



Energy for a New Era

Briefing Materials for the Regular Press Conference

27 November 2024

JERA Co., Inc.

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1. Progress Toward Achieving “JERA Zero CO₂ Emissions 2050”

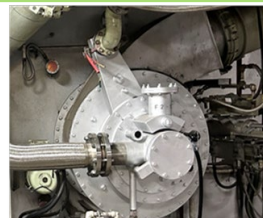
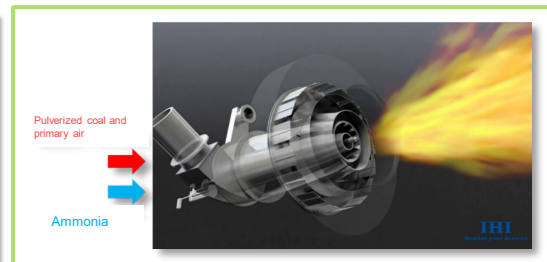
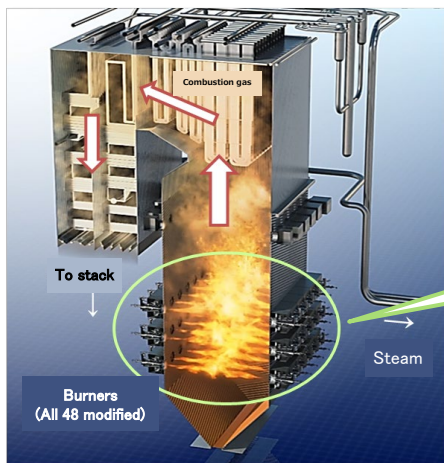
1. Progress Toward Achieving “JERA Zero CO₂ Emissions 2050”

Successful Demonstration Testing of 20% Fuel Ammonia Substitution

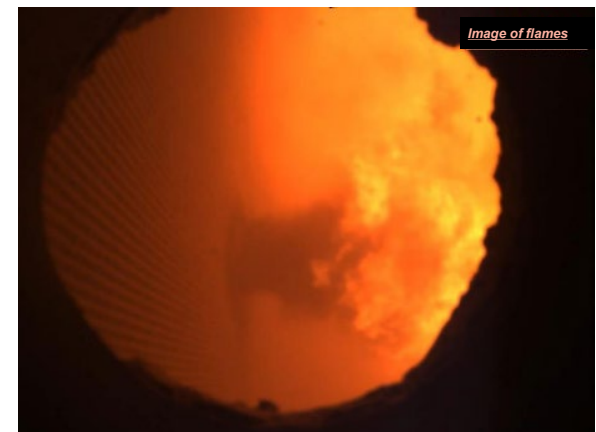
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- At Hekinan Thermal Power Station Unit 4, we conducted the world's first test* of 20% ammonia substitution at a large-scale commercial coal-fired power plant.
 - Results were positive, with the level of nitrogen oxides (NO_x) no higher than before ammonia substitution (no higher than when firing coal alone).**
 - In addition, we **achieved a maximum substitution rate of 28% (0.6GW)**, confirming feasibility of operation at a substitution rate higher than 20%.
- ⇒ Given the success of the demonstration testing, we are accelerating construction and supply chain development aimed at commercial operation

April				May				June				July
▼ 1 Apr. First firing												▼ 26 June Demonstration testing ends
▼ 10 Apr. Achieved 20% substitution (1GW)								▼ 17 June Achieved 28% substitution (0.6GW)				
Confirmation of ignition/extinction and collection of combustion data				Validation testing of operability and combustion characteristics								



Ammonia burner as installed



Ammonia combustion (Photo: IHI Corporation)

1. Progress Toward Achieving “JERA Zero CO₂ Emissions 2050” Acceleration of Hydrogen and Ammonia Supply Chain Development Aimed at Starting Commercial Operation

- Coordinating with leading companies both in Japan and overseas, we are making **steady progress on upstream, midstream, and downstream initiatives** as we work to develop hydrogen and ammonia supply chains.
- In addition, we **aim to strengthen supply chain resilience** by promoting the use of hydrogen, etc. in industries other than power generation and as a decarbonization solution for Asia and other overseas locations.

Feb. 2022

Production 

Conducted international competitive bidding for fuel ammonia procurement in preparation for commercial operation at Hekinan Unit 4.

Mar. 2024

Production 

Concluded an agreement with ExxonMobil to jointly explore a blue ammonia project.

ExxonMobil

Power Generation 

Production 

Complete construction of commercial-use facilities, begin ammonia production, etc.

2022

2023

2024

**Begin
Commercial
Operation by
Late 2020s**

Nov. 2022

Transport 

Concluded MOUs with Nippon Yusen and Mitsui O.S.K. Lines to study cooperation in transporting fuel ammonia.



Jan. 2023

Production 

Concluded MOUs with CF Industries and Yara related to joint development of blue ammonia projects and procurement.



