

# Progress of J-POWER Medium-Term Management Plan

May 11, 2022

Electric Power Development Co., Ltd.

# Medium-Term Management Plan FY2021-FY2023 published on April 30, 2021

J-POWER aims to increase its corporate value while addressing the transition toward the realization of carbon neutrality by 2050. While responding to the demand for a stable supply of electric power, J-POWER works on the realization of carbon neutrality and the enhancement of business foundation that supports it.



Action 1

# Accelerating the Development of CO<sub>2</sub>-Free Power Sources

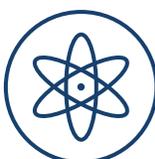
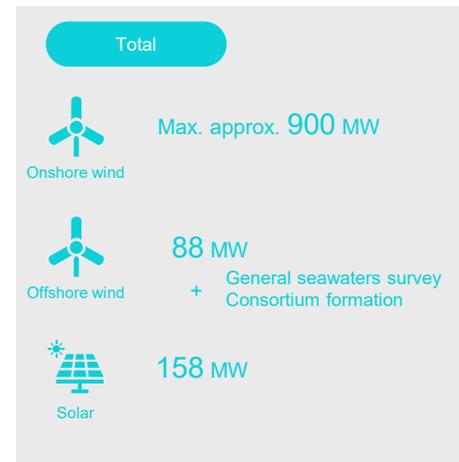
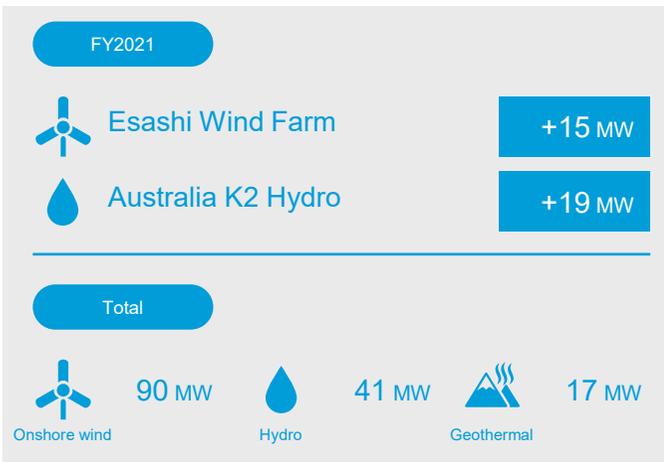


## Global renewable energy developments

J-POWER will preferentially allocate investment funds to the development of renewable energy and aim to achieve the development target of 1,500 MW or more\*1 by FY2025. (plan to invest approximately 300 billion yen in development of renewable energy\*2 from FY2022 to FY2025)



+214 MW



## Ongoing examination of the Ohma Nuclear Power Plant Project

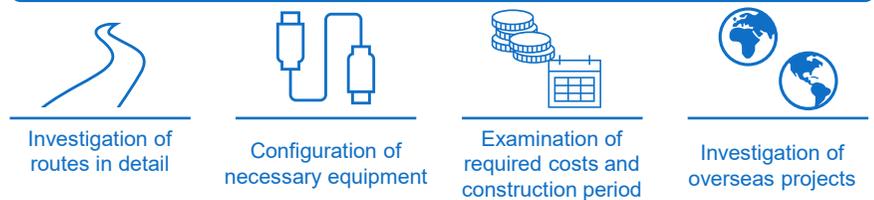
J-POWER is sincerely and appropriately responding to the items of the conformity assessment conducted by the Nuclear Regulation Authority, such as standard earthquake ground motion, the geology and geological structure of the site, and the standard tsunami. J-POWER will continue to improve safety without fail.



## Contracted research project for high-voltage DC (HVDC) power transmission system\*5

J-POWER has won a NEDO\*6 research project on HVDC power transmission systems, which are indispensable for the expansion of offshore wind power generation.

Research on the construction and operation of HVDC power transmission system from offshore wind power plant, etc.\*7



\*1: Compared to FY2017; \*2: Includes upcycle and repowering \*3: Output is calculated on owned capacity as of April 30, 2022, and in case capacity is not yet decided, it is calculated on estimated maximum owned capacity; \*4: Repowering that does not increase power output is excluded.; \*5: An initiative of J-POWER Transmission; \*6: New Energy and Industrial Technology Development Organization (NEDO); \*7: Joint contract with the Promotion and Research Institute for Marine Economy and Eukote Energy LLC

Action 2

# Upcycling to Next-Generation Hydropower Plants



## Implementing NEXUS Sakuma Project

Built to solve the power shortage after WWII, the Sakuma Hydropower Plant has contributed to the stable supply of electricity for over 60 years. Aiming to start renovation in the late 2020s, J-POWER will update major electrical facilities such as water turbines and generators including buildings with the latest technology, while utilizing existing dams and waterways, to transform the plant into a next-generation hydropower plant.

### Next-generation hydropower plant that creates new value and energy



#### Further increase in power output and generation capacity

J-POWER will maximize valuable domestic renewable energy sources, while contributing to the stabilization of power networks by improving adjusting capacity.



#### Engagement with local communities

To become a power plant trusted and needed by the community, J-POWER works on what it can do through communication with the local communities.



#### Operational capability multiplied by the use of digital technology

With the latest technology, J-POWER will transform into a workplace where people can more easily achieve high performance, more effectively ensure high quality, and more safely work with security.

# NEXUS

This project was named NEXUS\*1 after “NEXT US,” a vision of sustainable and better future required by people and society in the region and basin. J-POWER will comprehensively address the issues that it should undertake for hydropower generation, regions, basins, and people.

Transformation into a new high-value-added power plant



#### The plant was built by using the engineering marvel of the time

Use of large earth-moving machines enabled the project to complete in just three years, becoming a model for successor projects.



#### Japan's largest class hydropower generation

Maximum output: 350 MW  
Annual power generation: Approx. 1.4 billion kWh\*2



#### Abundant water resources from Lake Suwa

Basin area: 4,156.5 km<sup>2</sup>  
Total water storage capacity: 326.85 million m<sup>3</sup>



#### Power supply to both 50 and 60 Hz areas

The plant contributes to stable supply in both east and west Japan.



Sakuma Hydropower Plant, Hamamatsu City, Shizuoka Prefecture

A huge amount of electricity has been generated by the Sakuma Hydropower Plant.

\*1: Trademark registration pending; \*2: Equivalent to the annual power consumption of approximately 460,000 ordinary households.

