



Yamaha Motor Environmental Technology Briefing Session

7/19/2021

■ Agenda

■ President, CEO and Representative Director - Yoshihiro Hidaka

1: Long-Term Vision

2: Environmental Plan

■ Director, Senior Executive Officer, General Manager of Technical Research & Development Center, Heiji Maruyama

3: Carbon-neutral strategy in line with the unique style of Yamaha Motor

4: Specific Initiatives

■ Q&A session

Yoshihiro Hidaka

President, CEO and Representative Director

Due to the various environmental regulations and decarbonization movements accelerating all around the world, we have also been advancing business strategies and technological development toward carbon neutrality. Now, I would like to talk about that progress and our approach toward 2050.

■ Challenges: Paris Agreement - GHG Emission Reduction Targets

There is no waiting for "greenhouse gas reduction measures". As for companies, the challenge is for the survival

Reference to the "1.5°C" in the Paris Agreement

- Keeping the global average temperature rise below +2°C in comparison with pre-industrialization levels (1850-1900)
- Initiatives to limit the global average temperature rise to +1.5°C to pre-industrialization levels (1850-1900)
- Effective in 2016, implemented from 2020

Source: Intergovernmental Panel on Climate Change (IPCC), a summary of the "Special Report on Global Warming of 1.5 °C": Prepared by Ministry of the Environment

Greenhouse gas reduction targets in major countries

	2030 Targets	Base year	2050 Targets
Japan	-46%	Compared to 2013	Carbon neutral
US	-50-52%	Compared to 2005	Carbon neutral
EU	-55%	Compared to 1990	Carbon neutral
UK	-68%	Compared to 1990	At least -100% (compared to 1990 levels)
China	CO2 emissions per GDP over -65%	Compared to 2005	2060 Carbon neutral

Source: Created from the Ministry of Economy, Trade and Industry "Energy White Paper" https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/2021/042/042_004.pdf

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Needless to say, each country has set a non-binding target for reducing greenhouse gases in response to the effort goal of "temperature rise to less than 1.5 degrees C" in the Paris Agreement. As you can see, the target values for each country have been set extremely high.

We recognize that the measures to achieve that goal "cannot wait" any longer, and at the same time, while these are major issues for us, they are also an opportunity for further growth along with our survival.



Yamaha Motor Long-Term Vision

Before moving on to the main topic, we would like to reiterate our long-term vision announced at the end of 2018.



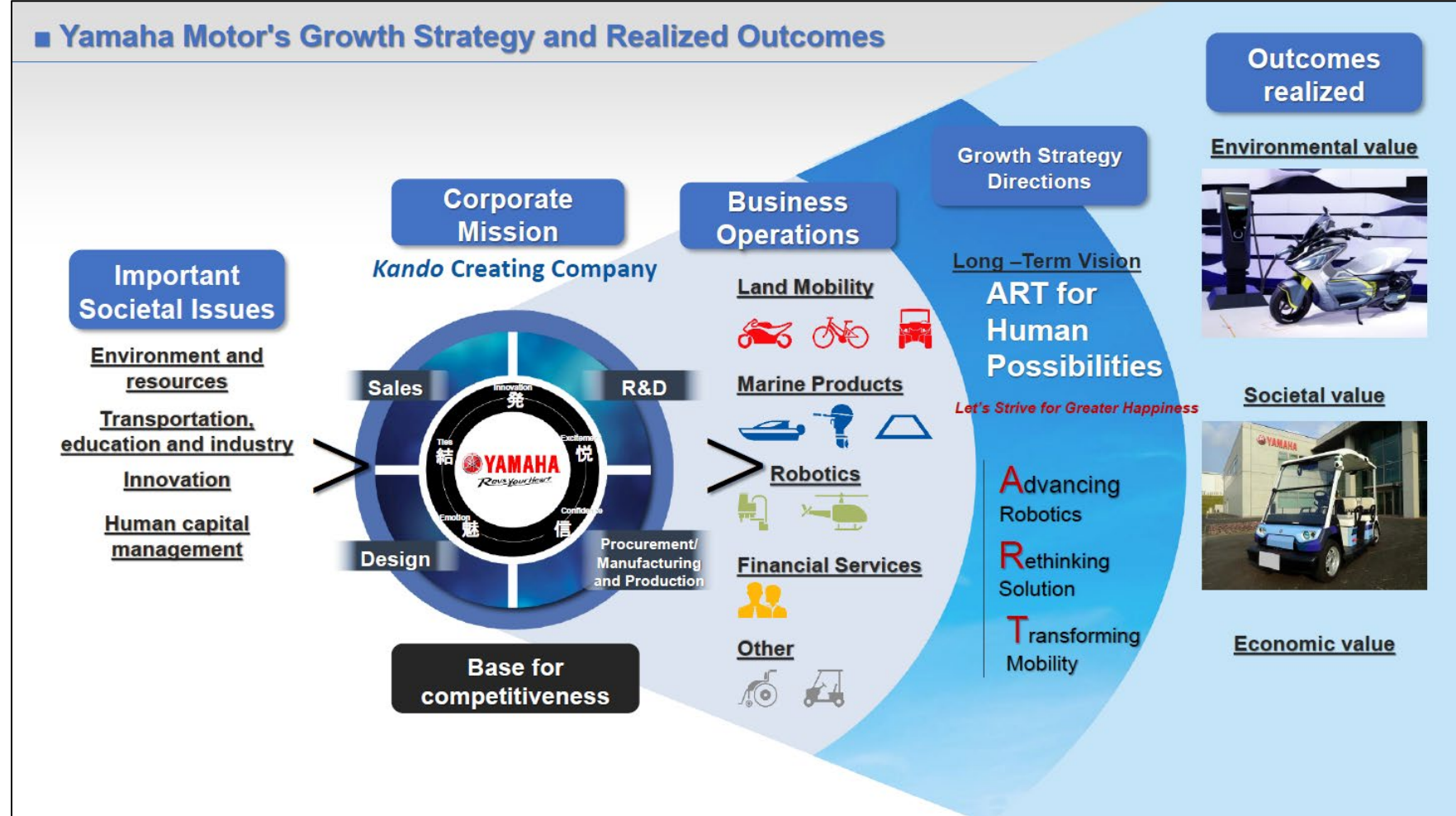
ART for Human Possibilities - Let's Strive for Greater Happiness

This is the theme of our long-term vision and the sense of direction we are aiming for.

In order for people to live in a more humanly prosperous and lively manner, we will continue to expand the possibilities available to us by creating greater mobility and robotics technologies using a combination of uniquely Yamaha solutions.

In the process of achieving carbon neutrality, technological breakthroughs will be required, and therefore some of the values in our societies and people will change. Under these circumstances, we believe that we have an opportunity to create and propose new value along with new enjoyment.

■ Yamaha Motor's Growth Strategy and Realized Outcomes



This is our growth strategy and the outcome flow that will be created by realizing it. For important social issues, we will work to drive the technologies, brands, businesses, products, etc. that we have cultivated so far in the direction of our long-term vision, and in turn, lead them to outcomes with higher social and environmental values.

■ Important Social Issues (Materiality)

While leveraging our strengths, we promote initiatives from identifying important social issues to be dealt with.

Issues directly involved with the sustainability of business models

**Environmental
and Resource**

**Transportation,
Education, and
Industry Issues**

Important issues related to strengthening the foundation

Innovation

**Promotion of
Human Resources
Utilization**

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These are the four important social issues that serve as the starting point for these.

