CHALLENGE ZERO EMISSIONS

JERA Zero CO_2 Emissions 2050

Zero-Emission Thermal Power

Coal-fired Power Generation × Ammonia

JERA
Energy for a New Era

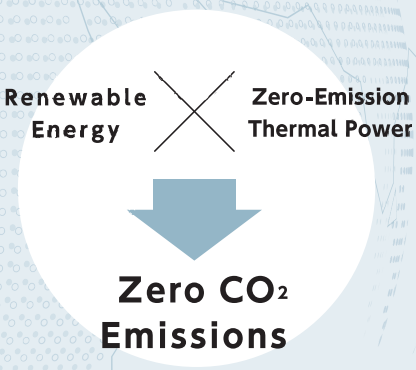
CHALLENGE ZERO EMISSIONS

Net Zero by 2050

The responsibilities and challenges ahead for Japan's largest power company

Currently, thermal power generation using fossil fuels supports more than 70% of Japan's electricity demand and accounts for about 40% of CO_2 emissions in Japan.

As Japan's leading power company, JERA has outlined the "JERA Zero CO_2 Emissions 2050" initiative as part of our commitment to achieving net zero CO_2 emissions from our operations by 2050.

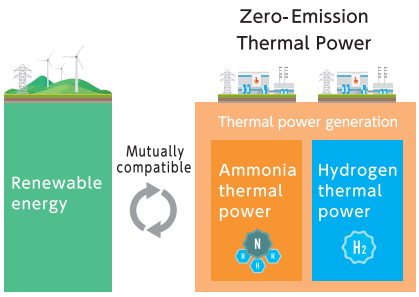


In addition to advancing renewable energy, primarily through offshore wind power, we aim to realize zero-emission thermal power using CO_2-free fuels, ensuring a stable power supply while eliminating CO_2 emissions.

Our zero-emission thermal power approach:

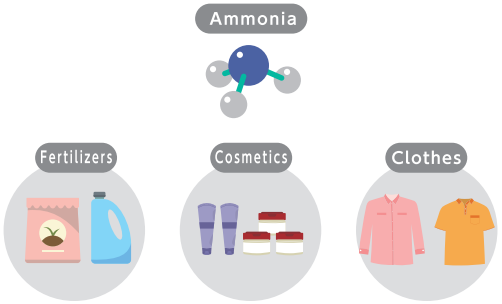
Renewable energy sources such as solar and wind power are crucial. However, they also pose challenges depending on the weather and season, which can cause significant fluctuations in output. Thermal power is unaffected by natural conditions, making it a flexible alternative that can be adjusted to complement fluctuations in renewable energy. However, its use of fossil fuels inevitably results in CO_2 emissions.
Thus, we have turned our attention to hydrogen and ammonia as next-generation energy sources. By substituting fossil fuels for hydrogen and ammonia through zero-emission thermal power, we aim to achieve both stable power supply and decarbonization.

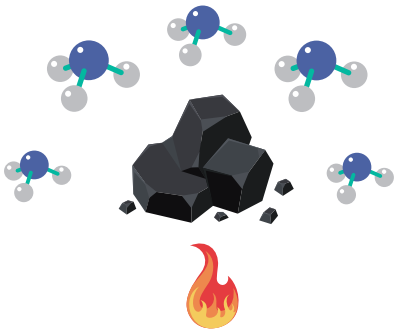
Balancing decarbonization efforts and a stable power supply



Exploring Its usefulness and Potential

What do you think of when you hear the word "ammonia"? Many may think of the sharp, pungent smell from science experiments. Yet, it plays a vital role across multiple industries and holds enormous potential.





Ammonia is a form of hydrogen energy used as a raw material for essential products in our daily lives, such as fertilizers, cosmetics, and clothing. It can also be used as a carrier for storing and transporting hydrogen energy and can be directly used as fuel for power generation.

A robust infrastructure and proven track record of safety

Ammonia continues to be widely used globally for industrial and fertilizer purposes. As a result, a well-established infrastructure leveraging existing manufacturing, transportation, and storage technologies is already in place, with proven safety measures for its handling. That is why we at JERA have turned our attention to ammonia and are working to harness it as a fuel for power generation.

