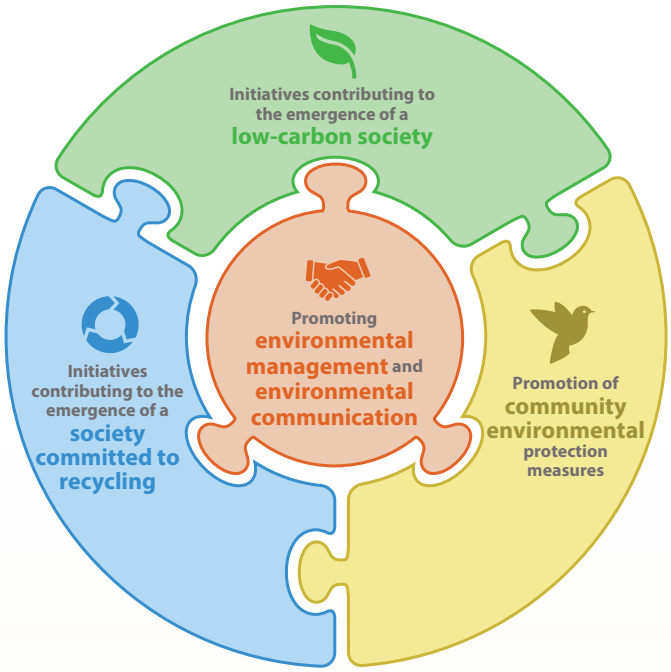
2 Proactive Approach with a View to Creating Ever Better Environment

CSR Action Principles

As a provider of energy services that are closely connected with the environment, the Kansai Electric Power Group fully recognizes the scale of impact its business activities have on the global environment and therefore will strive to alleviate the environmental burden and environmental risks accompanying our business activities. Furthermore, we will aspire for creating ever better environment and contribute proactively to the development of a sustainable society through provision of products and services having lesser environmental impact.

Kansai Electric Power Group Environmental Action Plan

Based on our Kansai Electric Power Group CSR Action Charter, as an energy business that has a deep connection to the environment, the Kansai Electric Power Group is taking on the initiatives contributing to the emergence of a low-carbon society and a society that is committed to recycling as well as the promotion of community environmental protection measures. In order to be a corporate group that is trusted by society, we are also striving to promote environmental management and environmental communication.



Initiatives contributing to the emergence of a low-carbon society

- Lowering electric power's carbon intensity
- Contributing to energy conservation, cost reductions and CO_2 emissions reductions for customers and society
- Technological developments for constructing the Smart Grid
- Overseas activities
- Technical development efforts
- Value chain efforts
- Efforts to reduce other greenhouse gases in addition to CO_2

Initiatives contributing to the emergence of a society committed to recycling

- Promotion of proactive 3R efforts toward the goal of zero emissions
- Promoting safe, reliable, and complete disposal of PCB wastes
- Promoting green procurement

Promotion of community environmental protection measures

- Measures to prevent air and water pollution, etc.
- Efforts to strictly manage and reduce toxic chemicals
- Promotion of business activities that consider the preservation of biodiversity

Promoting environmental management and environmental communication

- Continuous improvement and strict adherence to laws and regulations using environmental management systems based on ISO 14001 systems
- Active advancement of environmental awareness raising activities with local communities and customers and active disclosure of environmental information

Status overview of our business activities and environmental load (FY 2015)

INPUT

Fuels for power generation

Fuels for thermal power generation	Coal	3,871 thousand t (dry coal weight)
	Heavy oil	193 thousand kL
	Crude oil	3,366 thousand kL
	LNG (liquefied natural gas)	8,319 thousand t
	Wood pellets	18 thousand kL (heavy oil equivalent)
	Other	0.6 thousand kL (heavy oil equivalent)
Fuels for nuclear power generation		61 tU (weight of pre-irradiation uranium)

Water for power generation

Industrial water	4.53 million m³
Clean water	1.97 million m³
River water, groundwater, etc.	0.36 million m³
Seawater (desalinated)	2.55 million m³

Resources

Limestone	74 thousand t
Ammonia	14 thousand t

Office

Office electricity		80 GWh
Office water		0.42 million m³
Printer paper		908 t
Vehicle fuels	Gasoline	2.5 thousand kL
	Diesel oil	0.7 thousand kL

Business activities

Nuclear power generation
0.8 TWh

Thermal power generation
86.5 TWh

Power generation

Hydroelectric power generation
14.8 TWh
(80 GWh from small-scale hydropower generation)

Renewable energies
0.1 TWh
(Solar energy, biomass)

Purchased from other companies 36.8 TWh (of which solar, wind, biomass, and waste-derived power 3.8 TWh)

Electricity consumed within power plants (3.4) TWh

Pumped-storage hydropower (1.1) TWh

Power transmission and distribution

SF_6 gas recovery rate (upon inspection) 99.1%

Office

Low-pollution vehicle adoption rate 86.2%

Electricity consumed within transformer substations (0.2) TWh

Transmission and distribution losses (7.0) TWh

OUTPUT

Released into atmosphere

CO_2 (carbon dioxide)*	65 million t-CO_2 (63 million t-CO_2)**
N_2O (nitrous oxide)***	27 thousand t-CO_2
SF_6 (sulfur hexafluoride)***	44 thousand t-CO_2
SOx (sulfur oxides)	4,735 t
NOx (nitrogen oxides)	7,397 t

* Includes CO_2 originating from electricity purchased from other electric power companies
** Emissions taking carbon credits into account
*** CO_2 conversion

Released into water areas

COD emissions	21 t
Total effluents	5.30 million m³

Radioactive waste

Low-level radioactive waste generated*	−6,021 drums (200 L drums)

* Net generation (generated amount − reduced amount)

Industrial waste, etc.

Total emissions		670 thousand t
Processing classification	Recycling	669 thousand t
	Reduction in intermediate treatment	0.5 thousand t
	Final disposal	0.9 thousand t
Recycling rate		99.9%

CO_2 emissions resulting from office activities

Total emissions		46,925 t-CO_2
Emissions breakdown	Office electricity (0.50 kg-CO_2/kWh)	39,101 t-CO_2
	Office water (0.23 kg-CO_2/m³)	98 t-CO_2
	Vehicle fuels (Gasoline: 2.32 kg-CO_2/L) (Diesel oil: 2.58 kg-CO_2/L)	7,727 t-CO_2

- Figures in parentheses are CO_2 emission coefficients. The emission coefficient for office electricity consumption reflects carbon credit offsets and other factors.

Customers

Electric power sold 127.5 TWh

Environmental efficiency (FY 1990 = 100)

- Electric power sold / Composite index* 115
- Electric power sold / CO_2 emissions 69

* Composite index = (Environmental load caused by CO_2, SOx, NOx, and landfill disposal of industrial waste) + (Resources consumed Oil, coal, LNG)

- In calculations starting in FY 2007, we are using the LIME2 integrated coefficient developed by the National Institute of Advanced Industrial Science and Technology.
- The amount of CO_2 emissions shown takes carbon credits into account.