Jun.–Jul. 2024

Power Generation 

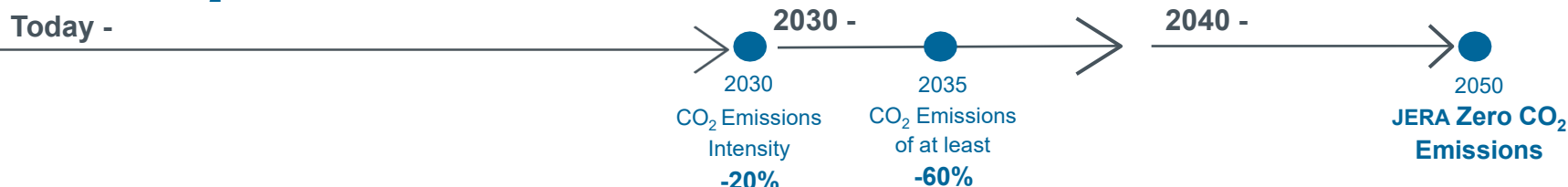
Completed demonstration testing of fuel ammonia substitution at Hekinan Unit 4. Began construction of commercial-use ammonia tank at Hekinan Thermal Power Station (July 2024).



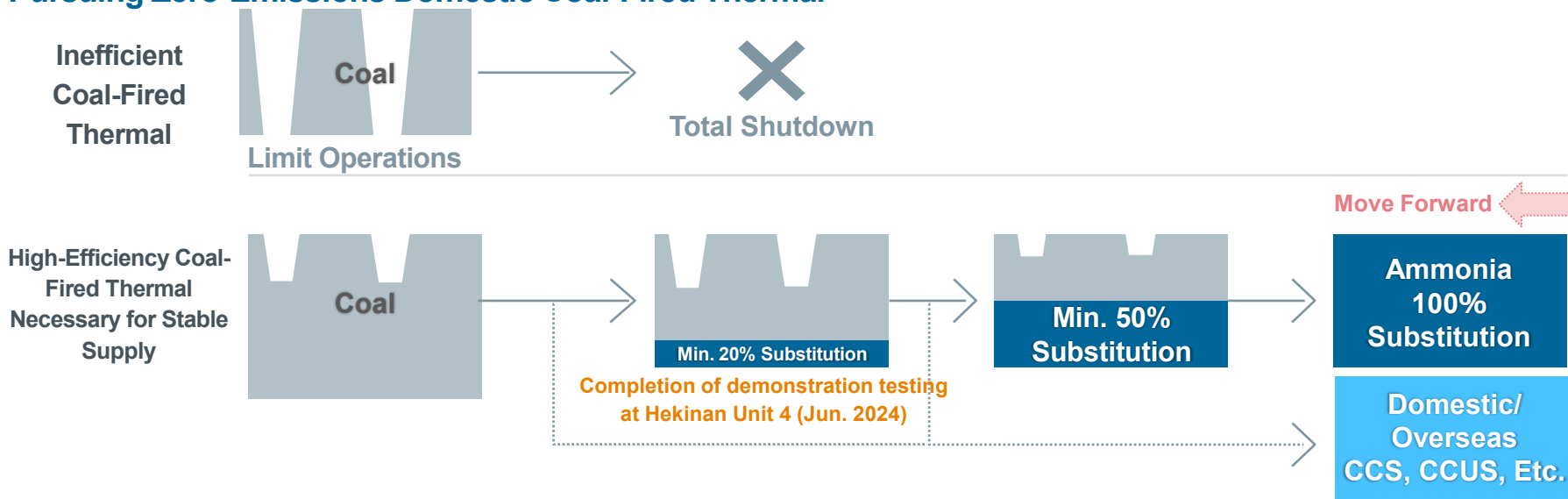
Efforts in Pursuit of Zero-Emissions Domestic Coal-Fired Thermal

- Based on demonstration testing, we are accelerating efforts to zero out CO₂ emissions from domestic coal-fired thermal:
 - Being careful to ensure a stable supply of electricity, **limit the operation of coal-fired thermal, particularly during low-demand periods**
 - Shutdown all inefficient coal-fired thermal by around FY 2030**
 - Move quickly to zero out** emissions at existing high-efficiency coal-fired thermal power plants through **partial/complete ammonia substitution and domestic/overseas CCS, Etc.**

JERA Zero CO₂ Emissions 2050 (Announced 13 October 2020)



Pursuing Zero-Emissions Domestic Coal-Fired Thermal



1. Progress Toward Achieving “JERA Zero CO₂ Emissions 2050”

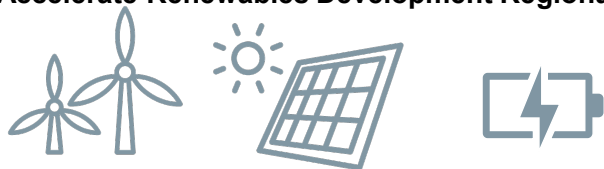
Adding Steadily Toward Goal of Developing 20GW Capacity in Renewables

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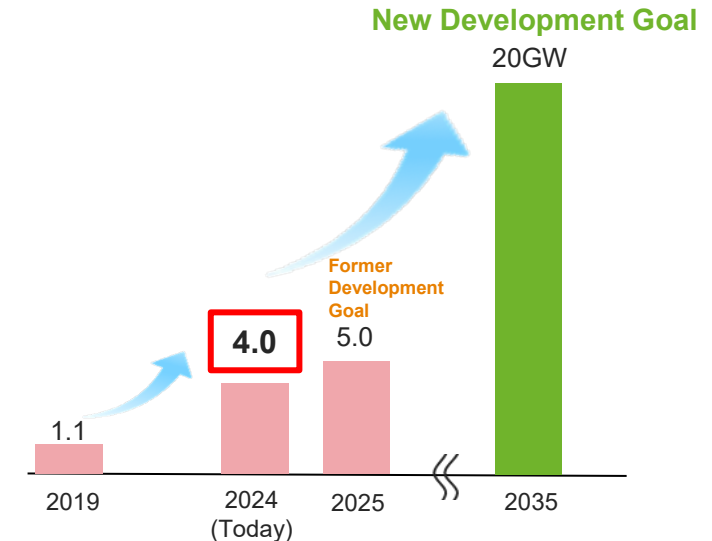
- In the JERA Group’s renewables business, **JERA Nex will undertake command of the global strategy**, combining **Parkwind’s knowledge** and track record in global development with **local development** undertaken by companies in each region as it expands worldwide.
- Acquired US solar farm projects (395MW) in August, **steadily reaching 4GW on the way to the goal of developing 20GW capacity by FY 2035**