We have organized and analyzed important social issues that can be worked through while leveraging our strengths, along with identifying the four materialities you see before you. To solve these issues, we are taking various initiatives based on the unique style of Yamaha.

Among these, environmental issues are especially important issues related to the sustainable growth of our mobility business.

■ Support for TCFD proposals, external evaluations

Task Force on Climate-related Financial Information Disclosure (TCFD) - Support for the proposal / Receipt of external evaluation

June 2018

Selected as a constituent of the "SNAM Sustainability Index"

May 2019

Task Force on Climate-related Financial Information Disclosure (TCFD) -
Support for the proposal

June 2019

Yamaha Motor Chosen for "SNAM Sustainability Index" for Second Straight
Year

June 2019

Selected as a constituent of the "S&P Japan 500 ESG"

June 2019

Selected as a constituent of the "FTSE4 Good Index Series" and "FTSE Blossom Japan Index"

November 2020

Selected as a constituent of the DJSI "Asia Pacific Index"

December 2020

Obtained an "A-" in the field of the CDP2020 Climate Change Report, an international non-
profit organization



Member of
**Dow Jones
Sustainability Indices**
Powered by the S&P Global CSA



In tackling environmental issues, we are also taking on climate change and disclosing information based on the TCFD.

In 2019, we announced our support for the Task Force on Climate-Related Financial Disclosures (TCFD) proposals, grasping and managing the opportunities and risks that climate change poses to our business, and reflecting the adaptation and mitigation measures in our business strategy. In addition, the efforts and progress are evaluated by the external organizations provided for you.



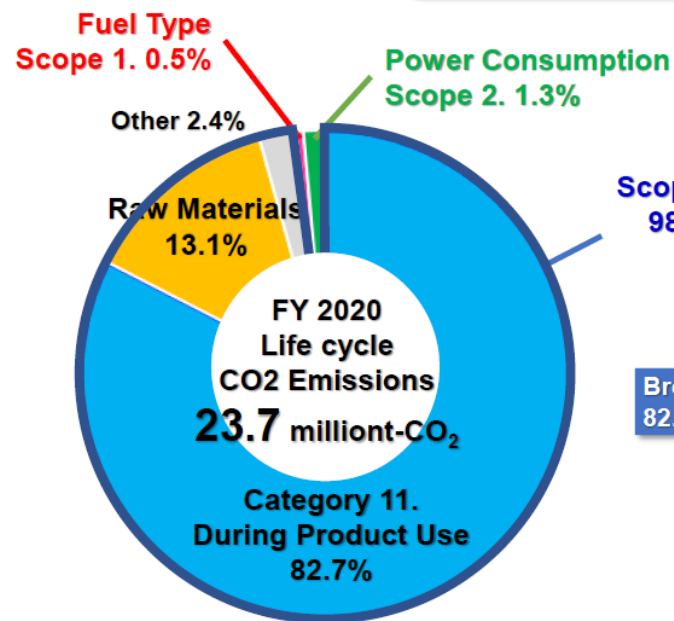
Yamaha Motor Environmental Plan

The next slides explain about our environmental plan. We have recently reviewed the environmental plan 2050 formulated in 2018 and set new target values accordingly.

■ CO2 emissions from the entire Yamaha Motor life cycle

Scope 3. Category 11. "During Product Use" account for 82.7% in Yamaha Motor life cycle CO2 emissions.
By product, "Motorcycles": 65%, "Marine Engines": 19%

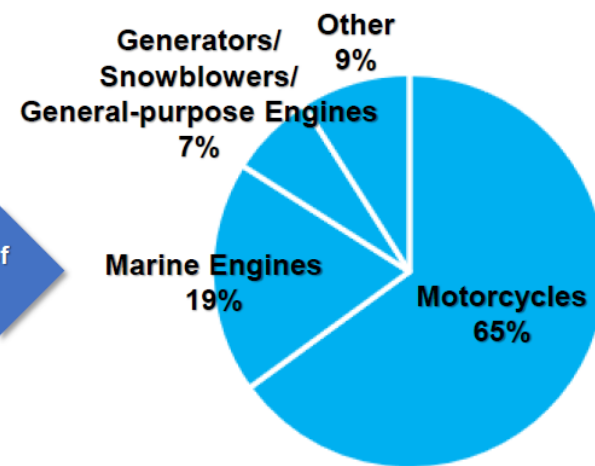
Life Cycle Break-down of CO2 Emissions



Scope 3.
98.2%

Breakdown of
82.7%

Scope 3. Category 11.
CO2 Emissions Break-down "During Product Use"



*Calculated using the "Emissions Intensity Database (ver3.1)" in accordance with the Ministry of the Environment "Basic Guidelines for Calculating Greenhouse Gas Emissions Through the Supply Chain Ver2.3_December 2017".
 (Source: https://www.env.go.jp/earth/ondanka/supply_chain/gvc/files/tools/unit_outline_V3-1.pdf)

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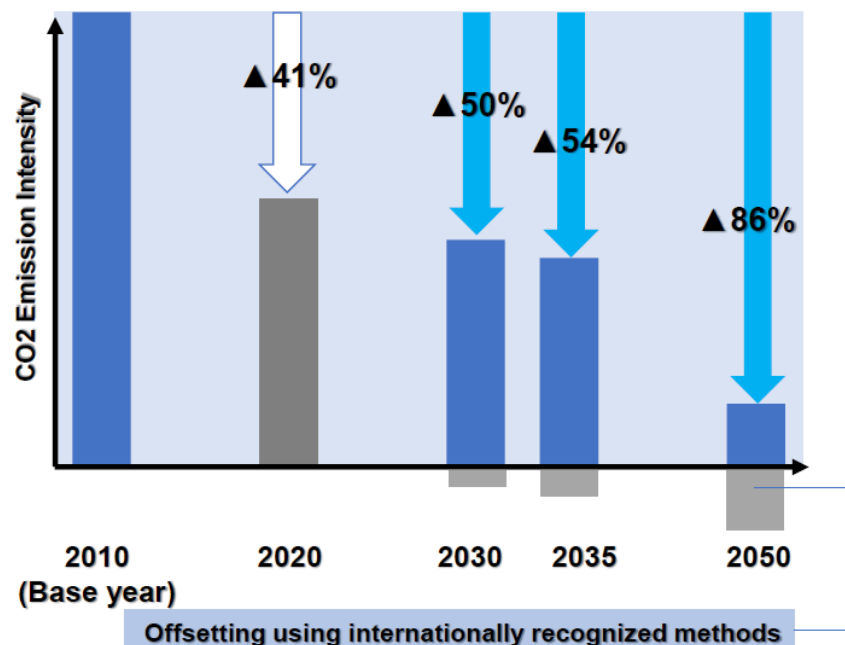
Our medium- to long-term goal is to aim for carbon neutrality in terms of life cycle CO2 emissions.

Please take a look at this. Within our life cycle CO2 emissions, Scope 1 & 2 is at 1.8% which is our own emissions in our corporate activities, and Scope 3 is at 98.2%, such as emissions from customer and employee product use, raw materials, transportation, disposal etc. As you can see, the largest source of emissions is Scope 3. Category 11. Emissions "During Product Use" account for 82.7% of the total. In addition, 65% of this is due to motorcycle use.

