

Medium-Term Management Plan 2023 (Energy & Environment Group)

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Plan 2023 and Long-Term Business
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Business Overview

01 Energy & Environment Group's Position within Sumitomo Heavy Industries

I SHI's Business Segments

Mechatronics



Gear reducers



Inverters

Logistics & Construction

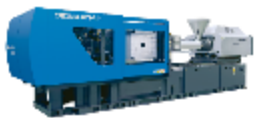


Hydraulic excavators



RTG cranes

Industrial Machinery



Injection molding machines



BNCT

Energy & Lifelines



CFB boiler power plants



BFB boiler power plants



Liquid Air Energy Storage (LAES)



Plant operation support systems



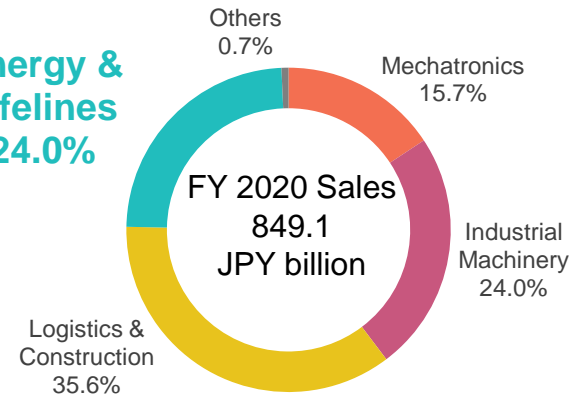
Steam turbines



Sludge collectors

I Sales by Segment

Energy & Lifelines
24.0%



Mixers



Food and beverage production equipment



Aframax tankers

01 Energy & Environment Group

Organization

Energy & Environment Group

- Design, procurement, manufacturing and construction of, and maintenance services for power plants equipped with the CFB boiler as their major unit, electrostatic precipitators, ash treatment facilities, evaporation and crystallization facilities, and rotary kilns

Sumiju Environmental Technologies (SKG)

- Design work related to CFB boilers (structural design etc.)
- Design work related to water treatment

Sumitomo SHI FW Energie (SFW)

- Design, procurement, manufacturing and construction of, and maintenance services for environment and energy plants including CFB boilers and BFB boilers

SHI Designing and Manufacturing (SDMI)

- Detail design work related to CFB boilers and SHI Group-related products
- Development and maintenance of SHI Group's design support software and information systems

Energy & Environment Group products





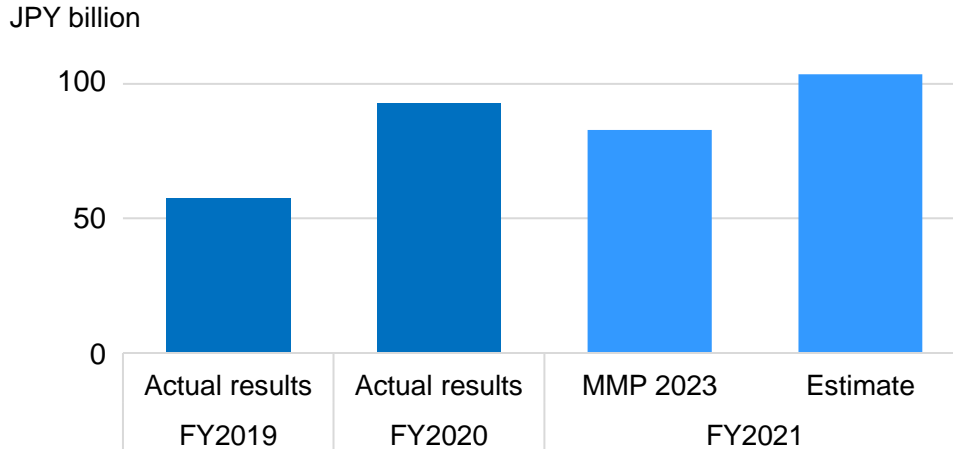
02

Progress on Medium-Term Management Plan 2023 (MTMP23) and Long-Term Business Assumptions

02

MTMP23: Summary for the First Year

Orders



[Orders for FY2021]

Overseas, we have secured a reasonable level of orders for small- to medium-size biomass combustion power plant projects, mainly in South Korea and North Europe, despite uncertainty due to the effect of the COVID-19 pandemic, as well as accelerated global decarbonization efforts.

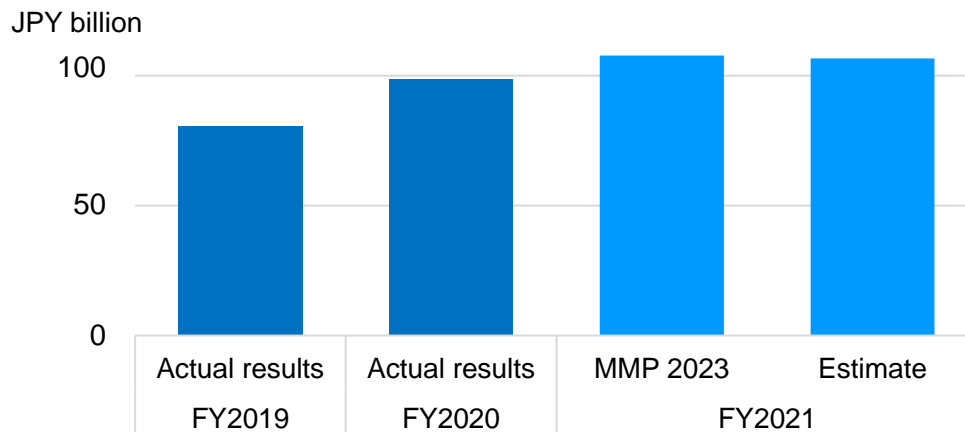
In Japan, we have steadily won contracts for medium-size FIT projects, in addition to two contracts for distributed power system projects, a segment we have worked on in earnest since the beginning of this fiscal year.