Accelerate Renewables Development Regionally



Renewables Development



Topics:

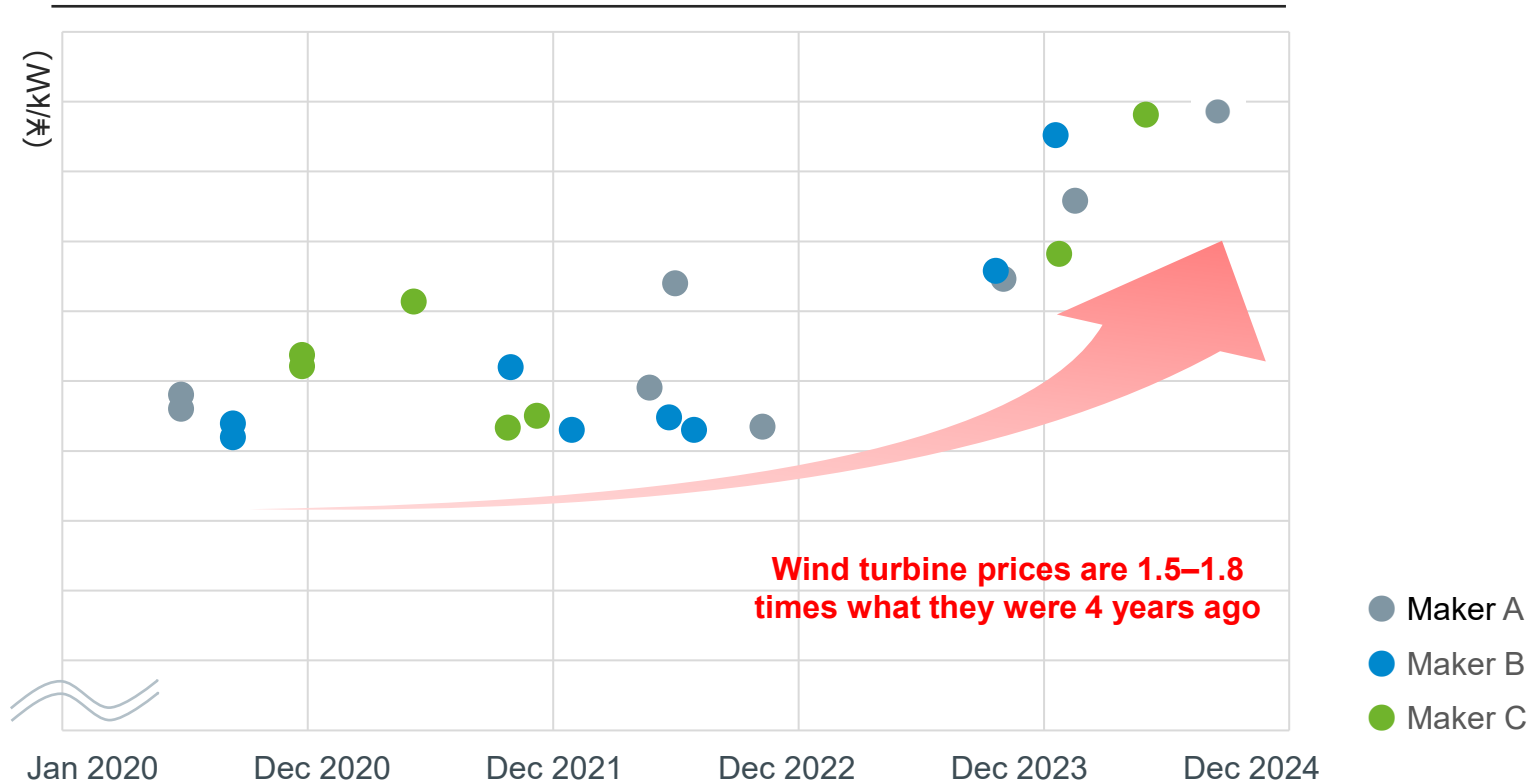
Examples of leveraging Parkwind’s knowledge for Akita offshore wind projects:

- Comparison with completed European projects when negotiating wind turbine contracts
- Use of responsibility confirmation charts between business operator and contractors
- Support for design and construction planning that incorporates latest European knowledge