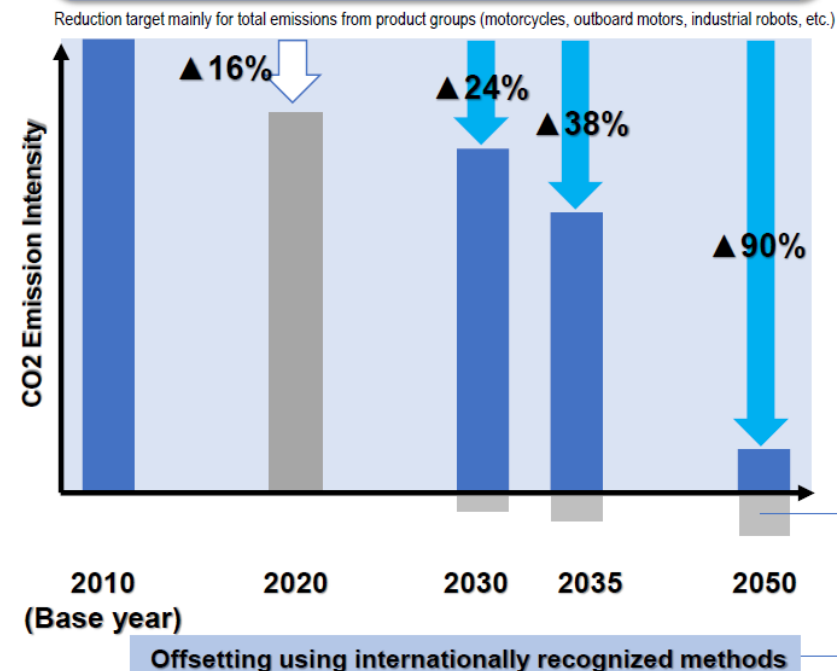
■ Yamaha Motor Initiatives for Climate Change

"Emissions other than Scope 1.2. (Scope 3./ Mainly for total emissions from product groups)"
 2030 ▲24% (compared to 2010). 2050 Carbon neutral

Company emissions in corporate activities (Scope 1./2.) Targets



Emissions other than Scope 1.2. (Scope 3.) Targets



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Here are the new targets for 2050 carbon neutrality. This is a review of the Group's environmental plan 2050, which was formulated at the end of 2018. The reduction values listed here are all comparisons with 2010.

First, we aim to halve our emissions by 2030 and then reduce them as much as 86% by 2050. We will offset this by an internationally recognized method while aiming to achieve carbon neutrality. However, as I mentioned earlier, our life cycle CO2 emissions are in Scope 3, with the main weight down to the use of the product. Regarding this, we have set a target for reduction of 24% in 2030 and 38% in 2035, with a further reduction to 90% by 2050.

Providing small and inexpensive mobility in Asia, which accounts for 85% of motorcycle sales, is an especially important mission from our SDGs perspective.

Needless to say, easy movement is directly linked to the expansion of living areas and the widening of vocational and educational opportunities.

On the other hand, the issue of climate change "will not wait" for us. We are aiming to meet these two contradictory expectations by combining the development of products with higher fuel efficiency, the spread of EV models, and the development of powertrains that support carbon-neutral fuel.

On top of that, we will optimally and effectively construct a lineup that includes next-generation mobility, while fully considering the energy policies and power composition requirements for each country and region.

■ Environmental Funds

In order to accelerate the development of environmental technology that Yamaha Motor should work on, the company will establish its own fund specializing in the environmental resources field

Environmental Resources Field - Overview of Yamaha Motor Fund

- **Fund Name** : Yamaha Motor Climate Scrum Fund (Draft)
- **Business Operations** : Search activities and investment of venture companies specializing in the environmental resources field
Total operation amount 100M dollars, Operation period 15 years
- **Establishment** : 2022 (Scheduled)
- **Business Location** : US / Silicon Valley
- **Administrator** : Yamaha Motor Ventures & Laboratory Silicon Valley Inc.
- **Purpose and Expectations** :
 - Supporting new businesses that contribute to the maintenance / improvement of the global environment
 - Focus on areas where we should work on solving environmental resource issues
 - Consider investing in growth potential businesses without specifying the region
 - Aiming to build new businesses that will lead to the acquisition of negative carbon in the environmental resources field



In 2022, we will establish our own fund specializing in the field of environmental resources in Silicon Valley to accelerate the carbon offset efforts necessary to achieve our goals.

We are planning a business with a total operation period of 15 years and a total of 100 million dollars, and while focusing on the areas we should work on, we will aim to build new business that will in turn lead to carbon negative.





Heiji Maruyama

**Senior Executive Officer,
Chief General Manager of
Technical Research & Development Center**

The next slides explain the technology strategy for 2050 and other specific initiatives, focusing on land mobility.