The service revenue is also gradually growing both in Japan and abroad, coupled with an increase in delivered boiler units, and is expected to reach its target.

[Sales for FY2021]

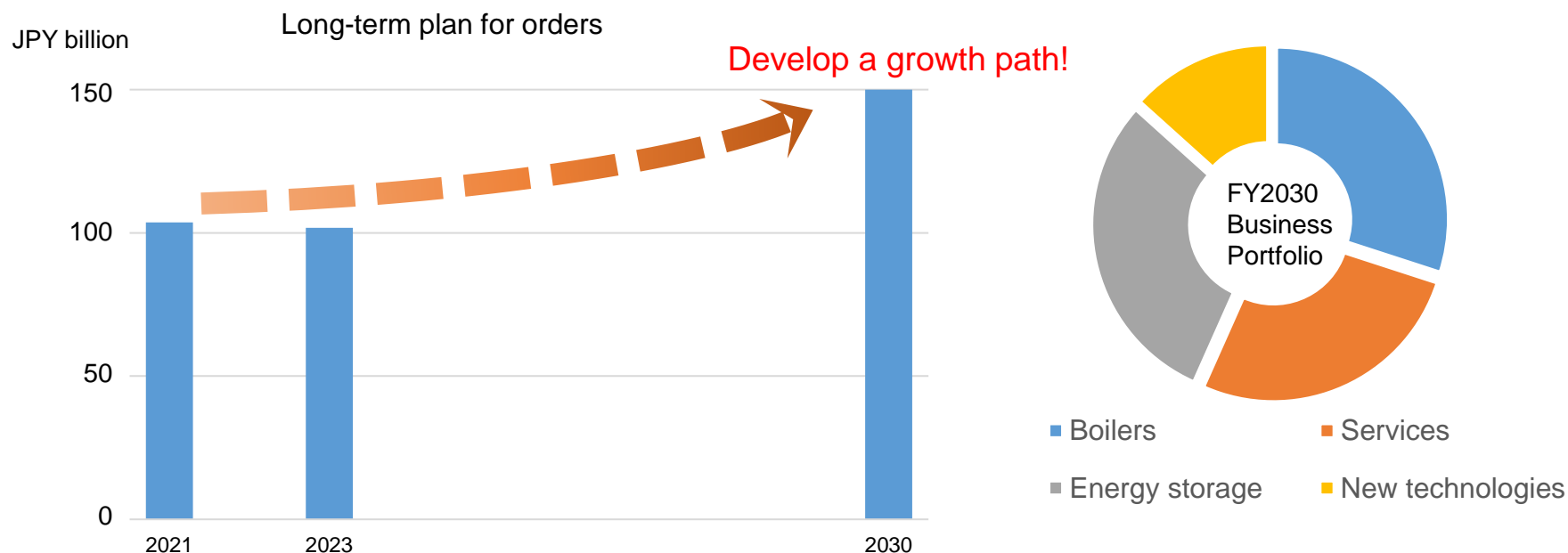
As construction work for the committed projects is making good progress, we are very likely to achieve the target for sales, and we also expect that the target for profit can be adequately met.

Sales



02

Long-Term Business Assumptions--Long-Term Plan for Orders-and Assumed Product Portfolio



We consider current changes in the market as an opportunity for transformation and growth.

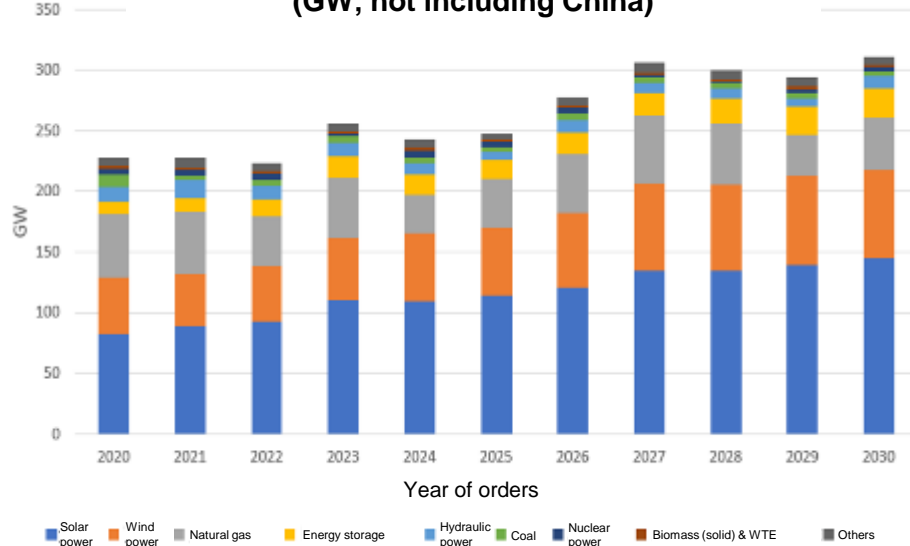
Assumed market needs and business opportunities

1. **Fuel conversions** for existing boilers ▶ A great opportunity to expand the service and modification businesses
2. **Coordination capability** to meet growing demand for renewable energy ▶ A great opportunity to introduce distributed power systems, large-scale biomass combustion power plants, and energy storage products
3. Efforts to provide **carbon negative** solutions ▶ Achieve a net-zero CO2 emission society by providing existing CO2 separation technologies, such as oxygen-enriched combustion and gasification, and commercializing new carbon recycling technologies