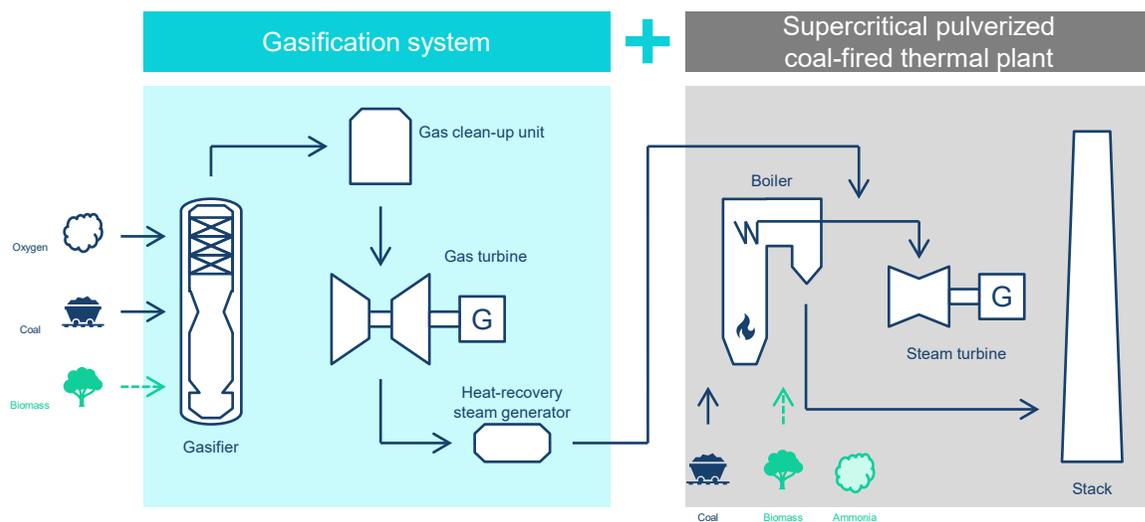
Action 2

# GENESIS Matsushima and Efforts to Reduce CO<sub>2</sub> Emissions



## Promoting GENESIS Matsushima Project

As the first step in CO<sub>2</sub>-free hydrogen power generation, J-POWER started the procedures for the environmental assessments in a upcycling project of GENESIS Matsushima.



2021-



### Start of environmental impact assessment

- September 2021: Submission of the document on primary environmental impact consideration at the early stage
- December 2021: Receipt of the opinions of the Minister of Economy, Trade and Industry (Preparation) Scoping document on environmental impact assessment

2024- (planned)



### Start of construction



FY2026- (planned)



### Start of operation



## Efforts to reduce CO<sub>2</sub> emissions

While expanding its efforts for biomass co-firing, J-POWER is also trying to establish a system that enables the early commercialization of ammonia co-firing.



### Expansion of biomass introduction

J-POWER has signed a memorandum of understanding (MOU) with Enviva Partners, LP\*1 in the United States, and begun joint research on a large-scale use (assuming up to 5 million tons per year\*2) and long-term supply chain for wood pellet fuel.



### Introduction of ammonia co-firing

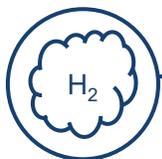
As a carrier of hydrogen, Ammonia is highly expected to be put into practical use very soon, which is also available for coal co-firing. J-POWER will participate in the development of the supply chain by the public and private sectors and try to establish its own system that enables fuel procurement, transportation, storage, acceptance, and co-firing to realize ammonia co-firing at an appropriate timing and scale.

\*1: Enviva Partners, LP, a global supplier of woody biomass energy; \*2: Equivalent to approximately 6.5 million tons of CO<sub>2</sub> emissions

Action 3

# Challenges to CO<sub>2</sub>-Free Hydrogen

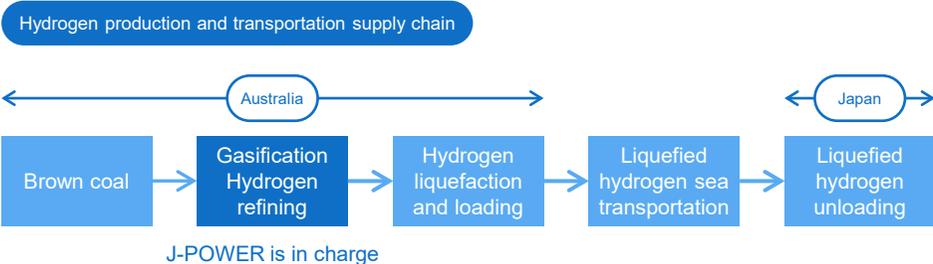
Internally, J-POWER has established a hydrogen/CCS task force to build a quick and efficient decision-making system. J-POWER will pursue the business potential of the production and supply of CO<sub>2</sub>-free hydrogen.



## Pilot demonstration project using hydrogen derived from Australian brown coal

J-POWER has completed a demonstration project to build a supply chain for production and transportation of liquefied hydrogen produced from gasification of brown coal. Efforts for early commercialization have been started, including a plan to store CO<sub>2</sub> generated during hydrogen production through CCS\*1 and use it as CO<sub>2</sub>-free hydrogen.

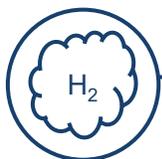
Hydrogen derived from Australian brown coal was also used in the Toyota hydrogen-powered car that run in the Super Taikyu Endurance Race Series Round 5 at Suzuka in September 2021.



Source: Hystra



Source: Toyota Motor Corporation



## Pursuing the potential of green hydrogen

### Joint study on green ammonia production

J-POWER has signed a memorandum of understanding (MOU) with Origin Energy Limited\*2 of Australia and started a joint research on the production of green ammonia using hydropower and wind power in Tasmania and export to Japan.

### Joining the AquaVentus consortium

J-POWER has joined the German Green Hydrogen Consortium, AquaVentus, to deepen its knowledge of green hydrogen production and transportation using offshore wind turbines.

Multiple projects are planned in the value chain from offshore hydrogen production to utilization, in which J-POWER is also aiming to participate.

### Joint study on negative emissions hydrogen production

In Japan, J-POWER has started a joint study on biomass gasification and negative emissions hydrogen production using CCUS\*3 with ENEOS Holdings, Inc.

\*1: Carbon dioxide Capture and Storage \*2: Origin Energy Limited is an integrated energy company in Australia. \*3: Carbon dioxide Capture, Utilization and Storage

Action 4

# Enhancement of Business Foundation



## Further promoting ESG management

J-POWER is stepping up its involvement with ESG management to achieve sustainable growth.