*In the unique style of
Yamaha Motor*

Compact Mobility

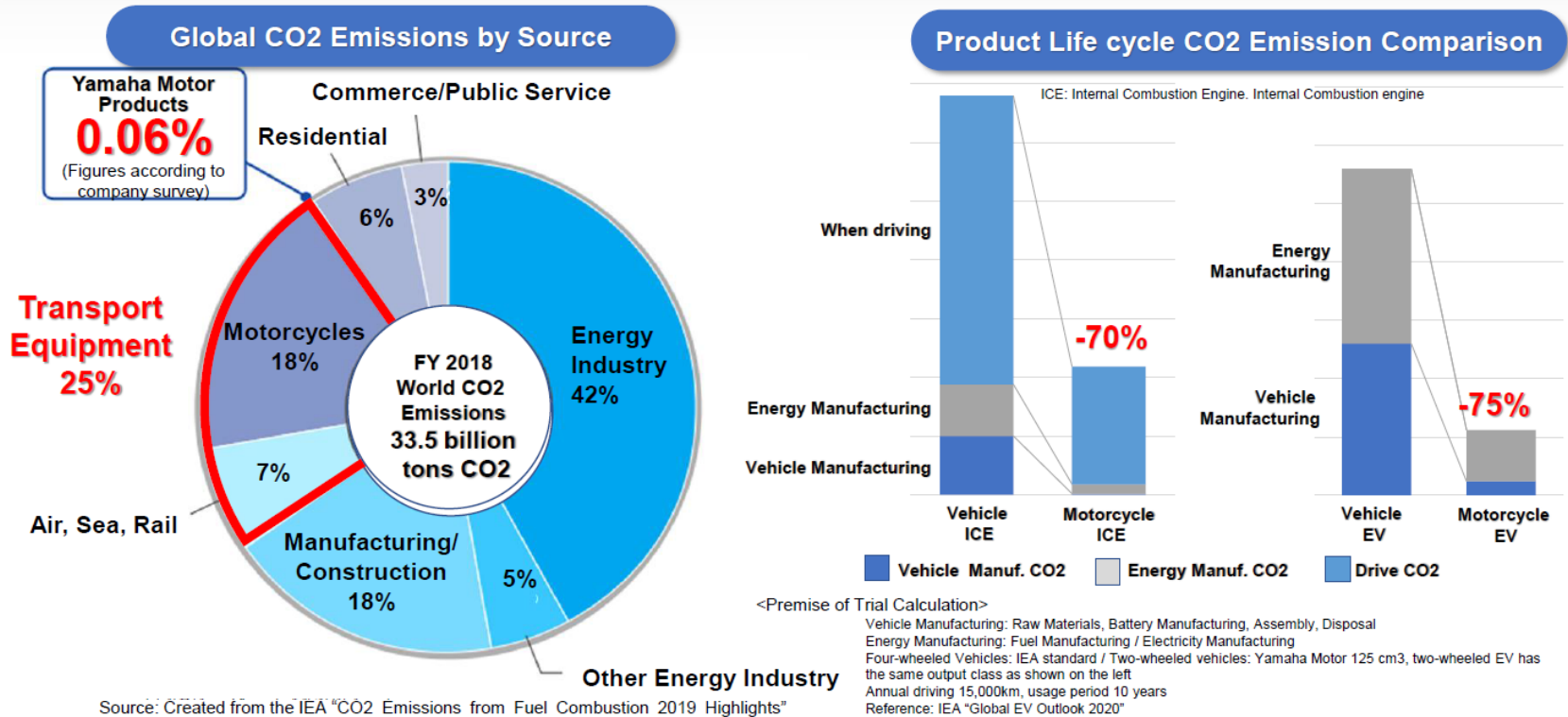


Since our founding in 1955, based on motorcycles, we have created a variety of small and compact mobility.

We pride ourselves on our traditional strength in our ability to create a wide range of highly unique compact mobility such as electrically power assisted bicycles, electric wheelchairs, and leaning multi-wheel LMWs.

Motorcycles - CO2 Emissions Impact

"Compact Mobility", one of the earth-friendly means of transportation compared to four-wheeled passenger cars



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The figure on the left shows global CO2 emissions by their emission sources. Of the transportation equipment that accounts for 25% of the total, our motorcycles account for 0.06%. Compared to four-wheeled vehicles, small mobility such as two-wheeled units are considered to be one of the means of transportation with less environmental impact.

On the other hand, the graph on the right is a comparison of the CO2 emissions from motorcycles and automobiles during the product life cycle. Here once more, you can see that motorcycles emit 70% less than other internal combustion engines, and for battery EVs, 75% less than four-wheeled vehicles.

■ "Environmentally friendly" compact mobility that Yamaha Motor continues to provide

1993 Continues to develop "compact mobility" that in-line with Yamaha Motor and low environmental load such as the world's first electrically power assisted bicycle

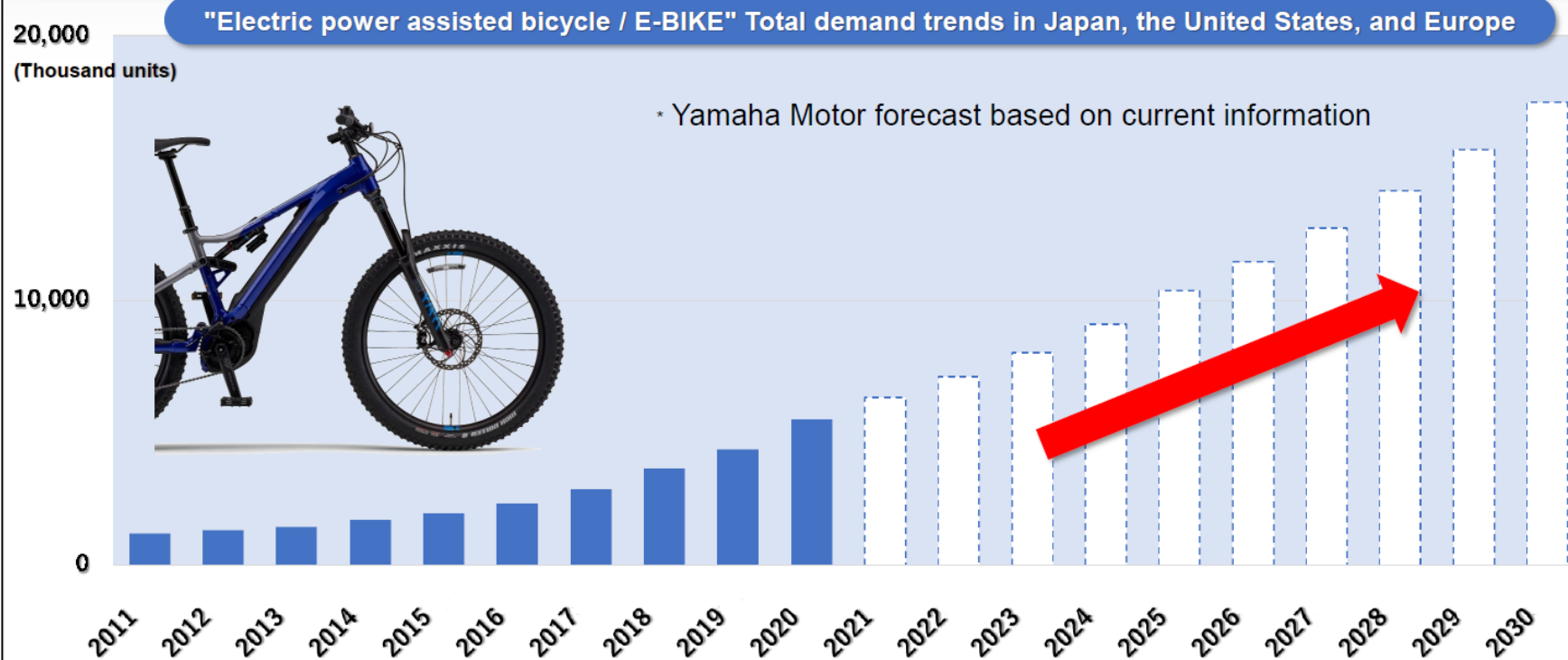


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This represents our achievements using small mobility development. The company developed and launched the world's first electrically power assisted bicycle in 1993. In 2002, we launched the mass-produced electric bicycle "Passol" for the first time in Japan, and since then we have continued to sell other various EV two wheeled units while improving their performance. In 2005, we developed a fuel cell vehicle "FC-me" equipped with a compact direct methanol fuel cell DMFC system and have continued to monitor it as a public vehicle at the Shizuoka Prefectural Office. Our work is not limited to two wheeled units. Electric powertrains are spreading to products in other various fields such as drones, electric wheelchairs, golf cars, and marine propulsion devices.

■ Electric Assisted Bicycle Market

The compact mobility "electrically assisted bicycle" created by Yamaha Motor has become a larger global market.



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By the way, one of the small mobility options that we created in 1993, the electrically power assisted bicycle, now with the support of people all over the world continues to be expanded to new customers mainly in developed countries. The graph you see shows the total demand for E-BIKE, an electrically power assisted bicycle sold in Japan, the United States and Europe. By 2030, we expect demand to grow to more than 15 million units a year, about three times the current level.

