

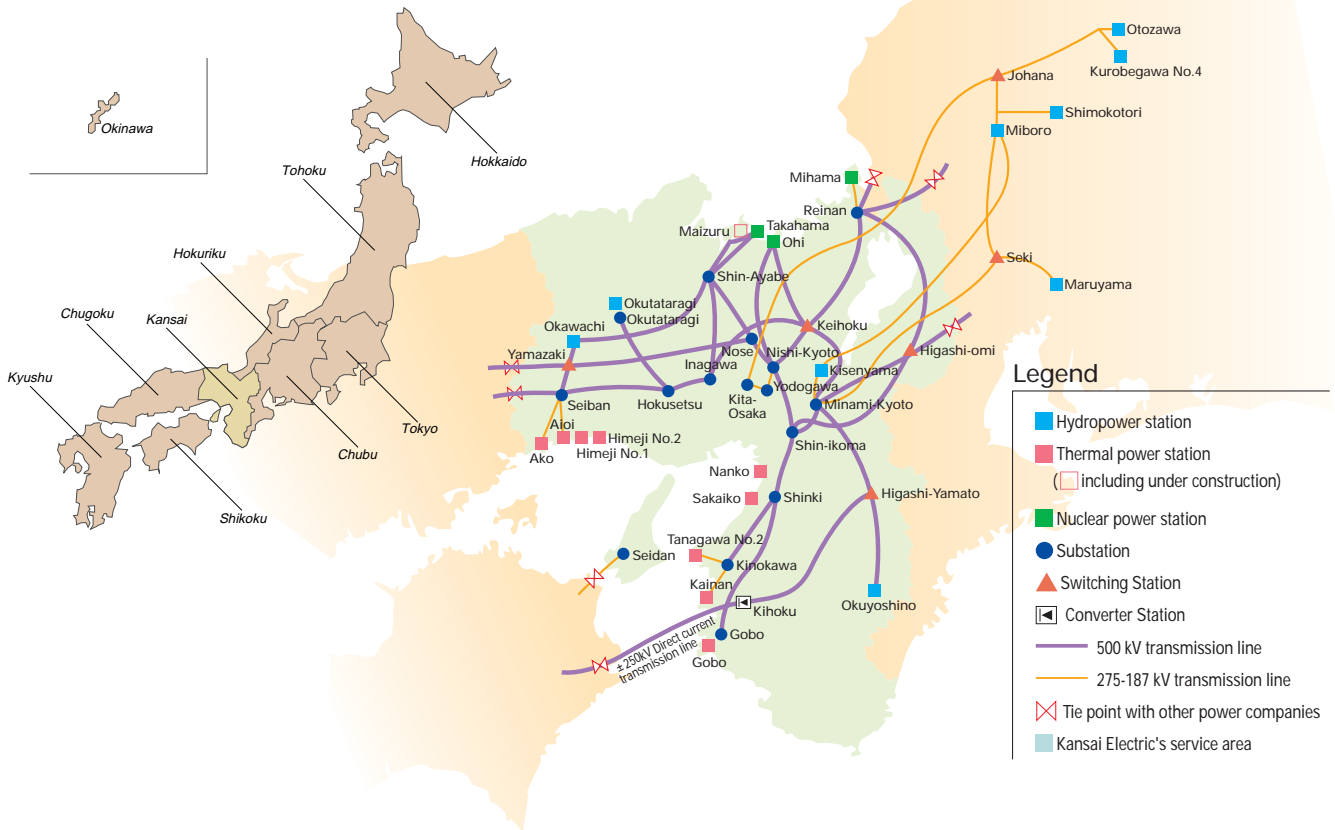


**Kansai Electric Power's  
Global Environmental Action Report 2003**

A Well-Balanced Environmental Today and Tomorrow

Service areas of Japan's ten electric power companies

System Map (As of March 31, 2003)



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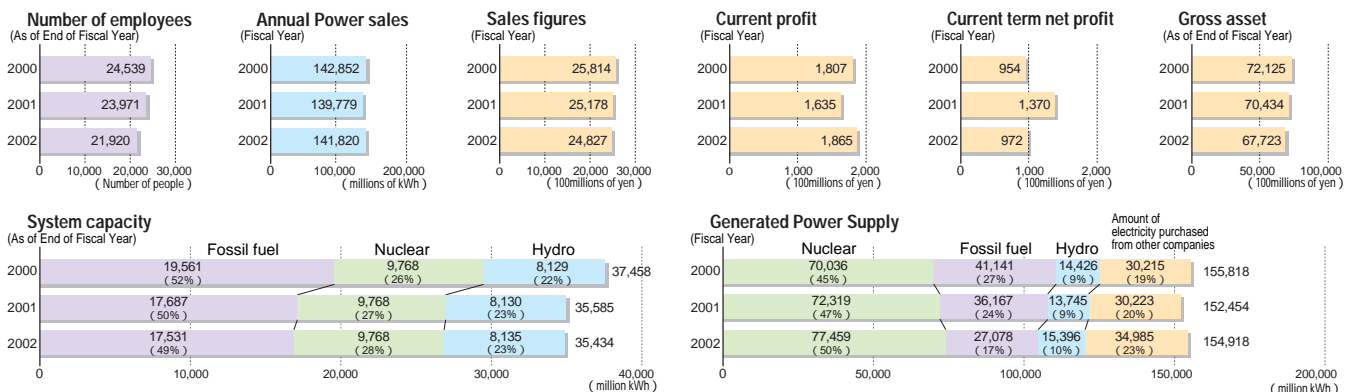
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# Overview of Kansai Electric

Company Name: The Kansai Electric Power Company, Incorporated  
 Headquarters: 3-3-22 Nakanoshima, Kita-ku, Osaka, 530-8270  
 TEL: 06-6441-8821  
<http://www.kepco.co.jp/>  
 Date of establishment: May 1, 1951  
 Capital: 489,320 million of yen (As of March 31, 2003)  
 Chairman of the Board of Directors: Yoshihisa Akiyama  
 President and Director: Yohsaku Fuji  
 Main Business: Electric power industry

Kansai Electric's Service Area: Osaka Prefecture, Kyoto Prefecture, Hyogo Prefecture (excluded in Fukuura, Akou City), Nara Prefecture, Shiga Prefecture, Wakayama Prefecture, Mie Prefecture and portions of Gifu Prefecture and Fukui Prefecture

Japan has ten major private electric utility companies which operate independently. Each company produces and distributes electricity to a specific geographical region of Japan. Kansai Electric's service area is located in the central part of the main island Honshu and covers 28,700 km<sup>2</sup> (8% of Japan's total land area). This region, generally known as Kansai, includes Osaka, Kyoto, and Kobe and has a population of 21 million, accounting for 16% of the nation's total. Since its establishment, Kansai Electric has emphasized the development of power sources to meet electricity demand, which has increased with the growth of the Japanese economy. As of March 31, 2003, the company's capacity for hydroelectric power is 8,135 MW, thermal power 17,531 MW, and nuclear power 9,768 MW, making the total capacity 35,434 MW, which is 16 times larger than the initial figure of 2,284 MW in May 1951, when we began operation. Electricity sold in fiscal 2002 amounted to 141,820 million kWh, accounting for 18% of the total power sold in Japan, or the second largest amount in Japan, following the Tokyo Electric Power Co., Inc.



Outline of Japan's ten major power companies (as of March 31, 2003)

	Capital (billions of yen)	Number of customers (thousands)	Maximum power demand (MW)	Annual power sales (millions of kWh)	Annual revenue from powersales (billions of yen)	Number of employees	System capacity (MW)			
							Hydro	Fossil	Nuclear	Total
Hokkaido Electric Power Co.	114	3,834	5,345	29,247	501	6,187	1,245	4,150	1,158	6,553
Tohoku Electric Power Co.	251	7,606	14,489	74,255	1,234	12,812	2,423	11,227	2,174	15,824
Tokyo Electric Power Co.	676	27,252	63,200	281,902	4,685	39,619	8,520	34,545	17,308	60,373
Chubu Electric Power Co.	374	10,181	27,283	123,050	2,050	17,994	5,216	23,901	3,617	32,734
Hokuriku Electric Power Co.	117	1,987	5,394	25,587	398	5,148	1,812	4,406	540	6,758
Kansai Electric Power Co.	489	12,969	31,610	141,820	2,421	23,488	8,135	17,531	9,768	35,434
Chugoku Electric Power Co.	185	5,171	11,488	55,847	889	11,001	2,900	8,015	1,280	12,195
Shikoku Electric Power Co.	145	2,867	5,738	26,248	445	5,274	1,141	3,730	2,022	6,893
Kyushu Electric Power Co.	237	8,190	15,966	76,636	1,310	13,964	2,373	11,506	5,258	19,137
Okinawa Electric Power Co.	7	771	1,428	6,883	133	1,502	-	1,676	-	1,676
<b>Total</b>	<b>2,595</b>	<b>80,828</b>	<b>181,941</b>	<b>841,475</b>	<b>14,066</b>	<b>136,989</b>	<b>33,765</b>	<b>120,687</b>	<b>43,125</b>	<b>197,577</b>

# Message

Affront a backdrop of rapid economic development in China and Southeast Asia, as well as a number of other major events, world energy consumption is predicted to rise steadily from this point forward, which means mankind will be placing an increasingly greater load on the global environment.

Amidst the situation, it is absolutely necessary, even in Japan, for each member of society to play a part - as their respective roles demand - in resolving global environmental problems.

Kansai Electric has always been conscious of our role as a company that delivers energy to people and businesses. While striving to foresee the demands of the times, we have promoted aggressive action for dealing with environmental problems. One quick example is our effort to prevent global warming. By increasing the capacity factor of our nuclear power stations, which do not release CO<sub>2</sub> in the power generation process, Kansai Electric has achieved the lowest level of CO<sub>2</sub> emissions per unit of power consumed of all power companies in Japan.

In the future as well, we will continue to promote action to reduce environmental load across the whole span of our business activities.

As part of this undertaking for the environment, Kansai Electric is promoting 3R's activities that aim to "reduce", "reuse" and "recycle" industrial and other waste and ultimately reduce the discharge of landfill-destined waste to zero, so that our business activities are consistent with the precepts of a recycle-oriented society. To give you an example, we already recycle all of the heavy crude ash and desulfurizing gypsum left over from thermal power stations, as well as all low voltage wiring and concrete utility poles used in power transmission. And, we are aggressively undertaking "green purchasing" practices with which we prioritize the purchase of products of low environmental load; as of this year, all of the electrical wiring conduit we will purchase is recycled from waste generated by us.

Recycling is also being addressed as a number of group projects, such as making mulch for livestock pens, fertilizer and soil improving agents out of driftwood collected from dam reservoirs, making brick-like blocks from sludge incinerator ash and other waste, and recycling polystyrene products like foam polystyrene using original solvents.

In the future, the Kansai Electric Group will continue to create new business opportunities and, at the same time, play an active part in resolving environmental problems by developing technologies and accumulating experience in environmental protection.

In the meantime, the business environment surrounding the power industry is changing at an accelerating pace. In June this year, the Electric Utilities Law was amended to even further broaden the scope of liberalization on the power retailing end. The competition that we will face in the future can only grow as more businesses will make inroads into the power market and diverse energy sources will compete amongst each other.

Given the situation, we take it to heart today that "trust" is the basis of doing business. We have made global environmental problems an important management issue for gaining everyone's trust and will continue to address global environmental problems voluntarily and aggressively.

In particular, we will make extra efforts to ensure that nuclear power stations operate safely and stably, while developing technology to separate, collect and effectively utilize CO<sub>2</sub>, and developing new energy sources.

The Kansai Electric Group will continue efforts to make operations transparent through the disclosure of information such as the publication of this Global Environmental Action Report, and offer solutions that meet customer needs in the fields of total energy, communications and lifestyle amenities. We want to continue growing as a "business group that customers trust and choose".

Please look over this report and let us know any thoughts or ideas you might have. We ask for your continued support of Kansai Electric and the Kansai Electric Group.



July 2003  
Yohsaku Fuji  
President and Director  
The Kansai Electric Power Co., Inc.

A handwritten signature in black ink that reads "Yohsaku Fuji". The signature is written in a cursive, flowing style.

# Management Policy and Environmental Policy

## Basic Direction of Management

### Mid-Term Management Policy (Adopted in 2002)

- In order that "customers will choose the Kansai Electric brand" -

Kansai Electric has always gone about business with the intention of enhancing our corporate value on a basis of customer "trust" and satisfaction deeply rooted in our desire to coexist and sympathy along with the communities we serve. As we believe this the road to further growth, this policy will never change. The age of energy competition is purely sympathetic to the "customer-first policy" that we have always promoted, therefore we will use this as our "competitive strength" in all aspects of business and take the necessary action to strengthen ourselves even further.

More specifically, Kansai Electric has contributed to the development and prosperity of communities in our service area by ensuring a stable supply of good quality energy since the establishment. Even when energy security and global environmental problems became public issues on the national level, we responded with a power makeup consisting of 50% nuclear generated power.

We will continue to steadfast address these issues even from within a framework of partial liberalization in the power market and make every effort to run our business based on fairness and transparency. We are building Kansai Electric as a "company you can trust" by seeking the trust of the communities we serve and fostering the trust required for a positive evaluation in capital markets. Plain and simple, we want to be the customer's choice. (Except from original text)

## Environmental Policies

### Philosophy Five Basic Principles of the Action Plan for Global Environmental Considerations (Adopted in 1990)

Kansai Electric is well aware of our big responsibilities as an energy provider. As we strive to deliver an affluent way of life to people in our service area, we are staking a serious challenge to protecting the global environment on the corporate level. In all aspects of our operations, we are investigating advanced means of global environmental protection and taking action immediately in areas where we can be effective.

- 1 Reduction of Environmental Impact
- 2 Promotion of Effective and Efficient Use of Energy and Resources
- 3 Development of Advanced Technology
- 4 Coordination of Efforts Throughout the Kansai Electric Group
- 5 Creation of a New Corporate Culture to Support Harmonious Coexistence with the Global Environment

### Action Guide Action Plan for Global Environmental Considerations (Adopted in 1991, Revised in 2000)

#### Action 1: Consideration for the Environment in All Areas of Our Business

##### 1 Addressing Global Environment Problems

###### a. Measures to prevent global warming (New ERA Strategy)

- E**fficiency: Efforts to Increase energy efficiency by society as a whole
- R**eduction: Reducing greenhouse gas emissions in power supply
- A**ctivities Abroad: Activities carried out abroad to prevent global warming

###### b. Protecting the ozone layer

##### 2 Addressing Local Environment Problems

- a. Measures to prevent air pollution
- b. Measures to prevent water pollution
- c. Measures Against Chemical Substances, etc.

#### Action 2: Activities Aimed at Building a Recycle-Oriented Society

- 1 Promoting Business Activities Suitable for a Recycle-Oriented Society
- 2 Earnest Exchange and Cooperation with External Groups
- 3 Raising Employee Awareness of their Responsibility as Global Citizens and Encouraging them to Develop Good Daily Practices

Concrete Action Plans

Eco Action (Adopted every year)



# Highlights from 2002

(Environmental management)

## Ohi Power Station acquired ISO14001 certification

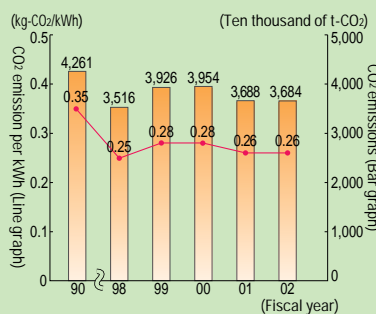
Our first nuclear power station, which is located in Ohi, gained ISO14001 certification for their environmental management system. This brought the number of certified facilities to 12 as of year's end. (See P.10)

Year of acquisition	Facility
1999	Miyazu Energy Research Center (Thermal power) Himeji No. 1 Power Station (Thermal power)
2000	Kainan Power Station (Thermal power) Himeji No. 2 Power Station (Thermal power) Kishiwada Substation
2001	Sakaiko Power Station (Thermal power) Tanabe Substation Kurobegawa Electric Power Office Nanko Power Station (Thermal power) Himeji LNG Management Office Himeji Substation
2002	Ohi Power Station (Nuclear power)

(CO<sub>2</sub> emission performance)

## Attained the lowest CO<sub>2</sub> emission per unit of power consumed at 0.26 kg-CO<sub>2</sub>/kWh

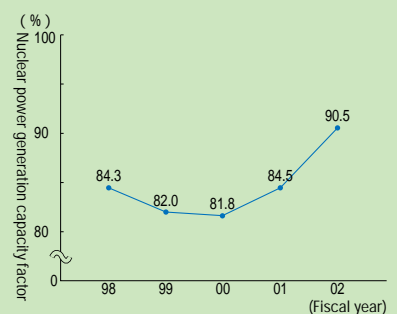
By promoting a New ERA Strategy that targeted safe, stable operation of nuclear power plants and the prevention of global warming, CO<sub>2</sub> emission per unit of power consumed was brought down to 0.26 kg-CO<sub>2</sub>/kWh in 2002. (See P.17)



(Promotion of nuclear power generation)

## Attained highest capacity factor ever for nuclear power stations at 90.5%

Capacity factor of our nuclear power stations reached the highest level ever in our history attaining a 90.5% level through the promotion of efficiency efforts that took safety and reliability as a pretext, and by introducing constant cycling at a rated thermal output. (See P.22)

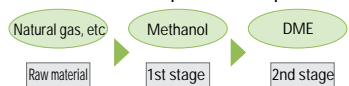


(Advanced technology development)

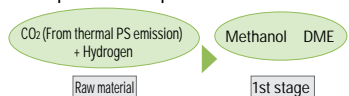
## Successfully synthesized a new dimethyl ether fuel from CO<sub>2</sub> contained in thermal power station emissions

In cohort with Mitsubishi Heavy Industries, Kansai Electric jointly developed technology for converting CO<sub>2</sub> found in thermal power station emissions into a clean alternative energy source for LPG and light oil-dimethyl ether (DME). The fuel was successfully produced at a test plant located at the Nanko thermal power station. (See P. 26)

### Current industrial production process



### DME production process from CO<sub>2</sub>



(Overseas activities)

## Started validation research into a CO<sub>2</sub> fixation model by forestation

Kansai Electric and Kansai Electric Group company Kansai Environmental Engineering Center Co., Ltd. (our group) are working with local forestry and pulp companies on the island of Sumatra in Indonesia on a CO<sub>2</sub> fixation model by forestation. Validation research started this year with a target of developing business. (See P.30)

Project overview	
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative organization	Musi Hutan Persada Tanjungem Restali Pulp and Paper (Local companies in Indonesia)
Project description	Build carbon fixation model that simultaneously produces sustainable forest and effectively fixates atmospheric CO <sub>2</sub> .
Site	Sumatra, Indonesia

(Looking to apply decarbonization technology abroad)

## Participated in CO<sub>2</sub> fixation technology development project

Having highly respected CO<sub>2</sub> recovery technology and know-how, Kansai Electric and Kansai Environmental Engineering Center decided to take part in a project to develop CO<sub>2</sub> fixation technology that is being promoted under a 5-year plan launched in 2002 by Japan's Ministry of Economy, Trade and Industry. (See P. 31)

Project overview	
Participating companies, etc	Kansai Electric, Kansai Environmental Engineering Center, etc.
Project description	Develop technology to stably fixate CO <sub>2</sub> separated and recovered from large sources such as thermal power stations by forcing into a carbon layer, and recover untapped methane (CH <sub>4</sub> ) that replaces CO <sub>2</sub> in the carbon layer as clean energy.

(Overseas activity)

### Started forest project aimed at preventing soil chlorination

In cooperation with Oilmali Company, a company formed in Australia by farmers to promote agriculture, Kansai Electric and Kansai Environmental Engineering Center started a forest project on the outskirts of Perth in the southeastern corner of Australia, to increase sources of CO<sub>2</sub> absorption and prevent soil chlorination. (See P.32)

Project overview	
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative organization	Oilmali Company (Local company in West Australia)
Project description	Plant 2.5 million mali eucalyptus trees that are strong against currently existing insects and drought in a belt pattern across 1,000 ha of farmland to simultaneously increase sources of CO <sub>2</sub> absorption and prevent soil chlorination.
Site	Perth outskirts, West Australia

(Promotion of recycling activities)

### Adopted Green Purchasing Guidelines for power equipment

Kansai Electric adopted green purchasing guidelines for power equipment to expand the scope of green purchasing practices beyond office supplies as was promoted earlier. (See P.47)

Green purchasing activities	
December 1999	• Adopted green purchasing policy.
April 2001	• Adopted green purchasing guidelines for office supplies. • Formed interdepartmental committee for promoting recycling activities.
June 2002	• Adopted green purchasing guidelines for power equipment.

### All-point inspection in voluntary inspections at nuclear power stations

After discovering problems in voluntary inspections at nuclear power stations in August 2002, Kansai Electric started all-point inspections the ensuing September.

From the 5,383 operations that were subjected to testing (work report: approx. 4,000 volumes, test report: approx. 3 million pages), nothing considered inadequate was detected in voluntary inspections, which confirmed our in-house systems and efforts to prevent mistakes are well in order. Nevertheless, we will work to improve our quality control activities in the future because there are matters that do not legally require reporting, because we want to constructively share information and because several matters are not documented.

#### History of all-point inspections

##### August 30, 2002

The Nuclear and Industrial Safety Agency instructed an all-point inspection be made to ensure the adequacy of voluntary inspections of nuclear facilities.

##### September 4, 2002

Launched a nuclear power station voluntary inspection commission of in-house members.

##### September 20, 2002

Submitted all-point inspection plans for evaluating the adequacy of voluntary inspections to The Nuclear and Industrial Safety Agency and Fukui Prefecture.

##### September 26, 2002

Set up meetings so that outside experts could share their opinions on Kansai Electric's voluntary inspections.

##### November 15, 2002

Submitted an interim report of all-point inspections to The Nuclear and Industrial Safety Agency and Fukui Prefecture.

##### March 14, 2003

Submitted a final report of all-point inspections to The Nuclear and Industrial Safety Agency and Fukui Prefecture.

(Group-wide activity)

### Established Kanden Eco-Meltz to recycle polystyrene

On the proposal of an employee who took advantage of the "Kanden Startup Challenge" program, Kansai Electric formed Kanden Eco-Meltz to recycle the polystyrene contained in waste foam polystyrene, etc. (See P. 60)

Company name	Kanden Eco-Meltz Co., Ltd.
Capital	120 million of yen Kansai Electric ... 80% Kansai Environmental Engineering Center ... 10% Shigenori Hamano (Employee) ... 10%
Main business	• Sales of pellets and regenerated solvent made from recycled polystyrene. • Development, operation planning and design, and sales of and technical consulting for polystyrene recycle plants.

(Environmental communication)

### Exchanged ideas with NPOs and students about our activities and improved Kansai Electric Environmental Report

Kansai Electric spent a total of 20 hours in 4 different sessions sharing ideas and opinions with NPO E-Being as well as college and graduate students living in the Kansai and, as a result, upgraded and developed a digest of the Kansai Electric's Global Environmental Action Report 2003 (See P.63)



# Targets and Performance

## Outline of Eco Action (Companywide Action Plan)

Item		Eco Action 2002 (Results from 2002 activities)			
		Result	Target	Performance evaluation	
Reduction of greenhouse gases	CO <sub>2</sub> emissions per unit of power consumed (sold)	0.26 kg-CO <sub>2</sub> /kWh	Approx. 0.3 kg-CO <sub>2</sub> /kWh (Forecast)	Improved CO <sub>2</sub> emission per power unit of consumed (sold) by efficiently using nuclear power generation.	
	Improving capacity factor of nuclear power stations	90.5%	More than 85%	Used nuclear power facilities extensively by ensuring safety and reliability, and working hard to increase work efficiency. Also, introduced constant cycling at rated thermal output to further increase work efficiency.	
	Improving and maintaining thermal efficiency of thermal power stations	42.4%	More than 42%	Increased allocation of high heat efficient combined cycling to improve overall thermal efficiency. Also, improve operation with older plants such as by shortening firing time, in order to maintain and improve heat efficiency.	
	Using LNG (Ratio of LNG to thermal fuel)	85%	More than 85%	Though consumption decreased, attained target for ratio of LNG.	
	Output expansion through hydropower station renovation (kW) (Total from 1989 to present)	34,752 kW	33,872 kW	Increased output 4,300 kW by refurbishing in line with designs.	
	Reduction in overall loss (Losses in generation, transmission and distribution)	8.5%	Reduce as much as possible	Same level as last year	
	Reducing emission of SF <sub>6</sub> (Rate of gas recovery during equipment inspection)	97.1%	94%	Attained high recovery rate well above target. Will work to maintain high rate in future and will review annual target if needed.	
Efficient use of energy	Load balancing	① Increase in contracts for all-electric home plan	199 thousand contracts	20 ten thousand contracts	Fell slightly below target. Must continue efforts to diffuse all-electric homes (Happy Plan contracts, etc.) by using Happy Package lease system.
		② Increase in contracts for heat storage and adjustment plan	5,594 contracts	5,600 contracts	Fell slightly below target with the number of contracts, but sales of the Eco-Ice Mini increased. Efforts are needed to expand use of heat storage systems.
		③ Promotion of peak-cut-type equipment	273 thousand units	28 ten thousand units	Fell slightly below target, therefore must continue efforts to increase use. Equipment is now commonly used, therefore diffusion ends in 2003.
	Introduction of electric vehicles		175 units	Approx. 170 units	Acquired determined number of vehicles in line with initial target.
	Use of untapped energy sources (Heat supply locations)		11 locations	11 locations	New locations under planning
	Cooperation in helping spread the use of new energy sources	Solar power generation	27 million kWh	Contribute to spread of new sources of energy by purchasing excess electricity generated by solar power, wind power, and waste-fired power, and supporting the Kansai Green Power Fund.	Increased number of contracts by about 6,100 over last year to approx. 17,900.
		Wind power generation	6 million kWh		Added 4 new contracts for total of 7.
Waste-fired power generation		555 million kWh	Added 4 new contracts for total of 30.		
Reduction of SO <sub>x</sub> and NO <sub>x</sub> emissions per unit of power generation	SO <sub>x</sub>	Our company: 0.01g/kWh (Thermal Power Station: 0.05g/kWh)	Maintain at current level	Increased slightly over last year because of increase in oil fuel use on account of LNG flexibility.	
	NO <sub>x</sub>	Our company: 0.03g/kWh (Thermal Power Station: 0.14g/kWh)	Maintain at current level		
Improving recycling rate of industrial wastes		85%	More than 90%	Beat target by reducing emissions of dust and substances from thermal power stations where recycling has been underway. (Reduced emission by about 14,000 t over last year.)	
Usage rate of 100% recycled copy paper		100%	100%	Continued using 100% used copy paper at all business sites.	
Increase in installations of systems conforming to ISO standards (total)		19 locations	Sequentially increase number of conforming facilities	Reduced number of facilities by restructuring power stations. (No real increase or decrease registered.)	
Development of 100,000 People's Eco-Family Campaign		Implemented in all locations	Upgrade voluntary activities at each location	Increased voluntary activities in all locations.	