<p>Identifying the five materialities</p> <ul style="list-style-type: none"> <li>Supply of energy</li> <li>Response to climate change</li> <li>Respect for people</li> <li>Engagement with Local communities</li> <li>Enhancement of our business foundation</li> </ul>	<p>Transition to a company with an audit and supervisory committee*1</p> <ul style="list-style-type: none"> <li>Speedy business execution</li> <li>Improved transparency and fairness</li> <li>Enhancement of supervision function</li> </ul>	<p>Diversifying the board members*1</p> <ul style="list-style-type: none"> <li>External board member 6/16</li> <li>Non-Japanese board member 1/16</li> <li>Female board member 1/16</li> </ul>	<p>Active use of green bonds</p> <ul style="list-style-type: none"> <li>2nd issue: 10 billion yen (Issued on January 20, 2022)</li> <li>1st issue: 20 billion yen (Issued on January 21, 2021)</li> </ul>	<p>Other ESG efforts</p> <ul style="list-style-type: none"> <li>✓ Formulation of basic sustainability policy</li> <li>✓ Introduction of internal carbon prices</li> <li>✓ Endorsement of the GX League Basic Concept</li> <li>✓ Introduction of performance-based and stock compensation for board members*1</li> </ul>
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## Improved competitiveness and stable operation of thermal power plants

The two companies play their respective roles and cooperate with each other to improve competitiveness and achieve stable operation.



e.g.: Real-time combustion optimization through analysis of boiler operation data and the like



## Improving asset management efficiency

Considering its business portfolio based on asset efficiency, J-POWER allocates management resources.

<p><b>Owned assets</b></p> <ul style="list-style-type: none"> <li>✓ While balancing equipment reliability, J-POWER controls renewal investment</li> <li>✓ J-POWER reviews and replaces owned assets as appropriate</li> </ul>	<p><b>New investment</b></p> <ul style="list-style-type: none"> <li>✓ Considering its business portfolio based on asset efficiency, J-POWER allocates management resources</li> <li>✓ J-POWER screens the investment projects according to the associated risks and capital costs</li> </ul>
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\*1: A planned agenda at the 70th General Meeting of Shareholders; \*2: Comprehensive service agreement from J-POWER to J-POWER Generation Service Co., Ltd.

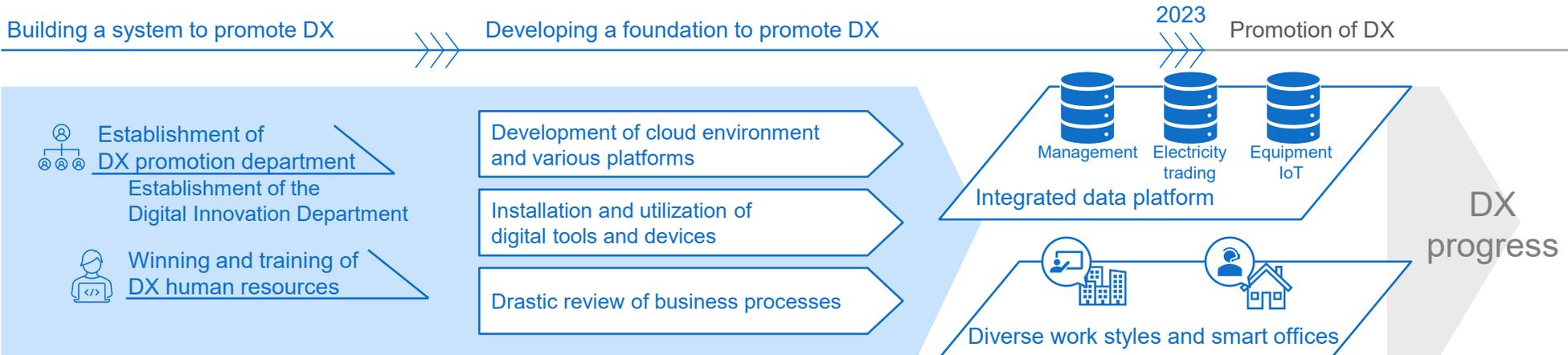
Action 4

# Enhancement of Business Foundation



## Development of a foundation to promote digital transformation (DX)

Assuming the future development of DX, J-POWER is improving the foundation to promote DX, such as data platforms and diverse work styles.



## Development and effective use of human resources and promotion of diversity

Through the creation of a workplace that encourages continuous innovation, J-POWER is promoting the development of human resources who tackle with various management issues.

<p><b>Flexible utilization of human resources</b></p> <p>Responding quickly to changes in the business environment</p> <p>Advancement of existing fields</p> <p>Reskilling</p> <p>Renewables/ Overseas/ Transmission and transformation /DX etc.</p>	<p><b>Continuous self-sustaining learning</b></p> <p>Expansion of a challenge-support system through open application</p> <ul style="list-style-type: none"> <li>Encouraging an exploration in a new frontier</li> <li>Participation in social issue-solving businesses in developing countries</li> <li>Study at graduate schools in Japan and abroad</li> </ul>	<p><b>Ensured safety and health enhancement</b></p> <p>Efforts to eradicate serious disasters while placing the highest priority on safety</p> <ul style="list-style-type: none"> <li>Improving safety by exploiting IT</li> <li>Expansion of crisis experience training</li> </ul> <p><b>Health management efforts</b></p> <ul style="list-style-type: none"> <li>Prevention of infectious diseases and adult diseases</li> <li>Enhancement of mental health care</li> </ul>	<p><b>Diverse work styles</b></p> <p>Enhancing the system <span style="border: 1px solid black; border-radius: 10px; padding: 2px;">Dedicated organization for promoting diversity (established in April 2022)</span></p> <p>Efforts to ensure diversity</p> <ul style="list-style-type: none"> <li>Female employment <math>\times 2</math></li> <li>Employees with management position</li> <li>Female <math>\times 3</math></li> <li>Mid-career employee <math>\times 1.5</math></li> <li>Non-Japanese</li> </ul> <p>Creating a system and workplace that enable diverse human resources to play an active role</p> <ul style="list-style-type: none"> <li>Target for childcare leave taken by male employee</li> <li>100%</li> <li>Retirement extension</li> <li>Gradually up to 65 years old</li> </ul>
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Action 4