■ Future movements drawn by Yamaha Motor

Solving social issues through the development of "compact mobility" that has a low environmental impact and is fun

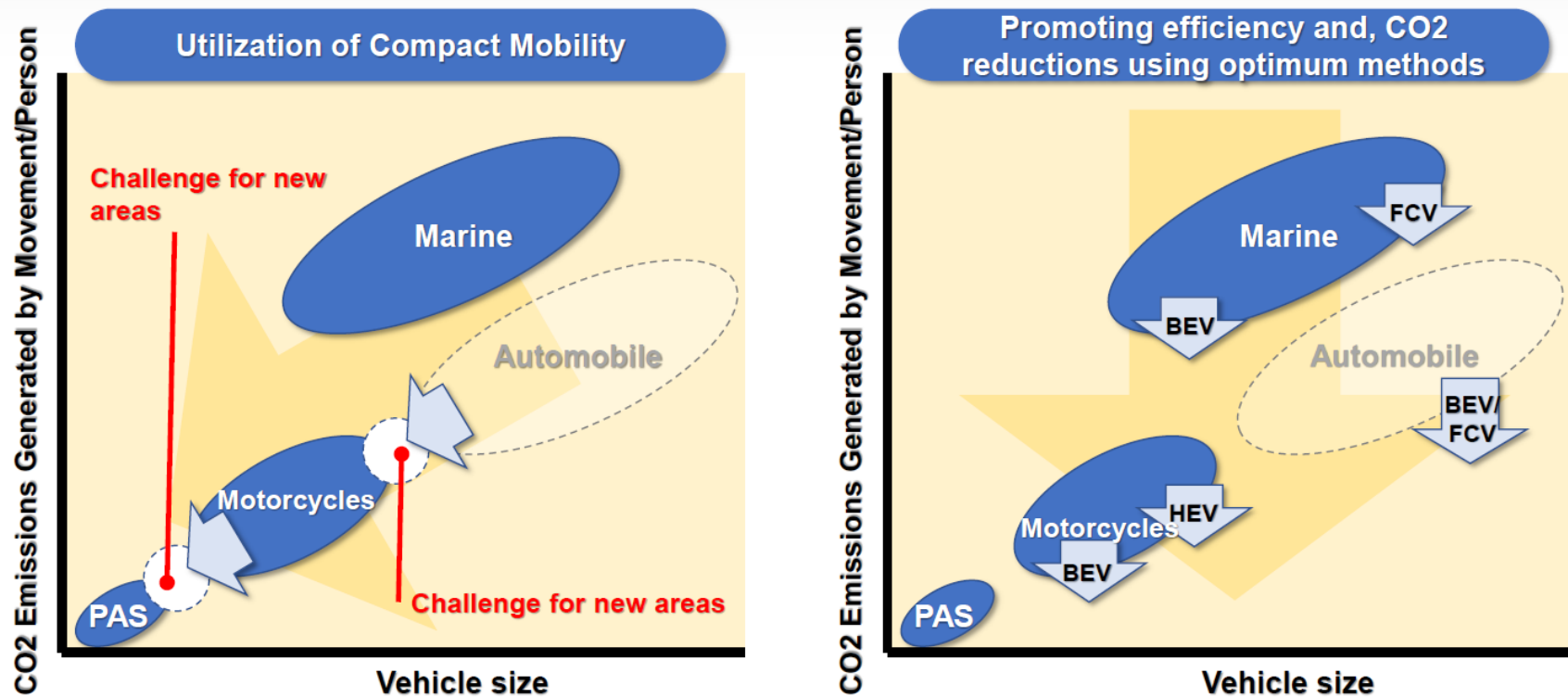


As represented by electrically power assisted bicycles, motorcycles, and electric wheelchairs, one of the features of small mobility is that it occupies a smaller area than its four-wheeled vehicle counterpart. It is a minimum sized vehicle designed for one person's movements.

What you are seeing is the movement of people in the near future as forecast by Yamaha Motor. In addition to four-wheeled vehicles, various small mobility vehicles can move safely and enjoyably in their respective speed ranges. In this way, we will visualize people's happy movements through a wide range of small mobility that has a low environmental impact and makes traveling fun.

■ Carbon-neutral strategy in line with the unique style of Yamaha Motor

Basic Policies: Aim to further reduce CO2 emissions per person due to movement



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At the heart of our strategy toward carbon neutrality is the basic idea of further reducing "CO2 emissions per capita due to movement." I would like to introduce two ways to doing that here.

First, look at the figure on the left. This represents a strategy to create new areas of compact mobility that have never been seen before, in order to expand the use of mobility, which also has a lower environmental impact. As for new areas, we are considering the development of small mobility that is between four-wheeled vehicles and two-wheeled vehicles, and small mobility that is between two-wheeled units and electrically power assisted bicycles. The other is to switch the existing small mobility powertrain to one with less environmental impact. As shown in the figure on the right, we are studying the use of battery EVs, FCVs, and carbon-free synthetic fuels in motorcycles and marine products.

We believe that both approaches are directly linked to "reducing CO2 emissions per capita associated with travel."

Internal Combustion Engine Development

~ Toward the future

Balancing carbon neutrality and improving customer value

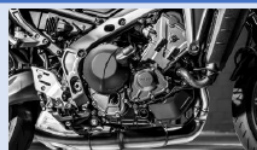
- Improved thermal and drive efficiency
- Compliant with environmental regulations
- Compliant with CN Fuel
- In pursuit of human-machine sensuality, Fun creation

- <Thermal Efficiency>
- High Compression Ratio
 - VVA (Variable Valve Actuation)
 - Strengthening In-cylinder Flow
- <Drive Efficiency>
- Electronic Controlled Shift
 - Electronic Controlled Throttle
 - Electronic Controlled AT

~ Present (2021)

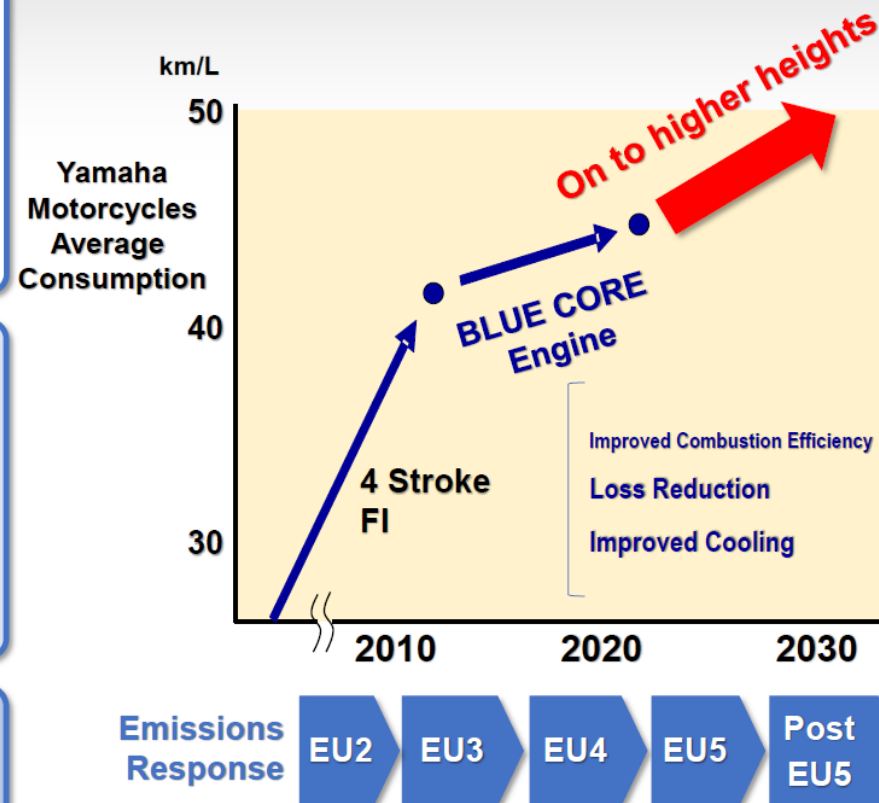
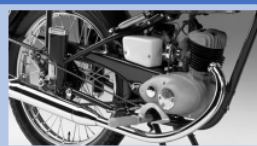
High Value Added Powertrain Creation