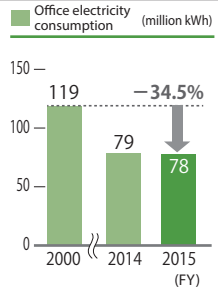
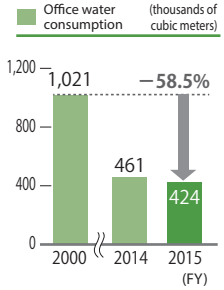
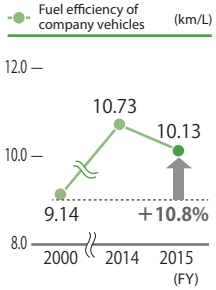
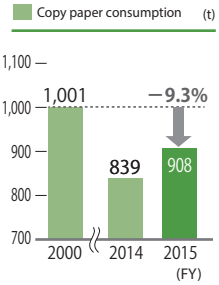
Note 1: This table contains non-consolidated figures for Kansai Electric Power Co., Inc. only.
Note 2: Totals may not sum due to rounding.
Note 3: Thermal power generation figures do not include biomass power generation.

Eco Action (annual targets and results)

Main environmental initiatives arising from our business activities

Item	Initiatives and Results: Initiative	Initiatives and Results: Result	Related page
Initiatives contributing to the emergence of a low-carbon society			
Promoting "safety first" operations at nuclear power plants	Independently and continuously advance measures that conform to new regulatory requirements as well as various safety measures that seek to further increase safety	Advance safety promotion measures that conform to new regulatory requirements, respond suitably to judgments of the Nuclear Regulation Authority, and implement efforts based on our "Ongoing Voluntary Initiatives to Enhance Nuclear Safety (roadmap)"	38 39
Maintaining and improving the thermal efficiency of thermal power plants (lower heating value base)	Implement ongoing measures at existing thermal power generation facilities and operations while maintaining or improving thermal efficiency.	Thermal efficiency 46.6%	39
Development and dissemination of renewable energy	Contribute to promoting the popularization of renewable energy through its development and other efforts	• Renewable energy development (fiscal 2015 results): 2 locations, 30,220 kW* • Renewable energy purchased: 4.0 billion kWh	39 40
Promoting use of innovative forms of energy among customers and communities	Promote the adoption of smart meters and the popularization and expansion of Hapi e-Miruden, which contribute to increasing customer energy conservation awareness and meeting a wide range of needs	Smart meters introduced: 1,600,000/yr (5,550,000 total) Hapi e-Miruden service: 1,608,000 subscribers in total	41 42
Limiting SF_6 emissions (calendar year basis) (gas recovery rate upon inspection/removal of equipment)	Implement steady SF_6 gas recovery through the appropriate operation of recovery equipment, for example	99.13% (upon inspection) 99.17% (upon removal)	—
Initiatives contributing to the emergence of a society committed to recycling			
Proper processing of PCB wastes	Process the entire amount reliably and safely within the legal time limit	Reference: Processed volume (cumulative total) Low-concentration PCBs: Insulation oil: about 77,000 kL Pole-mounted transformer cases: about 240,000 units** High-concentration PCBs: 4,763 units***	44
Promotion of community environmental protection measures			
Maintaining sulfur oxide (SOx) and nitrogen oxide (NOx) emission levels proportional to the volume of power generated (emissions intensity) SOx / NOx	Seek to maintain one of the world's lowest emissions (emissions intensity) levels through the appropriate operation of sulfur scrubbers and nitrogen scrubbers	Emissions intensity SOx: 0.046 g/kWh (overall) Thermal: 0.055 g/kWh NOx: 0.072 g/kWh (overall) Thermal: 0.085 g/kWh	45

Office energy and resource conservation activities

Item	Reducing office electricity consumption	Reducing office water consumption	Improving fuel efficiency of company vehicles	Reducing copy paper consumption
Change after FY 2000 (extract)				

* ① Arida Solar Power Station (29,700 kW, began operation in October), ② Dashidaira Power Station (520 kW, began operation in November)
** Completed processing at pole-mounted transformer case recycling center in July 2015
*** Processing results from high-voltage transformers, condensers and other electrical equipment processing subcontracted to the Japan Environmental Storage & Safety Corporation (JESCO)

Initiatives contributing to the emergence of a low-carbon society

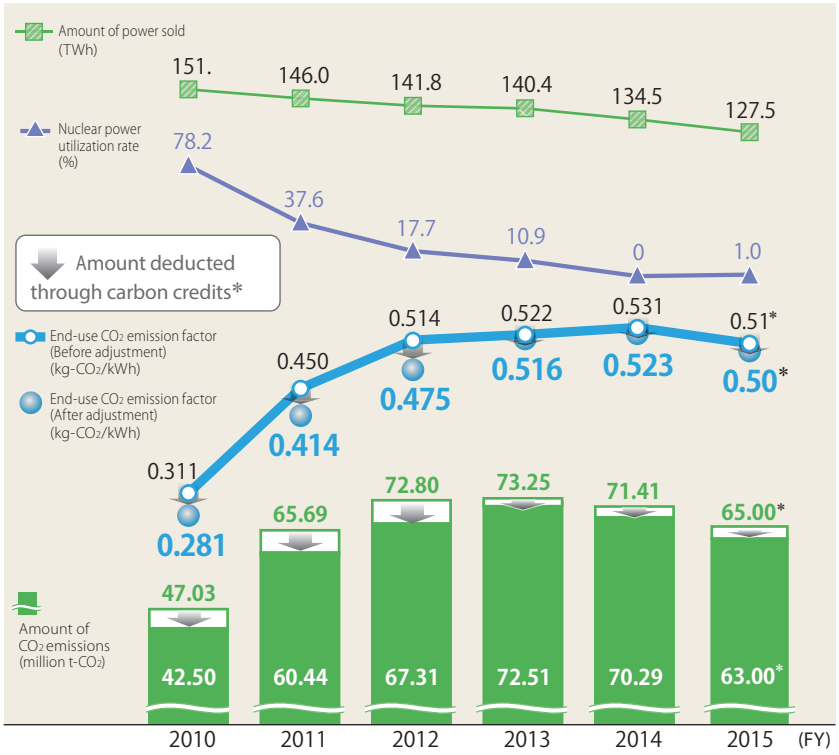
Efforts to reduce CO_2 emissions

Since fiscal 2011, due to the long-term shutdown of nuclear power plants, the amount of CO_2 emissions has increased for our company; however, as a result of increasing the use of nuclear power and renewable energy, our CO_2 emission factor improved compared to the previous fiscal year, and is expected to be about 0.50 kg-CO_2/kWh* (after adjustment) in fiscal 2015.

The power industry, including our company, established the Electric Power Council for a Low Carbon Society, and the industry as a whole is seeking to achieve an emission factor of about 0.37 kg-CO_2/kWh by fiscal 2030. We will continue to advance efforts to suppress CO_2 emissions, including the utilization of nuclear power generation with safety as the first priority, the maintenance and improvement of the thermal efficiency of thermal power plants, and the development of renewable energies.

* This value is provisional. Based on the Act on Promotion of Global Warming Countermeasures and other factors, the actual value of the CO_2 emission factor will be officially announced by the national government.