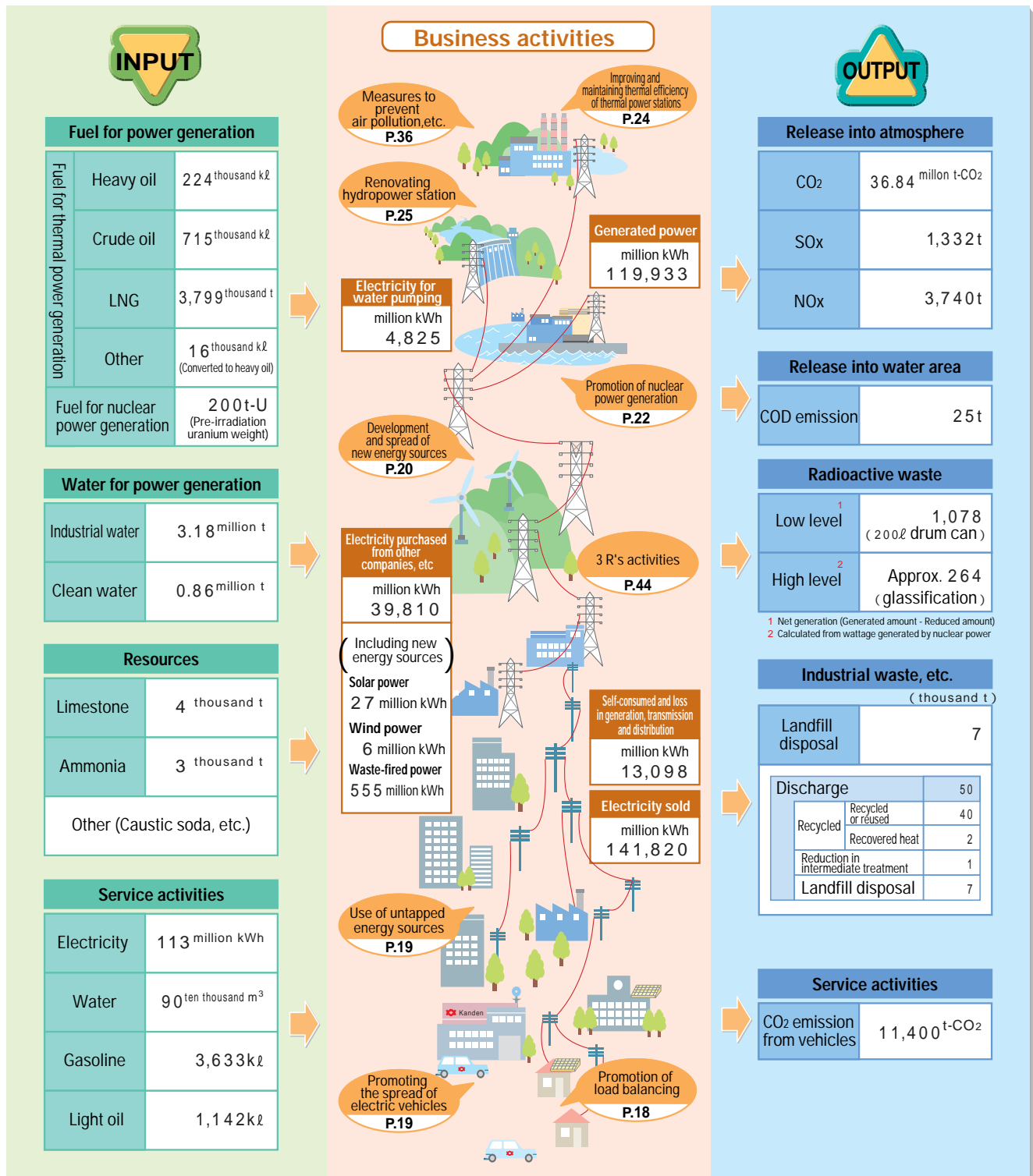


Item	Eco Action 2003 (Targets and action plans for 2003 and beyond)				See page		
	Fiscal 2003	Fiscal 2004	Fiscal 2005	Targets and action plans up to fiscal 2010			
Reduction of greenhouse gases	CO <sub>2</sub> emissions per unit of power consumed (sold)	Approx. 0.34 kg-CO <sub>2</sub> /kWh (Forecast)			Attain about 0.34 kg-CO <sub>2</sub> /kWh at Kansai Electric by 2010 in order to attain target for all electricity business (0.34 kg-CO <sub>2</sub> /kWh at consumption point by 2010). Promote New ERA Strategy to continually attain targets.	P 17	
	Improving capacity factor of nuclear power stations	More than 85%			Make efforts to ensure safe stable operation. Maintain capacity factor at 85% or more by introducing constant cycling at a rated thermal output.	P 22	
	Improving and maintaining thermal efficiency of thermal power stations	More than 42%			Maintain at current 42% or more level.	P 24	
	Using LNG (Ratio of LNG to thermal fuel)	More than 77%			Maintain high ratio of LNG fuel as thermal power generation decreases in power makeup ratio.	P 24	
	Output expansion through hydro power station renovation (Total from 1989 to present)	36,052kW	40,752kW	40,752kW	Aim for total increased output of 44,152 kWh in fiscal 2006 by refurbishing and improving older facilities.	P 25	
	Reduction in overall loss (Losses in generation, transmission and distribution)	Reduce as much as possible			Reduce loss greatly through both infrastructure and operation.	P 25	
	Reducing emission of SF <sub>6</sub> (Rate of gas recovery during equipment inspection)	95%	96%	97%	Maintain the industry's target of about 97%.	P 27	
Efficient use of energy	Load balancing	① Increase in contracts for all-electric home plan	25 ten thousand contracts	32 ten thousand contracts	40 ten thousand contracts	Work to increase use centered around spread of all-electric homes (Happy Plan contracts, etc.) by offering a new menu.	P 18
		② Increase in contracts for heat storage and adjustment plan	6,600 contracts	7,600 contracts	8,600 contracts	Work to increase use by developing effective measures.	P 18
		③ Promotion of peak-cut-type equipment	292 thousand units	-	-		
	Introduction of low-emission vehicles (Ratio of low-emission vehicles to all vehicles)	30%	35%	40%	Assess entire picture of vehicles that help reduce environmental load (i.e., electric vehicles, hybrid vehicles, low emission vehicles [LEV], etc.) and sequentially introduce into fleet.	P 47	
	Use of untapped energy sources (Heat supply locations)	11 locations	12 locations	12 locations	Activities are scheduled in line with plans.	P 19	
	Development and spread of new energy sources	6.1 100 million kWh	6.6 100 million kWh *	7.1 100 million kWh *	Contribute to spread and use of new energy sources by diverse measures including self-generation as instructed by Special Measures for Use of New Energy Sources in the Electric Power Industry (RPS law). (2.03 billion kWh* in 2010)	P 20	
		Promote growth of Kasai Green Electricity Fund			Contribute to diffusion through cooperation in fund management, PR, etc.	P 21	
	Energy and resource conservation (In-house use against 2000)	Reduction in electricity consumption in offices	Reduce by 4%	Reduce by 5%	Reduce by 6%	As of 2003, set and implement activities across entire company in order to upgrade companywide environmental management activities.	P 48
		Reduction in domestic water consumption	Reduce by 3%	Reduce by 4%	Reduce by 5%		
		Increase in vehicle mileage	Increase as much as possible				
Reduction in copy paper consumption		Reduce by 12%	Reduce by 14%	Reduce by 15%			
Reduction of SO <sub>x</sub> and NO <sub>x</sub> emissions per unit of power generation	SO <sub>x</sub>	Maintain at current level Reference: 5-year average for 1998 - 2002 Our company: 0.02 g/kWh (Thermal Power Station: 0.06 g/kWh)			Maintain at current world lowest level.	P 37	
	NO <sub>x</sub>	Maintain at current level Reference: 5-year average for 1998 - 2002 Our company: 0.04 g/kWh (Thermal Power Station: 0.14 g/kWh)					
Green purchasing of office supplies (43 target items)	100%			Work to increase number of target items.	P 47		
Improving recycling rate of industrial wastes	More than 90%			Further promote 3 R's (reduce, reuse and recycle) with industrial and other waste, and target zero landfill waste at midterm goal.	P 44		
Increase in installations of systems conforming to ISO standards (total)	Maintain and increase number of conforming facilities			Continually improve environmental management systems.	P 10		

\* Estimated figure of Agency for Natural Resources and Energy

# Conceptual View of Our Environmental Load

Kansai Electric is working hard to quantitatively identify the full picture of the environmental load caused by our business activities so that we can reduce that load.





## I.Environmental Management

Total quality management (TQM) is the basis at Kansai Electric for not only observing laws and regulations but also upgrading our environmental management systems so as to promote more efficient and more effective action.

### Chapter 1 Contents

- 10 Environmental Improvement Activities of our Environmental Management Systems
- 12 Environmental Accounting



## Environmental Improvement Activities of our Environmental Management Systems

Business activities at Kansai Electric are based on the principles of total quality management (TQM)\*. With particular regard to our environmental protection activities, we are working hard to upgrade environmental management systems and continually improve activities in line with our Protocol on Environmental Management of April 1998.

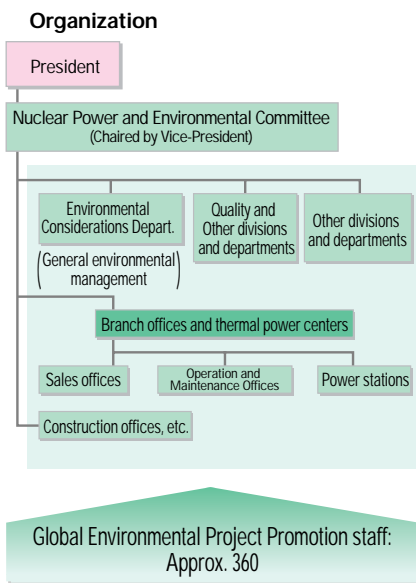
\* Kansai Electric was the first power company in Japan to introduce TQM back in 1981. These early efforts won us the Deming Prize in 1984. Since then, we have been pursuing consistent and comprehensive activities aimed at improving our environmental performance.

### Organization and Activities Cycle

At Kansai Electric, the Nuclear Power and Environmental Committee, which is made up of people from management, oversees the Environmental Considerations Department which deploys environmental management personnel to the various organizations in the company.

Every year, companywide environmental improvement activities are implemented using a PDCA cycle that is based on Eco Action, a specific action plan adopted by the Nuclear Power and Environmental Committee.

Kansai Electric also has about 360 environmental project promotion staff who impart environmental education in the workplace, do PR activities outside the company and a number of other chores aimed at helping the individual departments take up environmental activities of their own.



### Building Environmental Management Systems Conforming to ISO14001

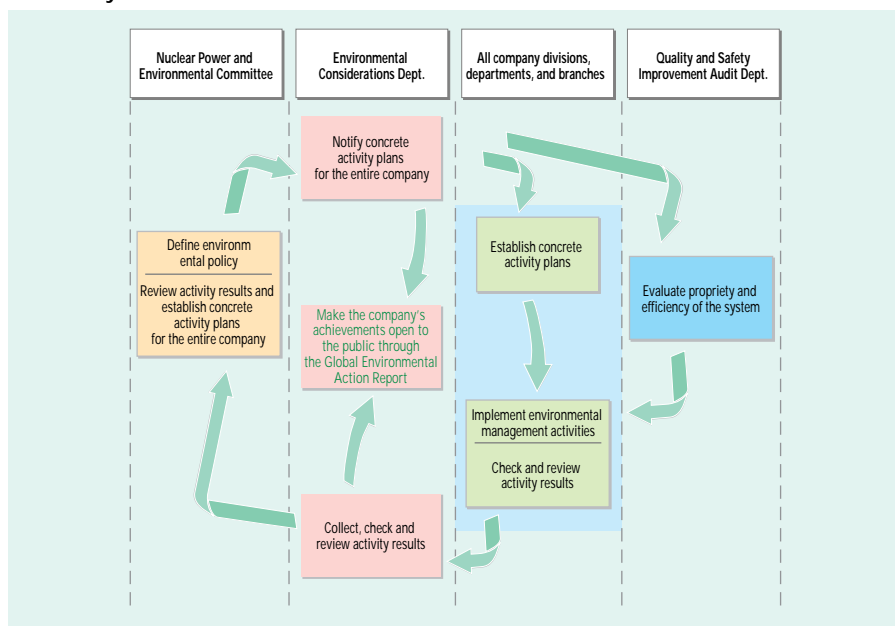
We started building ISO14001 environmental management systems for our thermal power stations, which generate the largest environmental load of our activities, in 1997. Today, systems are up and running at all thermal power stations we operate. As a result, the workforce is showing a heightened awareness of the environment and we are promoting energy and resource saving activities in more ways than ever. The positive results have encouraged us to apply these systems to nuclear power stations and operation and maintenance office.

And, in 2002, we started inviting employees from other operations and outside experts to join in the internal audit of self-declared thermal power stations so as to lend their thoughts and ideas on how to improve our systems even further.

#### Facilities conforming to ISO14001 (As of March 31, 2003)

Type of facility	Operation and Maintenance Offices	Thermal power stations	Nuclear power stations
Self-declared	0	6	1
Externally certified	4	7	1

### PDCA Cycle



### Acquisition of ISO14001

To gain an objective evaluation of our environmental efforts, we successfully acquired external certifications for 12 facilities by 2002. In 2003, activities targeted at acquiring external certification were launched at the Technical Research Center.

#### Facilities that have been awarded external certification (As of March 31, 2003)

Facility	Date of registration
Miyazu Energy Research Center (Thermal power)	March 24, 2000
Himeji No. 1 Power Station (Thermal power)	March 24, 2000
Kainan Power Station (Thermal power)	October 27, 2000
Himeji No. 2 Power Station (Thermal power)	March 23, 2001
Kishiwada Operation and Maintenance Office	March 23, 2001
Sakaiko Power Station (Thermal power)	February 22, 2002
Tanabe Operation and Maintenance Office	February 22, 2002
Kurobegawa Operation and Maintenance Office	February 22, 2002
Nanko Power Station (Thermal power)	March 29, 2002
Himeji LNG Management Office	March 29, 2002
Himeji Operation and Maintenance Office	March 29, 2002
Ohi Nuclear Power Station	October 25, 2002



## Environmental Education

In order to promote and improve environmental protection activities in all business fields, Kansai Electric is working hard to develop human resources that can create and implement voluntary and constructive activities in accordance with their own position and responsibilities in their specific workplace. We also want to upgrade our educational program using an e-learning system for all employees in the future.

### Educational programs for employees (Imparted by Kansai Electric)

Program	Period	Description	Imparted to	Number of participants
Environmental Staff Training	Sept. 2002	Provide knowledge of the company's environmental policy, and environmental problems in and outside the company. Aims to help employees promote voluntary and constructive activities.	New environmental staff	37
Internal Environmental Audit Training	Oct. 2002	Provide knowledge of ISO requirements and improve skills in environmental audit techniques.	Internal auditors (Asst. site managers and department managers)	21
ISO14001 Staff Training	Nov. 2001	Provide knowledge of ISO requirements and improve skills in environmental sampling, assessment and other special techniques.	ISO14001 Office (Managers in charge of program building and operation)	26

## Award of Excellence in Environmental Action Promotion

Since 1992, Kansai Electric has been giving an Award of Excellence to business sites that implement exemplar environmental activities, with the objective of encouraging even bigger and better activities.

The award has gone to business sites who have, in addition to exhibiting good environmental performance for the year (degree to which they reduced the environmental load of their activities), long supported grassroots activities.



Planting activities at an elementary school, followed by an environmental studies class. (Higashi Osaka Sales Office)

## Observing Environmental Regulations

### Observance of Environmental Laws and Regulations

Never once has Kansai Electric violated any laws or ordinances governing our facilities or any of the many Agreement on Environmental Protection we have with local communities that host our facilities.

#### Main Environmental Laws

- Air Pollution Control Law
- Water Pollution Control Law
- Noise Regulation Law
- Vibrations Regulation Law
- Offensive Odor Control Law
- Waste Disposal and Public Cleansing Law

#### Main Ordinances

- Ordinance Pertaining to the Protection of the Living Environment in Osaka Prefecture (Osaka Prefecture)
- Ordinance Pertaining to the Protection and Creation of the Environment (Hyogo Prefecture)
- Law on the Protection and Fostering of the Environment of Kyoto Prefecture (Kyoto Prefecture)
- Ordinance Pertaining to the Prevention of Environmental Pollution in Wakayama Prefecture
- Ordinance Pertaining to the Prevention of Environmental Pollution in Fukui Prefecture

#### Main Agreements

#### 11 environmental protection agreements for thermal power stations

- Agreement on Pollution Prevention at Nanko Power Station (Power stations in Nanko, Sakaiko and Osaka)
- Agreement on Environmental Protection (Himeji No. 1 and No. 2)
- Agreement on Pollution Prevention (Kainan Power Station)
- Agreement on Environmental Protection at Maizuru Power Station (Maizuru Power Station)

#### 3 safety agreements for nuclear power stations

- Agreement on Environmental Safety for Area Around Nuclear Power Stations (Nuclear power stations in Mihama, Ohi and Takahama)

### Environmental Assessment for Power Station Construction

In 1973, the Ministry of International Trade and Industry (MITI) (currently the Ministry of Economy, Trade and Industry) started requiring that an environmental impact assessment\* be conducted whenever a power station is constructed. In 1997, requirements for environmental impact assessments and power station siting were strengthened by ministerial decision. Since that time, Kansai Electric has conducted 16 environmental impact assessments.

Following the passage of the Environmental Impact Assessment Law in 1997 and revisions to the Electric Utilities Industry Law, specific procedures were added to assessments for power stations.

This environmental impact assessment system is the basis by which we are making efforts to incorporate everyone's concern for the environment into building and operating power stations.

\* For more information on environmental impact assessments, see P.66.



Water sampling in sea area near construction site





## Environmental Accounting

Since 1999, Kansai Electric has been using an environmental accounting system that serves to gain a quantitative picture of the costs of environmental protection and the effectiveness of our efforts. We publicly disclose our findings and use them to promote more efficient and more effective environmental protection activities.

### Important Matters at the Basis of Environmental Accounting Calculations

#### 1. Basic conditions for calculations

- (1) Target period One fiscal year from April 1, 2002 to March 31, 2003
- (2) Scope All business activities and operations at Kansai Electric

#### 2. Criteria for calculating environmental protection cost

- (1) Method for calculating depreciation Depreciation is left out of calculations so as to avoid duplicate investment figures.
- (2) Criteria for composite spending Environmental protection costs are sampled in the following order.  
[1] Balance computation [2] Prorating based on rational criteria [3] Prorating based on simplified criteria. Costs for buried cable infrastructure included in "III 3. Natural environment protection and harmonization" of the table on P.13 are calculated as 50% of the actual cost, because the purpose of burying cables is two-fold: to maintain scenery and ensure supply.

#### 3. Criteria for calculating environmental protection effect

- (1) Scope of target effect The emission from environmental load and the reduction through our primary business activities (electricity production, distribution, sales and service activities)  
Performance of environmental activities other than the above
- (2) Method for calculating effect In principle, the environmental protection effect is calculated by a simple comparison against a reference term, that being the previous year. Additionally, CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> are compared against 1990 levels.

#### 4. Criteria for calculating economic effect of environmental protection efforts

- (1) Scope of target effect Real effect based on hard evidence. Does not include estimated effects based on hypothetical calculations.
- (2) Method for calculating economic effect  
[1] Revenue Financially accountable revenue earned from environmental protection measures is included in accounting.  
[2] Cost cutting Results of environmental protection measures are compared against the inevitable if those same measures were not implemented, and are included in accounting.

#### 5. Other

- (1) Guidelines to conform by In principle, calculations for environmental accounting conforming to the 2002 Environmental Accounting Guidelines of the Ministry of the Environment, with some considerations being given to the nature and characteristics of the electric power industry in determining categories, etc.
- (2) Other important information There are diverse thoughts on how to sample environmental protection costs in regards to nuclear power generation. At present, because it is necessary to conduct environmental accounting carefully, the full amount of recognized individual environmental measures (radiation control and measuring, treatment of radioactive waste, planting projects, etc.) are included in accounting.

### Accounting Results for 2002

The environmental balance for 2002 showed ¥ 35.4 billion in investments and ¥ 39.0 billion in expense. This accounts for 11% and 2% of all investment and all expenditures costs for electric utilities business for the entire company, respectively.

With regard to investment, there was an increase alongside the progressive construction of new thermal power stations, but because of a decrease in buried transmission cable laying and other projects, Kansai Electric invested ¥ 2.6 billion less (total) than in 2001. A decrease was seen also with expense, as the closing and scrapping of thermal power stations brought a

reduction in pollution prevention equipment maintenance (repair) costs, the total decrease being ¥ 3.9 billion less than last year.

As for the environmental protection effect, we successfully reduced emissions of CO<sub>2</sub>, SO<sub>x</sub> and NO<sub>x</sub> by increasing the capacity factor of nuclear power stations and scaling back production at thermal power stations. An improvement was also registered in emissions per unit power consumed (SO<sub>x</sub> and NO<sub>x</sub> are rated against amount of power generated).

The economic effect of our environmental protection efforts was ¥ 3 billion less (total) than in 2001.

### Improving our Environmental Accounting Practices

The environmental accounting records we publicize are tabulated for Kansai Electric alone, but we believe it necessary to examine ways to calculate environmental balance on a consolidated base.

Because group companies deal in a broad range of businesses from energy production to lifestyle amenities and communications, we want to gradually get a picture of the environmental protection costs and effectiveness of each company and examine whether or not there is a way to compute a consolidated environmental balance.

**Environmental protection costs**

Units: ¥100 million

Category	Investment		Expense		Main items
	Fiscal 2002	Fiscal 2001	Fiscal 2002	Fiscal 2001	
I. Cost of environmental management	-	-	42.7	46.8	
1. Environmental management	-	-	0.8	0.8	Preparation of environmental reports, internal education programs, acquisition of external certification such as ISO
2. Environmental advertising	-	-	1.4	1.5	Monthly events related to the environment, PR work on energy conservation
3. Labor costs	-	-	40.5	44.5	
II. Cost of measures against global environmental problems	1.8	1.4	9.2	7.4	System linkage to new energy sources, purchase of excess electricity from new energy sources
III. Cost of conservation of regional environments	328.4	363.9	240.4	267.8	
1. Monitoring and measuring of environmental impact	7.5	8.4	19.6	20.5	Measurement and management of radioactivity levels, measurement and research of substance concentration in the environment
2. Pollution prevention	208.1	179.2	172.1	194.9	Measures for preventing air and water pollution
3. Natural environment protection and harmonization	112.8	176.3	48.7	52.4	Burying of transmission cables, planting projects
IV. Cost of building a recycle-oriented society	18.8	8.7	65.1	65.1	
1. Treatment and recycling of industrial waste	12.6	2.7	14.3	13.0	Industrial waste and PCB treatment
2. Treatment and recycling of general waste	0.6	-	0.2	0.3	Recycling of old paper
3. Treatment of radioactive waste	5.6	6.0	50.2	51.3	Low level radioactive waste treatment
4. Green purchasing	0.0	0.0	0.4	0.5	Effective use of insulation scrap in paving, use of recycled road base material
V. Cost of research and development	0.0	0.4	20.0	26.3	CO <sub>2</sub> measures, waste treatment measures
VI. Other costs	4.9	5.8	12.7	15.5	
1. Coexistence with local communities and support for environmental education	-	-	2.9	4.9	Membership in environmental organizations, donations for events
2. International activities	4.9	5.8	0.0	-	Donations to environment funds overseas
3. Environmental subsidies and donations	-	-	9.8	10.6	Levies on pollution levels
Total	353.9	380.2	390.1	428.9	
Total investment for the concerned period	3,265	4,105	-	-	
Total running costs for electric utilities business during the concerned period	-	-	21,552	22,061	

**Effect of environmental protection activities**

Category	Item (Unit)	Fiscal 2002 (A)	Fiscal 2001 (B)	Result (A - B)	Against 1990 (or accumulative total)	
I. Environmental management	Acquisition of external certification such as ISO (Facilities)	1	6	-	(12)	
II. Global environmental protection	CO <sub>2</sub> emissions (10,000 t-CO <sub>2</sub> )	3,684	3,688	4	577	
	CO <sub>2</sub> emissions per unit of power (kg-CO <sub>2</sub> /kWh)	0.26	0.26	0.00	0.09	
III. Regional environmental protection	Pollution prevention	SO <sub>x</sub> emissions (t)	1,332	1,438	106	9,911
		SO <sub>x</sub> emission per unit of power (g/kWh)	0.01	0.01	0.00	0.08
		NO <sub>x</sub> emissions (t)	3,740	4,801	1,061	11,306
	Environmental harmonization	NO <sub>x</sub> emission per unit of power (g/kWh)	0.03	0.04	0.01	0.09
		Extended length of buried cable (km)	178	186	-	(12,728)
		Forested area (1,000 m <sup>2</sup> )	4	46	-	(3,582)
IV. Building of a recycle-oriented society	Industrial waste discharge (1,000 t)	50	64	14	-	
	Industrial waste recycle rate (%)	85	87	2	-	
	Low level radioactive waste (Drum cans)	1,078	3,545	-	(115,828)	
	Introduction of electric vehicles (Total number of vehicles)	175	173	-	-	
V. Other	Forestation (10,000 trees) ... (31.7) (Since Fiscal 1993)	2.4	2.9	-	(31.7) (Since Fiscal 1993)	
	Beautification activities (no. of cases) ... (6,142) (Since Fiscal 1996)	841	1,027	-	(6,142) (Since Fiscal 1996)	

Note: CO<sub>2</sub> emissions include that for other companies. SO<sub>x</sub> and NO<sub>x</sub> emissions are only for self-generated power. CO<sub>2</sub> emission per unit of power is based on amount of energy sold. SO<sub>x</sub> and NO<sub>x</sub> emission per unit of power is based on amount of power generated.

**Economic effect of environmental protection efforts**

Units: ¥100 million

Category	Fiscal 2002	Fiscal 2001	Main items	
Revenue				
Revenue from recycle business	0.0	0.0	Sales of desulfurizing gypsum for flue gas	
Expenditure	Cost reduction by energy-saving	79.8	111.2	Reduction in fuel consumption by improving heat efficiency of thermal power stations*
	Cost reduction by material reuse and recycling	49.8	46.8	Cost reduction by reusing utility pole transformers, etc.
	Other	0.2	1.5	Reduction in pollution load levies by reducing SO <sub>x</sub> emissions
Total	129.8	159.5		

\* The reduced fuel consumption for this year was calculated from the heat efficiency improvement compared against 1990 levels.



### Evaluation of Eco-Efficiency

#### What is Eco-Efficiency?

For the sustainable development of a company, it is necessary to reduce one's environmental load while maximizing profitability. The relationship between environmental performance and financial performance can be expressed as the "Eco-Efficiency" proposed by the World Business Council for Sustainable Development (WBCSD).

#### Eco-Efficiency

= Value of products and services \*1 ÷ Environmental impact \*2

"Generally applicable" index

\*1 Amount of products, services offered, sales and earnings

\*2 Amount of energy consumption, greenhouse gases emitted, pollutants emitted and waste discharged

#### Eco-Efficiency at Kansai Electric

Along this line of thinking, Kansai Electric devised and tested a formula for expressing the relationship between the environmental load generated by our business activities and the economic value (profits) of our business activities, or in other words, the economic profit per unit environmental load.

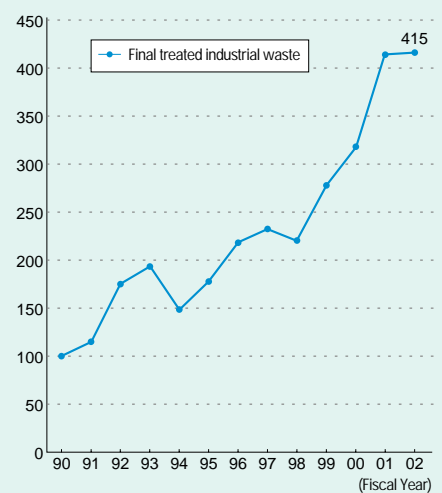
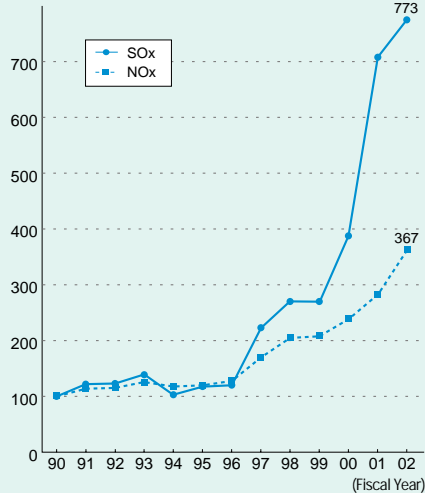
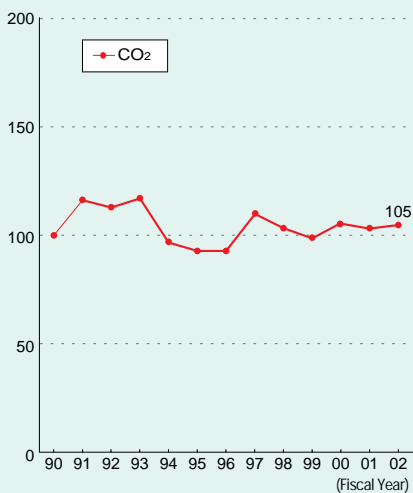
Because of the nature of our business, we look at the amount of emitted CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub> and final treated industrial waste discharged in order to calculate environmental load. And, to calculate economic profit, we use the operating profits recorded on our accounting balance for environmental performance-calculated business (electric power business).

#### Trial Results and Future Direction

Compared against 1990 levels, CO<sub>2</sub> emissions for 2002 improved by 5%, while SO<sub>x</sub>, NO<sub>x</sub> and industrial waste each improved far more.

So that we can promote business activities that both reduce environmental load and increase economic value, we will continue to pursue this eco-efficiency and will examine the applicability of other business management indexes. and final treated industrial waste discharged in order to calculate environmental load. And, to calculate economic profit, we use the operating profits recorded on our accounting balance for environmental performance-calculated business (electric power business).

Eco-Efficiency (Operating profits ÷ Environmental load), 1990 level = 100



Note: Overseas, a method for standardizing environmental load substances of differing units into a single index was developed by adding the environmental impact and degree of damage to living things and ecosystems. It is also being studied in Japan. However, because countries cite differing conditions as the pretext for determining compounding variables and because the variables themselves change depending on the type of thinking that is applied, we will continue to look for a standardized approach to assessing environmental load through discussions and research in Japan.



## II. Addressing Global Environmental Problems

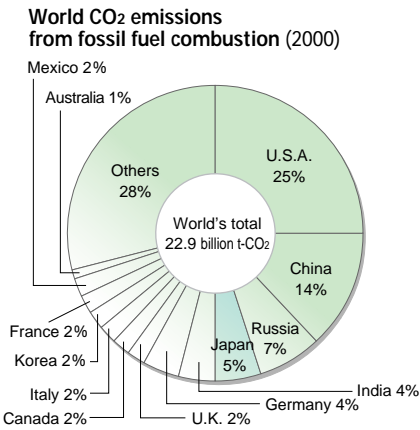
In the New ERA Strategy, Kansai Electric is developing activities and operations around the world to reduce greenhouse gases and efficiently use energy as a comprehensive countermeasure to global warming.

### Chapter 2 Contents

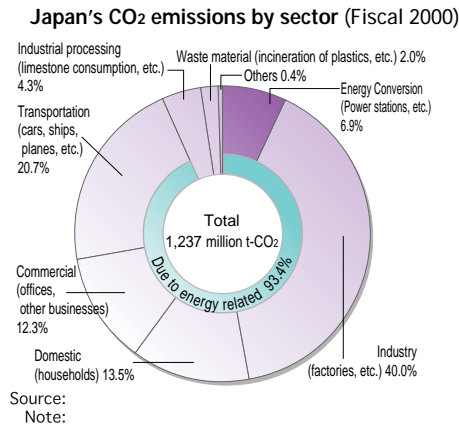
- 16 CO<sub>2</sub> Emissions Around the World and in Japan
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## CO<sub>2</sub> Emissions Around the World and in Japan

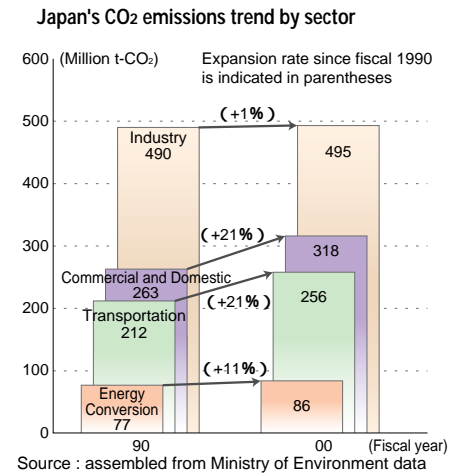
The world as a whole emits about 23.5 billion t-CO<sub>2</sub> (figure for 2002), of which Japan accounts for about 5%.



Emissions of CO<sub>2</sub> in Japan are climbing markedly compared to 1990 levels in the private and transportation sectors, but in June 2002, Japan



signed the Kyoto Protocol, which gave the country the target of reducing emissions of greenhouse gases to 6% the level of 1990 from 2008 to 2012.



## Measures for Reducing CO<sub>2</sub> Emissions in the Electric Utility Industry

The Federation of Electric Power Companies of Japan adopted an Environmental Plan of Action for the Electric Power Industry with which it is promoting action on both the electricity supply and demand (consumption) ends to reduce the emission of CO<sub>2</sub> in its relation to electricity usage.

### Environmental Plan of Action for the Electric Power Industry

The Federation of Electric Power Companies of Japan adopted and released the Environmental Plan of Action for the Electric Power Industry in November 1996. The plan went through its 5th review in September 2002.

The plan raises as the reduction target to "reduce emissions per unit consumption to about 20% the level of 1990 (0.34 kg- CO<sub>2</sub>/kWh) by the

year 2010". To achieve this goal, on the supply side, Kansai Electric is using a best-mix concept of power sources centered around nuclear power generation and improving the thermal efficiency of thermal power stations, while on the demand side, promoting energy conservation and load balancing.