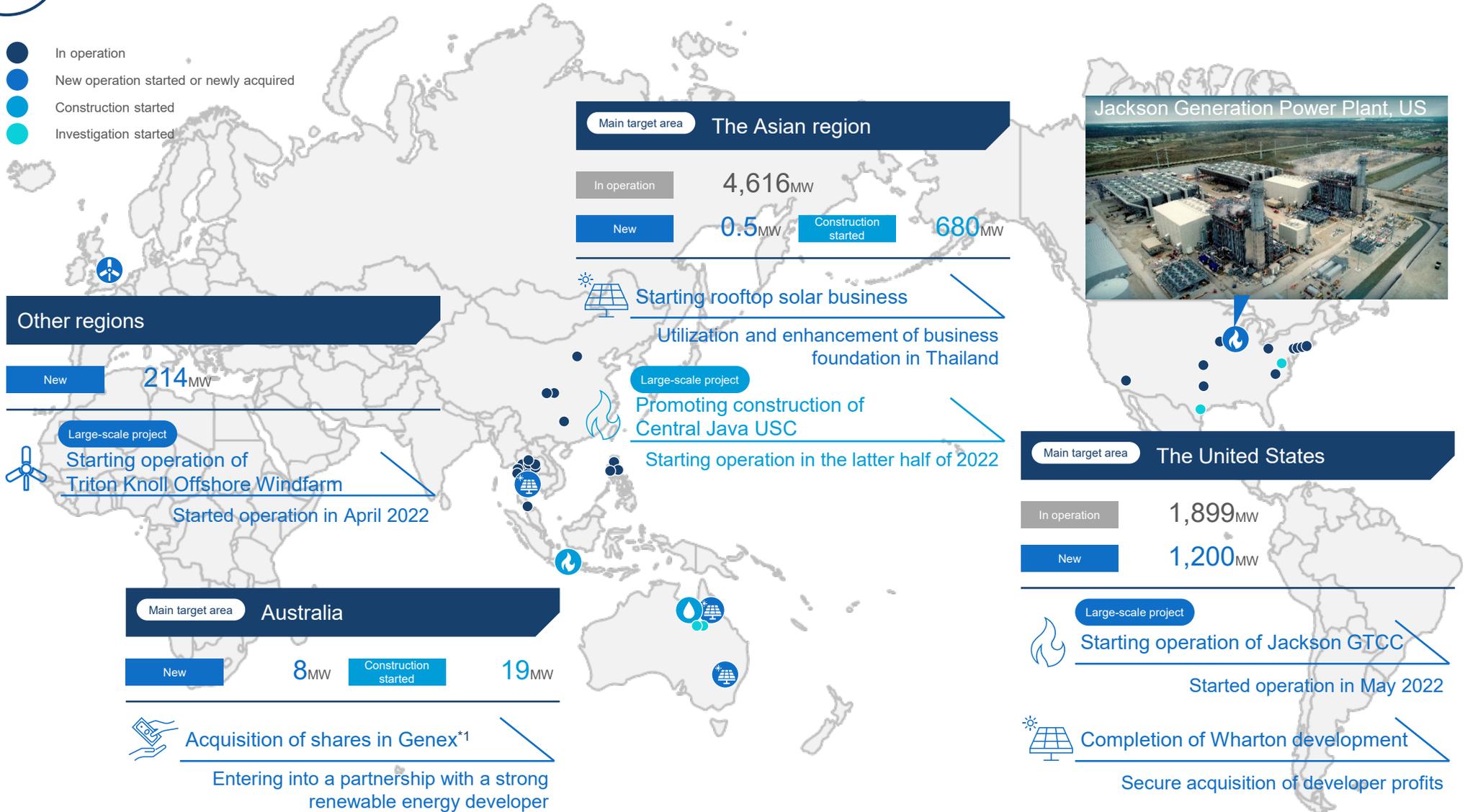
# Enhancement of Business Foundation



## Steady expansion of overseas business foundation

While steadily executing large-scale projects, J-POWER has strengthened its business foundation and diversified its business in the three priority areas.

- In operation
- New operation started or newly acquired
- Construction started
- Investigation started

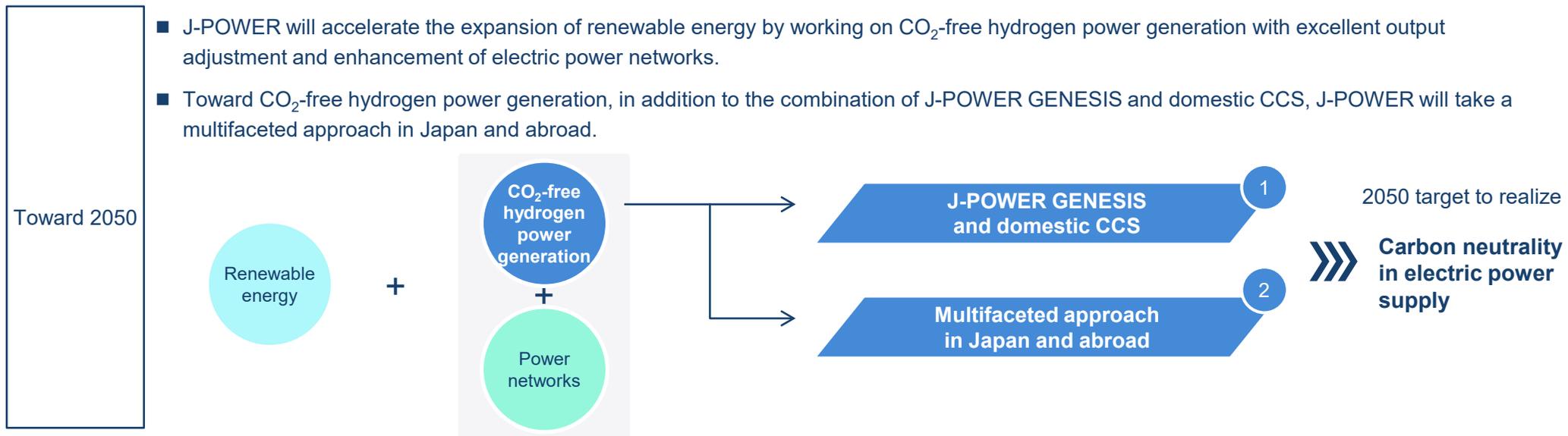
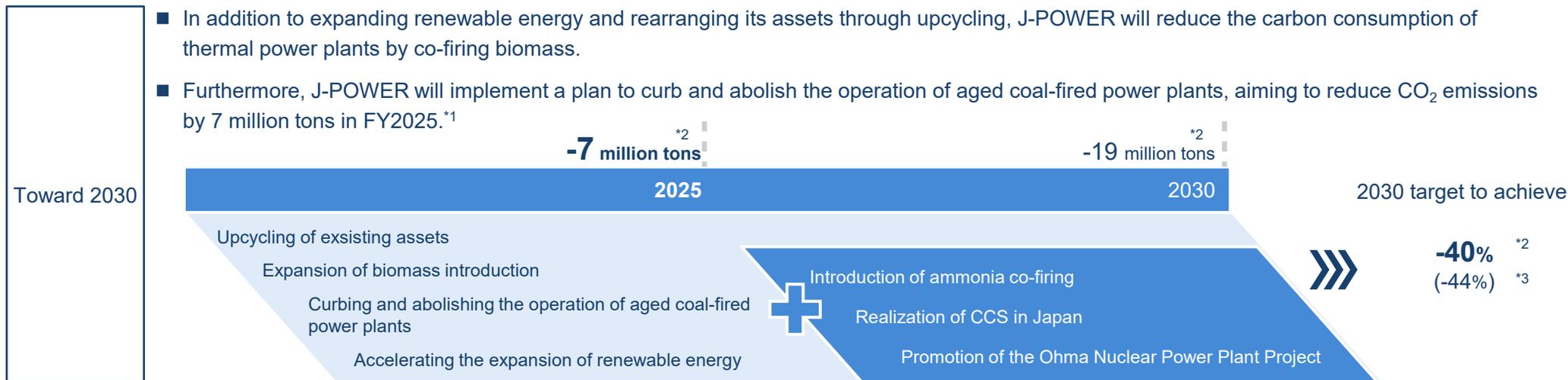


