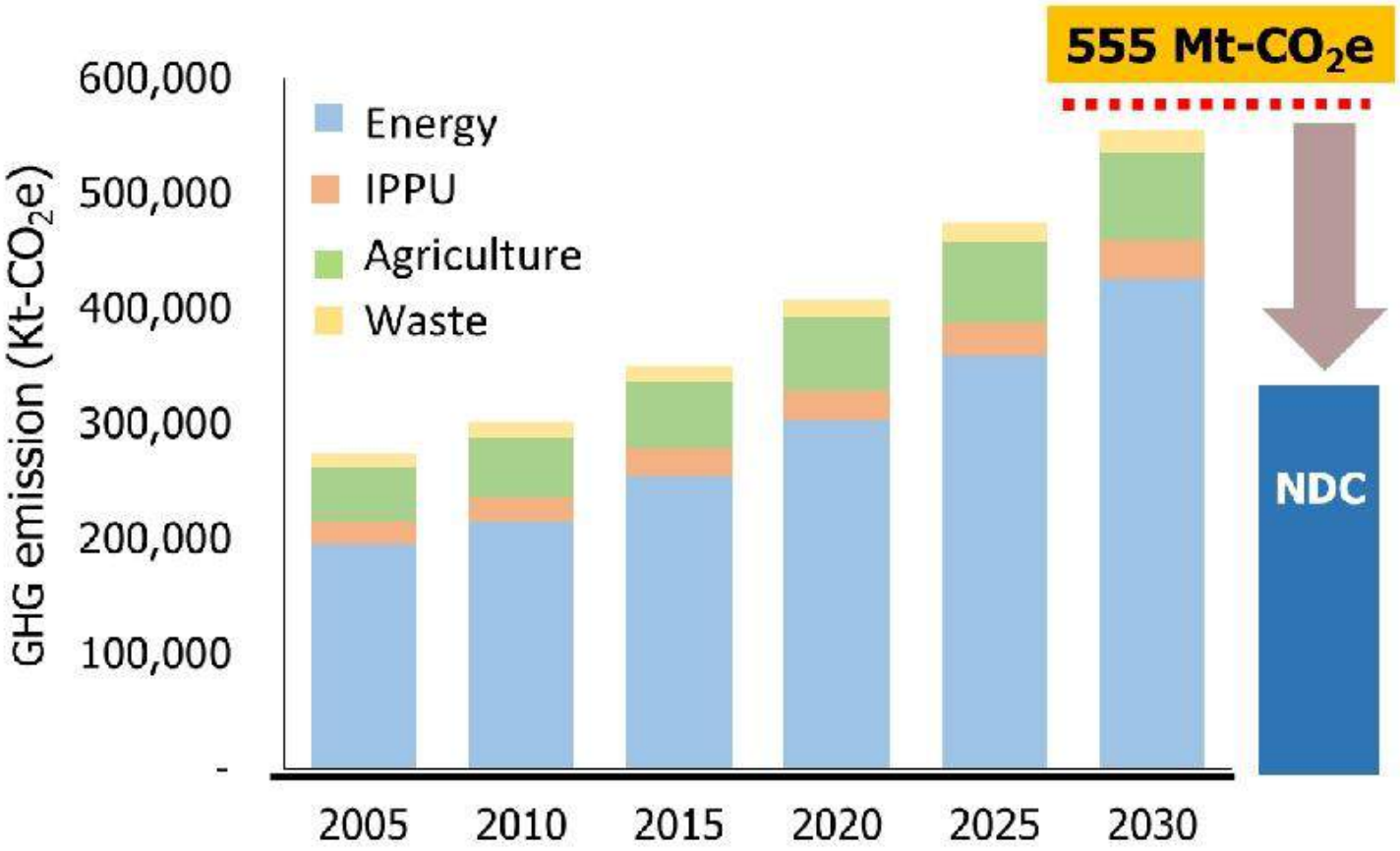
2030 : NDC 40%

2050 : Carbon Neutrality

2065 : Net Zero Emission



Thailand's Nationally Determined Contribution (NDC)



At 2030
Reduce GHG emission
222 Mt-CO_2e

Equal to
40 % Reduction*

Action Plan for NDC (Potential)

Energy +Transport
216 $MtCO_2eq$

Agriculture
2.6 MtCO2eq

IPPU
1.1 $MtCO_2eq$

Waste
2.6 $MtCO_2eq$

Remark : with international support

National Energy Plan

On 4th August 2021 : NEPC considered and approved national energy plan framework. The goal is to support Thailand *moving towards clean energy and reduce carbon emissions to net zero.*

แผนพลังงานชาติ
National Energy Plan

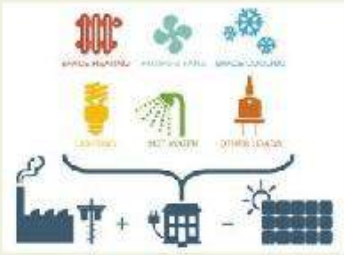
EPPO is preparing the details of the National Energy Plan, in line with Carbon Neutrality.