- Brings out high-quality torque characteristics "Crossplane engine"
- Combines acceleration and environmental performance "BLUE CORE Engine"



Founded (1950s)

The beginning of the Yamaha internal combustion engine

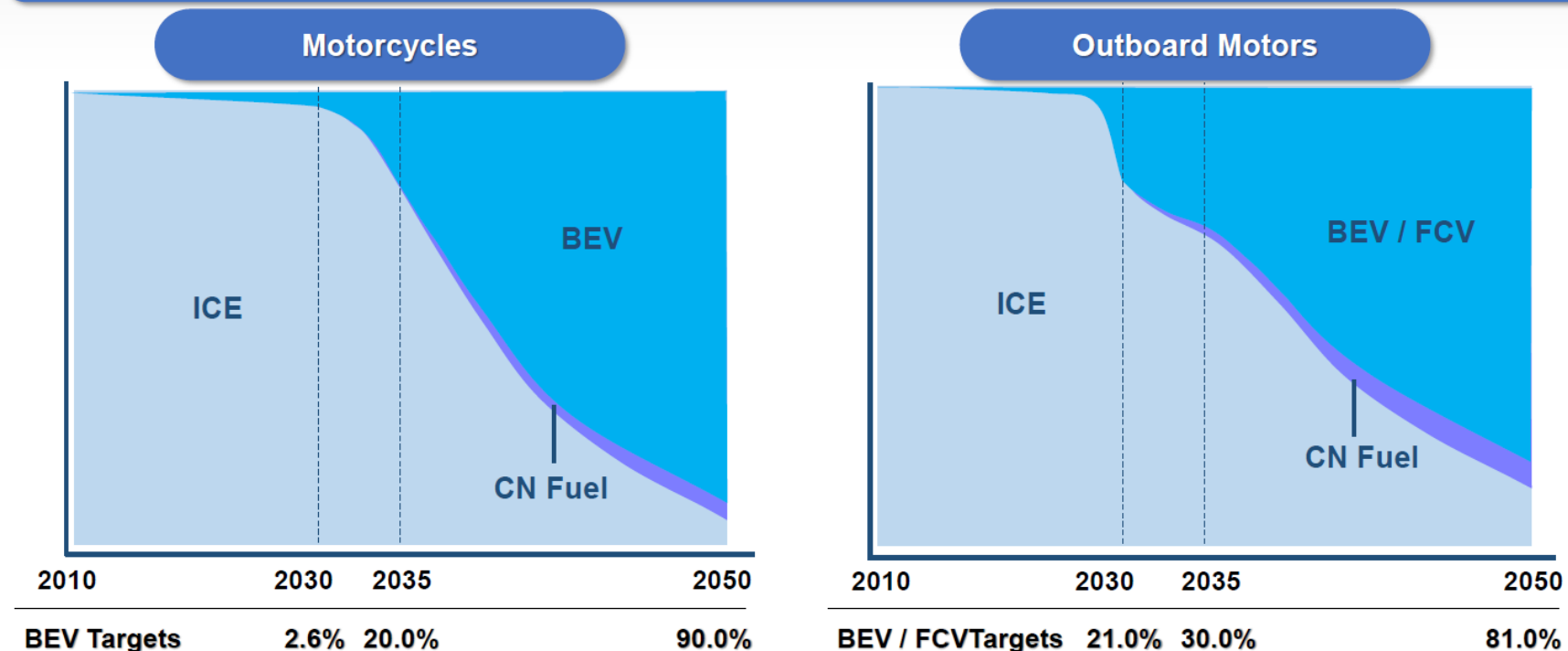


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On the other hand, we think it is necessary to persistently work on improving the thermal efficiency and drive efficiency of internal combustion engines. As President Hidaka explained at the beginning, this is because we regard this area as an important mission that we should work on from the perspective of our own SDGs. We have been working on improving fuel efficiency and environmental friendliness with our specialty small engine technology, such as further work toward 4-stroke engines and fuel injection; and in the development of our BLUE CORE engine line-up. For the time being, we will continue to steadily develop more efficient engines for areas where internal combustion engines are required and to prepare for the spread of carbon-free synthetic liquid fuels in the future.

■ Specific Measures

Powertrain composition ratio for motorcycles and outboard motors in order to realize a carbon-neutral society



As a prerequisite, it is assumed with reference to future forecast scenarios such as IEA when aiming for carbon neutrality in 2050. In the future, reviews will be carried out as appropriate according to power source composition policies and infrastructure conditions designed for each country and region.

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This graph shows the future changes in the composition ratio of major powertrains by product. We do not expect it to change across the board as it is greatly affected by the penetration rate and model mix of each market, however from around 2030, we will accelerate the spread of electrification and support for synthetic liquid fuels. By 2050, it is expected that 90% of motorcycles will be electrified and outboard motors will utilize fuel cell technology.

Specific Initiatives

The next slides detail the progress of some of our specific efforts. Here, we will mainly introduce land mobility, that is, small mobility unique to Yamaha Motor on land.

ART for Human Possibilities
Let's Strive for Greater Happiness



In the unique style of Yamaha Motor
Eco-friendly Compact Mobility

Yamaha Motor Original
Carbon Neutral Strategy



Looking back on this point.

A sense of direction headed toward 2030: Long-term vision ART for Human Possibilities, and Let's Strive for Greater Happiness.

The company specialty: Small, eco-friendly mobility typical to Yamaha Motor. Then, we have a unique carbon-neutral strategy and specific initiatives that focus on **"CO2 emissions per capita due to movement "**

The first is the challenge in new areas.

Challenge for new areas

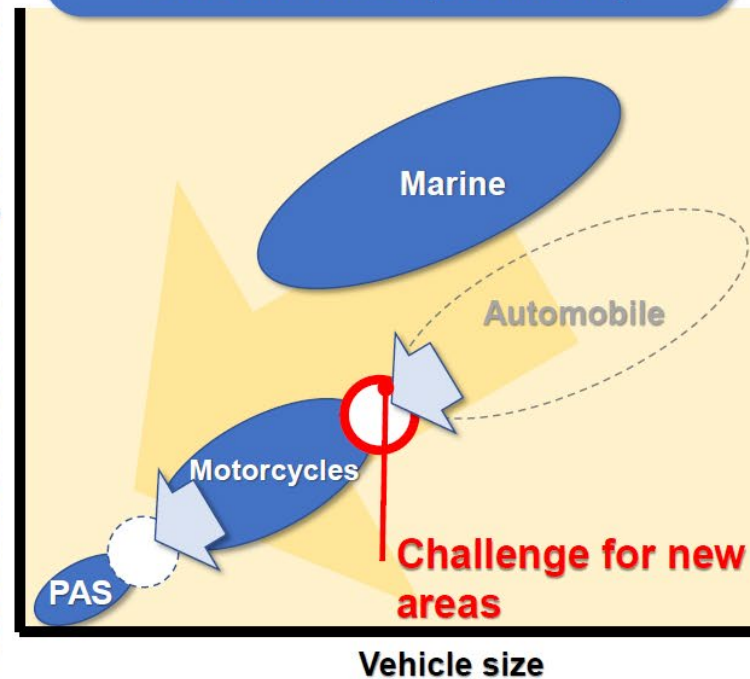
Tokyo Motor Show 2019 reference: Exhibited Model

MW-VISION



CO2 Emissions Generated by Movement/Person

Utilization of Compact Mobility



This is the electric compact mobility "MW-VISION" in a new area seen between four-wheeled vehicles and two-wheeled vehicles. We are proceeding with development based on the models exhibited at previous Tokyo Motor Shows.