\*1: Genex Power Limited is a renewable power generation and energy storage development company in Australia.

# Toward the Realization of J-POWER BLUE MISSION 2050

To achieve the target for 2030, J-POWER has newly set the CO<sub>2</sub> emissions reduction target by FY2025, a halfway mark.

To realize carbon neutrality in 2050, J-POWER will work on CO<sub>2</sub>-free hydrogen power generation.



\*1: The targets will be updated as appropriate, if the preconditions such as the government policies and economic conditions significantly change.; \*2: Compared to the 3-year average of actual emissions in FY2017-FY2019;

\*3: Compared to actual emissions in FY2013

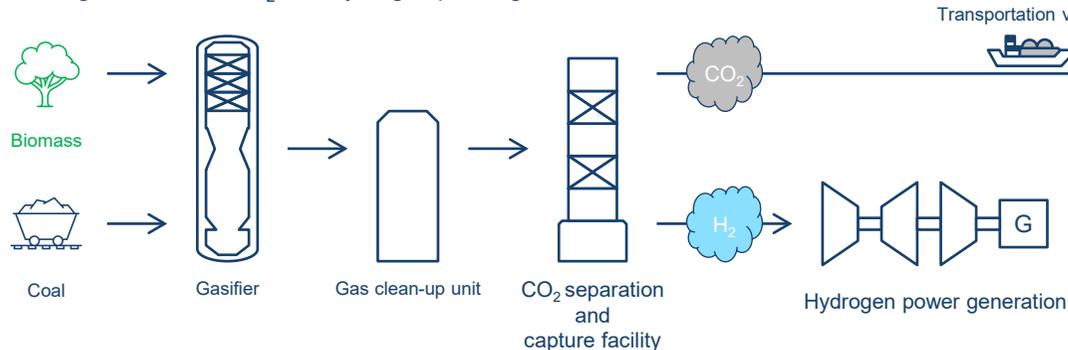
# Efforts for CO<sub>2</sub>-Free Hydrogen Power Generation

1

J-POWER GENESIS and domestic CCS

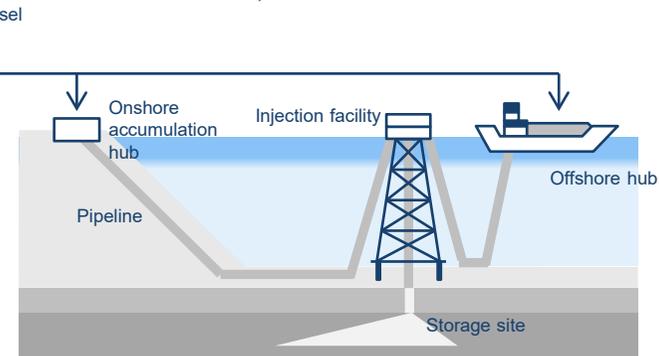
## CO<sub>2</sub> capture: Ready

J-POWER GENESIS has a system configuration that enables to apply the proven CO<sub>2</sub> separation and capture technology\*1. J-POWER will expand the system by combining new technologies to realize CO<sub>2</sub>-free hydrogen power generation.



## CO<sub>2</sub> injection and storage: Challenge

J-POWER will lead in conducting a feasibility studies of domestic CCS and work on CO<sub>2</sub> injection and storage from 2030. (Joint efforts with ENEOS)



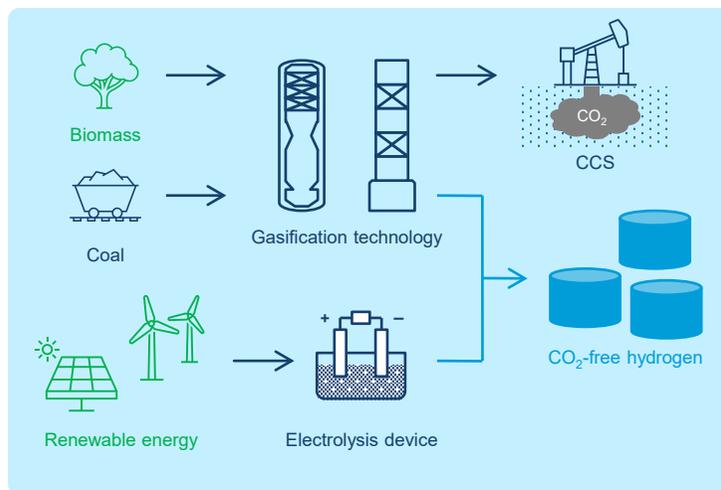
\* System configuration when hydrogen power generation is realized

2

Multifaceted approach in Japan and abroad

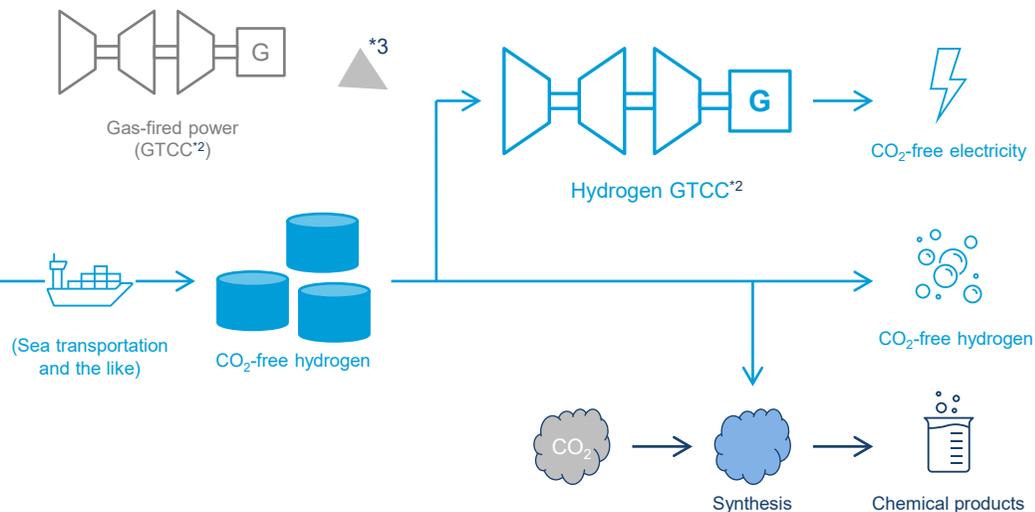
## Quick decision-making and a wide range of efforts

J-POWER will establish a dedicated organization (hydrogen/CCS special mission line) to promote a wide range of efforts both in Japan and abroad based on quick decision-making.



