JERA Report

Is Japan's top CO_2 emitter really aiming for zero emissions?

Kiko Network
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Contents

Introduction

With carbon dioxide concentrations rising to levels unprecedented in human history and average temperatures rising at a pace we have never before experienced, avoiding dangerous climate change requires dramatic reductions in greenhouse gas emissions over the coming years. Considering the current carbon budget, Japan should reduce emissions by 60% from 2010 levels by 2030 and to zero by 2050, but Japan's current reduction target of 46% by 2030 and its energy policies—dependent on thermal power generation—are seriously misaligned with the 1.5°C target.

Japan's energy policies are still unable to break the country's dependence on fossil fuels because the legacy power companies are being protected. In particular, the actions of JERA Co., Inc., Japan's largest energy company and largest CO_2 emitter, have had a major influence on Japanese policies. In October 2020, JERA announced the policy "Zero Emissions 2050." Since then, it has declared itself as "leading Japan's decarbonized society," but a variety of Japanese energy policies to realize a "decarbonized society" were subsequently put in place that actually benefit JERA. Examples of this include policies that promote excessive investment in hydrogen and ammonia as contained in the government's Strategic Energy Plan, a variety of legislative amendments, and the Green Transformation (GX) Basic Policy. In fact, the government's current energy policies bolster the direction JERA has taken, together with generous assistance from national finances. This report reveals that JERA continues to emit a massive amount of CO_2 despite its commitment to "Zero Emissions," and shines a light on the government's generous support for JERA despite it being a such a huge emitter.

Key takeaways from this report:

1. JERA was established by a merger of the thermal power generation divisions of Tokyo Electric Power Company (TEPCO) and Chubu Electric Power Company. It is the largest energy company and largest CO_2 emitter in Japan.
2. Despite having declared a message of "Zero Emissions 2050 " for its domestic operations, JERA has been working to build new coal- and LNG-fired power plants since 2020 and is attempting to keep its existing thermal power plants operating. A pillar of JERA's "Zero Emissions" concept is ammonia co-firing with coal, which is entirely inconsistent with the 1.5°C target.
3. JERA's policies have had a profound impact on Japan's energy policy, and a series of generous government policies and financial measures have been rolled out to support JERA's business.
4. JERA has been running advertising campaigns proclaiming it can create "CO2-free fire." These ads mislead people to think that ammonia fuel does not emit CO_2 and give the impression that JERA is seriously addressing global climate change, but this is all greenwashing.
5. JERA is involved in a wide range of energy-related projects around the world, from resource

development to power generation projects. JERA presents LNG, renewable energy, hydrogen and ammonia as pillars of its future business development, and in particular, is actively expanding its procurement of LNG, hydrogen, and ammonia.

1. What is JERA?

Established in April 2015, JERA is Japan's largest power producer, as a fifty-fifty joint venture by TEPCO and Chubu Electric Power. JERA publicly claims that it was established with the aim of creating an energy company that competes globally, by integrating the entire value chain—from upstream fuel procurement to power generation and sales of electricity and gas.

However, this is not exactly a company founded solely upon the most noble of ideals. The massive Tohoku earthquake and tsunami in 2011 had triggered an accident at TEPCO's Fukushima Daiichi nuclear power plant, and the government rescued TEPCO from the verge of bankruptcy. In 2012, the Japanese government invested a total of 1 trillion yen through the Nuclear Damage Compensation and Decommissioning Facilitation Corporation (NDF), effectively nationalizing TEPCO by holding more than 50% of its shares. Following discussions at the TEPCO Reform and 1F (Fukushima Daiichi Nuclear Power Station) Issues Committee established by the Ministry of Economy, Trade and Industry (METI) in 2016, the company made its thermal power generation division a subsidiary of TEPCO Fuel & Power that same year, and concluded a joint venture agreement with Chubu Electric Power in 2017 for the integration of their existing thermal power generation operations. In effect, the huge cost burden of decommissioning reactors from the Fukushima nuclear plant accident was isolated so that it would not affect the thermal power generation division, and the burden would not extend to JERA[1]. As mentioned in the "TEPCO Reform Recommendations" compiled in December 2016[2], JERA played the role of "fulfilling its responsibility to Fukushima in a stable and long-term manner by aiming to expand into the growing global energy market."

However, with the adoption of the Paris Agreement in 2015 and its entry into force in 2016, this was a time when momentum was building in the international community to move rapidly away from fossil fuels. The very fact that in 2017—just as the U.K., Canada, and other countries were hammering out plans to phase out coal-fired power generation—officials in Japan were integrating TEPCO's thermal power generation business with the thermal power division of another company (Chubu Electric Power) and aiming for growth in the international community is a testament to the

1 "TEPCO reforms and responsibility for the Fukushima nuclear power plant accident: Discussions that led to recommendations for reform and a review of what happened next" https://dlisv03.media.osaka-cu.ac.jp/contents/osakacu/kiyo/04515986-72-1-33.pdf

2 TEPCO reform proposal (in Japanese) https://www.scj.go.jp/ja/member/iinkai/genshiriyou/pdf23/hatsuden-siryo5-6-3.pdf

serious lack of recognition of the climate crisis by those involved in promoting TEPCO's reforms.

In contrast to the global trend toward phasing out coal, Japan was giving coal-fired power generation a key place as an important base-load power source in the 2017 revision of the country's Strategic Energy Plan by promoting high-efficiency coal-fired power generation. Against the backdrop of this national policy, Chubu Electric Power proceeded with plans to build a new large-scale coal-fired power plants in Taketoyo Town (Aichi Prefecture), and TEPCO one in Yokosuka City (Kanagawa Prefecture). Although it was pointed out that these plants would eventually become stranded assets[3], rather than having their plans halted, they were gradually integrated into JERA from the planning stage.

Currently, JERA has a joint-CEO structure with Yukio Kani (formerly of TEPCO Holdings) as Global CEO and Chairman, and Hisahide Okuda (formerly of Chubu Electric Power) as CEO and COO. Although the company has declared its intention to become a listed stock since it was first established, it remains unlisted.

2. Thermal power plants owned by JERA

LNG accounts for the largest share of the fuel mix powering JERA's thermal power plants, at about 70% of generating capacity and 80% of electricity generated, both about 20 to 30 percentage points above the national average. Oil-fired power plants still account for about 14% of JERA's installed capacity, but data shows that they are hardly being used at all (Figure 1).

(1) Coal-fired power plants

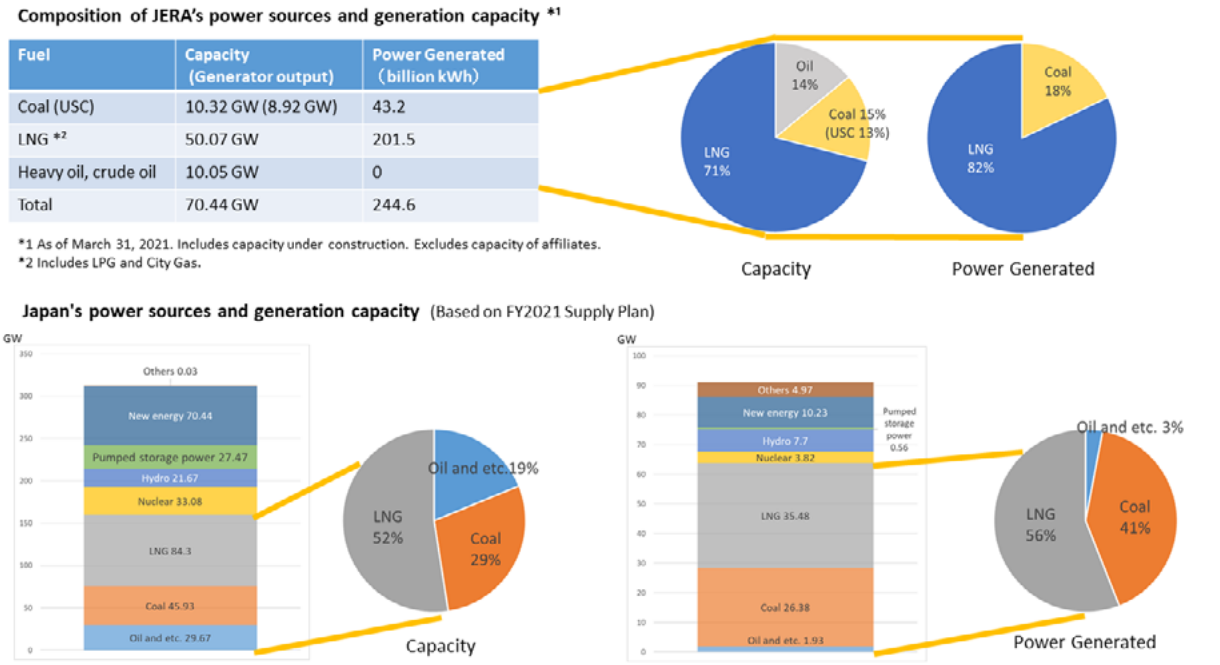
JERA has 12 coal-fired power plants (excluding jointly operated thermal power plants) in five locations (Hirono, Hitachinaka, Yokosuka, Hekinan, Taketoyo), with a total installed capacity of 9.67 gigawatts (GW), the largest in Japan (Figure 2). All of these are large-scale coal-fired power plants, with a capacity of 600 megawatts (MW) to 1 GW per generating unit. Many of them are relatively new power plants, with none having been operating for 40 years. In terms of power generation, Hekinan Power Station Units 1 and 2 use supercritical pressure (SC) technology, which is classified as inefficient coal-fired power generation, while all other units use ultra supercritical pressure (USC) technology. Those among them that have received Feed-In Tariff (FIT) certification for biomass co-firing include Hekinan Thermal Power Station (2017), Hitachinaka (2015), and Taketoyo (2017). Also, biomass co-firing was considered in the environmental impact assessment (EIA) process for the

3 For example, this was pointed out in "Stranded Assets and Thermal Coal in Japan: An analysis of environment-related risk exposure" https://www.smithschool.ox.ac.uk/sites/default/files/2022-04/satc-japan.pdf

Yokosuka Thermal Power Station.

In addition, JERA reported that on April 1, 2024, it started a demonstration test of ammonia co-firing in Unit 4 of the Hekinan Thermal Power Station, with a co-firing rate of 20% (by calorific value)[4]. In addition, JERA has announced that it will conduct high-ratio co-firing tests with a co-firing mix of 50% or more in Hekinan Unit 5 by FY2028. For ammonia co-firing, some voices were calling for mandatory EIAs when facilities for co-firing with ammonia are being installed, because they could generate large amounts of nitrogen compounds (NOx), but they are still not being implemented.