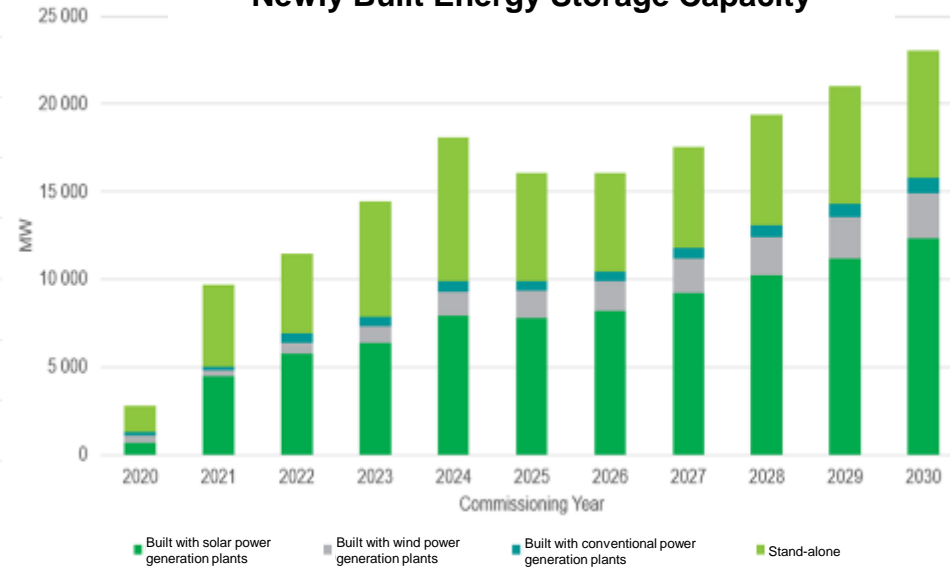
02

Long-Term Business Assumptions--Accelerated Introduction of Renewable Energy and the Energy Storage Market

**The Electricity Market (New Investments)
(GW; not including China)**



Newly Built Energy Storage Capacity



[The Electricity Market]

- Investments in natural energy sources, primarily solar power and wind power, will increase in an accelerate manner.

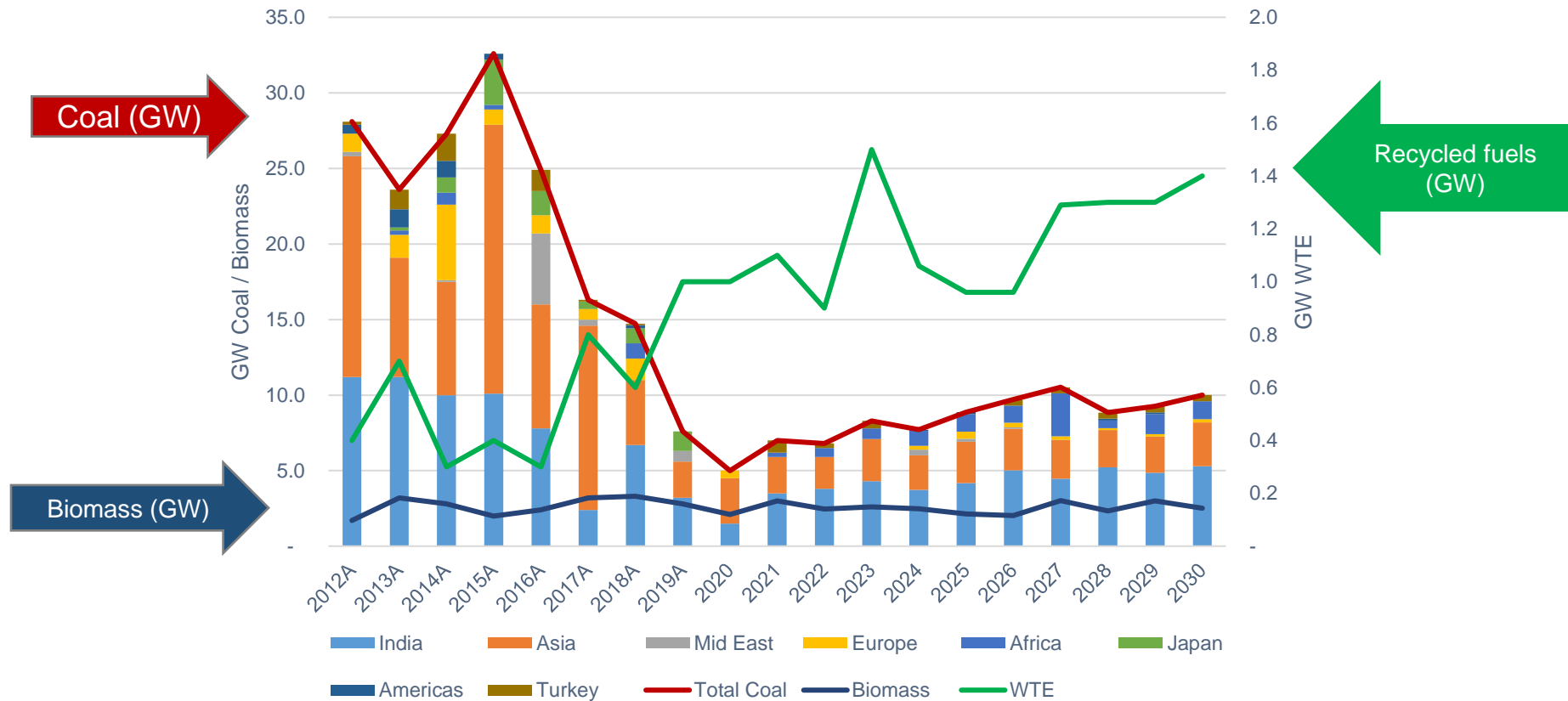
⇒ We assume that due to the increase in the use of natural energy sources, the output of which fluctuates, demand for a stable supply of electricity will increase further.

[The Energy Storage Market]

- As energy storage is essential for a stable electricity supply, we assume that the energy storage market will grow rapidly at more than 20% per year.
- We also assume that long-term energy storage will account for 40% of the market.