**CO<sub>2</sub> Emissions**  
Approx. 320 million (Approx. 14% increase against 1990 level)

**Amount of power generated (Amount of electricity consumed)**  
Approx. 943.0 billion kWh (Approx. 43% increase against 1990 level)

**CO<sub>2</sub> emissions per unit power generated**  
0.34 kg- CO<sub>2</sub>/kWh (Approx. 20% decrease against 1990 level)

Whereas power consumption on the user end is predicted to increase 43% by 2010, the outlook on CO<sub>2</sub> emissions is about a 14% increase.

### Reference Kyoto Protocol

The Kyoto Protocol, which sets specific numerical CO<sub>2</sub> reduction targets for advanced nations, was adopted at the United Nations Framework Convention on Climate Change (COP3 or Global Warming Summit in Kyoto) held in Kyoto in December 1997. Japan signed the Kyoto Protocol in June 2002.

#### Outline of the Kyoto Protocol

Target period	5-years period from 2008 ~ 2012 (1st promissory period)	Kyoto Mechanism	Emission credits (Tradable between advanced nations)	System that allows advanced nations to buy and sell emission credits amongst themselves in order to attain reduction targets.
Target gases	CO <sub>2</sub> , CH <sub>4</sub> , NO <sub>x</sub> , HFC, PFC, SF <sub>6</sub>		Joint implementation (Projects between advanced nations)	System that allows advanced nations to jointly implement projects. Investing nations can apply the reduction towards attaining their own reduction targets.
Reference year	1990 (1995 may be selected for HFC, PFC and SF <sub>6</sub> .)		Clean development mechanism (Projects between advanced nations and developing nations)	System that allows advanced nations to jointly implement projects in cohort with developing nations. Investing (industrially advanced) nations can apply reduction of developing nations towards attaining their own reduction targets.
Reduction target	All advanced nations: Min. 5% below reference year level EU: s8%, USA: s7%, Japan: s6%, Russia: 0%, etc.			
Absorption sources	System that allows nations to use the amount of CO <sub>2</sub> absorbed by new forestation, reforestation and forest depletion since 1990 as well as forest management, farmland management, graze land management and forest restoration.			



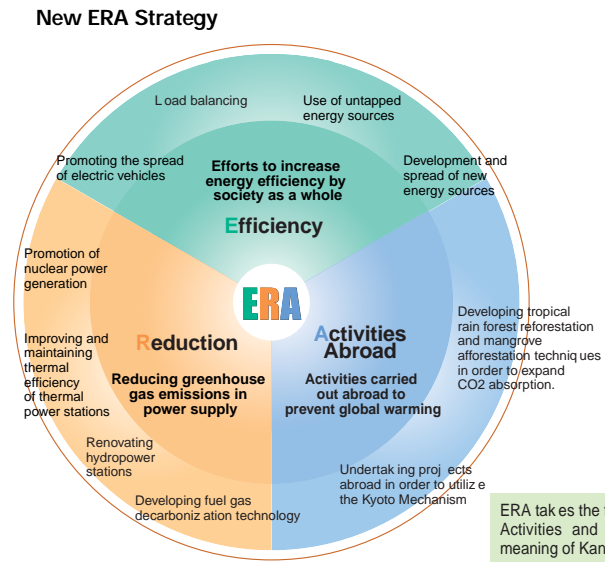


## Kansai Electric's Action Against Global Warming - New ERA Strategy

Kansai Electric has developed an aggressive "New ERA Strategy" as a comprehensive approach to reducing greenhouse gas emissions.

### Outline of New ERA Strategy

Kansai Electric's New ERA Strategy is a long-term approach to achieving sustainable development as a company. It aims to simultaneously attain "Economic", "Energy" and "Environmental" targets - or the so-called 3 E's - by delivering a careful balance of E, R and A.



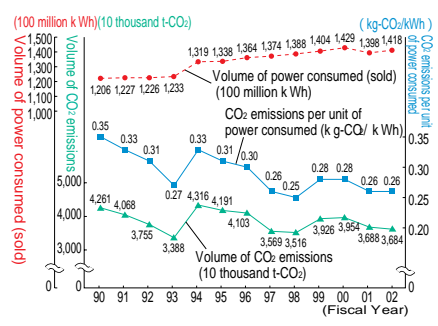
ERA takes the first letter in the words Efficiency, Reduction, Activities and Abroad. It spells era as it carries the meaning of Kansai Electric pioneering a new age.

### CO<sub>2</sub> Reduction Targets and Performance

Kansai Electric has set the same numerical targets for CO<sub>2</sub> reduction as the whole electric utility industry, that being about 0.34 kg- CO<sub>2</sub> kWh.

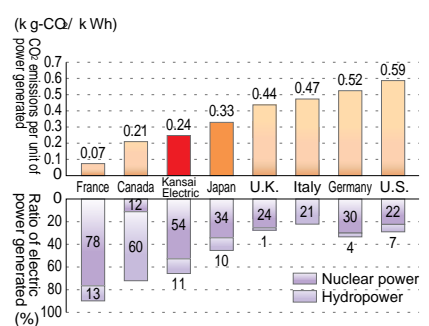
As a result of our promoting the New ERA Strategy, CO<sub>2</sub> emissions per unit of power consumed was 0.26 kg- CO<sub>2</sub>/kWh in 2002.

Trend of CO<sub>2</sub> emissions per unit of power consumed (sold)



Compared to fiscal 1990, the volume of power consumed increases by 18%, while the volume of CO<sub>2</sub> emissions reduced by 14%.

CO<sub>2</sub> emissions per unit of power generated and nuclear / hydropower ratio (2000)



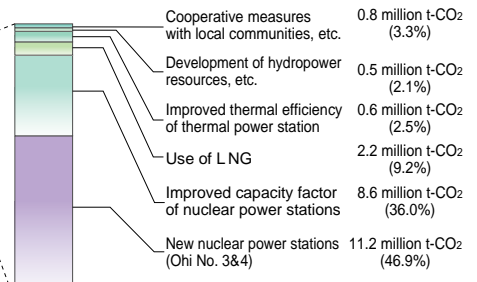
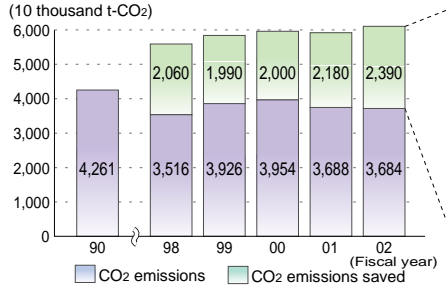
Source for foreign countries: Energy Balances of OECD Countries 1999-2000  
Source for Japan: survey by the Federation of Electric Power Companies.  
Actual results for Kansai Electric for fiscal year 2002.

Compared CO<sub>2</sub> emissions per unit of power generated of Kansai Electric to those of Europe and U.S., we are in the third level behind France, high ratio of nuclear power, and Canada, high ratio of hydropower.

### Effect of Avoiding CO<sub>2</sub> Emissions

In 2002, Kansai Electric avoided emitting about 23.90 million t- CO<sub>2</sub> compared to 1990 levels, of which nuclear power generation accounted for about 80%. This amount is equivalent to about 2% of the 1.237 billion t- CO<sub>2</sub> (2000) that Japan generates annually. When converted into a quantity of oil, it is 8.60 million kl or about 1.4 times the fuel Kansai Electric consumed in 2002.

CO<sub>2</sub> emissions saved



Note: Percentages are calculated against total amounts.

# Efficiency Efforts to Increase Energy Efficiency by Society as a Whole

## INPUT Promotion of Load Balancing

### Encouraging the Use of Nighttime Electricity (Less CO<sub>2</sub> Emission)

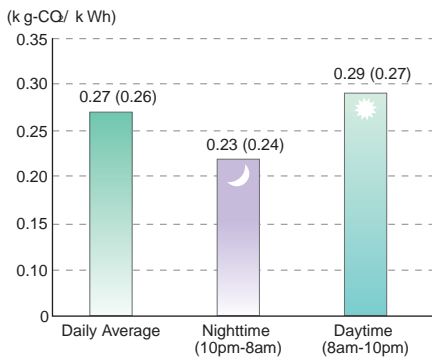
With the increase in air conditioning demand of recent years, power consumption has come to differ greatly between daytime and nighttime use. By balancing load between day and night, Kansai Electric can efficiently use equipment and reduce emissions of CO<sub>2</sub>. Therefore, Kansai Electric is encouraging customers to use nighttime electricity in the following ways.

Activities for diffusing ice (water) heat storage air-conditioning systems that use nighttime electricity

Offering rating systems\* such as less expensive heat storage adjustment contracts that shift daytime demand peaks to nighttime when electricity rates are lower

\* For more information on rates, see P. 68.

#### CO<sub>2</sub> emissions per unit of power consumed (sold)



(Average demand over five years from fiscal 1998 to 2002. Figures in parentheses are for fiscal 2001 only)

### PR Activities for Customers

Kansai Electric does PR activities and provides customers with ideas on how to lead safe, stable, convenient and comfortable lives while at the same time constructively showing concern for the global environment.

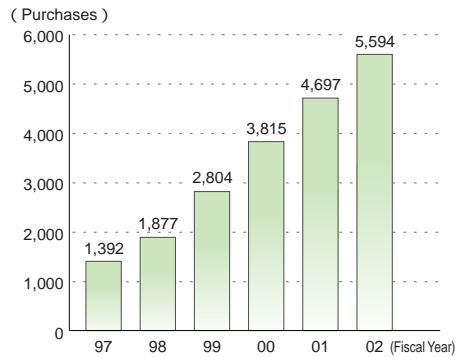
#### Events

Name	Description
Lifestyle Electricity Fair (April - May)	Proposals on the easily obtainable affluence of electricity through electric water heaters, etc.
Heat Storage Air-conditioning Fair (May or June)	General proposals on how to use energy by showing heat storage systems, etc.
All-Electrification Campaign (Oct. - Dec.)	PR activities aimed at popularizing the electric home, centered around IH ranges, etc.

### Proposals for Factories and Buildings

Heat storage systems have spread as air conditioning and industrial process equipment. Year after year, the number of Heat Storage and Adjustment plan that allow customers to use less expensive nighttime electricity have increased in number, and the Eco-Ice Mini ice heat storage air-conditioning system is growing amongst customers with offices or stores of some 50 - 200 m<sup>2</sup> in floor space.

#### Number of contracts for heat storage and adjustment plan



### Energy-saving Consulting Services

To help customers with factories and equipment understand the characteristics of electricity and select the best system for their needs, the Kansai Electric Group has consolidated technology and know-how into energy-saving consulting services.

As part of our solution sales activities that serve to resolve a variety of problems in cohort with the customer, we investigate energy and cost-saving measures for factory systems. Our activities are broad in nature as they address the reduction of CO<sub>2</sub> emissions and industrial waste. These services are gaining Kansai Electric the customer's trust and contributing to environmental protection for society as a whole.

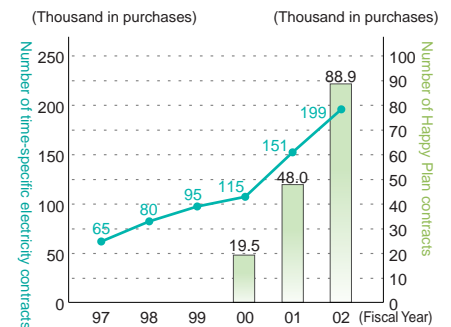


Diagnosis of customer's equipment

### Proposals for the General Household

Many customers are using electric water heaters, a product that runs on nighttime electricity. And, there has been an increase in the number of customers who have contracted time-specific electricity that lets them take advantage of lower rate nighttime electricity. Kansai Electric also offers the consumer a variety of rate plans that they can select according to need, such as when a customer chooses an all-electric home, they can opt for a Happy Plan that discounts our Happy Time by another 10%.

#### Time-specific electricity contracts and Happy Plan contracts



### Happy Package

The all-electric home is - in our eye - safe, comfortable and convenient besides financially advantageous and eco-friendly. To aggressively encourage consumers to switch over, Kansai Electric officially introduced the Happy Package lease system in October 2001 that lets consumers lease electric water heaters and IH cooking ranges.

Since no deposit is required, anyone can easily change to an all-electric way of life, hence the trend is growing rapidly.

In the first year and a half since the initial offering (as of March 31, 2003), Kansai Electric has concluded about 7,500 Happy Package contracts in all.



## INPUT Promoting the Spread of Electric Vehicles

The use of electric vehicles (EV) reduces CO<sub>2</sub> emissions to about one-third that of gasoline-powered vehicles. And, if they EV is charged using nighttime electricity that emits less CO<sub>2</sub>, CO<sub>2</sub> emissions can be even further reduced.

Kansai Electric is promoting the use of EV by participating and exhibiting at events. Also, for what regards in-house use of EV, Kansai

Electric is evaluating the whole span of low-pollution vehicles in addition to the EV and searching for ways to introduce low environmental load vehicles into our vehicle fleet. (See P. 47)

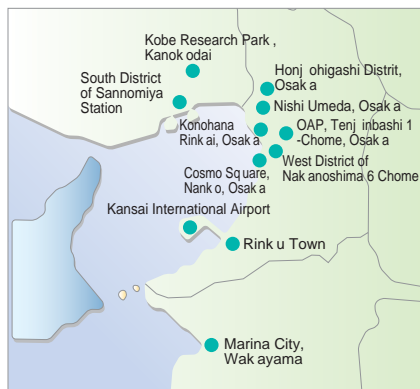


EV used as the lead car for a marathon

## INPUT Use of Untapped Energy Sources

Kansai Electric currently has 11 heat supply projects that utilize untapped energy sources. Plans are to introduce regional heat supply that uses river water and exhaust heat from a power substation in Osaka Nakanoshima 3-chome district in December 2004.

### Regional Heating Service Area

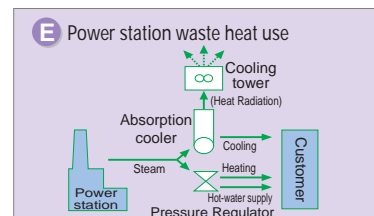
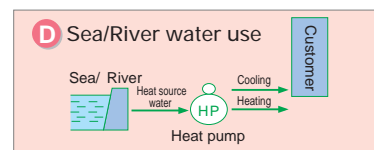
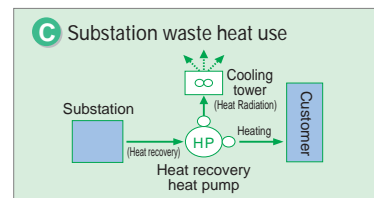
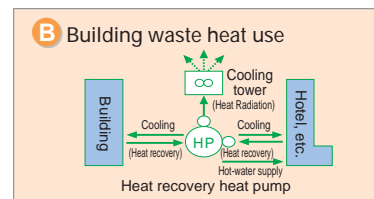
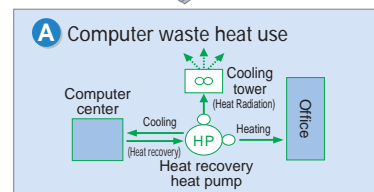


Utility tunnel and pipes

### Projects for Practical Use of Untapped Energy

Area	Energy source Started	Applied system
Osaka Nishi Umeda	Waste heat from cogeneration Apr. 1991	
Osaka Honjo Higashi	Waste heat from computers Jan. 1992	A
Nakanoshima 6-chome Nishi	Waste heat from buildings Nov. 1992	B
Osaka Nanko Cosmo Square	Sea water temperature, waste heat from cogeneration and buildings Apr. 1994	B D
Kansai International Airport	Waste heat from power stations Apr. 1994	E
Wakayama Marina City	Extracted steam from power stations Jul. 1994	E
Kobe research Park Kanoko-dai	Waste heat from computers and buildings Nov. 1994	A B
Tenjinbashi 1-chome	River water temperature, waste heat from cogeneration Jan. 1996	D
Rinku Town Area	Waste heat from substation and building Sep. 1996	B C
South of Sannomiya Station	Waste heat from buildings and computers Apr. 1999	A B
Osaka Konohana Rinkai	Waste heat from cogeneration Apr. 2001	

### Example Systems



## INPUT Development and Spread of New Energy Sources

### For the Diffusion of New Energy Sources

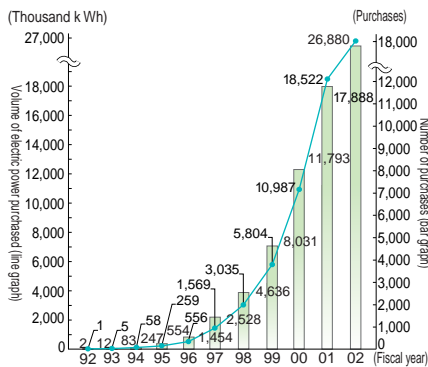
Kansai Electric has been constructively supporting the use of new energy sources by purchasing surplus electricity generated by solar power and wind power as well as by donating to the Kansai Green Power Fund. Also, since April 2003, when the Special Measures for Use of New Energy Sources in the Electric Power Industry (RPS Law)\* -- requires electric utilities to use a certain amount or more electricity of generated by new energy sources -- came into full effect, Kansai Electric has been working to introduce new energy sources including self-developed sources by the Kansai Electric Group.

\* For more information on the RPS Law, see P. 67.

### Solar Power Generation

Since we introduced a system for purchasing surplus electricity from customers in April 1992, there has been a marked increase in the number of purchases and the amount of electricity purchased. Kansai Electric is also installing solar power generation systems every time we build a new office or add to an old one. Equipment capacity was 765 kW as of March 31, 2003.

Purchase of surplus power from photovoltaic generation



Solar panels on a roof at the Nanko Power Station

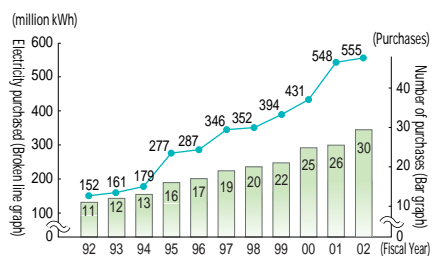
### Wind Power Generation

In addition to purchasing surplus electricity from customers, we started purchasing electricity outright from operators whose business is power generation. In fiscal 2002, we purchased a total of 6.25 million kWh from 7 separate purchases. Moreover, as of March 31, 2003, Kansai Electric owned wind power generation systems with a capacity of 154 kW.

### Waste-fired Power Generation

Kansai Electric also purchases surplus electricity from local governments that generate power using the heat of waste incineration as a heat source. This method additionally lowers environmental load. Every year, the number of purchases and the amount of electricity purchased increases.

Surplus electricity purchased from waste-fire power generation



### Reference New Energy Sources

New energy sources are defined as "useable new energy sources" in the Special Measures Law for the Promotion of New Energy Sources. More specifically, they are that which is "technically practical but cannot be diffused because of financial restraints, yet must be introduced as an alternative to oil."

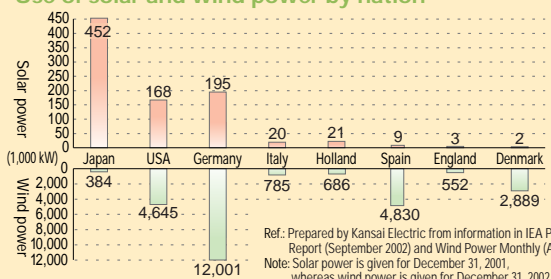
Of these, solar power and wind power have great advantages as natural energy sources in that they do not generate CO<sub>2</sub>, however on the hind side, energy density is low and supply is effected by the weather. Moreover, they cost more than other sources of energy.

Nevertheless, new energy sources are being promoted on the national level in Japan as the country has very little energy resources of its own. In fact, Japan leads the world in the amount of solar power systems installed. In contrast to this, Europe has moved forward with wind power generation because of the considerably wider area for catching favorable winds than Japan has.

### Types of new energy sources

- Solar power generation, wind power generation, solar heat recovery, temperature differential energy
  - Waste-fired power generation, waste-fired heat recovery, fuel production from waste
  - Biomass power generation \*, biomass heat recovery \*, fuel production from biomass \*
  - Snow and ice heat recovery \*, clean energy vehicles
  - Natural gas co-generation, fuel cells
- \* Newly added with revisions to laws made in January 2002. (Ref.: Agency of Natural Resources and Energy website)

### Use of solar and wind power by nation



Ref.: Prepared by Kansai Electric from information in IEA PVPS Report (September 2002) and Wind Power Monthly (April, 2003)  
Note: Solar power is given for December 31, 2001, whereas wind power is given for December 31, 2002.



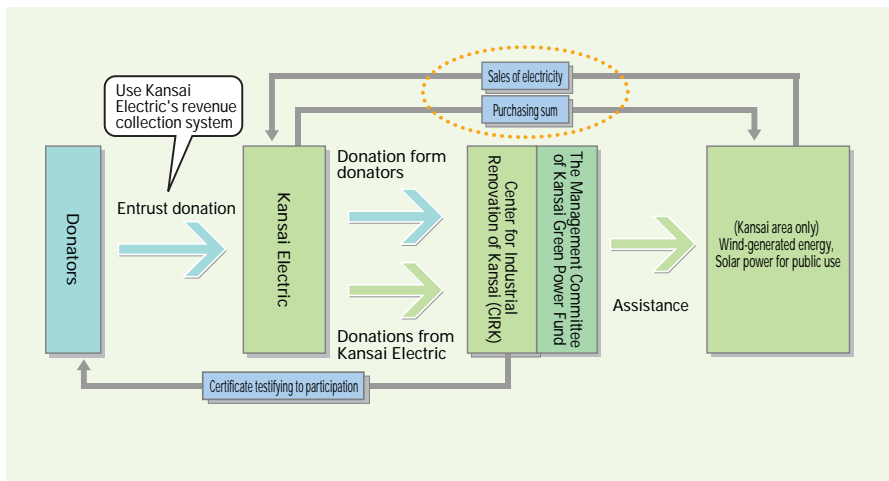


## Cooperation with the Kansai Green Power Fund

The Kansai Green Power Fund\* was created in October 2000 on a proposal made by Kansai Electric. It was set up to promote the use and spread of new energies. The Fund basically provides financial aid for the construction of solar and wind power generation systems for public or business use, from donations received from our customers. Kansai Electric matches the donations that customers give yen-for-yen. Kansai Electric is collaborating in other constructive ways, too, by handling PR activities, accepting and depositing donations, and more.

\*To join the Kansai Green Power Fund, contact your nearest Kansai Electric sales office or send in the postcard provided at the end of this report. We are always looking for more supporters of the Fund.

Structure of Kansai Green Power Fund



Solar panels on the Bandani Higashi Elementary School

Aid recipients for 2002 (Solar power generation)

Recipient	Output Capacity
Minakuchi-cho Bandani Higashi Elementary School (Shiga)	20kW
Shinmeji Tunnel (Hyogo)	16.2kW
Kyotanabe Chubu Jumin Center (Kyoto)	10kW
Tatsuno Haturatsu Center (Hyogo)	10kW
Toyouka Jonan Daycare (Hyogo)	10kW
Inagawa Hokubu Medical Center (Hyogo)	4kW

Aid recipients for 2003

(Solar power generation)

Recipient	Output Capacity
Chorai-cho Yamaguchi Elementary School (Hyogo)	324.392kW
Other 22 recipients*	(Total output: 244.392kW)

\* For more information, see P. 67.

(Wind power generation)

Recipient	Output Capacity
Hotel New Awaji (Hyogo)	2,000kW

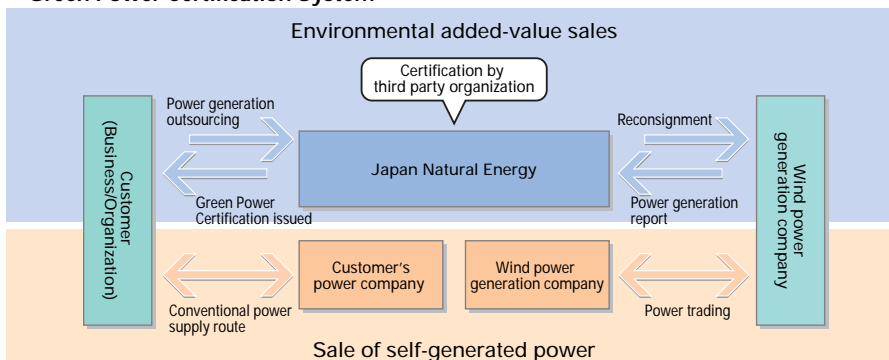
## Japan Natural Energy

Japan Natural Energy was founded in November 2000 with capital from 11 power companies including Kansai Electric. The company provides natural energy generation to customers who prefer to use natural energy, by outsourcing power generation to natural energy producers. As part of the contract with the customer, a third party verifies power generation performance of the natural energy producer. Japan Natural Energy then issues a Green Power Certification to the customer, showing that they have converted to natural power for part of their power needs. Natural

power is one way to conserve energy and reduce CO<sub>2</sub> emissions, so the customer can advertise this as their environmental activity. As

of April 17, 2003, Japan Natural Energy had wind power contracts for 40.299 million kWh from 36 companies and organizations.

Green Power Certification System



<http://www.natural-e.co.jp>



# Reduction Reducing Greenhouse Gas Emissions in Power Supply

## INPUT Promotion of Nuclear Power Generation

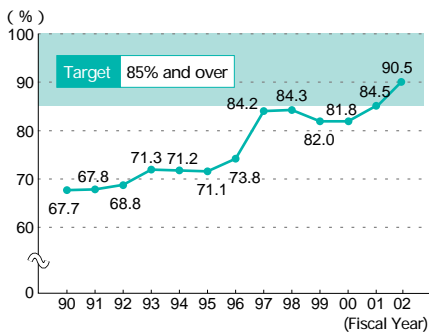
### Improving Capacity Factor of Nuclear Power Stations

Kansai Electric is aggressively promoting nuclear power generation as it does not generate CO<sub>2</sub> emissions in the power generation stage. Since 1997, facilities had been maintained at a 80% capacity factor, but in 2002, we recorded the highest rate in our history at 90.5%. In the future, we will continue efforts to ensure safe stable operation as we aim for a capacity factor of 85% and above.

#### 【Major Activities Aimed at Boosting Capacity Factor】

- Efficiency improvements such as systematically coordinating special work for periodic inspections on the premise of ensuring safety and reliability
- Introduction of steady cycling at a rated thermal output

Capacity factor of nuclear power stations



### To Ensure Safety at Nuclear Power Plants

Safety is the prime concern of a nuclear power plant. That is why the facilities have been designed and built with redundant measures that safely avert accidents and, in the event of trouble, contain it to as small an area as possible. Every possible scenario has been taken into consideration.

#### Prepared for Nuclear Accident

In line with The Law for Measures Against Nuclear Accidents, Kansai Electric has adopted an Accident Response Plan that spells out action to take in a nuclear emergency.

\*Formulated through discussions with local government offices, the plan is part of efforts to ensure our preparedness in the event of trouble, as Kansai Electric continues to build and upgrade our accident prevention readiness. The Law provides a framework of cooperation that allows national and local governments, power companies and related organizations to build a defense against nuclear accidents that threaten surrounding areas.

#### Drills

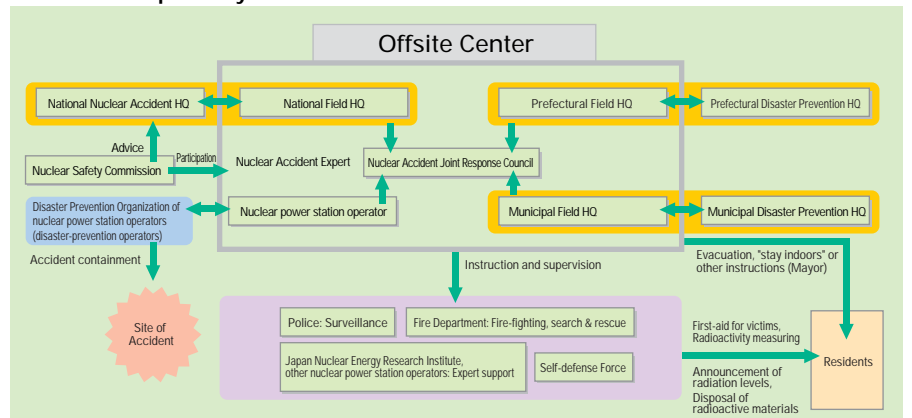
As indicated in the Accident Response Plan, each nuclear power plant stages drills once a year to ensure preparedness in the event of a nuclear accident.

The national and local governments play an active part in these drills as they serve to strengthen coordination.



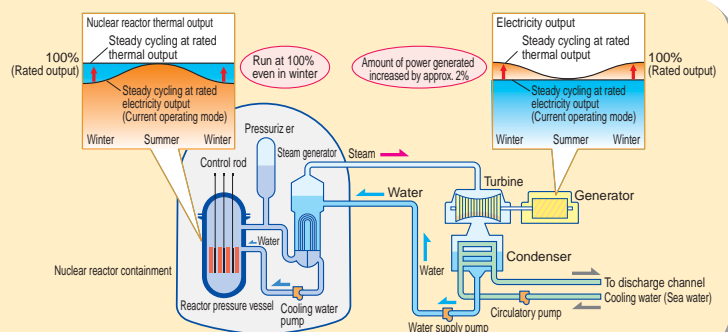
Accident response HQ meeting during emergency drills at Mihama Power Station

#### Accident response system



#### Reference Steady Cycling at Rated Thermal Output

Steady cycling at rated thermal output is an operation mode for a nuclear reactor that maintains thermal output at the maximum regulated level. It improves power generation efficiency and thereby increases electricity output, when the temperature of seawater is low as in winter. The mode is designed to maintain safety and utilize energy effectively. It also reduces CO<sub>2</sub> emissions and is expected to boost output by about 2% a year.





## Activities Aimed at Gaining Trust

Public trust in the nuclear power industry has been lost because of a series of recent incidents to note the criticality accident at the JCO uranium processing plant, the discovery that BNFL (British Nuclear Fuels Ltd.) had falsified data on MOX fuel and wrongdoings in inspection records for nuclear power stations. There has also been a delay in the national Pluthermal plan, making the overall situation tough. In response to this situation, the entire nuclear power industry must regain public trust. Kansai Electric is taking every opportunity to promote activities to do just this - gain back public trust in nuclear power.

### Kansai Atomic Power Information Net-Surfing

In October 2000, universities, research institutes and businesses and organizations with some kind of involvement with nuclear-related facilities in the Kansai area formed Kansai Atomic Power Information Net-Surfing.

This organization is aggressively providing information through various facilities and human resources to gain a proper understanding of nuclear power. Kansai Electric is a part of this effort.

