

KOMATSU

Komatsu IR-Day 2021

**Construction Business,
Electrification**

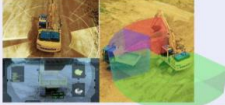


Seiichi Fuchita

**Senior Executive Officer
President, Development Division**

Thank you for joining us today.

I'm Seiichi Fuchita, Senior Executive Officer and President of Development Division.

Today I would like to explain the electrification of our construction business.

Mid-Term Management Plan	
We will achieve sustainable growth in the face of changing external environment and challenges by focusing efforts on the following three pillars of growth strategies.	
<p>Value creation by means of innovation</p> 	<ul style="list-style-type: none"> ◆ Optimization platform and solutions business strategies <ul style="list-style-type: none"> * SMARTCONSTRUCTION, Autonomous Haulage System (AHS), and platforms (LANDLOG and IntelliMine) ◆ Automation, autonomous operation, electrification and remote controlling of construction, mining and utility equipment ◆ Smart forestry and agriculture
<p>Growth strategies based on business reforms</p> 	<ul style="list-style-type: none"> ◆ KMC integration synergies and business reinforcement ◆ Value chain reforms and redefinition of the aftermarket business <ul style="list-style-type: none"> * Preventive maintenance by applying IoT and AI, and Lifecycle support under serial number-based management * Logistics reforms * Next-generation key components ◆ Next-generation KOMTRAX ◆ Stronger focus on aggregate & cement, forestry, agriculture and other segments ◆ Efforts for "DANTOTSU NO. 1 in Asia" and in the growing markets of India and Africa ◆ Reforms of the industrial machinery business (Expansion of synergy with the construction equipment business and growth by capitalizing on core technologies)
<p>Structural reforms for growth</p> 	<ul style="list-style-type: none"> ◆ Business reforms by means of ICT and IoT ◆ Structural reforms of development operation <ul style="list-style-type: none"> * Model base development * Open innovation ◆ Connected plants with Zero impact on environment and workers ◆ Global human resource development

At first, I would like to explain our mid-term management plan.

The DANTOTSU Value - FORWARD Together for Sustainable Growth three-year mid-term management plan is slated to conclude with FY2021.

The three pillars of our growth strategy are value creation through innovation, growth strategy through business reform, and structural reform for growth in our mid-term management plan.

Regarding value creation through this innovation, we are working on automation, independence, and electrification of construction, mining, and utility machineries.

We have commenced initiatives for responding to the rising global concern regarding climate change, such as introduction of mini excavator in Japan market, verification tests for electrified small and medium-sized hydraulic excavators, and the development of electrified super-large dump trucks for mining applications.

Today I would like to explain the electrification.

World Trend for Carbon Neutrality

CO2 reduction target

Country·Region	Due to	from	Reduction ratio	C/N Target
Japan	2030	2013	▲46%	2050
USA	2030	2005	▲50-52%	2050
Canada	2030	2005	▲40-45%	2050
EU	2030	1990	▲55%	2050
UK	2035	1990	▲78%	2050
Russia	2030	1990	▲30%	2060
China	2030	-	Decreasing	2060
India	2030	2005	Renewable energy ratio 50%	2070
Australia	2030	2005	▲26-28%	2050

COP26 Agreement

- ✓ Global average temperature rise: Pursue effort to limit to 1.5 degrees Celsius
- ✓ Coal-fired power generation (has not taken measures to reduce emissions): Accelerate to efforts to phasedown
- ✓ Emission reduction target due to 2030: Review and strengthen by end of '22
- ✓ Support for developing countries: Steadily maintain annual contribution of 100 billion dollars promised by developed countries until 2025
- ✓ Carbon credit trading framework: Approval

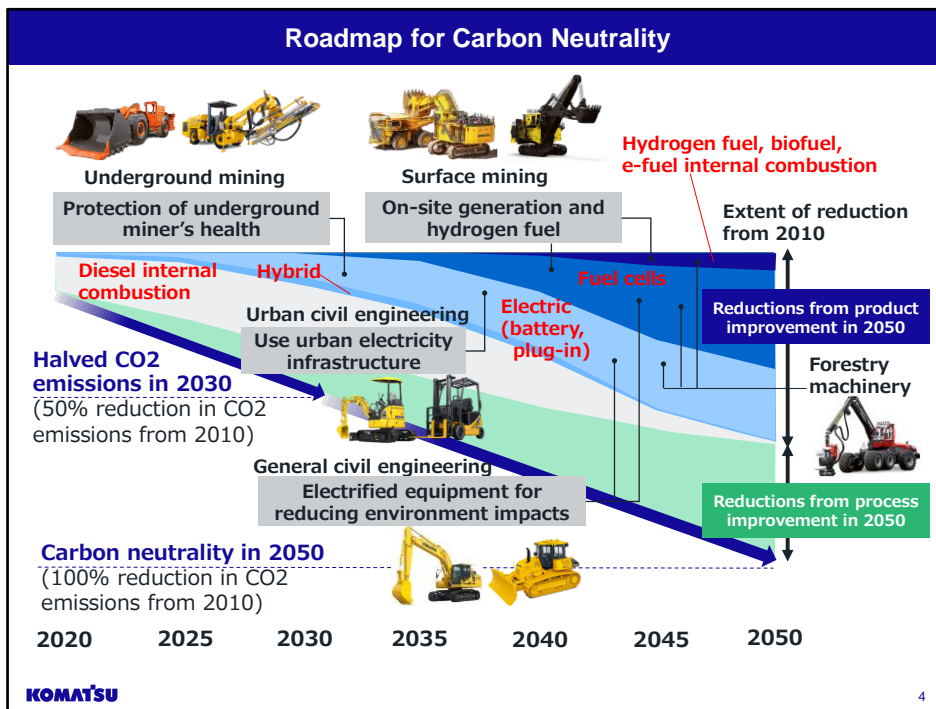
Others

- ✓ Vow to end and restore forest destruction by 2030 (by leaders from more than 100 countries)
- ✓ Announce global cooperation framework to reduce methane emissions due to 2030
- ✓ USA-China cooperation: Keep temperature rise to 1.5 degrees during this century

Regarding the global movement toward carbon neutrality, many issues were discussed at COP26 held last month, and specific goals for carbon neutrality were confirmed.