Policy Direction to National Energy Plan

1 **RE >50% w ESS**

2 **EV 30@30**

3 **EE >30%**



4 **4D1E**

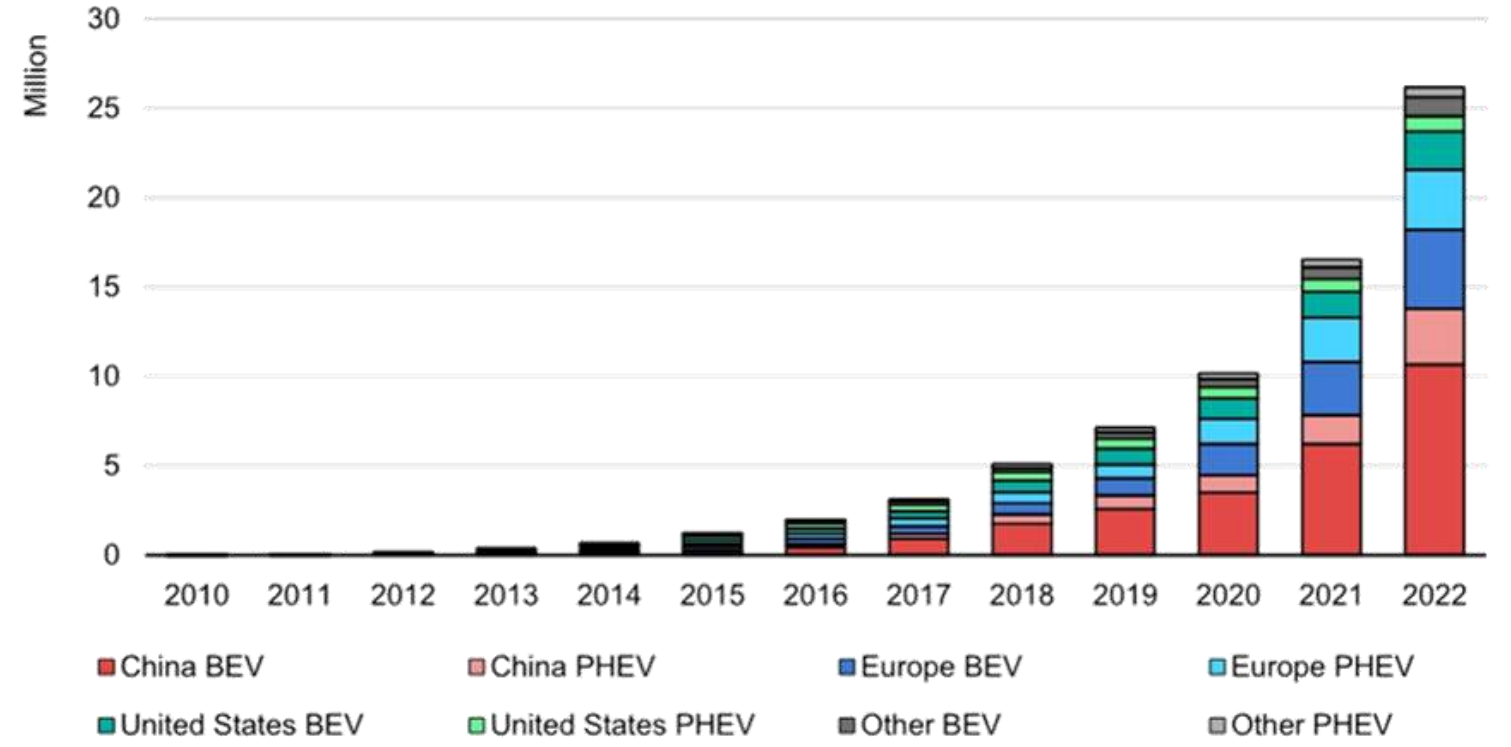
- DIGITALIZATION
- DECARBONIZATION
- ELECTRIFICATION
- DECENTRALIZATION
- DE-REGULATION

Carbon Neutrality

in the year 2050

Global PHEV & BEV stock

Figure 1.1 Global electric car stock in selected regions, 2010-2022



Notes: BEV = battery electric vehicle; PHEV = plug-in hybrid electric vehicle. Electric car stock in this figure refers to passenger light-duty vehicles. In "Europe", European Union countries, Norway, and the United Kingdom account for over 95% of the EV stock in 2022; the total also includes Iceland, Israel, Switzerland and Türkiye. Main markets in "Other" include Australia, Brazil, Canada, Chile, Mexico, India, Indonesia, Japan, Malaysia, New Zealand, South Africa, Korea and Thailand.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Source : IEA Global EV Outlook (2023)