Figure 1. JERA's installed capacity and electricity generation mix (domestic)

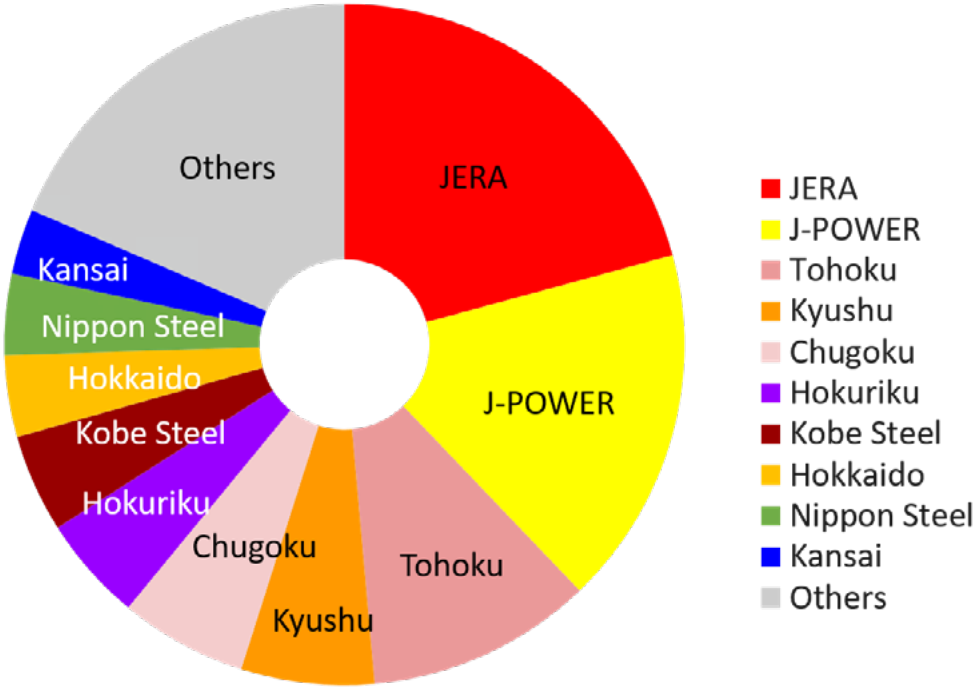


Source: JERA "JERA's Decarbonization Initiatives"[5]

4 Start of Demonstration Testing of Fuel Ammonia Substitution at JERA's Hekinan Thermal Power Station: The World's First Demonstration Testing of 20% Ammonia Substitution at a Large-Scale Commercial Coal-Fired Thermal Power Plant https://www.jera.co.jp/en/news/information/20240401_1863

5 Document 5 of first joint meeting of the Sub-Committee on Hydrogen Policy (Committee on Conservation and New Energy) and Sub-Committee on Ammonia and Other Decarbonized Fuel Policies (Committee on Resources/Fuels), under the Advisory Committee for Natural Resources and Energy

Figure 2. Japan's top 10 coal-fired power generation companies



Source: Japan Beyond Coal

Table 1. List of JERA's coal-fired power plants in Japan

Plant name	Location	Unit no.	Capacity (MW)	Technology	Operation start	Status
Hirono Thermal Power Station	Hirono-machi, Fukushima Prefecture	5	600	USC	Jul 2004	Operating
		6	600	USC	Dec 2018	Operating
Hitachinaka Thermal Power Station	Tokai-mura, Ibaraki Prefecture	1	1000	USC	Dec 2003	Operating
		2	1000	USC	Dec 2013	Operating
Hitachinaka Joint Thermal Power Station	Tokai-mura, Ibaraki Prefecture	1	650	USC	Jan 2021	Operating
Yokosuka Thermal Power Station	Yokosuka, Kanagawa Prefecture	New 1	650	USC	Jun 2023	Operating
		New 2	650	USC	Dec 2023	Operating
Hekinan Thermal Power Station	Hekinan-shi, Aichi Prefecture	1	700	SC	Oct 1991	Operating Decommission in 2030?)
		2	700	SC	Jun 1992	Operating Decommission in 2030?)
		3	700	USC	Apr 1993	Operating
		4	1000	USC	Nov 2001	Operating * Ammonia co-firing
		5	1990	USC	Nov 2002	Operating
Taketoyo Thermal Power Station	Taketoyo-cho, Aichi Prefecture	5	1070	USC	Aug 2022	Operating
Total			11,310			

Source: Prepared by Kiko Network.

In addition, there are six units at three coal-fired thermal power plants jointly operated by JERA, which were carried over from TEPCO group companies. Of these, the Shinchi Power Station and Nakoso Power Station in Fukushima Prefecture are SC and aging thermal power plants.

Table 2. List of coal-fired power plants in Japan operated by JERA subsidiaries

Plant name	Location	Unit no.	Capacity (MW)	Technology	Operation start	Status
Shinchi Thermal Power Station (Soma Kyodo Power Company)	Shinchi-machi, Fukushima Prefecture	1	1000	SC	Jul 1994	Operating
		2	1000	SC	Jul 1995	Operating
Nakoso Thermal Power Station (Joban Kyodo Power Company)	Iwaki-shi, Fukushima Prefecture	7	250	Sub-C	October 1970	Operating
		8	600	SC	September 1983	Operating
		9	600	SC	Dec 1983	Operating
Total			3,450			

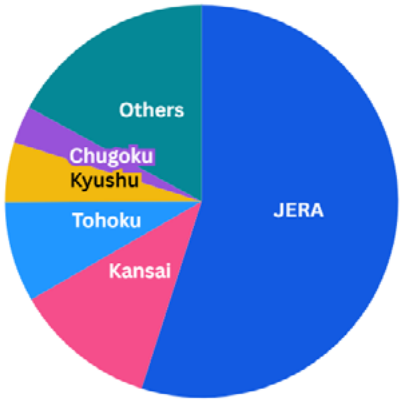
Source: Prepared by Kiko Network.

(2) LNG-fired power plants

JERA's LNG-fired power plants are in 16 locations: Chiba, Anegasaki (2), Sodegaura, Futtsu, Kawasaki, Higashiogishima, Minami Yokohama, Yokohama, Joetsu, Shin-Nagoya, Nishi-Nagoya Chita, Chita Daini, Kawagoe and Yokkaichi. Their total capacity is 42.484 GW (see Appendix Table 1). As in the case of coal-fired plants, these are some of the nation's largest-scale plants, with JERA owning more than half of Japan's total domestic gas-fired installed capacity.

Figure 3.

Top five gas-fired power generation companies

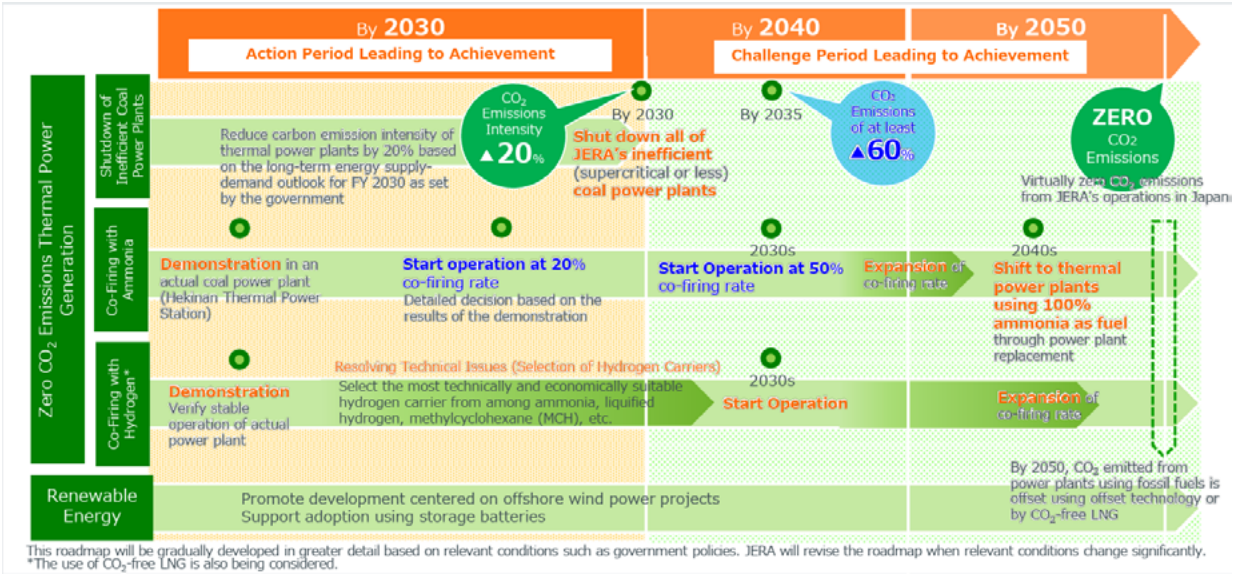


Source: Prepared by Kiko Network.

3. JERA's reduction targets

On October 13, 2020, JERA issued a press release titled "Toward Zero CO2 Emissions in 2050," in which it presented a roadmap for "Zero CO2 Emissions 2050" (Figure 4) for their domestic business, and set new environmental targets for 2030. To achieve zero emissions, JERA said that it would use renewable energy and "zero-emission thermal power," and that the introduction of renewable energy will be supported by thermal power generation that can generate electricity regardless of natural conditions. Regarding thermal power generation, the company said it will "promote the introduction of green fuels and pursue zero-emission thermal power that does not emit CO_2 during power generation."

Figure 4. Updated roadmap for JERA's Zero Emissions 2050



Source: JERA Zero Emissions 2050 (revised May 2022)

(1) Targets and roadmaps for 2030/2035/2050

The targets for 2030 and 2035 as indicated in the Roadmap are as follows.

JERA Environmental Targets 2030

- JERA will actively work to reduce CO_2 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 Environmental Targets 2035

- JERA aims to reduce CO_2 emissions from domestic operations by at least 60% (relative to FY2013) by FY2035 through the following:
- Given the expanded adoption of renewable energy based on the national government's 2050 carbon neutral policy, JERA will strive to develop and adopt renewable energy in Japan.
- JERA will work to reduce carbon emission intensity from thermal power generation by promoting hydrogen and ammonia co-firing.

By 2050, JERA aims to achieve net zero CO_2 emissions from its own operations and has stated that it aims to have (1) 100% firing with ammonia, (2) co-firing of gas-fired power plants with hydrogen, and (3) the use of approaches such as offset technology and "CO_2-free LNG" to address CO_2 emissions from power plants that cannot operate without co-firing by 2050. The plan is essentially to continue operating the existing thermal power plants that it currently owns, to proclaim a commitment to hydrogen and ammonia fuels even though they are still unproven technologies, and to use offsets for emissions that it cannot reduce. This plan is fraught with technological and economic hurdles, making it extremely difficult to achieve.