We wrote down the CO2 reduction targets of each country and the main contents discussed at COP26 in this page.

COP26 has agreed to continue efforts to keep the global average temperature rise to 1.5 ° C before the Industrial Revolution, and we believe that the global movement toward carbon neutrality will continue to accelerate.

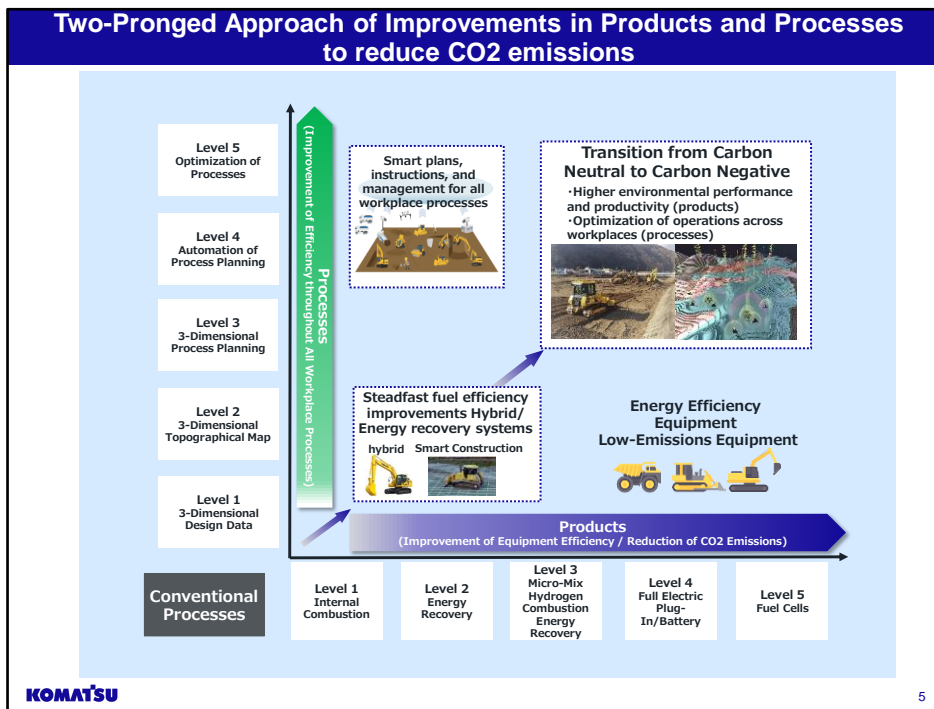


Komatsu made a declaration toward the realization of carbon neutrality in 2050 in the integrated report "Komatsu Report 2021" issued on September 16. Komatsu's carbon neutrality initiatives will not be limited to cutting emissions from the use of its products. Rather, we are broadening the focus of our initiatives to target customer workplaces in their entirety. With this focus, we will seek to reduce CO2 emissions by evolving our Smart Construction solution and otherwise optimizing customer workplace. Komatsu has declared its goal of achieving carbon neutrality by 2050 along with its commitment of halving the CO2 emissions from product operation by 2030 compared to 2010.

In the past, we have achieved massive success in improving the fuel efficiency of our products by developing and producing major components in-house and combining these components in an optimal manner. We also launched the world's first hybrid hydraulic excavator for sale in 2008. We will continue to pursue such improvements to product fuel efficiency in the future. However, we also realize that achieving carbon neutrality will require us to go further to adopt new drive sources. The workplace conditions under which construction and mining equipment developed and produced by Komatsu is used can vary based on model and output.

We need to select a power source that is ideal for each piece of equipment in order to meet customer expectations. We are currently ramping up development of products that use drive sources that do not emit CO2, like batteries and fuel cells. Accordingly, we are incorporating cutting-edge technologies to eliminate CO2

emissions from products by model and by output class. At the same time, we are sharing our roadmap for carbon neutrality with external development partners and customers while making steady progress based on this map.



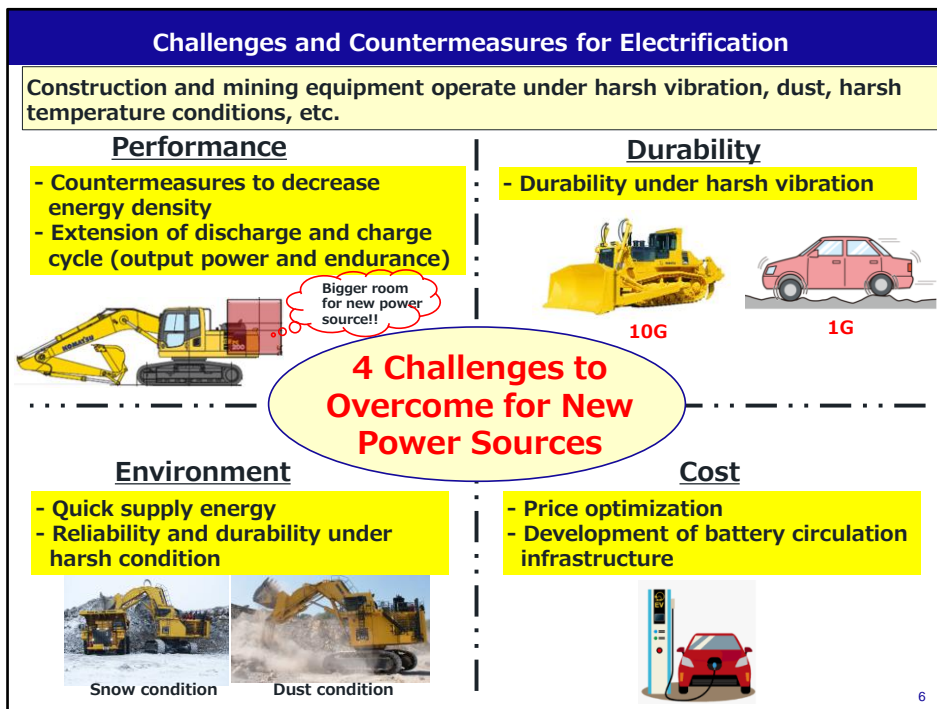
Komatsu is adopting a two-pronged approach toward reducing the amounts of CO2 emitted at customer workplace.