BEV Models in Thailand

Lowest price: 325,000 Baht
Highest price: 12,000,000 Baht

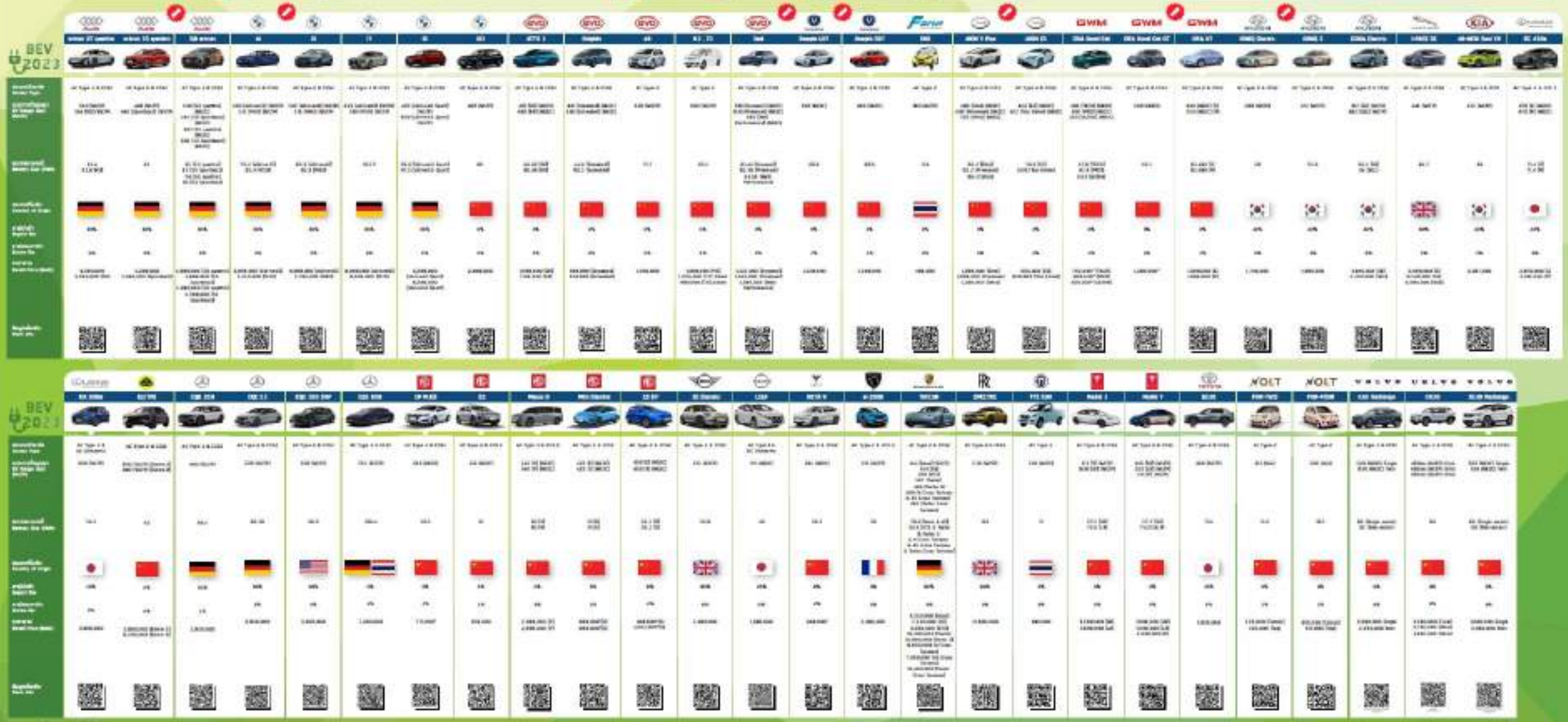
= 27 = 10 = 4 = 4 = 3 = 2 = 1 = 1 = 1

2023 Electric Vehicle Association of Thailand

สรุปรุ่นรถยนต์ไฟฟ้า BEV ที่มีจำหน่ายในประเทศไทย

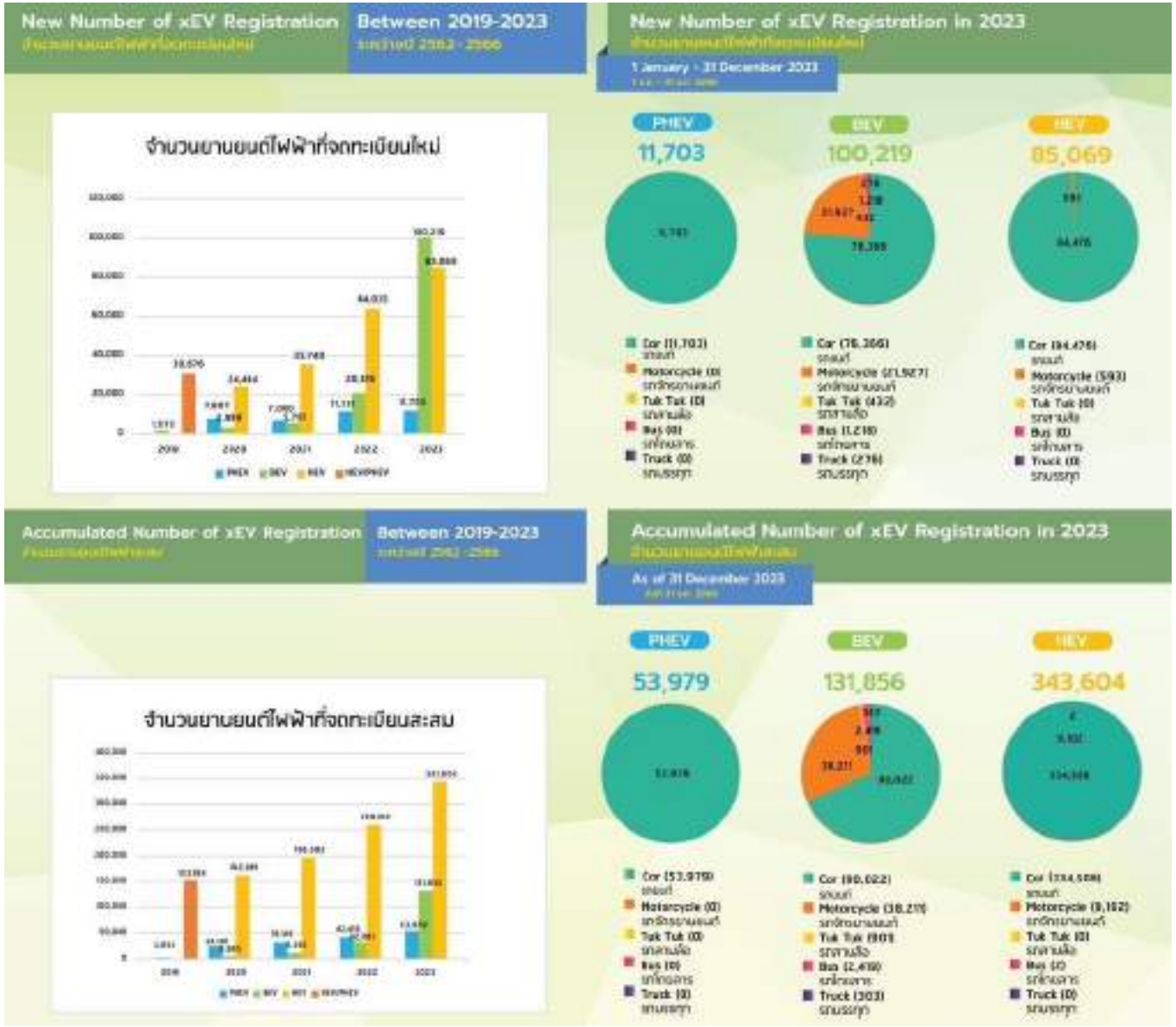
Summary of Battery Electric Vehicle Models in Thailand

Total 25 Brands 53 Model



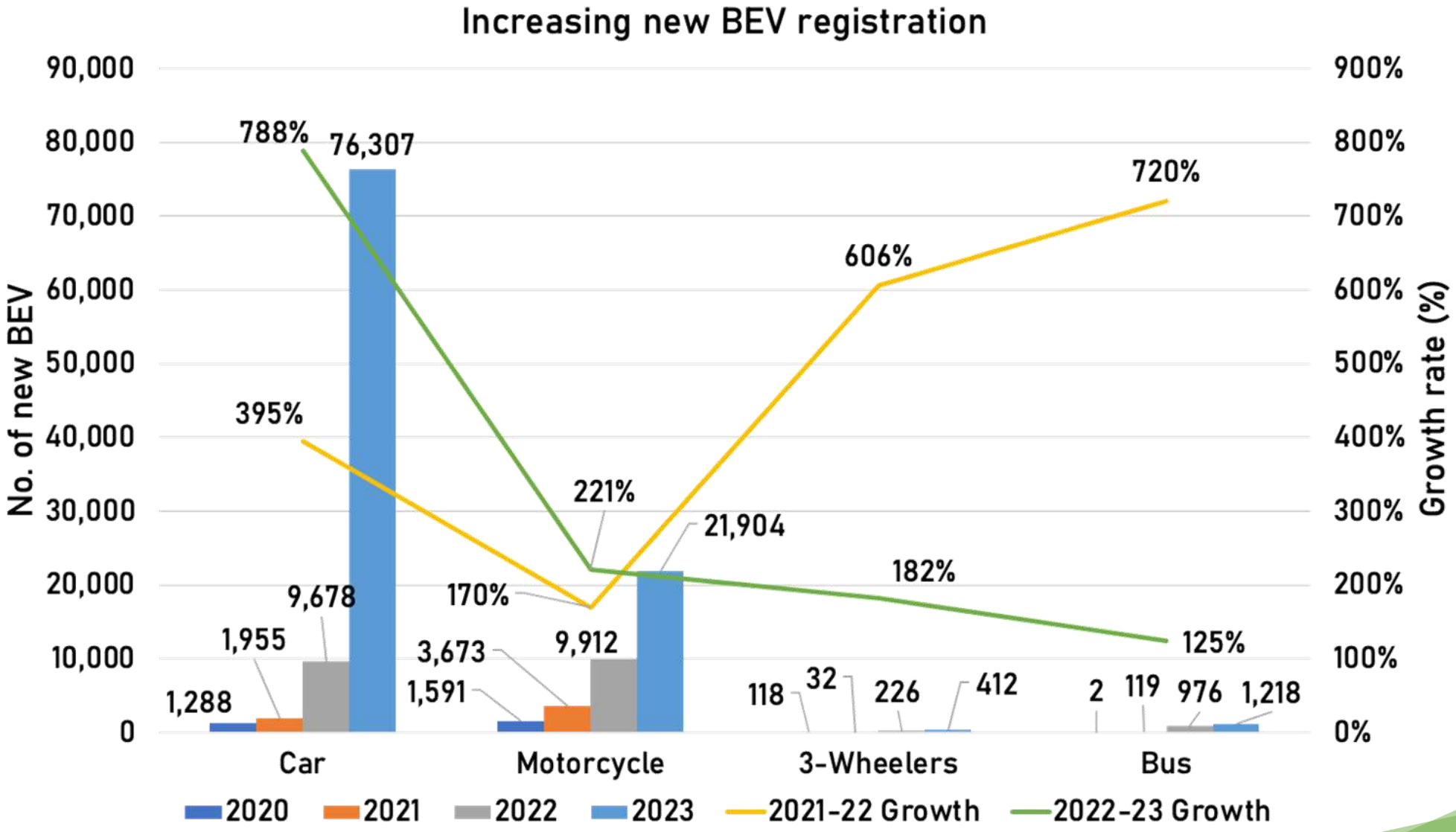
Sources by : Electric Vehicle Association of Thailand (EVAT)

Thailand's Electric Vehicle Status In 2023



- EV registrations in Thailand between 2019-2023 increase thanks to EV 3.0 and EV 3.5 measures.
- The share of EV registrations for passenger car push to 12% in 2023.