(2) Alignment with Paris Agreement 1.5°C target

(a) Closing/decommissioning all inefficient coal power plants

JERA plans to shut down all inefficient (supercritical or below) coal power plants and conduct demonstration tests of mixed combustion with ammonia at high-efficiency (ultra-supercritical) coal power plants. If "all inefficient units" refers to coal-fired power plants with "supercritical or below" technology, JERA only has two such units (Units 1 and 2 at Hekinan Thermal Power Station), while all of its other units use ultra-supercritical technology. Even if Hekinan Units 1 and 2 are shut down, JERA will still have 8.27 GW of ultra-supercritical coal-fired thermal power plants in 2030.

The Shinchi Thermal Power Station and Nakoso Thermal Power Station—owned by JERA's subsidiaries Soma Kyodo Power Company and Joban Kyodo Power Company—are also inefficient power stations, but the fact that they are jointly owned by JERA is not explicitly mentioned in these communications.

(b) Construction and operation of new coal-fired power plants

JERA made those commitments in October 2020, and later started commercial operation of Taketoyo Thermal Power Station in August 2022, then Unit 1 at the Yokosuka power plant in June 2023, and Unit 2 in December 2023. Despite repeated statements from the United Nations against starting new coal power plants after 2020, JERA started a total of 2.37 GW of new coal power generation, actions that will undoubtedly accelerate climate change.

At the COP 28 summit in 2023, Prime Minister Fumio Kishida declared at the high-level segment on December 1 that "Japan will end new construction of domestic unabated coal power plants." Yokosuka Thermal Power Station Unit 2, however, is exactly that—new construction of a domestic unabated coal power plant—but JERA put it into operation at the end of 2023, evidently to slip it in at the last moment. The original plan was to start Unit 2 in February 2024, but at a routine press conference on November 29, 2023, just prior to COP28, JERA's Hisahide Okuda (President, CEO and COO) stated that he had moved the schedule forward "to be in time for the winter peak." It

was a mild winter that year, and there were no projected power shortages or appeals to the public to save electricity even at peak times.

In contrast, Taketoyo Thermal Power Station was halted after an explosion at a temporary storage facility for wood biomass fuel on January 31, 2024, but JERA declared that despite the shutdown, there was no problem supplying stable electricity. The reasons given by the company to construct new coal power plants included stable supply and a shortage of electricity, but comments made after the accident revealed that there was in fact surplus capacity.

(c) Expansion of LNG-fired power plants

As for LNG-fired thermal power, old plants are being decommissioned and new ones are being built. Since 2020, Units 1 to 4 of the Anegasaki Thermal Power Station (600 MW x 4 units) were decommissioned (December 7, 2021), while Units 5 and 6 of the Yokohama Thermal Power Station (525 MW total), and Units 1 to 4 of the Chita Thermal Power Station (1.3 GW) were decommissioned on March 31, 2022, all totaling 4.225 GW. Meanwhile, as shown in Table 3 below, plans are underway to build a total of about 4.94 GW of capacity in seven new gas-fired generating units at three power plants (Goi, Anegasaki, and Chita), and Units 1 and 2 (each at 650 MW) at Anegasaki Thermal Power Station have already started commercial operation in 2023.

Shutting down old thermal power plants that have become unprofitable and constructing new high-efficiency thermal power plants is simply an exercise in management efficiency, not an actual effort to reduce emissions. The construction of new large gas-fired power plants will lock in future CO_2 emissions over the long term, is misaligned with the G7 commitment to “achieve a fully or predominantly decarbonized power sector by 2035,” and will make it difficult to achieve zero emissions by 2050. The development of new power sources should be limited to renewable energy.
As for Chita Thermal Power Station Units 7 and 8, bids were won for 589,836 kW each in the first round of decarbonized power auctions (described below), and they are guaranteed to be operating for at least 20 years from the start of operation.

Table 3. Planned new natural gas power plants

Plant name	Location	Unit no.	Capacity (MW)	Technology	Operation start	Efficiency
Goi Thermal Power Station	Ichihara-shi, Chiba Pref.	New 1	Approx. 780	MACC Ⅱ	Aug 2024	Approx. 64%
		New 2	Approx. 780	MACC Ⅱ	Oct 2024	Approx. 64%
		New 3	Approx. 780	MACC Ⅱ	Mar 2025	Approx. 64%
Chita Thermal Power Station[6]	Chita-shi, Aichi Pref.	7	Approx. 650	GTOC	Aug 2027	Approx. 63%
		8	Approx. 650	GTOC	Dec 2027	Approx. 63%
Anegasaki Thermal Power Station	Ichihara-shi, Chiba Pref.	New 1	Approx. 650	GTOC	Feb 2023	Approx. 63%
		New 2	Approx. 650	GTOC	Apr 2023	Approx. 63%

Source: Compiled by Kiko Network.

(d) Emission intensity target “20% reduction”

JERA has declared its target for 2030 as being to 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. This wording is difficult to understand because it does not specifically indicate the emission factor, but to unravel this, the government’s FY2030 target for the emission intensity of thermal power generation is 0.6 kg-CO_2/kWh[7], so 20% less would be 0.48 kg-CO_2/kWh. As mentioned above, JERA has a high proportion of gas-fired power in its thermal power generation mix. Its current emission factor is 0.489 kg-CO_2/kWh[8], which is nearly 20% lower than the government’s energy intensity target for 2030. A target of 0.48 kg-CO_2/kWh would mean a reduction of only 0.009 kg/kWh by 2030. This figure could easily be achieved by increasing the capacity of LNG power plants and operating them. (However, if they don’t construct new LNG-fired power generation, their coal-fired plants such as Yokosuka and Taketoyo will push their emission intensity upward, so new LNG plant construction would be essential to keep the emission intensity down.)

The emission factor for electricity in 2030 under the IEA net zero scenario is 0.138 kg-CO_2/kWh. There is a big gap between that value and JERA’s target. Meanwhile, the 2030 emission intensity target for the electric power industry falls short of 0.25 kg-CO_2/kWh[9].

(e) Ammonia co-firing and 100% firing

One of the pillars of JERA’s zero emissions thinking is co-firing ammonia with coal, at mix

6 Ministry of Economy, Trade and Industry (METI) “Assessment Report on Environmental Impact Assessment of the Construction Plan of Units 7 and 8 of JERA Chita Thermal Power Station” https://www.meti.go.jp/policy/safety_security/industrial_safety/sangyo/electric/files/chita/hohosyo_shinsasyo.pdf

7 Based on “Average thermal power emission factor in FY2030: 0.60 kgCO_2/kWh (from Projections of energy supply and demand in FY2030)” as published in an appendix to the Global Warming Countermeasures Plan (October 22, 2021). However, according to Kiko Network’s calculations, the average thermal power emission factor is 0.56 kgCO_2/kWh based on the “Outlook for energy supply and demand in FY2030.” In that case, a 20% decrease would be 0.448 kgCO_2/kWh.

8 From JERA website E Environmental Data https://www.jera.co.jp/en/sustainability/data/e

9 Electricity Business Council for a Low Carbon Society “Review of Carbon Neutral Action Plan” https://e-lcs.jp/news/detail/000275.html

ratios of up to 100% ammonia. Using a slogan about creating "CO_2-free fire" the company proclaims that it is taking on the challenge of achieving zero emissions. Practical operations are expected to begin by 2030, and the goal is to achieve a 20% ammonia co-firing mix for all of its coal-fired thermal power plants in the first half of the 2030s. However, the ammonia being produced at present is referred to as "gray ammonia" (made from fossil fuels). When natural gas is used as the feedstock, the overall CO_2 emission reductions are estimated at only 1% to 4% relative to conventional coal-fired power generation at a 20% co-firing mix.[10] In addition, even if "blue ammonia" (made from so-called low-carbon hydrogen) is used, CO_2 is still emitted during LNG extraction and the production of ammonia by the Haber-Bosch process, so major emission reductions overall are not to be expected.

Indeed, JERA has no prospect of being able to achieve 20% co-firing by 2030 in the coal-fired power plants it owns. If JERA's 8.47 GW of coal-fired power plants (USC) are to be co-fired with a 20% mix, 4.235 million tons of ammonia will be required annually.[11] However, JERA says that it aims to procure only 2 million tons of ammonia by 2030, less than half of the required amount.

In addition, there are various other problems with ammonia beyond the issue of CO_2. The first is development costs. The technology is still at the demonstration stage and involves costs from the development to the commercialization stage. These costs would need to be covered through governmental or other policy supports, which means the burden would be loaded onto the public. Second, the cost of ammonia as a fuel would also be higher than that of fossil fuels, because it is produced from fossil fuels. Even if ammonia-fired power generation can actually be achieved, the costs of the fuel will be passed on to electricity users, which means a jump in electricity costs. Third, there are issues with the very nature of ammonia. Because of its high toxicity, prolonged inhalation of leaked ammonia to the human body could cause inflammation of the mucous membranes of the eyes, bronchial tubes, and lungs. Fourth, there are concerns about air pollution caused by nitrogen oxides generated from combustion. If the use of ammonia is to increase, a thorough environmental impact assessment should be conducted.

JERA signaled plans to start construction in July 2024 for a large-scale shift to commercial operations using ammonia (20%, by calorific value) on-site at the Hekinan Thermal Power Station. It was reported that storage would be increased from the existing 1,300-ton tank to four tanks totaling 40,000 tons. Despite the increasing likelihood of a massive earthquake occurring in the Nankai Trough, there are no signs (based on minutes of environmental and municipal councils) that JERA has communicated with residents about the risks. JERA's Taketoyo Thermal Power Station, which

10 Kiko Network "Hydrogen and ammonia co-firing in the power sector: Japan is choosing to expand fossil-fuel extraction and perpetuate coal and LNG" https://kikonet.org/en/content/31125

11 METI estimates that if ammonia is co-fired at a 20% mix in coal-fired power generation, approximately 500,000 tons of ammonia will be required per unit (1 GW), and if ammonia is co-fired at a 20% mix in all coal-fired power generation plants of major power companies in Japan, approximately 2 million tons will be required per year, which is equivalent to the current global trade volume. https://www.enecho.meti.go.jp/about/whitepaper/2021/html/3-8-4.html

uses co-firing with biomass, suffered three fire-related accidents in its first year, and operations are currently suspended. There have been many problems with JERA's handling of the incidents, including inadequate information disclosure and communications with residents. Since the Hekinan Thermal Power Station uses highly toxic ammonia, there are concerns about the risk of mass casualties in the event of an accident at the plant. It is crucial to provide adequate prior information.

In the first round of decarbonized power auctions, JERA won bids for power to be supplied from Hekinan Units 4 and 5 ammonia co-firing facilities.