## Multifaceted approach

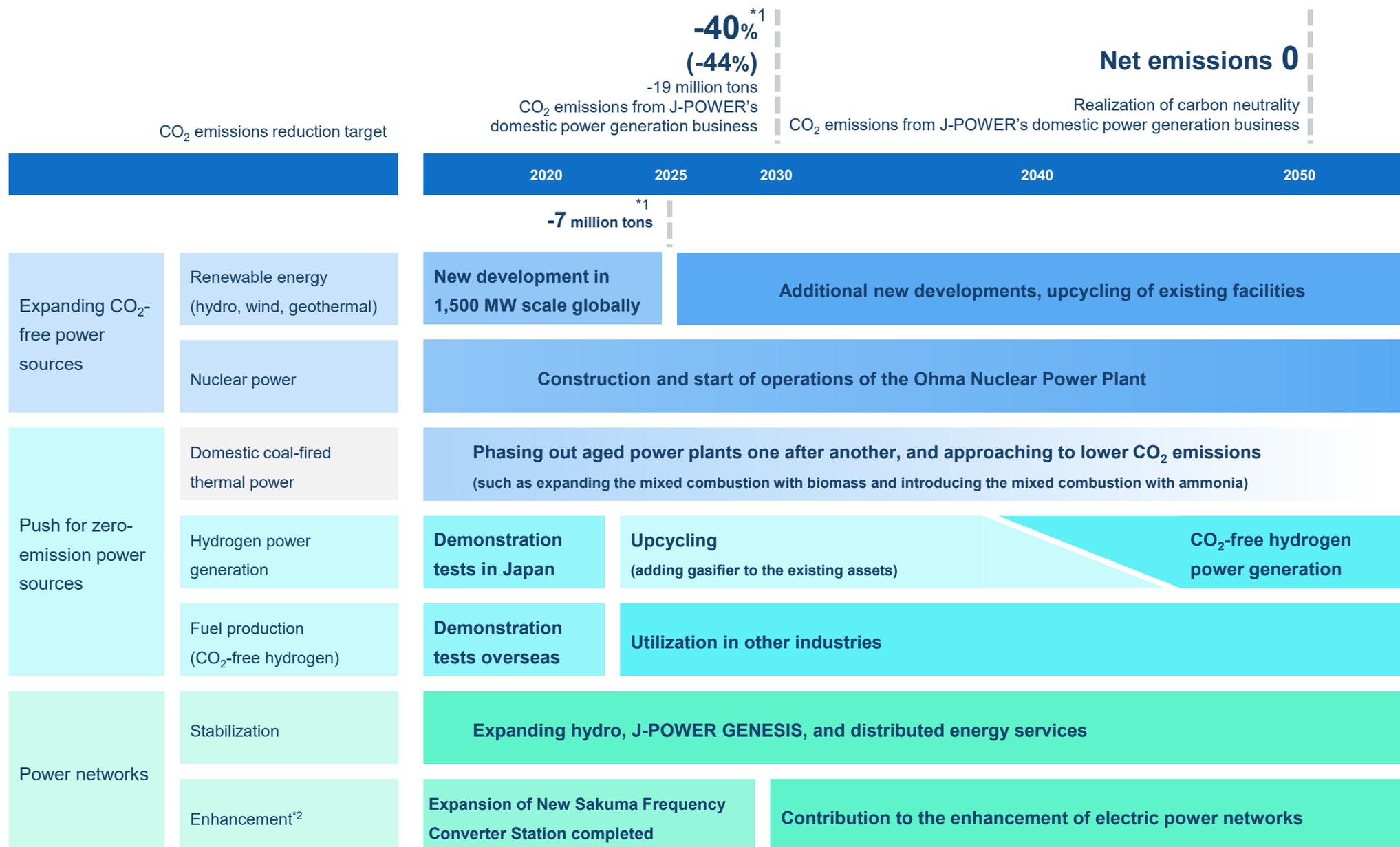
J-POWER will work on the production and supply of CO<sub>2</sub>-free hydrogen by various techniques in Japan and abroad and approach the power generation using such CO<sub>2</sub>-free hydrogen as well as hydrogen GTCC.