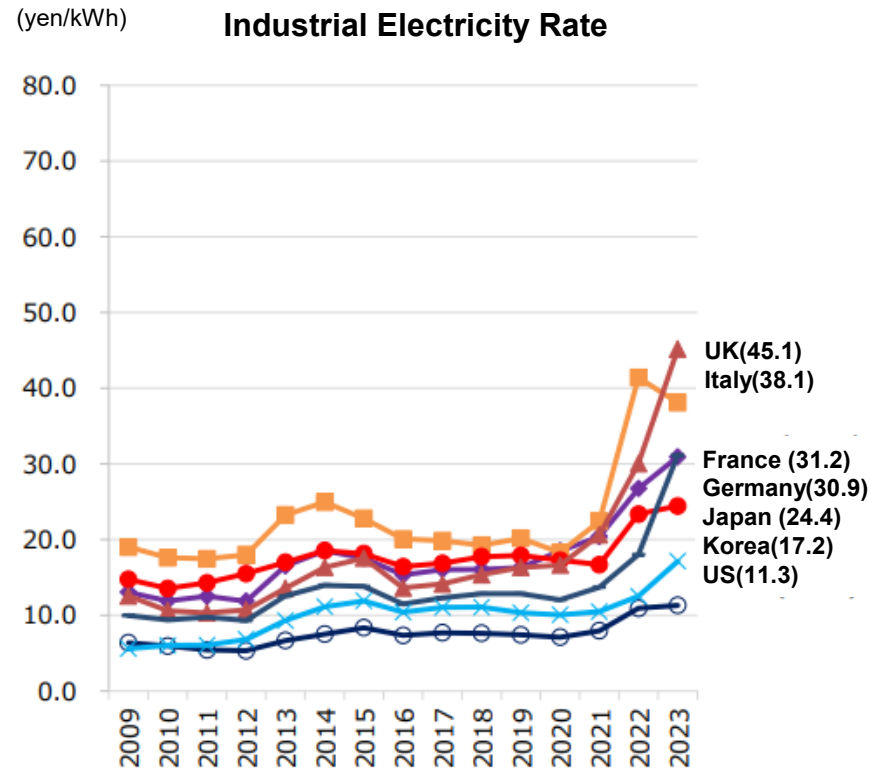
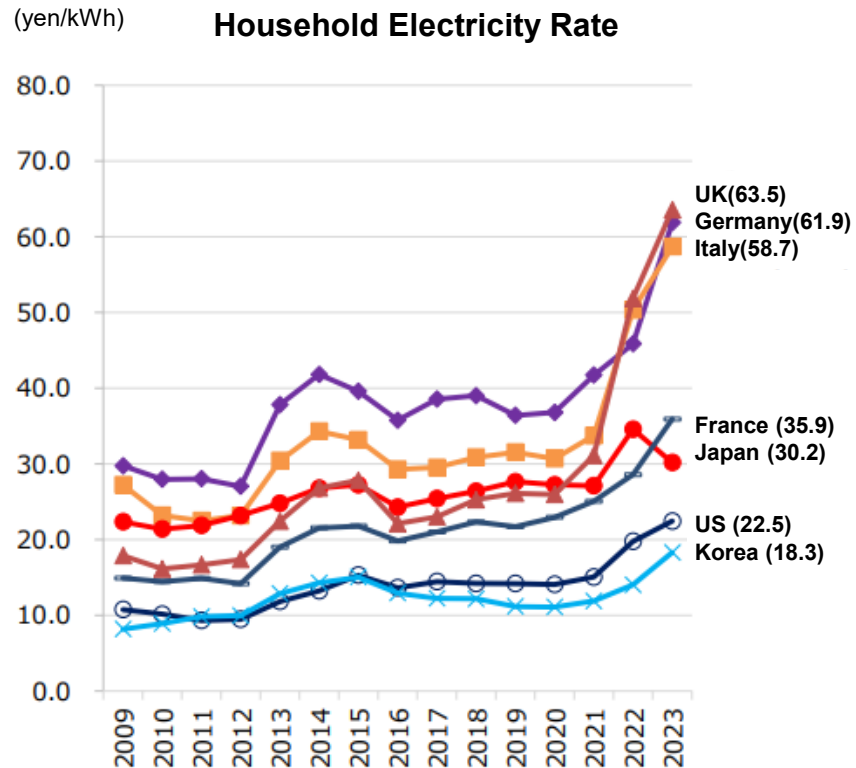
A Difficult Business Environment for Decarbonization

- Global inflation has caused a **rapid rise in decarbonization costs related to offshore wind and hydrogen & ammonia manufacture**
- Concerns that **rapid decarbonization could lead to a hollowing out of industry** (Ex.: Already manifesting in part in Europe)
 - ⇒ **Implementation of realistic decarbonization scenarios that combine a variety of options in line with the upgrading of industrial structures will be increasingly important.**

Price of Wind Turbines Over Time (Illustrative)



Reference: International Comparison of Electricity Rates



Source: Materials from the 82nd meeting of the Basic Policy Subcommittee

2. Ensuring Stable Supply This Winter

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Progress in Replacing Thermal Power Sources Steadily Enhances Supply Capacity

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- Progress in replacing older facilities with state-of-the-art thermal power generation facilities has so far led to the start of commercial operation at 9 units (totaling 6.53 GW).