(f) 60% reduction in 2035 from 2013

JERA has set a target of reducing emissions by 60% from FY2013 levels by 2035. Since the year 2013 was before JERA was established, no concrete numbers for the base year have been provided. A 60% reduction would hypothetically be 67.49 million tons, because the combined total CO_2 emissions from power generation by TEPCO and Chubu Electric Power in FY2013 would have been 168.73 million tons. JERA's total CO_2 emissions in FY2019 came to 124.02 million tons, but no concrete figures have been disclosed on how it could reduce emissions by about 55 million tons while keeping existing thermal power plants running.

In any case, while other developed countries are aiming to decarbonize their power sources by 2035 in order to align with the Paris Agreement 1.5°C target, it should be noted that a 60% reduction by Japan's largest power producer is an unambitious and low target.

As described above, JERA's reduction target is entirely inconsistent with the 1.5°C goal. In fact, the company's approach could even exacerbate social costs and the public burden by expanding coal- and gas-fired power generation at this late stage. At the same time, it increases the risks of climate change and environmental damage while relying on national funds to promote options like ammonia co-firing—an approach with poor cost-effectiveness.

4. Japanese energy policy and JERA

Japan's current energy policy states that it will introduce renewable energy to the greatest extent possible, but in fact, it is more as if the brakes are being applied. Meanwhile, policies for maintaining and preserving nuclear power plants and coal, policies in conflict with climate action, have been set in the Strategic Energy Plan and the Basic Policy on Green Transformation (GX). In particular, the policies promoting ammonia co-firing, despite it being rife with problems, are 100% in support of JERA's direction, and various measures that effectively provide subsidies are being applied to keep existing thermal power plants running. JERA seems to have had a significant direct and indirect influence on the government's policy-making processes. The connections are clarified

below.

(1) 2050 carbon neutral declaration

On October 26, 2020, then-Prime Minister Yoshihide Suga declared in his policy speech to parliament that Japan would aim to achieve net zero by 2050.[12] This was about two weeks after JERA had come out with "Zero Emissions 2050" (October 13, 2020).[13] The Japanese government had finally changed course toward net zero, from its previous target of an 80% reduction by 2050. In his speech, Prime Minister Suga stated that the "key here is revolutionary innovations, such as next-generation solar cells and carbon recycling," and declared, "we will accelerate research and development aimed at realizing utilization of such technologies in society." Immediately after this, a framework was rapidly put in place to promote ammonia as a fuel.

(2) Public-Private Council report, government framework for promoting ammonia

On October 27, 2020, the day after the prime minister's declaration that Japan would aim to realize a carbon-neutral, decarbonized society, the Public-Private Council for Fuel Ammonia Introduction was established within the Agency for Natural Resources and Energy. The purpose of this council was stated as follows: "Ammonia, which does not emit CO_2 during combustion, is considered to be effective for co-firing in coal-fired power plants, in order to achieve carbon neutrality in Japan. Demonstration testing using actual equipment is also planned to start next year. Going forward, we will establish a Public-Private Council for Fuel Ammonia Introduction in order to share technical and economic issues and timelines for resolving these issues among the public and private sectors to respond to the introduction and expansion of the use of ammonia for fuel applications, and to promote joint efforts.[14]" The words "demonstration testing using actual equipment" here refer to JERA's Hekinan power plant Unit 4, and the Prime Minister's declaration the previous day could be seen as one of a series of moves, with the Council being established to prepare a framework to support JERA's ammonia co-firing for power generation.

Besides JERA, members of the Council would come to include equipment and plant makers IHI Corporation, JGC Holdings Corporation (previously known as Japan Gasoline Company), and Mitsubishi Heavy Industries, as well as trading companies such as Marubeni Corporation and Mitsubishi Corporation. In practice, the Council was closed to the public: (1) no public attendance was allowed, (2) the secretariat was given the discretion to decide which documents to withhold or

12 Policy Speech by Prime Minister Suga to 203rd Session of Diet https://www.kantei.go.jp/jp/99_suga/statement/2020/1026shoshinhyomei.html

13 Towards Zero CO2 Emissions in 2050 https://www.jera.co.jp/en/news/information/20201013_539

14 Guidelines for establishing the Public-Private Council for the Introduction of Fuel Ammonia https://www.meti.go.jp/shingikai/energy_environment/nenryo_anmonia/PDF/001_02_00.pdf

release to the public, and (3) no details were provided to the public, only general information.

The Council issued an interim report on February 8, 2021[15]. The report covered various measures intended to create a favorable environment for ammonia, including legislative measures enabling the use of fuel ammonia, regulatory design to control supply-side CO_2 emissions, formulation of international standards and guidelines for the use of fuel ammonia, financial support, enhanced resource diplomacy and international cooperation, and the establishment of the Green Innovation Fund initiative. In 2022, as mentioned in the interim report, the government made amendments to the Act on Rationalizing Energy Use, the Act on the Promotion of Use of Nonfossil Energy Sources and Effective Use of Fossil Energy Materials by Energy Suppliers, and the JOGMEC Act, and it was decided that projects would be implemented using the Green Innovation Fund.

In addition, in the Growth Strategy Through Achieving Carbon Neutrality in 2050 (June 18, 2021) and the Sixth Strategic Energy Plan (October 22, 2021)[16], the utilization of hydrogen and ammonia fuels in the electric power sector ended up being pillars of the government's approach to achieving a decarbonized society. The Strategic Energy Plan included hydrogen and ammonia for the first time in the 2030 target, with a 1% share of the electricity mix.

(3) Green Transformation (GX)

While following the Suga administration's approach to carbon neutrality, the Kishida administration started to consider the Green Transformation (GX) that was being promoted by the GX League, which itself had been created by METI together with the business community. In August 2022, the GX Implementation Council was established directly under the Prime Minister's Office[17], consisting of 13 members including Satoru Katsuno, chairman and representative director of Chubu Electric Power, one of JERA's parent companies. At all 5 meetings of GX Implementation Council held by December 2022, Katsuno presented materials on topics that included the need to secure a stable power supply, the image of [energy] transition and zero emissions from thermal power, GX Economic Transition Bonds and growth-oriented carbon pricing and financial resources, and the role of nuclear power, etc. The GX Basic Policy (Draft) compiled in December was formulated in line with these proposals. With regard to hydrogen and ammonia strategy, as a high-priority policy relating to GX, the draft policy stated "Domestic targets for hydrogen/ammonia introduction: 3 million tons (ammonia equivalent) each by 2030, 20 million tons hydrogen and 30 million tons ammonia (ammonia equivalent) by 2050 ."

15 Interim Report of the Public-Private Council on the Introduction of Fuel Ammonia: https://www.meti.go.jp/shingikai/energy_environment/nenryo_anmonia/20200208_report.html

16 Sixth Strategic Energy Plan https://www.enecho.meti.go.jp/category/others/basic_plan/pdf/strategic_energy_plan.pdf

17 GX Implementation Council https://japan.kantei.go.jp/101_kishida/actions/202405/13gx.html

5. The flow of financial support to JERA

To support the hydrogen and ammonia-related projects led by JERA and the continued operation of existing thermal power plants, various institutional frameworks were put in place, along with a generous financial support system to channel substantial funds to JERA. The main forms of support were as described below.

(1) Hydrogen and ammonia

(a) NEDO R&D funds

In FY2021, the New Energy and Industrial Technology Development Organization (NEDO) had a budget for "Technology development for carbon recycling and next-generation thermal power generation / R&D and demonstrations on technologies for ammonia co-firing thermal power generation[18]." The project was to "carry out necessary construction on Hekinan Thermal Power Station Unit 4 (1 GW) and switch to a 20% ammonia fuel mix (calorific value)." The demonstration project will run for approximately four years from June 2021 to March 2025 . The period for generating power using an actual system with a 20% ammonia mix was expected to last about two months, concluding by the end of FY2024. To design the burners, preliminary combustion tests have been underway in Unit 5 since October 2021.

(b) Green Innovation Fund

The Green Innovation Fund was established at NEDO as a 2 trillion yen fund as part of the government's third supplementary budget for FY2020. The Fund's purpose is to provide "continuous support for R&D projects, demonstrations and social implementation projects for up to 10 years to companies that commit to ambitious goals." JERA has been receiving funding as an implementing entity for numerous projects under the Fund.

18 New Energy and Industrial Technology Development Organization (NEDO), "Decision on implementation arrangements on Carbon Recycling, Technology Development for Next-Generation Thermal Power Generation, Research and Development for Ammonia-Co-firing Thermal Power Generation, Demonstration Project" https://www.nedo.go.jp/koubo/EV3_100227.html

Table 4. Projects implemented by JERA under the Green Innovation Fund

Project name	Topic	Contractors
Build a fuel ammonia supply chain Implementation period FY2021 to FY2030 (planned) Max budget 68.8 billion yen	Development and technology verification of new catalysts for ammonia production to build a fuel ammonia supply chain	Chiyoda Corporation, Tokyo Electric Power Company Holdings, Inc., JERA Co., Inc.
	Full-scale demonstration research for establishing high-ratio ammonia co-firing technology at commercial thermal power plants	IHI Corporation, JERA Co., Inc.
	Full-scale demonstration test for high-ratio ammonia mix at a thermal power plant using dedicated ammonia burner	Mitsubishi Heavy Industries, JERA Co., Inc.
Project to develop technologies such as CO_2 separation and capture Max budget 38.23 billion yen	Achieving commercialization of low-cost CO_2 separation and capture process from natural gas combustion exhaust gas	Chiyoda Corporation, JERA Co., Inc., and the Research Institute of Innovative Technology for the Earth
Project to develop a large-scale hydrogen supply chain Max budget 300 billion yen	Technology verification of hydrogen co-firing power generation for the development of a large-scale hydrogen supply chain	JERA Co., Inc.

Source: Prepared by Kiko Network from Green Innovation Fund website.

(c) GX Economic Transition Bonds

The Act on Promotion of a Smooth Transition to a Decarbonized Growth-Oriented Economic Structure (GX Promotion Act), which was enacted by the Diet in FY2023, had provisions for GX Economic Transition Bonds as indicated in the Basic Policy.