The first prong is improvements to products. Initiatives in this regard will include increasing the work efficiency of equipment, pursuing steadfast improvements in fuel efficiency, and transitioning from diesel and other internal combustion engines to cleaner power sources, including hybrid and electric engines and fuel cells.

The second prong is improvements to processes.

By Smart Construction, specifically, we look to lower CO2 emissions by optimizing customers' workplace operations and processes in order to reduce the amount of equipment needed along with the operating times of this equipment and to improve operational efficiency, etc. by smart construction. We reduce CO2 emissions from not only Komatsu's equipment but also other equipment, by improving workplace efficiency via smart plans, instructions, and management.

Komatsu seeks to contribute to carbon neutrality by improving products and processes efficiency and combining both improvement.

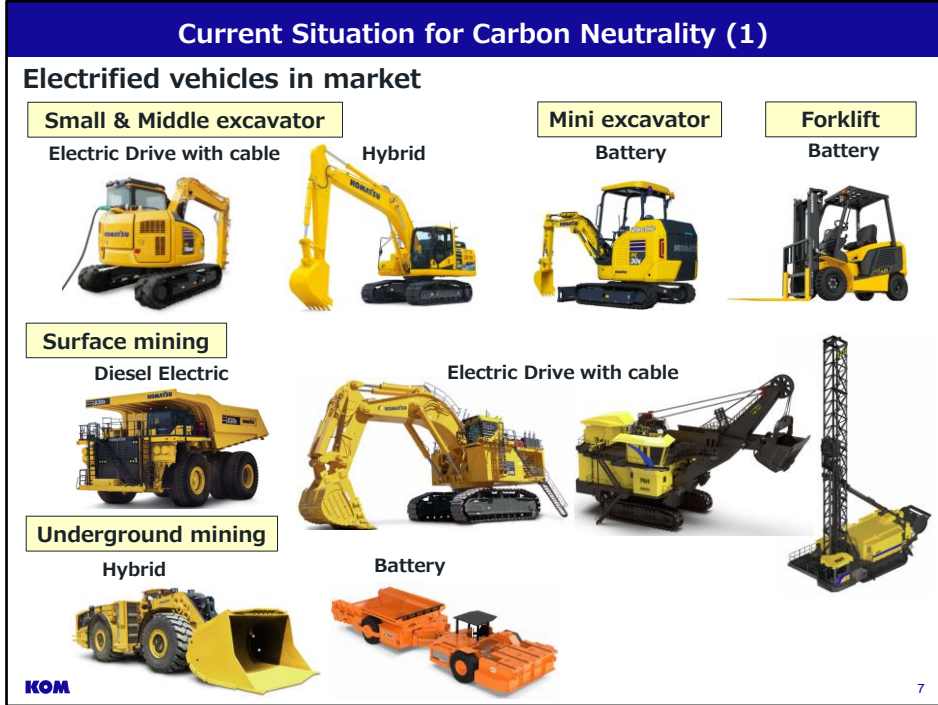


There are some difficulties in advancing development for carbon neutrality in construction and mining equipment unlike automobile.

Construction and mining equipment operate under harsh vibration, dust, harsh temperature conditions, etc.

The new power source needs to overcome four challenges.

- As "Performance", how to install batteries and hydrogen tanks in a limited space to secure the same output and operating time as an engine.
- As "Durability", unlike automobile, it is necessary to mount the battery, Fuel Cell with a strong frame in order to be required high durability for vibration.
- As "Environment", it need reliability and durability under harsh condition and there is also the issue of how to supply energy in the field.
- As "Cost", It is not cheap in order to the number is overwhelmingly smaller than that of automobiles and there are various models, so the challenge is how to keep the price of the power source down. And we also think it is necessary to study and develop some battery circulation infrastructures.



While solving these issues, we have released several products for carbon neutrality in the market.

Those are current products for carbon neutrality we introduced in the market.

The second from the left in the upper row is the world's first hybrid hydraulic excavator which we introduced to the market in 2008. Currently, there are 20-ton class and 30-ton class.

We believe that it is a machine equipped in-house development and production of components, so it has excellent fuel efficiency with quality and reliability.

Currently, in Europe, the sales ratio of 30-ton hybrid excavators is about more than 40% of the total sales of 30-ton class.

We are also considering the development and market introduction of a 40-ton class hybrid hydraulic excavator to ensure that we take all possible measures to reduce CO2 emissions.

The right side of the hybrid excavator is the mini excavator PC30E-5, which was introduced to the market in April, 2020.

We have received a lot of feedback from our customers about the benefits of electrification.





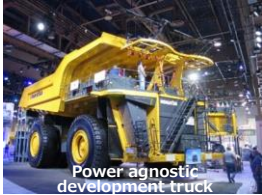
As examples,

- The smell of exhaust gas has disappeared
- Safe and environmentally friendly indoor operation without exhaust gas
- Comfortable because heat does not come around the driver's seat
- Quiet and easy to detect danger
- Talkable to surrounding workers
- Noise complaints from neighbors are reduced
- Good for city and night construction without noise
- Operator is less tired, and so on.

In order to deliver these merits to more customers, we are currently developing a model-changed equipment with further improvements.

Mining equipment has introduced diesel-electric dump trucks, wired electric excavators, hybrid loaders, and battery-powered dump trucks to the market.

