

Jera

Energy for a New Era



JERA's Challenge for the Future of Ammonia Business

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JERA's Decarbonization Strategy

JERA Zero CO₂ Emissions 2050

In order to help achieve a sustainable society, JERA is taking on the challenge of achieving zero emissions from its business both in Japan and overseas.

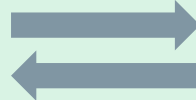
The Three Approaches

1. Renewable Energy and Zero Emissions Thermal Power Generation

<Renewable Energy>

- Clean energy (CO₂-free)
- Variable power needs to be complemented by flexible thermal power generation

(Complementary)



Provide stable, clean, economical energy

<Zero Emissions Thermal Power>

- Adoption of greener fuels such as Ammonia and Hydrogen
- Accommodating fluctuating RE power

2. Roadmaps Suitable for Each Country and Region

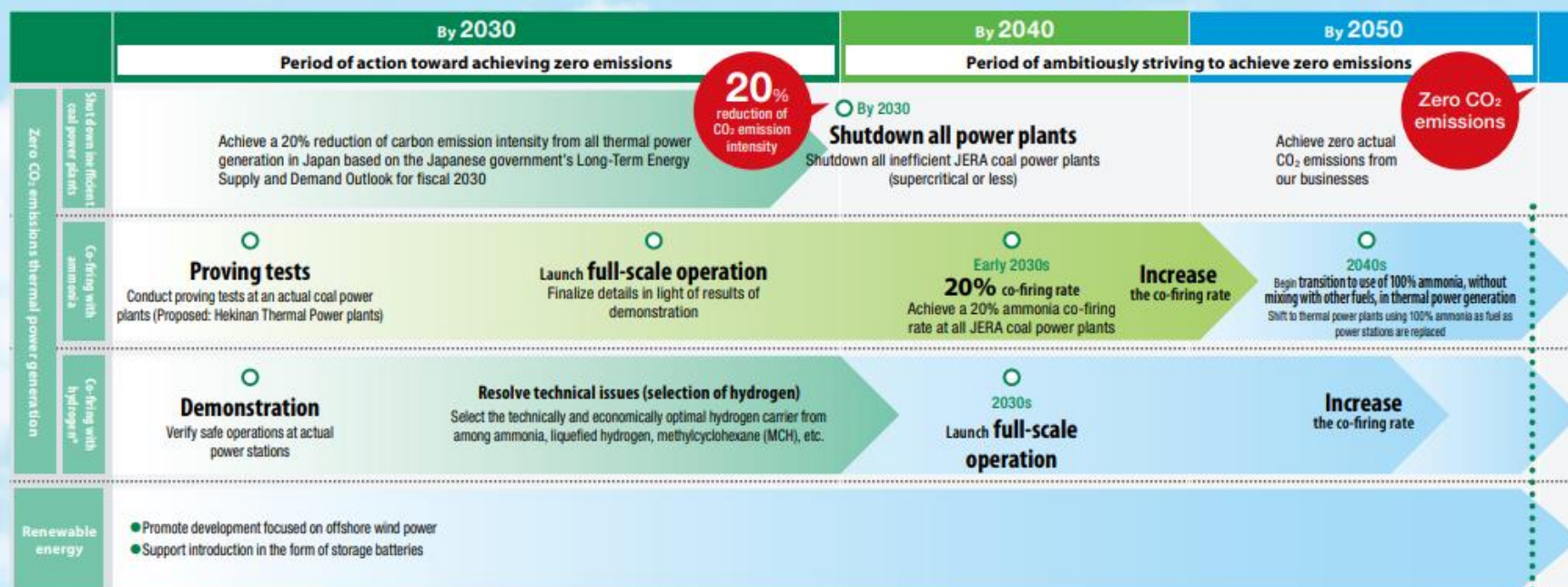
- Zero emissions should be pursued by optimal solutions for each.

3. Smart Transition

- Utilizing existing equipment can minimize costs and risks associated with the transition.

JERA's roadmap for its business in Japan

JERA Zero CO₂ Emissions 2050 Roadmap for its Business in Japan



This roadmap will be gradually developed in greater detail based on relevant conditions such as government policies. JERA will revise the roadmap when relevant conditions change significantly.

* The use of CO₂-free LNG is also being considered.

By 2050, CO₂ emitted from power plants using fossil fuels is offset using offset technology or by CO₂-free LNG

JERA Environmental Target 2030 for its Business in Japan

JERA is actively working to reduce CO₂ emissions. In its domestic operations, JERA will achieve the following by FY2030:

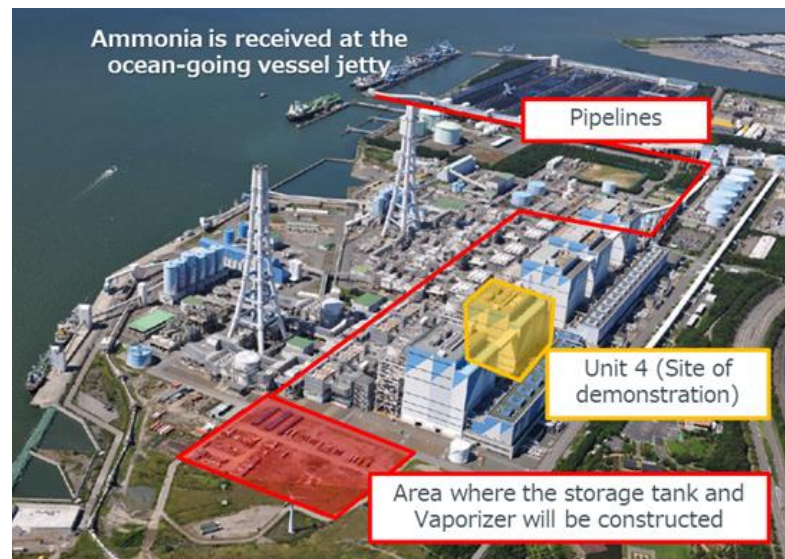
- ☑ Shut down all inefficient (supercritical or less) coal power plants and conduct demonstration tests of mixed combustion with ammonia at high-efficiency (ultra-supercritical) coal power plants.
- ☑ Promote the development of renewable energy centered on offshore wind power projects and work to further improve the efficiency of LNG thermal power generation.
- ☑ Reduce carbon emission intensity of thermal power plants by 20% based on the long-term energy supply-demand outlook for FY 2030 as set by the government.

* JERA Zero CO₂ Emissions 2050 Roadmap for its Business in Japan and JERA Environmental Target 2030 are premised on the continual development of decarbonization technology, economic rationality, and consistency with government policy. JERA is continuing to develop decarbonization technology, and is taking the initiative to ensure economic rationality.

Outline of the demonstration test

Outline of the demonstration project

NEDO "Development of Technologies for Carbon Recycling and Next-Generation Thermal Power Generation / R&D and Demonstration of Technologies for Ammonia Co-Firing Thermal Power Generation"	
Business entity	JERA, IHI
Place	at Hekinan Thermal Power Station Unit 4 (Output: 1,000MW) in Aichi prefecture, Japan
Contents	- Installation of burner/ammonia supply facility - 20% of fuel will be converted to ammonia.
Duration of the demonstration	July 2021 - March 2025 > 20% ammonia generation test in about 2 months until the end of FY 2024 > Small amount of combustion is planned in 2021 at Unit 5 for the burner design.
Amount of ammonia in the demonstration	30,000 to 40,000 tons of Ammonia



NEDO: New Energy and Industrial Technology Development Organization

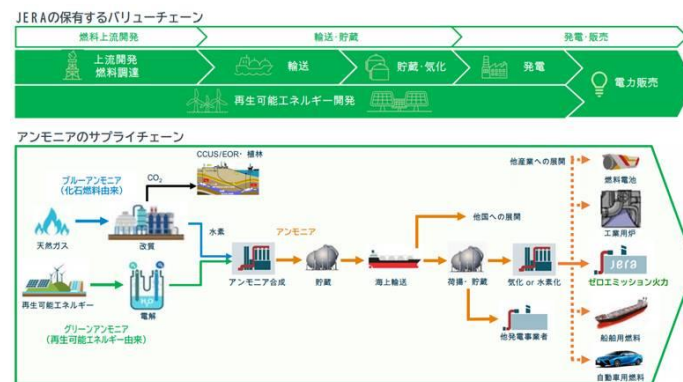
Schedule of the demonstration project

	FY 2021		FY 2022		FY 2023		FY 2024	
	1H	2H	1H	2H	1H	2H	1H	2H
Installation of ammonia co-firing burner	Basic design		Detailed design		Installation			
Construction of ammonia supply equipment	Small amount combustion at Unit 5				Constructin (shortening the period)			
					20% ammonia demonstration (2 months)			

Building an Ammonia Supply Chain

The partnership and cooperation

- A large amount of ammonia is required for power generation and cannot be covered by the existing supply chain, which is mainly built for fertilizer. Therefore, we will try to build and expand a new supply chain for power generation fuels.
- We will cooperate not only with the energy industry but also with major domestic and foreign companies such as experienced companies and large-scale users in the processes of clean ammonia production, transportation, power generation and other uses.



ammonia supply chain

- In July 2021, JERA signed a joint study agreement with ADNOC, INPEX and JOGMEC on exploring the commercial potential of a clean ammonia production in the UAE and transportation to Japan.
- In May 2021, a memorandum of understanding was signed with Yara International, a major nitrogen-based fertilizer company in Norway, for cooperation in the ammonia supply chain. Discussions are underway for cooperation in each supply chain, including the production of blue ammonia at the Pilbara Manufacturing Plant in Australia.
- In February 2021, a Memorandum of Understanding on cooperation in the decarbonization field was concluded with Petronas, the Malaysian National Oil Company.



INPEX



Knowledge grows



PETRONAS

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END

[Disclaimer]

The numbers of energy demand and supply forecast expressed or implied in this presentation are quoted from existing researches or experimentally calculated based on those. Those are NOT JERA's business plan, view, outlook, etc.