● **Changes in CO_2 Emission Factor, etc.**

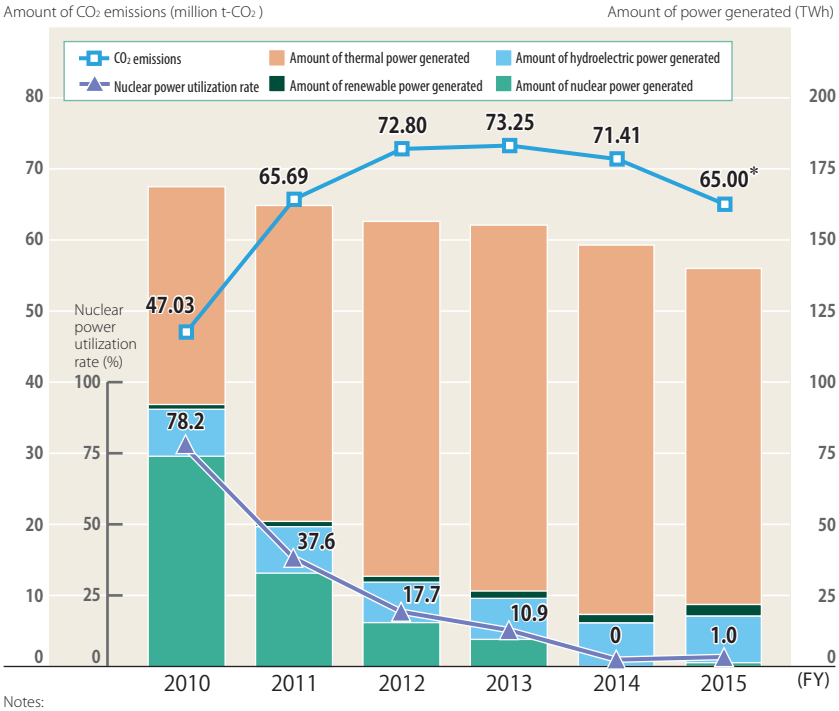


* Values result from the GHG Emissions Accounting, Reporting, and Disclosure System as mandated by the Act on Promotion of Global Warming Countermeasures. Emission factors for FY 2011 and beyond after adjustment account for exclusions reflecting carbon credits as well as environmental value adjustments based on the purchasing system for surplus solar power and the feed-in tariff (FIT) for renewable energy.

Effect of nuclear power generation on controlling CO_2 emissions

Unlike thermal power generation fueled by hydrocarbons such as coal, oil, and natural gas, nuclear power generation emits no CO_2; it is a method of power generation that contributes greatly to CO_2 emission control. Since the Great East Japan Earthquake, CO_2 emissions have risen significantly with the large drop in the availability of nuclear power generation and increased thermal power generation. The shutdown of nuclear power generation facilities has resulted in an extreme consequence, the release of tens of millions of tonnes of CO_2 annually.
We therefore believe that nuclear power, generated with an emphasis on safety, will be a very important source of power from the perspective of environmental issues, preventing global warming while ensuring energy security and economic growth in the future.

● **Changes in Nuclear Power Utilization Rate and CO_2 Emissions**



Notes:
1. CO_2 emissions values shown do not include value of carbon credits or other factors.
2. The amounts of power are amounts demanded from our company (generating end).

Lowering electric power's carbon intensity

In addition to our efforts to support the restart of our nuclear power stations, we will continue to increase the efficiency of our thermal power plants and promote the development and adoption of renewable energy. In this way, we will strive to lower the carbon intensity of the electric power we provide to our customers.

Nuclear power generation prioritizing safety

Since nuclear power generation emits no CO_2, it is an important source of energy that does not contribute to global warming. Kansai Electric Power is responding appropriately to the Nuclear Regulation Authority (NRA) to achieve a quick restart of our plants with safety assurances and with the understanding of residents of our local communities. As well, we are further enhancing safety by continuing to promote autonomous measures that exceed regulatory requirements.

Maintain and improve thermal efficiency and implement fuel conversion at thermal power plants

We undertook to convert the Himeji No. 2 Power Station, one of our largest natural gas-fired thermal power plants, to a combined-cycle power plant* with advanced 1,600°C class gas turbines. We are working to suppress the amount of CO_2 emissions by increasing thermal efficiency to about 60%, which is the highest global standard, and reducing the amount of fuel used.

Moreover, at Unit 1 of the Aioi Power Station, in addition to the heavy oil and crude oil we had been using thus far, we began using natural gas, which is less expensive and better for the environment, in May 2016. We also plan to begin using natural gas at Unit 3 of the same plant in August of the same year.

* A power plant with high thermal efficiency that generates electricity through a gas turbine as well as a steam turbine utilizing the waste heat of the gas turbine

Development and dissemination of renewable energy

Like nuclear power, renewable forms of energy such as hydroelectric power, solar power, and wind power emit no CO_2 when generating power, making them effective energy sources for preventing global warming. As a unified group, we are making efforts that include improving the output of existing hydroelectric power stations and building solar and wind power generation plants. As of March 2016, we have announced the development and planning of about 110,000 kW of generation capacity. We will continue to work proactively for the development of diverse energy sources, including offshore wind power generation and geothermal electric power generation, both inside and outside our jurisdiction.

We are also promoting the adoption of this energy by accommodating a system of feed-in tariff of renewable energy. In short, by utilizing a good balance of varied energy sources, we are helping to lower the carbon intensity of electric power. The electricity generated by solar and wind power fluctuates with the weather over a short time, however. As a result, the frequency remains unstable, and power generated in excess of demand can have an effect on the quality of electricity. Furthermore, the cost of power generation rises because the utilization rate of the power facilities is low; moreover, because the energy density of such sources is low, a much larger area and larger facilities are required for power station construction. We are promoting initiatives to overcome the issues of stability of supply and cost of power generation as we seek to expand and promote the adoption of renewable energy.

① Solar power stations (9 locations)

Reduction in CO_2 emissions

About 27,000 tonnes/year

Arida Solar Power Station

② Dashidaira dam

Reduction in CO_2 emissions

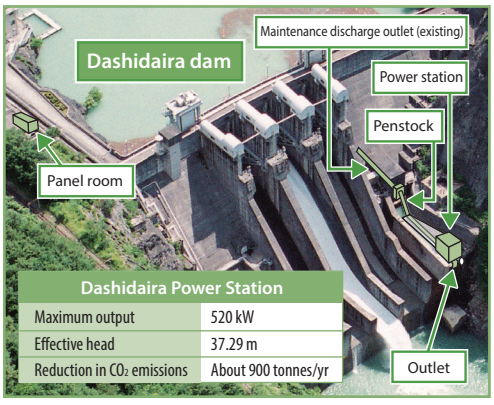
About 900 tonnes/year

■Solar power development ①

In October 2015, Kanden Energy Solution Co., Inc. (Kenes) began operation of the Arida Solar Power Station (29,700 kW output) in Arida City, Wakayama Prefecture. Under construction is the Shiso Solar Power Station (1,980 kW; scheduled to begin operation in September 2016) in Shiso City, Hyogo Prefecture. Including these, our Group operates solar power plants in nine locations in total, resulting in a total expected reduction in CO_2 emissions of 27,000 tonnes/year.

■Development of hydroelectric power generation ②

In November 2015, the Dashidaira Power Station (520 kW maximum output) began operation in Unazuki, Kurobe City, Toyama Prefecture as our 152nd hydroelectric power plant.