⇒ JERA has **steadily enhanced its supply capacity.**

FY2020

FY2021

FY2022

FY2023

FY2024 –

Nov. 2024

Hitachinaka Joint Thermal Unit 1

Taketoyo Thermal Unit 5

Anegasaki Thermal New Unit 1

Anegasaki Thermal New Unit 2

Yokosuka Thermal Unit 1

Anegasaki Thermal New Unit 3

Yokosuka Thermal Unit 2

Goi Thermal Unit 1

Goi Thermal Unit 2

Goi Thermal Unit 3

Est. Oct 2029

Chita Thermal Unit 7

Est Jan 2030

Chita Thermal Unit 8

Commercial Operation Has Begun
6.53 GW

Under Construction
0.78 GW

Development Under Consideration
1.32 GW

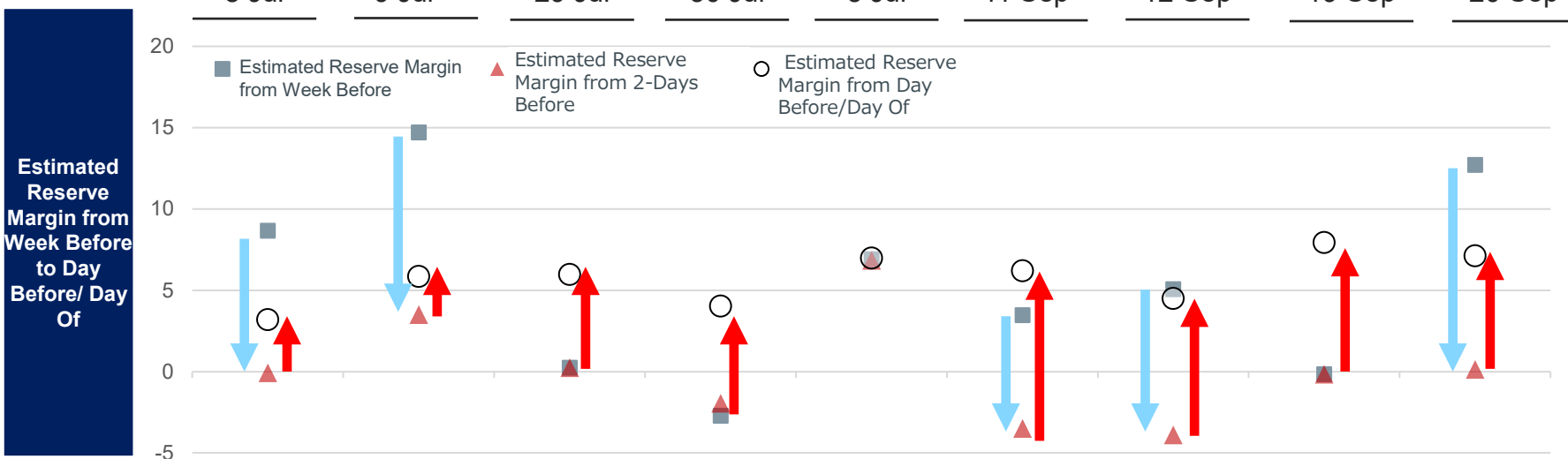
Replacement
8.63 GW

Reviewing Summer Supply and Demand

- This summer, **low reserve margin advisories were issued two days and one day in advance**, bringing short-term directives to secure reserve margins.

⇒ **JERA contributed to supply stability by responding flexibly with measures such as operating at increased output and adjusting repair schedules for offline power sources**

Changes in estimated reserve margin from previous week to day-of: A selection of days from this summer when JERA increased output in response to supply and demand conditions



JERA's Contribution to Stable Supply This Summer

- Moved forward operation of Goi Thermal Power Station Unit 1 (30 Aug. → 1 Aug.)
- Conducted increased-output operations at thermal power stations (15 days)
- Adjusted repair schedules for offline power sources
- Activated reserve power sources

Restarting Taketoyo Thermal Power Station to Contribute to a Stable Supply This Winter

- Concerning the fire that occurred at Taketoyo Thermal Power Station in Jan. 2024, based on the measures to address causes and prevent reoccurrence that were compiled by the accident investigation committee, we aim to **restart biomass co-firing at the facility around the end of FY 2026**.
- As a provisional measure** until biomass co-firing can be restarted, **coal-only operation will be conducted during high-demand summer and winter periods beginning this winter (around Jan. 2025)**.
 ⇒ By restarting and operating the facility with a priority on safely, we will contribute to securing a stable supply of electricity

Provisional Restart

True Restart

Date of
Restart
(Target)

Around Jan 2025

Around End of FY 2026

Operating
Conditions

Coal Only*

Biomass Co-Firing
(17% → 8%)*



Unit

Taketoyo Thermal
Power Station Unit 5

Output

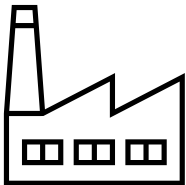
1.07 GW

* Raising the co-firing rate will be considered provided safety can be ensured. Given the change in co-firing rate and the provisional measure of coal-only operation, we will implement measures to reduce CO₂ emissions provided that a stable supply of electricity can be ensured.