#### 【Activities in Kansai Atomic Power Information Net-Surfing】

- Joint planning and implementation of nuclear power PR activities
- Publication of information on nuclear power through websites, pamphlets, etc.
- Organizing tours of nuclear power facilities
- Awareness activities for members through seminars on nuclear power



Web page of Kansai Atomic Power Information Net-Surfing

### Sharing Information over NSN

On the lessons learned from the criticality accident at the JCO uranium processing plant, the nuclear power industry created NSN (Nuclear Safety Network)\* in December 1999, with the objective of ensuring the safety of nuclear power across the entire industry. Kansai Electric is also active as a member of NSN and is helping to ensure the safe stable operation of nuclear power stations.

#### 【Main Activities】

- Building a safety culture in the nuclear power industry
  - Seminars, safety caravans, etc.
- Peer reviews of members
  - Evaluations of nuclear power safety through site visits by experts
- Sharing and providing information on nuclear power safety
  - Sharing information on trouble, etc.

In January 2003, we launched the 46th Safety Caravan with lectures and opportunities to share information on safety at the Mihama Nuclear Power Station.



Seminar on building business logic programs



Engineers sharing information on establishing schemes for controlling radioactivity

### Information Release over the Internet

Kansai Electric's website has four corners including one entitled "Information on Nuclear Power Generation" that explains about nuclear power in an easy-to-understand fashion. We also constructively release trouble reports and other information. By the way, in fiscal 2002, there was only one trouble report required by law.

In the future, Kansai Electric will continue with a positive attitude towards information disclosure so as to provide more information above and beyond reporting the requirements mandated by the national government.



Web page

### Tours of Nuclear Power Stations

Seeing is believing! And so, as part of the effort at Kansai Electric to reassure the general public that our nuclear power plants are safe, we give tours\* of the facilities. In fiscal 2002, about 110,000 people visited our facilities.

The initiative aims to let people see for themselves through displays such as the actual steam generator from the Mihama Power Station where cracked steam pipes sent a scare through the local community in February 1991.

\*To tour a power station, contact your nearest Kansai Electric sales office. (See P. 91)

## Improving and Maintaining Thermal Efficiency of Thermal Power Stations

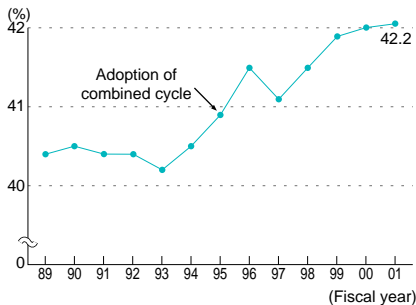
### Measures to Improve Thermal Efficiency using Combined Cycle Generation.

By improving thermal efficiency at fossil fuel stations, we are able to conserve thermal power, which in turn enables us to reduce CO<sub>2</sub> emissions.

We have introduced highly efficient combined cycle generation (thermal efficiency 54%) at our Himeji No. 1 Power Station. As a result, we have raised the total thermal efficiency for thermal power stations by maintaining a high capacity factor.

We are also working to maintain and improve thermal efficiency by adopting improvement measures for both equipment and operation at older steam turbine plants.

### Kansai Electric's thermal power gross transmission thermal efficiency



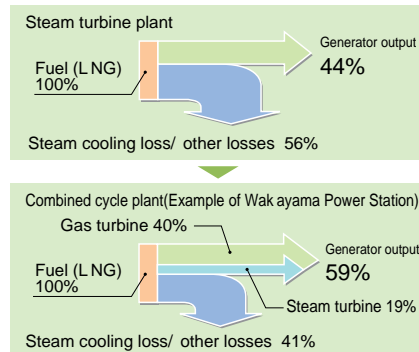
In recent years, we have introduced highly efficient combined cycle power generation with a thermal efficiency of 54%. By operating existing equipment, gross thermal efficiency is approximately 42% at all thermal power stations.

### Combined Cycle Generating System with State-of-the-art Gas Turbines.

We are planning to adopt combined cycle power generation at our Wakayama Power Station, which is in the construction planning stages, incorporating state-of-the-art 1500°C-class (combustor exit temperature) gas turbines.

We expect that this will raise the gross thermal efficiency to the world's highest level, at about 59%, and will reduce CO<sub>2</sub> emissions from electricity generation by about 25% compared to conventional LNG power generation.

### Gross thermal efficiency of combined cycle generating system

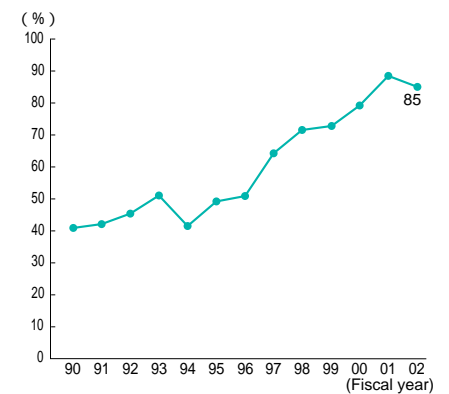


**Combined cycling power generation:**  
As the name suggests, two power generations systems are combined into one. Hot exhaust from a gas turbine is routed to a heat recovery boiler, where it is used to generate steam to run a steam turbine. Effective combination of these two generation cycles can improve the thermal efficiency of the entire generation facility.

## Using LNG

LNG (Liquid Natural Gas) contains very little sulfur and nitrogen and, as a result, emits far less CO<sub>2</sub> than other fossil fuels like oil and coal. So, it is very eco-friendly. Since test-firings with LNG in fiscal 1973, Kansai Electric has been importing this fuel from Indonesia, Western Australia, Malaysia and Qatar. The diversified supply base ensure us steady procurement. In 2002, we used a total of 3.80 million tons of LNG or approximately 85% (heavy oil conversion ratio) of all our thermal reactor fuel.

### LNG ratio of thermal reactor fuel



LNG ship

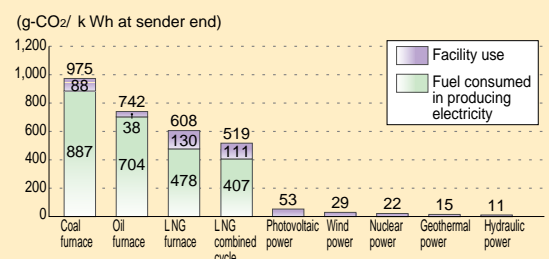
### Reference Life Cycle CO<sub>2</sub> Emissions Per Unit of Power by Type of Electricity Source.

The graph on the right compares CO<sub>2</sub> emissions per unit of power by type of electricity source for Japan.

#### [Explanation]

Calculations take into account all energy consumed, not just the fuel burnt in producing the electricity but also the energy consumed in obtaining the basic fuel for the construction of facilities, transportation of fuel, refining, use and maintenance. For electricity produced by nuclear power generation, we have included spent fuel that is currently planned for domestic reprocessing, the use of Pluthermal (on the premise of one recycling only) and high-level radioactive waste disposal.

### Units and comparison of CO<sub>2</sub> emissions in Japan by type of electricity source

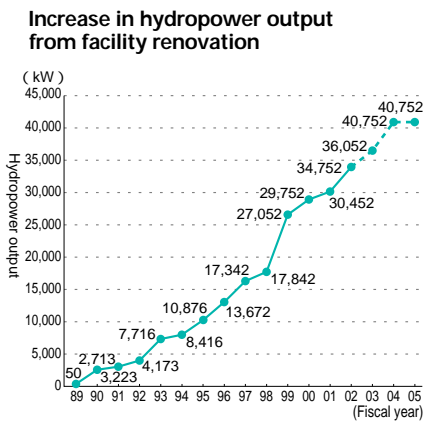


(Tak en from the Report of the Central Research Institute of Electric Power Industry)



## INPUT Renovating Hydropower Stations

Hydropower is a clean energy resource that is purely domestic, therefore Kansai Electric is promoting various activities to increase output. This includes replacing obsolete facilities in already-existing power stations with more efficient water turbines and, in rivers with an ample amount of water, using the maximum amount of water for power generation. From fiscal 1989 through fiscal 2002, output by our hydro power stations increased to 34,752 kW as a result of plant renovation. And, we plan to further increase output by 6,000 kW, or 3 units, from fiscal 2003 through fiscal 2005.

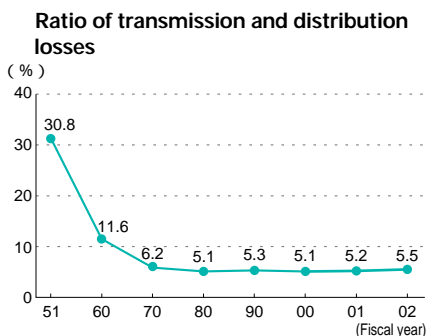


Replacement of a water turbine

## OUTPUT Reducing Transmission and Distribution Losses

### Reducing Transmission and Distribution Losses.

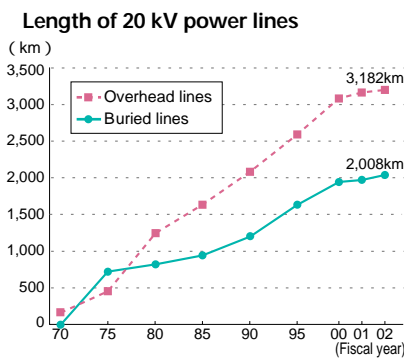
The electricity we generated loses some electrical energy as heat in transmission and distribution to the customer. To reduce this loss, Kansai Electric has turned to technological innovation for boosting transmission voltage and capacity. These efforts have paid off as we are maintaining transmission and distribution loss at a low level.



### Introduction of 20 kV Power Lines

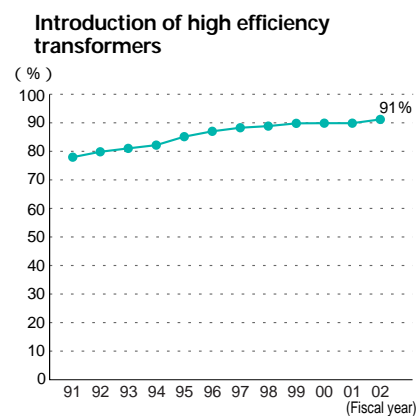
Because a 20 kV line carries 3 to 5 times higher voltage than a 6 kV line, it can supply more power while reducing transmission loss at the same time. Kansai Electric is making efforts to increase and expand the reach of 20 kV class power lines (22 kV and 33 kV) that deliver electricity to customers.

The lines are used to supply special customers who contract 20 kV supply and high-rise buildings. We also use utility towers for both 6 kV and 20 kV lines so that infrastructure is efficiently utilized.



### Adoption of High Efficiency Transformers

To reduce loss from utility pole transformers, Kansai Electric is introducing a high efficiency type of transformer. In fiscal 2002, we purchased 19,000 of these transformers, presently 90% of all transformers used. The loss reduction effect when converted into CO<sub>2</sub> emissions comes out to a roughly 60,000 t- CO<sub>2</sub> annually.





**OUTPUT** Technological Development with the Goal of Reducing CO<sub>2</sub> Emissions

**Developing Flue Gas CO<sub>2</sub> Recovery Technology.**

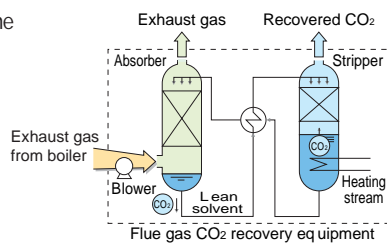
With the goal of eliminating CO<sub>2</sub> from flue gas at thermal power stations, Kansai Electric has been researching chemical absorption methods, by operating a flue gas CO<sub>2</sub> recovery pilot plant at Nanko Power Station. We have established highly efficient technology for separating and recovering CO<sub>2</sub> and patented the technology in Japan, the USA, Europe and many countries in Asia. And, this CO<sub>2</sub> recovery technology has been applied to a urea production plant in Malaysia.

Research continues today on ways to reduce the costs of CO<sub>2</sub> separation and recovery.



Flue gas CO<sub>2</sub> recovery pilot plant (Nanko Power Station)

**Mechanism of flue gas CO<sub>2</sub> recovery equipment (chemical absorption method)**

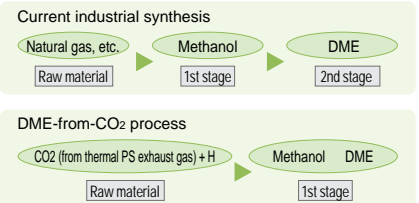


**Development of Technology for the Effective Use of CO<sub>2</sub>**

To expand the use of CO<sub>2</sub> recovery technology, Kansai Electric is promoting research and development into synthesizing dimethyl ether (DME) from CO<sub>2</sub> recovered by flue gas decarburization systems.

DME offers expectations as a new clean fuel alternative for LPG and light oil. Though in general DME is produced from fossil fuel natural gas, our research is looking to synthesize it from CO<sub>2</sub> and hydrogen.

**Making DME from CO<sub>2</sub>**



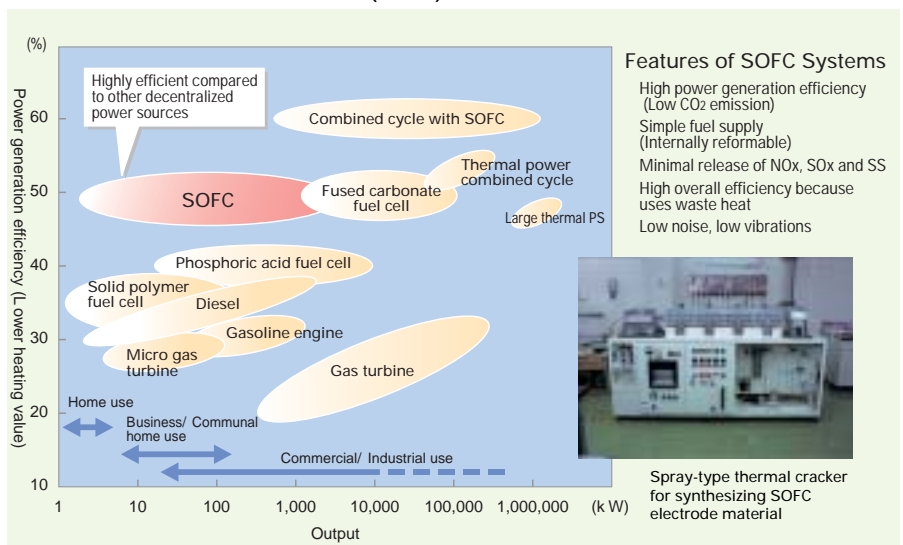
**INPUT** Development of Advanced Technology for Next-Generation Energy Supply

**R&D into SOFC**

Fuel cells chemically react hydrogen and oxygen to directly produce electricity. They are highly efficient with minimal loss in energy conversion. Also, since natural gas, methanol, coal gas and a host of other fuels can be used, fuel cells are a hopeful new power generation system with a widely diverse fuel base. Kansai Electric is researching practical applications of solid oxide fuel cells (SOFC) because of their potential as part of a highly efficiency co-generation system built in combination with high temperature exhaust gas.

\* For other advanced technology developments, see P70

**Features of solid oxide fuel cells (SOFC)**



- Features of SOFC Systems**
- High power generation efficiency (Low CO<sub>2</sub> emission)
  - Simple fuel supply (Internally reformable)
  - Minimal release of NO<sub>x</sub>, SO<sub>x</sub> and SS
  - High overall efficiency because uses waste heat
  - Low noise, low vibrations



Spray-type thermal cracker for synthesizing SOFC electrode material



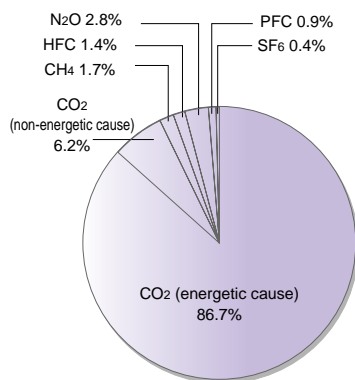


## INPUT Reducing Emissions of Greenhouse Gases other than CO<sub>2</sub>

### Emissions of Greenhouse Gases

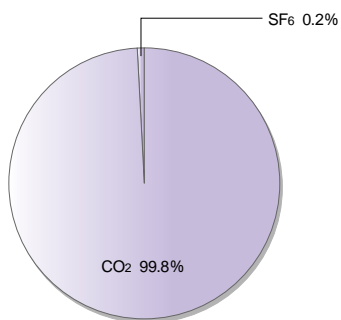
CO<sub>2</sub> accounts for about 90% of all greenhouse gases emitted by Japan and more than 99% of that emitted by Kansai Electric. Other than CO<sub>2</sub>, we emit small amounts of SF<sub>6</sub>, which is used in insulation of electrical equipment. Apart from that, we emit hardly any greenhouse gases.

Emission rate of greenhouse gases in Japan (Fiscal 2000)



Note: Emission rate was calculated as carbon dioxide equivalent (IPCC, 1995), using global warming coefficient.  
Source: assembled from data of Ministry of Environment

Emission rate of greenhouse gases at Kansai Electric (Fiscal 2002)



Note: Emission rate was calculated as carbon dioxide equivalent (IPCC, 1995), using global warming coefficient.

### Reducing Emissions of SF<sub>6</sub>

Kansai Electric overhauls SF<sub>6</sub> gas insulated equipment \* such as gas circuit breakers and insulated switchgears once every 18 years. With the cooperation of electric equipment manufacturers who recover and use SF<sub>6</sub> gas, we have reduced the amount of SF<sub>6</sub> gas that is released into the atmosphere.

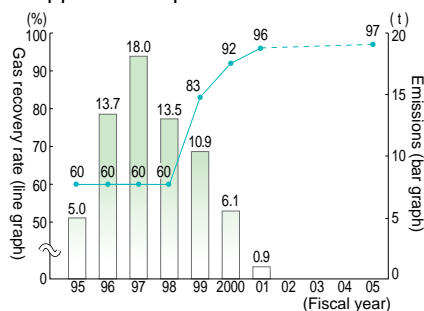
Moreover, Kansai Electric developed auxiliary equipment for recovering any residual SF<sub>6</sub> left over in the SF<sub>6</sub> recovery system itself. When this auxiliary equipment is used, recovery can be boosted to 97% or higher.

\*SF<sub>6</sub> is widely used as a high performance insulating gas because it helps downsize electric equipment and is safe to humans.



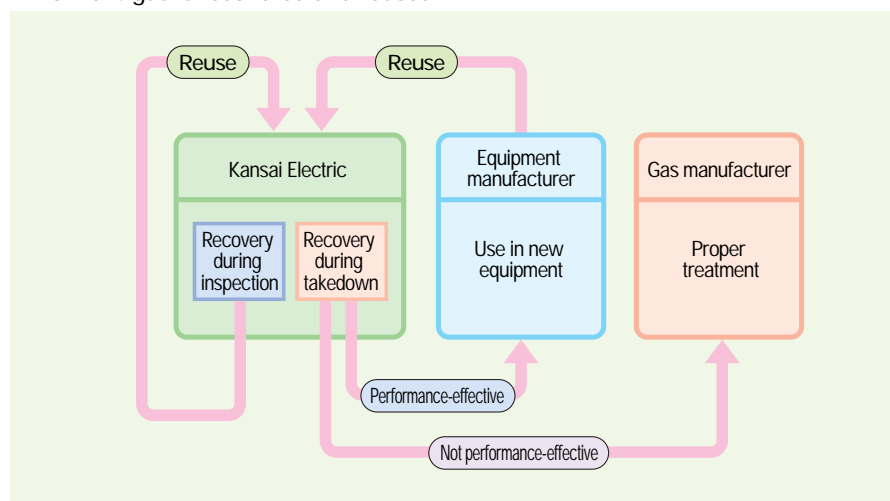
One of 26 SF<sub>6</sub> gas recovery systems installed at Kansai Electric facilities

SF<sub>6</sub> gas recovery rate during apparatus inspection



"Kankyo 1" auxiliary unit for recovering residual SF<sub>6</sub> gas in main system

How SF<sub>6</sub> gas is recovered and reused

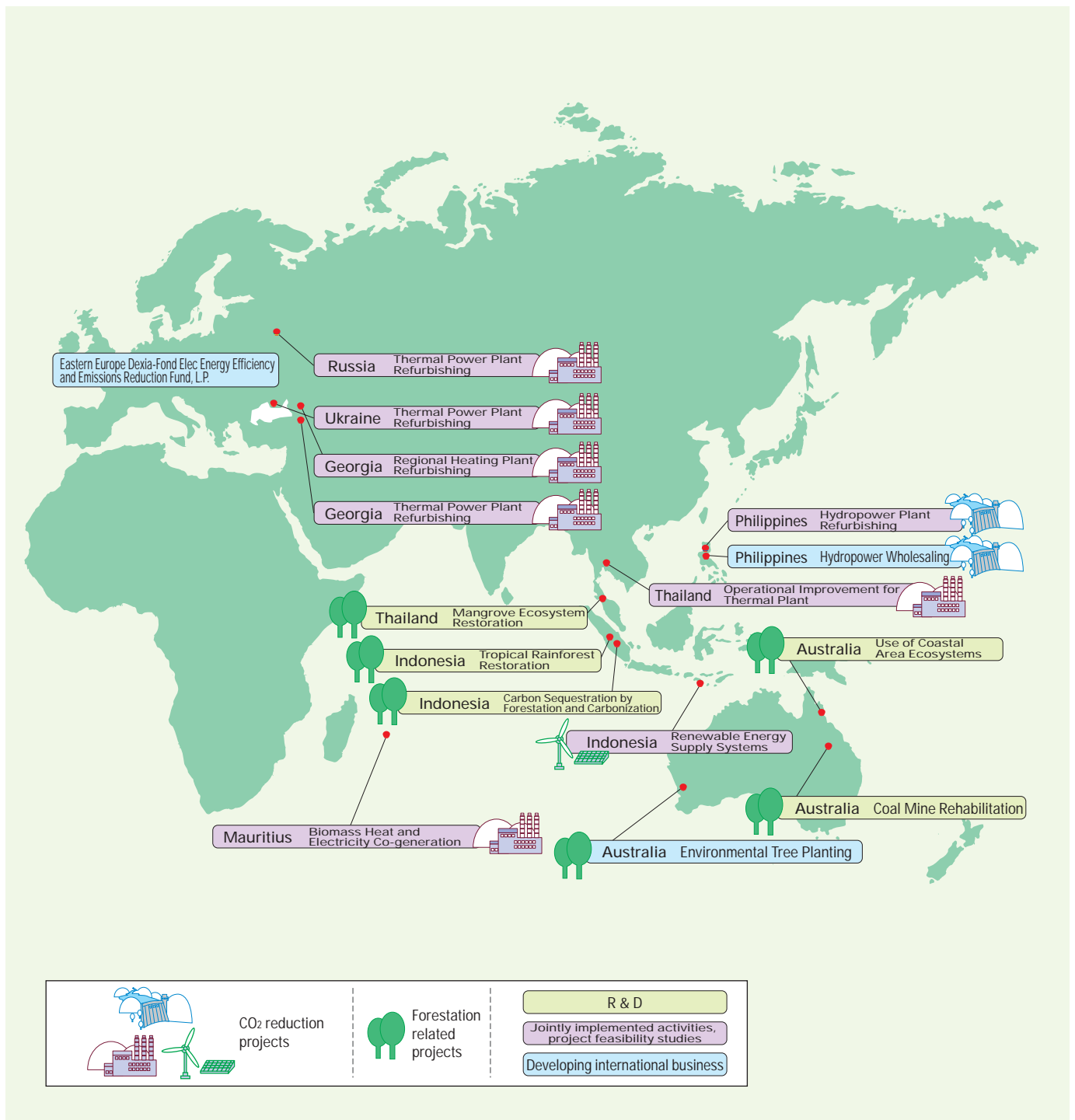




# Activities Abroad Activities Carried out Abroad to Prevent Global Warming

Kansai Electric believes that the Kyoto Mechanism adopted at the Conference of the Parties at its Third Session to the United Nations Framework Convention on Climate Change (UNFCCC), COP3, in 1997 in Kyoto, is a feasible cost-effective means for reducing greenhouse gas emissions. Kansai Electric is developing projects overseas with applying technical expertise, experiences and know-how of years of research and development with the aim of applying those projects to the Kyoto Mechanism.

## Activities Abroad





## Research and Development to Expand Natural Sinks

### Developing Technology to Restore the Rainforests through Large-Scale Afforestation.

Kansai Electric and Gadjah Mada University in Indonesia have been carrying out international joint research since fiscal 1992 under the Tropical Rainforest Restoration Technology Development Project.

Under this project, researchers make use of the symbiotic relationship between lauan and mycorrhizal mushrooms in order to raise the number and growth rate of the seedlings.

So far, they have selected certain mycorrhizal mushrooms beneficial to the growth of lauan saplings and developed a method of inoculating large numbers of lauan saplings with these mycorrhizal mushroom fungi. They have also found that the fungi have been effective in doubling tree size growth and in increasing the number of trees by five-times. As part of the

research follow-up, monitoring of the trees has been conducted.

#### Outline of joint project with Indonesia's Gadjah Mada University

	Contents
Project name	Tropical Rainforest Restoration Technology Development Project
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative body	Gadjah Mada University
Project description	Develop technology for the reforestation of the lauan, a native tree, in order to restore the tropical rainforests, which act to absorb CO <sub>2</sub> .
Site	Java and Sumatra, Indonesia
Area	Approx. 80 ha
Duration of the project	Fiscal 1992 - Fiscal 2001

**Symbiotic relationship between lauan and mycorrhizal mushrooms**

Spawns spread out vertically and horizontally from the roots collecting water and nutrients such as phosphorus from the soil, and supplying them to the roots. Spawns simultaneously receive sugar from the roots. Hence, the two live symbiotically.

**Effect of mycorrhizal mushrooms**

- Contribute to growth of the lauan seedlings and planted trees.
- Resistant to dryness.
- Not susceptible to disease.
- Not likely to wilt and die.

Four-month-old saplings have been treated with fungi and grow at twice the rate of untreated ones.

### Developing Technology for Planting Mangroves in Devastated Lands for the Sake of Local Improvement.

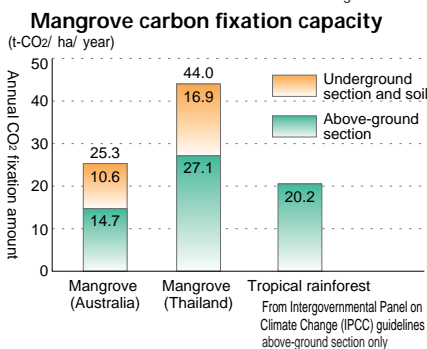
For four years from fiscal 1996 to fiscal 1999, the Kansai Electric Group and the Australian Institute of Marine Science carried out joint research into CO<sub>2</sub> absorption and fixation of mangrove forests\* in Australia and Thailand.

This research revealed that mangrove forests are comparable to tropical rainforests in absorbing and fixing CO<sub>2</sub>. This means that these coastal areas are promising as storage tanks for carbon.

The Kansai Electric Group is now building on these results in the Mangrove Ecosystem Restoration Reforestation Technology Development Project, a joint effort with the Royal Forest Department in Thailand (current Department of Marine and Coastal Resources) started in October 2000. We have planted approximately 250,000 mangrove trees covering an area of roughly 83 ha and are additionally

looking into the possibility of creating a "Silvo-fishery system" that combines forestry and fishery related activities.

\*Mangrove\* is the general term for thickets of salt-resistant plants distributed throughout tropical and subtropical regions in the brackish waters of coastal and estuarial intertidal regions.

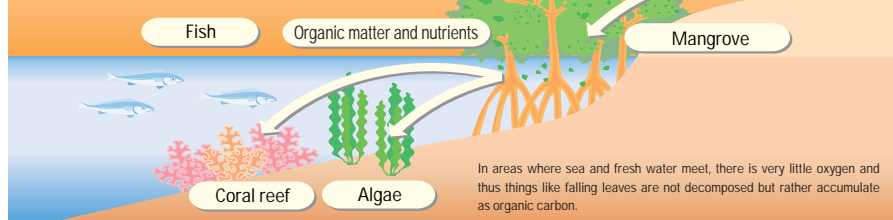


#### Outline of project with the Australian Institute of Marine Science

	Contents
Project name	CO <sub>2</sub> Absorption and Fixation Research Through the Use of Coastal Ecosystems
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative body	Australian Institute of Marine Science
Project description	Confirm the coastal areas are highly effective in absorbing and fixing CO <sub>2</sub> and propose measures to protect coastal ecosystems
Site	Hinchinbrook, Australia; Chumpon, Thailand
Duration of the project	Fiscal 1996-Fiscal 1999

#### Ecology of mangrove forests

In these swamps, leaves and twigs fall continuously from plants, then decay and are consumed by plankton, which are in turn eaten by fish. Thus, a mangrove swamp plays an important role, forming the center of an entire food chain. In the coastal areas of Southeast Asia, mangrove swamps have rapidly disappeared because of expanded shrimp cultivation and tin mining.



#### Outline of project with the Department of Marine and Coastal Resources

	Contents
Project name	Mangrove Ecosystem Restoration Reforestation Technology Development Project
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative body	Department of Marine and Coastal Resources in Thailand
Project description	Development of technology to plant trees in a devastated mangrove forest, which is a promising CO <sub>2</sub> pool
Site	Don Sak and Khanom and other locations in Thailand
Area	83ha
Duration of the project	Fiscal 2000-Fiscal 2003

#### Model Development of Carbon Sequestration Project by Forestation and Carbonization

In 2002, the Kansai Electric Group began research on a project to sequester carbon by forestation and carbonization (CFC), which are seeking to realize sustainable wood production and effective atmospheric CO<sub>2</sub> sequestration simultaneously.

With the cooperation of local forestry and pulp companies, technology through carbonizing left-over woods from the site and wastes from the pulp company. It also aims at estimating how much usable amount of charcoal can be produced and how much carbon can be sequestered. The ultimate goal is to prove this carbon sequestration project model is economically feasible.

#### Outline of Carbon Sequestration Project by Forestation and Carbonization

	Contents
Project name	Model Development of Carbon Sequestration by Forestation and Carbonization (CFC)
Participating Japanese companies	Kansai Electric, Kansai Environmental Engineering Center
Cooperative body	PT. Musi Hutan Persada, PT. Tanjungenim Lestali Pulp And Paper (Indonesia companies)
Project description	Develop model carbon sequestration project that simultaneously enables sustainable wood production and effective CO <sub>2</sub> fixation.
Site	Sumatra, Indonesia
Duration of the project	Fiscal 2002-Fiscal 2004

#### Development of Tree-Planting Technology for Rapid and Reliable Rehabilitation of Open-Cut Coal Mine

Since October 2000, a group consisting of Kansai Electric and three other companies has been carrying out a joint Japan-Australia project to develop and test technologies for growing forests of high CO<sub>2</sub> fixation capacity on the site of an open-cut coal mine. The project is run by the New Energies and Industrial Technologies Comprehensive Development Organization (NEDO).

Kansai Electric hopes to make the most of the technologies it has developed to enhance plant growth using mycorrhizal mushrooms and charcoal. Currently, about 13,000 eucalyptus trees have been planted over roughly 28 ha site and growth is being monitored.

#### Outline of Open-cut Coal Mine Rehabilitation Project in Australia

	Contents
Project name	Open-cut Coal Mine Rehabilitation Project
Participating Japanese companies	Kansai Electric, Japan Coal Energy Center, Idemitsu Kosan Co., Ltd., Electric Power Development Co., Ltd.
Cooperative body	Commonwealth Scientific and Industrial Research Organization (CSIRO)
Project description	To look into methods for the rapid planting of forests high in CO <sub>2</sub> absorbing capabilities in open-cut coal mine, and to develop simulations in order to achieve effective use of such new technologies.
Site	Australia's Ensham and Ebenezer Mines
Area	Approx. 28ha
Duration of the project	Fiscal 2000-Fiscal 2004

#### Site of rehabilitation project

This open-cut mine in Australia is dry and lack of nutrients, which makes it harder to restore vegetation.



Initial planting (December 2000)



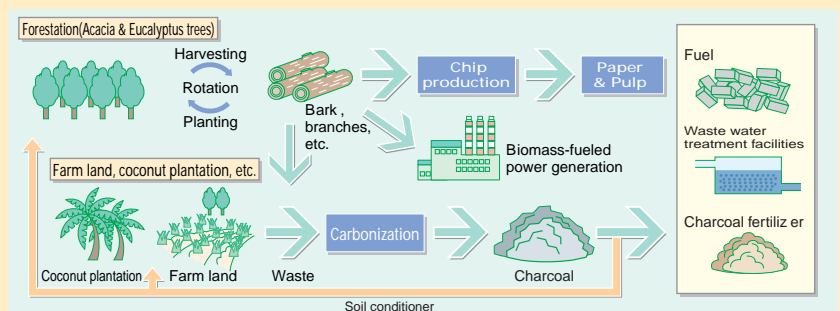
July 2003



Panoramic view of forested area (May 2001)

#### Reference Carbon sequestration by Forestation and Carbonization (CFC)

Carbon sequestration by Forestation and Carbonization makes sustainable wood production possible. It uses the large amount of waste wood generated by a growing pulp industry as biomass for power generation, which has the compounded effect of reducing fossil fuel consumption. The waste wood is transformed into charcoal, that can sequester atmospheric CO<sub>2</sub> semi-premonitory is then used to improve soil quality as a soil conditioner, etc.





## Looking to Apply CO<sub>2</sub> Recovery Technology Abroad

### Research into Possible Overseas Applications

In 2001, Kansai Electric began research on consignment from CCP\* and started searching for ways to improve the efficiency of oil extraction by injecting CO<sub>2</sub> into oil fields. Research tests were conducted at our Nanko Power Station. The fact that we were consigned this research owes to interests the CCP showed in the absorption technology for efficiently recovering CO<sub>2</sub> from flue gas (See P. 26) that we developed in cohort with Mitsubishi Heavy Industries.

Decarbonization technology is expected to contribute greatly to the effective use of CO<sub>2</sub> overseas.

\* CCP: CO<sub>2</sub> Capture Project, international consortium of 8 major oil companies

### Research into decarbonization technology applications

	Contents
Project name	CO <sub>2</sub> Capture Project (CCP)
Participating companies	Kansai Electric, Mitsubishi Heavy Industries, Kvaerner Process Systems (KPS)
Cooperative body	BP Amoco, ENI, Norsk Hydro, Chevron Texaco, EnCana, Shell, Statoil, Suncor Energy
Project description	Reduce cost of CO <sub>2</sub> fixation by combining CO <sub>2</sub> recovery technology from Kansai Electric and MHI with membrane technology from KPS.
Site	Kansai Electric's Nanko power station
Duration of the project	Fiscal 2001-Fiscal 2002

### Development of Technology for CO<sub>2</sub> Coal Seam Sequestration

The Kansai Electric Group has been taking part in the CO<sub>2</sub> sequestration and Effective Utilization program of Ministry of Economy, Trade and Industry since 2002.

This project is attempting to sequester CO<sub>2</sub> in a stable coal seam by utilizing a mechanism that replaces CO<sub>2</sub> with methane (CH<sub>4</sub>). Research and development is moving forward with the cooperation of universities and research institutes on the premise of creating practical applications.

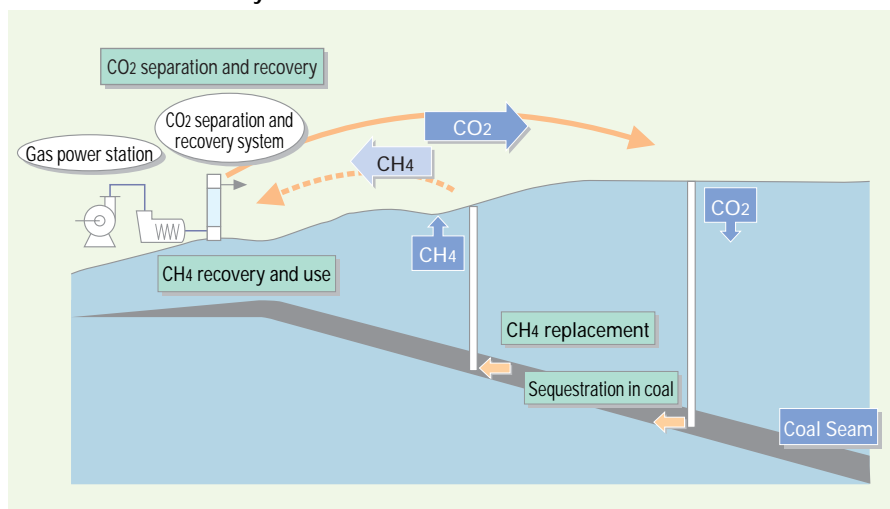
Specific studies are trying to identify the mechanism by which CH<sub>4</sub> replaces CO<sub>2</sub>, optimum conditions for fixating CO<sub>2</sub> conditions and examining diverse monitoring techniques.

After field verification tests, the next step will be to look for ways of turning this technology into business.

### Outline of development of technology for CO<sub>2</sub> coal seam sequestration

	Contents
Project Name	Development of Technology for CO <sub>2</sub> Coal Layer Fixation
Participating companies	Kansai Electric, Kansai Environmental Engineering Center, etc.
Project description	Develop a series of technologies to stably compact and fixate CO <sub>2</sub> in a coal layer and effectively utilize the resulting CH <sub>4</sub> using a mechanism whereby CH <sub>4</sub> replaces CO <sub>2</sub> in coal.
Duration of the project	Fiscal 2002 - Fiscal 2006 (Planned)

### CO<sub>2</sub> Fixation in coal layer



### Reference Effective Use of CO<sub>2</sub> Recovery Technology

There are various techniques for effectively utilizing the CO<sub>2</sub> recovery system. Some of the more common applications are dry ice, carbonated beverages and welding. It is also used industrially to produce urea. In fact, a CO<sub>2</sub> recovery system developed with proprietary technology of Kansai Electric's was installed at a urea production plant in Malaysia in 1999 and has been running stably since.

Furthermore, efficient oil extraction and CO<sub>2</sub> carbon layer fixation technologies we are involved with contribute to the prevention of global warming by sequestering CO<sub>2</sub> deep underground, while also increasing oil production and methane recovery. Kansai Electric is helping to efficiently use the planet's limited energy resources.



Flue gas CO<sub>2</sub> recovery plant installed in Malaysia



## Activities and Feasibility Studies on Utilizing the Kyoto Mechanism

### Feasibility Studies for Business Development

Looking to drum up future business under the auspices of the Kyoto Mechanisms, Kansai Electric took part in studies under a publicly recruited feasibility study organized by NEDO and the Study for Environment and Plant Rehabilitation Project organized by JETRO (Japan External Trade Organization)\*. In one NEDO project, Kansai Electric studied the possibilities of improving efficiency of a bagasse-fired electricity and heating co-generation plant in Mauritius in 2002. Then, in 2003, we opted to participate in feasibility studies into the possible conversion to biomass at a coal-fired co-generation plant in Poland as part of the Ministry of the Environment's program on Clean Development Mechanisms for Global Warming Prevention. We also joined a study on heat and electricity

\* For details of projects implemented before 2001, see P.71

co-generation by bagasse and rice husk in Thailand, which was suggested by the group member, the Kansai Environmental Engineering Center.

#### Outline of feasibility study in Mauritius

	Contents
Project name	Study into Possible Efficiency Improvements of Bagasse-fired Electricity and Heating Co-generation Plant
Participating Japanese companies	Kansai Environmental Engineering Center Kansai Electric Sumitomo Corp. Meidensha Corp.
Cooperative body	Mauritius, Sugar public Corporation
Project description	Study the feasibility of burning bagasse (waste left over after squeezing sugar cane) that is highly valuable amongst agricultural biogases, as an energy source for co-generating electricity and heating in Mauritius.
Location	Mauritius
Expected effect	CO <sub>2</sub> reduction: Approx. 60,000 t-CO <sub>2</sub> /year

Kansai Electric will continue to explore new opportunities for utilizing the Kyoto Mechanism.



Project site

## Developing International Business that Contributes to the Prevention of Global Warming

### Developing Environmental Tree Planting Project

In 2002, the Kansai Electric Group started an Environmental Tree Planting Project in Australia aiming at expanding natural CO<sub>2</sub> sinks and preventing salinity problem, which was the first-ever project implemented by Japanese power companies for the above-mentioned purpose. The project uses plant-growth-enhancing technology developed by the Kansai Electric Group, which utilizes mycorrhizal mushrooms and charcoal to promote plant growth. We plan to investigate possibility of applying the experiences gained through this project to environmental tree planting in dry region with salinity problems emerged around the world.

\* In Australia, the salinity problems have emerged and damages of crop yields have expanded because of the rising of ground water level caused by cutting down of native vegetation.

#### Outline of Environmental Tree Planting Projects in Australia

	Contents
Project name	Environmental Planting to Prevent Soil Salinity Problem
Participating Japanese companies	Kansai Electric Kansai Environmental Engineering Center
Cooperative body	Oil Mallee Company (Local company in West Australia)
Project description	To achieve expansion of natural CO <sub>2</sub> sinks and prevention of salinity problem simultaneously by planting 25 million mallee eucalyptus trees of 1,000 ha that have tolerance to diseases, pests, and drought in a belt pattern on farmland.
Site	Perth outskirts, Western Australia
Area	Approx. 1,000 ha
Expected effect	CO <sub>2</sub> absorption: Approx. 860,000 t-CO <sub>2</sub> over 20-year period
Duration of the project	Fiscal 2002 - Fiscal 2022 (Planned)



Image of Soil Salinity

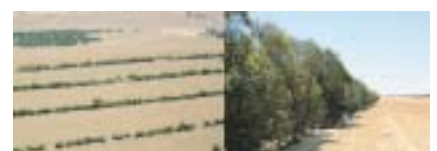


Image of the tree planting



## Participation In Hydropower Generation Project

In April of 1998, Kansai Electric decided to participate in a hydropower project in the Philippines, known as the San Roque Multipurpose Project. This was the first involvement in a foreign power project as an investor among Japanese 9 power companies. This is one of the biggest hydropower plants in the Philippines, and we are jointly investing and participating in the project with Marubeni Corp. and Sithe Energies, Inc. The plant took 5 years to complete and operation started in May 2003. 700,000 t-CO<sub>2</sub> reduction is expected annually.

### Outline of the project in the Philippines

	Contents
Project name	San Roque Multipurpose Project (115MW × 3 Units)
Implementing corporation	San Roque Power Corporation*
Project description	Construct a hydropower plant, and hand over the ownership of the plant to National Power Corporation after 25 years of operation.
Site	Agno River (northern part of Luzon Island, Philippines)
Expected effect	CO <sub>2</sub> emission reduction: 0.7 million t-CO <sub>2</sub> /year

\*Kansai invest in San Roque Power Co., Ltd. through wholly owned company Kansai Power International Co. and its subsidiary KPIC Singapore PTE, L td.



San Roque Hydropower Station

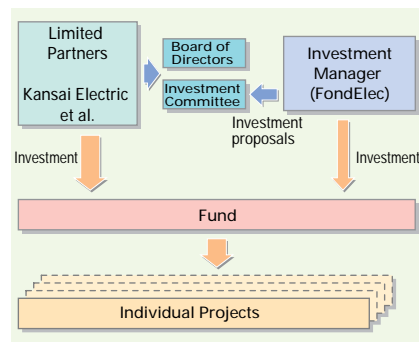
## Investing in the Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P.

Since January 2000, Kansai Electric has been participating in the Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P. promoted by the European Bank for Reconstruction and Development. Presently, two projects have begun in Poland and nine in Hungary. The projects are mainly being promoted to create revenue through improved energy efficiency (ESCO) and the installation of high efficiency gas turbines, but they also aim to reduce greenhouse gases.

### Outline of the Eastern Europe investment fund project

	Contents
Project name	Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P.
Investors	European Bank for Reconstruction and Development (project planner), Kansai Electric, Dexint, Marubeni Corporation, Electric Power Development Co., Ltd., Mitsui & Co., Ltd.
Investment manager	FondElec (Connecticut, USA)
Project description	Invest in the energy businesses of 26 Eastern European countries, thereby reducing the emission of greenhouse gases while at the same time increasing revenues through improvement of efficiency, eventually aiming for the acquisition of emission reduction credits for greenhouse gases.
Fund size	71 million euro
Duration	2000 - 2009 (extended a maximum of two years)

### How the investment fund works



### Outline of major projects

Target country	Contents
Hungary	Install energy management system and tree-biomass boiler at a chemical plant owned by Nitrokemia to improve energy efficiency.
Hungary	Build a gas co-generation system at a heat supply company and sell electricity to this same company and distribution company in the area.
Poland	Enhance capacity factor by adding a steam turbine and transmission and substation equipment, and supply heat and electricity to nearby areas.

## Towards Collaboration with Partners

### Promoting Worldwide Technical Cooperation to Contribute to Prevention of Global Warming

In order to address critical issues facing the international society today such as "global warming" and "sustainable development", Kansai Electric recognizes the importance of coordination of activities across diverse organizations.

Standing at the forefront in the fight against energy shortages and environmental pollution among developing countries, we have been pursuing collaboration with our partners to enhance developing impact and effectiveness of private sector participation.

In this regard, not only as individual commitments, but also as innovating collective actions by the industry, Kansai Electric has been participating in multitude of international projects targeting

- Promotion of sustainable energy development
- Reduction and mitigation of Green House Gas (GHG) emissions in developing countries
- Human Capacity Building related to electricity and environment in developing countries

### Highlights of our Activities

As a member of e7 from the onset, Kansai Electric has always been playing an active role to promote "sustainable energy development" in developing countries. We have provided human capacity building and implemented renewable energy development, rural electrification of under-served areas, and GHG reducing projects in developing and emerging countries.

In addition, we aggressively participate in various dialogues on global energy and environmental issues, such as COP, World

Economic Forum (WEF), and World Business Council for Sustainable Development (WBCSD), in order to enhance the quality of global initiatives by sharing experiences and insights. Kansai Electric is also cooperating internationally for the global safety of nuclear power by providing technical support to China and other nations. We believe our support and cooperation can contribute to the development of nuclear power.

#### e7 (a group of leading electric utilities in the G7 countries)

Contents	
Established	1992
Objective	To play an active role in protecting the global environment and promoting sustainable energy development through efficient generation and use of renewable energy sources
Outline of activities	Enhancing the quality of international debate on global environment policy issues by sharing its experience and insights. Taking initiative to organize international cooperation for actions to curb and reduce greenhouse gas emissions in developing countries, such as AJJ projects in Indonesia and Jordan.
Membership	American Electric Power (USA), EDF (France), ENEL (Italy), Hydro Quebec (Canada), Ontario Power Generation (Canada), RWE (Germany), Tokyo Electric (Japan), Kansai Electric (Japan), Scottish Power (UK)

#### WBCSD (World Business Council for Sustainable Development)

Contents	
Established	1995
Background and objective	WICE (World Institute for Conservation and Environment, established in 1993) and BSCD (Business Council for Sustainable Development, established in 1990) merged as WBCSD in 1995. It promotes cooperation between business, government and industry associations in the search for lasting solutions to environmental issues.
Outline of activities	Conducting seminars and producing papers that support the WBCSD's commitment to sustainable development, such as "Climate and Energy", "Eco-Efficiency", "Social Trust", "Standardization of greenhouse gas emission calculation method"
Membership	This coalition represents about 160 companies from 30 countries

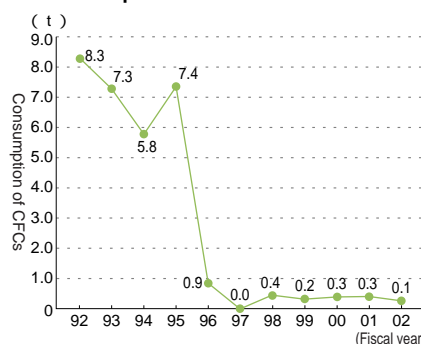
## Protecting the Ozone Layer

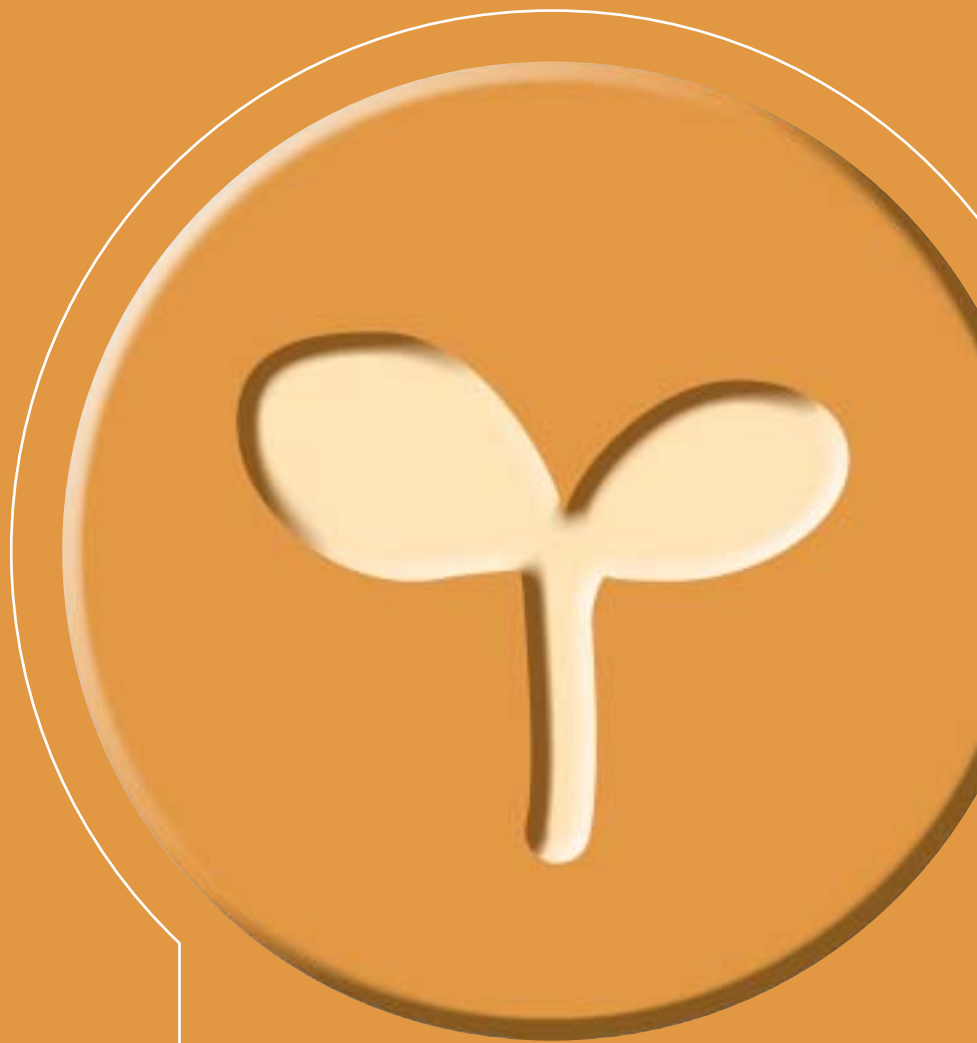
Kansai Electric is taking every possible measure to abolish the use of specified CFCs, as a measure for protecting the ozone layer.

### Measures to eliminate use of specified CFCs

	Use	Measures	
		New facilities	Existing facilities
Specified CFCs	Mainly AC refrigerant	Introduces equipment that uses alternative refrigerants.	Replaced equipment with non-CFC type. Recovered CFC properly at equipment inspection.
Specified halons	Fire extinguishing agent for power generation facilities	Introduced CO <sub>2</sub> and other chemical fire extinguishers.	Not use except for fires.

### Consumption of CFCs





### III. Addressing Local Environmental Problems

**Kansai Electric takes environmental protection into consideration with all plants and systems and is working to create a better environment in order to live and prosper with the local communities that host us.**

#### Chapter 3 Contents

- 36 Efforts for Load Environmental Protection
- 37 Measures to Prevent Air Pollution
- 38 Measures to Prevent Water Pollution
- 38 Measures to Prevent Noise and Vibrations
- 38 Measures to Prevent Offensive Odors
- 39 Measures Against Chemical Substances
- 40 Harmonizing with the Local Environment

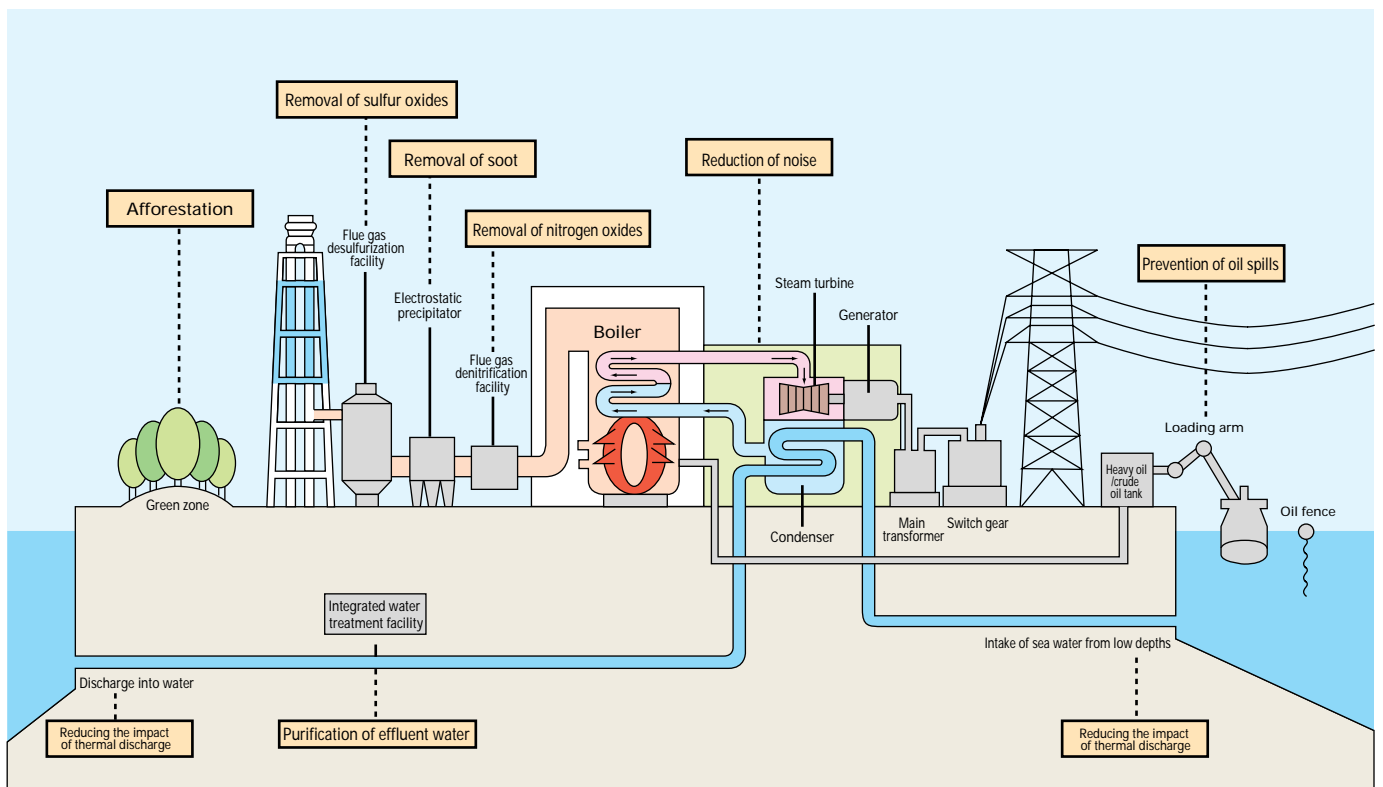


### Efforts for Local Environmental Protection

Kansai Electric long ago started taking action against air and water pollution, and is now also carefully addressing new issues such as chemical pollution. Kansai Electric is also searching for greater harmony between our operations and local environments by planting greenery, adapting infrastructure to maintain scenery and more



### Environmental protection system in a thermal power station



In accordance with the Environmental Protection Agreement, thorough care is taken at thermal power stations in not only implementing countermeasures against air pollution, water pollution, noise and vibration, but also in observing how these measures are working.



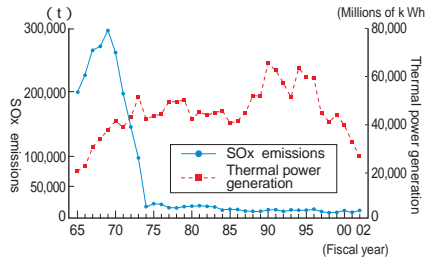
# Measures to Prevent Air Pollution

## Sulfur Oxides (SOx)

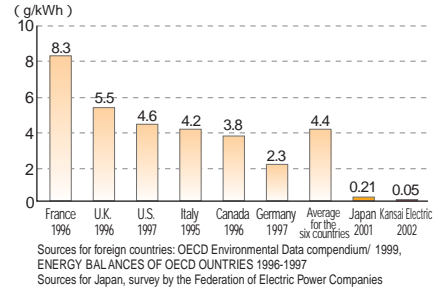
Kansai Electric is minimizing SOx emissions by taking steps both with fuel and equipment. We are using a heavy and crude oil of low sulfur content as well as LNG and NGL (natural gas liquid), which contain no sulfur, to nip SOx generation in the bud, while we have installed flue gas desulfurization systems to remove SOx from exhaust gas.

SOx emissions in fiscal 2002 were 0.7% of 1965 levels and we have attained the lowest level of SOx emissions per unit of thermal power generated in the world.

SOx emissions and thermal power generation



SOx emissions per unit of thermal power generated

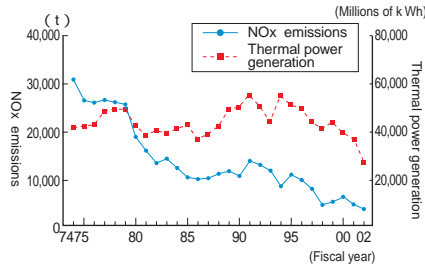


## Nitrogen Oxides (NOx)

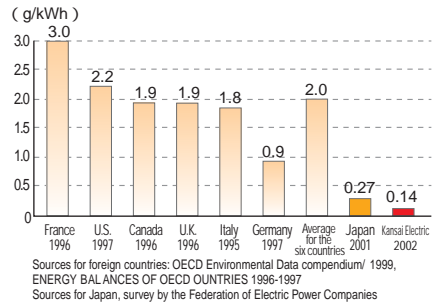
Kansai Electric is working to reduce NOx emissions by using low N-content fuel (LNG, high quality oil, etc.), improving combustion (boiler improvements, etc.) and installing flue gas denitrification systems to remove NOx from exhaust gas.

NOx emissions in fiscal 2002 were 12% of 1974 levels and we have attained the lowest level of NOx emissions per unit of thermal power generated in the world.

NOx emissions and thermal power generation



NOx emissions per unit of thermal power generated



## Dust

Kansai Electric has greatly reduced the amount of dust generated in plant operations by installing high performance electric dust catchers on all boilers that burn heavy and crude oil.



Electric dust catcher at the Kainan Power Station

## Monitoring and Measurement of Environmental Impact

Kansai Electric monitors and measures air quality, water quality, noise and vibration in and around power stations as set forth in agreements signed with local governments. Findings are relayed to environmental monitoring centers run by these local governments and reported to the general public. Furthermore, the air and sea area around power stations are also monitored to assess the overall environmental impact of operations and ensure that there is nothing wrong.

## Response in an Emergency Situation

If a chemical smog alert is issued, Kansai Electric moves to reduce NOx emissions at the request of hosting prefectures by raising efficiency of desulfurization systems at thermal power stations, controlling output or switching to reformed fuel. Specific plans for implementing these measures have already been drawn up and submitted to prefectural authorities for each of our power stations.

### Number of measures taken to reduce NOx emissions in the chemical smog alert (Number for fiscal year 2002)

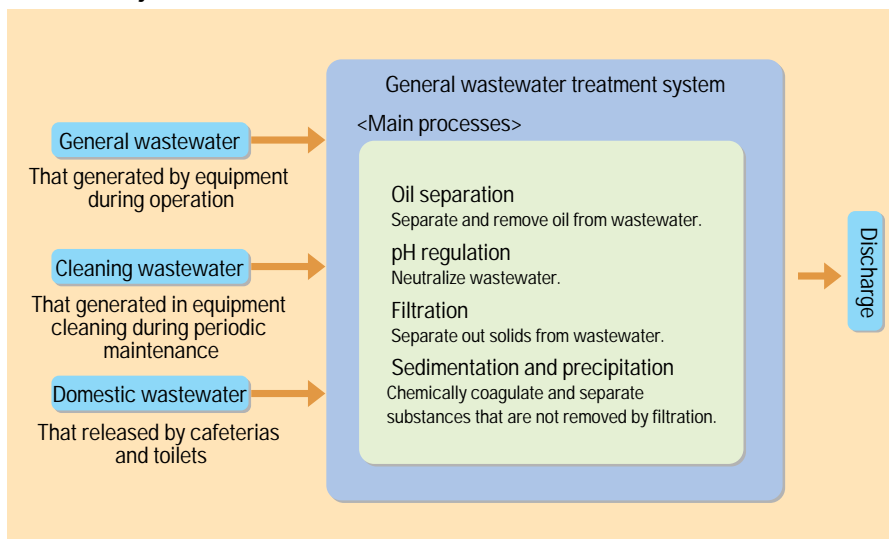
Number of measures taken to reduce NOx emissions at our thermal power plants concerned	Number of photochemical smog warnings issued	
	Forecast	Warning
65	19	14

## Measures to Prevent Water Pollution

### On-site Wastewater

A thermal power station generates general wastewater, cleaning wastewater and domestic wastewater. Whatever the case, Kansai Electric has treatment systems designed to deal with properties of each specific kind of wastewater, and sufficiently purifies this water before release. Moreover, some power stations recycle wastewater that has been through final treatment for use in desulfurization systems as well as to use this water resource effectively such as to water green tracts on the premises.