02

Long-Term Business Assumptions--The Global Solid Fuel Combustion Boiler Market (New Investments)



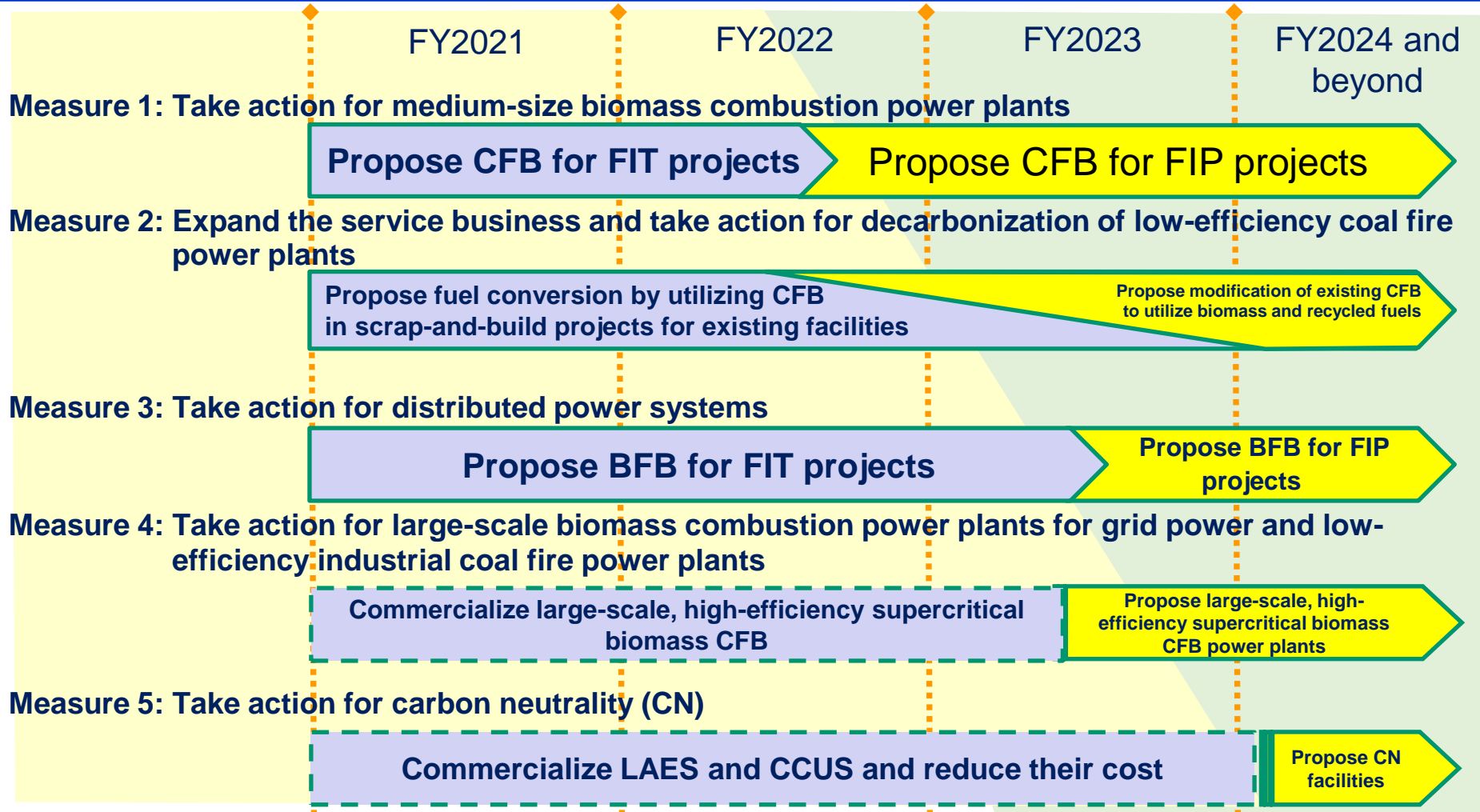
- We assume that while the coal combustion boiler market will dramatically decrease, the biomass combustion boiler market will remain at 2GW to 3GW per year.
- We assume that the recycled fuels (surface resources) combustion boiler market will grow.

⇒ We assume that market demand will increase for distributed power systems and diversification of fuels due to the call for the phase-out of coal power.

02 Long-Term Business Assumptions--Major Sales Measures

Long-term: Maintain the business for fire power, which will continue to serve as sources for electricity and thermal energy, while accelerating the development of products for carbon neutrality and their cost reduction

Medium-Term Management Plan: Shift from FIT projects to fuel conversion projects for low-efficiency coal fire power plants as well as renewable energy source projects, which aim to make renewable energy a primary energy source and promote distributed power systems



02

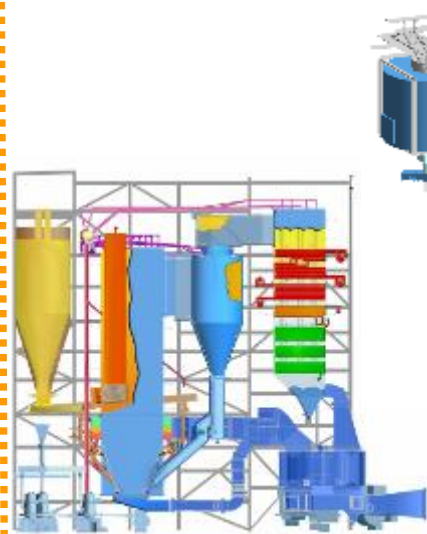
Measure 2: Expand the service business and take action for decarbonization of low-efficiency coal fire power plants

Target: Double the service business by leveraging DX and fuel conversion technology