With regard to hydrogen and ammonia, the policy states that Japan will build a large-scale and robust supply chain (production, transport, utilization) over the next ten years, through frameworks to support supply chain and hub development, with a view to achieving the domestic introduction of 3 million tons of hydrogen and 3 million tons of ammonia (ammonia equivalent) in 2030, and 20 million tons of hydrogen and 30 million tons of ammonia (ammonia equivalent) in 2050. To achieve this, the policy states that about 7 trillion yen in investment will be mobilized. The GX Transition Bonds are expected to attract private investment by raising 20 trillion yen out of more than 150 trillion yen of public and private investment. The 20 trillion yen of government support includes “support for expanding demand for hydrogen ammonia and R&D of new technologies” and that the government will invest about 6 to 7 trillion yen in that. From the policies, one can see that the principle is to direct targeted government support at “projects where it is truly difficult for private companies to make investment decisions,” while things such as the introduction of renewable energy are left to the private sector to handle alone.[19]

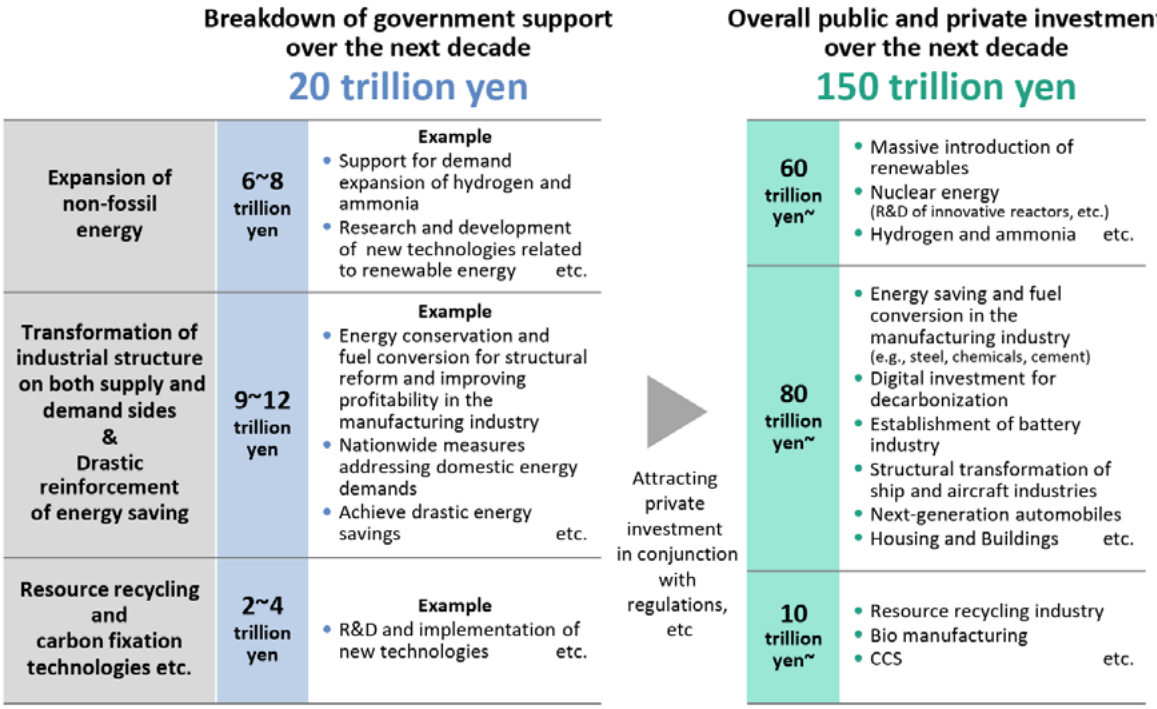
The redemption of the 20 trillion yen is expected to go until 2050, and to be covered by

19 Cabinet Decision on the Basic Policy for the Realization of GX https://www.meti.go.jp/english/press/2023/0210_003.html

sources such as revenues from a carbon surcharge to be introduced in FY2028 and the proceeds of paid auctions under an emission trading system to be introduced in FY2033.

Figure 5. Image of government support for integrated promotion of regulatory / support measures for GX Transition Bonds

Source: Agency for Natural Resources and Energy.



(d) Price-gap subsidy program for hydrogen and ammonia

The Act on the Supply of Low-Carbon Hydrogen and the Promotion of Its Supply and Use (Hydrogen Society Promotion Act), enacted in May 2024, clearly stipulates that support should be provided, focusing on price differentials. This is a measure that allows the government to subsidize businesses for the price differential vis a vis fossil fuels because the costs of hydrogen and ammonia are at a high enough level that they could not otherwise be expected to be widely used in the market. A policy was proposed to select and subsidize projects from among those that are expected to start providing supply by FY2030, based on the criteria that they will lead to the construction of supply chains, are innovative and expected to be self-sustaining. If approved, the businesses will continue to receive support for 15 years. Eligibility also includes ammonia co-firing in coal-fired power plants. For the source of funds, the government is expected to allocate around 3 trillion out of the 20 trillion yen from the GX Economic Transition Bonds issued by the government. However, the legislation does not state that the government will provide support, only mentioning that funds will flow from the Japan Organization for Metals and Energy Security (JOGMEC), so there is a possibility that funds other than the GX Economic Transition Bonds will be disbursed.

A target for the ammonia supply cost (CIF) target of 15-20 yen/Nm3-H2 for 2030, but even this cost target is high, at about twice the current price of coal.

(2) Maintaining existing thermal (fossil fuel) power generation

(a) Scale of auction bids in the capacity market

The capacity market is one of the new electricity markets that started in FY2020, and was created to pay in advance for the supply capacity in order to secure future electricity (to be supplied four years later). Since its inception, it has been pointed out that the system preserves nuclear and thermal power generation.[20]

The results of the first auction in 2020 have not been disclosed, but the list of successful bidders has been released publicly since FY2021, and the number and size of the successful bids by JERA are now known (although the names of power stations are not disclosed). According to published information, 82 generating units were awarded about 49.22 GW in 2021 (to supply electricity in FY2025), and 91 units about 45.86 GW in FY2022 (to supply in FY2026). In other words, of the 66 GW of generating capacity of thermal power plants owned by JERA,[21] 70 to 75% of them were in the capacity market. The contract price was 3,495 yen/kW (Tokyo and Chubu service areas) in FY2021, and 5,834 yen (Tokyo service area) and 5,832 yen (Chubu service area) in FY2022. Based on simple calculations, this means 172.0 billion yen in FY2025, and 283.2 billion yen in FY2026. As for the auction results for FY2020, the contract price was pre-set at the upper limit price of 14,137 yen/kW, so if JERA won a bid of 46 GW as it did the following year, this would mean about 650.3 billion yen for FY2024 (details not disclosed). All of this is to be paid by electricity retailers through OCCTO, and ultimately added to the consumer's electricity bill.

20 Kiko Network also made this point in a press release: "Major rethink needed regarding capacity market, which is contrary to needed climate measures and preserves coal and nuclear power." (in Japanese) https://kikonet.org/content/18386

21 Based on JERA's website as of March 31, 2022, showing data including projects under construction: https://www.jera.co.jp/en/corporate/business/thermal-power

Table 5. Status of JERA's successful bids in main auction of the capacity market

Auction year	Target year (to supply electricity)	JERA's winning bid	Contract price	Projected auction proceeds
2020	FY2024	Not disclosed	14,137 yen/kW (nationwide)	
2021	FY2025	Approx. 49.22 GW (82 units)	3,495 yen/kW (Tokyo/Chubu area)	Approx. 172 billion yen
2022	FY2026	Approx. 45.86 GW (91 units)	5,834 yen/kW (Tokyo area) 5,832 yen/kW (Chubu area)	Approx. 283.2 billion yen
2023	FY2027	Approx. 48.99 GW (103 units)	9,555 yen/kW (Tokyo area) 7,823 yen/kW (Chubu area)	Approx. 383.2 to 468.0 billion yen

Source: Prepared by Kiko Network based on OCCTO bid results.

(b) Long-term decarbonized power auction

The long-term decarbonized power auction is a bidding system for new investments in decarbonized power sources with the aim of promoting new investments in decarbonized power sources[22]. The auction uses a multi-price approach in which the bid price by each participating power source becomes the contract price. In principle, capacity payments covering fixed costs are secured for 20 years, while approximately 90% of additional revenue from other markets is refunded retroactively. The first auction was held in January 2024, and the contract results were published in April[23]. The result was that JERA won the bidding for upgrading to ammonia co-firing equipment for its Hekinan thermal power plant Unit 4 (187,334 kW) and Unit 5 (187,315 kW), and for its LNG-only firing at its Chita thermal power plant Unit 7 (589,836 kW) and Unit 8 (589,836 kW).

Although each upper price limit is not disclosed for each contact price, for the first round the upper price limit was 74,446 yen/kW/yr for ammonia co-firing equipment. Discussions are underway to raise this to 100,000 yen/kW/yr starting with the second round. With regard to LNG, the upper limit is set at 36,945 yen/kW/yr, and the expected capacity of 6 GW over three years ended up being reached with the planned scale being won in the first round at 5.756 GW. As a result, there is a plan to increase the limit for LNG thermal power generation, which by no means could be considered to be a "decarbonized power source."

In addition, METI has pointed to the need to secure "standby power sources" as an additional measure separate from the capacity market and long-term decarbonized power auction, and has started considering securing 3 to 4 GW of mothballed thermal power plants, considering them to be backup in the case of large-scale disasters and as insurance against the difference between required

22 Document 3-1 "What is a long-term decarbonized power source?" from the 77th meeting of Advisory Committee on Natural Resources and Energy, Electricity and Gas Business Subcommittee, Electricity & Gas Basic Policy Subcommittee, Institutional Review Working Group https://www.meti.go.jp/shingikai/enecho/denryoku_gas/denryoku_gas/seido_kento/077.html

23 Announcement of contract results for long-term decarbonized power supply auctions in the capacity market (bid year FY2023) https://www.occto.or.jp/market-board/market/oshirase/2024/20240426_youryouyakujokekka_kouhyou.html

supply capacity and the amount procured from the capacity market.[24]

Table 6. Long-term decarbonized power auction - FY2024 results (20-year fixed)

Generation method	Supplier of winning bid	Capacity	Upper price limit	Annual amount (approx.)
Ammonia co-firing	Hekinan Unit 4	187,334 kW	74,446 yen/kW /year	13.9 billion yen/year
Ammonia co-firing	Hekinan Unit 5	187,315kW	74,446 yen/kW/year	13.9 billion yen/year
100% LNG	Chita Unit 7	589,836kW	36,945 yen/kW/year	21.8 billion yen/year
100% LNG	Chita Unit 8	589,836kW	36,945 yen/kW/year	21.8 billion yen/year

Source: Prepared by Kiko Network based on OCCTO bid results.

As described above, the government has been working together with electric power companies to promote hydrogen and ammonia, raising funds for these efforts, and providing generous measures to maintain existing aging thermal power plants. All of these costs will end up being borne by the public.