Current Situation for Carbon Neutrality (2)

Construction	Mining
<p>2020 April: Mini excavator PC30E in Japan market (Rental)</p>  <p>Proceed with next development based on opinions of customers who used PC30E-5.</p> <p>Honda and Komatsu announce joint development of micro electric excavators powered by "Honda Mobile Power Pack Batteries"</p>  <p>Promote development to introduce in market around 2021</p> <p>Joint PoC verification tests to start for electrification of small and middle excavators: collaboration with Proterra (USA)</p>  <p>PoC's vehicle is moving at customer's workplace now. And try to introduce in market as soon as possible.</p>	<div style="border: 2px solid blue; padding: 10px; text-align: center;"> <p>Major mining companies  Komatsu</p> <p>Komatsu GHG Alliance</p> <p>Accelerate development of mining dump truck to reduce GHG</p> </div> <p>MINExpo2021 (9/13-15@Las Vegas)</p>  <p>Power agnostic development truck</p>

Here are some development projects we are currently working on.

We are currently promoting to develop a model-changed equipment with further improvements, based on the opinions of our customers regarding the PC30E-5.

It is scheduled to be mass-produced in FY2022, and we are considering introducing it to the European market, which is highly environmentally conscious.

We are also developing the electrification of PC01 as a joint development with Honda Motor.

We are developing to aim at electrifying its micro excavators with swappable "Honda Mobile Power Pack" batteries, and to establish a battery-sharing system that enables mutual use of Honda Mobile Power Packs among different construction equipment and other equipment for the civil engineering and construction industries.

The PC01 micro excavator is commonly used for pipe-laying work, gardening, agriculture, livestock, and other applications, so we think that you can work comfortably in various work environments both indoors and outdoors.

Other micro excavators and mini excavators up to 1 ton class will be

electrified with the same idea.

We are developing the electrification of small and middle excavators in collaboration agreement with Proterra Inc. of the United States.

We conducted verification tests for 20-ton class excavator at the customer's workplace. We got various data and customer's opinions.

We are proceeding with development for mass production from 23 to 24 years.

Regarding mining business, for the purpose of accelerating the reduction of greenhouse gas emissions from mining operations, Komatsu has founded the Komatsu GHG Alliance together with major mining companies that are also its customers.

The founding members of the alliance are Rio Tinto plc, BHP Group Limited & Plc, National Copper Corporation of Chile (Codelco), and Boliden AB, which are global top-class, industry-leading mining companies.

In order to aim to realize zero emissions of mining operations with both Komatsu and major mining companies in this alliance, Komatsu will provide information on each process such as product planning, development, testing, and introduction of next-generation mining machinery, and mining companies will provide information on mining infrastructure. It is a framework that provides information on equipment to each other and works closely together.

We will accelerate the development and market introduction of next-generation mining equipment in cooperation with leading mining companies.

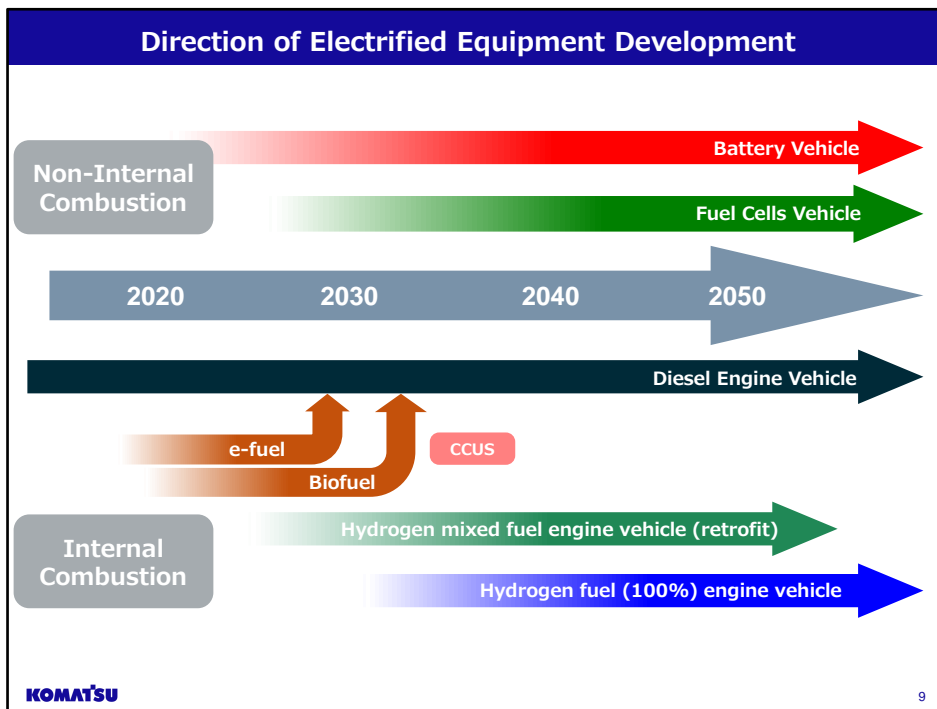
The first target model of this alliance will be a super heavy-duty dump truck.

In addition to the power sources already on the market, such as diesel-electric and trolley, we will be developing the "Power Agnostic Truck" concept, which can be operated by any power source, including battery electric, fuel cell and other hydrogen sources.

We will accelerate the development of a power agnostic concept truck that can run on a variety of power sources.

Komatsu exhibited the concept of a power agnostic super-large dump truck for the first time at the mining machinery trade fair "MIN Expo INTERNATIONAL 2021" held in Las Vegas, Nevada, USA from September 13th to 15th.

We have received great interest from our customers, and at the same time, we have high expectations. We will proceed with research and development to meet your expectations.



Next, I will explain the direction of development related to the power source to mount on the vehicle.

Considering the electrification by the battery, the required battery capacity is from about 3kWh to several thousand kWh.

Regarding fuel cell, we need high output fuel cell in the same way.

As I explained, construction and mining equipment operate under harsh vibration, dust, harsh temperature conditions, etc.

The operating hours also vary. Small construction equipment operate for several hours a day, and large equipment used in mine site operate almost all day long.

And new power sources must achieve higher production efficiency while ensuring "quality and reliability" for customer expectations.

As I explained, some electrified equipment by battery has already been introduced to the market. and we will also proceed to research and develop

electrified equipment by fuel cells.

As you know, battery-powered BEVs and fuel cell-powered FCEVs are the mainstream in automobiles.

However, there will be issues regarding the supply and price of materials, such as lithium, nickel, and cobalt.