3. The Importance of Thermal Power and the Business Environment

The Roles Thermal Power Generation is Expected to Play

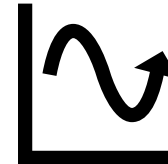
✓ Developing infrastructure to meet the growing demand for electricity



Candidate Power Sources

- Renewables
- Nuclear
- **Thermal**
-
-

✓ Addressing increased fluctuations in electricity supply and demand



Candidate Power Sources

- Storage batteries (short-term fluctuations)
- DR (short-term fluctuations)
- **Thermal** (medium- to long-term fluctuations)
-
-

⇒ **Thermal power generation is a reliable power source that satisfies both requirements**

3. The Importance of Thermal Power and the Business Environment

Consider Power Source Development in Anticipation of Increased Demand for Electricity

- Demand for electricity is expected to increase with the new construction and expansion of data centers and semiconductor factories
 - ⇒ • In the last stages of deliberation aimed at making a Final Investment Decision (FID) about Chita Thermal Power Station Units 7 and 8 (est. start of operation FY 2029)
 - Consider the development of additional medium- and long-term thermal power sources through methods including replacement
 - Given the lead time for power source development, also consider repowering or refreshing existing facilities

Chita Thermal Power Station Units 7 and 8

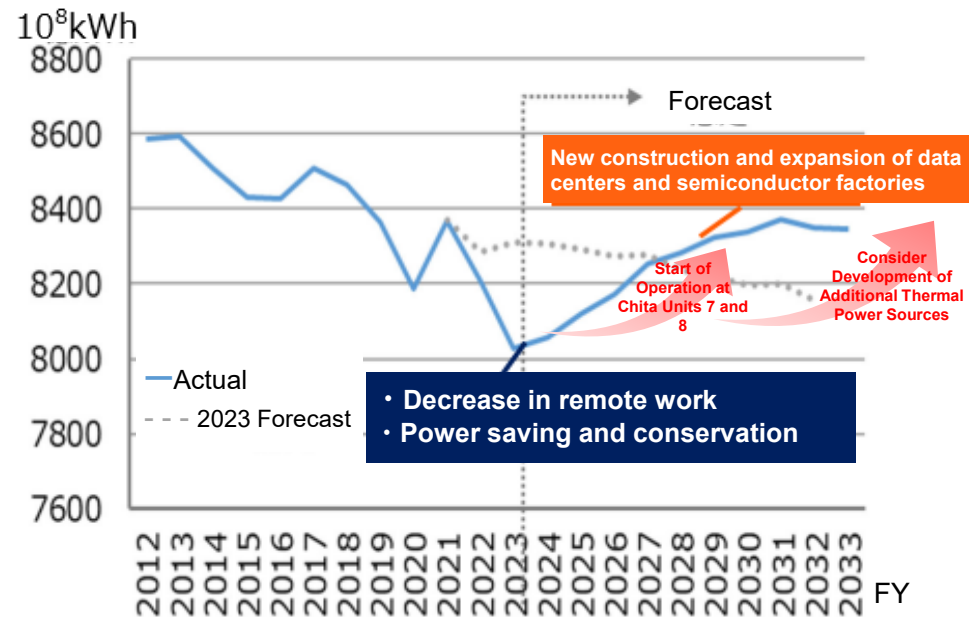
Conceptual Rendering of Completed Station



Construction Plan

	Capacity (MW)		Fuel	Planned Start of Operation
Unit 7	659.9	1319.8	LNG	Oct. 2029
Unit 8	659.9			Jan 2030

Forecast Growth of Electricity Demand in Japan



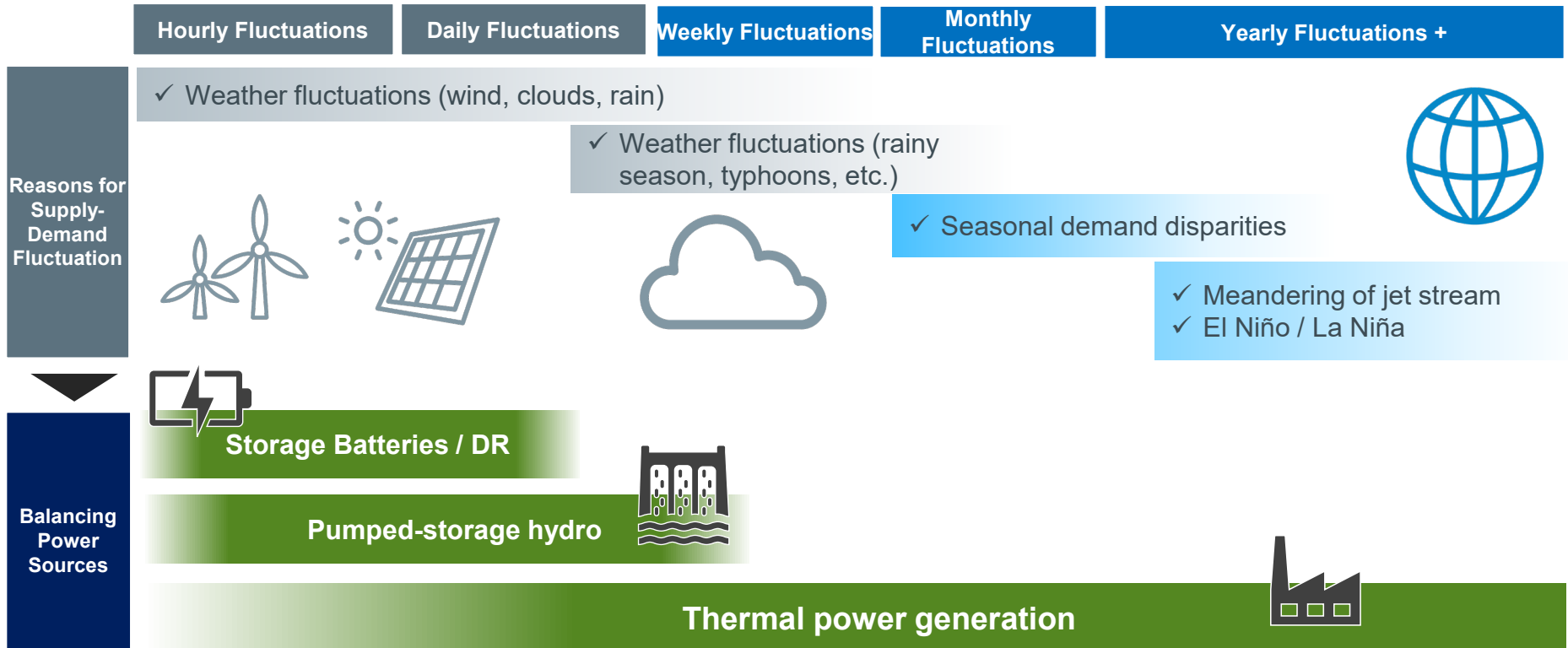
Source: Materials from the 62nd meeting of the Basic Policy Working Group