Dashidaira Power Station	
Maximum output	520 kW
Effective head	37.29 m
Reduction in CO_2 emissions	About 900 tonnes/yr

Water is released from the Dashidaira Dam, which is owned by our company, to protect the scenery and otherwise maintain the river environment downstream. This power plant uses this water to generate power.

■Wind power development ③

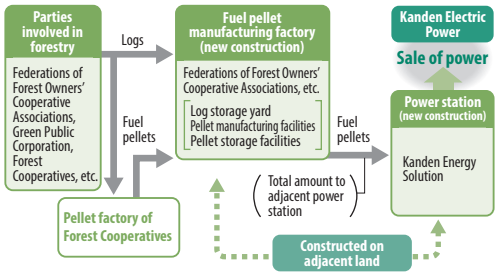
In the city of Tahara, Aichi Prefecture, Kenes' Tahara No. 4 Wind Power Station (6,000 kW [2,000 kW × 3 units]) has been in continuous operation since May 2014. Together with the Awaji Wind Power Station (12,000 kW), our Group operates wind power stations in two locations, which reduce our CO_2 emissions by about 19,000 tonnes/year in total.

Tahara No. 4 Wind Power Station

■Development of biomass power generation ④

Kenes is planning a wood pellet biomass fuel project in collaboration with Hyogo Prefecture, the City of Asago, the Hyogo Prefectural Federations of Forest Owners' Cooperative Associations, and Hyogo Midori Kosha (Green Public Corporation). As result, we can expect CO_2 emissions to be reduced by about 24,000 tonnes/year.

● Biomass Project in the City of Asago, Hyogo Prefecture



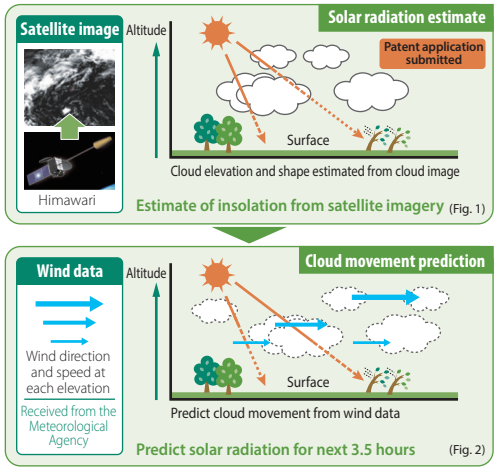
Technical development efforts

By making use of our specialized technical capabilities as an electric company, we are contributing to the emergence of a low-carbon society. Specifically, we are developing breakthroughs in energy management, green innovation, and system operation and control, among other technologies.

Apollon solar power short-time forecasting system

In preparation for the high-volume adoption of solar power generation, which varies in output according to the weather, we developed the Apollon solar power short-time forecasting system together with the Meteorological Engineering Center, Inc. from fiscal 2012–2014. The Apollon system analyzes the heights and shapes of clouds from cloud images captured by weather satellites and estimates the solar radiation strength on the Earth's surface (Fig. 1). In addition, it calculates the movement of the clouds by analyzing the data with wind data at each altitude (Fig. 2) and predicts the amount of solar radiation in 3-minute intervals for 1 km grid units up to 3.5 hours ahead. By utilizing predicted solar radiation amounts, fluctuations in solar power generation output can be predicted in advance, allowing stable control of supply and demand. In this way, we are contributing to the adoption of photovoltaic power generation and are contributing to the emergence of a low-carbon society.

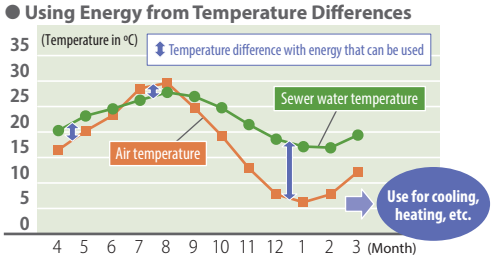
Predicting solar radiation for 3 1/2 hours (in 3-minute intervals) from a single weather satellite image



Utilizing wastewater heat from basin-wide sewer pipes

Since fiscal 2015 we have been conducting joint research with Shiga Prefecture, Sekisui Chemical Co., Ltd. and Nihon Suido Consultants Co., Ltd. on the feasibility of using sewage heat from basin-wide sewer pipes* in Shiga Prefecture to provide heat to private industrial facilities. This is the first joint government-private research project in Japan that uses sewage in basin-wide sewer pipes as a heat source with industrial facilities as the users. If this can be realized, we expect that it will lead to increased utilization of a previously unused energy resource and serve to reduce greenhouse gases and cut lighting and heating costs for customers.

● Using Energy from Temperature Differences



③ Wind power station (2 locations)

Reduction in CO_2 emissions

About 19,000 tonnes/year

④ Asago, Hyogo Biomass power station

Reduction in CO_2 emissions

About 24,000 tonnes/year

* Basin-wide sewer pipes are large pipes that receive sewage from multiple public sewers and carry high volumes.

Contributing to energy conservation, cost reductions and CO_2 emissions reductions for customers and society

By enabling customers to use energy efficiently and comfortably, we are contributing to increased energy efficiency, lower costs, and reduced CO_2 emissions for customers and society. We are also promoting energy conservation and CO_2 emissions reductions at our workplaces.

Encouraging efficient energy use

With the goals of realizing energy conservation, cost cutting and CO_2 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, for example. In addition, we are providing total support for energy management to customers and other members of society and undertaking activities that serve these purposes, including offering Hapi e-Miruden and other services that allow customers to see energy use and participating in regional demand response empirical testing.

■Serving residential customers

Starting with the Home Eco Diagnosis service, which is offered in coordination with the Ministry of the Environment, we are undertaking energy conservation consulting activities that respond to customer needs. Moreover, the Hapi e-Miruden Service, which allows people to see the status of their electricity use on the Internet, shows amounts of CO_2 emissions compared to amounts of electricity used and related rankings. In addition, we are providing other information related to energy conservation and have established "environmental household account books" in which users can input gas and kerosene charges to check their total household CO_2 emissions. In these ways, we are advancing a variety of efforts that contribute to helping customers conserve energy, cut costs and reduce CO_2 emissions.

■Serving corporate customers

We provide our customers with support for total energy management according to customer needs and offer advice regarding optimal energy systems and their application. In addition, we work with other Group companies to offer a range of services including 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_2 emissions.

■Publishing energy-efficiency information via website and brochure

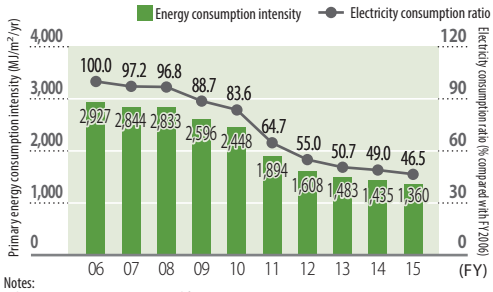
Through our Hapi e-Life navi website and Energy-efficiency Guidebook, we are helping our customers implement energy-efficiency methods more effectively. These introduce intelligent ways to use electric power as well as energy-saving methods that customers can employ in their homes.