6. Cooperation with other power companies

In April 2023, JERA announced that it was considering the possibility of collaborating with Kyushu Electric Power, Chugoku Electric Power, Shikoku Electric Power, and Tohoku Electric Power, to introduce hydrogen and ammonia as fuel for power generation,[25] and in June that year, Hokuriku Electric Power and Hokkaido Electric Power were added to the list.[26] In October of the same year, it signed a memorandum of understanding (MOU) with Kyushu Electric Power on comprehensive collaboration studies aimed at stable energy supply and the realization of a decarbonized society,[27] and in December, Okinawa Electric Power joined the above-mentioned discussions on potential collaboration with other electric power companies.[28] Eight companies,

24 Document 4 “Standby power” from the 79th meeting of the Advisory Committee on Natural Resources and Energy, Electricity and Gas Business Subcommittee, Electricity & Gas Basic Policy Subcommittee, Institutional Review Working Group (May 23 2023) https://www.meti.go.jp/shingikai/enecho/denryoku_gas/denryoku_gas/seido_kento/079.html

25 JERA, “Hokuriku Electric Power’s participation in the study of collaboration with Kyushu Electric Power, Chugoku Electric Power, Shikoku Electric Power, and Tohoku Electric Power to introduce hydrogen and ammonia” (April 24, 2023) (in Japanese) https://www.jera.co.jp/news/notice/20230424_1425

26 JERA, “Hokkaido Electric Power’s Participation in the Study of Collaboration with Kyushu Electric Power, Chugoku Electric Power, Shikoku Electric Power, Tohoku Electric Power, and Hokuriku Electric Power to introduce Hydrogen • Ammonia” (June 30, 2023) (in Japanese) https://www.jera.co.jp/news/notice/20230630_1553

27 Comprehensive Discussions on Collaboration Between JERA and Kyushu Electric Power Aimed at Achieving Decarbonization and a Stable Energy Supply https://www.jera.co.jp/en/news/information/20231023_1697

28 Okinawa Electric Power Company participates in study of collaboration with Kyushu Electric Power Co., Chugoku Electric Power Co., Shikoku Electric Power Co., Tohoku Electric Power Co., Hokuriku Electric Power Co., and Hokkaido Electric Power Co. for the introduction of hydrogen and ammonia (December 27, 2023) (in Japanese) https://www.jera.co.jp/news/notice/20231227_1761

including JERA, are accelerating efforts to build and expand supply chains for hydrogen and ammonia for fuels.

In addition, as discussed below, they are also collaborating with power companies in other countries.

7. JERA's advertisements

JERA has been running ad campaigns proclaiming it can create "Zero-Emission Thermal Power (CO_2-free fire)." The ads claim that JERA will take on the challenge of pursuing zero CO_2 emissions by 2050 with renewable energy and zero-emission thermal power. They also include messaging saying "The world has changed. Energy is changing."

This advertising is problematic in two ways: First, the wording invites misunderstanding by conveying the impression that fuels such as ammonia do not emit CO_2. At the very least, the ammonia fuel currently used by JERA is gray ammonia, and the messaging gives no indication that a large amount of CO_2 is emitted during production, even if CO_2 is not emitted during combustion. In addition, the fuel now being used is not 100% ammonia; it only has a small percentage of ammonia in the mix. The advertising gives the impression that the power plants are switching away from fossil-fuel-fired thermal power generation, but this is not in line with the facts.

Second, the advertising gives the impression that JERA is sincerely responding to global calls for climate action. As described in this paper, what JERA is doing now is building new thermal power plants that burn fossil fuels and keeping existing coal-fired power plants running by co-firing with ammonia, while not taking actual measures to reduce emissions.

These ads from JERA are complete greenwashing, unaccompanied by any real action.

Figure 6. Examples of JERA advertising.

8. JERA's international activities

JERA is involved in a wide range of energy-related projects around the world, from resource development to power generation projects. The company has approximately 30 overseas power generation projects in more than 10 countries, with a total generating capacity (equity-based installed capacity) of approximately 12.40 GW.[29] In fuel-related businesses, JERA is participating in projects in Australia, Timor-Leste, and the United States.[30] JERA argues that the "path to decarbonization" cannot be realized with the European approach alone,[31] and positions LNG, renewable energy, hydrogen, and ammonia as pillars for future business development, but it will be largely reliant on foreign countries for the procurement of LNG, hydrogen and ammonia.

(1) LNG procurement

JERA is involved in the development or ownership of 11 LNG receiving terminals, has long-term LNG procurement arrangements with 10 countries around the world, and is involved in five LNG production projects. JERA Global Markets, a trading subsidiary of JERA, utilizes 20 LNG carriers for trading, and including the businesses of its group companies, JERA is involved at all stages, from upstream development to trading and transportation. In particular, the company is actively expanding its procurement of LNG, hydrogen, and ammonia. The company is developing LNG projects in many countries such as Australia, Bangladesh, and Vietnam, and some specific projects include the Barossa gas field in Australia, the Freeport LNG production and export facility in the United States, multiple LNG import terminals in Asia, and LNG to Power projects.

The fact that JERA is leading Japan's energy procurement is reflected in a December 2023 announcement by Nippon Export and Investment Insurance (NEXI, Japan's official export credit agency) that it would insure a 100 billion yen commitment line for JERA arranged by Sumitomo Mitsui Banking Corporation (SMBC).[32] This is the first time that NEXI has applied insurance to loans to domestic companies, demonstrating how the government is supporting the strengthening of the LNG supply chain. The aim is purportedly to diversify risks by diversifying suppliers, but inevitably these actions will end up sustaining thermal power generation powered by fossil fuels.

(2) Ammonia and hydrogen procurement

JERA is promoting co-firing with ammonia or hydrogen as a measure to reduce emissions from

29 JERA Group Integrated Report 2023

30 Investment Projects from the JERA website https://www.jera.co.jp/en/corporate/business/projects

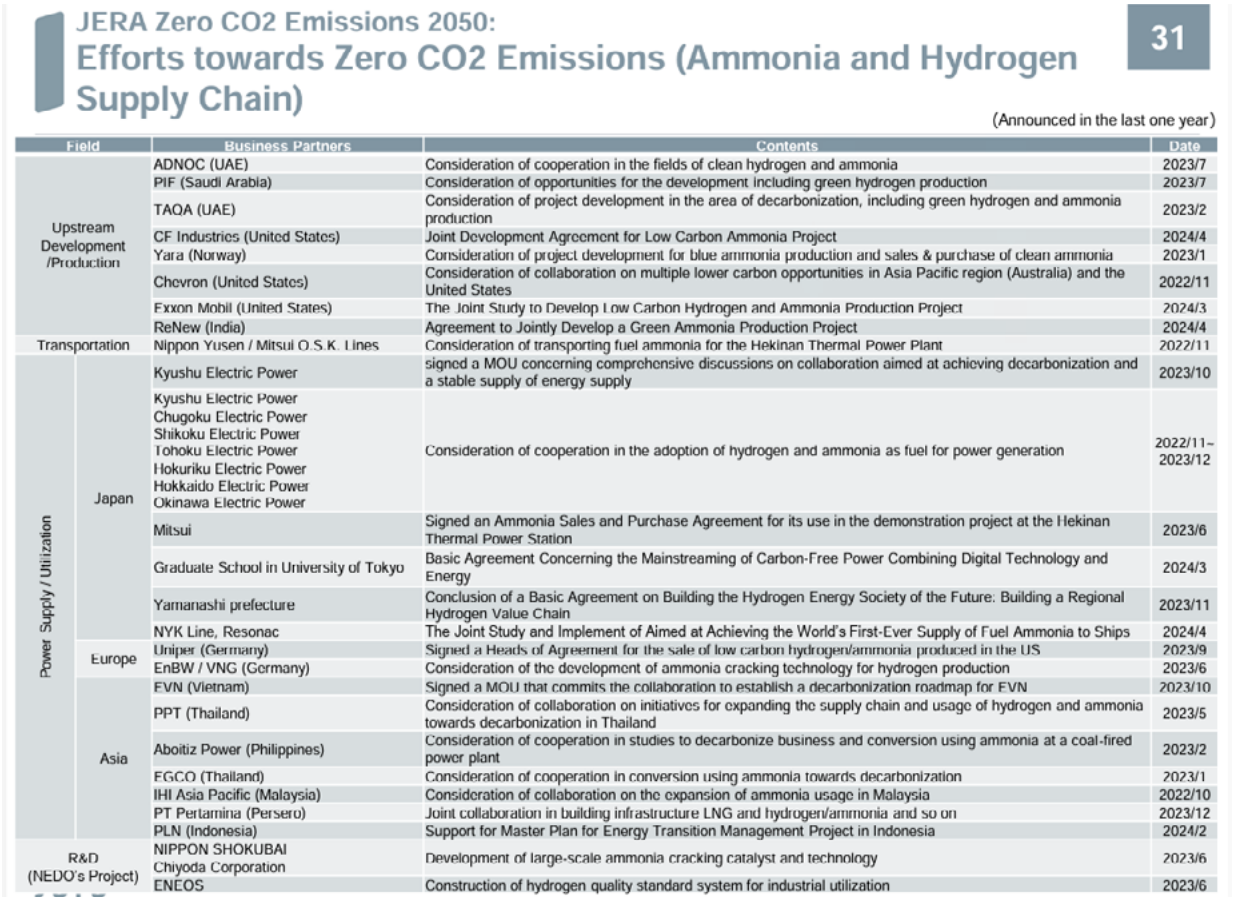
31 JERA: Powering Toward a Global Decarbonized Future by Embracing Innovation https://www.jera.co.jp/en/action/discover/047

32 Nippon Export and Investment Insurance (NEXI), "Loan Insurance for commitment line for LNG import to support overseas procurement of LNG by Japanese power company" (December 5, 2023) https://www.nexi.go.jp/topics/newsrelease/202311270163.html
English: https://www.nexi.go.jp/en/topics/newsrelease/202311270163.html

coal-fired power generation, and this is at the core of JERA's transition strategy. However, co-firing with ammonia and hydrogen poses many problems. One of them is securing the required quantities. In January 2023, JERA signed a memorandum of understanding with Yara Clean Ammonia Norge AS, a subsidiary of Yara International ASA, one of the world's largest ammonia manufacturers, headquartered in Norway, for demonstration trials for ammonia co-firing at the Hekinan Thermal Power Station, Unit 4.[33] On April 18, 2024 JERA also signed a joint development agreement with CF Industries, a US ammonia and nitrogen fertilizer manufacturer, for a low-carbon ammonia production project.[34]

Although JERA has plans to import around 2 million tons of ammonia per year in 2030,[35] it remains doubtful whether it will be able to secure a supply that really amounts to decarbonization.