3. The Importance of Thermal Power and the Business Environment

The Large-Scale Introduction of Renewables Increases the Need for Balancing Power Sources

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- **The large-scale introduction of renewables** brings **greater fluctuations in electricity supply and demand** due to seasonal demand disparities and weather fluctuations. This means **balancing power sources are increasingly important** to ensure a stable power supply.
- **A combination of balancing power sources is needed, with storage batteries, DR, pumped-storage hydro and thermal power addressing short-term fluctuations and LNG thermal power sources addressing medium- to long-term fluctuations where larger demand fluctuations are expected.**
(Currently, LNG thermal is used for balancing most short- to long-term supply-demand fluctuations)



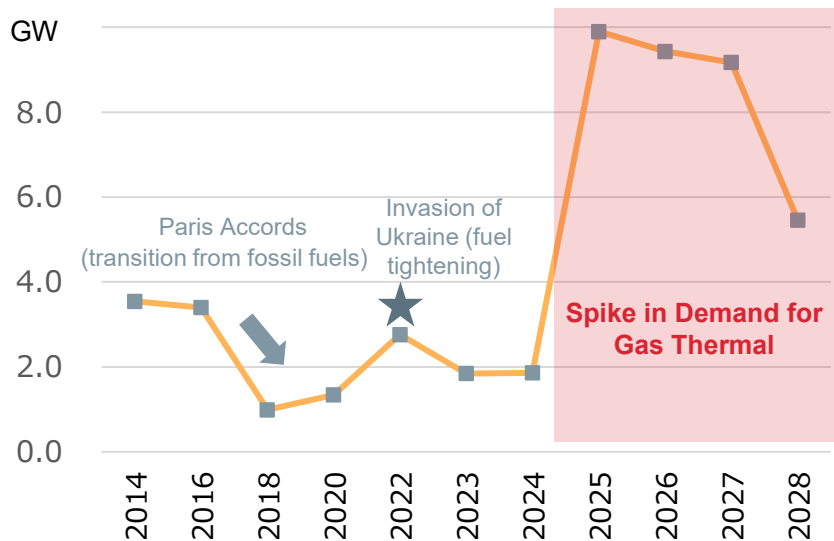
3. The Importance of Thermal Power and the Business Environment

An Increasingly Challenging Environment for Procuring Materials and Equipment for Thermal Projects

- In global markets, there is an **increasing demand for gas-fired thermal** as a realistic option for the energy transition.
- For **gas turbines**, in particular, the **Big 3 manufacturers** have a roughly **80% share**, leading to a **scramble to secure these manufacturers' production capacity**.

⇒ With the emergence of rising prices and longer delivery times, the business environment for thermal project-related materials and equipment procurement is becoming increasingly challenging.