#### Flow of major wastewaters



### Prevention of Oil Spills

To prevent oil spills when pumping oil ashore from a tanker, a loading arm was installed to ensure proper connection to the onboard oil port and the oil port on the wharf. Additionally, an oil fence is stretched around the tanker just in case. And, the fuel tank yard is enclosed in an oil catching embankment that keeps any spills from escaping to the outside.



Oil fence

### Hot Water Discharge

Seawater used for cooling at power stations is cooled to about 7°C warmer than the surrounding sea before release. The water intake port is also located so that water intake and discharged water do not disturb marine wildlife.

Because of their geographic location, some power stations use a deep water intake and submerged discharge \* to minimize the exposure range of hot water discharge.

\* Water intake and discharge are done at depths where water temperature is low. The intake method lowers the temperature differential around the discharge port, while the discharge method minimizes the temperature rise of seawater.

## Measures to Prevent Noise and Vibrations

Kansai Electric locates equipment for power stations and substations on site and as far away from perimeters as possible. The foundations underneath this equipment are also strong. Additional efforts are made to prevent noise and vibrations from going beyond property lines such as by installing silencers and soundproof walls, and designing equipment for quieter running.



Soundproof wall

## Measures to Prevent Offensive Odors

At power stations, Kansai Electric injects ammonia into flue gas denitrification systems and electric dust catchers. An automated unit controls ammonia injection to the proper level so as to keep ammonia concentration of the flue gas low all the time. And, ammonia concentration is measured periodically. Similarly, systems that use or hold ammonia are periodically inspected to prevent leaks.

## Measures Against Chemical Substances

### PRTR

Since 1997, Kansai Electric has been voluntarily managing chemical substances we use, ahead of the PRTR Law. Those results have been included in this report since 2000.

We also have a PRTR Chemical Handbook that is used to accurately know and manage the chemicals used by us and other group companies.

The chemical most discharged in fiscal 2002 was paint (ethyl benzene, etc.) \* used to maintain equipment. \*For detailed data, on P.83.

### Dioxins

Kansai Electric has taken various approaches including recycling to reduce the amount of waste we generate and subsequently the amount of waste that is treated by incineration. We are also gradually shutting down our incinerators. In fact, of the 430 that were running in 1997, only 14 remained in 2002. From other voluntary measures taken with thermal power stations, exhaust has been confirmed to contain almost no dioxins and is today at a level believed to be harmless to the environment. \*

\* For measurement results taken from thermal power station exhaust gas of the whole countries, see P. 82.

#### Results of measurements on dioxin levels in reported facilities and discharged gases (Fiscal 2002)

	Combustion capacity	Concentrations of stn'dard value unit : (ng-TEQ/m <sup>3</sup> N)	Number of facilities (unit)	Result of measurements on concentrations of dioxins unit : (ng-TEQ/m <sup>3</sup> N)
Waste product incinerator	Over 200kg/h	5	1	0.082
		10	2	0.007 ~ 0.081
	Over 50kg/h, less than 200kg/h	5	4	0.000071 ~ 3.8
		10	7	0.017 ~ 7.5

Dioxin concentrations measured at facilities required to report on dioxin content clear environmental regulations.

#### Reference PRTR Law

The PRTR (Pollutant Release and Transfer Register) Law provides a system whereby businesses must know and report the quantity of controlled hazardous chemicals they release into the environment to governmental authorities and the governments who receive these reports must publicize the information.

The system was enforced with the July 1999 promulgation of the Bill Concerning Reporting, etc. of Release to the Environment of Specific Chemical Substances and Promoting of the Improvements in Their Management.

Under this law, Kansai Electric has had to report to governmental authorities the known amount of chemical release and transport every year by the end of June, since April 2001.

### Soil Contamination

By order of the Ministry of International Trade and Industry (now Ministry of Economy, International Trade and Industry), a system of environmental assessments was introduced for power stations in 1997. Kansai Electric has since been investigating soil contamination and is observing all pertinent laws (Water Pollution Control Law, Waste Management and Public Cleansing Law, PRTR Law, etc.).

Also, prior to converting land over to other uses, we do soil tests and take the proper measures against contamination as prescribed by the Soil Contamination Law that was enforced in February 2003.

As for the planned site for our new power station in Wakayama, we tested the site ourselves because it has been used for waste landfill. We detected a comparatively high concentration of dioxins (max. 25,000 pg-TEQ/g) in some of the buried incinerated waste and sludge. We have sought the advice of experts and have taken measures to prevent the waste from being dispersed in the air or run off by water. Findings and action have been reported to governmental authorities and disclosed to the general public. In the future, Kansai Electric will continue seeking the advice of experts and the guidance of governments so as not to effect the surrounding environment.

### Polychlorinated Biphenyl (PCB)

PCB, an insulating material used with electric equipment like transformers, was discovered to be harmful after an outbreak of Kanemi oil disease in 1968. Since that time, it has been regulated and careful handling is mandatory by law. Kansai Electric keeps it in a special storage facility. We are building treatment facilities for utility pole transformers which carry a low concentration of PCB. As for high voltage transformers and condensers that have a high concentration of PCB, we are studying plans to adequately treat the PCB by the deadline (by 2016) specified in the law.

#### PCB Stockpile (As of March 31, 2003)

High voltage transformers and condensers	5,413
Utility pole transformers	Approx. 160,000



PCB waste storage facility

#### Reference PCB

Now, PCB is a controlled substance. In 1972, the government advised businesses to stop all production and use. In 1974, with the enactment of the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances, it became generally prohibited to make, import or even use PCB in Japan so PCB has to be kept under strict control. In July 2001, the Special Measures Law on the Promotion of Proper Treatment of PCB was enacted, which built a nation-wide system to constructively promote the treatment of PCB.



## Harmonizing with the Local Environment

### Planting Activities

#### Ecological Greening Method

In the vast green tracts of our thermal and nuclear power stations, Kansai Electric is applying ecological greening method \* to build near-natural forests that are highly effective in preserving the environment. Today, some 20 years after building these green tracts, there stand rich forest lands, underneath which a rich natural (bio-diversified) soil has been verified. In the green tract around the Tanagawa No. 2 Power Station, we've added a path and opened it to the general public so that they can enjoy the beautiful surroundings.

\* In order to grow a near-natural forest in as little time as possible, a mix of samplings of species suitable for the area are carefully selected and densely planted.



Ecologically planted area around the Gobo Power Station

#### Biotopes

At our thermal and nuclear power stations, Kansai Electric is creating biotopes where insects like dragonflies and lightning bugs can live. These biotopes are opened to the general public so that everyone can enjoy them.

Now, 7 years after we created these biotopes, wild birds have started using them as watering holes. The biotopes have fulfilled their innate purpose of creating a network of natural wildlife.



Visitors calmly watching lightning bugs at the Himeji No. 1 Power station



A pond for dragonflies at the Miyazu Energy Research Center

#### Rooftop Greening

A garden (approx. 100 m<sup>2</sup>) with trees and an arbor was created on the rooftop of the Kansai Electric Hospital. A path allows visitors to stroll by beds of seasonal flowers even on wheelchair, and there are benches for relaxing. The garden is used for walking rehabilitation and meeting people.

On the third floor of Kansai Electric's Head Office is a small rooftop garden where evergreen oaks and camellias have been growing since 1975. It makes for a refreshing view in the tight space between buildings.



Rooftop garden at Kansai Electric Hospital



Rooftop garden at Kansai Electric's Head Office

## TOPICS

### Planting truffle-treated black pines in Amanohashidate Park

In March 2003, Kansai Electric planted 100 black pine saplings that had been inoculated with truffle spores in Amanohashidate Park. The samplings were inoculated with truffle spores as it builds up their defense against pine-eating insects. With the cooperation of group company Kansai Environmental Technical Research Center, engineers spent about 1 year helping spores attach to roots at the Miyazu Energy Research Center. By carefully managing the black pine saplings, it is expected to increase the grove's resistance to withering.



Planting in Amanohashidate Park



Mycorrhiza growing on black pine roots after inoculation of truffle spore



One species of truffle





## Environmental Harmonization of Electric Power Facilities

### Designing Facilities with Surrounding Scenery in Mind

In the construction and maintenance of electric power facilities, Kansai Electric takes due consideration for urban plans and regional development plans, and makes the effort to design structures to blend in with the surrounding cityscape, as a means for protecting the scenery and harmonizing with the environment.

Spring



Designed as a monument, the smokestack at the Nanko Power station lights up different in each season.



The smokestack of the Himeji No. 1 Power Station uses color-coded lights to report the tides, temperature and time.



The Sakaigawa Power Station was modeled after the UNESCO World Heritage steep-rafter-roofed homes of central Japan.



High voltage towers use minimal lighting in order to blend into the surroundings.



The Hoshida Substation was designed with a low roof to look like a home from the outside.



Power lines were buried underground in the area around the Osaka International Conference Center as a measure to preserve the cityscape.

### Reduced Areas Required for Substations by Using GIS

Kansai Electric has successfully downsized substation equipment by using gas insulated switches (GIS) \*. With them, we have greatly reduced the amount of land required for our substations, which helps the substation blend in better with the surrounding environment.

\* GIS is an electric device such as a breaker sealed in SF<sub>6</sub> gas. It is entirely housed in a metal casing, so it is smaller than conventional air-insulated devices.

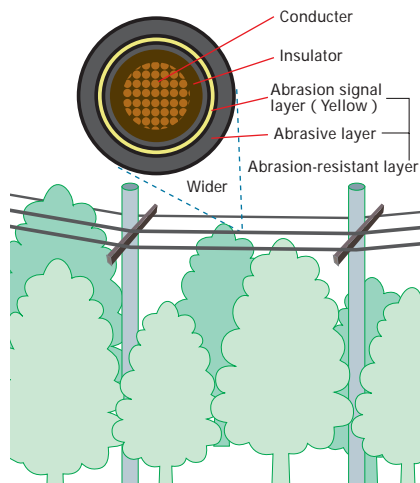


GIS at the Nose Substation

### Protecting Trees by Using Abrasion-Resistant Insulated Cables

In mountainous areas, trees used to be periodically trimmed or felled to prevent insulation breaks in high voltage overhead cables caused by rubbing with branches. Now, Kansai Electric uses an insulated cable of improved abrasion-resistance performance that adequately protects the line against contact with trees. By using this new type of cables, we fell less trees and thus can protect forested environments.

#### Abrasion-resistant insulated cable







### Protecting the Natural Environment

#### Reducing Land Modification in Natural Areas

The site where the Maizuru Power Station is currently under construction is partially located inside the Wakasa-wan Quasi National Park, therefore it was decided to make good use of the different elevations of the terrain to create a 2-level site. And, by adopting a coal silo \*, we were able to greatly minimize the amount of reclamation from the sea and land modification on shore. Additionally, only the bare minimum of forested area was felled, which made it possible to preserve part of the existing forest and nearby orange groves.

\* Coal silo: Coal is stored in a silo rather than yard.

#### Protection of Rare Plants

On the site of the Maizuru Power Station that is currently under construction was discovered *Epimedium sempervirens*, an extremely rare species of plant. Kansai Electric decided to transplant it into a natural forest on the premises of the power station and monitor growth from there.



*Epimedium sempervirens*

#### Reduced Use of Rain Forest Lumber

Kansai Electric uses metal and plastic frames in construction work. This reduces the use of tropical wood and helps to protect the rain forests.



Metal frames used in the construction of the Maizuru Power Station

### Effective Use of Hot Water Discharge

#### Fishery Related Activities

Using the thermal energy of hot water discharged from our power stations, Kansai Electric is test-cultivating important regional fish and young shellfish such as Kuruma prawns and abalone. This trial study aims to establish techniques for utilizing our hot water discharge and verify its effectiveness and safety. Using this technology and by releasing the cultivated fish and shellfish into the nearby sea area, we hope to promote the local fishing industry.



Diver attaching an abalone to an oyster shell for release at the Takahama Power Station



Kuruma prawn raised at the Tagawa No. 2 Power Station and Miyazu Energy Research Center

#### Agricultural Related Activities

Using the thermal energy of hot water discharge and a heat pump, we are trying to grow orchids at the Takahama Power Station. And at the Miyazu Energy Research Center we try to grow agricultural specialty of the local area. This activity is aimed at contributing to the local agriculture.



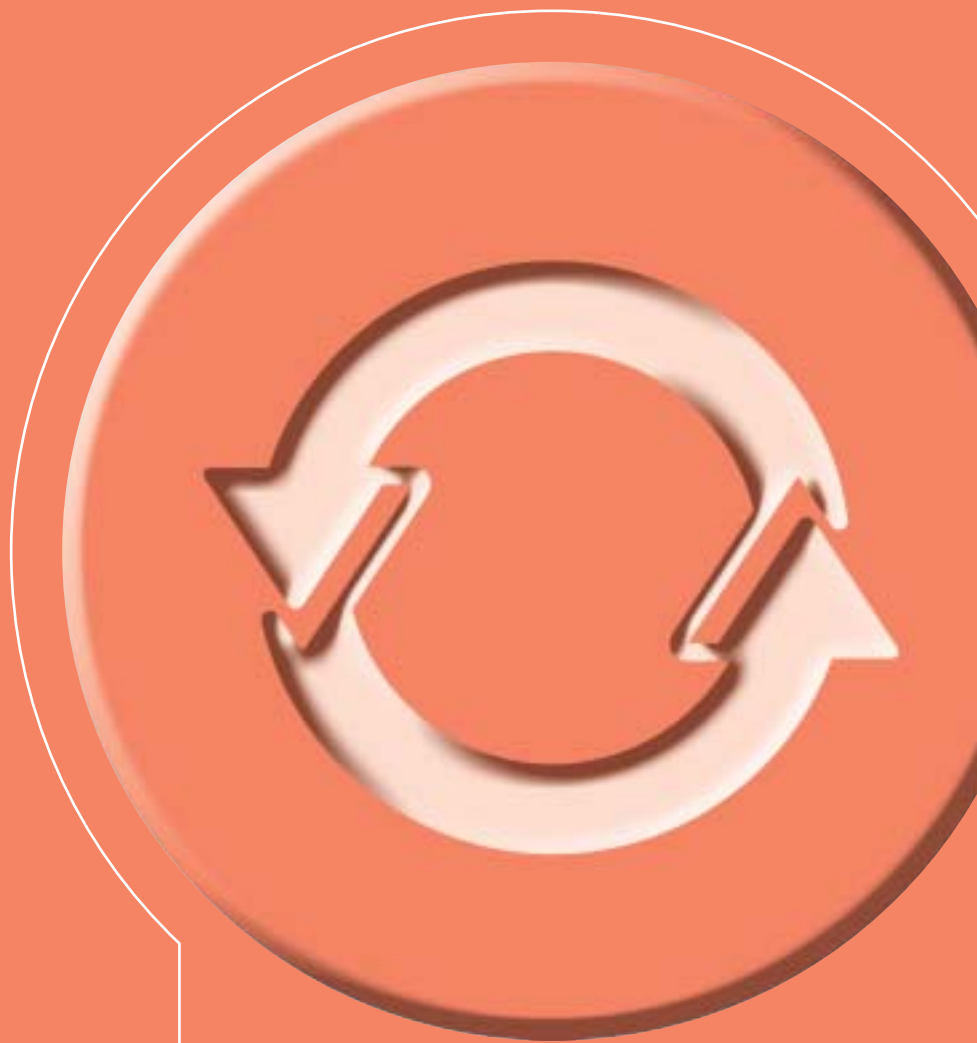
Orchids growing at the Takahama Power Station



Strawberries grown by local coops and farmers nearby the Miyazu Energy Research Center

### Current situation with regard to experimentation and research

	Location of activity	Type of activity
Fisheries related	Takahama Power Station( 1977- )	Fish and Shellfish were released into the power station as an experiment in breeding and farming
	Tanagawa No.2 Power Station( 1977- )	
	Miyazu Energy Research Center( 1989- )	
Farming related	Takahama Power Station( 1979- )	Experiment in breeding temperate zone plant life orchids : phalaenopsis, etc.
	Miyazu Energy Research Center( 1989- )	Experiment in adapted breeding of plant life Ornamental plants : Turkish Bellflower, etc. Vegetables : strawberries, etc.



## IV. Promoting Business Activities Suitable for a Recycle-Oriented Society

Kansai Electric is promoting recycle projects and activities through initiatives such as our "3 R's" (Reduce, Reuse and Recycle) program and green purchasing, while still other activities are underway for a midrange goal of completely eliminating the discharge from waste for landfill.

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- 44 Promotion of Resource Recycling Measures
- 47 Promotion of Green Purchasing
- 48 Energy Conservation and Resource-saving Activities with Office Supplies
- 49 Treatment of Radioactive Waste

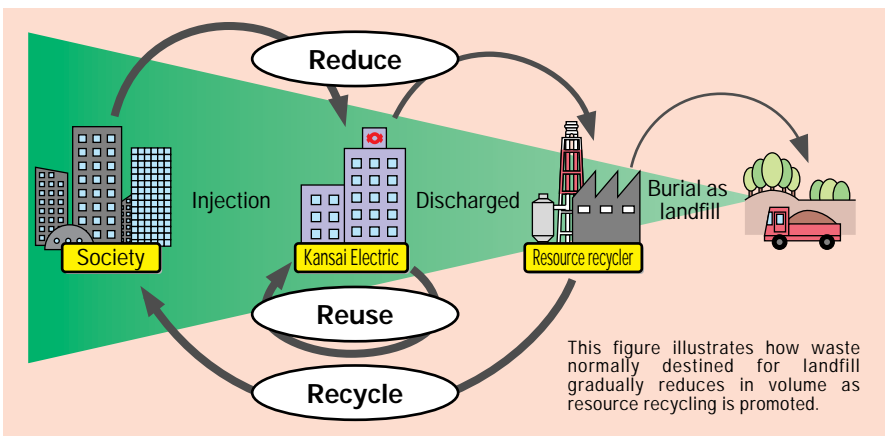


## Promotion of Resource Recycling Measures

Already for some time now, Kansai Electric has been reducing industrial waste generation and recycling and reusing resources through programs like the "3 R's" (Reduce, Reuse and Recycle). In the meantime, the waste we cannot reuse is disposed of properly. Kansai Electric will continue promoting the "3 R's" with even greater thrust as our part in the formation of a recycling-oriented society.

### Promoting "3 R's" Activities

Conceptual view of "3 R's" activities



### How 3 R's" Activities Work

#### Reduce

Kansai Electric is taking various steps to reduce waste generation, by designing longer-lasting equipment and instruments, extending replacement intervals, saving on resources by building smaller equipment, using prefabricated equipment and simplifying packaging.

#### Reuse

Kansai Electric is looking to effectively utilize resources by putting reusable equipment to use and repairing and reusing salvageable equipment.

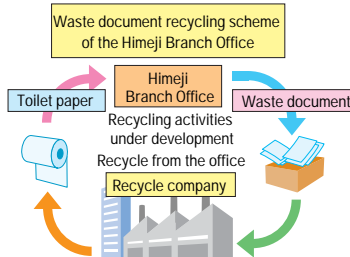
#### Recycle

Kansai Electric is using dust and desulfurizing gypsum from thermal power stations that burn heavy and crude oil to make cement aggregate, fuel and construction materials. Also, most of the unnecessary concrete utility poles are being recycled as roadbed material.

### 【Recycling Paper】

Kansai Electric is also acting very constructively in the office by collecting, sorting and recycling paper waste. Used copy paper is recycled as toilet paper. By reusing resources, the company is trying to cyclically use resources

#### Activities of the Himeji Branch Office



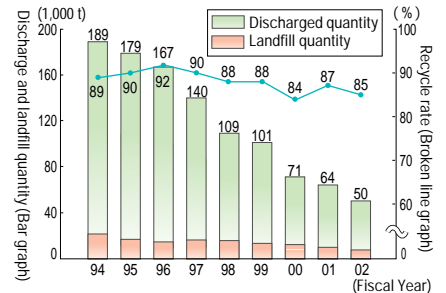
Sticker used to enhance awareness

### Discharge and Recycling of Industrial Waste

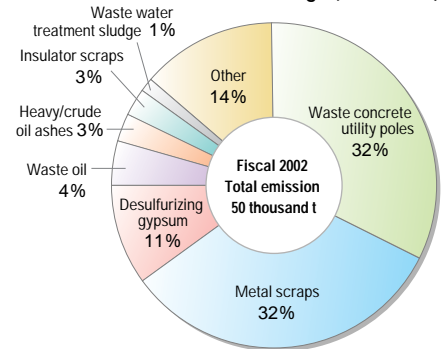
In fiscal 2002, Kansai Electric discharged 50,000 t of waste, 22% less than the year before, while recycle rate was maintained at a high 85%.

In the future, we will continue to study ways to recycle waste that is currently not recycled so as to attain our midrange goal of ultimately eliminating the generation of landfill-destined waste completely.

#### Discharge and Recycling



#### Breakdown of overall discharge (Fiscal 2002)



#### Recycling Examples

Industrial waste, etc.	Recycle rate	Main uses after recycling
Desulfurizing gypsum	100%	Construction materials
Waste water treatment sludge	77%	Ingredient for cement
Heavy/crude oil ashes	100%	Precious metal recovery
Waste oil	71%	Fuel, etc.
Metal Scraps	96%	Metal recovery
Waste concrete utility poles	100%	Roadbed materials
insulator scraps	41%	Roadbed materials

## Example "3 R's" Activities

### Zero Emissions

#### Staking a Challenge to Zero Emissions

The Himeji No. 1 and No. 2 Power Stations are promoting "3 R's" activities to reduce the amount of waste they generate at the plants to zero.

More specifically, they have examined ways to reduce, reuse and recycle waste and resultantly are changing the way they use equipment and recycle resources. These activities are being developed horizontally to other business sites like the Kainan Power Station.



Waste bins for sorting resources and achieving zero emission

#### [Recipient of the 3 R's Award]

The Himeji No. 2 Power Station received the 3 R's Award from the Council on Reduce, Reuse and Recycle for their activities aimed at achieving zero emissions.



3 R's Award

### Reduce

#### Insulation Blocks

At thermal power stations, pipes are wrapped with insulation to minimize the loss from heat escaping.

Earlier types of insulation were destroyed for inspections, which made it necessary to overhaul equipment. However, Kansai Electric started using insulation blocks that can be detached and reattached, hence preventing any insulation waste and effectively using resources.



Insulation block for piping

### Reuse

#### Repeated use of Power Meters

There are about 11 million power meters in Kansai Electric's service area that serve to measure how much electricity customers are using.

These power meters have an expiration date to them, so they are replaced every so often, however every year some 1.1 million are detached, inspected, repaired and put back into service.



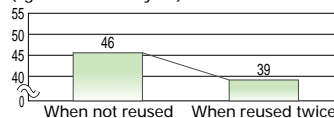
Inspect and Repair Power Meters

#### 【Use of LCA】

Life cycle assessment (LCA) is a method for quantitatively evaluating the environmental impact of a product from design to discard. This method was applied on a trial basis to see what degree of CO<sub>2</sub> reduction was gained from reusing power meters. Results are as follows.

#### CO<sub>2</sub> emission per power meter over the entire life cycle (set to 10 years)

(kg-CO<sub>2</sub>/meter/10 year)



By using a power meter twice, there is a CO<sub>2</sub> reduction of about 7 kg per unit over the entire life cycle of the unit. In terms of the total service area, this is roughly an 80,000 t reduction in CO<sub>2</sub>.

### Reuse

#### Effectively Utilizing Resources by Reusing Equipment

Kansai Electric is trying to utilize equipment from the 15 small capacity thermal power stations we shut down. Of the roughly 3,000 units, about half have been used for the Maizuru Power Station that is currently under construction, while the other half have been put to use at other power stations. For example, the boiler from the Amagasaki No. 3 Power Station is being reused at the Aioi Power Station.



Reused boiler at Aioi Power Station



**Recycle**

**Recycling Used Insulator Scraps**

In servicing power equipment, the ceramic insulators that serve as insulation are sometimes broken. Research was conducted to find an effective way to recycle this waste. Engineers came up with a water-permeable pavement material and bright-colored asphalt material.



Water-permeable pavement at Amagasaki Techno-land



Bright-colored asphalt pavement in a parking lot

**Recycle**

**Recycling PCB Waste**

The Waste Disposal Law of 1976 approved of high temperature incineration as treatment for PCB, but years went by without treatment advancing.

Together with group company Kansai Tech, Kansai Electric developed original chemical treatment technology that generate no combustion gases and the concerned governmental agencies evaluated as practical. Then, in 1998 when Waste Disposal and Public Cleansing Law was amended, it was approved as one technique for treating PCB. Today, we are building a treatment facility that will apply this technology to the low concentration PCB of utility pole transformers. It is also planned to effectively use the insulation oil -- once rendered harmless by treatment -- for fuel, etc.

**Building a recycle center for utility pole transformers**

Kansai Electric devised plans to build a recycle center for utility pole transformers that would render harmless the insulating oil used in these transformers - as it contains a small amount of PCB. In February 2002, we received a permit to build the facility from Osaka City through the Waste Disposal and Public Cleansing Law. At present, construction is underway as planned.



Conceptual view of recycle center for utility pole transformers

**Recycle**

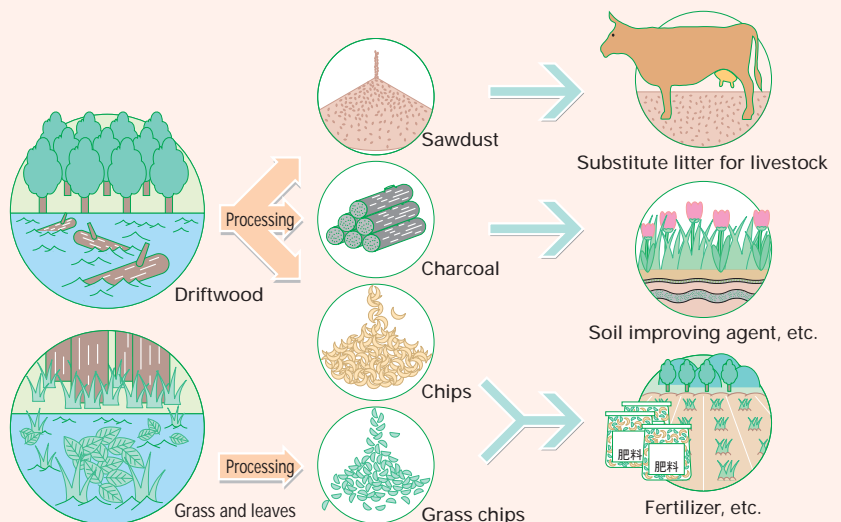
**Recovery of Driftwood From Hydro-power Stations**

Driftwood collected at the intake gate of hydro power stations is properly sorted, and the wood and leaves are effectively utilized. A driftwood recycle plant in Nakatsugawa, Gifu, processes driftwood recovered from our hydro-power station on the Kizu River into products that the local community can use.



Working at the driftwood recycle plant

**Recycle flow of driftwood collected at hydropower station**





## Promotion of Green Purchasing

For some time now, Kansai Electric has been purchasing energy-saving equipment and eco-label products. However, in fiscal 1999, these efforts were converted into a company-wide activity under a new Green Purchasing Promotion Policy that prioritizes the purchasing of products and services of low environmental load.

### Office Supplies, etc.

In April 2001, green purchasing was started with office supplies and targeted the purchase of copy paper, office equipment, stationary and documents across the entire company. In fiscal 2003, the green purchasing target was expanded to all office supplies and activities are being promoted even more aggressively.

#### Office supplies green purchase targets and results

Item	Target	Result (Purchase rate *)	
		Fiscal 2001	Fiscal 2002
Copy paper	100%	100%	100%
Office equipment	100%	100%	100%
Stationary	50%	51%	63%

\* Purchase rate is computed by the number of articles.

### Work Clothes

Kansai Electric adopted work clothes made from recycled plastic bottles. In fiscal 2000, quality test and trial use were done to verify insulation, strength and comfort. (Eco Mark was acquired.) The work clothes have been adopted by all sales offices and electric power offices. In the two years since fiscal 2001, we have purchased 20,000 uniforms.



Work clothes made from recycled plastic bottles

### Vehicles

In addition to adding electric vehicles to our fleet, Kansai Electric is aggressively replacing gasoline and diesel-powered vehicles with lower emission vehicles at the expiration of leases. Of the 336 vehicles whose lease expired in fiscal 2002, 276 were replaced with low emission vehicles or hybrid vehicles.

### Power Generation Equipment Purchases

In June 2002, Kansai Electric adopted Green Purchasing Guidelines for power generation equipment, hence starting green purchasing activities for about 70 items. The company will expand this list in the future.

#### Green purchasing results for major equipment (Fiscal 2002)

Item	Purchased quantity	
Cabling	Recycled vinyl insulated cable	23 km
	Eco cable	56 km
	Low wind sound, low reflection cable	342 km
Recycled polyethylene insulation conduit (PE conduit)	1,000	
Resin drum spools	332	
Recycled plastic protective plate for buried conduit	12,669	
Amorphous transformer	300	
Water-permeable pavement (Made from used insulators)	800 m <sup>2</sup>	

### Coordination with Outside Organizations

Kansai Electric is also promoting activities in cooperation with outside organizations like the Kansai Economic Federation and the Green Purchase Network (GNP).

Also, as local networks, the Shiga Branch Office is constructively working with the Shiga Green Purchase Network, while the Wakasa Branch Office is participating in the Green Purchase Network of Fukui.



Representative of the Shiga Branch Office presenting activities of Kansai Electric at the General Meeting of the Shiga GPN

### Purchase of Recycled Products via a "Closed Recycle System"

Retiring power transmission equipment generates a large volume of waste plastic in the form of cable sheathing and polyethylene conduit (PE conduit). Since fiscal 2002, the waste has been recycled into new sheathing, conduit and drum spools for wire, which Kansai Electric is purchasing. Moreover, in fiscal 2003, the waste started being recycled into branch line guards and wiring connection covers.