Challenge for new areas

Tokyo Motor Show 2019 reference: Exhibited Model

MW-VISION



Concept

Closer to people's senses in order to be more in tune with the city and its people.

Human Size Mobility

Lean Control Technology

By combining scooter and EV technology, practicality in everyday use and a high-quality feel that surpasses conventional scooters is achieved.

An actuator is mounted on the Front Leaning Multi Wheel (LMW) mechanism, providing a unique lean control technology according to riding conditions.

Leaning Multi Wheel = A general term for vehicles with three or more wheels that lean and turn like a motorcycle.

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This is a proposal that combines the advantages and fun of two-wheeled vehicles and four-wheeled vehicles as a new compact mobility that can further harmonize people with the city and their senses. It has a simple cabin, is self-supporting by automatic control, and can tilt and turn like a two-wheeled vehicle.

This vehicle is under development. The prototype, we made, has reached a level where it can be driven well, and we are in the process of developing it further.

Challenge for new areas

Tokyo Motor Show 2019 reference: Exhibited Model

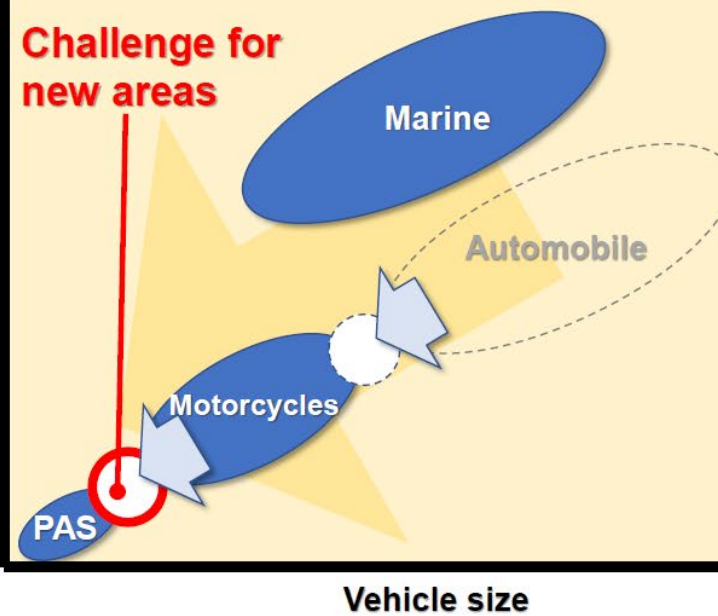
TRITOWN



CO2 Emissions Generated by Movement/Person

Utilization of Compact Mobility

Challenge for new areas



On the other hand, this is the small electric mobility "TRITOWN" that stands between two-wheeled vehicles and electrically power assisted bicycles.

Challenge for new areas

Tokyo Motor Show 2019 reference: Exhibited Model

TRITOWN



Concept

Making the last mile fun and enjoyable!

We worked hard to make short-distance travel more enjoyable and comfortable.

Lean Mechanism

In the main, we adopted a leaning mechanism using a parallelogram link.

It becomes more independent by the rider balancing on the vehicle

By placing your feet on both the steps that move up and down on the left and right, you can balance (stop) the movement and stand.

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The idea is to make the last one mile safer, more enjoyable and, of course more comfortable. Complicated controls have been eliminated, allowing riders to move around more easily by just maintaining balance, enabling a greater level of independence.

This is the small standing mobility "TRITOWN" using LMW technology.

Challenge for new areas

NeEMO



Through customers' daily use, the company will explore new possibilities of utilization such as means of transportation after the returning of licenses and the expansion of life such as **improving physical and mental health by offering greater opportunities to get out.**

Slow Mobility



Responding to social issues such as depopulation, aging, and labor shortages while also considering future autonomous driving options.

Providing mobility as a place where people can connect
Designed under the idea that interactions will increase inside a face-to-face in-vehicle environment

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We are also simultaneously developing and experimenting with small mobility in various places. "NeEMO", as an example, is a vehicle that increases outing opportunities and leads to health promotion. Slow mobility works to connect people as they ride together.

This concludes the introduction of the progress of mobility development in new areas that are unique to Yamaha.

Efficiency with the optimal methods

Tokyo Motor Show 2019 reference: Exhibited Model

E01

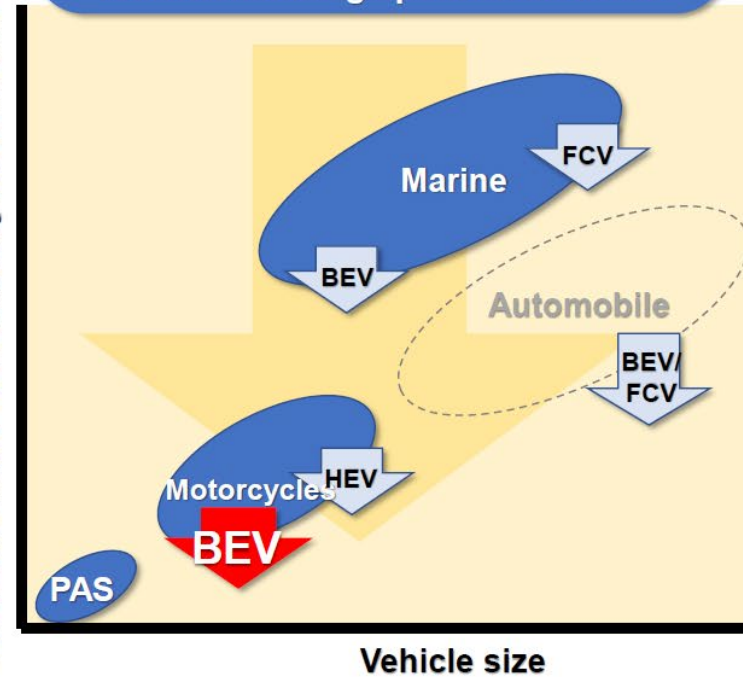


E02



CO2 Emissions Generated by Movement/Person

Promoting efficiency and CO2 reductions using optimum methods



Next, we would like to introduce our power source initiatives.

This is an approach to reduce the per capita CO2 emissions associated with the movement of existing compact mobility with powertrain technology.

The "E01" shown in the photo is a next-generation electric commuter equivalent to 125cc. It is a battery EV platform with high mobility that covers traffic between cities to some extent, leads the flow of traffic, and realizes comfortable commuting to work or school.