Figure 7. JERA Zero Emissions 2050



JERA Zero CO2 Emissions 2050:
Efforts towards Zero CO2 Emissions (Ammonia and Hydrogen Supply Chain)

31

(Announced in the last one year)

Field		Business Partners	Contents	Date
Upstream Development /Production		ADNOC (UAE)	Consideration of cooperation in the fields of clean hydrogen and ammonia	2023/7
		PIF (Saudi Arabia)	Consideration of opportunities for the development including green hydrogen production	2023/7
		TAQA (UAE)	Consideration of project development in the area of decarbonization, including green hydrogen and ammonia production	2023/2
		CF Industries (United States)	Joint Development Agreement for Low Carbon Ammonia Project	2024/4
		Yara (Norway)	Consideration of project development for blue ammonia production and sales & purchase of clean ammonia	2023/1
		Chevron (United States)	Consideration of collaboration on multiple lower carbon opportunities in Asia Pacific region (Australia) and the United States	2022/11
		Exxon Mobil (United States)	The Joint Study to Develop Low Carbon Hydrogen and Ammonia Production Project	2024/3
		ReNew (India)	Agreement to Jointly Develop a Green Ammonia Production Project	2024/4
Transportation		Nippon Yusen / Mitsui O.S.K. Lines	Consideration of transporting fuel ammonia for the Hekinan Thermal Power Plant	2022/11
Power Supply / Utilization	Japan	Kyushu Electric Power	signed a MOU concerning comprehensive discussions on collaboration aimed at achieving decarbonization and a stable supply of energy supply	2023/10
		Kyushu Electric Power Chugoku Electric Power Shikoku Electric Power Tohoku Electric Power Hokuriku Electric Power Hokkaido Electric Power Okinawa Electric Power	Consideration of cooperation in the adoption of hydrogen and ammonia as fuel for power generation	2022/11~ 2023/12
		Mitsui	Signed an Ammonia Sales and Purchase Agreement for its use in the demonstration project at the Hekinan Thermal Power Station	2023/6
		Graduate School in University of Tokyo	Basic Agreement Concerning the Mainstreaming of Carbon-Free Power Combining Digital Technology and Energy	2024/3
		Yamanashi prefecture	Conclusion of a Basic Agreement on Building the Hydrogen Energy Society of the Future: Building a Regional Hydrogen Value Chain	2023/11
		NYK Line, Resonac	The Joint Study and Implement of Aimed at Achieving the World's First-Ever Supply of Fuel Ammonia to Ships	2024/4
	Europe	Uniper (Germany)	Signed a Heads of Agreement for the sale of low carbon hydrogen/ammonia produced in the US	2023/9
		EnBW / VNG (Germany)	Consideration of the development of ammonia cracking technology for hydrogen production	2023/6
	Asia	EVN (Vietnam)	Signed a MOU that commits the collaboration to establish a decarbonization roadmap for EVN	2023/10
		PPT (Thailand)	Consideration of collaboration on initiatives for expanding the supply chain and usage of hydrogen and ammonia towards decarbonization in Thailand	2023/5
		Aboitiz Power (Philippines)	Consideration of cooperation in studies to decarbonize business and conversion using ammonia at a coal-fired power plant	2023/2
		EGCO (Thailand)	Consideration of cooperation in conversion using ammonia towards decarbonization	2023/1
		IHI Asia Pacific (Malaysia)	Consideration of collaboration on the expansion of ammonia usage in Malaysia	2022/10
		PT Pertamina (Persero)	Joint collaboration in building infrastructure LNG and hydrogen/ammonia and so on	2023/12
		PLN (Indonesia)	Support for Master Plan for Energy Transition Management Project in Indonesia	2024/2
R&D (NEDO's Project)		NIPPON SHOKUBAI Chiyoda Corporation	Development of large-scale ammonia cracking catalyst and technology	2023/6
		ENEOS	Construction of hydrogen quality standard system for industrial utilization	2023/6

[36]

Source: FY2023 Consolidated Financial Results

33 JERA and Yara International Execute MOU for the Joint Project Development and Sales & Purchase of Clean Ammonia https://www.jera.co.jp/en/news/information/20230117_1069

34 JERA and CF Industries Execute Joint Development Agreement for Low Carbon Ammonia Project https://www.jera.co.jp/en/news/information/20240418_1885

35 From Nihon Keizai Shimbun article https://www.nikkei.com/nkd/industry/article/?DisplayType=2&n_m_code=012&ng=DGKKZO-70657150Q3A430C2TB0000

36 FY2023 Consolidated Financial Results, FY2023 Investors Meeting https://www.jera.co.jp/static/files/ir/library/pdf/20234Q_Investors%20Meeting.pdf

Regarding hydrogen, in June 2023, JERA signed a memorandum of understanding with EnBW Energie Baden-Württemberg AG, a major German energy company, and VNG, a gas wholesaler in Germany, for the joint development of ammonia cracking technology for hydrogen production[37]. In March 2024, JERA signed a contract with U.S.-based ExxonMobil to jointly explore the development of a low-carbon hydrogen and ammonia production project[38].

In its management strategy up to FY2035[39], the company plans to invest a cumulative total of about 5 trillion yen in thermal power generation using hydrogen and ammonia for decarbonization and set a target of handling about 7 million tons of hydrogen and ammonia. Based on this, one could expect to see an expansion of collaboration with companies in other countries related to hydrogen and ammonia. If JERA continues co-firing with fossil fuels, and its co-fired hydrogen and ammonia is not green, JERA's strategy of claiming to be net zero CO_2 while still emitting CO_2 will clearly be a contradiction of actions versus words.

Conclusion

As a major greenhouse gas emitter historically and currently the world's fifth largest emitter, Japan has a responsibility to show leadership by making significant emission reductions. However, Japan has made little progress in addressing climate change over the past 30 years, falling far behind the rest of the world. In addition, despite ostensibly declaring the intention to achieve zero emissions by 2050, Japan continues to promote energy policies that rely on power from burning fossil fuels. About 10% of Japan's total CO_2 emissions come from thermal power plants operated by JERA. It is very problematic that Japan's largest CO_2 emitter is so deeply involved in the decision-making processes related to Japan's national energy policies. As a result, even though fuel ammonia cannot substantially reduce emissions, Japan has set the development of fuel ammonia as a national energy priority, while making decisions to ensure that existing fossil fuel fired power plants will continue operating far into the future.

From the perspective of international competitiveness, Japan's continued use of high-carbon electricity as a power source will be a major disadvantage for companies that aim to achieve 100% renewable energy and make it more difficult to achieve emission reduction targets.

37 EnBW, VNG and JERA plan feasibility study for an ammonia cracker demonstration plant in Rostock https://www.jera.co.jp/en/news/information/20230612_1493

38 JERA and ExxonMobil to Develop Low Carbon Hydrogen and Ammonia Production Project https://www.jera.co.jp/en/news/information/20240325_1852

39 JERA Unveils 2035 Growth Strategy Leading Decarbonization as a Responsible Energy Solutions Provider https://www.jera.co.jp/en/ir/ir_news/20240516_1917

Moreover, the preferential policy conditions for existing thermal power plants will reduce motivation of and deprive new entrants of opportunities to aggressively adopt renewable energy. Notably, the public funds being spent on a variety of JERA projects impose a heavy burden on the public. Fiscal measures and tax reforms to build a decarbonized society are sorely needed, but instead policies result in vast sums of money invested in maintaining fossil fuels, nuclear power, and technologies such as ammonia fuel and CCUS that are both unreliable and will fail to reduce emissions. The priorities are backwards; the focus should be on expanding renewable energy and promoting energy-saving measures that can more reliably contribute to reducing CO_2 emissions in order to avoid a worsening climate crisis. Like many other countries, Japan is facing significant increases in the cost of fossil fuels due to the global energy crisis, and importing hydrogen and ammonia made overseas from fossil fuels will only weaken Japan's energy security. The deployment of renewable energy is key to increasing the country's energy self-sufficiency.

To effectively tackle climate change to realize a truly decarbonized society, Japan needs to fundamentally review how policy decisions have been made to date and what the nation's energy systems should look like in the future. The government must move away from fossil fuels and develop and support policies that put the country on the path to full decarbonization of electricity by 2035, and JERA itself should accordingly take meaningful, effective actions toward decarbonization, if it is serious about its goal of "Zero CO_2 Emissions."

Appendix 1. List of JERA's thermal power plants

Plant name	Prefecture	Main fuel	Output	Remarks
Joetsu Thermal Power Plant	Niigata	Units 1 - 2, gas	2.38 GW	
Hirono Thermal Power Station	Fukushima	Units 1 - 4, oil Units 5 - 6, coal	3.20 GW 1.20 GW	
Hitachinaka Thermal Power Station	Ibaraki	Units 1 - 2, coal	2.00 GW	
Hitachinaka Joint Thermal Power Station	Ibaraki	Unit 1, coal	0.650 GW	
Kashima Thermal Power Station	Ibaraki	Unit 7, gas	1.26 GW	
Chiba Thermal Power Station	Chiba	Units 1 - 3, gas	4.38 GW	
Goi Thermal Power Station	Chiba	New units 1 - 3, gas	2.34 GW	Start operation 2024–25
Anegasaki Thermal Power Station	Chiba	Units 5 - 6, New units 1 - 2, gas	2.4938 GW	
Sodegaura Thermal Power Station	Chiba	Units 1 - 4, gas	3.6 GW	
Futtsu Thermal Power Station	Chiba	Units 1 - 4, gas	5.342 GW	
Yokosuka Thermal Power Station	Kanagawa	New units 1 - 2, coal	1.30 GW	Start operation 2023–24
Minami-Yokohama Thermal Power Station	Kanagawa	Units 1 - 3, gas	1.15 GW	
Yokohama Thermal Power Station	Kanagawa	Units 7 - 8, gas	3.016 GW	
Higashi Ohgishima Thermal Power Station	Kanagawa	Units 1 - 2, gas	2.00 GW	
Kawasaki Thermal Power Station	Kanagawa	Units 1 - 2, gas	3.42 GW	
Oi Thermal Power Station	Tokyo			Decommissioned Mar 2022
Shinagawa Thermal Power Station	Tokyo	Unit 1, gas	1.14 GW	
Atsumi Thermal Power Station	Aichi	Unit 3 - 4, oil	1.40 GW	
Hekinan Thermal Power Station	Aichi	Units 1 - 5, coal	4.10 GW	
Taketoyo Thermal Power Station	Aichi	Unit 5, coal	1.07 GW	Biomass co-firing
Chita Thermal Power Station	Aichi	Units 5 - 6, gas	1.554 GW	
Chita Daini Thermal Power Station	Aichi	Units 1 - 2, gas	1.708 GW	
Shin-Nagoya Thermal Power Station	Aichi	Units 7 - 8, gas	3.058 GW	
Nishi-Nagoya Power Station	Aichi	Unit 7, gas	2.3764 GW	
Kawagoe Thermal Power Station	Mie	Units 1 - 4, gas	4.802 GW	
Yokkaichi Thermal Power Station	Mie	Unit 4, gas	0.585 GW	