In addition, construction and mining machinery have various uses, and the required output and infrastructure are also various. Therefore, we think to need multiple power sources that can respond to that.

Komatsu is also considering the utilization of internal combustion engines.

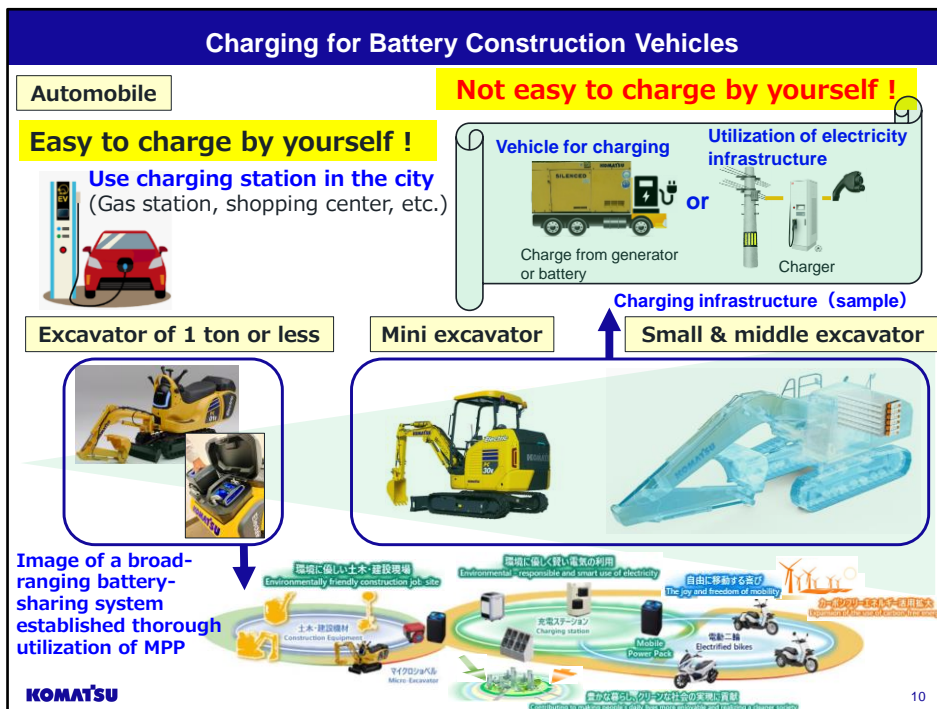
Regarding biofuel, Indonesia has already made B30, which is a mixture of 30% light oil and fatty acid methyl ester (FAME) derived from palm oil, since 2020, and we are supplying products corresponding to it.

Currently we are also working on support for B50.

We call a hydrogen engine which is an internal combustion engine using hydrogen as fuel. And we are also proceeding to research and develop that hydrogen engine.

We will proceed to research and develop new power sources, such as internal combustion engines, batteries, and fuel cells.

Even if these power sources change, Komatsu will pursue "quality and reliability" basically, and will provide customers with products that improve the production efficiency at customer's workplace.



I will talk about charging electrified construction equipment.

Automobiles move fast and can be charged at charging stations, which will be further increased in the future.

However, construction equipment move slowly and operate very often in places where the infrastructure is not sufficient.

First is excavator of 1 ton or less. This is an electrification that will be promoted to join with Honda, and the concept is the replacing batteries as using Honda's Mobile Power Pack (MPP).

It can be easily charged even with a household outlet.

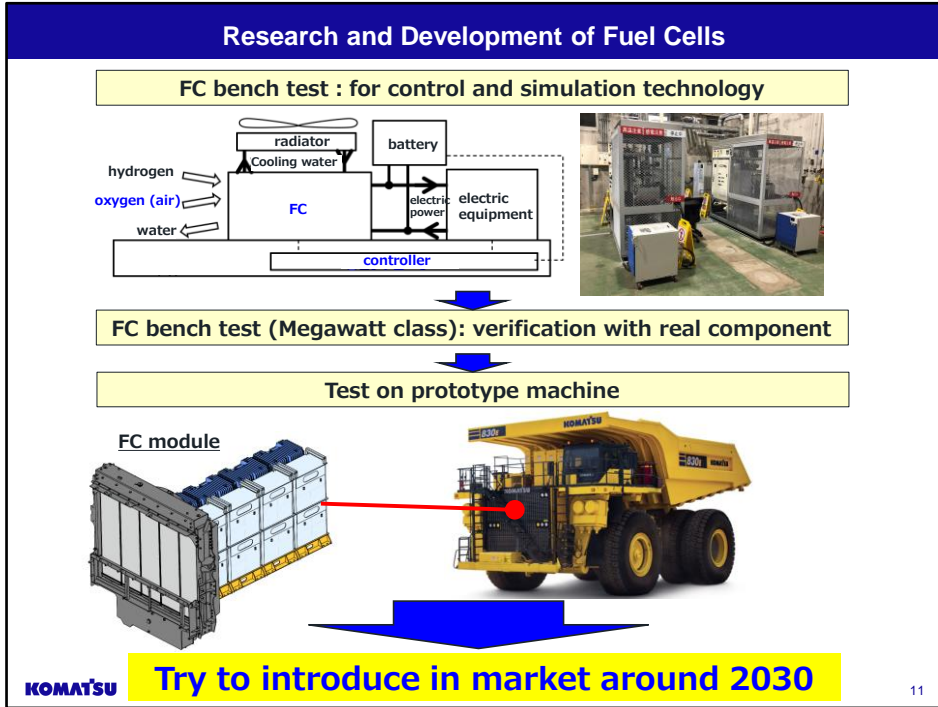
Komatsu will work to disseminate electric excavators, (i.e., our micro electric excavators). In addition, a variety of electric equipment on civil engineering and construction sites will join our smart and electric operations, working with Honda's electric mobility and power products. Together with Honda, Komatsu will also work to develop a broad network of MPP-based battery-sharing systems used by the civil engineering and construction industries.

Batteries are expensive, but if we can share batteries (reuse) and charging infrastructure at construction workplaces, we can expect cost reductions, convenience, and work efficiency.