Bev Registration Statistics



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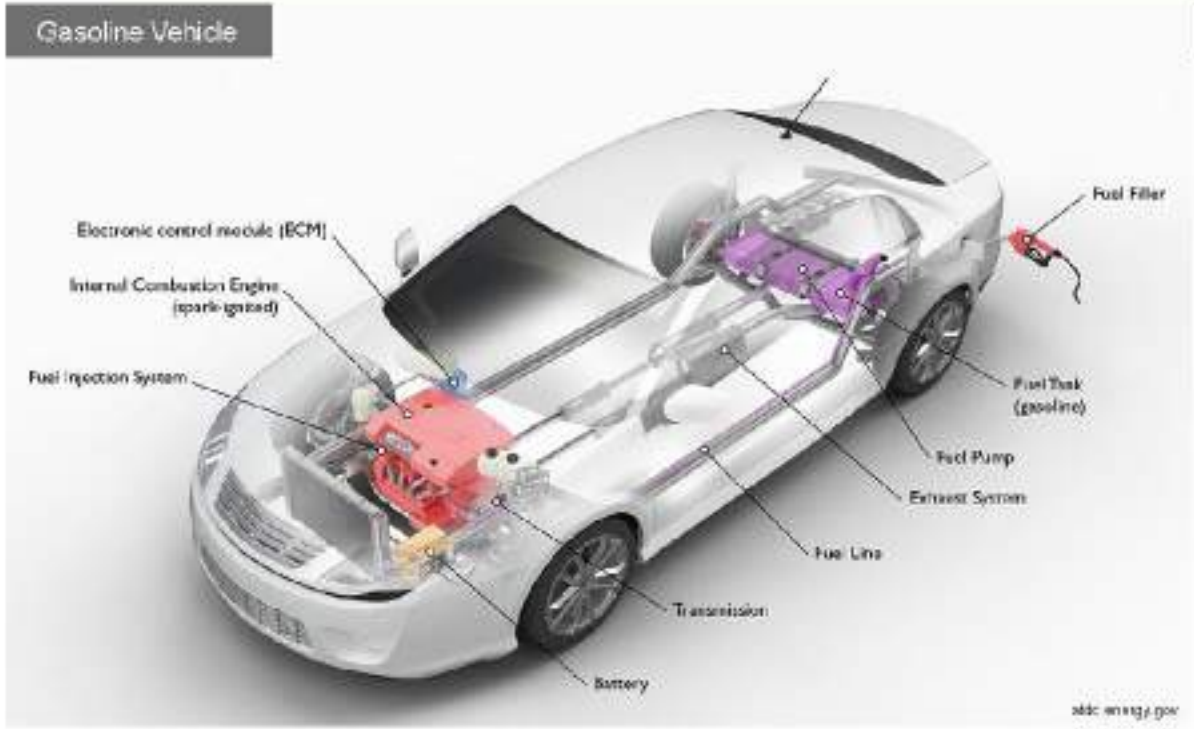
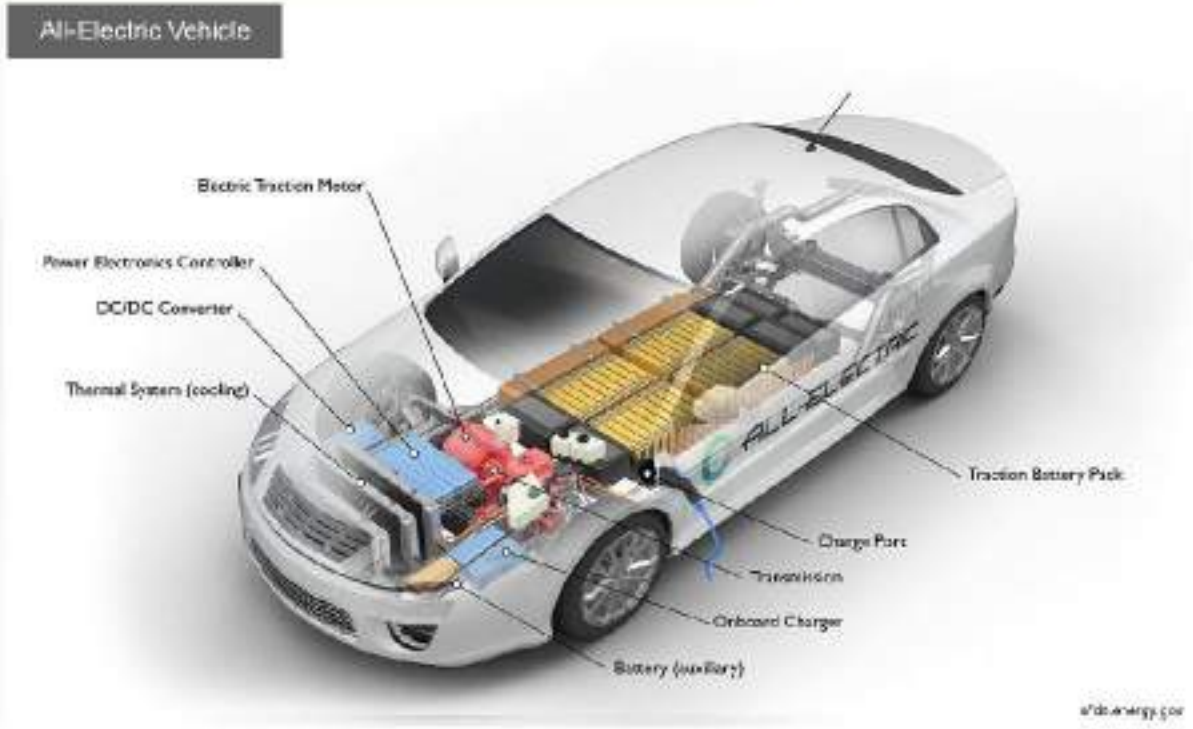
Important Parts: ICE vs BEV





ส่วนประกอบสำคัญของรถยนต์สันดาป (ICE Car) :