Ammonia storage tanks for denitrification

Ammonia production plants (Courtesy of CF Industries)

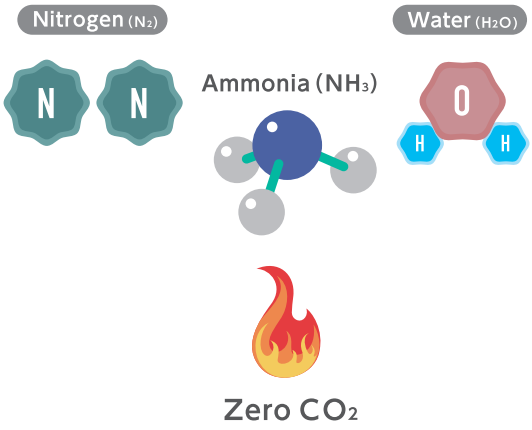
Ammonia Power Generation

Next-Generation Technology for Zero CO_2 Emissions

Ammonia power generation technology holds the key to realizing zero-emission thermal power

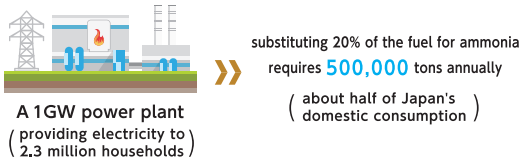
Ammonia, which is composed of hydrogen and nitrogen, produces no CO_2 when burned. Replacing coal with ammonia in existing power plants significantly cuts CO_2 emissions, making this technology highly promising.

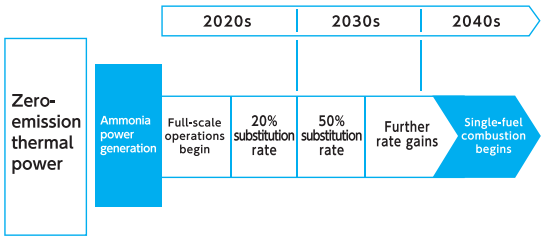
Additionally, once ammonia-receiving facilities are in installed, simply replacing parts of the existing power generation equipment, such as burners, can be a swift and cost-effective way to reduce CO_2 emissions—another significant advantage.



Paving the way for a groundbreaking approach to thermal power generation

Using ammonia as a fuel has its challenges. In a 1GW coal-fired power plant, substituting 20% of the fuel for ammonia would require about 500,000 tons of ammonia annually, equivalent to roughly half of Japan's domestic consumption. JERA aims to substitute 20% of its fuel during the 2020s and more than 50% in the 2030s, requiring an unprecedented supply of ammonia in the near future.



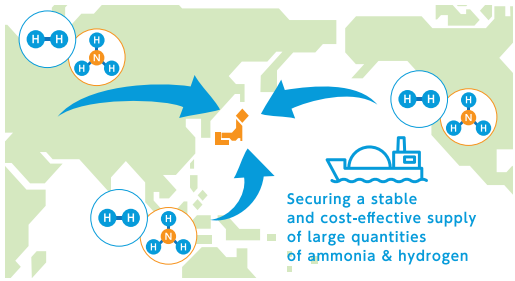


JERA's PROJECT

Building a Robust and Flexible Ammonia Fuel Supply Chain

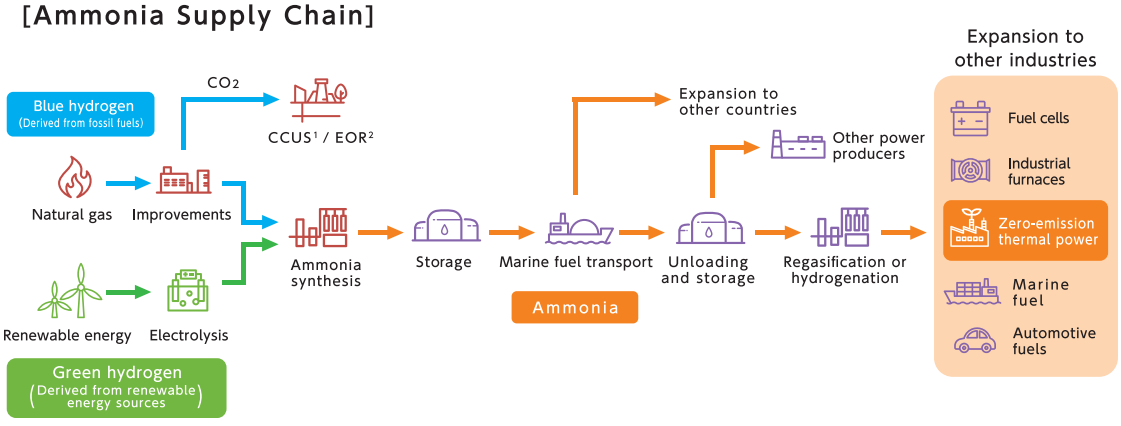
Securing an unprecedented volume of ammonia requires the creation of an entirely new supply chain, apart from the one currently in place for industrial and fertilizer use.

