

# 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 pledged in October 2020 to achieve carbon neutrality by 2050. Moreover, at the climate change summit in April 2021, it announced a greenhouse gas reduction target of 46% below fiscal 2013 levels by fiscal 2030.

<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 pages 41-48 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 CO<sub>2</sub> 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 the measures for zero-carbon society. At the same time, we will provide various solutions (electrification, storage batteries, etc.) to help customers and society reduce their CO<sub>2</sub> emissions.

The Zero Carbon Roadmap, meanwhile, includes an interim target for fiscal 2030 toward the 2050 goal. Specifically, our voluntary measures aim to halve CO<sub>2</sub> 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 CO<sub>2</sub> emission factor of electricity supplied to customers to industry-leading levels and providing customers and society with various services to help reduce CO<sub>2</sub> 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 (compared to March 2019) 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 CO<sub>2</sub> emissions

- Keep the top spot for the amount of zero-carbon power generation in Japan
- Halve CO<sub>2</sub> emissions associated with power generation in Japan in FY 2025 (compared to FY 2013)

#### ● Continuing safe and stable operation of nuclear power plants\*<sup>1</sup>

- 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\*<sup>1</sup>

- Achieve benchmark indicators\*<sup>2</sup> (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 SF<sub>6</sub> emissions (calendar year basis) (gas recovery rate upon inspection/removal of equipment)

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

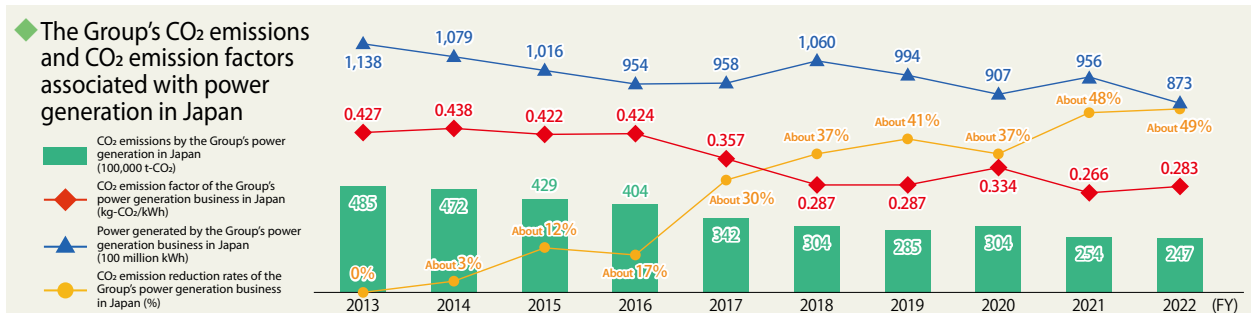
\*1 Targets and results apply only to the Company \*2 Indicators based on the benchmark system of the Act on Rationalizing Energy Use and Shifting to Non-fossil Energy



## ▶ Efforts

### ● Our Group's CO<sub>2</sub> emissions associated with power generation in Japan

The Group's CO<sub>2</sub> emissions originating from its domestic power generation amounted to around 24.7 million tonnes in fiscal 2022; 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 49% reduction in CO<sub>2</sub> emissions from the levels in 2013.



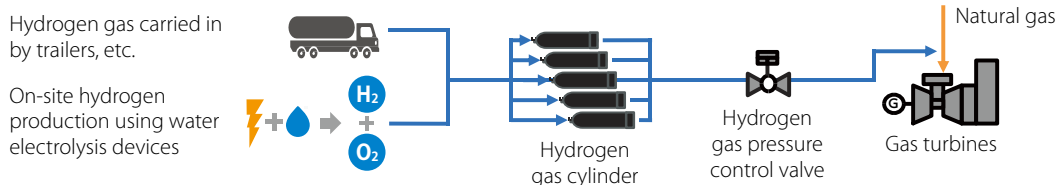
### ● Continuing safe and stable operation of nuclear power plants

As a power source that emits no CO<sub>2</sub>, 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.

### ● Acquiring knowledge on the introduction of hydrogen power generation Green Innovation Fund Project in the Himeji area

We have been working on feasibility studies since the adoption of the Green Innovation Fund Project\*<sup>1</sup>—Large-scale Hydrogen Supply Chain Development, which was offered by NEDO\*<sup>2</sup> in August 2021. Going forward, after design and manufacture of the system, we will conduct demonstration of power generation by co-firing of hydrogen at the gas turbines installed at the Himeji No. 2 Power Station and aim to establish operational techniques that can be used for social implementation of hydrogen power generation.

#### Demonstration system process flow



### ● Acquiring knowledge on the introduction of CCUS

#### ◆ CO<sub>2</sub> capture technology research

We are supporting NEDO's project at our Maizuru Power Station, where solid sorbent system CO<sub>2</sub> capture technology is being tested for treatment of coal-fired emissions\*<sup>3</sup>. The commissioning run started in fiscal 2022 at testing facilities, with full-scale demonstrations scheduled in the second half of fiscal 2023. The solid sorbent system is potentially a great deal more energy efficient than its conventional counterparts in capturing CO<sub>2</sub> and is therefore considered promising next-generation capture technology.

#### ◆ Demonstrating CO<sub>2</sub> mass transport

We are supporting another project from NEDO, also at our Maizuru Power Station, where research, development, and demonstrations are underway for CO<sub>2</sub> mass transport\*<sup>4</sup>. Specifically, the project, which involves CO<sub>2</sub> liquefaction at the shipping base, includes 1) R&D related to liquefied CO<sub>2</sub> marine transport technology, 2) demonstrations of 90,000 tonne scale liquefied CO<sub>2</sub> marine transport, and 3) marine transport feasibility studies for CCUS purposes. CO<sub>2</sub> marine transport demonstrations are scheduled to start in fiscal 2024.

\*1 The 2 trillion yen Green Innovation Fund, set up by the government for NEDO, aims to encourage innovation among companies to achieve carbon neutrality by 2050, subsidizing companies for up to 10 years.

\*2 New Energy and Industrial Technology Development Organization

\*3 Development of carbon recycling/next-generation thermal power generation technology / Research and development of CO<sub>2</sub> capture technology / Research on application of advanced CO<sub>2</sub> solid sorbents to treatment of coal-fired emissions

\*4 CCUS R&D and demonstration project / Large-scale CCUS demonstration in Tomakomai / Demonstration of CO<sub>2</sub> transport / Technological development and demonstration of CO<sub>2</sub> marine transport



## ● Aioi Bioenergy in full-scale operation

We established Aioi Bioenergy Corporation, a joint venture with Mitsubishi Corporation Clean Energy Ltd., and started construction work at Aioi Power Station Unit 2 in Aioi City, Hyogo Prefecture in February 2022 to switch the fuel from heavy/crude oil to woody biomass and its full-scale operation started in March 2023. The fuel switch resulted in an output of 200,000 kW, one of the largest biomass exclusive firing thermal power generation capacities in Japan.



\* A ventilator that feeds pulverized fuel to burners

## ● Encouraging efficient energy use

With the goals of realizing energy conservation, cost cutting and CO<sub>2</sub> 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 CO<sub>2</sub> 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 CO<sub>2</sub> emissions.

## ● Adoption of smart meters

Kansai Transmission and Distribution, Inc. has been 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. Smart meters are installed at all special-high-voltage and high-voltage customers. For low-voltage customers, excluding those operating in areas where replacement is not feasible, smart meters were installed by the end of fiscal 2022.

## ● Group companies' renewable energy programs

Kanden Energy Solution Co., Inc. leverages its solar and wind 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)

This 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 <sub>2</sub> 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 <sub>2</sub> emission reduction	Approx. 7,000 tonnes/annum*
Commencement	December 2012

\* The reduction in CO<sub>2</sub> emissions was a figure calculated upon commencement of operations.



## ● Performance data

GHG emissions	Unit	FY 2020	FY 2021	FY 2022
Direct greenhouse gas emissions (Scope 1)*1*2	10,000 t-CO <sub>2</sub> eq	2,857.2	2,377.1	2,304.3*15
Energy-derived CO <sub>2</sub>		2,850.3	2,370.4	2,297.6
Vehicle-emitted CO <sub>2</sub>		0.6	0.6	0.6
Non-energy-derived CO <sub>2</sub>		0.0	0.0	0.0
CH <sub>4</sub>		0.0	0.0	0.0
N <sub>2</sub> O		2.3	2.3	2.1
HFC		0.0	0.0	0.0
PFC		0.0	0.0	0.0
SF <sub>6</sub>		4.0	3.8	4.0
NF <sub>3</sub>		0.0	0.0	0.0
Indirect greenhouse gas emissions (Scope 2)*1*3		0.6	0.5	0.5*15
Other indirect greenhouse gas emissions (Scope 3)*1*4		2,409.9	1,924.2	3,126.1
Category 1*5*14		266.6 (159.9)	248.5 (143.4)	255.0
Category 2*6*14		166.7 (158.8)	104.9 (99.9)	101.7
Category 3*7*14		1,549.8 (1,561.6)	1,147.6 (1,151.2)	2,353.5
Category 4*8		0.0	0.0	0.0
Category 5*9	1.0	1.1	1.0	
Category 6*10	0.2	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*14	—	421.4 (347.5)	414.1	
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. 2.5) 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 CO<sub>2</sub>, SF<sub>6</sub> and N<sub>2</sub>O emissions) reported by electric companies in line with the Law Concerning the Promotion of the Measures to Cope with Global Warming along with CO<sub>2</sub> emissions from transportation fuel use, which are excluded from the reporting obligations. SF<sub>6</sub> emissions, which are factored in, are based on calendar year.

\*3 Indirect GHG emissions (Scope 2) include CO<sub>2</sub> emissions originating from electricity and heat purchased from other 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 + Total gas sales × emission intensity. Results from past years were reviewed 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).

\*6 Capital goods price × emission intensity. Results from past years were reviewed with the revision of some calculation methods.

\*7 Fuel and heat consumption × emission intensity + power purchased from other corporations × emission intensity + emissions derived from the production of power purchased from other corporations for sale to end users. Results from past years were reviewed 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).

\*8 Fuel consumption × emission intensity

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

\*10 Number of employees × emission intensity

\*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. Results from past years were reviewed with revision of some calculation methods.

\*14 Figures in parentheses were determined before revision of the calculation method.

\*15 Given the third party assurance for figures shown on page 48 of the Kansai Electric Power Group Integrated Report 2023



GHG emissions, including values from group companies*1		Unit	FY 2020	FY 2021	FY 2022
Direct greenhouse gas emissions (Scope 1)*2*3		10,000 t-CO <sub>2</sub> eq	—	—	2,304.8
Indirect greenhouse gas emissions (Scope 2)*2*4			—	—	1.5
Other indirect greenhouse gas emissions (Scope 3)*2*5			—	—	3,522.6
Category 1*6			—	—	296.8
Category 2*7			—	—	129.1
Category 3*8			—	—	2,646.0
Category 4*9			—	—	0.0
Category 5*10			—	—	1.0
Category 6*11			—	—	0.3
Category 7*12			—	—	0.7
Category 8*16			—	—	—
Category 9*16			—	—	—
Category 10*16			—	—	—
Category 11*13			—	—	448.4
Category 12*14			—	—	0.1
Category 13*15		—	—	0.3	
Category 14*16		—	—	—	
Category 15*16		—	—	—	

\*1 Including the Company, Kansai Transmission and Distribution, Inc., Kanden Energy Solution Co., Inc., Kanden Realty & Development Co., Ltd., and OPTAGE Inc.

\*2 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. 2.5) issued by the Ministry of the Environment and the Ministry of Economy, Trade and Industry.

\*3 Direct GHG emissions (Scope 1) refer to emissions (energy-derived CO<sub>2</sub>, SF<sub>6</sub> and N<sub>2</sub>O emissions) reported by electric companies in line with the Law Concerning the Promotion of the Measures to Cope with Global Warming along with CO<sub>2</sub> emissions from transportation fuel use, which are excluded from the reporting obligations. SF<sub>6</sub> emissions, which are factored in, are based on calendar year.

\*4 Indirect GHG emissions (Scope 2) include CO<sub>2</sub> emissions originating from electricity and heat purchased from other corporations, which should be reported by electric operators in line with the Law Concerning the Promotion of the Measures to Cope with Global Warming.

\*5 Indirect emissions not covered by Scope 1 or Scope 2 (emissions from other corporations related to the business activities of the company concerned)

\*6 Product/service price (purchased or obtained) × emission intensity

\*7 Capital goods price × emission intensity

\*8 Fuel and heat consumption × emission intensity + power purchased from other corporations × emission intensity + emissions derived from the production of power purchased from other corporations for sale to end users

\*9 Fuel consumption × emission intensity

\*10 Waste disposal volume × emission intensity + fuel consumption × emission intensity

\*11 Number of employees × emission intensity

\*12 (City classification-based) Σ (number of employees × operating days × emission intensity)

\*13 Total gas sales × emission intensity + real estate sales × emission intensity × remaining statutory useful life + number of openings × emission life period × product power consumption per day × emission intensity

\*14 Real estate sales × emission intensity + weight of products sold × emission intensity