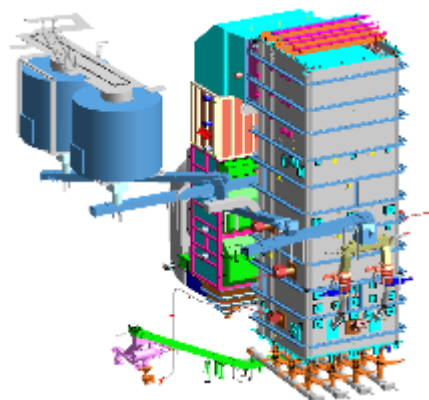
FY2021

FY2030

Amount of orders

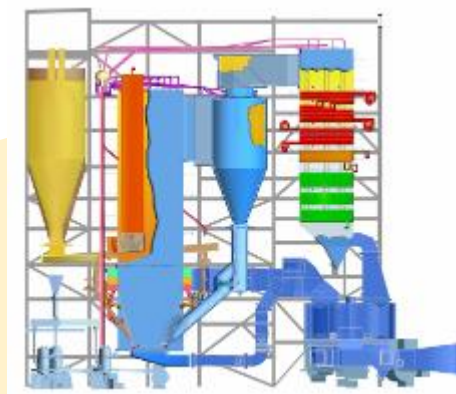


Upgrade of coal combustion CFB for fuel conversion



Modification of existing coal combustion PC (applying BFB technology)

Increase orders received for facilities modification for the phase-out of coal and for carbon neutrality



Exit from the FIT biomass power plant project business; additional installation of oxygen-enriched combustion (CO2 separation) and CCUS facilities; becoming carbon negative

Increase orders for periodic inspection and maintenance work by leveraging AI, IoT and robotics



Operation support systems



Inspection of the inside of furnaces by using a drone



Measurement of wall thickness by using a robot



Measurement inside a laser-based furnace



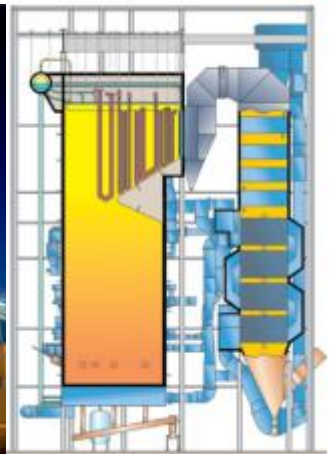
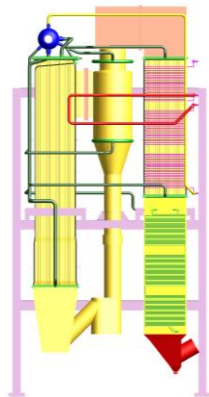
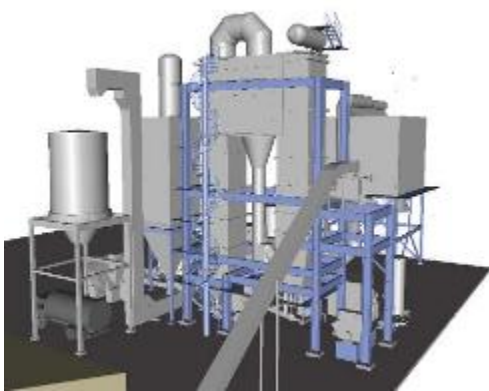
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Measure 3: Take action for distributed power systems

Demand is growing for distributed power systems, which promote local production for local use of resources and help enhance resilience.



Meet broader customer needs by launching BFB (bubbling fluidized bed boilers) in addition to CFB (circulating fluidized bed boilers) in the Japanese market



5MW package CFB power plant
 Delivered to date: 10 units (only in Japan)
 Fuels: wood chip, wood pellets, etc.

SFW BFB power plant
 Delivered to date: more than 140 units (10-32MW)
 Fuels: wood chip, wood pellets, bark, sludge, etc.

Advantage of CFB: a high combustion efficiency

Advantage of BFB: applicable to a wide variety of fuels

02

Measure 4: Take action for large-scale biomass combustion power plants for grid power and low-efficiency industrial coal



The world's largest 300MW-class dedicated biomass combustion CFB boiler (located at Teesside, UK; scheduled to start operations in 2022)



The world's first 550MW coal-biomass co-combustion ultra-supercritical CFB boiler (located at Samcheok, South Korea; started operations in 2015)

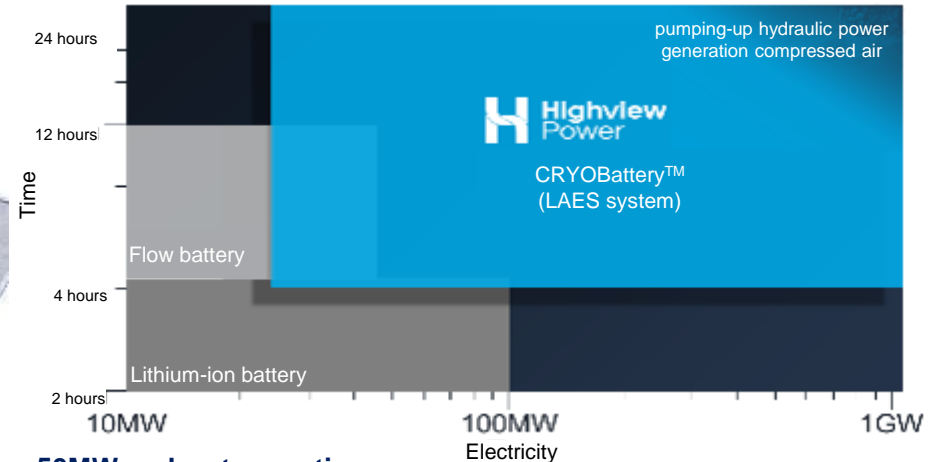
Take on the challenge of developing high-efficiency biomass power generation as a competitive renewable energy source



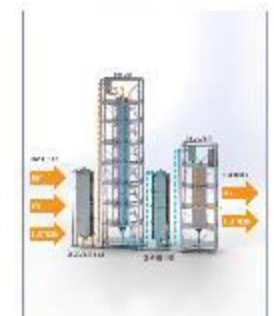
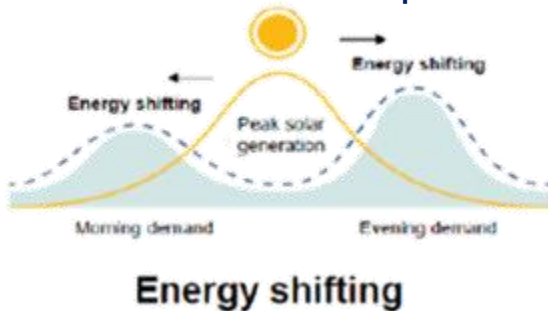
The world's largest-class 300MW dedicated biomass combustion supercritical CFB boiler (power efficiency: 40% or more)

