Toyota's Challenge

Aiming to Popularize BEVs

June 7, 2019

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Executive Vice President

Toyota Motor Corporation

Initiatives for vehicle electrification

Core technology for the electrification of Toyota vehicles and CASE technology

Core technology for electrification


Motor


Battery


Power Control Unit


FC stack


High-pressure hydrogen tank

FCEVs


Charger

BEVs


Engine

PHEVs

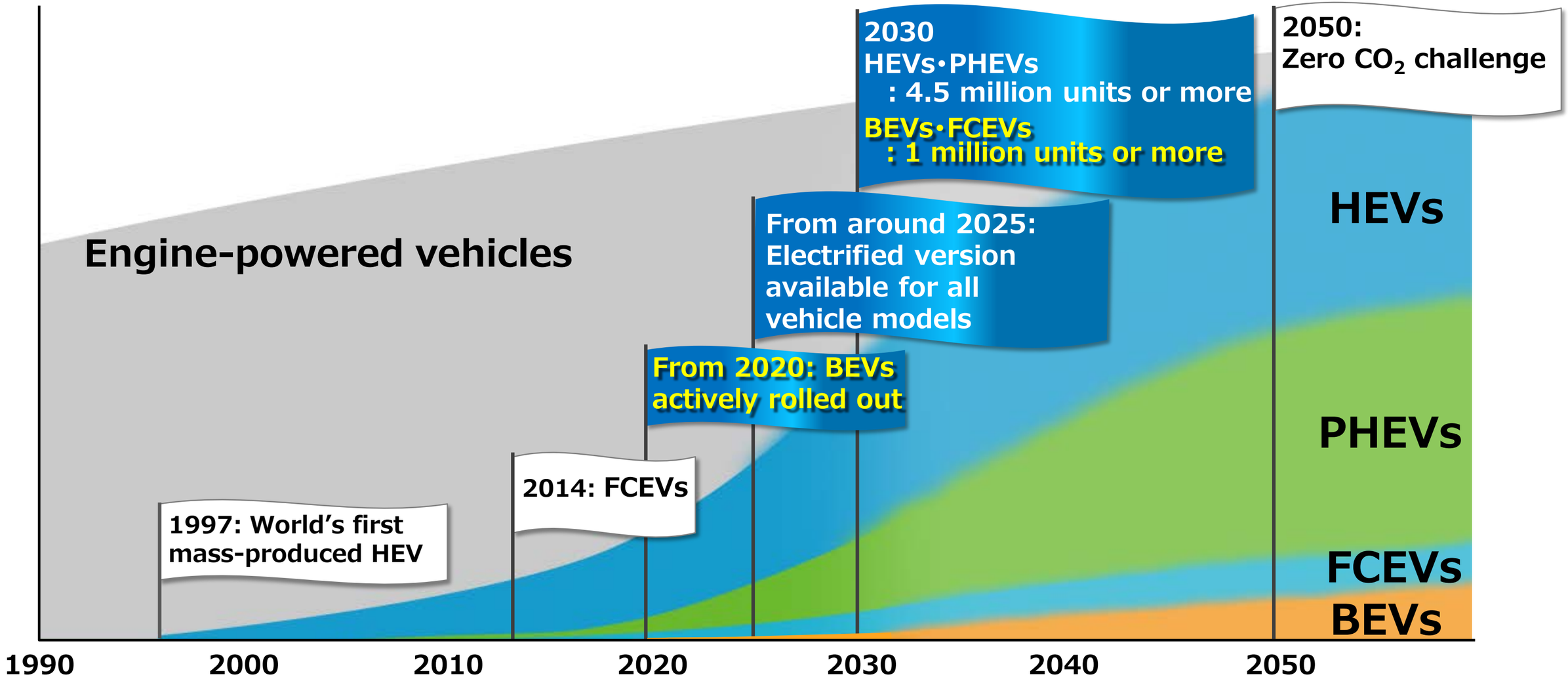
HEVs

Automated driving technology

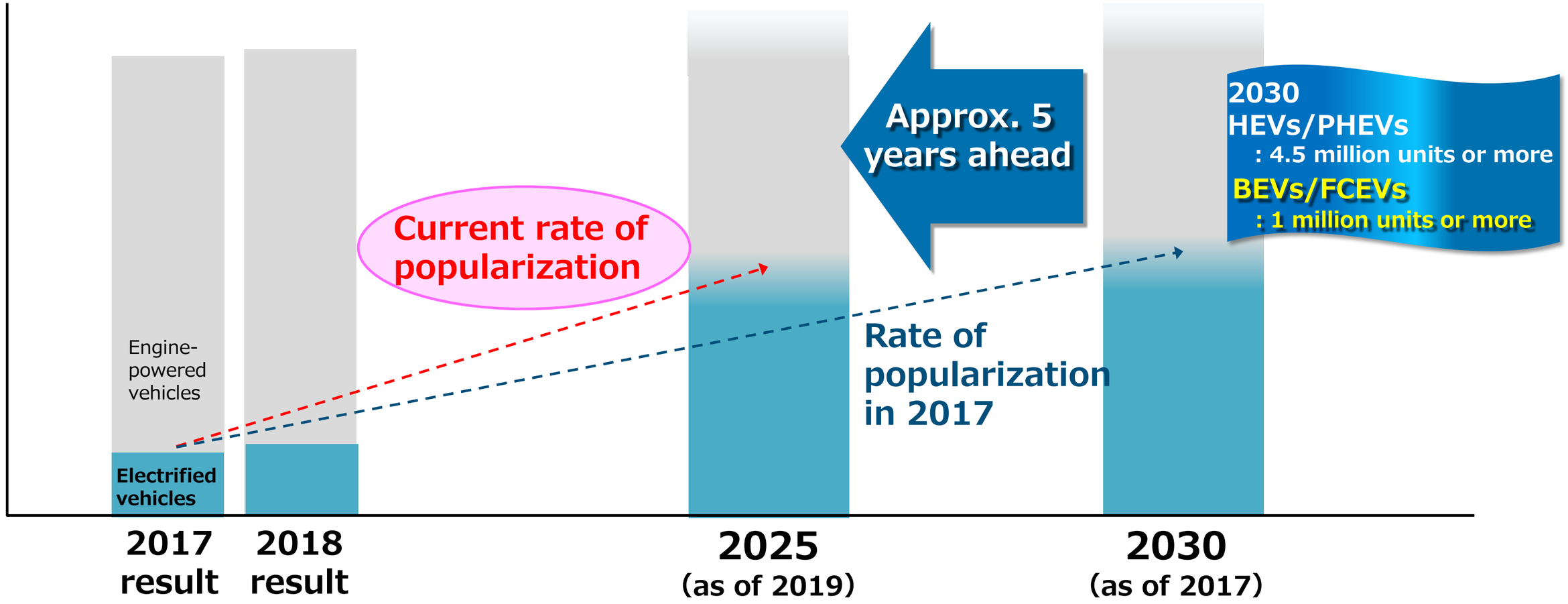
Connected technology

MaaS

Milestones in popularizing electrified vehicles (announced in Dec. 2017)



Rate of popularization of Toyota's electrified vehicles



Sudden surge in electrification at a pace exceeding initial challenge declared in 2017.

Main zero-emission vehicles
(Including development concept, driving demonstrations, and system provision)

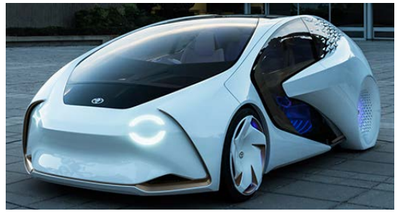
← Passenger vehicles → ← Commercial vehicles →

Lunar Rover

FCEVs

MaaS

BEVs



← Walking area → ← Ultra-compact → ← Compact and midsize →

Active rollout of BEVs (announced Dec. 2017)

In 2020, commence mass production of proprietary BEVs starting in China

Increase Toyota and Lexus BEV models worldwide (gradual introduction in Japan, India, U.S., and Europe)

10 BEV models to be available worldwide by the early 2020s

From 2020, introduce proprietary BEVs starting in China