Next is mini excavators to medium-sized excavators. The charging takes the form of charging the in-vehicle battery rather than replaceable.

In an environment where the infrastructure of an electric power company can be utilized, charging is performed with a charger, and in places where such an environment cannot be secured, charging is performed from a battery for power supply or from a generator.

When charging from a generator, the charging system must be prepared in consideration of the carbon neutrality of the generator itself.



We have also started research and development to install fuel cells in our vehicles.

The photo is test bench of a fuel cell.

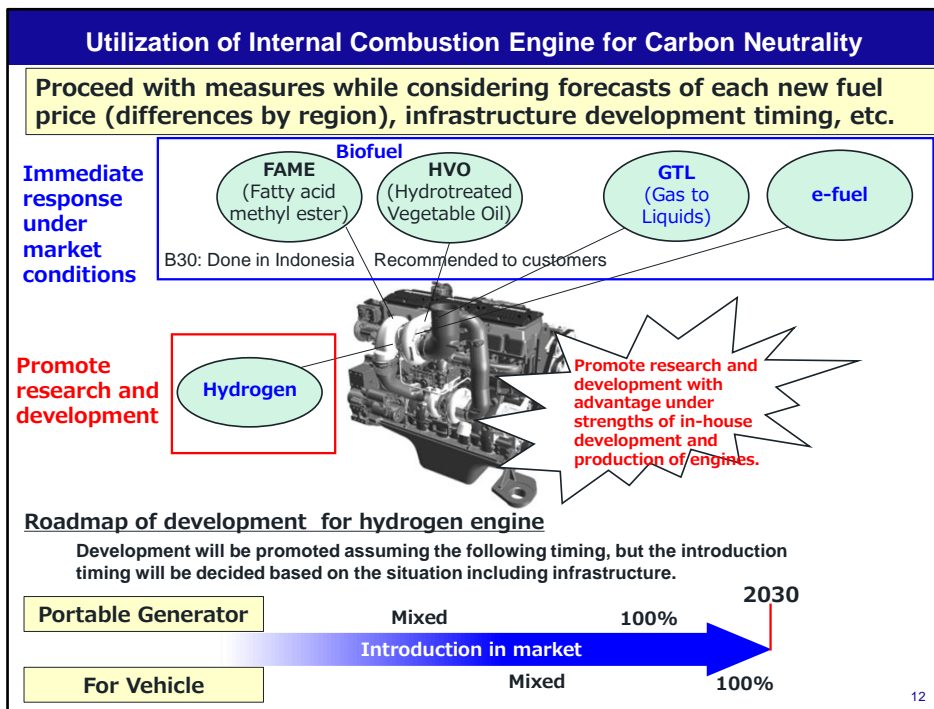
On this bench, We control multiple fuel cells and conduct tests to establish stable energy management.

We are also developing simulations in parallel to speed up system development, ensure quality and reliability, and visualize FC systems when in-vehicle.

We are also developing a digital twin so that it will be synchronized with the vehicle development.

Currently, we are testing a fuel cell with a small output, but we are planning a large-capacity fuel cell bench test for a super-large dump truck for mines.

We will proceed to research and develop to meet our customer's expectations.



I mentioned that we will utilize internal combustion engines toward carbon neutrality. So next I would like to explain that utilization of internal combustion engines.

As I mentioned the biofuel "B30", some customers have already used HVO and GTL.

In addition, e-fuel which called "e-Diesel" at Komatsu equipment, that we do not know how much the price and supply amount, but we will respond to customer requests.

We will promote the utilization of new fuels in that way.

The hydrogen engine is one of the things we are currently researching and developing.

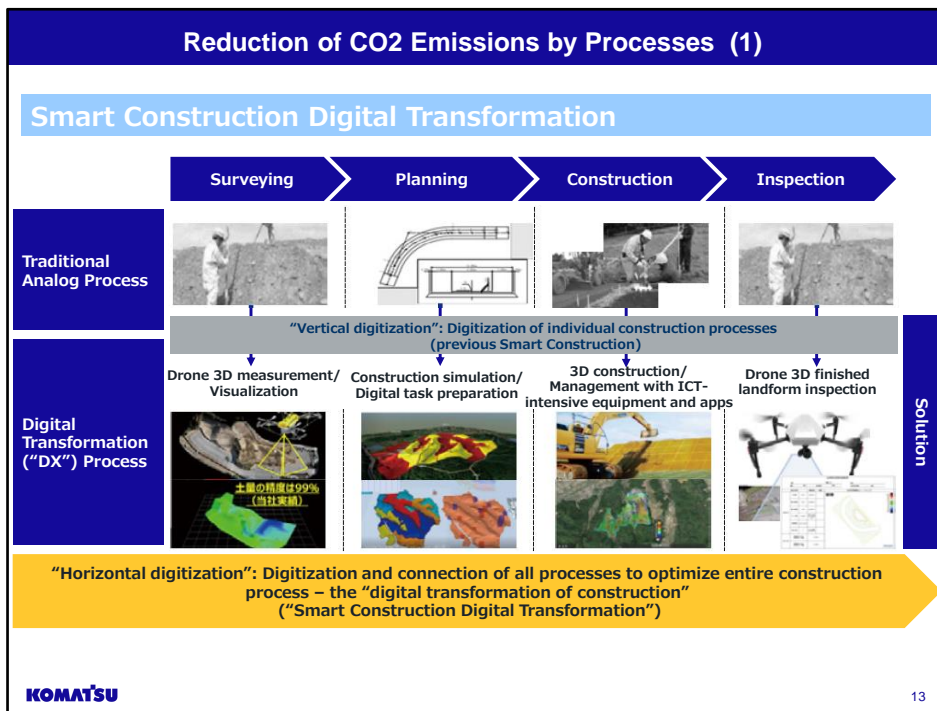
Komatsu is providing the SAA6D170E-5 engine for generators and providing technical cooperation in the engine field regarding the development of the 250kW hydrogen mixed fuel generator that Denyo Co., Ltd. is working on. Hydrogen mixed power generation is a technology that suppresses the generation of carbon dioxide (CO₂) by mixed hydrogen with fuels such as light oil and city gas.