As Japan's largest power company, JERA is engaged across the entire value chain—from upstream fuel development to transportation, storage, power generation, and sales. Leveraging our strengths, we are building a comprehensive supply chain for green fuels such as ammonia, which are free of CO_2 emissions. We are collaborating with major companies across various sectors, even beyond the energy industry, to expand this network.

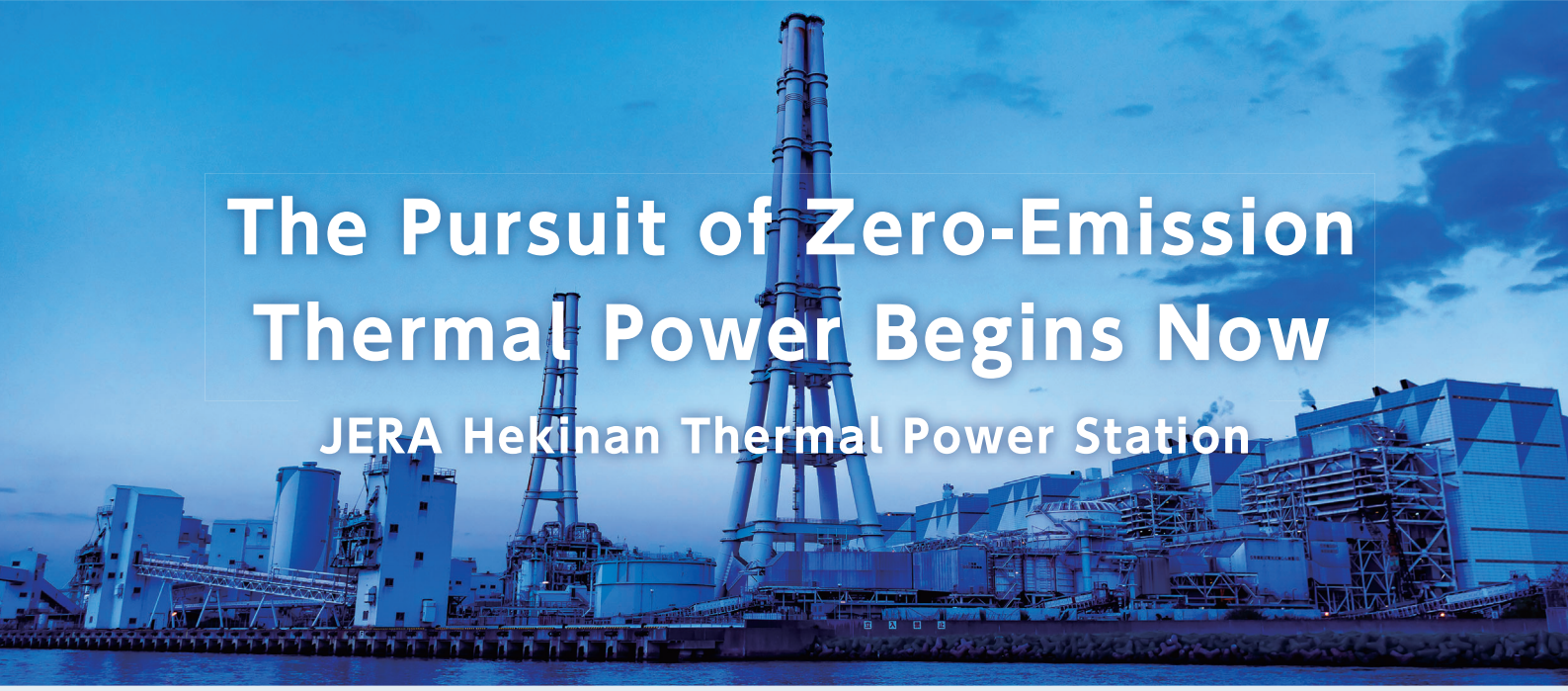


Images of different fuel ammonia carriers

[Ammonia Supply Chain]



1 CCUS: Carbon dioxide capture, utilization, and storage
2 EOR: Enhanced oil recovery



The Pursuit of Zero-Emission Thermal Power Begins Now

JERA Hekinan Thermal Power Station

The ammonia energy revolution starts with JERA

JERA's Hekinan Thermal Power Station in Aichi Prefecture is pioneering the world's first effort to use ammonia as a fuel, marking the first step toward zero-emission thermal power generation.