C-HR/IZOA

*World premier at Shanghai Motor Show in April 2019

Initiatives Toyota will engage in to popularize BEVs

Toyota will take a cooperative stance and work together with many parties to promote initiatives for the construction of new business models.

1) Commence initiatives that aim to create new business models leveraging ultra-compact BEVs, starting in Japan

2) For areas in which the BEV market is already growing, efficiently develop various types of BEVs adapted to market needs at a low cost

3) Develop high-performance batteries, which are the key to improved performance, and prepare a system for supplying batteries to respond to the rapidly expanding needs for electrified vehicles

1) To popularize BEVs
-Development of business model-

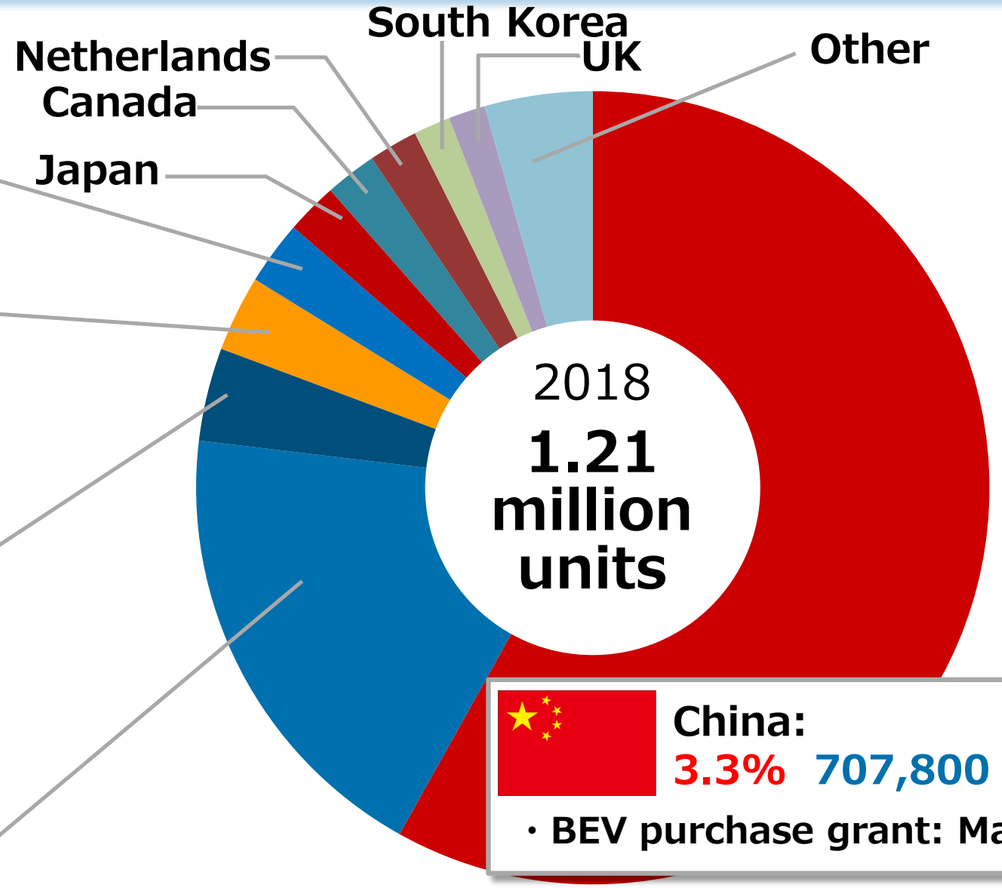
Major BEV markets and main policies worldwide

France:
1.5% 32,200 units
- BEV purchase grant: Max. 820,000 yen

Germany:
1.1% 37,300 units
- BEV purchase grant: Max. 520,000 yen

Norway:
31.2% 46,000 units
- BEV acquisition tax exemption: 1.38 million yen
- Import tax exemption, added-value tax (25%) exemption

US:
1.3% 228,600 units
- Max. 800,000 yen tax exemption from federal government
- Also tax exemptions by state



China:
3.3% 707,800 units
- BEV purchase grant: Max. 1 million yen

Blue: Number of BEV units sold in each country
Red: Domestic BEV share (According to Toyota Motor Corporation)