02 Measure 5: Take action for carbon neutrality (CN)--Energy Storage

The Highview Power Liquid Air Energy Storage (LAES) system to support efforts to make renewable energy a primary energy source



- Competitive power storage cost, with a power output of more than 50MW and a storage time of more than 6 hours
- Offers responsiveness, load-following capacity and inertial force comparable to gas turbine power generation
- Offers a grid stabilization function as a synchronous phase modifier, even during charging
- A minimal environmental impact due to the operation of the facilities



SaltX CFB reactor for chemical energy storage

- Chemical energy storage media mainly made of carbonates (patented)
- Using CFB as a reactor to take out heat from SaltX

02

Measure 5: Take action for carbon neutrality (CN)--Decarbonization Technology (Utilization of Recycled Fuels)

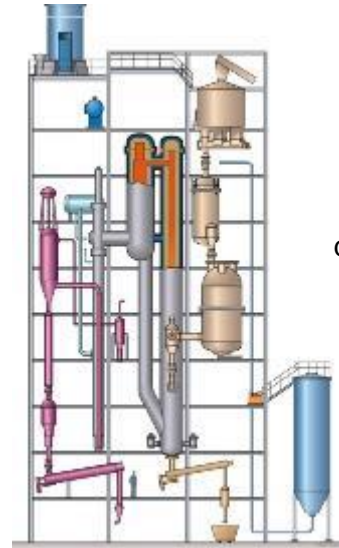
Shift from waste power generation to waste resource utilization (chemical recycling)

Waste (source of thermal energy)



Waste to Energy by CFB

Waste (resource recycling)



Deploy this technology for waste resource utilization

Supply raw materials replacing fossil fuels

Biomass fuels
Biodiesel

Raw materials for chemical products

H_2
 CH_4
MEOH
Olefin, etc.

Synthetic gas generated by decomposition

From Waste-to-Energy to Waste-to-Value

Gasification technology (CO₂ separation before combustion)

The gasification technology has been implemented in biodiesel production plants using biomass as a raw material.

Going forward, we will work to deploy this technology for hydrogen production and chemical recycling utilizing such resources as biomass and waste. Further, we will work to extend this technology to biorefinery and waste plastic refinery.

CFB gasification technology Biomass Gasification Plant



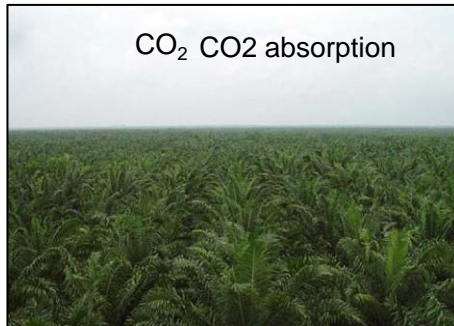
A demonstration plant is in operation, using biomass.

02

Measure 5: Take action for carbon neutrality (CN)-- Decarbonization Technology (CO₂ Capture)

From carbon neutral solutions to carbon negative solutions

Dedicated biomass combustion boiler

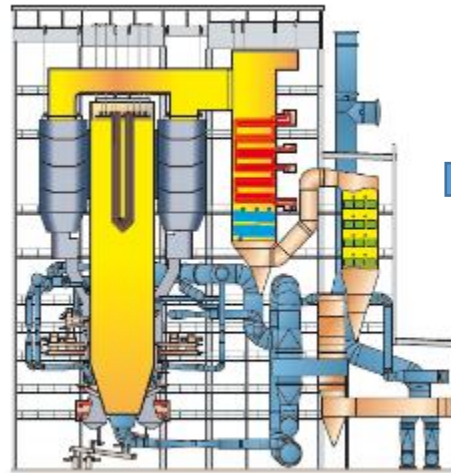


**CFB oxygen-enriched combustion
technology**
30 MWth pilot in CIUDEN



A test has been completed, using coal.

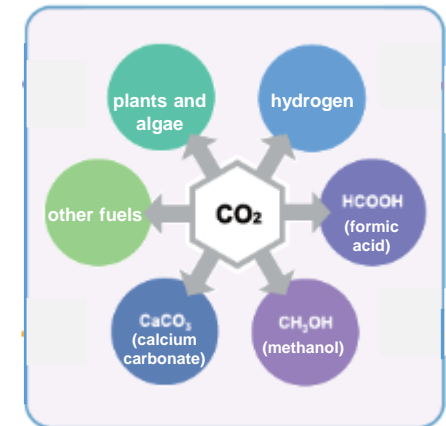
Oxygen-enriched biomass combustion



Deploy this technology for
biomass combustion

Toward achieving more efficient CO₂ capture

Selectively capture CO₂



Deploy this technology for
carbon recycling

Add CO₂ capture to biomass combustion power plants

CFB oxygen-enriched combustion technology

Proven at CIUDEN of Spain

CFB enables more economical capture of CO₂.