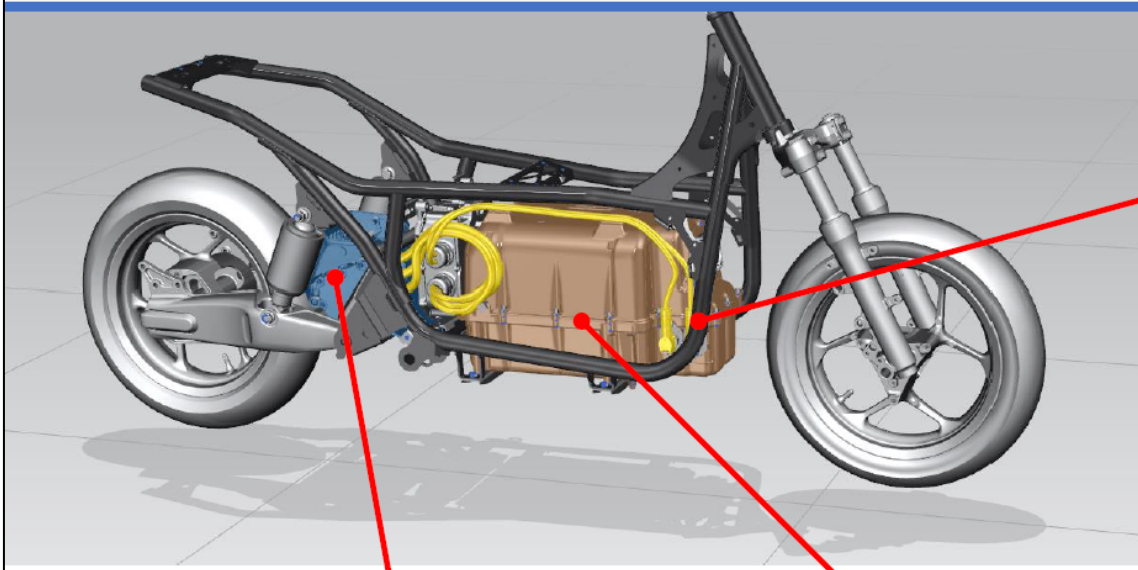
On the other hand, the "E02" photo is a next-generation electric commuter equivalent to 50cc. We are developing it as a compact and lightweight battery EV platform that is ideal for moving around the city.

Now, we would like to introduce these battery EV2 models, which aim to improve efficiency by using optimum methods.

Efficiency with the optimal methods E01 Tokyo Motor Show 2019 reference: Exhibited Model

Concept

A new-generation high-mobility EV platform that leads **the flow of urban transportation and realizes comfortable commuting to work and school**



High Rigidity Cradle Frame

A double cradle frame structure made of high-strength steel piping that achieves both a rational layout of the motor and battery along with a high-level running performance. By mounting a heavy battery in the center of the unit, higher capacity is secured and greater ride quality is realized by centralizing the mass.

High Rotation Type Motor

A high-speed air-cooled brushless DC motor developed exclusively for motorcycle characteristics. Achieves ease of handling in the low-speed range, a feeling of linear acceleration across the entire range, and high-quality high-speed driving from low-speed high torque and high rotation type motors.

High output, Large-capacity Lithium-ion Battery

High output fixed batteries that enable high-speed driving while satisfying a cruising range designed for everyday use. The miniaturization of the battery case makes it possible to mount it on a more compact vehicle body, and also supports quick charging that can be carried out to 90% in 60 minutes(*).
*Charging time from 0% / When battery temperature is 25°C

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First is the "E01". This model is equipped with a high-speed air-cooled brushless motor that was specially developed according to the characteristics used in motorcycles. It is easy to handle at low speeds due to large torque and has high level output characteristics. It also realizes a linear acceleration feeling and high-quality driving experience from the everyday range to high-speed use.

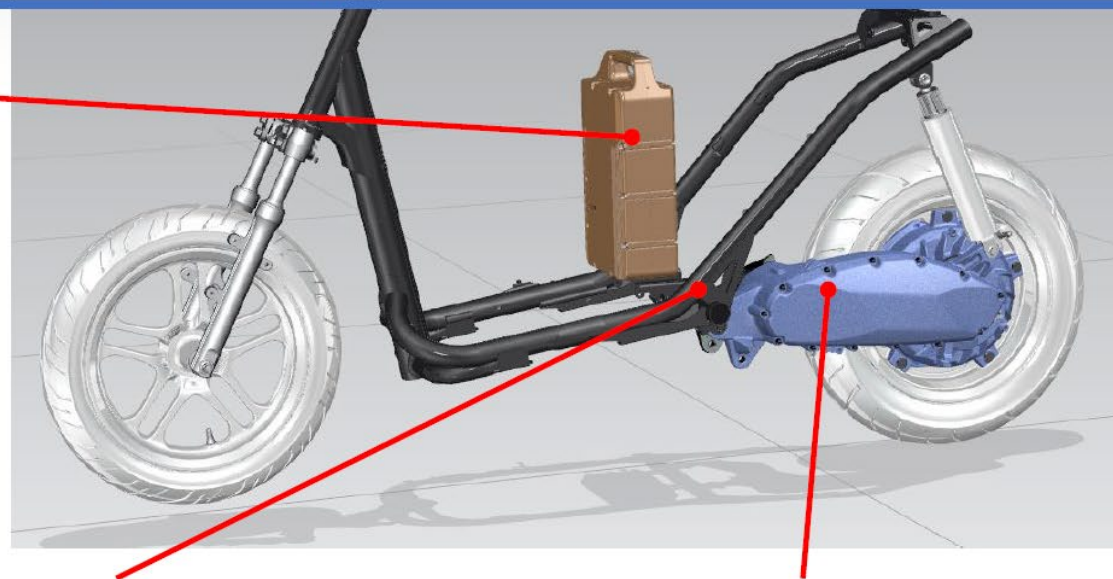
The battery is a high-output, large-capacity fixed lithium-ion battery. The miniaturized battery makes it possible to mount it on a compact vehicle body, and the dedicated quick charge can charge up to 90% in 60 minutes. There are also efforts to improve efficiency in the body. By laying out the heavy battery in the center of the body, a greater ride quality is also realized by centralizing the mass weight.

Concept

A platform for next-generation electric commuting **ideal for city travel**

**Lightweight, High-output
Removable Batteries**

A structure made for the installation of various 48V battery systems (including replaceable ones) expected for each global region. As a removable type that supports home charging, Yamaha Motor has developed a 48V battery that is both lightweight and portable and has high output. Convenience has been improved by devising a fixed structure to facilitate the work of replacing the battery.

**Body Layout Ensuring Storability**

Based on the frame of the existing engine models, a relaxed riding posture and sufficient storage space are secured even when the battery is installed. A platform that takes into consideration future product expandability.

Rear Arm Integrated Power Unit

A direct drive in-wheel motor is used to achieve a more quiet and smooth acceleration feeling. Achieving compactness by consolidating power unit parts on the rear arm.

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And this is the "E02". This is designed on the assumption of the use of a 48V removable battery. It fixes a battery in a way that is easy to install or remove. It is also laid out to accommodate a variety of regional removable battery systems. The power unit uses a direct drive in-wheel motor that provides a quiet and smooth acceleration feeling. By consolidating the power unit parts, it is integrated with the rear arm, achieving an unprecedented compact layout. The body is based on the frame of the existing commuter and incorporates various other requirements for EVs. It uses a design that will serve as a platform for expanding the lineup in the future. This concludes, the presentation on the EV platform.



Today, we have explained about our environmental technology, but we think that vehicles are not only tools that make transportation convenient, but also partners that are designed originally to give us fun.

In aiming to achieve carbon neutrality, we see the act of creating more environment-friendly, safer, and enjoyable solutions as a positive challenge and an opportunity for us. Please continue to follow our progress with these ventures.



Thank you for your attention