Energy management at business locations ①

We have been employing energy management measures at business locations since fiscal 2007. In our efforts, we measure the amount of electricity used by application and by time period for buildings in order to investigate and implement effective energy conservation means.

① Through energy management at business locations, we achieved a **53% reduction** compared to fiscal 2006

● **Primary Energy (Electricity) Consumption Intensity at Business Locations Employing Energy Management**



Notes:
- Electricity consumption is corrected for air temperature.
- From FY 2011 to 2015, the reduction achieved through energy conservation is included.
- 20 business locations employing energy management, as of March 2016

KEPCO Building (headquarters)
Received "10 Year Award" from the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan

In May 2016, our continuous efforts to improve the energy performance and operation of our headquarters building in the 10 years since construction was completed received a high evaluation. The energy consumption in the 10th year was about 32 percent less than in the year of completion, achieving energy conservation comparable to a new building. In addition, the Kansai Denryoku Hospital also received a "Technology Promotion Award" from the same organization.

Our headquarters building was also recognized as the first "Building with High Energy Conservation Performance" in the "Osaka Prefecture Energy Conservation Level Determination System."

Technological developments for constructing the Smart Grid

The Kansai Electric Power Group aims to contribute to the emergence of a low-carbon society and better usability for customers through the construction of a smart grid (next-generation electricity transmission and distribution network).

What is the "Smart Grid"?

Our Group has positioned the smart grid as a key to achieving an efficient, high quality, reliable electricity transmission and distribution system, employing advanced information, communications, and storage battery technologies to achieve a low-carbon society and a better energy environment for customers without sacrificing the stability of the basic power grid.

Meeting the challenges of large-scale renewable energy use

With large-scale or focused introduction of renewable energy, including solar power, into the electric power grid, the stability of the power grid can be compromised. Therefore, Kansai Electric Power is promoting R&D of countermeasure technologies, including systems for evaluating such impact, development of advanced voltage controls, and electricity supply and demand control technologies incorporating storage batteries.

Usability improvements for customers ②

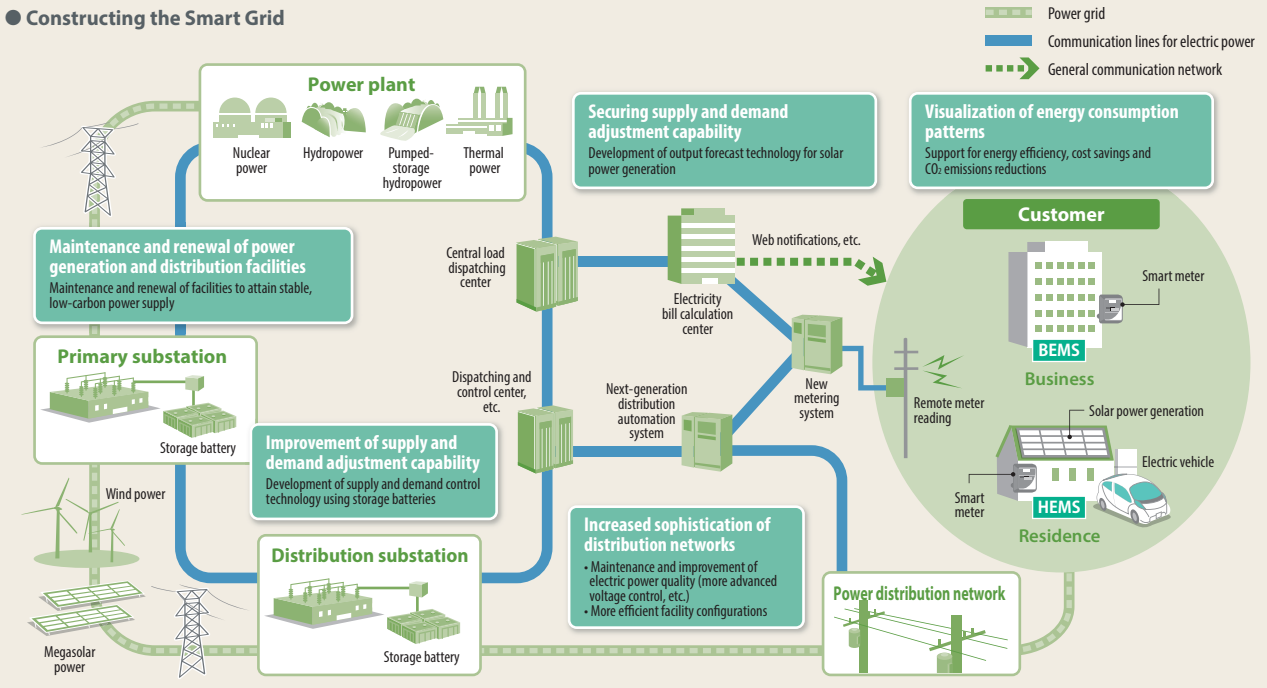
By the end of fiscal 2015, we had installed approximately 5.55 million smart meters for residences and other customers who receive low-voltage power. These meters, which have communication functions, can measure and record the amount of electricity a customer uses every 30 minutes. We will advance our plan to install these for every customer by fiscal 2022.

Among the many benefits, installing smart meters contributes to the energy conservation of society as a whole, enables flexible handling of changes to new rate options and makes meter reading work more efficient. Through this endeavor, which leads the nation, we are improving usability for customers by enabling them to see their energy use. We are supporting their efforts to conserve energy, cut costs and reduce CO_2 emissions with services such as the Hapi e-Miruden Service (residential), which allows people to see the status of their electricity use, and the Electricity Usage Notification service (business).

② Number of smart meters installed (for customers who receive low-voltage power)

About 5.55 million

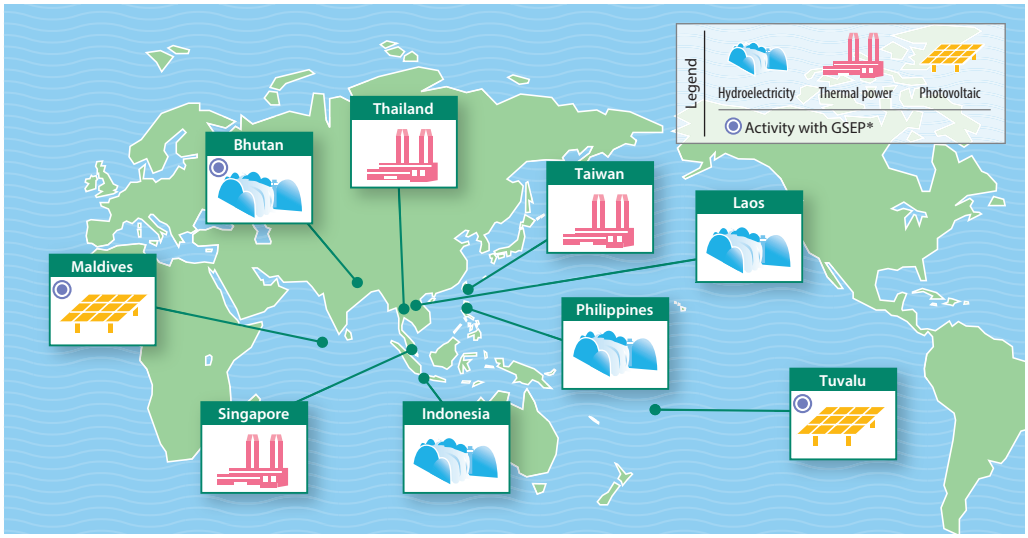
● Constructing the Smart Grid



Overseas activities

We are implementing a wide range of initiatives outside Japan in an effort to devise solutions to global environmental issues and other global problems by applying the technical capabilities, knowledge, and expertise we have gained through our years of operation as an electric power supplier.