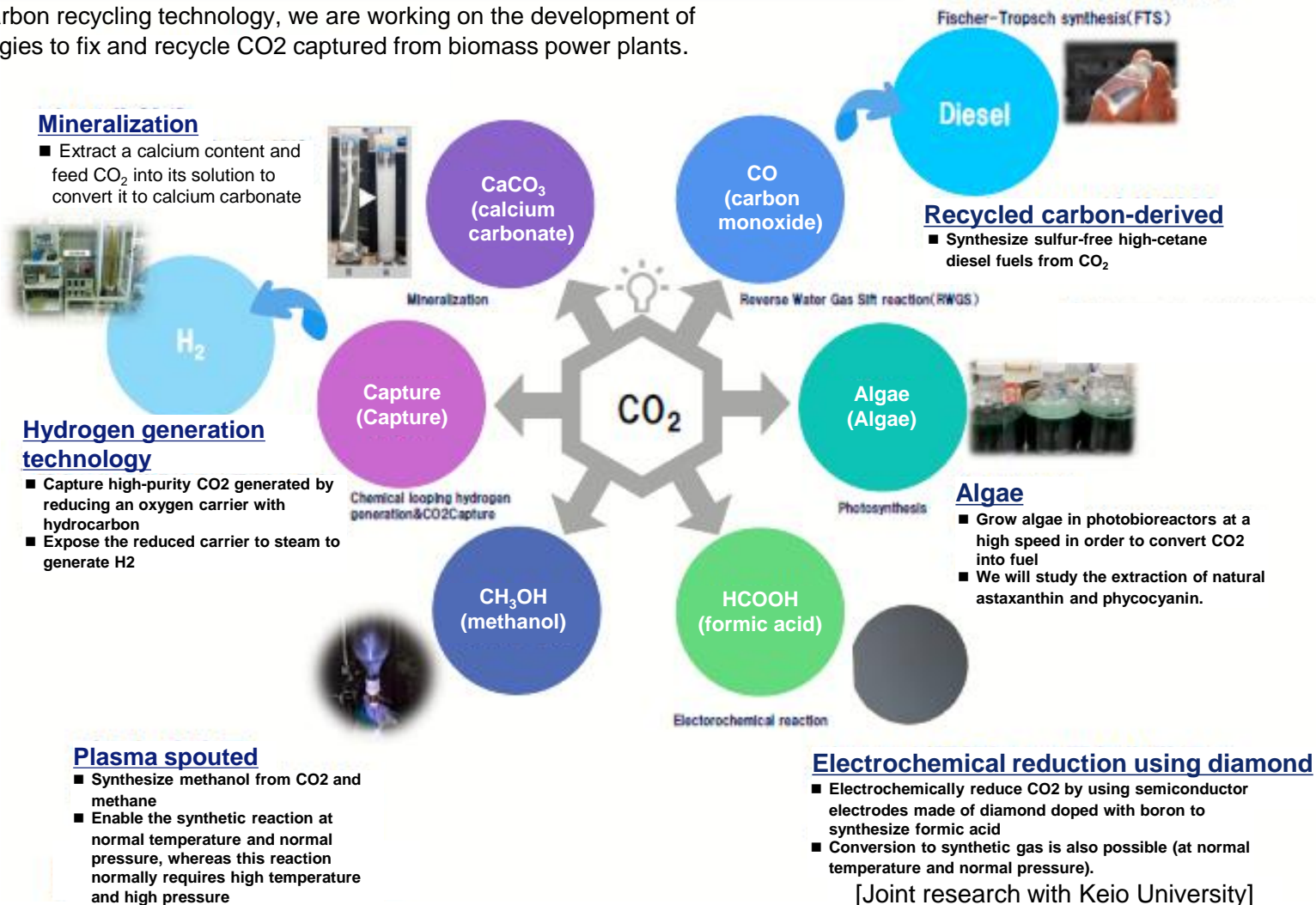
We will achieve a more economical carbon recycling and carbon negative solution by applying this technology to carbon-neutral biomass power plants.

02 Measure 5: Take action for carbon neutrality (CN)--Carbon Recycling

Development of technologies to fix and recycle captured CO₂

[Joint research with GITC]

Using carbon recycling technology, we are working on the development of technologies to fix and recycle CO₂ captured from biomass power plants.



[Joint research with Keio University]

03

Topics

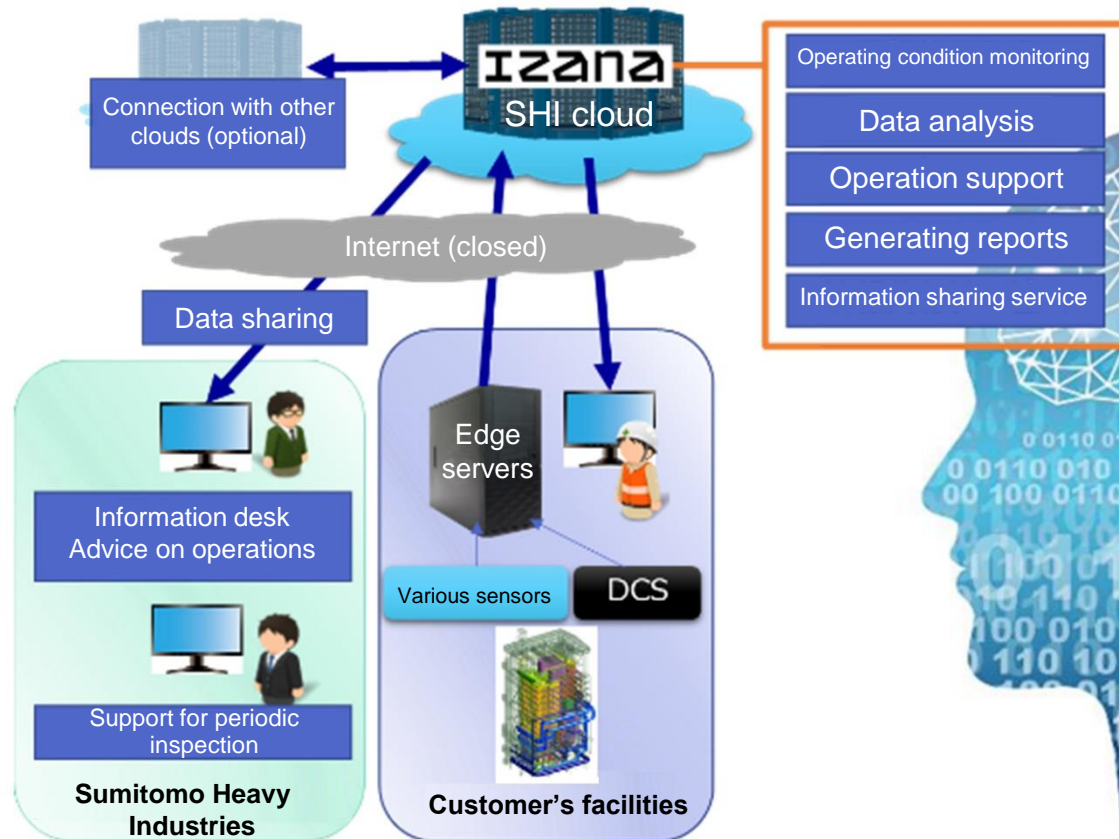
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Plant Operation Support System IZANA™