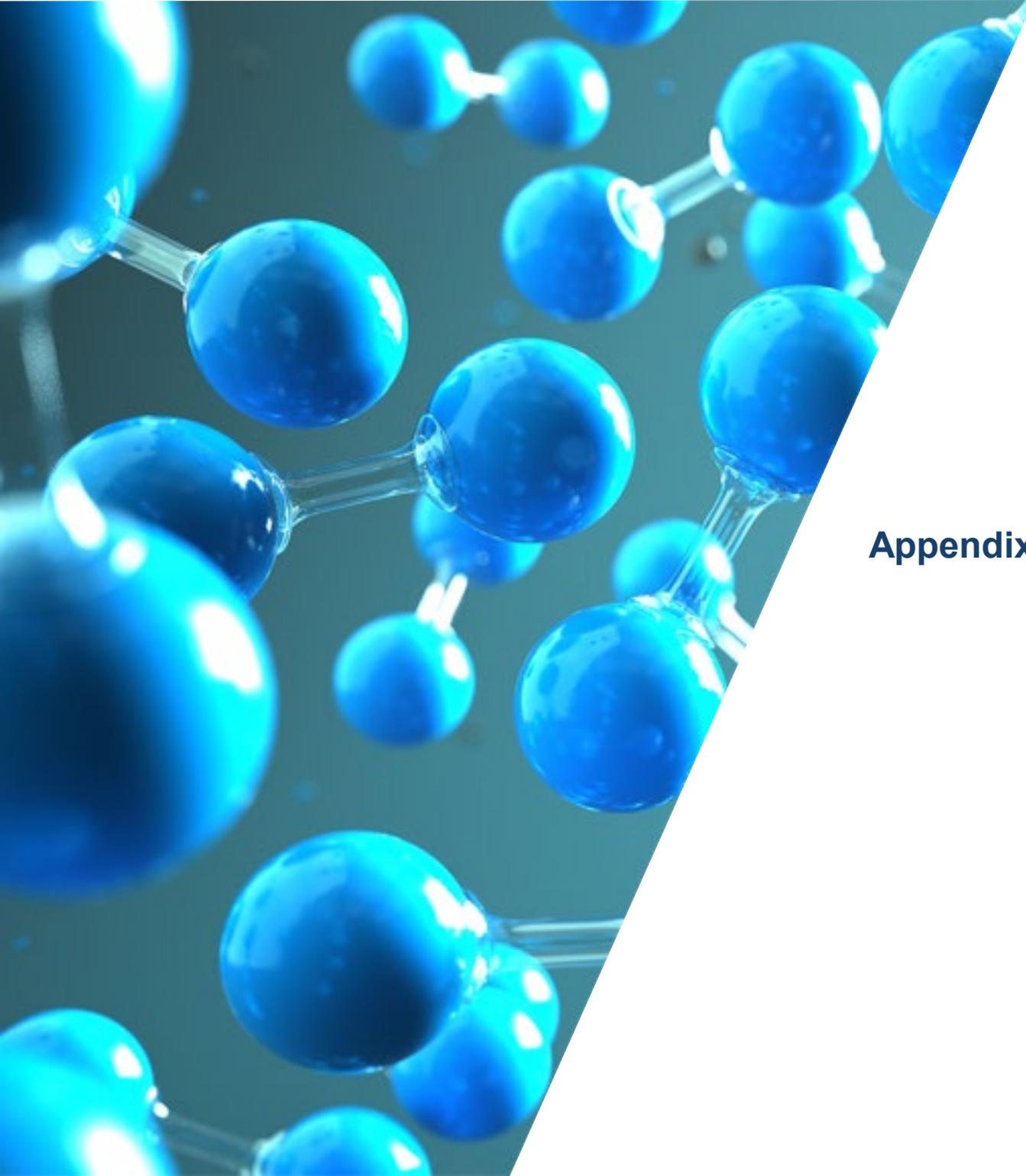
\*1: Osaki CoolGen Project jointly implemented with the Chugoku Electric Power Co., Inc. as a subsidized project of the New Energy and Industrial Technology Development Organization (NEDO) in FY2016-FY2022;;  
 \*2: GTCC: Gas turbine combined cycle; \*3: J-POWER also has an option to aim for CO<sub>2</sub>-free hydrogen power generation through a transition to LNG thermal power generation, according to the government policy demands for future CO<sub>2</sub> emissions reduction and economic conditions such as resource prices.

# [Reference] Roadmap

\* This roadmap will be updated and refined as needed, subject to changes in policy and other conditions and industrial progress. Also, the contents of this roadmap will be reviewed when the preconditions change.



\*1: Compared to the 3-year average of actual emissions in FY2017-FY2019 (Figures in parentheses are compared to actual emissions in FY2013); \*2: The power networks enhancement is an initiative of J-POWER Transmission



## Appendix

## Major Efforts Other Than Renewable Energy Development since April 2021

\*Regarding renewable energy development, please refer to pp.15-16

2021	News Release	Relation with Actions
Apr. 13, 2021	Promotion of advanced maintenance for hydroelectric power plants	Action 4
Apr. 27, 2021	J-POWER has signed UN Global Compact	Action 4
May 11, 2021	Starting joint study on multiple businesses including biomass fuel production using waste oil palm wood with Green Earth Institute Co., Ltd.	Action 2 Action 3
May 24, 2021	Winning NEDO demonstration project for research and development of ammonia co-firing thermal power generation technology	Action 2
Jun. 11, 2021	Osaki CoolGen Project received "Edison Award"	Action 2
Jun. 22, 2021	Suzuyo Power and Kasugai City, Aichi Prefecture, have signed the Partnership Agreement on Power Supply to Public Facilities and Promotion of Zero Carbon.	Action 3
Jun. 22, 2021	J-POWER joined the German green hydrogen consortium "AquaVentus"	Action 3
Jun. 23, 2021	J-POWER Joined Asia CCUS Network as a Supporting Member	Action 2 Action 3
Jul. 19, 2021	Commencement of Feasibility Study for the First Southeast Asia CCS Demonstration Project in Gundih Indonesia	Action 2 Action 3
Sep. 16, 2021	J-POWER to Introduce New Inhouse-Developed Water Turbines	Action 2
Sep. 28, 2021	Submission and public release of the document on primary environmental impact consideration at the early stage on the GENESIS Matsushima Project	Action 2
Sep. 30, 2021	Establishment of the Hydrogen/CCS Special Mission Line	Action 3
Oct. 7, 2021	J-POWER and Origin Energy Limited, Australia to collaborate on Green Ammonia Export Project	Action 3
Nov. 17, 2021	J-POWER and Enviva Partners, LP to collaborate on supply chain for woody biomass thermal power generation	Action 2
Nov. 18, 2021	J-Power and KDDI joint demonstration of drone-based inspection of about 40 electric power facilities nationwide	Action 4
Nov. 19, 2021	Starting VPP business utilizing large-capacity storage battery system	Action 3
Dec. 6, 2021	J-POWER receives order in India for consulting services related to construction of the Turga Pumped Storage Project	Action 4