The development of Denyo's 250kW hydrogen mixed generator aims to

reduce CO2 emissions by 50% compared to the case where only light oil is used as fuel by setting the co-firing rate of hydrogen to 50%.

Currently, we are also researching hydrogen-only combustion engine with 100% hydrogen fuel.

We will start to develop portable generator with hydrogen mixed fuel, and by 2030 we are considering introducing equipment with a hydrogen engine with 100% hydrogen fuel to the market.



Next, I would like to how to reduce CO2 emissions by "Processes".

Komatsu introduced the ICT bulldozer in 2013 and the ICT hydraulic excavator in 2014.

Then, in February 2015, we launched Smart Construction, and announced the concept of "Smart Construction" that optimizes all customer's construction processes in terms of both "Products" and "Processes" and started this service.

I learned a lot while working on improving the customer's construction efficiency with smart construction.

Taking advantage of that learning, we are evolving smart construction speedy.

We started by visualizing and digitizing each process with the latest digital technology. This is called "vertical digitization".

Then, we proceeded to connect each process with digital technology. This is called "horizontal digitization".

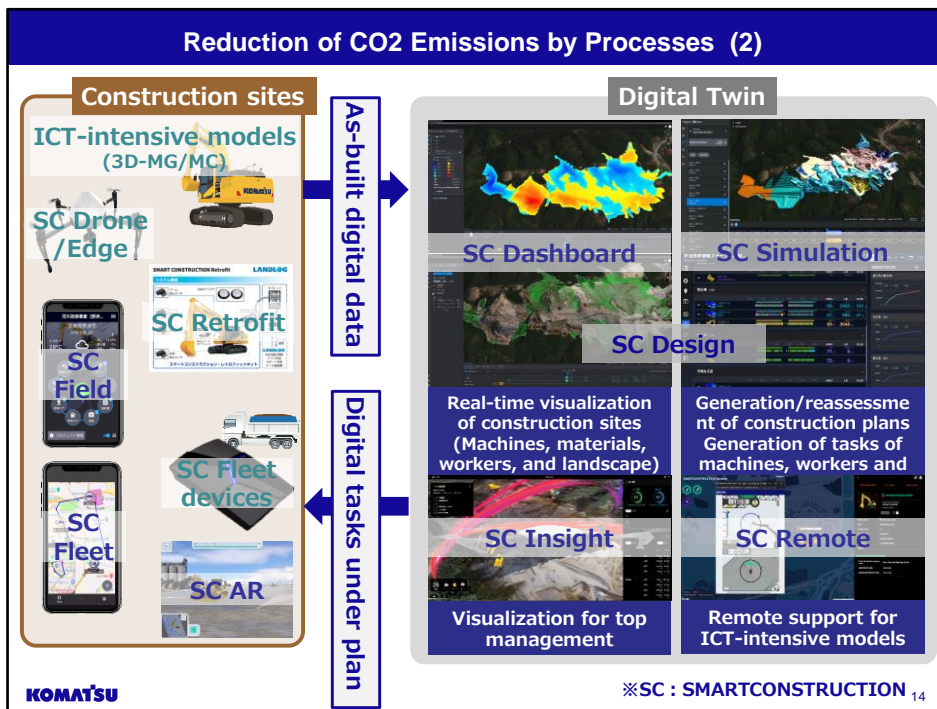
This vertical and horizontal digitization makes it possible to optimize the entire construction by "digitizing" all processes.

This is exactly digital transformation, and this evolved smart construction is

called DX smart construction.

You can build a "digital twin" at the construction workplace by DX smart construction.

This allows for any simulation. In addition, you can check the "digital twin" from your computer or tablet device without any time or place restrictions, and you can remotely check the progress of construction and study the construction.



I will explain what kind of expectations are there for the effect of reducing fuel consumption in the workplace by DX smart construction.

First, there is "reduction of fuel consumption of construction equipment by ICT construction itself".

The function of ICT construction equipment enables accurate and speedy construction and improves construction efficiency.

And there is "reduction of fuel consumption of dump truck by SC Design and SC Fleet".

As a result, the gradient resistance can be minimized by adjusting the gradient of the temporary road, and the dump acceleration resistance can be minimized by matching the quantity of construction equipment and dump trucks.

In addition, "Minimization of total soil transportation distance by SC Simulation" and "Accurate quantity grasp and minimization of rework by SC Dashboard", etc.

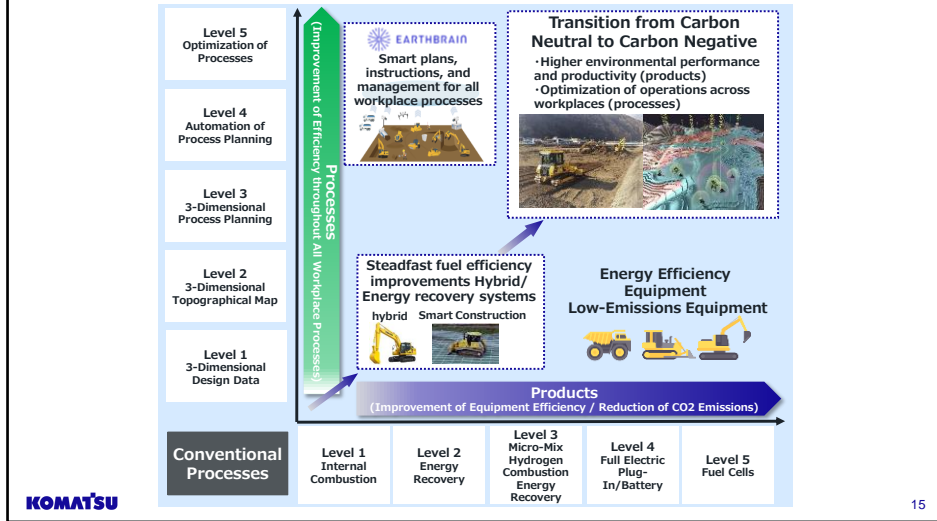
It is expected that the effect of CO2 reduction from the workplace will be achieved.