BEV market formation supported by incentives such as tax benefits and grants

Toyota’s challenges toward the popularization of BEVs

Shift focus from the conventional idea of “manufacturing BEVs and having customers buy them,” to the idea of…

Searching for partners openly and extensively, striving toward contributing to a better society and engaging in initiatives to construct new business models

BEV business models under consideration

Peripheral services

・Improved convenience/added value, such as charging services and insurance

Development and manufacturing

・Reasonable prices
・High-performance batteries

Leases

・Reduce customer burden with RV setting
・Improve battery recovery rate

Sales

Assessment judgment

・Battery remaining value

Used vehicle sales

・Establish used BEV business leveraging battery remaining value

Reuse of batteries

・Conduct in supply parts, dealers, and homes
⇒Promote through complete use of batteries, and use of renewable energy

Battery recycling

・Recovering scarce resources

Promote initiatives for the maximum utilization of added value for BEVs and batteries, from sales to disposal including improving product appeal such as battery performance, in collaboration with partners in various fields

1) To popularize BEVs:
Deploy ultra-compact BEVs in Japan

Customer opinions & concerns regarding BEVs

- Unwilling to drive long distances daily; need free mobility for local errands such as shopping or going to hospitals
- Concerned about being able to drive a standard car
- Usually drive alone or with one passenger
- Only need to drive at certain times; car not needed at home
- Prefer similar cruising range as new cars regardless of how many years the car has been used
- Suitable car size for ease of parking
- Safe & free mobility for all in both urban & rural environments

Local municipalities

Corporations

Emergence of new business opportunities for BEVs, including for compact vehicles, short distance use, and corporate use

Ultra-compact BEVs

Concept-i RIDE model

(Exhibited at Tokyo Motor Show 2017)

Ultra-compact BEVs

Commercially planned vehicles

Business concept model

Expected users

- Younger people and the elderly individuals who prefer smaller vehicles
- Corporations and local municipal bodies that want to respond to environmental issues and make economical choices

Ultra-compact BEVs

Commercially planned vehicles

[Planned for release in 2020]

Main uses & features

Mobility for daily errands such as shopping

Business use for short-distance trips or visits

Overview

Occupancy: 2 people
Size (mm): Length Approx. 2,500
Width Approx. 1,300
Height Approx. 1,500
Maximum speed : 60 km/h
Cruising range on a single charge: Approx. 100 km

Ultra-compact BEVs

i-ROAD

Main uses & features

Unlikely to topple over, despite being the size of a motorcycle Short-distance mobility

- **Serves as the last-mile in urban areas**
- **Mobility for tourist outings and resort stays**

Overview

Occupancy: 1 or 2 people
Size (mm): Length 2,345
Width 870
Height 1,455
Maximum speed: 60 km/h
Cruising range on a single charge: Approx. 50 km

Walking area BEVs

Concept-i WALK
Concept model

(Exhibited at Tokyo Motor Show 2017)

Standing type

[Planned for release in 2020]

Main uses & features

Patrolling and security checks at large facilities such as airports or plants Mobility for luggage transport/handling

Overview

Size (mm): Length 700
Width 450
Height 1,200

Maximum speed: 2, 4, 6, 10 km/h (variable speed)

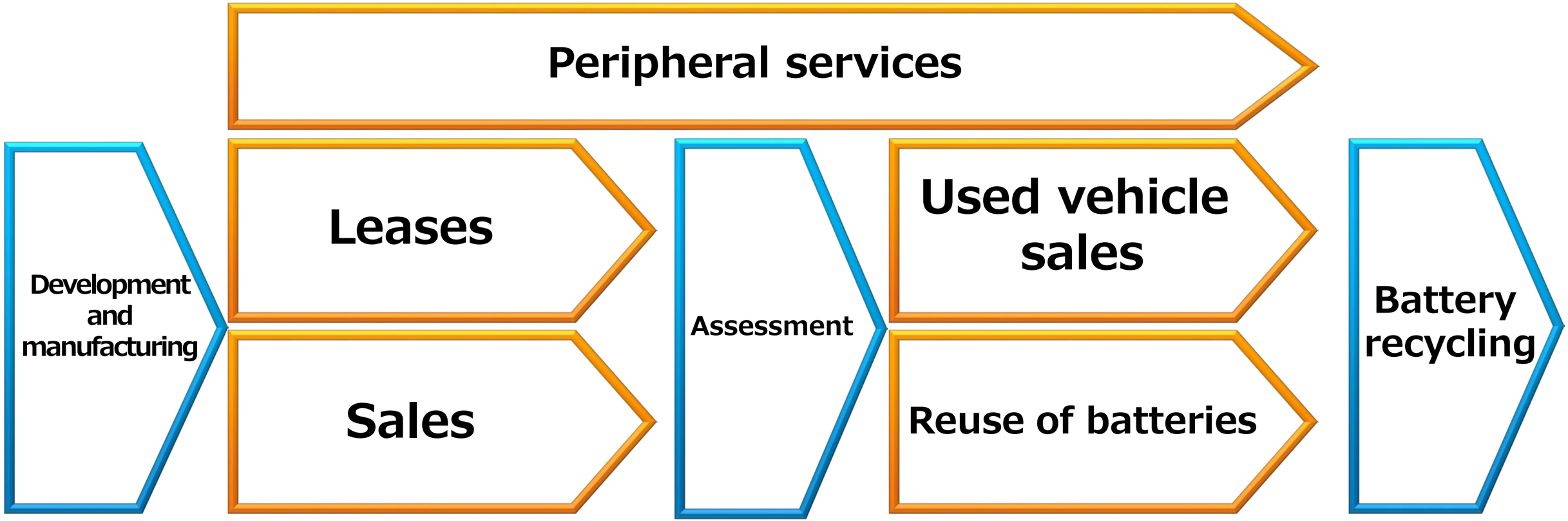
Cruising range on a single charge: Approx. 14 km

Charging time: 2.5 hours (battery is replaceable)