Demand for Additional Gas-Fired Thermal Capacity in Europe Over Time

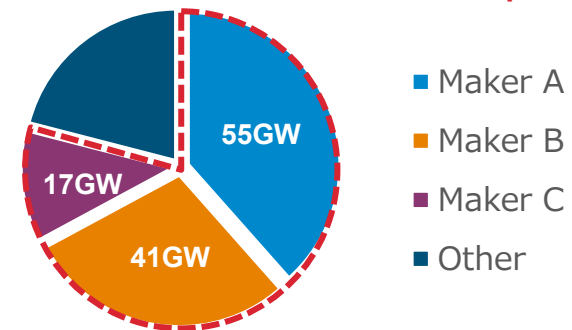


Source: Produced in-house based on BloombergNEF's *New Energy Outlook 2024*

Gas Turbine Share by Maker

80% of Thermal Under Construction* is Concentrated in 3 Companies

⇒ A Scramble for Their Production Capacity



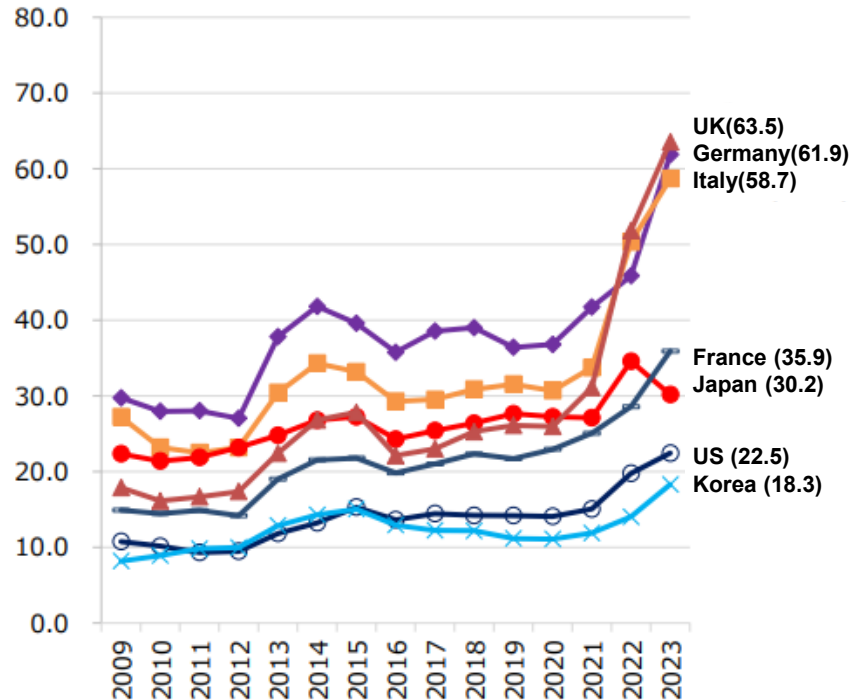
Source: Produced in-house based on *Global Energy Monitor*

*Most recent 4 years

Repeat: International Comparison of Electricity Rates

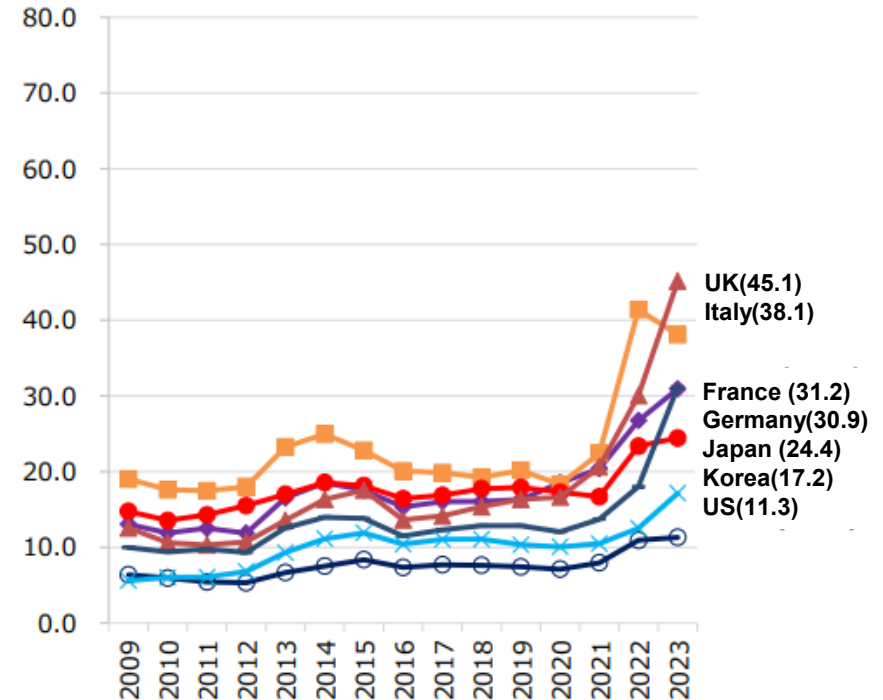
(yen/kWh)

Household Electricity Rate



(yen/kWh)

Industrial Electricity Rate



Source: Materials from the 82nd meeting of the Basic Policy Subcommittee

Maintaining the Functionality and Continued Business Viability of Thermal Power Generation

- There is a need to **create a mechanism for properly evaluating the value generated by thermal power.**
- For its part, aiming to maintain functionality and business viability, JERA will accelerate initiatives to **strengthen measures to secure human resources, improve field expertise, and promote Digital Power Plants.**

Changing Environment for Thermal Projects

1 Increased electricity demand caused by DX

2 Increased load on facilities caused by addressing supply-and-demand fluctuations (more start-ups and shut-downs, etc.)

3 Rising cost of materials and equipment

4 Difficulty in securing field engineers

Additional Measures for Maintaining Functionality and Business Viability

Create a Mechanism for Properly Evaluating the Value Generated by Thermal Power

+

1 Strengthen Measures to Secure Human Resources

- Strengthen field expertise
- Expand use of senior citizens
- Expand use of foreign nationals

2 Improve Field Expertise

- Strengthen ability to respond to contingencies
- Development of in-house VC for upstream technology
- Develop human resources through career rotation

3 DPP (Digital Power Plants)

- Maximization of life-cycle value (reduce unplanned shutdowns, lower repair costs by optimizing maintenance cycles, etc.)
- Streamline and enhance operational tasks such as analysis and decision-making.

Reference

Reference: Progress on the Growth Strategy

- Steady progress is being made toward achieving the *JERA Growth Strategy to Realize the 2035 Vision*, which was announced in May 2024

LNG

- ✓ Ongoing efforts aimed at ensuring a stable supply of LNG and enhanced flexibility

Renewables

- ✓ Steady progress toward the target of developing 20GW in capacity by 2023

Hydrogen & Ammonia

- ✓ Value chain development underway (upstream, midstream, and downstream)

Topics:

