

Climate Change

ENVIRONMENT



► Policy and Concept

● Social background

Countries are carrying out actions against climate change aiming to achieve their greenhouse gas reduction targets under the Paris Agreement, which sets the framework for climate change mitigation. The Japanese government reviewed the Strategic Energy Plan, the Long-term Strategy under the Paris Agreement (as a growth strategy) and the Plan for Global Warming Countermeasures. Accordingly, targets were set to achieve carbon neutrality by 2050 and reduce greenhouse gas emissions in fiscal 2030 by 46% below fiscal 2013 levels.

<Addressing TCFD Recommendations>

In May 2019, our Company declared our support for the recommendations of the Task Force on Climate-related Financial Disclosures or TCFD*.

Recognizing the size of the impacts that our Group business activities have on the global environment, we declare our support for the TCFD Recommendations to “analyze and disclose business risks and opportunities originating in climate change over the medium and long terms in order to reduce risks of financial market destabilization.”

Refer to page 29 of the Integrated Report for details about scenario analysis, etc.

* TCFD was established by the Financial Stability Board, which is an international agency that has central banks, financial regulatory authorities and other organizations from major countries as members. In total, 3741 organizations around the world, including financial institutions, businesses and governments, declared their support for the TCFD Recommendations as of August 31, 2022.

● Targets and efforts to achieve them

The Kansai Electric Power Group is committed to carbon neutrality by 2050 throughout the entirety of our business activities, including the power generation business, as declared in the Zero Carbon Vision 2050 and the Zero Carbon Roadmap, which provides a pathway to zero carbon. Specific measures to reduce CO₂ emissions include transforming renewable energy into the main power source, leveraging nuclear power to the fullest, achieving zero carbon in thermal power generation, using zero-carbon hydrogen, and optimizing power grids to support these measures. At the same time, we will provide various solutions (electrification, storage batteries, etc.) to help customers and society reduce their CO₂ emissions. The Zero Carbon Roadmap, meanwhile, includes an interim target for fiscal 2030 toward the FY 2050 goal. Specifically, our voluntary measures aim to halve CO₂ emissions associated with power generation in fiscal 2025 compared to fiscal 2013 to maintain our status as front runners in reduction rates thereafter and to completely electrify over 5,000 vehicles owned by the Group. To better serve customers and society, moreover, we are committed to decreasing the CO₂ emission factor of electricity supplied to customers to industry-leading levels and providing customers and society with various services to help reduce CO₂ emissions by over 7 million tonnes.

We also aim to invest a total of as much as 1 trillion yen in renewable energy development in Japan by 2040, which translates into a newly installed capacity of 5 GW and a cumulative installed capacity of approximately 9 GW. Furthermore, as a member of the Electric Power Council for a Low Carbon Society (ELCS), which was established by a consortium of electric companies including the Company, we are contributing to the ELCS initiatives as well by working on these Group endeavors.

► Goals

● Advancing efforts to control CO₂ emissions

- Keep the top spot for the amount of zero-carbon power generation in Japan
- Halve CO₂ emissions associated with power generation in Japan in FY 2025 (compared to FY 2013)

● Continuing safe and stable operation of nuclear power plants*¹

- Operation of nuclear power plants with top priority placed on safety

● Further development and utilization of renewable energy

- Achieve 5 GW scale of new development and 9 GW scale of cumulative capacity in Japan by 2040

● Maintaining and improving the thermal efficiency of thermal power plants*¹

- Achieve benchmark indicators*² (A: 1.00, B: 44.3%)

● Reducing transmission and distribution loss

- To be maintained and reduced

● Promoting use of innovative forms of energy among customers and communities

- Contribute to making energy use by customers and society more sophisticated

● Limiting SF₆ emissions (calendar year basis) (gas recovery rate upon inspection/removal of equipment)

- 97% (upon inspection)
- 99% (upon removal)

*¹ Targets and results apply only to the Kansai Electric Power Co., Inc.

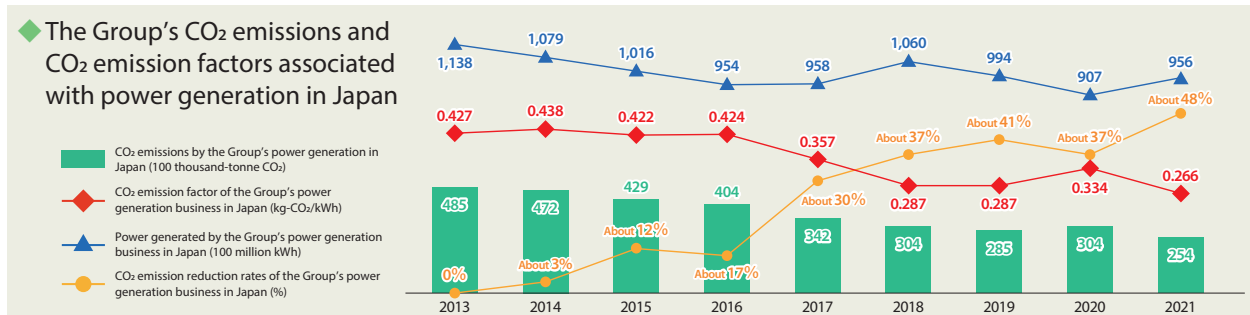
*² Indicators based on the benchmark system of the Law Concerning the Rational Use of Energy



▶ Efforts

● Our Group's CO₂ emissions associated with power generation in Japan

The Group's CO₂ emissions originating from its domestic power generation amounted to around 25.4 million tonnes in fiscal 2021; emissions have been on the decline since the benchmark year of 2013. As a leading company in zero-carbon energy, we are committed to safe, stable operation of nuclear power plants and development and promotion of renewable energy. These efforts have resulted in a 48% reduction in CO₂ emissions from the levels in 2013.



● Continuing safe and stable operation of nuclear power plants

As a power source that emits no CO₂, nuclear power generation is key to tackling global warming. With the understanding of residents from relevant local communities, we ensure safe and stable operation of restarted plants, gearing up to resume operations of suspended plants that have been confirmed to be safe. Dealing appropriately with investigations conducted by the Nuclear Regulation Authority, we will continuously promote voluntary safety measures that go beyond regulatory requirements.

● Maintaining and improving the thermal efficiency of thermal power plants

We continuously undertake measures related to facilities and operation, working to reduce the amount of fuel used and suppress CO₂ emissions by maintaining and improving thermal efficiency.

Our Himeji No. 2 Power Station, one of our largest natural gas-fired thermal power plants, employs a combined-cycle power generation with advanced 1,600°C class gas turbines. We are working to suppress CO₂ emissions by increasing thermal efficiency to about 60%, which is the highest global standard, and reducing the amount of fuel used. Moreover, at Units 1 and 3 of the Aioi Power Station, in addition to the heavy oil and crude oil we had been using, we began using natural gas, which is less expensive and better for the environment, in 2016.

● Biomass power generation project at Aioi Power Station Unit 2

Maximizing the use of its Aioi Power Station Unit 2, Aioi Bioenergy Corporation* is converting the power station into one of the largest biomass power generation plants in Japan. Construction is on schedule for commercial operation in January 2023, with the plant expected to contribute to achieving low-carbon energy.

* Aioi Bioenergy Corporation is jointly established by the Kansai Electric Power Co., Inc. and Mitsubishi Corporation Clean Energy Ltd.

● Support projects at the Maizuru Power Station for the R&D of CO₂ Capture System and for the CO₂ Marine Transport Technology Development and Demonstration

We support an entity*¹ involved in a NEDO*² project where the feasibility of treating coal-fired emissions with solid sorbent system CO₂ capture technology*³ is studied, providing a site for testing facilities at our Maizuru Power Station for future demonstrations. The solid sorbent system to be demonstrated is potentially a great deal more energy efficient than its conventional counterparts in capturing CO₂ and hence is considered promising next-generation capture technology. The construction of demonstration facilities started on July 1, 2021, with the commissioning run starting in fiscal 2022, followed by demonstrations in fiscal 2023.

We also support an entity*⁴ involved in an additional NEDO project*⁵ at our Maizuru Power Station to develop bulk CO₂ marine transport technology where R&D/demonstration sites are provided. The project, which involves CO₂ liquefaction at the shipping base, includes 1) R&D of liquefied CO₂ marine transport technology, 2) demonstrations of annual 10,000 tonne scale of CO₂ marine transport and 3) marine transport feasibility studies for CCUS purposes. Demonstrations of CO₂ marine transport are scheduled to start in fiscal 2024.

Through these initiatives, we are committed to reducing CO₂ emissions toward the realization of a decarbonized society.

*1 Kawasaki Heavy Industries, Ltd. Research Institute of Innovative Technology for the Earth (RIITE)

*2 New Energy and Industrial Technology Development Organization

*3 CCUS R&D and demonstration project / R&D of CO₂ capture technology / Feasibility study of treating coal-fired emissions with advanced solid sorbents

*4 Japan CCS Co., Ltd., Engineering Advancement Association of Japan, Itochu Corporation, Nippon Steel Corporation

*5 CCUS R&D and demonstration project / Large-scale CCUS demonstration in Tomakomai / Technological development and demonstration of CO₂ shipping



● Encouraging efficient energy use

With the goals of realizing energy conservation, cost cutting and CO₂ reduction for our customers and society, we are offering high-efficiency systems that utilize renewable energy sources and heat pump technologies, as well as proposing effective operation procedures. We are also providing total support for energy management to customers and other members of society and undertaking activities that serve these purposes, including the services for visualizing energy use.

The solution offered to residential customers is “total electric conversion,” which, through efficient use of energy, can make our lives more comfortable and convenient. Specific products and services include an energy-efficient hot water supply system (EcoCute), safe, comfortable and convenient electric appliances (IH cooking heaters, etc.), and power consumption visualization (Hapi e-Miruden). The internet-based service Hapi e-Miruden monitors the amount and rate of electricity and gas consumed. By entering data on utility costs the system can automatically indicate the total household CO₂ emissions while providing useful information, such as tips on energy conservation according to registered equipment or power consumption patterns.

We are providing total support for the energy management of our business customers. We offer proposals for energy systems that are optimized to their various needs, including making energy use more efficient, and explain how to operate these systems. We also work with other group companies to provide a range of services such as energy conservation diagnoses and energy management support appropriate to the customer's facility usage patterns. We remain committed to helping our customers minimize their energy consumption, achieve cost savings, and reduce their CO₂ emissions.

● Adoption of smart meters

Kansai Transmission and Distribution, Inc. is systematically introducing smart meters. In addition to making amounts of electricity use visible to customers, installing smart meters contributes to the energy conservation of society as a whole, and enables formation of facilities efficiently according to the conditions of electricity use, among other benefits. We have completed installation of smart meters for customers that receive high-voltage and extra-high-voltage electricity, and we plan to install them for every customer that receives low-voltage power by fiscal 2022.

● Group companies' renewable energy programs

Kanden Energy Solution Co., Inc. leverages its solar, wind and biomass power plants to decarbonize energy systems. Moreover, as a comprehensive energy business operator, we are promoting distributed renewable energy sources, storage batteries, and energy conservation, particularly by upgrading and standardizing energy management systems, thereby helping customers and society achieve zero-carbon emissions.

◆ Major achievements

Solar power generation

Arida Solar Power Station (Arida City, Wakayama Prefecture)

The Arida Solar Power Station is the Group's largest solar power station with about 150,000 solar panels installed across a large area.



Power output	29,700 kW
Generated energy	Approx. 31 GWh/annum (Equivalent to the annual consumption by 10,000 standard households)
CO ₂ emission reduction	Approx. 16,000 tonnes/annum*
Total site area	Approx. 45 ha
Commencement	October 2015

Wind power generation

Awaji Wind Power Station (Awaji City, Hyogo Prefecture)

While harmonizing with the community, this station operates by utilizing the wind blowing through the hills in northern Awaji City.



Power output	12,000 kW (6 turbines @2,000 kW)
Generated energy	Approx. 20 GWh/annum (Equivalent to the annual consumption by 6,500 standard households)
CO ₂ emission reduction	Approx. 7,000 tonnes/annum*
Commencement	December 2012

* The reduction in CO₂ emissions was a figure calculated upon commencement of operations.



● Performance data

GHG emissions		Unit	FY 2019	FY 2020	FY 2021
Direct greenhouse gas emissions (Scope 1)*1*2		10,000 t-CO ₂	2,663.2	2,857.2	2,377.1
Indirect greenhouse gas emissions (Scope 2)*1*3			0.5	0.6	0.5
Other indirect greenhouse gas emissions (Scope 3)*1*4			2,063.4	1,882.2	1,738.7
Category 1*5			142.7	159.9	143.4
Category 2*6			129.3	158.8	99.9
Category 3*7			1,789.6 (2,900.0)	1,561.6 (2,890.9)	1,146.0
Category 4*8			0.0	0.0	0.0
Category 5*9			1.0	1.0	1.1
Category 6*10			0.3	0.2	0.2
Category 7*11			0.6	0.6	0.6
Category 8*12			—	—	—
Category 9*12			—	—	—
Category 10*12			—	—	—
Category 11*13			—	—	347.5
Category 12*12			—	—	—
Category 13*12		—	—	—	
Category 14*12		—	—	—	
Category 15*12		—	—	—	

*1 The amount of greenhouse gases emitted in our entire supply chain is calculated in accordance with the Basic Guidelines on Accounting for Greenhouse Gas Emissions Throughout the Supply Chain (ver. 2.4) issued by the Ministry of the Environment and the Ministry of Economy, Trade and Industry.

*2 Direct GHG emissions (Scope 1) refer to emissions (energy-derived CO₂, SF₆ and N₂O emissions) reported by electric companies in line with the Law Concerning the Promotion of the Measures to Cope with Global Warming along with CO₂ emissions from transportation fuel use, which are excluded from the reporting obligations. SF₆ emissions, which are factored in, are based on calendar year.

*3 Indirect GHG emissions (Scope 2) include CO₂ emissions originating from electricity and heat purchased from external corporations, which should be reported by electric operators in line with the Law Concerning the Promotion of the Measures to Cope with Global Warming.

*4 Indirect emissions not covered by Scope 1 or Scope 2 (emissions from other corporations related to the business activities of the company concerned)

*5 Product/service price (purchased or obtained) × emission intensity

*6 Capital goods price × emission intensity

*7 Fuel consumption × emission intensity + electricity purchased externally × emission factor

With the revision of the interpretation of the Basic Guidelines on Accounting for Greenhouse Gas Emissions Throughout the Supply Chain (Ministry of the Environment/Ministry of Economy, Trade and Industry), we reviewed our performance in fiscal 2019 and 2020. The figures in parentheses represent values calculated before the revision.

*8 Fuel consumption × emission intensity

*9 Waste disposal volume × emission intensity + fuel consumption × emission intensity

*10 Number of employees × emission factor

*11 (City classification-based) Σ (number of employees × operating days × emission intensity)

*12 Not applicable because of specific to our business

*13 Total gas sales × Emission intensity

Included in calculation from fiscal 2021

The Group's CO ₂ emissions and their factors associated with power generation in Japan	Unit	FY 2019	FY 2020	FY 2021
CO ₂ emissions*1	10,000 t-CO ₂	2,850	3,040	2,540
CO ₂ emission factor (at the generation end) (per power generation output)*2	kg-CO ₂ /kWh	0.287	0.334	0.266

*1 CO₂ emissions refer to those produced by fuel combustion at the Group's thermal power plants in Japan.

*2 CO₂ emission factor (at the generation end) corresponds CO₂ emissions per kWh of the Group's domestic power generation business

• CO₂ emission factor (at the generation end) = CO₂ emissions of the Group's domestic power generation business ÷ amount of power generated

CO ₂ emissions and retail emission factors of our Company	Unit	FY 2019	FY 2020	FY 2021
CO ₂ emissions (before adjustment)*1	10,000 t-CO ₂	3,844	3,702	3,006
CO ₂ emissions (after adjustment)*2		3,594	3,581	3,099
CO ₂ emission factor (energy used) (before adjustment) (per amount of electric power sold)*3	kg-CO ₂ /kWh	0.340	0.362	0.299
CO ₂ emission factor (energy used) (after adjustment) (per amount of electric power sold)*3		0.318	0.350	0.308

*1 CO₂ emissions refer to those produced by fuel combustion at the thermal power plants and include those for power purchased from other corporations.

*2 Adjusted CO₂ emissions include the environmental value adjustments under the surplus solar power purchasing system and the renewable energy feed-in tariff system.

• CO₂ emissions = CO₂ emissions (before adjustment) + CO₂ emissions (after feed-in tariff adjustment, etc.)

*3 CO₂ emission factor (energy used) corresponds CO₂ emissions per kWh of the Kansai Electric Power Co., Inc. electricity used.

• CO₂ emission factor (energy used) (before adjustment) = CO₂ emissions (before adjustment) ÷ amount of electric power sold

• CO₂ emission factor (energy used) (after adjustment) = CO₂ emissions (after adjustment) ÷ amount of electric power sold

*1,2,3 The results for FY 2021 are provisional; the actual CO₂ emission factor will be officially announced by the government in accordance with the Law Concerning the Promotion of the Measures to Cope with Global Warming, etc.



Greenhouse gases other than CO ₂	Unit	FY 2019	FY 2020	FY 2021
N ₂ O (dinitrogen oxide)* ¹	10,000 t-CO ₂	2.3	2.3	2.3
SF ₆ (sulfur hexafluoride)* ¹ * ²		3.8	4.0	3.9

*1 The results were first made public in fiscal 2010. CO₂ equivalent

*2 SF₆ emissions are based on the calendar year.

Utilization rate of nuclear power facilities and net thermal efficiency of thermal power facilities	Unit	FY 2019	FY 2020	FY 2021
Utilization rate of nuclear power facilities* ¹	%	48.4	28.0	61.0
Net thermal efficiency of thermal power facilities* ²		48.6	47.8	48.2

*1 Utilization rate of nuclear power facilities = amount of power generated ÷ (permitted output × calendar hours) × 100

*2 Net thermal efficiency of thermal power facilities = (amount of power transmitted × quantity of heat per kWh) ÷ total amount of input heat (lowest heat value standard) × 100

Energy consumption	Unit	FY 2019	FY 2020	FY 2021	
Total energy consumption*	1,000 GJ	460,063	494,045	380,842	
Thermal fuel consumption	Coal	1,000 t	3,305	3,254	3,597
	Heavy oil	1,000 kL	48	210	683
	Crude oil		30	218	176
	LNG	1,000 t	6,502	6,814	4,319
	Wood pellets	1,000 kL (heavy oil equivalent)	0.2	4	3
	Other		202	298	181
Fuels for nuclear power generation (weight of pre-irradiation uranium)	tU	52	77	30	

* These figures are reported to the government in accordance with the Act on the Rational Use of Energy. (Fossil fuel consumption, purchased electricity, and purchased heat)