We are now analyzing data to visualize how much CO2 has been reduced from conventional construction by introducing DX Smart Construction at customer's workplace.

We would like to be able to clearly quantify and show the amount of CO2 reduction by this "Processes" as soon as possible.

Contribution of Carbon Neutrality by “Products” and “Processes”

Komatsu seeks to contribute to carbon neutrality, at both construction and mining workplaces, through a combination of efforts to reduce CO2 emissions by means of highly efficient equipment and measures for improving workplace efficiency via smart plans, instructions, and management.



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That is all for today's explanation regarding the electrification of our construction business.

Komatsu will proceed the electrification speedy and step by step in order to contribute to carbon neutrality by improving products and processes efficiency and combining both improvement.

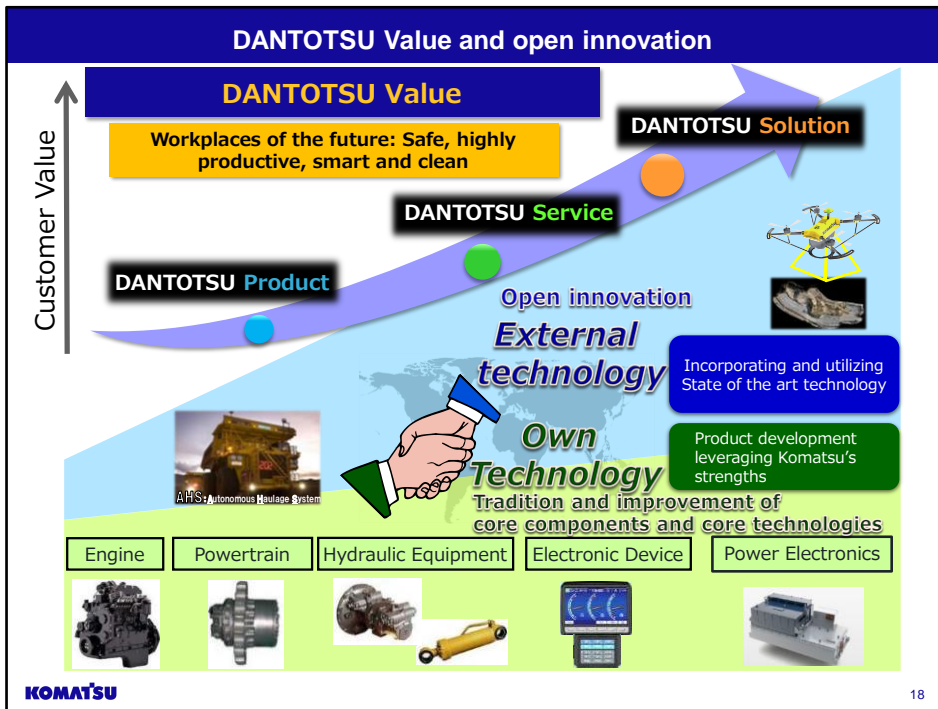
Thank you for your attention



[Picture] Fully electric mini excavator (Concept machine)

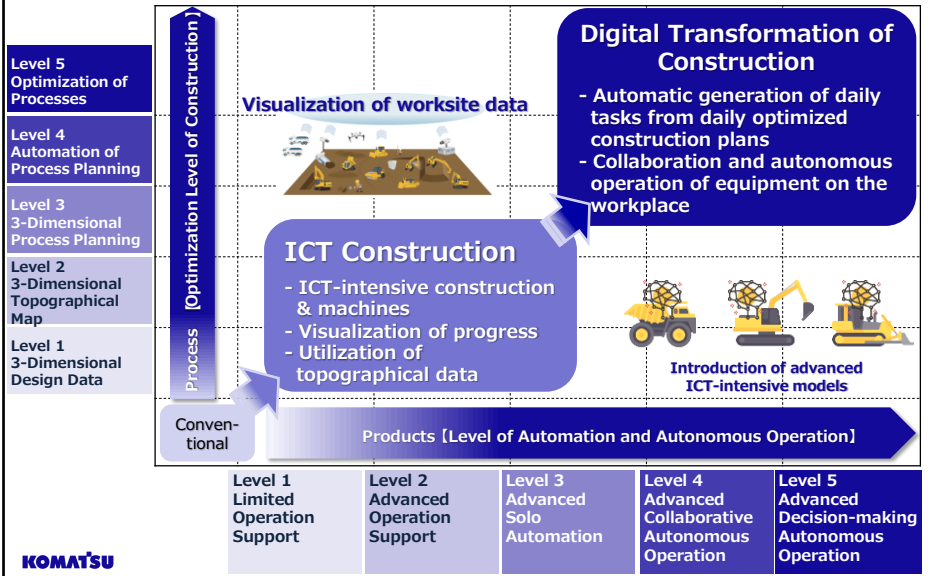
Thank you for your attention.

Appendix



Create Future Construction Workplaces by promoting Digital transformation (DX)

Workplaces of the future: Safe, highly productive, smart and clean



Cautionary Statement

The announcement set forth herein contains forward-looking statements which reflect management's current views with respect to certain future events, including expected financial position, operating results, and business strategies. These statements can be identified by the use of terms such as "will," "believes," "should," "projects" and similar terms and expressions that identify future events or expectations. Actual results may differ materially from those projected, and the events and results of such forward-looking assumptions cannot be assured. Factors that may cause actual results to differ materially from those predicted by such forward-looking statements include, but are not limited to, unanticipated changes in demand for the Company's principal products, owing to changes in the economic conditions in the Company's principal markets; changes in exchange rates or the impact of increased competition; unanticipated cost or delays encountered in achieving the Company's objectives with respect to globalized product sourcing and new Information Technology tools; uncertainties as to the results of the Company's research and development efforts and its ability to access and protect certain intellectual property rights; and, the impact of regulatory changes and accounting principles and practices.

KOMATSU

Business Coordination Department, KOMATSU LTD.

TEL: +81-3-5561-2687 FAX: +81-3-3582-8332 <https://www.komatsu.jp/en> 20