#### Recycled materials



Cables

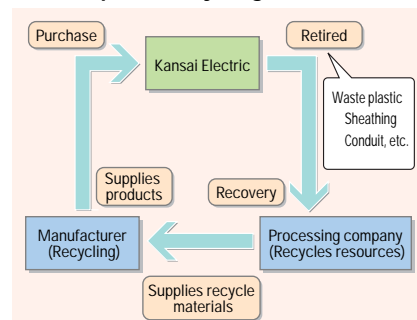


Polyethylene conduit (PE conduit)



Resin drum spools

#### Waste plastic recycling scheme



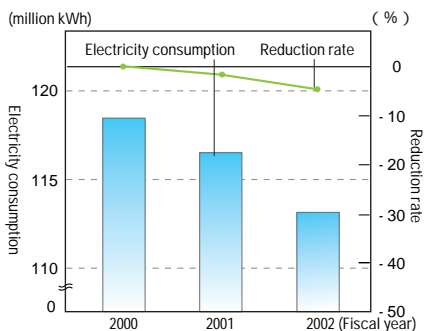
## Energy Conservation and Resource-saving Activities with Office Supplies

Electricity and water are indispensable to everyday operations, so at all business sites, Kansai Electric is using resources carefully and consolidating efforts to reduce use. As a part of this effort, company-wide targets have been set for electricity, water, copy paper and vehicle fuel.

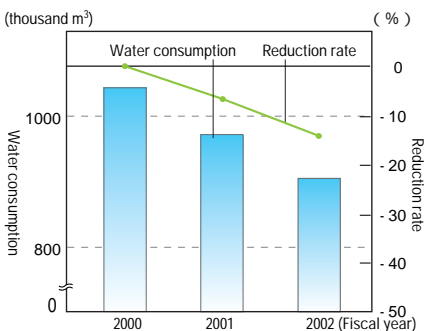
### Reduction in Electricity and Water Consumption

By checking lights are out, carefully setting air conditioning temperature and regulating air conditioning use, and a host of other measures, electricity consumption in fiscal 2002 was reduced by 4.5% compared to fiscal 2000. Also, efforts are being made to reduce water consumption by reusing rainwater and introducing water-saving equipment. Noting also that some facilities were shut down in fiscal 2002, water consumption was greatly reduced by 13.9% over fiscal 2000.

#### Electricity consumption of offices



#### Water Consumption

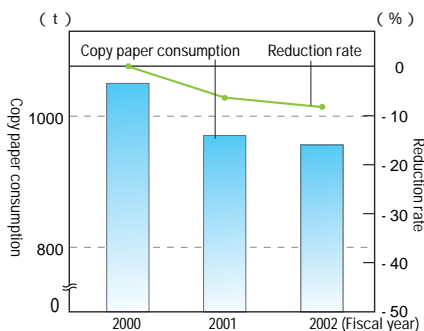


By installing solar planters to save on water in fiscal 2002, the Akashi Sales Office reduced water consumption by 15% over the previous year.

### Reduced Purchase of Copy Paper

By changing to e-documentation for meetings and introducing other activities to reduce paper use such as using the backside of once-used copy paper, copy paper consumption in fiscal 2002 was reduced by 8.1% in comparison to fiscal 2000.

#### Copy paper consumption



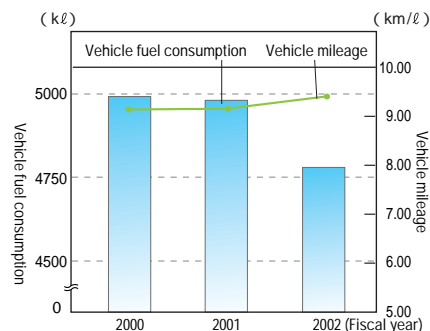
#### Example activities

Category	Example activities	Reporting and management method
Reduction in electricity consumption	<ul style="list-style-type: none"> <li>Shutting OFF PCs and lights during lunch</li> <li>Checking and using less lighting</li> <li>Introducing brightness-sensing lights</li> <li>Regulating indoor temperature and period of use of air conditioning</li> <li>Hanging awareness posters near elevators to encourage people to take the stairs</li> </ul>	<ul style="list-style-type: none"> <li>Making announcements and periodically reporting results at workplace meetings</li> <li>Recording results on a check sheet</li> <li>Identifying situations via questionnaires</li> </ul>
Reduction in water consumption	<ul style="list-style-type: none"> <li>Installing water-saving equipment</li> <li>Installing automated water washing on sinks</li> <li>Encouraging staff to wash vehicles with a bucket and rags</li> <li>Using well water by pumping</li> <li>Collecting rainwater for use in vehicle washing</li> </ul>	
Reduction in purchase of copy paper	<ul style="list-style-type: none"> <li>Providing "recycle boxes"</li> <li>Keeping once-copied paper in copy machine cassettes at all times</li> <li>Circulating only the required number of copies for those present</li> <li>Making the cost of copy paper known around copy machines</li> <li>Using less paper at meetings</li> </ul>	
Improvement in vehicle mileage	<ul style="list-style-type: none"> <li>Through stop of idling</li> <li>Changing gears according to speed</li> <li>Prohibiting unnecessary rapid braking or acceleration</li> <li>Having managers check speed charts</li> </ul>	

### Improved Vehicle Mileage

Before using vehicles at Kansai Electric, personnel check tires are properly inflated in order to gain good mileage out of a tank of gas. Also, through stop of idling vehicle engines, vehicle mileage for fiscal 2002 improved by 0.3 km/ℓ over fiscal 2000.

#### Vehicle fuel consumption and mileage



# Treatment of Radioactive Waste

## Monitoring and Measurement of Radioactivity and Radioactive Materials

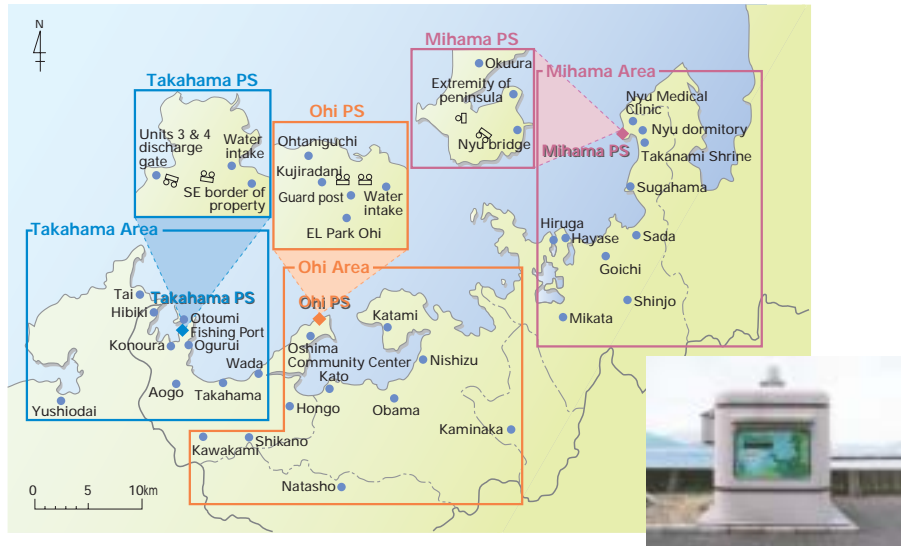
In order to make sure that the amounts of radiation produced in the running of our nuclear power stations do not reach a level where they may become a problem, radiation and radioactive materials are monitored. We keep the volume of radioactive waste transferred from our nuclear power stations well below regulatory levels, therefore exposure in the surrounding public area is less than 0.001 mSv/year. This value is far below the approx. 2.4 mSv/year that the same public area is exposed to by natural radiation.

## Management of Radioactive Waste

### Low-level Radioactive Waste

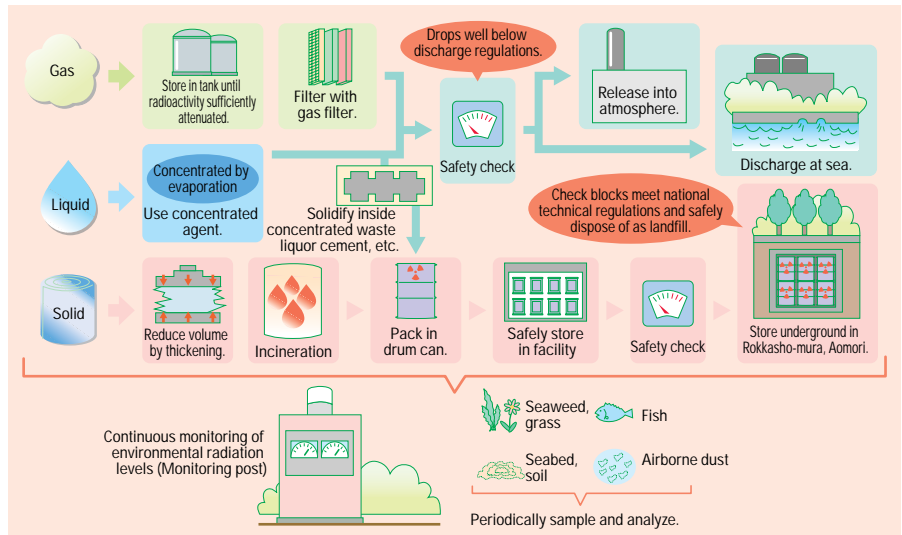
Kansai Electric carefully manages the radioactive waste generated in the operation of nuclear power stations in order to minimize any potential effects on the environment. Radioactive gas and liquids at our nuclear power stations are filtered according to properties and stored in tanks to attenuate the radioactivity. After that, the concentration of radioactive substances is monitored to ensure it is sufficiently low before releasing into the atmosphere or sea. Solid radioactive waste is compressed, incinerated and melted to reduce its volume then solidified inside of asphalt. It is then packed in drum cans and safely stored in storage facility. Continuous monitoring of environmental radiation levels (Monitoring post) is conducted. Periodically sample and analyze seaweed, grass, fish, seabed soil, and airborne dust.

Monitoring Point



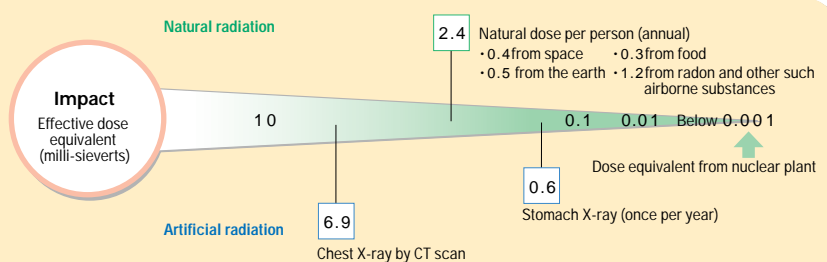
Monitoring post

Example processing for radioactive waste



### Reference Daily Life and Radiation

Radioactivity has existed in Mother Nature since long ago, whether coming from space, in the ground or in food. People in Japan are exposed to about 2.4 millisievert of natural radiation a year. Other than that, artificial radiation is used all around us in medical X-rays, syringe sterilization, potato germination inhibitors, etc.



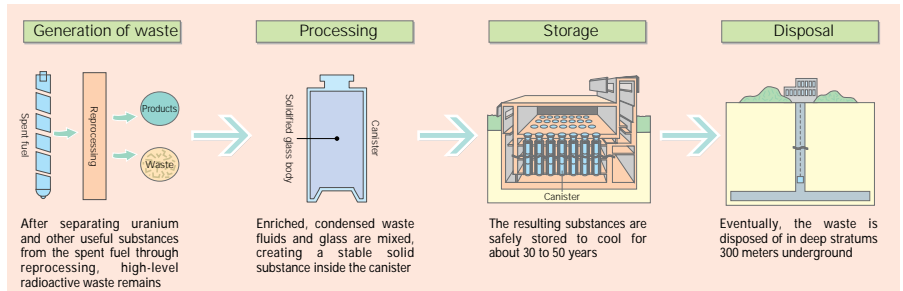
High-level Radioactive Waste

The reprocessing of spent fuel from a nuclear power station separates out useful materials like uranium. The remaining high-level radioactive waste is carefully stored for around 30 to 50 years to allow it to cool. The policy after that is to ultimately bury it at least 300 m below ground.

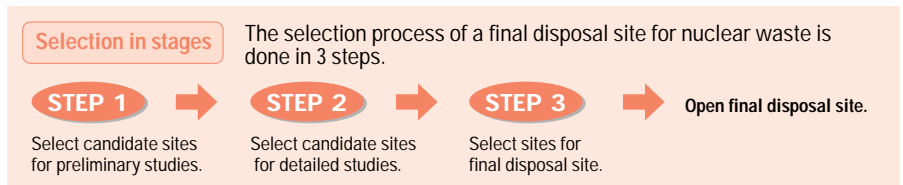
At present, the Nuclear Waste Management Organization of Japan is making preparations to select a final disposal site. When thinking about our children and grandchildren, Kansai Electric believes it necessary to properly manage nuclear waste.

<http://www.numo.or.jp/>

Processing and disposal of high-level radioactive waste



Disposal site selection process



Recycling of Used Nuclear Fuel - Pluthermal Plan

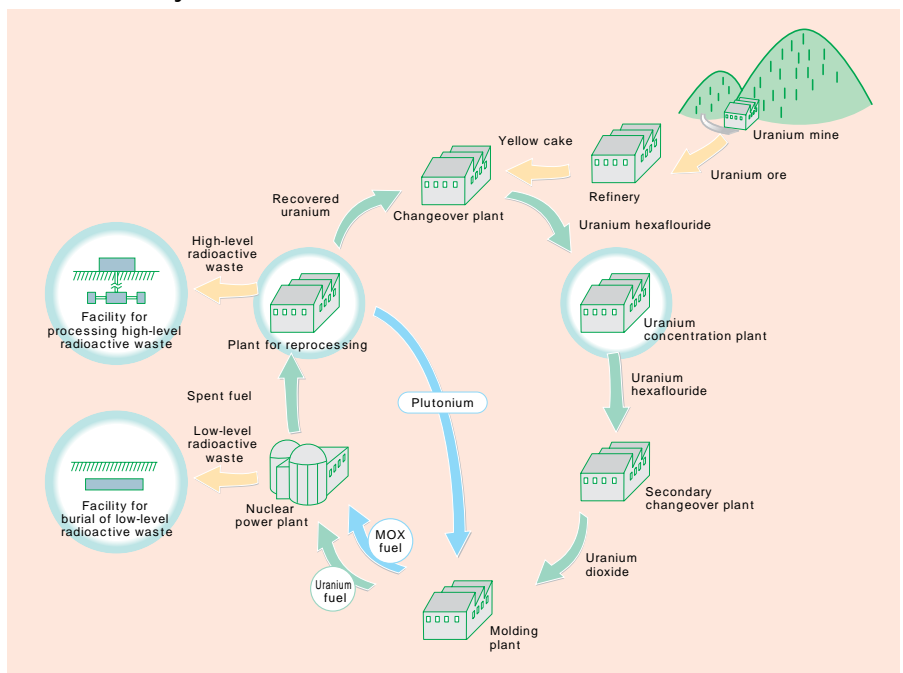
Having limited natural resources, Japan's basic energy policy is to recycle used fuel to effectively recover useful materials such as plutonium and uranium. In line with this policy, Kansai Electric is proceeding with its own Pluthermal Plan.\*

Kansai Electric had planned to start using Pluthermal at the Takahama Power Station in 1999, but because the MOX fuel data from BNFL that year had been falsified, no real progress was made. Nevertheless, since 2000, it was agreed that measures was adopted to prevent the reoccurrence of falsified data on MOX fuel and then we tried to improve and enforce quality assurance systems. In 2002, the fuel was returned to England at the responsibility and expense of BNFL.

In 2003, Kansai Electric hopes again to conclude a processing agreement for MOX fuel with the understanding of everyone not only from the local area but all across Japan.

\* Pluthermal which has been collected by reprocessing used fuel is mixed with uranium to form MOX fuel (mixed oxide fuels) and then reused nuclear reactors (light-water reactor; thermal reactor)

Nuclear fuel cycle





## V. Cooperation with the Local Community

**While valuing our relationship with people and local communities, each and every employee at Kansai Electric knows to think like a member of global society so that we may think as a company like everyone else and continue to grow alongside society.**

### Chapter 5 Contents

- 52 Interaction and Cooperation Outside the Company in Environmental Protection Efforts
- 54 Activities to Benefit Local Communities
- 55 Animating the Workplace



## Interaction and Cooperation Outside the Company in Environmental Protection Efforts

To protect the environment, it is necessary to build partnerships in which national and local governments, businesses and individuals each think and act with due concern for the environment. Kansai Electric cooperates with local communities and organizations on a broad plane so that we can share common thoughts about the importance of environmental problems and the importance of what each person can do for it. (For activities, see also P. 74.)

### Spreading Awareness on Saving Energy

On our website, Kansai Electric has added a corner entitled "Energy-saving Solutions: Housewife Challenger" that offers an entertaining way to learn about energy conservation. The company also publishes pamphlets and provides PR items designed to make learning more fun. Moreover, the Notice of Electricity Consumption that is provided to customers when we come to read meters lists not only the amount of electricity consumed this month but also that of the same month last year, so consumers can make the comparison.



PR items and pamphlets about energy conservation



### Classes and Study Tours

Kansai Electric offers classes and study tours on how to use electricity wisely to housewives, and cosponsors exhibits at the request of local governments and consumer groups.

### Participation in Events

Kansai Electric is part of a wide range of educational activities for the general public, including efforts to promote energy conservation through the mass-media and our own in-house publications, and the co-sponsorship of exhibits on the effective use of energy with outside groups such as the Energy Conservation Center.



Kansai Electric participated in this exhibition on the effective use of energy.

### Everyone's Eco-Friendly Campaign

Since 1993, Kansai Electric has taken part in the Everyone's 1-2-3 Campaign, which calls for participants to plant trees, reduce paper waste, and collect empty cans for recycling. This success led to the start of the New Everyone's 1-2-3 Campaign in 1996, which comprises the three activities of tree planting, resource and energy conservation in the office, and community beautification. In 2000, we started the Everyone's Eco-Friendly Campaign, in which the company continues to contribute to the protection of the local environment through various activities that require our cooperation of the local community.



Planting trees together with elementary school children. In 2002, Kansai Electric planted 23,964 saplings in schools, parks and public facilities. The company has planted 317,000 trees since 1993.



Clean-up nearby a business site. In 2002, Kansai Electric staged 841 clean-ups.

### 100,000 People's Eco-Family Campaign

In the 100,000 People's Eco-Family Campaign that has been running since 1998, employees of Kansai Electric and their families have been doing what they can at home to conserve energy such as setting air conditioners to 28°C and heaters to 20°C. Also, to expand these activities to local communities and spread this initiative, the company has produced pamphlets and taken advantage of event opportunities.

Furthermore, since 1999, each business site has been developing their own activities to aggressively encourage the general public to purchase green products and services.



Leaflets (left and middle) and stickers (right) for the 100,000 People's Eco-Family Campaign

### Environmental Household Budgeting

Using the company's database, Kansai Electric has been introducing examples of energy reduction initiatives and results since 2003. And, we started activities aimed at getting people to think about the environment in their household budgeting chores.



Guide window to the company's database



### During Environment Month

In response to the call from the Environment Agency (now Ministry of the Environment), Kansai Electric established June as Environment Month in 1975. For the entire month, all of our business sites interact and cooperate with local communities through events that take environmental problems as their theme.

In 2003, we expanded the sphere of activities to group companies, calling it "Kansai Electric Group Environment Month".



Kanden Green Festival

### Staging Symposia

With the support of Osaka Prefecture and Osaka City, Kansai Electric stages symposia on environmental themes every year as an opportunity for us and residents of the local community to think together about environmental problems both global and local.



Environmental Month Symposium

### Support for Environmental Education

Kansai Electric creates animated children's videos that explain about global environmental problems in an easy-to-understand manner, as well as pamphlets that introduce the eco-systems of wildlife children know or may come to know in their life.

Moreover, personnel from Kansai Electric visit schools to talk about energy and environmental problems as part of a "visiting classroom" (staged about 700 times for 35,000 students in 2002). We also give tours of our facilities (about 650 tours for 29,000 persons in 2002) and have created a corner on the company website where children can learn on their own.

### Cooperation with Environmental Protection Groups

In cooperation with environmental protection groups, Kansai Electric provides environmental education, recycle activities and environmental beautification activities.



Recycle class organized in cooperation with an environmental protection group

### Cooperation with the Osaka Chamber of Commerce and Industry

The Osaka Chamber of Commerce and Industry has an interactive relationship with Japan's environmental administration. They also promote self-initiated research into global warming and waste countermeasures, management of hazardous substances and environmental information disclosure. The results of these activities are provided to support the environmental efforts of all the industrial world. Kansai Electric participates constructively in these activities.

 <http://www.osaka.cci.or.jp>

### Cooperation with the Global Environment Forum, Kansai

The Global Environment Forum, Kansai studies global environmental problems and makes proposals on a base of activities run by six subcommittees, with the ultimate goal of developing a "Metabolism-Oriented Society". Kansai Electric participates constructively in these activities.

 <http://www.global-kansai.or.jp/navi.htm>

### Cooperation with Kansai Economic Federation

The Kansai Economic Federation has a wide range of activities for the "Construction of an Eco-cycled Society and Shift to a New Lifestyle", which is an important action plan in their Kansai Revitalization Plan adopted in December 1999. As part of this initiative, they have released statements on "Green Purchasing Promotion" and "Summer Energy Conservation", in which Kansai Electric is playing an active part.

 <http://www.kankeiren.or.jp/index-j.htm>

### Support for the Kansai Research Foundation for Technology Promotion

The Kansai Research Foundation for Technology Promotion provides support to researchers in the Kansai area in the form of grants for testing, research and international exchange activities with the ultimate goal of achieving the sustainable development of society which balances human activity with environmental protection.

In the eleven years since their founding, the Kansai Research Foundation has dolled out 432 grants equivalent to ¥460 million total.

Kansai Electric helped to found the organization in 1992 and has since been a major supporter of their work.

 <http://www.krf.or.jp/>



Subsidy presentation ceremony (Photo courtesy of the Denki Shimbum Newspaper)

### Community Relations Facilities

In an attempt to provide information on our electric utility business and our environmental preservation efforts and to communicate with local residents, Kansai Electric has built community relations facilities at power station sites, where a broad range of people can familiarize themselves with our operations and equipment.



Website guide map



## Activities to Benefit Local Communities

As a company that lives in step with local society, Kansai Electric is involved in various types of activity aimed at enabling us to "Live in Harmony with the Local Community".

### Support for Local Festivals and Events

Many business sites within Kansai Electric organize their own events as well as take part in locally sponsored events in order to make residents more familiar with the company.

Kobe Luminarie



Mihama Itsuki Hiroshi Marathon

### Welfare for the Elderly

It is predicted that one in every four persons will be age 65 or older in the year 2020. This aged society poses various topics for local communities to deal with.

Kansai Electric is helping to improve welfare for the elderly of the local communities that host us by setting up general welfare facilities for the elderly and checking electric appliances for elderly who live alone. And, by supplying them with electricity, we are offering each and every person a safe and comfortable way of life.



Personnel visiting an elderly woman who live alone to check her appliances

### Welfare for the Physically Challenged

Our wish is for a society in which everyone -whether physically or mentally challenged or not -can experience the joy of living. Our activities here target a "No Barriers Between Hearts". One example that is drawing attention both in and outside the company is Kanden L-Heart (Multi-Purpose Work Center for the Severely Physically Challenged), a company we set up as a place where the physically challenged can enjoy doing a variety of useful jobs.

Lively festival



Kanden L-Heart

### Support for the Arts, Culture and Sports

Every year, Kansai Electric holds concerts in various communities so that local residents can enjoy classical music and opera. We also cosponsor the FLASH BOWL series in the Kansai Collegiate American Football Association. We are taking a comprehensive approach toward the promotion of arts, culture and sports on the local level.

The opera Trovatore



FLASH BOWL

### Fostering Good Health in the Young

Kansai Electric promotes various events and exchange activities that help to make children sensitive to others and develop a social perspective of life.

One example of such efforts is the Kanden Youth Soccer Tournament cosponsored annually with the Osaka Soccer Society, to provide children an opportunity to play highly organized level of soccer.



Kanden Youth Soccer Tournament

### Support for Volunteer Activities by our Staff

In order to support our staff who spontaneously give to society through volunteer activities, Kansai Electric has a system whereby staff can take time off to participate in volunteer work, as well as a gift matching system. We also host seminars aimed at encouraging such activity.

Clean-up cosponsored by Osaka Gas



Home nursing seminar

# Animating the Workplace

As part of our Mid-Term Management Policy, Kansai Electric wants to "animate the workplace". We are striving to create a work environment that is safe, healthy and where employees can feel motivated and perform to the best of their abilities.

## Human Resources Activation Plan

### Improving On-the-Job Attitude

Kansai Electric has restructured the company's personnel system on the concepts of "compensating employees for their efforts", "allowing employees to pursue interests" and "making employees feel secure". We have instituted a number of activities so that employees can work actively as independent members of society.

#### [Main Systems]

- Performance evaluations based on a two-way dialog
- In-house job offerings so that employees can choose work they want to do
- Support for employees who want to change their way of life and values
- Rehiring of persons age 60 and older who still desire to work

Moreover, Kansai Electric has long utilized human resources without discriminating about gender. In fact, since Equal Employment Opportunity Law between Men and Women went into effect in 1986, the scope of work handle by women has broadened considerably as women are now constructively deployed for equipment operation and maintenance. Kansai Electric is also providing balanced support for both the job and home. Support structures have been set up in accordance with pertinent laws and regulations, including leave time for childcare and nursing, and the company paying 3 years of social insurance premiums for the employee.

### Developing Independent Human Resources

Job training programs at Kansai Electric are tailored to employee skill and aim to improve temperament, attitude and abilities while also ensure that employees acquire and improve the specialist knowledge required to get the job done. These programs aim to develop strong and independent human resources. Moreover, the company supports employees with a challenging spirit by offering study programs in Japan and abroad as well as holiday classes. Kansai Electric also provides education on human rights in the workplace every year as a part of departmental training.

## Safety and Sanitation Activities

### Safety and Sanitation Activities

As far as the company attitude about safety and sanitation is concerned, Kansai Electric is well aware that the safety and health of our employees are valuable assets to the company. So, with this in mind, we are involved in work that puts great emphasis on ensuring both. Not only do we strictly observe all the related laws and regulations in this field, such as the Industrial Safety and Health Law, but we have also set down our own company standards and are involved in independent activities toward such goals.

#### Fiscal year 2001-2004

#### Main points of Kansai Electric's policy on the Management of Safety and Sanitation

##### Safety Related

1. Preparation of a solid basis for the management of safety
2. Encouragement of activities that boost safety in cooperating companies

##### Sanitation Related

1. Promotion of mental healthcare for the competitive age
2. Promotion of supportive measures that assist personal responsibility for one's health
3. Strengthening of foundations of our health support system

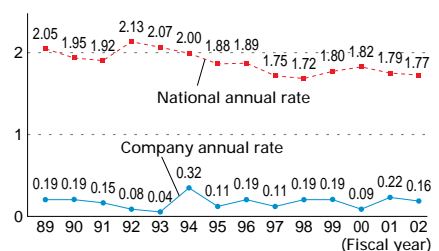
### Safety and Sanitation Management

To prevent occupational accidents, Kansai Electric has built a corporate environment with events and education for raising safety awareness. As a result, our company's annual rate of on-the-job accidents is lower than the national level. Moreover, to deal with stress, a big issue of recent years, and bad habits, we provide education and counseling services.

#### [Main Activities]

- Study of measures for preventing reoccurrence of accidents caused by human factor and horizontal development thereof
- Imparting practical training and checking driving ability as part of designation system for drivers
- Sharing company-weighted safety information, and providing advice and guidance
- Providing mental healthcare
- Providing information and support such as health guidance and support for persons who want to quit smoking

#### Annual rate of accidents at work\*



\* Annual Rate: Indicator of accident frequency widely used around the world. Number of hours of work missed through accident per total of 1,000,000 working hours.

## TOPICS

### Full Compliance by All Employees

In February 2003, Kansai Electric published a Compliance Manual that explains all laws, company policies and rules that employees must observe. We also launched counseling services to assist employees on compliance issues.

Kansai Electric also published "How You Should Act, 2003" with the goal that goes beyond the compliance of the individual to help him/her maintain the right frame of mind on the job and encourage them to think and act with a forward-looking attitude.

In the future, we will work on creating a corporate culture where employees feel like themselves, so as to gain back the trust of the general public.



#### What our Employees Have to Say

##### Fully aware of what it takes to do the job right — Acquiring the first ISO14001 certification for a nuclear power station at Kansai Electric —



Yoshio Hida,  
General Manager,  
Ohi Nuclear Power Station

The Ohi Nuclear Power Station started an environmental management system in August 2001 and acquired ISO14001 certification - the first nuclear power station of Kansai Electric's to do so - on October 25, 2002.

As a part of our activities, we set targets based on environmental policy and, as before, went about reducing radioactive waste, promoting energy and resource-saving, and properly managing industrial waste. In offices, we of course sort waste and, in a departure from past practices, set up an eco-post in each room to collect and recycle paper even from confidential documents. Also, as of last year, we have been working to reduce CO<sub>2</sub> emissions by introducing steady cycling at a rated thermal output and improving power output by shortening periodic inspections. It is important to create a system in the future with which each employee can act self-knowingly based on the environmental precepts of "observing laws and regulations", "preventing pollution from happening", and "continually improving our efforts" so that we can develop sustainable business activities in which safety is of top priority in environmental policy.

##### Converting CO<sub>2</sub> into a Useful Gas — Development of Flue Gas Decarburization Technology —



Takashi Nojo,  
Engineering Group Manager,  
Customer Division (Formerly  
Chief Researcher at the  
Environmental Technical  
Research Center, Electric Power  
Technical Research Center)

The removal of nitrogen oxides and sulfur oxides are called "denitrification" and "desulfurization" respectively, so the recovery of carbon dioxide from exhaust gas would be called "decarburization". Carbonic gas and CO<sub>2</sub> are other names for carbon dioxide. It's hardened dry ice.

The truth of the matter is that my real enthusiasm grew when I learned there were not as many organizations around the world as I thought researching equipment for recovering carbon dioxide from exhaust gas. I felt that directly recovering carbon dioxide from exhaust gas would be a sure means for reducing emissions.

Also, while carbon dioxide is called a "greenhouse gas", it is widely used around the world in many ways. Research began looking for countermeasures to global warming, but if we can expand the effective use of the recovered carbon dioxide as a material for chemical products, there would be ample need for recovery equipment.

Following the development of a new absorbent liquid for separating and recovering carbon dioxide, equipment efficiency is now thought to be the world's highest. I am hoping that the developed system can be deployed in countries around the world.

##### Helping to Make Power Stations Greener — Recipient of the Ministry of Economy, Trade and Industry Award —



Hidekazu Oitsu,  
Design Department,  
Miyazu Energy Research  
Center

At the 21st National Factory Greenery Conference, the Miyazu Energy Research Center received the Minister of Economy, Trade and Industry Award. The research center lies within Wakasa Quasi-national Park, therefore the site is 54% (230,000 m<sup>2</sup>) covered in greenery including areas where ecological planting was adopted to create near-natural forests. Recently, we planted black pine saplings that had been inoculated with truffle spores to prevent withering, in Amanohashidate Park.