\*15 Energy consumption × emission intensity

\*16 Not applicable because of specific to our business

\*17 Figures including values representing the Company, Kansai Transmission and Distribution, Inc., and group companies

Group's CO <sub>2</sub> emissions and their factors associated with power generation in Japan	Unit	FY 2020	FY 2021	FY 2022
CO <sub>2</sub> emissions*1	10,000 t-CO <sub>2</sub>	3,040	2,540	2,470
CO <sub>2</sub> emission factor (at the generation end) (per power generation output)*2	kg-CO <sub>2</sub> /kWh	0.334	0.266	0.283

\*1 CO<sub>2</sub> emissions refer to those produced by fuel combustion at the Group's thermal power plants in Japan.

\*2 CO<sub>2</sub> emission factor (at the generation end) corresponds CO<sub>2</sub> emissions per kWh of the Group's domestic power generation business.

• CO<sub>2</sub> emission factor (at the generation end) = CO<sub>2</sub> emissions of the Group's domestic power generation business ÷ amount of power generated



CO <sub>2</sub> emissions and retail emission factors of the Company	Unit	FY 2020	FY 2021	FY 2022
CO <sub>2</sub> emissions (before adjustment)* <sup>1</sup>	10,000 t-CO <sub>2</sub>	3,702	3,011	4,012
CO <sub>2</sub> emissions (after adjustment)* <sup>2</sup>		3,583	3,106	4,689
CO <sub>2</sub> emission factor (energy used) (before adjustment) (per amount of electric power sold)* <sup>3</sup>	kg-CO <sub>2</sub> /kWh	0.362	0.299	0.360
CO <sub>2</sub> emission factor (energy used) (after adjustment) (per amount of electric power sold)* <sup>3</sup>		0.350	0.309	0.420

\*1 CO<sub>2</sub> emissions refer to those produced by fuel combustion at the thermal power plants and include those for power purchased from other corporations.

\*2 Adjusted CO<sub>2</sub> emissions refer to values adjusted according to FIT, non-FIT non-fossil fuel power source procurement, and certified emission reduction in Japan and abroad.

\*3 CO<sub>2</sub> emission factor (energy used) corresponds CO<sub>2</sub> emissions per kWh of the Kansai Electric Power Co., Inc. electricity used.

• CO<sub>2</sub> emission factor (energy used) (before adjustment) = CO<sub>2</sub> emissions (before adjustment) ÷ amount of electric power sold

• CO<sub>2</sub> emission factor (energy used) (after adjustment) = CO<sub>2</sub> emissions (after adjustment) ÷ amount of electric power sold

\*1,2,3 The results for FY 2022 are provisional; the actual CO<sub>2</sub> 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.

Note: Figures representing the Company only

Greenhouse gases other than CO <sub>2</sub>	Unit	FY 2020	FY 2021	FY 2022
N <sub>2</sub> O (dinitrogen oxide)* <sup>1</sup>	10,000 t-CO <sub>2</sub> eq	2.3	2.3	2.1
SF <sub>6</sub> (sulfur hexafluoride)* <sup>1*2</sup>		4.0	3.9	4.0

\*1 The results were first made public in fiscal 2010. CO<sub>2</sub> equivalent

\*2 SF<sub>6</sub> emissions are based on the calendar year.

Utilization rate of nuclear power facilities and net thermal efficiency of thermal power facilities	Unit	FY 2020	FY 2021	FY 2022
Utilization rate of nuclear power facilities* <sup>1</sup>	%	28.0	61.0	48.5
Net thermal efficiency of thermal power facilities* <sup>2</sup>		47.8	48.2	48.1

\*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

Note: Figures representing the Company only

Energy consumption	Unit	FY 2020	FY 2021	FY 2022	
Total energy consumption* <sup>1</sup>	1,000 GJ	494,045	380,842	370,022	
Thermal fuel consumption* <sup>2</sup>	Coal	1,000 t	3,254	3,597	3,294
	Heavy oil	1,000 kL	210	683	822
	Crude oil		218	176	183
	LNG	1,000 t	6,814	4,319	4,150
	Wood pellets	1,000 kL (heavy oil equivalent)	4	3	2
	Other		298	181	197
Fuels for nuclear power generation (weight of pre-irradiation uranium)* <sup>2</sup>	tU	77	30	114	

\*1 These figures are reported to the government in accordance with the Act on Rationalizing Energy Use and Shifting to Non-fossil Energy. (Fossil fuel consumption, purchased electricity, and purchased heat)

\*2 Figures representing the Company only