The first commercial unit is scheduled to start operations in January 2022.

- Support fuel conversion from coal to biomass
- Help optimize plant operations in response to unstable biomass fuel
- Help minimize time and cost to restore facilities after incidents

AI monitors the operating condition of facilities, detects faults, and provides guidance for operators.



SHI engineers will immediately share operation data and provide advice on follow-up measures in the event of an incident taking place at facilities.

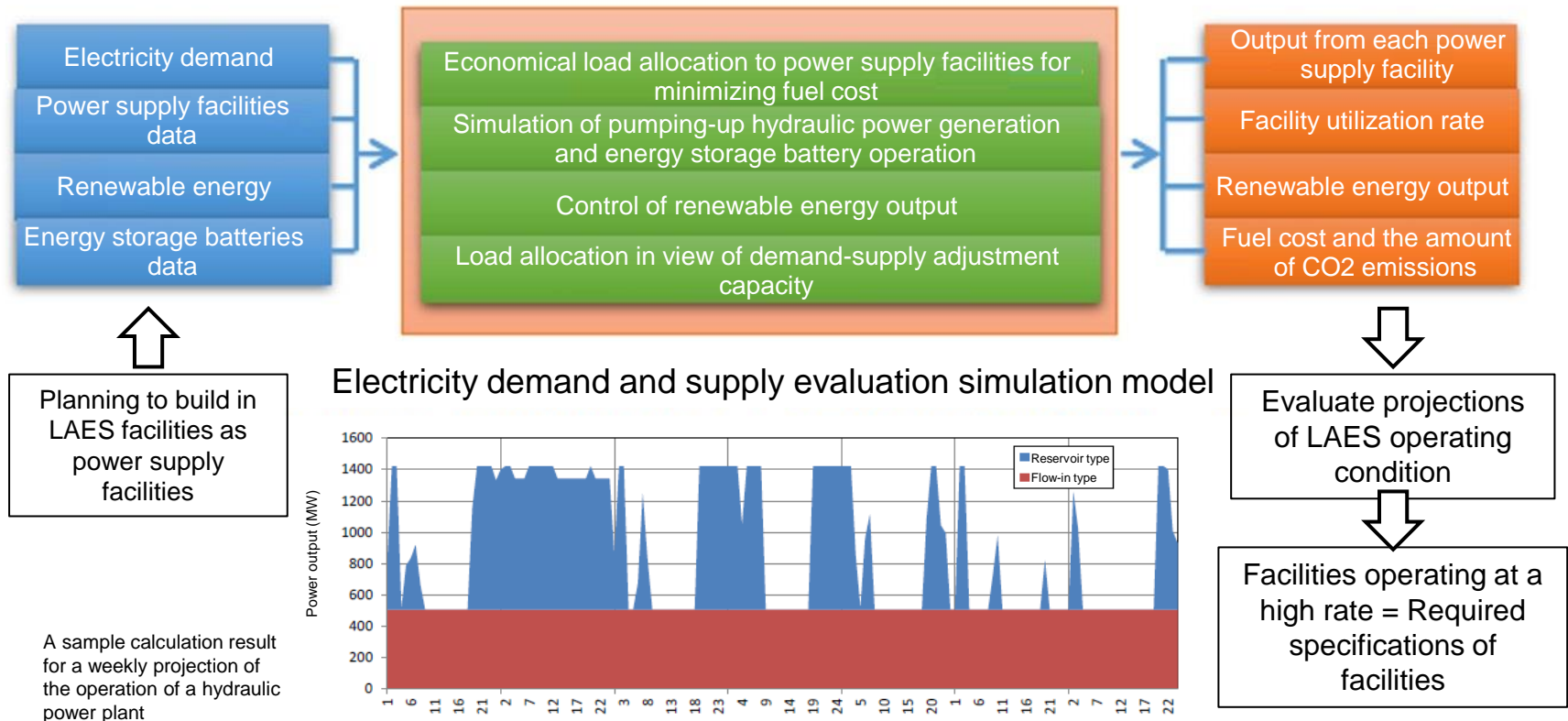


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Energy Storage--Cooperation with Institute of Industrial Science, the University of Tokyo, Research Program

Evaluate the contribution of LAES to grid stabilization and electricity transaction value

Engaged in a study on the evaluation of stable electricity supply conducted by Energy System Integration (ESI) Social Cooperation Program of Institute of Industrial Science, the University of Tokyo (including production of tools and models for 2021 to 2023); evaluate not only the current status but also market projections for 2030 and 2050 to incorporate functional needs and social contribution in the development and design process



Source: J-POWER Business Service Corporation corporate website (<https://www.jpbs.co.jp/it/product05.html>)

Large-capacity energy storage facilities (for grid stabilization)
LAES (electricity storage system)
 Achieve zero fluctuation for renewable energy sources!





All forward-looking statements regarding the company's future performance are based on information currently available to Sumitomo Heavy Industries and determined subjectively. Future performance is not guaranteed and all information related to future performance contained herein is subject to changes in business environments.