Walking area BEVs

	Seated type	Wheelchair-linked type
	[Planned for release in 2021] 	[Planned for release in 2021] 
Main uses & features	• **Mobility when handling luggage** • **Mobility when walking is difficult**	• **Rental at large facilities and tourism spots for manual wheelchair users**
Overview	**Size (mm): Length 1,180 Width 630 Height 1,090** **Maximum speed : 2, 4, 6 km/h (variable speed)** **Cruising range on a single charge: Approx. 10 km** **Charging time: 2 hours (battery is replaceable)**	**Size (mm): Length 540 Width 630 Height 1,090** **Maximum speed: 2, 4, 6 km/h (variable speed)** **Cruising range on a single charge: Approx. 20 km** **Charging time: 2.5 hours (battery is replaceable)**

Initiatives for the popularization of ultra-compact BEVs/walking area BEVs



Collaborate with partners in various fields and also engage in dialogue with customers to establish business models while fulfilling various roles (Companies or local governments currently sharing ideas: 40 entities)

Roles fulfilled by ultra-compact BEVs and walking area

To achieve “Mobility for All,” offer safe and secure mobility that responds in detail to various customer needs

2) BEVs for global deployment

BEVs for global deployment

Aiming for popularization in major markets with strong demand such as China, the U.S., and Europe

To encourage various customers with different needs to choose this product:

1) **Prepare enough variations**

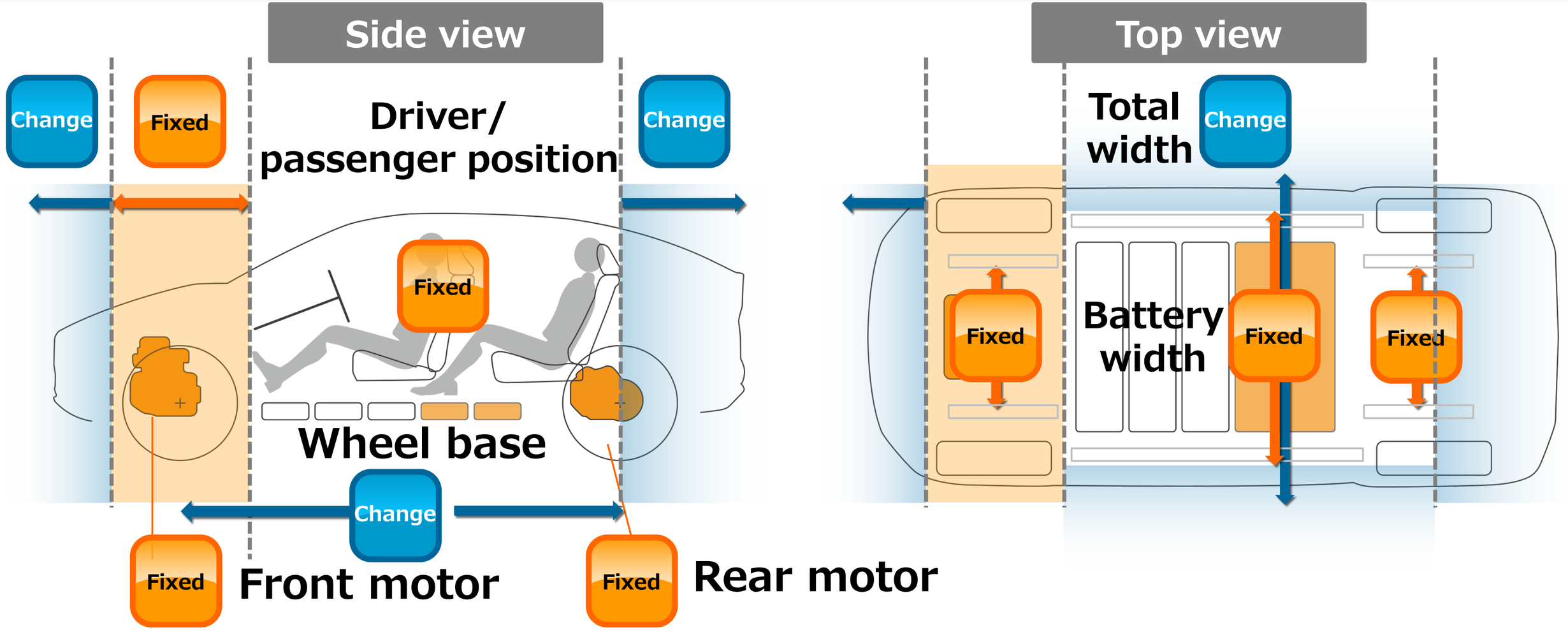
(At least 10 models globally from 2020 onward)

2) **Implement efficient and smart development to offer vehicles at reasonable prices**

Efficient planning and development

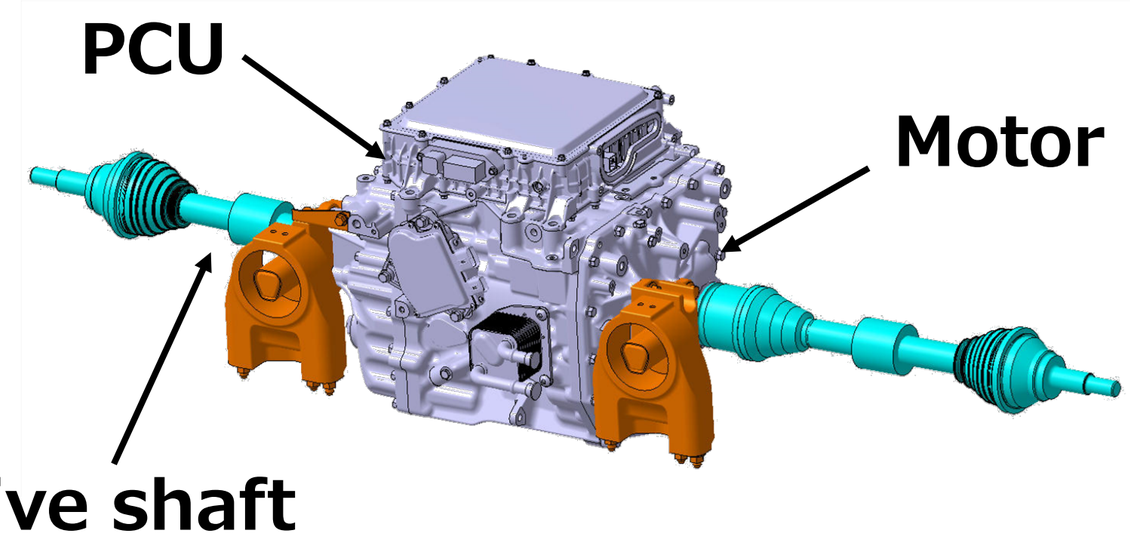
Deploy six variations jointly with partners in their respective fields of expertise