1) Battery
2) Electronic control module (ECM)
3) Exhaust system:
4) Fuel injection system
5) Fuel filler
6) Fuel line
7) Fuel pump
8) Fuel tank (gasoline
9) Internal combustion engine
10) Transmission

ส่วนประกอบสำคัญของรถยนต์ไฟฟ้า (BEV Car) :

1) Battery (all-electric auxiliary Charge port)
2) DC/DC converter.
3) Electric traction motor.
4) Onboard charger:
5) Power electronics controller
6) Thermal system (cooling)
7) Traction battery pack
8) Transmission (electric)

ที่มา : สำนักงานเศรษฐกิจอุตสาหกรรม (สศอ.) กระทรวงอุตสาหกรรม

Transition from ICE to BEV will affect supply chain

Disrupt Parts

- Internal Combustion engine
- Exhaust system
- Fuel system
- Brakes booster

Common Part

- Wheels and tires
- Seats
- Body
- Interior
- Climate control
- Frame and Axles
- Suspension
- Steering

New Parts Electrification

- Electric drivetrain
- Battery

New Parts Digital

- ADAS and sensors
- Electronics
- Infotainment and communication

Software

Aftermarket Service

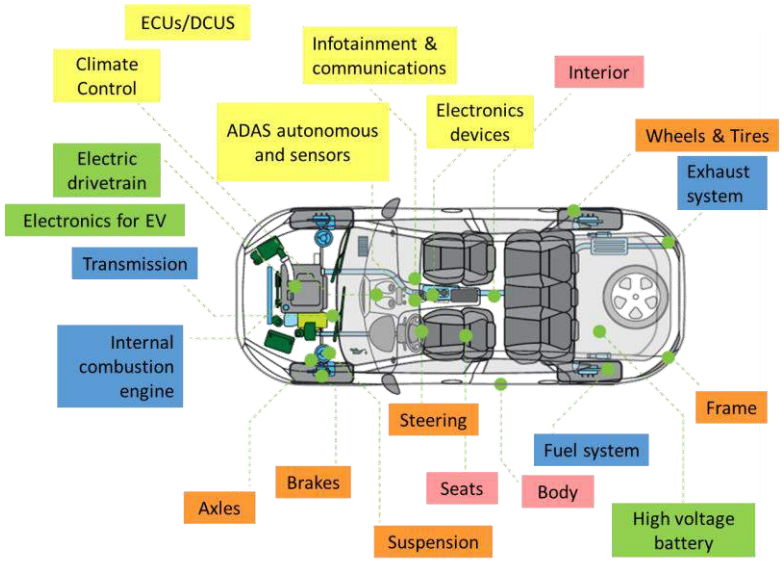
- Customize service
- Preventive maintenance

Waste Management

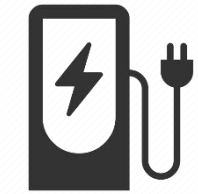
- Reuse / Remanufacturing
- Recycle

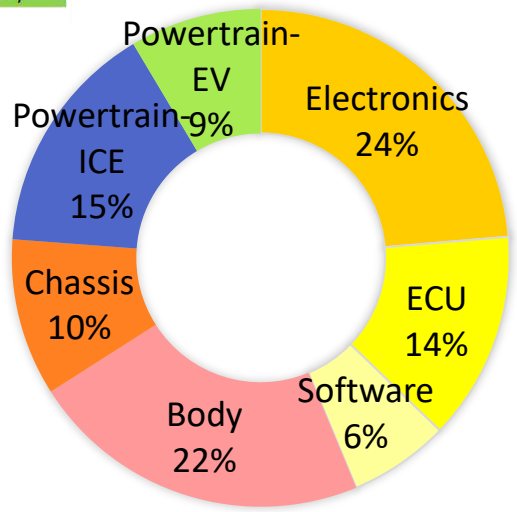
HOW HAS TECHNOLOGY CHANGED THE AUTOMOTIVE INDUSTRY?