## Major Efforts Other Than Renewable Energy Development since April 2021

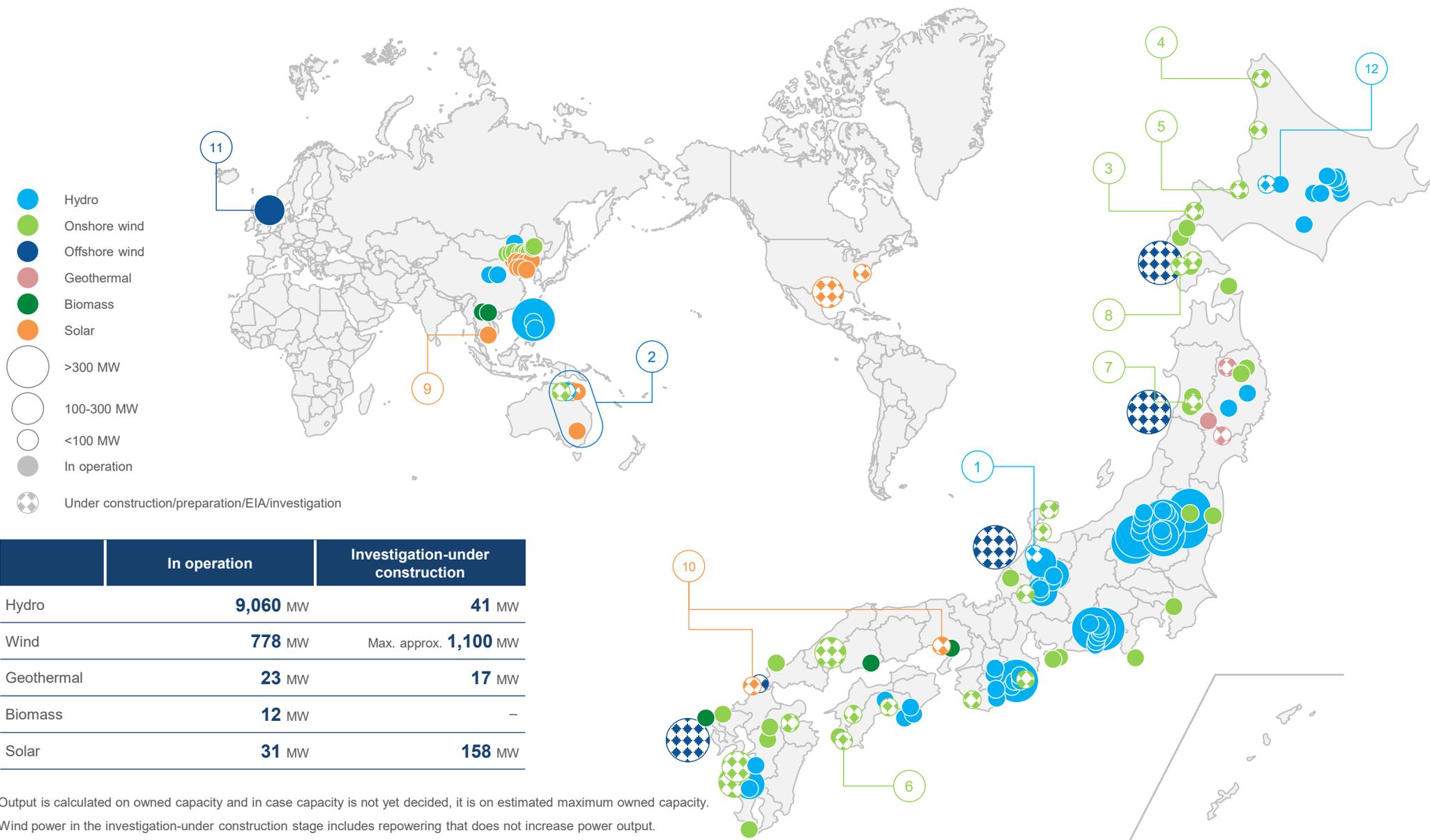
\*Regarding renewable energy development, please refer to pp.15-16

2022	News Release	Relation with Actions
Jan. 12, 2022	Mitsui Fudosan and J-POWER team up on BCP and decarbonization for first time in Japan	Action 3
Jan. 14, 2022	Issuance of "2nd J-POWER Green Bond" (76th unsecured corporate bond)	Action 4
Jan. 21, 2022	Approval as a NEDO Green Innovation Fund Project, Cost-Reduction Project for Offshore Wind Power Generation	Action 1
Feb. 2, 2022	J-POWER endorses GX League Basic Concept	Action 4
Feb. 28, 2022	Introduction of performance-based and stock compensation for board members	Action 4
Feb. 28, 2022	Decision on the transition policy to a company with an audit and supervisory committee	Action 4
Mar. 11, 2022	Starting the study on how to create new businesses using microalgae	Action 3
Mar. 28, 2022	Starting the development of new transmission equipment that meets international standards	Action 4
Apr. 9, 2022	A ceremony to mark the completion of the world's first maritime transport and loading/unloading of liquefied hydrogen produced from brown coal	Action 3
May 6, 2022	Starting commercial operation of Jackson Generation Power Plant, US	Action 4
May 10, 2022	Joint efforts toward carbon neutral in energy supply	Action 2    Action 3

## Major Efforts Related to Renewable Energy Development since April 2021

2021	News Release	Relation with Actions
1	Apr. 14, 2021 J-POWER constructs Onabara Power Plant	Action 1
2	May 18, 2021 Acquisition of shares in Genex Power Limited, Australia	Action 1 Action 4
3	May 25, 2021 Renewal works of Shimamaki Wind Farm have started	Action 2
4	Jul. 27, 2021 Renewal works of Sarakitomanai Wind Farm have started	Action 2
5	Aug. 10, 2021 J-POWER carries out “Hachinosawa Wind Power Project (tentative name)” in Ishikari City, Hokkaido Prefecture, as a joint project	Action 1
6	Sep. 28, 2021 Construction works of Minami Ehime No. 2 Wind Farm have started	Action 1
7	Sep. 28, 2021 Renewal works of Nikaho Kogen Wind Farm have started	Action 2
8	Oct. 22, 2021 Construction works of Esashi Wind Farm have started	Action 1
9	Nov. 11, 2021 Realizing carbon neutrality through rooftop solar projects in Thailand	Action 1 Action 4
10	Nov. 26, 2021 Successful bid: Total 32,000 kW in the 10th solar power bidding	Action 1
2022	News Release	Relation with Actions
11	Jan. 14, 2022 Triton Knoll Offshore Wind Farm, UK completes turbine commissioning	Action 1 Action 4
12	Apr. 13, 2022 Kumaoui Hydropower Station starts commercial operation	Action 1

# Development Status of Renewable Energy as of April 30, 2022



- Output is calculated on owned capacity and in case capacity is not yet decided, it is on estimated maximum owned capacity.
- Wind power in the investigation-under construction stage includes repowering that does not increase power output.
- In addition to the above, a maximum of approximately 1,850 MW of offshore wind power is under development survey at four areas outside port in Japan. (Developers of offshore wind projects outside port area in Japan are decided by bidding after each sea area is designated as a promoting area. The output of joint projects with other companies is assumed maximum equipment output without considering equity.)
- In addition to the above, biomass is being co-fired at Takasago Thermal Power, Takehara Thermal Power New Unit 1 and Matsuura Thermal Power.

This material contains statements that constitute forward-looking statements, plans for the future, management targets, etc. relating to the Company and/or the J-POWER group. These are based on current assumptions of future events, and there exist possibilities that such assumptions are objectively incorrect and actual results may differ from those in the statements as a result of various factors.

Furthermore, information and data other than those concerning the Company and its subsidiaries/affiliates are quoted from public information, and the Company has not verified and will not warrant its accuracy or appropriateness.



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