*GSEP:
The Global Sustainable Electricity Partnership is an organization in which the world's leading power companies exchange ideas about the environment, including global warming, and development.



Popularization of solar power generation overseas 1

1 Republic of Maldives Solar power generation

Reduction in CO_2 emissions

About 50 tonness/year

In 2016, as an activity of the Global Sustainable Electricity Partnership, we built a 40 kW solar power generation facility on Dhiffushi Island in the Republic of Maldives. In this project, we installed an ice-making machine to support the fishing industry, which is one of the main industries of the island, and to control the amount of power generated by solar radiation. This arrangement balances power generation and electricity use by running the machine when power generation is relatively high. Through this effort, we expect that about 50 tonnes of CO_2 can be reduced per year. Hopes are also high for this model project as an example that can be reproduced on other islands.

Solar power generation facility and ice-making machine we installed

Value chain efforts

We are working to introduce and utilize high-efficiency LNG ships.

Fuel value chain 2

2 LNG FUKUROKUJU

Fuel consumption (compared to previous ships with the same forms)

About 25% less

We are advancing the introduction of LNG ships with excellent energy conservation performance. Following the LNG EBISU and the LNG JUROJIN, which are already in service, we expect to complete the LNG FUKUROKUJU in fiscal 2016. These ships use a new type of steam turbine that reheats steam. This secondary use of steam that has already been used once realizes fuel reductions of about 25% compared to previous ships with the same forms. Moreover, utilizing the latest heat resistance systems, these ships achieve an LNG evaporation rate of 0.08% per day, which is the lowest level in the world, making them outstanding in terms of both environmental and economic performance.

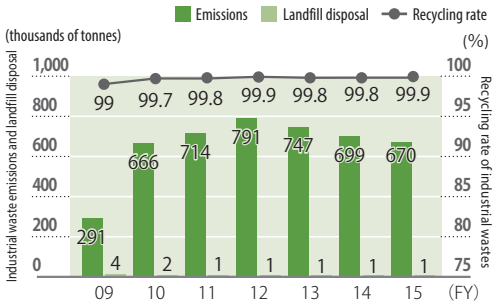
LNG FUKUROKUJU

Initiatives contributing to the emergence of a society committed to recycling

Efforts to achieve zero emissions ③

The principal types of industrial waste generated by Kansai Electric Power include coal ash from coal-fired thermal power plants and concrete pole fragments remaining from power grid construction. We have targeted an industrial waste recycling rate of at least 99.5% with the goal of achieving zero emissions. We achieved a 99.9% recycling rate in fiscal 2015, which marks the sixth consecutive year that we have reached our target. We are also working to reduce and recycle general waste, such as printer paper, produced by our offices.

● Changes in Emissions and Recycling Rates for Industrial Wastes



Note: Industrial waste recycling rate (%) = (industrial waste emissions – landfill disposal amount) / industrial waste emissions × 100

● Main Applications of Recycled Industrial Waste, etc.

Type of industrial waste	Recycling rate	Main recycling applications
Metal scraps	99.6%	Metal recovery
Demolition debris (Waste concrete utility poles, etc.)	99.9%	Roadbed materials
Soot (Coal ash, heavy oil ash, etc.)	100%	Cement raw materials
Sludge (Desulfogypsum, wastewater processing sludge, etc.)	99.7%	Construction materials
Cinders (Coal ash, heavy oil ash, etc.)	100%	Rare metal recovery
Waste oil	99.9%	Fuel

■Recycling of coal ash

The coal ash produced by the Maizuru Power Station is recycled for use as a raw material for cement and as a roadbed material. The minute spherical particles found in coal ash are called "fly ash" when in their modified form and, when mixed with concrete, add strength. Fly ash is used as concrete admixture for engineering and construction projects for bridges and the like. Kanden Power Tech is promoting sales of this material.

Fly ash

③ Industrial waste recycling rate

99.9%

Polychlorinated biphenyl (PCB) waste processing

Kansai Electric Power complies strictly with the Law Concerning Special Measures Against PCB* Waste and related laws, and promotes safe, reliable disposal based on the special characteristics of the PCB waste involved. Kansai Electric Power uses a range of methods for dealing with the disposal of electrical equipment containing minute amounts of PCBs. We established the Recycling Center for Utility Pole Transformers to render insulating oil and transformer cases harmless and suitable for recycling. At the end of July 2015, we completed processing of stored insulating oil and transformer cases. For other equipment, we are promoting effective processing using technologies from our Group companies. In keeping with government plans, we have commissioned Japan Environmental Storage & Safety Corporation (JESCO) to process waste containing high concentrations of PCB insulating oil.

■Initiatives of our Group companies

In July 2013, the Minister of the Environment granted KANDEN GEO-RE Inc. the nation's first authorization for decontamination treatment at its contaminated soil processing facility. The company treats oil contaminated with low concentrations of PCBs in its high-temperature thermal treatment facility (rotary kiln) for purifying contaminated soil. Regarding PCB-contaminated soil, the company acquired a permit under the oil Contamination Countermeasures Law in July 2014 and is now offering decontamination treatment. In May 2014, the Minister of the Environment granted Kanden Engineering Corporation a decontamination treatment permit for minute amounts of PCBs in discarded electrical equipment; this was the first permit in Japan used for movable solvent-based cleaning technology. The company conducts safe and economical decontamination and treatment without requiring that the contaminated equipment be moved or dismantled. In the future, our Group will continue contributing to the advancement of PCB processing in Japan.

Contaminated soil treatment facility (high-temperature treatment facility) of KANDEN GEO-RE Inc.

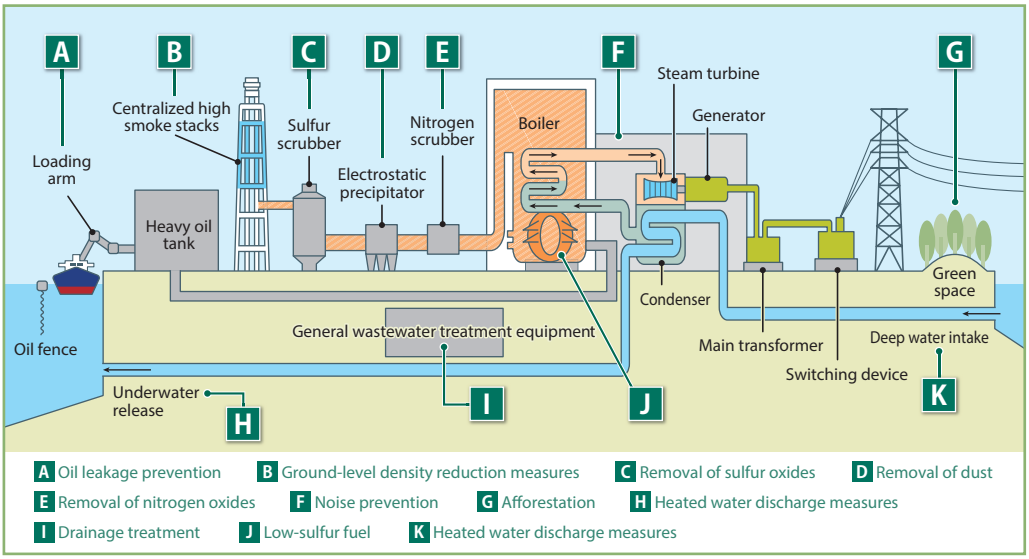
* PCB:
Initialism for polychlorinated biphenyl. It is a strong electrical insulator and has been used as an insulating oil in electrical transformers. Because it has an adverse environmental impact, its production and use have been prohibited in principle.

Promotion of community environmental protection measures

Environmental protection measures at power plants

At our power plants, we undertake measures based on laws, local regulations, environmental protection agreements and other rules to reduce air pollution, water contamination, noise, vibrations, and other problems. In addition, we monitor and measure the air and ocean around our power plants and carefully evaluate the environmental effects of our operations on the regional environment to ensure that no problems occur.

● **Environmental Measures Adopted at Thermal Power Stations**



Air pollution prevention measures (NOx, SOx, soot) [1]

Kansai Electric Power has implemented measures aimed at reducing the volume of SOx (sulfur oxides) emitted by our thermal power plants by using low-sulfur fuels, installing sulfur scrubbers, and other measures. To address the issue of NOx (nitrogen oxides), we are taking steps to lower emission levels, such as improving combustion methods and installing nitrogen scrubbers. As a result, our SOx and NOx emissions per unit of electric power generated are significantly lower than those of the major countries of Europe and North America, remaining among the lowest in the world. In addition, we have installed high-performance electrostatic precipitator that dramatically cut soot emissions.

[1] Lowest level worldwide

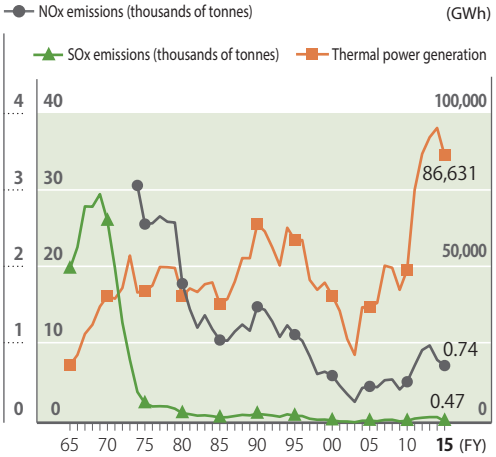
SOx emissions (per unit of power from thermal power generation)

0.055g/kWh

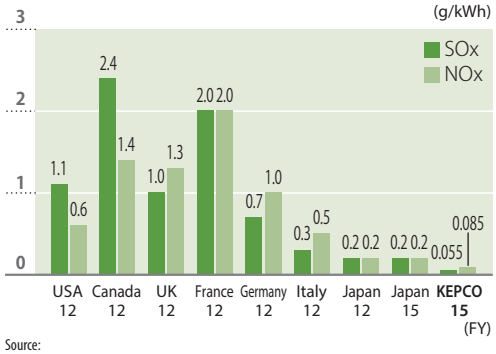
NOx emissions (per unit of power from thermal power generation)

0.085g/kWh

● **Thermal Power Generation and SOx and NOx Emissions**



● **SOx and NOx Emissions per Unit of Thermal Power Generated of Major Countries and Kansai Electric Power**



Source:
Overseas: Emission amounts: OECD.StatExtracts Complete databases available via OECD's iLibrary
Amounts of electric power generation: IEA, Energy Balances of OECD Countries 2014 Edition
Japan figures: Federation of Electrical Power Companies of Japan (10 electric power companies and Electric Power Development Co., Ltd.)

Handling chemicals

We regularly monitor the status of buildings and equipment that contain asbestos and systematically advance the removal of asbestos and replacement with non-asbestos products. In these ways, we are managing asbestos suitably as we strictly abide by related laws, regulations and other rules.

Moreover, in addition to abiding by the PRTR (Pollutant Release and Transfer Register) Law, we are working to manage toxic chemicals strictly and to reduce them based on our "Guidelines for Managing Chemicals Subject to PRTR."

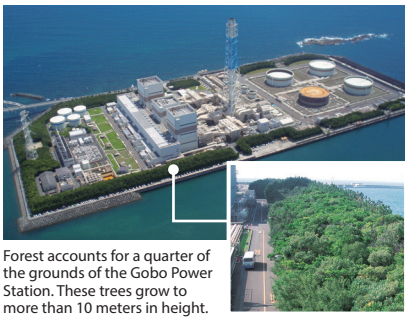
● Scope of Use (Buildings and Facilities) of Asbestos (at March 31, 2016)

Blown-in materials containing asbestos		Acoustic insulation, thermal insulation, and fireproofing materials in company buildings; acoustic insulation for transformers
Asbestos-containing products	Building materials	Fireproofing panels, roofing materials, and flooring for buildings
	Asbestos-cement pipes	Duct lining for underground lines (transmission, distribution, and communications facilities)
	Thermal insulation	Power generation facilities (thermal power facility, nuclear power facility)
	Sealing materials, gaskets	Power generation facilities (thermal power facility, nuclear power facility)
	Buffers	Suspension insulators for transmission facilities and the like
	Thickeners	Electric wire for the overhead transmission lines, hydroelectric dams

Conservation of biodiversity

■ Natural forest creation

In order to make forests that are similar to nature at power plants in short amounts of time, we are trying to create environments that protect the original biodiversity of the region by selecting cultivated tree saplings that are suited to the region, and planting different species densely in close proximity.



Forest accounts for a quarter of the grounds of the Gobo Power Station. These trees grow to more than 10 meters in height.

■ Protecting oriental white storks

In Toyooka City, Hyogo Prefecture, released oriental white storks, which are designated a Special Natural Treasure in Japan, sometimes make their nests on utility poles and steel towers. Not only are there concerns about accidents, but there are also fears that storks could be electrocuted. For these reasons, we patrol carefully, removing nests as quickly as possible and conducting measures to discourage them from coming near utility poles in cooperation with the University of Hyogo and the Hyogo Park of the Oriental White Stork. In these ways, we are both protecting the storks and maintaining the safety and stability of the power supply.

Stork building nest on utility pole

Promoting environmental management and environmental communication

Promoting environmental communication

■ Community environmental initiatives undertaken in cooperation with local governments

We consider the environment together with the community residents through environmental events hosted by the local government, cleaning campaigns, and environmental education at local schools. We emphasize environmental communication by seeking out residents' opinions about our initiatives. June is Environment Month at Kansai Electric Power Group, a time when our entire Group engages in activities such as community cleanups, tree planting, exhibiting at environmental events, and conducting on-site environmental classes at schools.

Local preschoolers planting seed potatoes (Gobo City, Wakayama Prefecture)

■ Offering environmental education contents

We are offering contents on a website that we hope will encourage the next generation and their family members to understand environmental issues as issues that matter to them and inspire independent actions through contents that allow them to learn enjoyably and that can also be utilized in independent research, for example.