1. AUTO PARTS CHANGING Type and value



Electronics
Body
Powertrain
Chassis
EV Parts
Charger

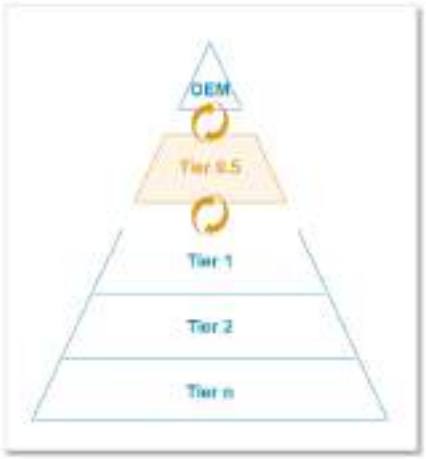




2. AUTOMOTIVE DESIGN

Modular architecture and Common platform

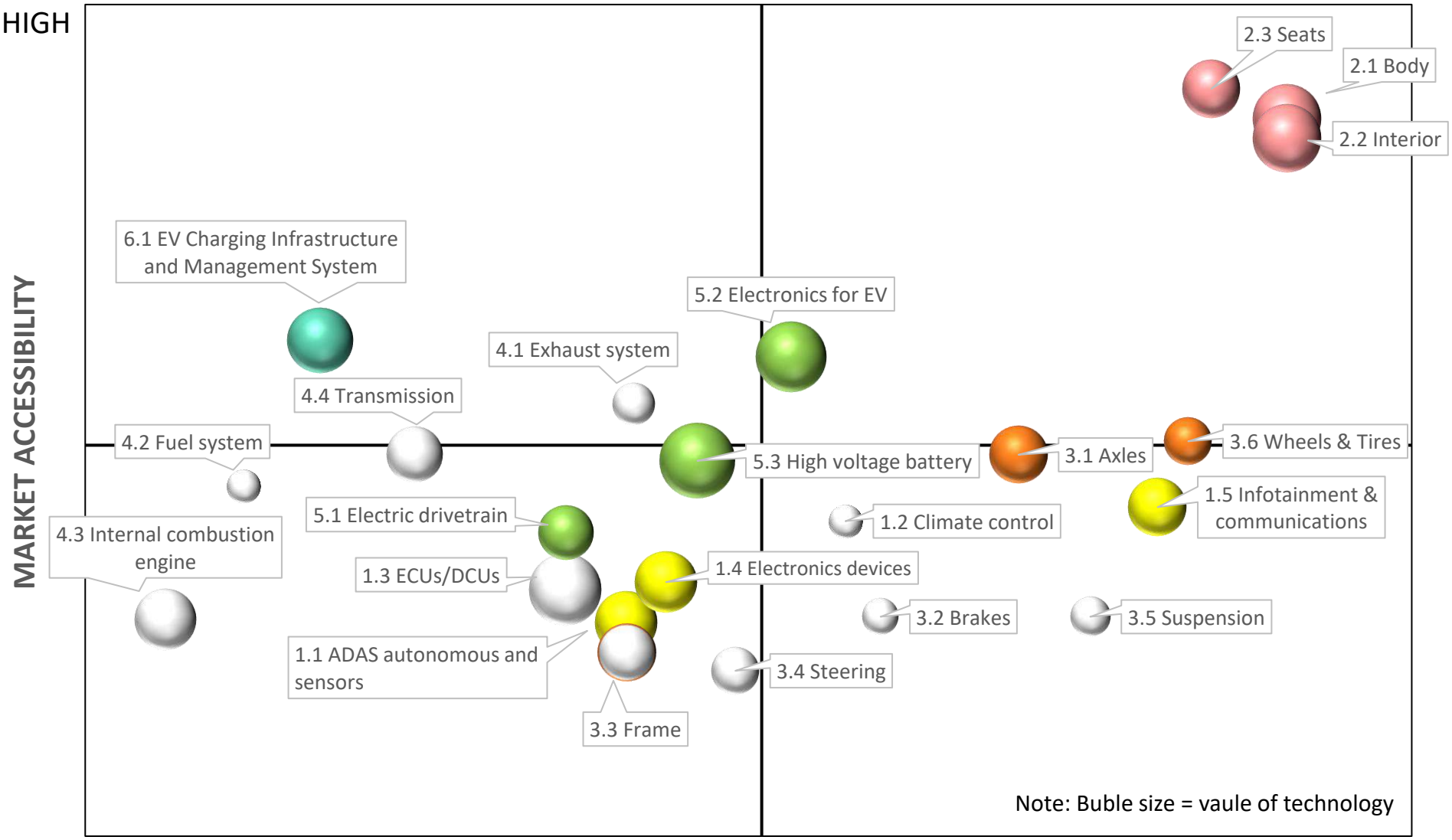
3. NEW PLAYER IN SUPPLY CHAIN



Offer	• Development and manufacturing of integrated systems/modules co-located at OEMs' sites
Key capabilities	• R&D on system level, integrating ecosystem of suppliers and partners • System integration • Program management
Success factors	• Innovation leadership with proprietary know-how • High vertical integration for key components for economies of scale • Strategic partnerships
Key features of best-in-class player	• > €10 BN revenues p.a. • Global footprint

POTENTIAL PRODUCT CHAMPION

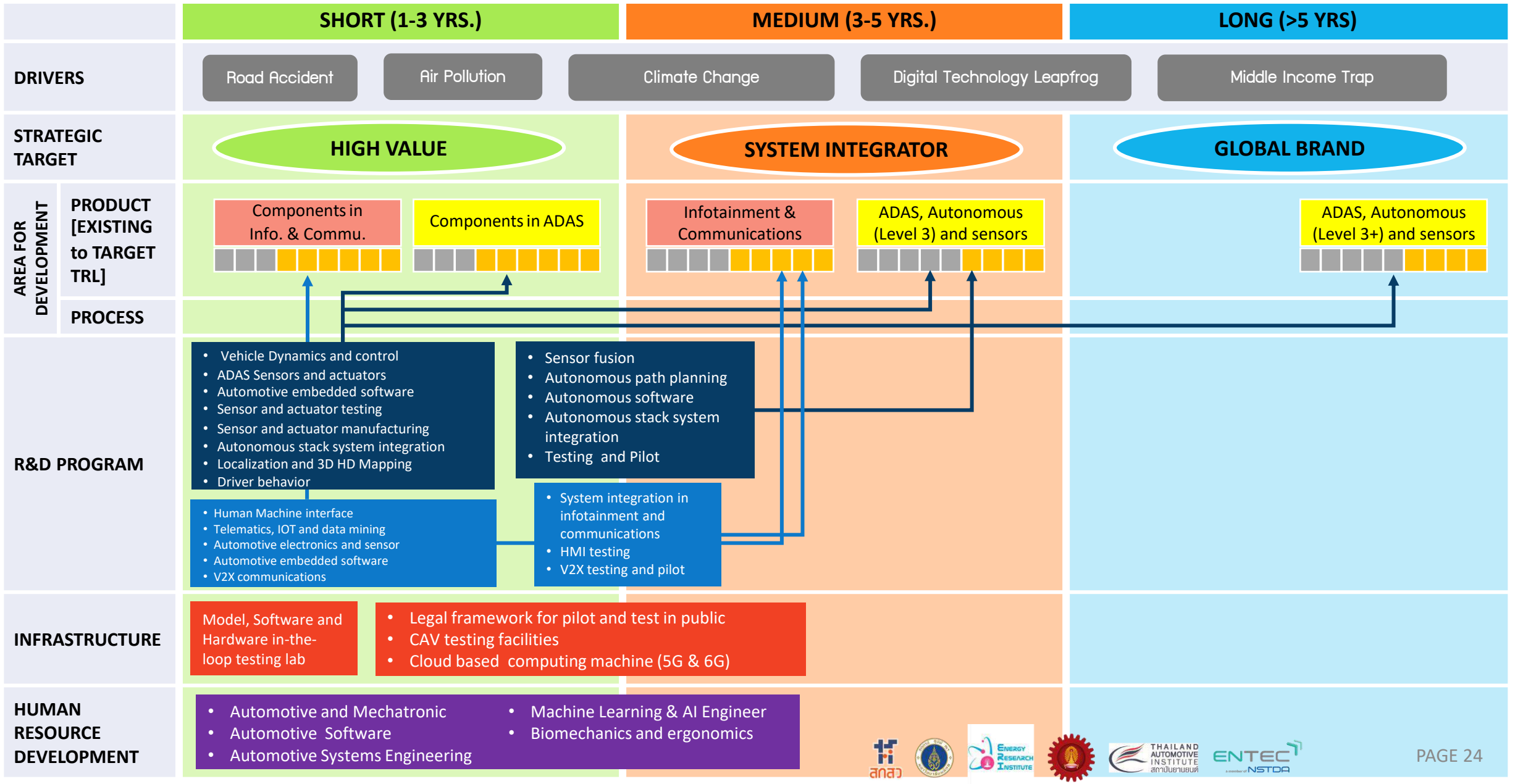
1. ELECTRONICS
2. BODY
3. CHASSIS
4. POWERTRAIN
5. EV PARTS
6. CHARGER