Appendix 2. List of JERA's gas-fired power plants

Plant name	Location	Unit/series	Output (MW)	Fuel type	Technology	Operation start
Kashima Thermal Power Station	Kamisu City, Ibaraki Pref.	Grp 7 - no. 1	420	City gas	ACC	May 2014
		Grp 7 - no. 2	420	City gas	ACC	Jun 2014
		Grp 7 - no. 3	420	City gas	ACC	Jun 2014
Chiba Thermal Power Station	Chiba City, Chiba Pref.	Grp 1 - no. 1	360	LNG	ACC	Apr 2000
		Grp 1 - no. 2	360	LNG	ACC	Oct 1999
		Grp 1 - no. 3	360	LNG	ACC	Apr 1999
		Grp 1 - no. 4	360	LNG	ACC	Dec 1998
		Grp 2 - no. 1	360	LNG	ACC	Feb 1999
		Grp 2 - no. 2	360	LNG	ACC	Jul 1999
		Grp 2 - no. 3	360	LNG	ACC	Jan 2000
		Grp 2 - no. 4	360	LNG	ACC	Jun 2000
		Grp 3 - no. 1	500	LNG	MACC	Apr 2014
		Grp 3 - no. 2	500	LNG	MACC	Jun 2014
		Grp 3 - no. 3	500	LNG	MACC	Jul 2014
Anegasaki Power Station	Ichihara City, Chiba Pref.	Unit 5	600	LNG、LPG	SC	Apr 1977
		Unit 6	600	LNG、LPG	SC	Oct 1979
Sodegaura Power Station	Sodegaura City, Chiba	Unit 1	600	LNG	SC	Aug 1974
		Unit 2	1000	LNG	SC	Sep 1975
		Unit 3	1000	LNG	SC	Feb 1977
		Unit 4	1000	LNG	SC	Aug 1979
Futtsu Power Station	Futtsu City, Chiba	Grp 1 - no. 1	167	LNG	CC	Dec 1985
		Grp 1 - no. 2	167	LNG	CC	Feb 1986
		Grp 1 - no. 3	167	LNG	CC	May 1986
		Grp 1 - no. 4	167	LNG	CC	May 1986
		Grp 1 - no. 5	167	LNG	CC	Jul 1986
		Grp 1 - no. 6	167	LNG	CC	September 1986
		Grp 1 - no. 7	167	LNG	CC	Nov 1986
		Grp 2 - no. 1	160	LNG	CC	Dec 1987
		Grp 2 - no. 2	160	LNG	CC	Feb 1988
		Grp 2 - no. 3	162	LNG	CC	Apr 1988
		Grp 2 - no. 4	160	LNG	CC	May 1988
		Grp 2 - no. 5	160	LNG	CC	Sep 1988
		Grp 2 - no. 6	162	LNG	CC	Sep 1988
		Grp 2 - no. 7	160	LNG	ACC	Nov 1988
		Grp 3 - no. 1	380	LNG	ACC	Nov 2003
		Grp 3 - no. 2	380	LNG	ACC	Jul 2003
		Grp 3 - no. 3	380	LNG	ACC	Dec 2001
		Grp 3 - no. 4	380	LNG	ACC	Jul 2001
		Grp 4 - no. 1	507	LNG	MACC	Jul 2008
		Grp 4 - no. 2	507	LNG	MACC	Nov 2009
		Grp 4 - no. 3	507	LNG	MACC	Oct 2010
Shinagawa Power Station	Shinagawa Ward, Tokyo	Grp 1 - no. 1	380	City gas	ACC	Jul 2001
		Grp 1 - no. 2	380	City gas	ACC	Mar 2002
		Grp 1 - no. 3	380	City gas	ACC	Aug 2003
Kawasaki Power Station	Kawasaki City, Kanagawa	Grp 1 - no. 1	500	LNG	MACC	Feb 2009
		Grp 1 - no. 2	500	LNG	MACC	Jun 2008
		Grp 1 - no. 3	500	LNG	MACC	Jun 2007
		Grp 2 - no. 1	500	LNG	MACC	Feb 2013
		Grp 2 - no. 2	710	LNG	MACC Ⅱ	Jan 2016
		Grp 2 - no. 3	710	LNG	MACC Ⅱ	Jun 2016
Higashiogi-shima	Kawasaki City, Kanagawa	Unit 1	1000	LNG	SC	Sep 1987
		Unit 2	1000	LNG	SC	Mar 1991
Minami Yokohama	Yokosuka City, Kanagawa Pref.	Unit 1	350	LNG	SubC	May 1970
		Unit 2	350	LNG	SubC	Apr 1970
		Unit 3	450	LNG	SubC	May 1973

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Yokohama	Yokosuka City, Kanagawa Pref.	Grp 7 - no. 1	377	LNG	ACC	Jan 1998
		Grp 7 - no. 2	377	LNG	ACC	Oct 1997
		Grp 7 - no. 3	377	LNG	ACC	Jan 1997
		Grp 7 - no. 4	377	LNG	ACC	Jun 1996
		Grp 8 - no. 1	377	LNG	ACC	Jul 1996
		Grp 8 - no. 2	377	LNG	ACC	Feb 1997
		Grp 8 - no. 3	377	LNG	ACC	Oct 1997
		Grp 8 - no. 4	377	LNG	ACC	Jan 1998
Joetsu	Joetsu City, Niigata Pref.	Grp 1 - no. 1	595	LNG	ACC	Jul 2012
		Grp 1 - no. 2	595	LNG	ACC	Jan 2013
		Grp 2 - no. 1	595	LNG	ACC	Jul 2013
		Grp 2 - no. 2	595	LNG	ACC	May 2014
Shin-Nagoya	Nagoya City, Aichi	Grp 7 - no. 1	243	LNG	ACC	Aug 1998
		Grp 7 - no. 2	243	LNG	ACC	Oct 1998
		Grp 7 - no. 3	243	LNG	ACC	Nov 1998
		Grp 7 - no. 4	243	LNG	ACC	Nov 1998
		Grp 7 - no. 5	243	LNG	ACC	Dec 1998
		Grp 7 - no. 6	243	LNG	ACC	Dec 1998
		Grp 8 - no. 1	400	LNG	MACC	Oct 2008
		Grp 8 - no. 2	400	LNG	MACC	Jul 2008
		Grp 8 - no. 3	400	LNG	MACC	Jun 2008
		Grp 8 - no. 4	400	LNG	MACC	Apr 2008
Nishi-Nagoya	Tobishima, Aichi Pref.	Unit 7	1,188	LNG	MACC II	Sep 2017
		Grp 7 - no. 2	1,188	LNG	MACC II	Mar 2018
Chita	Chita City, Aichi Pref.	Unit 5	700	LNG	SC	Mar 1978
		Unit 5 GT	154	LNG	Repower	Jun 1995
		Unit 6	700	LNG	SC	Apr 1978
		Unit 6 GT	154	LNG	Repower	Sep 1994
Chita No 2	Chita City, Aichi Pref.	Unit 1	700	LNG	SC	Sep 1983
		Unit 1 GT	154	LNG	Repower	Sep 1994
		Unit 2	700	LNG	SC	Nov 1983
		Unit 2 GT	154	LNG	Repower	Jul 1996
Kawagoe	Kawagoe, Mie Pref.	Unit 1	700	LNG	SC	Jun 1989
		Unit 2	700	LNG	SC	Jun 1990
		Grp 3 - no. 1	243	LNG	ACC	Jun 1996
		Grp 3 - no. 2	243	LNG	ACC	Aug 1996
		Grp 3 - no. 3	243	LNG	ACC	Aug 1996
		Grp 3 - no. 4	243	LNG	ACC	Nov 1996
		Grp 3 - no. 5	243	LNG	ACC	Nov 1996
		Grp 3 - no. 6	243	LNG	ACC	Dec 1996
		Grp 3 – no. 7	243	LNG	ACC	Dec 1996
		Grp 4 - no. 1	243	LNG	ACC	Jun 1997
		Grp 4 - no. 2	243	LNG	ACC	Aug 1997
		Grp 4 - no. 3	243	LNG	ACC	Aug 1997
		Grp 4 - no. 4	243	LNG	ACC	Sep 1997
		Grp 4 - no. 5	243	LNG	ACC	Sep 1997
		Grp 4 - no. 6	243	LNG	ACC	Nov 1997
		Grp 4 – no. 7	243	LNG	ACC	Nov 1997
Yokkaichi	Yokkaichi City, Mie Prefecture	Grp 4 - no. 1	117	LNG	CC	Feb 1988
		Grp 4 - no. 2	117	LNG	CC	Jun 1988
		Grp 4 - no. 3	117	LNG	CC	Jun 1988
		Grp 4 - no. 4	117	LNG	CC	Jul 1998
		Grp 4 - no. 5	117	LNG	CC	Jul 1998
Total			43,115			

Appendix 3. Members of the Public-Private Council on the Introduction of Fuel Ammonia (As of July 2024)

Private sector	
Kouji Takeda	Managing Executive Officer, President of Resources, Energy and Environment Business Area, IHI Corporation
Hisahide Okuda	Corporate Vice President, Managing Executive Officer, Director, Corporate Strategy, JERA Co., Inc.
Hiroshi Sasatsu	Director and Executive Vice President, Electric Power Development Co., Ltd. (J-POWER)
Masahiro Aika	Senior Executive Officer, General Manager, Sustainability Co-Creation Unit, JGC Holdings Corporation
Akira Kono	Representative Director, Executive Vice-President Executive Officer, NYK Line
Akihiko Sagara	Managing Executive Officer, CEO, Energy & Mineral Group, Marubeni Corporation
Hirokazu Nakagawa	Executive Officer, Deputy Head of Energy Domain, General Manager of New Energy Business Division, Mitsubishi Heavy Industries, Ltd.
Hiroki Haba	Executive Officer, General Manager, Petroleum Division, Mitsubishi Corporation
Yukari Yamashita	Managing Director, Institute of Energy Economics, Japan
Shigeru Muraki	Representative Director, Green Ammonia Consortium, Executive Advisor to Tokyo Gas Co., Ltd.

Government and related organizations	
Ryo Minami	Director, Petroleum and Natural Gas Division, Agency for Natural Resources and Energy
Hidemasa Nishiyama	Director, Policy Planning Division, Natural Resources and Fuel Department, Agency for Natural Resources and Energy
Masashi Watanabe	Director, Fuel Ammonia, Petroleum and LNG Policy, Agency for Natural Resource and Energy
Hiroshi Tsuchiya	Director, Coal Division, Natural Resources and Fuel Department, Agency for Natural Resources and Energy
Hajime Wakuda	President, Japan Organization for Metals and Energy Security(JOGMEC)
Tsuyoshi Nishitani	Managing Executive Officer, Japan Bank for International Cooperation (JBIC)
Hidenobu Teramura	Senior Managing Executive Officer, Nippon Export and Investment Insurance (NEXI)

JERA REPORT: Is Japan's top CO_2 emitter really aiming for zero emissions?

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July 2024

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