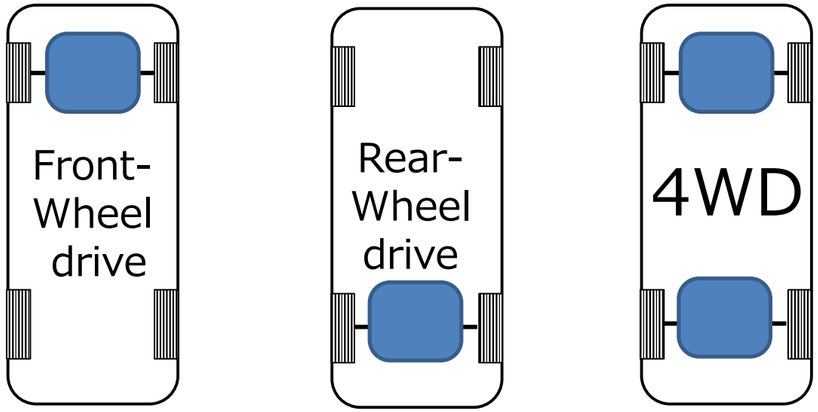
Dedicated platform collaborative planning (SUBARU): e-TNGA



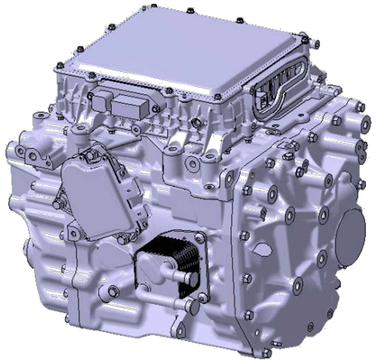
Determine fixed points and points of change, and respond fluidly to multiple variations

Dedicated platform collaborative planning (SUBARU): e-TNGA

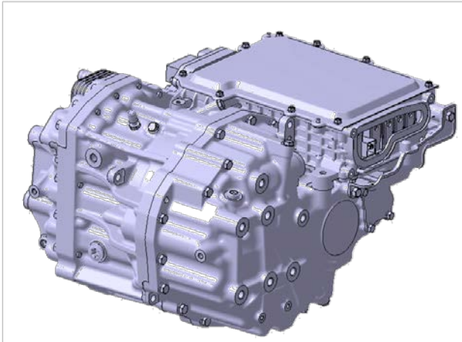




Front motor

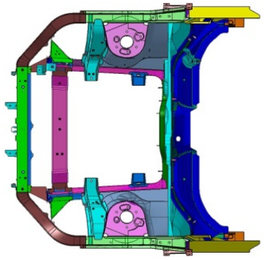
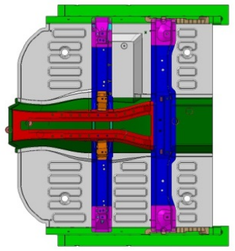
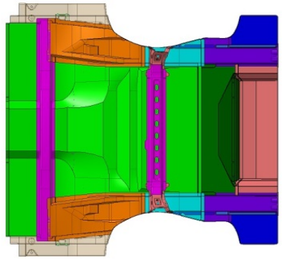
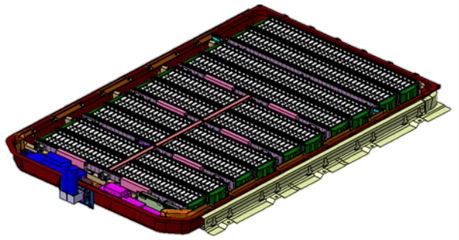
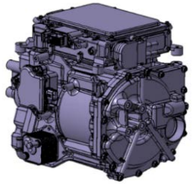
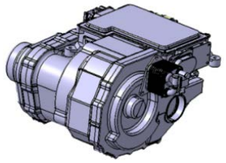


Rear motor



BEV unit that enables multiple variations through motor combinations

Module development: e-TNGA

	Front module	Center module	Rear module	Battery	Motor
					 Front  Rear
	Overhang: Short, Long	Wheel base: Short, Middle, Long	Overhang: Short, Long	Capacity: Small, Medium, Large	Output: Small, Medium, Large
A	●	●	●	●	● ●
B	●	●	●	●	● ●
C	●	●	●	●	●
⋮					

Deploy multiple variations efficiently

BEVs for global deployment

System for BEV popularization

EV C.A. Spirit Corporation (From Oct. 2017)

Employ full-time engineers from each company for collaborative development of common architecture

Supply basic technology to accelerate product development

EV Business Planning Dept.
(From Oct. 2016)

Toyota ZEV Factory (from Nov. 2018)

Promoting BEV product development and related business planning

Toyota ZEV factory roles

Contribute to reducing CO_2 emissions through the global popularization of BEVs

Achieve “Mobility for All” with the compact mobility lineup

Globally deployed BEVs

BEVs

FCEVs

Ultra-compact

Passenger vehicles and commercial vehicles

Pursuing mobility that is loved by people and society

Vehicle size

Traveling distance

Battery development

Automated driving

Mobility-related business

Toyota ZEV Factory

Main duties

- BEV and FCEV business strategy planning
  →Product planning, collaboration
- BEV development planning
  →Platform development, production technology etc.
- BEV product development to address walking area, ultra-compact design, full-scale deployment

Framework

Add logos for Hayashi Telempu and Toyota
Personnel as of June 2019: Approx. 290

Employees on loan from related companies and organizations to promote BEV product development and related company plans