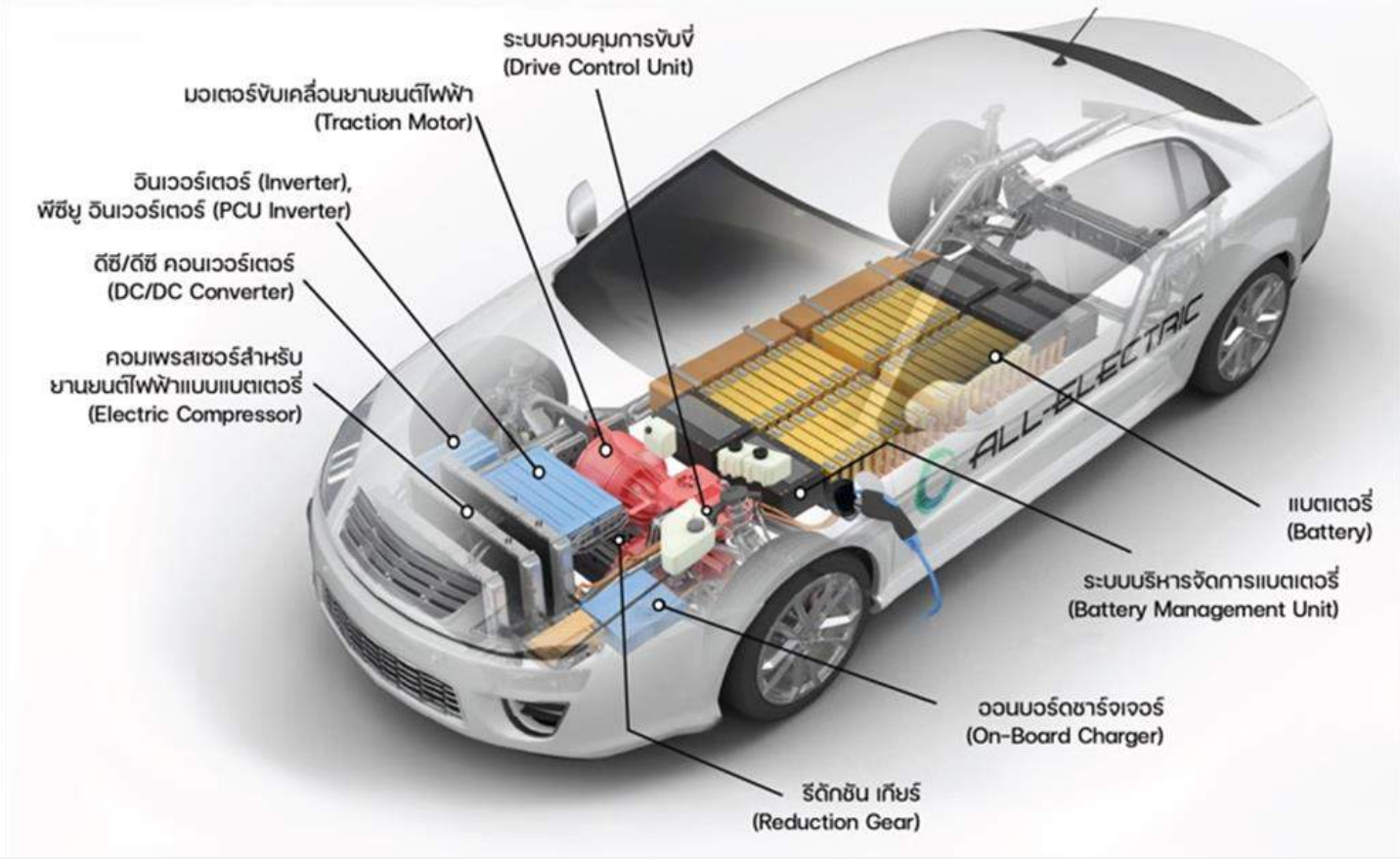
NATIONAL STRATEGIC R&D ROADMAP FOR NEXT GENERATION AUTOMOTIVE

			SHORT (1-3 YRS.)	MEDIUM (3-5 YRS.)	LONG (>5 YRS)
TIMEFRAME					
DRIVERS			Road Accident; Air Pollution	Climate Change; Digital Technology Leapfrog	Middle Income Trap
STRATEGIC TARGET			Thai manufacturers capable of producing High Value parts	Thai manufacturers becoming System Integrator in Next Generation Automotive industry	Thai manufacturers becoming Global Brand for Next Generation Automotive Industry
AREA FOR DEVELOPMENT	PRODUCT	ELECTRONICS	Components in ADAS; Infotainment & Communications	ADAS, Autonomous (Level 3) and sensors; Infotainment & Communications	ADAS, Autonomous (Level 3+) and sensors
		EV PARTS and CHARGERS	Customized Battery Packing	Electronics for EV (Converter, Inverter, Onboard charger); High voltage battery; DC Charger; AC Charger (Mode 3)	Electronics for EV Combo
		CHASSIS	Wheels; Tires	eAxles; Suspension module	Light weight wheels; Eco-Tires; eAxles Module (Motor, Differential, Axles/Driveshaft)
		BODY	Exterior (Lighting, Accesorries)	Aluminum/ Composite Material Body; Interior (Triming part, console, lining, lighting, mat, floor); Seats	Adaptive Lighting; Adaptive / Safety seat
	PROCESS	BODY			Mold&Die for light weight body

National Strategic R&D Roadmap for Next Generation Automotive : Electronics



EV parts import duty exemption under current promotion



Incentive

Exempt from duty on electric vehicle parts imported until December 31, 2025 for assembly or production of new electric vehicles. (Exclude EV conversion)

Condition

1. Having a certificate from the Thailand Automotive Institute that it is a component used for assembling or producing an electric vehicle
2. A component exempt from duty must be used for the assembly or production of electric vehicles to be completed within a period of one year from the date of import

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"Collaborating with
the National Science and Technology Development Agency"

Developing a Battery Management System
for Electric Vehicles

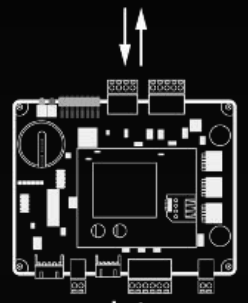
บริษัท ECUSHOP + นักวิจัย สวทช.

Established 2023

BMS

ECUSHOP has researched and developed two types of battery management system (BMS) equipment, which are Centralized BMS and Dedicated BMS. In addition to developing software for managing the BMS, ECUSHOP aims to provide battery manufacturers with the freedom to manage and configure the system as they see fit. ECUSHOP has also collaborated with the National Science and Technology Development Agency (NSTDA) to develop a BMS that meets both national and international standards.