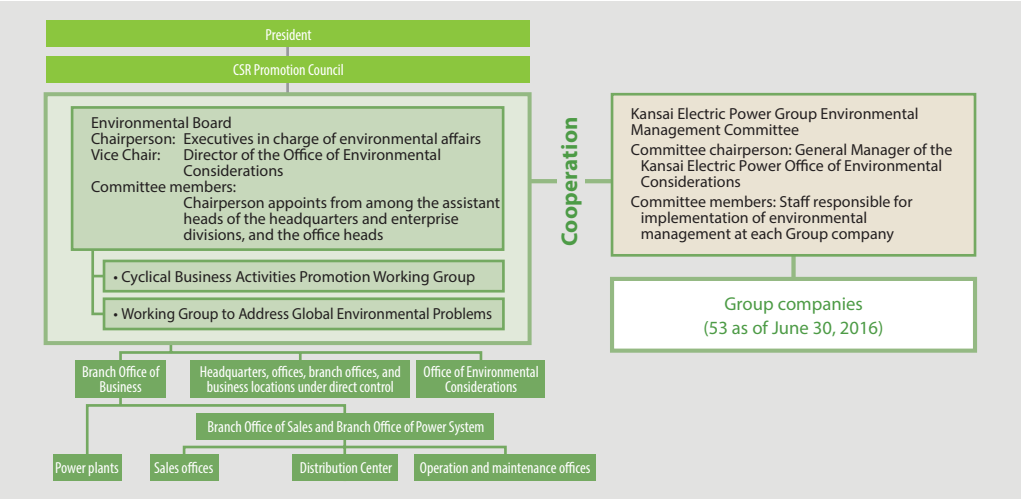
Supervised by Manabu Ishiwata Sensei, the first "environmental performer" in Japan (certified by the Ministry of the Environment

Promoting environmental management

■ Promoting environmental management on a Group wide basis

In an effort to reduce environmental impacts and environmental risks, we have begun establishing an environmental management promotion system across the entire Group. Kansai Electric Power has established an Environmental Board within its CSR Promotion Council. For the Group, we have established the Kansai Electric Power Group Environmental Management Committee, and are working to develop Eco Action measures and implement Check and Review, as well as comply with environmental law and other regulations.

● **Environmental Management Promotion System of the Kansai Electric Power Group**



● **Eco Action: Kansai Electric Power Group Company Concrete Action Plans**

Item	Results for FY 2014*	FY 2015		Evaluation (Reasons for increase/reduction)
		Targets	Results*	
Reducing office electricity consumption	55.8 GWh	Continuing energy conservation efforts	57.8 million kWh (3.50% increase)	Despite the energy conservation efforts of individual offices, Group consumption of electricity increased slightly year-on-year due to business expansion.
Reducing office water consumption	261,300 m^3	Reduce as much as possible	256,300 m^3 (1.92% reduction)	As a result of water conservation efforts at individual offices, year-on-year Group water consumption declined overall.
Improving fuel efficiency of company vehicles	9.17 km/L	Increase as much as possible	9.11 km/L (0.65% decrease)	Despite each company having strictly enforced the practices of "eco" driving and stopping engine idling, as well as adopting vehicles with high fuel economy, fuel efficiency worsened slightly compared to the previous fiscal year because of factors that include changes in the rate of operation of vehicles due to business needs.
Reducing printer paper consumption	964.3 t	Reduce as much as possible	959.9 t (0.45% decrease)	Though the amount increased in some companies due to greater work volume, the amount reduced overall compared to the previous fiscal year by making efforts, such as the use of double-sided copies and electronic documents for meetings.
Green procurement of printer paper	86.7% green procurement rate	100% green procurement rate	86.8% purchase rate (0.14% increase)	The rate improved compared to the previous fiscal year through our conscious efforts. As in the previous fiscal year, 90% of all of the companies achieved a 100% green procurement rate. Furthermore, one more company achieved 100% green procurement for the first time.

* The calculation of results covers 44 companies in FY 2014 and FY 2015. Parentheses ( ) show comparisons with the previous fiscal year.

■ Observance of laws and regulations

In July 2015, at the Ako Power Station, a large quantity of jellyfish flowed into the water intake, reducing the amount of intaken seawater, which is used to cool steam. This caused the difference in temperature between the water intake and output to exceed the agreed environmental protection value (press release issued). In addition, during the same month, while building an expansion of a wireless relay station in the mountains of Shiga Prefecture, we created a work yard that exceeded the extent permitted based on the Natural Parks Act. As soon as we identified these issues, we immediately reported to the relevant government offices and have since been implementing thorough in-house recurrence prevention measures.

■ Incorporation of electronic manifests

With goals that include ensuring compliance in the processing of industrial wastes, we are planning to incorporate and expand electronic manifest systems.

Some initiatives of the Kansai Electric Power Group

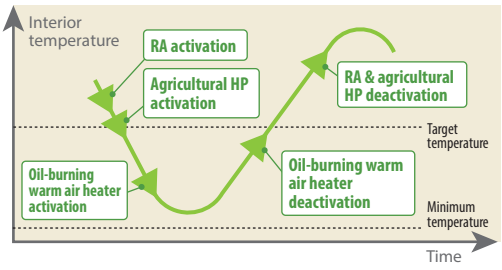
Our Group has undertaken a variety of environmental initiatives by combining the technological capabilities of individual companies and the management resources of our entire Group.

The General Environmental Technos Co., Ltd.

Developing energy conservation technologies for air-conditioning in horticulture greenhouse facilities

As research under contract from Kansai Electric Power, The General Environmental Technos Co., Ltd. is undertaking the development of energy conservation technologies for air-conditioning in horticulture greenhouse facilities. Oil-burning warm air heaters are mainly used for heating in horticulture greenhouses. Since the period of sudden oil price increases, however, electric air-conditioning systems have been receiving attention. They focused on household room air conditioners (RA), which are inexpensive and highly efficient, and tried to build an inexpensive hybrid system that combines them with oil-burning warm air heaters. In empirical testing in a tomato cultivation greenhouse in Takahama, Fukui Prefecture, they achieved the target of reducing costs by more than 40%. They did this by increasing the operation rate of an agricultural heat pump (HP) through the installation of ducts on its top section and by aiming to keep the temperature constant with improved duct opening rate of the oil-burning warm air heater.

● **Equipment Operation Illustration**



The Kanden L & A Co., Ltd.

Effective reuse of used insulators

The Kanden L & A Co., Ltd. recycles industrial waste with a focus on used insulators. Conventionally, scrap insulators have been limited to use as a roadbed material after crushing because of the sharp edges that remain. However, we collaborated with Kanden L & A in developing a grinder that eliminates such sharp edges; as a result, crushed insulators can now be used as landscaping stone for residential use. At the fiscal 2015 Awards for Resource-Recycling Technologies and Systems, this technology received a Ministry of Economy, Trade and Industry Technology Environmental Director General Award. Moreover, in cooperation with Kindai University, this company confirmed that mixing crushed insulators with asphalt pavement had the effect of lowering road surface temperatures in the summer compared to ordinary paving materials. As a heat island countermeasure, it is expected to contribute to protecting the environment, and work has begun to utilize it on the marathon course for the Tokyo Olympics.