Hekinan is Japan's largest coal-fired power plant and one of the largest in the world, with a total output of 4.1 million kW, ensuring a stable power supply across multiple regions.

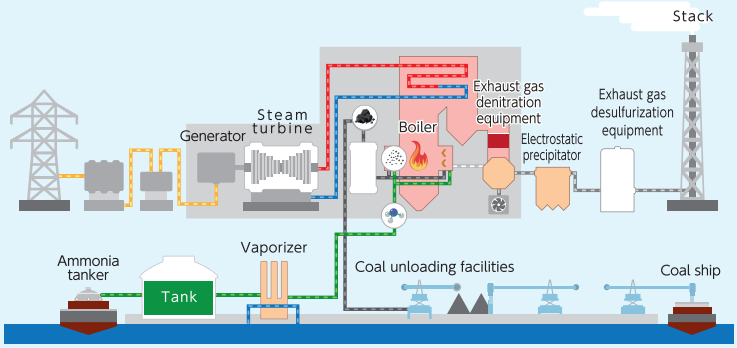
It is here that we have led the world in developing technology to substitute coal for ammonia as a fuel since FY2021.

*Project for Research, Development, and Demonstration of Technologies for Ammonia Co-Firing Thermal Power Generation subsidized by the New Energy and Industrial Technology Development Organization (NEDO)

Newly built ammonia fuel tank for large-scale demonstration testing

Control room

[How Ammonia Power Generation Works in Coal-Fired Plants]



100% Coal

↓

80% Coal + 20% Ammonia
CO_2 emissions reduced by 20%

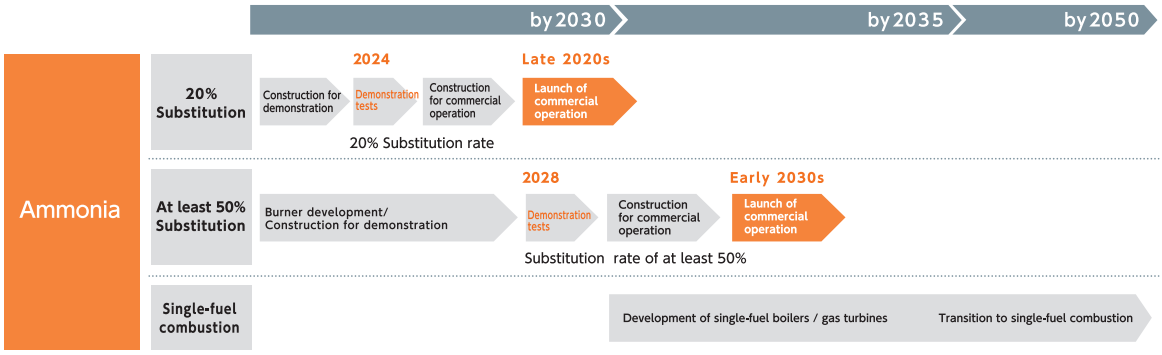
↓

Ammonia 100%
CO_2 emissions reduced by 100%

Charting Steady Progress on Our Roadmap to Net Zero

After installing burners, tanks, and other equipment, we conducted a large-scale test from April to June 2024 on Unit 4, substituting 20% of the fuel for ammonia, with promising results.

We plan to begin commercial operations by the late 2020s following final evaluation. Additionally, we plan to conduct tests on Unit 5 with a substitution rate of over 50% by FY2028, with the goal of commercial operations at this rate by the early 2030s.



Ensuring Safety, Today and Always

While ammonia is classified as a hazardous substance due to its odor and toxicity, Hekinan Thermal Power Station, along with all of JERA's other thermal power plants, has managed ammonia both safely and effectively for exhaust gas treatment over many years.

We have implemented safety measures for equipment, including earthquake-resistant designs and systems to neutralize ammonia, ensuring a high level of safety. Going forward, we will implement even more stringent safety measures in compliance with regulations and standards.

Sprinkler system for the ammonia fuel tank (highlighted in yellow)

[Sprinkler System]

In addition to earthquake-resistant designs, we have installed decontamination equipment, such as sprinklers, to neutralize ammonia.

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