Centralized BMS | Dedicated BMS

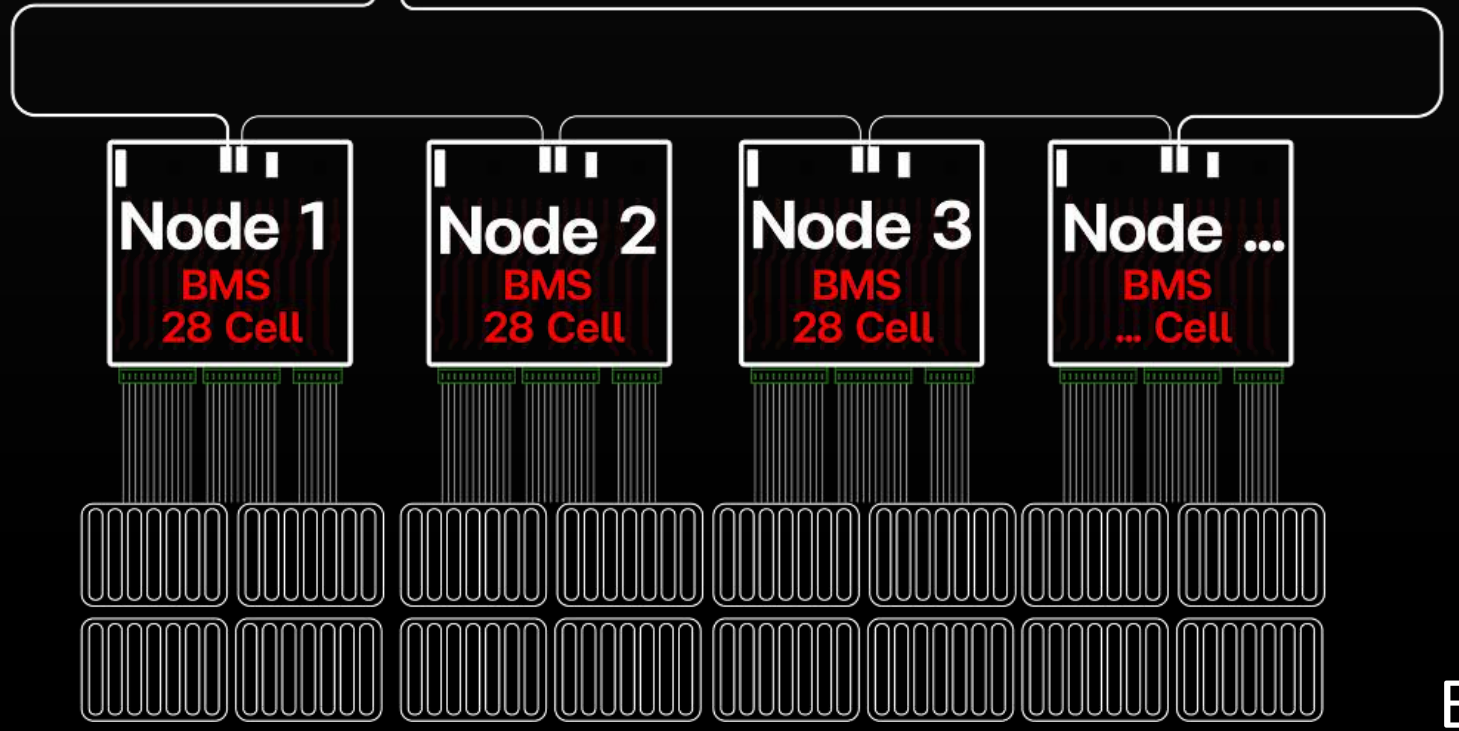


Main BMS

Supports a maximum voltage of up to **1,512 volts.**

Supports a maximum of **420 cell** connections.

Multi-node BMS



Battery Cell

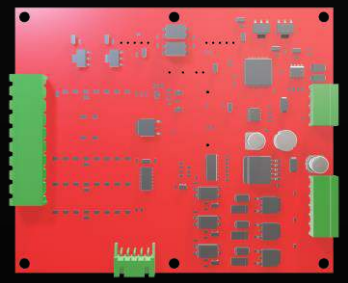
ECU-SHOP
WHERE PERFORMANCE BEGINS

NSTDA

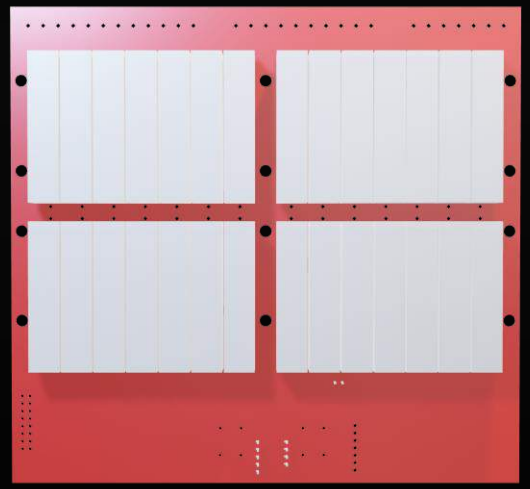
Established 2023

BMS

From Research to Commercial
Customized BMS

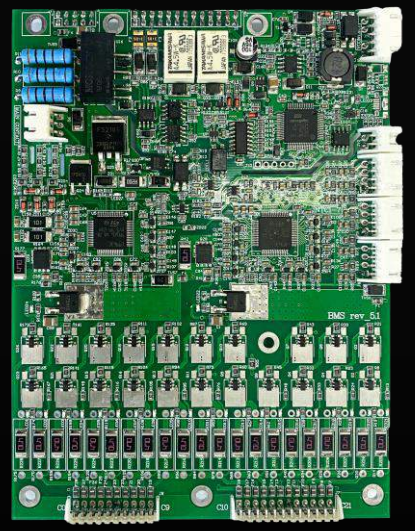


Main BMS



Balance 28 Cell 5W

Balance 28 Cell 10W



BMS 21 Cell

BMS 14 Cell

Established 2023

IMD

IMD (Insulation Monitoring Device) is a state-of-the-art equipment designed to detect high voltage leaks, ensuring user safety. It can be installed as a stand-alone unit or integrated with a VCU over the CAN BUS system. With immediate warning status alerts, automatic high voltage system cutoff, and data transmission over CAN BUS, the IMD takes proactive measures to prevent hazards and protect users. By prioritizing safety and providing peace of mind, our IMD is the ideal solution for enhanced user protection in high voltage environments.

ทดสอบมาตรฐาน IMD 100VDC/450VDC/850VDC

		Report No.	Equipment Under Test (EUT) No.
ผ่านการทดสอบกันน้ำกันฝุ่น Degrees of protection provided by enclosures (IP code) IP68 standard IEC 60529:2013	100 VDC 450 VDC 850VDC	206/66-050	ST-66-0485
ผ่านการทดสอบการทำงาน ที่อุณหภูมิ 70 °C เป็นเวลา 5 ชั่วโมง	100 VDC	STR/66-081	ST-66-0482
	450 VDC	STR/66-082	ST-66-0483
	850VDC	STR/66-083	ST-66-0484
ผ่านการทดสอบมาตรฐาน การสั่นสะเทือน UNR-100 Rev2	100 VDC	STR/66-084	ST-66-0479
	450 VDC	STR/66-085	ST-66-0480
	850VDC	STR/66-089	ST-66-0481

ทดสอบโดย

PTEC
ELECTRICAL AND ELECTRONIC PRODUCTS TESTING CENTER

ศูนย์ทดสอบผลิตภัณฑ์ไฟฟ้าและอิเล็กทรอนิกส์ (PTEC)
สำนักงานพัฒนาวิทยาศาสตร์และเทคโนโลยีแห่งชาติ (สวทช.)

ECU-SHOP WHERE PERFORMANCE BEGINS
สวทช NSTDA

Established 2023

Q & A
Thank You

Electric Vehicle Association of Thailand (EVAT)

สมาคมยานยนต์ไฟฟ้าไทย

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Email : contact@evat.or.th (General contact)

member@evat.or.th (Membership)