AISIN
アイシン・エィ・ダブリュ株式会社
アイシン軽金属株式会社
FTS FUEL TOTAL SYSTEMS
Kojima
SANGO
SUZUKI
SUBARU
SUMITOMO ELECTRIC Connect with Innovation
DAIHATSU
DENSO
TOYODA GOSEI
豊田市 Toyota City
トヨタ車体 TOYOTA AUTO BODY
TOYOTA
TOYOTA 豊田自動織機 TOYOTA INDUSTRIES CORPORATION
豊田通商 TOYOTA TSUSHO
トヨタ紡織 TOYOTA BOSHOKU
NEXTY Electronics
HAYASHI TELEMPU comfort and beyond
Producing The Future Pacific Consultants
MITSUI & CO.
YAZAKI

Aiming for the popularization of globally deployed BEVs

Peripheral services

Development and manufacturing

Leases

Sales

Assessment

Used vehicle sales

Reuse of batteries

Recycling

Promote the construction of new business models for globally deployed BEVs

3) Battery development and supply

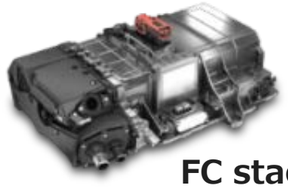
Core technology for Toyota vehicle electrification and CASE technology

Core technology for electrification


Motor


Battery


Power Control Unit


FC stack


High-pressure hydrogen tank


Charger


Engine

FCEVs

BEVs

PHEVs

HEVs

Automated driving technology

Connected technology

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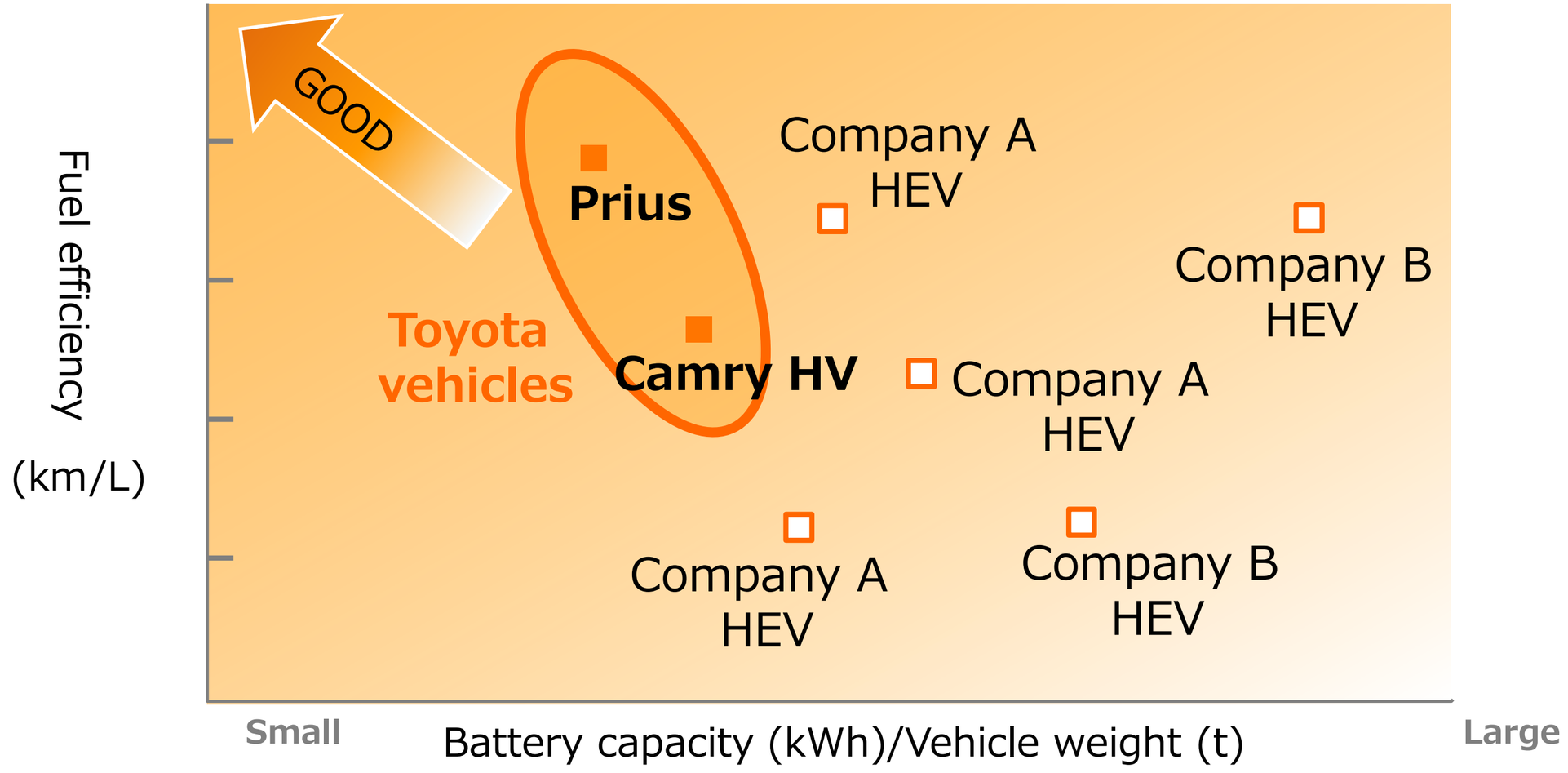
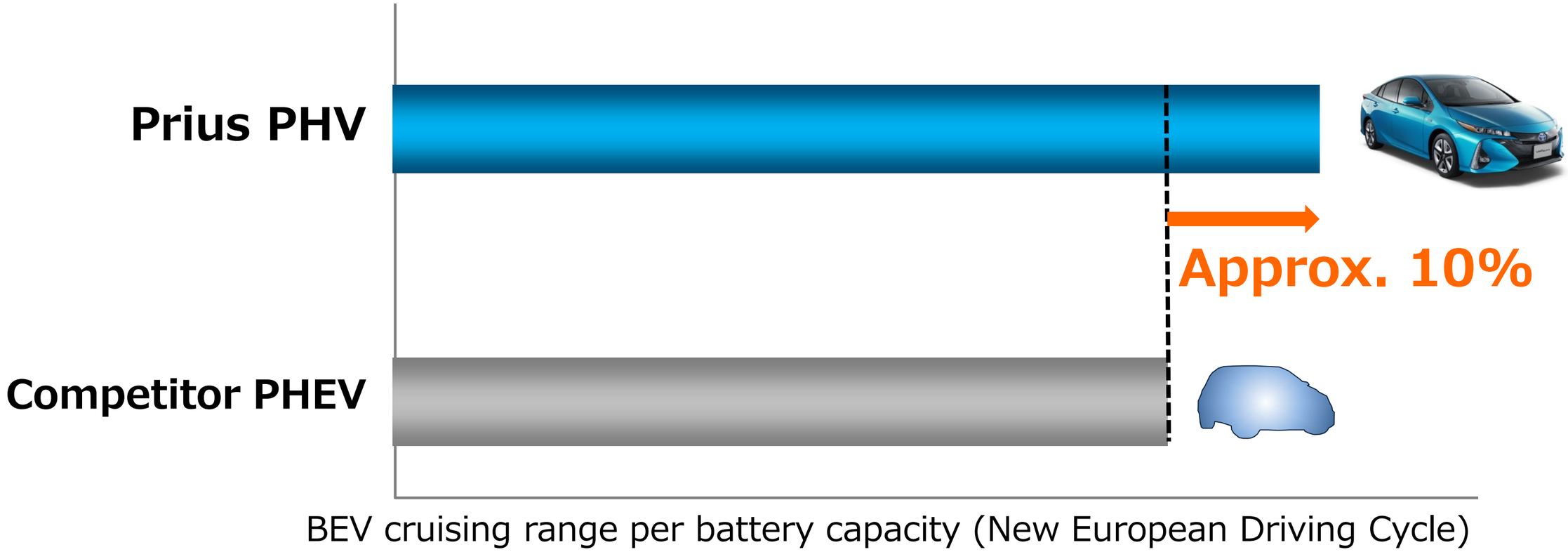
Toyota vehicle electrification technology cultivated through HEV development



HEVs: Achieve fuel efficiency even with low battery capacity due to highly efficient system ➡ Utilize in BEVs

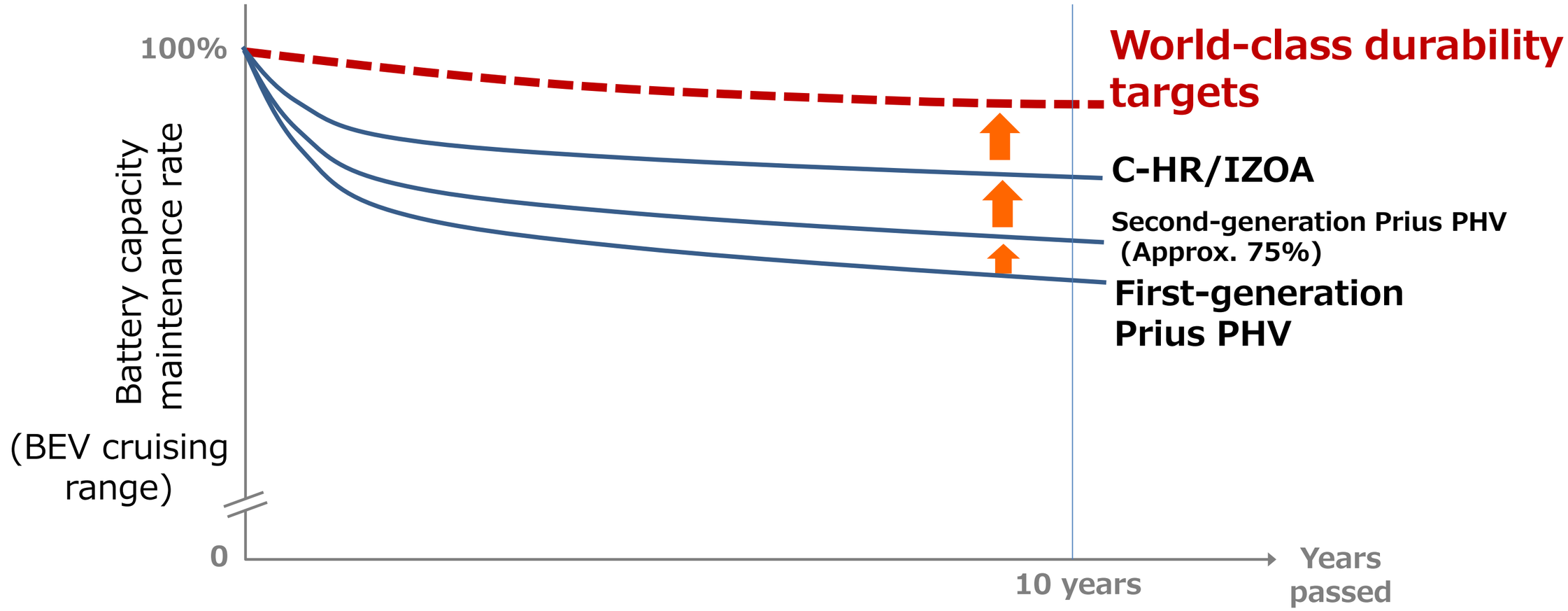
PHEV system development



PHEVs: Realize long BEV cruising range by means of a highly efficient system

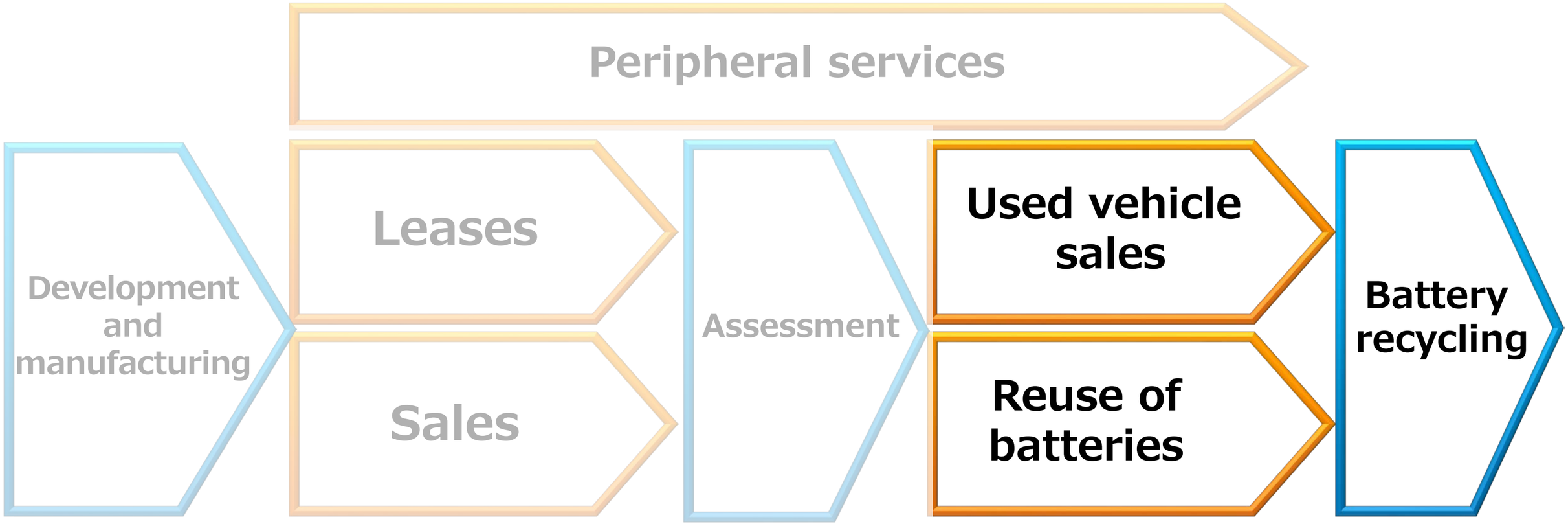
➡ **Utilize in BEVs**

Battery durability (battery remaining capacity after long-term use)



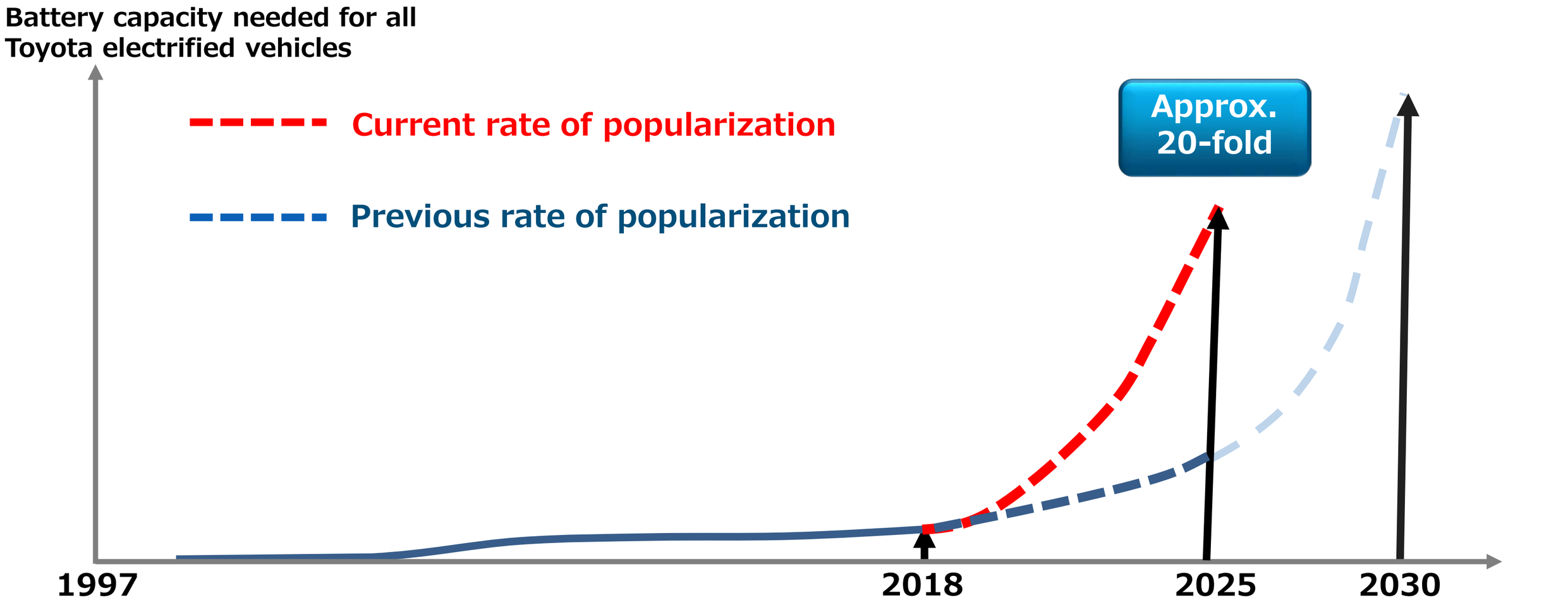
Aim for world-class durability to control degradation in various aspects including battery materials, pack structure, and the steering system

BEV business models envisioned by Toyota



Increasing battery durability not only improves product appeal, but is effective for used vehicle sales and the battery reuse business

Need to develop partnerships in development and supply



Batteries are needed at a rate significantly exceeding previous expectations

Framework for battery procurement and collaborations

CATL

BYD
Build Your Dreams

Panasonic

TOYOTA

EV ENERGY
プライムアースEVエナジー(株)

GS YUASA

TOSHIBA

TOYOTA

Coordinate with global battery manufacturers in addition to conventional partners, Panasonic and PEVE, to respond to the rapid popularization of electrified vehicles

Message from Toyota

Aiming to popularize BEVs

- Much work lies ahead to achieve the popularization of BEVs. Specifically, we will be focusing on vehicle development and the stable supply, improved durability, and reuse of batteries.
- Toyota is steadily preparing a framework to respond thoroughly to the challenge, putting all the pieces in place, including the construction of new business models.
- We are searching for partners in a more extensive and open manner as we strive to contribute to a better society. Please join us in promoting our initiatives.

Transitioning from an automobile company to a mobility company

Mobility for All

Our home planet

Popularization of electrified vehicles on a global scale

TOYOTA