###### What was hard?

Because of excessive sunlight, the water we gave to the ivy that covered the embankment dried up quickly, causing early withering. However, through trial and error, we came up with a planting mat of high water retention which we laid underneath the ivy roots to prevent withering.

###### Where was the most contrived?

Building a corner of flowering and fruiting trees, paths, the dragonfly pond and pagoda around the PR building so that visitors could enjoy themselves walking about the grounds.

###### What worried you most?

Because of the residential homes nearby, we made a grassy lawn in flat areas to prevent sand from scattering to the neighborhood. We were also extremely careful not to effect nearby animal facilities such as fish farms with the chemicals we were using. Moreover, we effectively used soil from the site that was excavated during the construction of the power station on the basic concept of "not removing or bringing in any dirt".

###### Comment

I look forward to managing these green tracts so that visitors can enjoy them and I hope that this contributes to the local community in some sort of way.

##### For the Children who will Shoulder the Future — Visiting classroom —



(Left) Junko Motomachi,  
(Right) Yumiko Fujii,  
General Affairs (Community Cooperation)  
Department, Kobe Sales Office

###### Tell us about what you do.

We visit primarily elementary schools to teach the children about the environment and energy.

###### Where is the most effort needed?

It's hard to talk entirely about environmental problems, so we link them to energy issues and try to get the children to ask themselves and think about what they can do in their daily lives to help. Also, lecturing loses the children's attention, so we try to add as many hands-on activities as possible.

###### Tell us about a particular episode.

A teacher at one school asked if there were some kind of "experiment kit that would show the children just how hard it is to generate electricity". After repeated trial and error, we made a kit of seven hand-cranked generators linked in a series that would light up a fluorescent lamp when all were turned in unison. This was a big hit in all the schools we brought it to and teachers have commented that it was "great to experience directly how difficult it is to make electricity in a fun way".

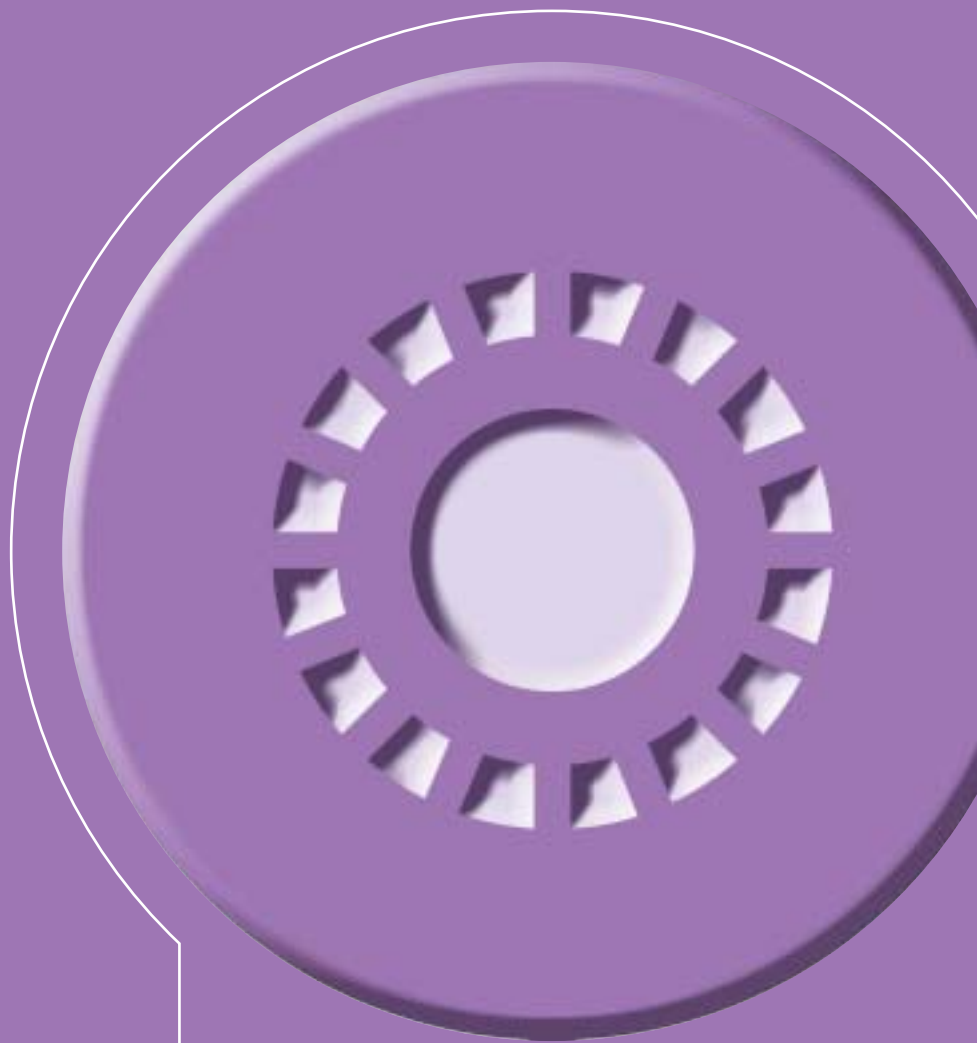
###### What are your aspirations?

Now that elementary schools have introduced self-interest constructive time into the curriculum, every year there have been more and more requests for the visiting classroom. We want to develop the visiting classroom so that children, who will be shouldering the future, will be interested in the environment and energy, and will think about what they can do for the future of the planet.



Children cranking generators by hand





## VI. Activities of The Kansai Electric Group

**Environmental protection is a group-wide effort at the Kansai Electric Group. While doing what we can for the environment, we will continue to provide customer-satisfying products and services so that customers and local communities alike recognize us as a "trustworthy and strong" group.**

### Chapter 6 Contents

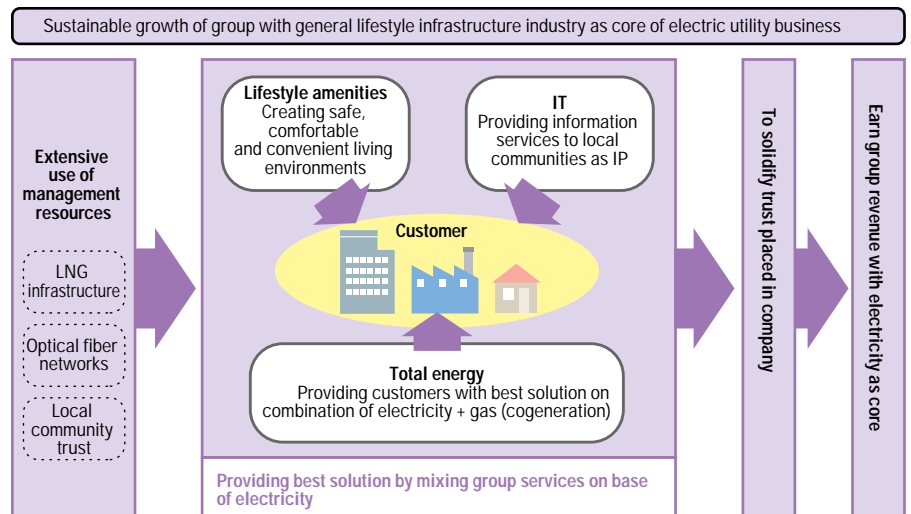
- 58 Activities of The Kansai Electric Group - General Consumer Infrastructure Industry
- 58 Group-wide Activities
- 60 Developing the Eco-Business

## Activities of The Kansai Electric Group - General Consumer Infrastructure Industry

At the core of the electric utility business of the Kansai Electric Group is a "general consumer infrastructure industry", where we develop business in three areas: "total energy", "IT (Information Technology)" and "lifestyle amenities".

To continue as the customer's trusted choice and attain sustainable growth as a group, we will propose to customers the best solution possible on a mix of quality services available only through the Kansai Electric Group.

### Aims of Kansai Electric Group business



## Group-wide Activities

Working from the Five Basic Principles of the Action Plan for Global Environmental Considerations ([4] Coordination of efforts throughout the Kansai Electric Group) that guide company activities, the Kansai Electric Group is united in core efforts to increase group revenue by promoting the eco-business and to strengthen our risk management through improved environmental management.

### Relations with Group Companies

Kansai Electric takes advantage of various opportunities to strengthen relations with group companies.

Sharing information by holding "report meetings"

Support for eco-business development by utilizing the diversity of technology and know-how available to us

Providing information by publishing "Eco-Business News"

At group companies, environmental protection is an important management issue. All companies have introduced an environmental management system and are developing environmental protection activities according to the nature and configuration of their business.

### Report meeting history

Meeting title	Date	Description	Number of attending companies
Group-wide study meeting for recycle activities	Oct. 2002	Staged every year during 3 R's Month. Each company reports on recent events in eco-business. At 9th meeting, Kanden Kogyo reported on shell volume reduction technology and shell waste recycling technology.	15
Company information report meeting	Nov. 2002	Explained future group-wide activities such as environmental management and green purchasing. Provided information on ISO environmental management systems.	21
Explanatory meeting of Soil Contamination Law	March 2003	Kansai Electric and Kansai Environment Engineering Center (certified inspection organization of the Ministry of the Environment) provided information on Soil Contamination Law and testing methods. Introduced soil contamination engineers from each company.	14



Kanden Kogyo Co., Ltd. providing information



Eco-Business News



## Improving Environmental Management

### ISO14001 Acquisition

#### Kinden Corporation

The Osaka and Chubu branch offices of Kinden were the first in the industry to acquire ISO14001 certification, that being in September 1999. Since then, all of their domestic business sites have become certified. Now, they plan to do the same with ISO9001 by upgrading and strengthening systems as an "technology you can trust" and working to assure and improve quality and the environment on their company motto of "creating customer satisfaction".

#### < Environmental policy >

(Basic Policy)

Harmony with the environment  
(Theme)

Promoting the design and installation of environment-friendly systems  
(Action Plan)

- Proper management of waste
- Resource conservation
- Energy conservation

#### NEWJEC Inc.

After the head office in Osaka acquired ISO14001 certification in January 2000, the company developed activities for all offices and became fully certified by January 2001. They have already gained ISO9001 certification and are using that to gain the satisfaction and trust of customers as a company that "uses technology to link the natural environment and people".

#### 【Environmental Activities】

NEWJEC targets many environmental results in the jobs they take on. In 2002, they developed activities to submit environmental-friendly proposals, which helped to increase orders. In the future, they will work to produce technical proposals developed with creative ideas.

#### Kansai Tech Corporation

In 2000, Kansai Tech launched an environment division to aggressively promote activities to reduce environmental load. In 2002, both the Environmental Department and their Fukuzaki Plant acquired ISO14001 certification.

#### 【Activities to Reduce Environmental Load】

Kansai Tech has aggressively addressed environmental load reduction by utilizing processing technology for rendering PCB oil harmless and targeting zero emission and discharge design and energy-saving design. They are also building waste management systems for accurately sorting PCB pollutants and non-pollutants.

#### Osaka Rinkai Netsu Kyokyu Co., Ltd.

Osaka Rinkai Netsu Kyokyu began in 2001 by supplying heat to Universal Studios Japan and other nearby facilities. After that, they launched energy-saving activities and started building systems to prevent air pollution, eventually acquiring ISO14001 certification in January 2003. Their plans for the future are to horizontally develop their environmental activities to their regional heat supply centers in Nanko, Rinku Town and Sannomiya.

#### < Environmental Policy (abstract) >

Protect the local and global environments as an important business issue in all heat supply activities.

#### < Environmental Objectives and Targets >

- ( 1 ) Stable supply of heat
- ( 2 ) Energy conservation
- ( 3 ) Resource conservation
- ( 4 ) Prevention of air pollution
- ( 5 ) Waste reduction

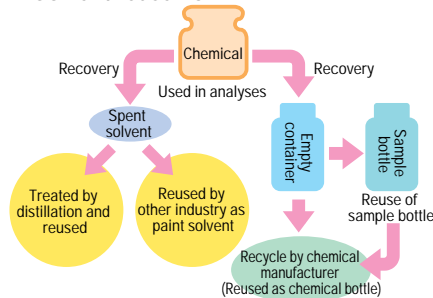
#### Kansai Environment Engineering Center Co., Ltd.

The Environmental Chemical Test and Analysis Lab acquired ISO14001 certification in May 1996. They already have acquired JISO17025 as well, and are promoting activities to improve both quality and the environment.

#### 【Waste Reduction Activities】

A new test and analysis lab completed in October 2002 is collecting, sorting and reusing organic solvents used at the facility. In 2002 alone, they reused about 200ℓ of solvent and reduced glass waste by about 2.7 t.

#### Solvent reuse flow



#### Understanding Environmental Load Data

Kansai Electric is also working to understand the environmental load of the Kansai Electric Group. In 2002, they compiled data on electricity, water and vehicle fuel consumption from the 25 main group companies. They also investigated air pollutants, water pollutants and waste.

#### Environmental load of 25 main group companies

Item	Fiscal 2002 results
Electricity consumption	275,879,988kWh
Water consumption	1,291,135m <sup>3</sup>
Gasoline consumption	1,398kℓ
Light oil consumption	811kℓ

## Developing the Eco-Business

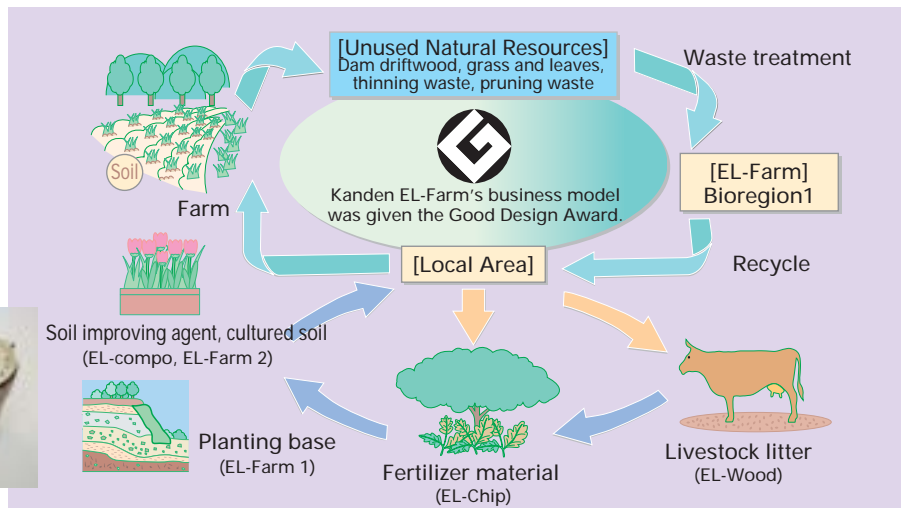
### Kanden EL-Farm Co., Ltd.

#### Recycling of Driftwood Collected from Dam Reservoirs

Kanden EL-Farm was the first venture company to come from the Kansai Electric's Entrepreneurial Opportunity System. Their business is to recycle driftwood and leaves collected from dam reservoirs, lumbered wood from the local area and tree trimmings. Their main products are a soil improving agent known as EL-Compo and a cultured soil called EL-Farm 2. They also developed and are selling a gardening pot set called EL-Pianta.



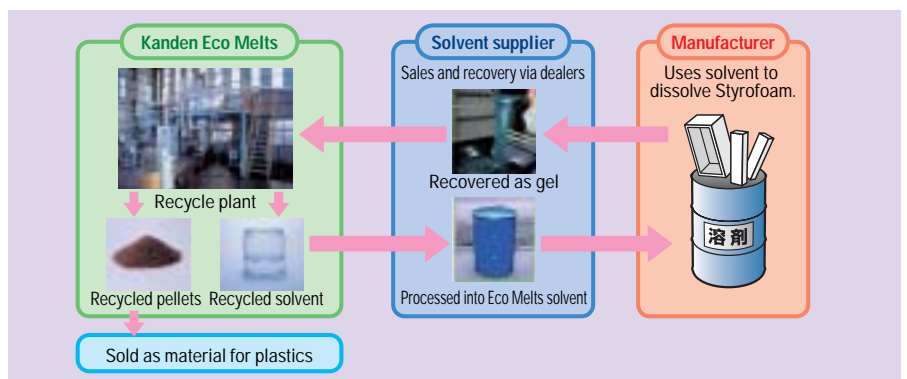
EL-Pianta



### Kanden Eco Melts Co., Ltd.

#### Recycling of Polystyrene

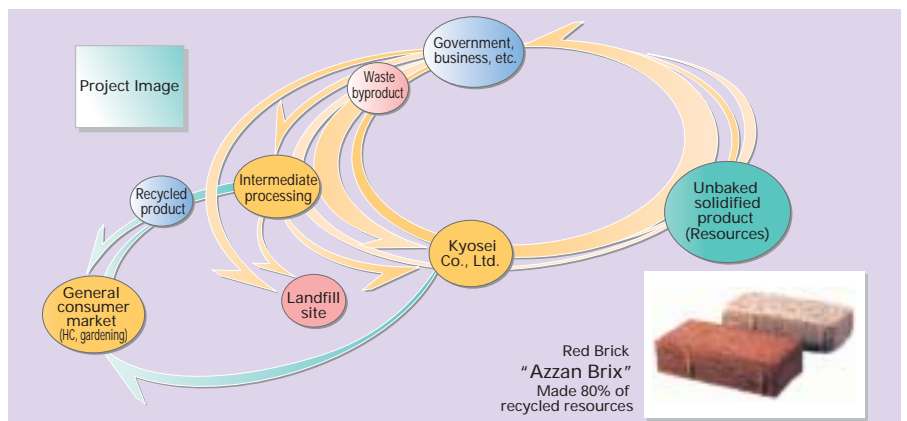
Kanden Eco Melts dissolves and palletizes such as Styrofoam that previously had been either incinerated or buried as landfill. And then sells them as a material for plastics polystyrene products. We will begin to operate In August 2003.



### Kyosei Co., Ltd.

#### Recycling and Reuse of Waste Brick

Using special solidification technology, Kyosei makes unbaked red bricks from 80% waste insulation from thermal power stations and waste from businesses and local governments, without baking the material. They started production and sales in 2001 and the products are today widely used as a construction and gardening material.





**Mos works Kanden Co., Ltd.**

**Production and Sales of Rooftop Garden Products**

The heat island phenomenon gets worse every year in large urban areas like Osaka, yet one solution that is grabbing attention is the rooftop garden. Mos works Kanden sells rooftop garden products that utilize a lightweight and conveniently portable "growth mat" for growing sedum and lichens that are strong against heat and require little maintenance. Their nursery is located on the grounds of the Tanagawa No. 2 Thermal Power Station.



Rooftop garden at Itami Airport

**Kansai Environmental Engineering Center Co., Ltd.**

**Developing Soil and Ground Water Pollution Testing and Recovery Business**

Following the enforcement of the Soil Contamination Law, Kansai Environmental Engineering Center became certified as a designated testing organization of the Ministry of the Environment in January 2003. Putting to work a rich history of testing results, they propose soil and ground test methods suitable to the target site and surrounding environment. Also, in the field of purification and recovery, they have a turnkey system for providing everything from test results evaluation to proposal, design, installation and confirmation tests of countermeasure solutions.

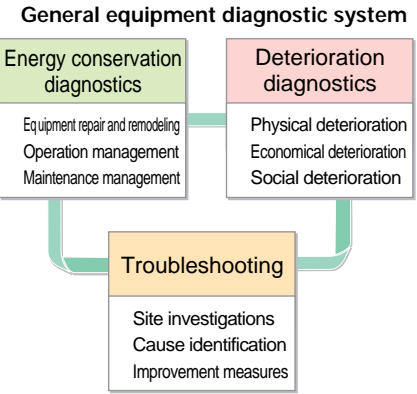


Soil testing by boring

**Kinden Corporation**

**Energy Conservation Activities**

Following amendments to the Law Concerning the Rational Use of Energy, Kinden set out to optimize energy conservation by pulling the host of diagnostic technologies we had (deterioration diagnostics, energy conservation diagnostics and troubleshooting) into a "energy conservation promotion technology" package, and are now developing services from renewal proposals to planning, installation and verification.



**New Energy Activities**

Kinden is also responding to diversified demands for "wind power generation" and producing steadfast results by building simpler downsized systems utilizing the strong points of foreign manufactured.



Sarakitomanai (Hokkaido) 1,650 kW X 9 units

**Kanden Kogyo Co., Ltd.**

**Developing the Air Conditioner Filter Cleaning Business**

Kanden Kogyo is cleaning medium performance air conditioner filters by ultrasonic wave and reusing them. This is important because these filters are normally discarded after use. With Kanden Kogyo technology, filters can be washed 3 to 5 times. The filters are restored to almost a new state and delivered to the customer. This reduces waste to 1/3 - 1/5 and helps to cut costs that normally would be spent on new purchases. In the future, they want to try washing intake filters for gas turbines.

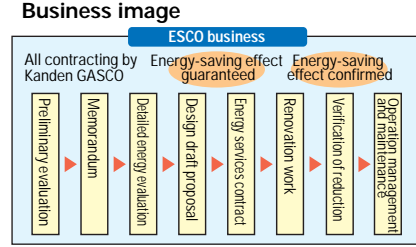


Automatic ultrasonic filter cleaning machine

**Kanden Gas and Cogeneration Co. Inc.**

**Developing the "Energy Services company" Business**

Kanden Gas and Cogeneration (Kanden GASCO) sells gas for Kansai Electric and proposes the best energy system to customers. As a part of their business activities, they are involved in ESCO (Energy Services Company) business. They are helping customers to save energy by proposing the best energy system for their needs and by providing them with total energy support. In a public bidding for work at the Osaka Prefecture Hospital, Kanden GASCO was selected as the best proposal.



## The status of Environmental Communication

Kansai Electric is aggressively promoting face-to-face communication activities that relate to the needs of customers and hosting communities and that rely on upgraded operations and mutual understanding.

### Communication with Hosting Communities

Kansai Electric uses an in-house LAN nicknamed the "The Voice of Dumbo" to convey opinions and needs with regard to the company's business activities to management in a timely fashion. This approach promotes information-sharing inside the company and helps to improve operations. Also, at branch office and subsidiaries, we started an "energy confab" and at sales offices a "service confab" to hear the thoughts and ideas of scholars and opinion-leaders from local communities and apply them to improving business operations.

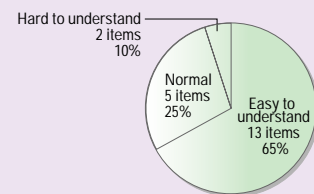
### Communication Over the Internet

Kansai Electric introduces environmental activities in detail and posts press releases and announcements on environmental events in a timely fashion on the company website. Moreover, we utilize a purpose-specific database to manage responses to mail inquiries on environmental information or company activities with every effort being made to suitably and promptly reply to messages.

### Communication via this Environmental Action Report

A questionnaire is provided at the end of this report. We use the comments that people send us as reference for improving our environmental protection activities and this report.

#### Impression of the 2002 report



## Some Major Comments on the Environment and Our Activities

### Comments on Kansai Electric's Environmental Protection Activities

More PR is needed about the Kansai Green Power Fund. Kansai Electric should build their entire vehicle fleet of electric vehicles.  
 More PR is needed about all-electrification's relation to environmental problems. Can Kansai Electric do something to process PCB?  
 You need to make a greater effort to spread new energy sources. Your activities would be highly praised overseas. I wish you would push hydropower more.  
 People can relate to your gesture of giving away flower seeds, so I'd like you to continue doing it in the future. I'd like more PR that links daily life to your activities.  
 I learned from your visiting classroom how various environmental problems start, such as CO<sub>2</sub> being generated by the burning of fossil fuels.

Kansai Electric reports the progress of environmental activities through the company website and this report, but more importantly we use the feedback from readers to continue and improve these activities.

### Comments on this Environmental Action Report

#### Concerning the Content

There is plenty of information, but more efforts are needed in its structure. It is also hard to identify the thinking and direction of your activities.

More PR is needed on what has been done to respond to customer demands as well as on educational programs for elementary school children.

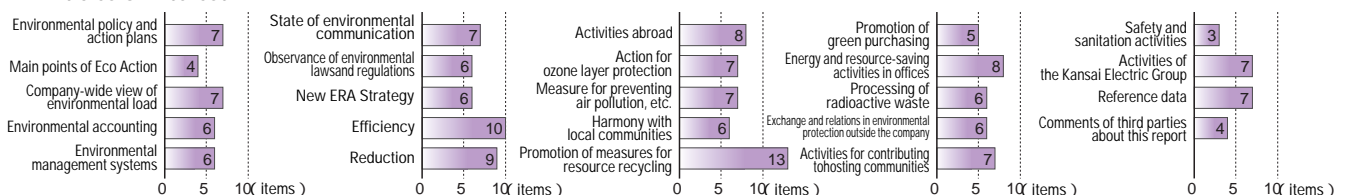
You should emphasize the environmental protection efforts of related companies more and not just talk about the eco-business.

We listed reference information separately as background to our activities and supplemental information. We tried illustrating our thinking in the headers of individual articles.

We introduce some specific comments of customers and how we have responded to them following this page. We also discuss for the first time what was said at the opinion-sharing meetings where we talked about this report. Moreover, we introduce what our employees at many business sites think about the representative examples given in the visiting classroom.

We introduced businesses that have acquired ISO14001 certification and included the progress made in trying to understand our own environmental load.

### Articles of Interest



# Environmental Communication with the Coming Generation

## Opinion-sharing Meeting with Younger Generations

Kansai Electric held a series of meetings with college students from the Kansai area at the Nanko Power Station and ATC Green Eco Plaza, to share opinions about company environmental protection activities and this Environmental Action Report. The purpose of the meeting was to gain the participants' understanding of our activities, create a digest edition of this report from the reader's perspective, and hear a few ideas and suggestions about future activities. The group met a total of four times with the help of staff from NPO E-Being, which served as coordinator of the cooperative relations between industry, government and academia.



《1st meeting》  
Tour of primary facilities at the Nanko Power Station



《1st meeting》  
Explanation by Kansai Electric of all company environmental protection activities



《2nd & 3rd meetings》  
Creation of a digest edition of this report from the reader's perspective



《4th meeting》  
Announcement of opinions and suggestions on future activities

At the 2nd and 3rd meetings, students shared their thoughts and opinions on what information should be provided and how it should be presented to customers and residents of hosting communities. As a result, they prepared a digest edition of the Kansai Electric's Global Environmental Action Report 2003.

### Some of the Major Comments

It would better if we could see the people who work at Kansai Electric and read interviews with them.

More PR is needed on activities the company does in cohort with customers.

It is tiring to go through pages and pages of graphs and text. I'd like to see some simpler visuals.

You need more tools and listings of places to contact so people can seek more information.

### Our Application of Comments

We listed comments of company personnel who are behind environmental protection activities.

We broke up our global environmental protection efforts into supply-side efforts (up to when electricity is delivered to the customer) and demand-side efforts (what we do together with customers and society as a whole).

We worked on expression by using more concise text and simpler visuals.

We presented the information we wanted to convey (what we think readers want to read) in greater detail and provided links so that readers could seek further information.



### Participating Students (Honorifics omitted)

(Upper row from left) Yoshitomo Ono, Masamichi Okano, Hiroshi Ogawa and Sayaka Tatsumi of Osaka University Graduate School, Yuichiro Takai of University of Osaka Prefecture Graduate School, and Momoko Sugawara of Kyoto University Graduate School.  
(Bottom row from left) Rie Ichii and Yu Kobori of Kobe University Graduate School, Yumi Igarashi, Kazutoshi Ukon, Takuya Konishi, Emi Takagawa and Keiichi Tazaki of Doshisha University Faculty School of Economics.



Ryosuke Kuribayashi  
NPO E-Being

I would like to express my heartfelt appreciation to the students who took part in this exchange and the staff from the Environmental Department that respectfully and seriously listened to the sometimes harsh opinions of the students. These meetings were moments I will cherish forever.

A large part of the interest that customers show in businesses is "just how much these businesses are doing for the environment". We strongly feel that this is the very criteria of supplier selection that characterizes the times. In this kind of world, the opinion exchanges we held this time proved to be a valuable opportunity for us to see things from the customer's perspective and rethink about how we can better convey our activities to our customers. Kansai Electric wants to continue with this kind of encounter not only to discover ways to disclose environmental information but also to gain an understanding amongst customers and the general public of the whole span of business activities we promote.

## From the Perspective of an Environmental NPO - Opinion-sharing Meetings with Kansai Electric

These opinion-sharing meetings were more significant than I had ever imagined they could be as participants walked away with a good understanding of the environmental protection activities of Kansai Electric and an easy-to-understand digest edition of Kansai Electric's Environmental Action Report was created on the cooperation of industry, academia and private NPO.

For our NPO, it was a chance to deepen out contact with how businesses do businesses, while for the students, it was a great opportunity to learn about the energy situation and what business is doing about the environment. It was also encounter with the way people who work in the energy sector "think".

The students that read Kansai Electric's Global Environmental Action Report 2002 felt for the most part that it was "overly difficult", "hard to understand" and "forced them to give up halfway through". But, through these opinion-sharing meetings, there were some wonderful suggestions that were reflected in the report and the students left Kansai Electric a message.



Takeo Inoue  
Director, NPO E-Being

### Message from Students shouldering the future to Kansai Electric

#### 《How to Go about Future Activities》

You should present your corporate vision and philosophy (how you think of yourselves as a company within society) in concrete terms, and then evaluate and explain your current activities.

We'd like to see you commend employees who take the initiative ahead of others to promote environmental activities.

We expect an aggressive stance rather than vagueness about current activities, which you could demonstrate by developing clean energy as an industry leader.

#### 《Improving Your Environmental Communications》

You need to build an effective communication system that clarifies the mutual relationships, targets, roles and other matters of the various types of information media (i.e., Environmental Action Report, website, TV commercials, newspaper advertisements, PR pavilions, fliers, pamphlets, events, meter slips, etc.)

You need to deepen relations between departments (i.e., sales offices, PR department, etc.) and oversee all of the information you release so as to provide more effective information that is carefully tailored to the individual stakeholders.

Your work is not over with the completion of the Environmental Action Report. You must feed back evaluations and link them to future activities.

These opinion-sharing meetings were wonderful, therefore we want them to continue.

For the students, this experience was not just for expressing their approval or disapproval of what is being done about energy problems as it presented them with an opportunity to think about the current situation as someone who can contribute to resolving these problems. It was pointed out that behind this opportunity was not the one-way type of environmental communication in which a company throws out information and a report, but an atmosphere of participation in which committed parties could painfully share and think about environmental problems together. As an environmental NPO, we reconfirmed just how useful this kind of structure is towards promoting a partnership between business and the general public when it comes to promoting activities.

In the future, I would like to create more opportunities for sharing opinions with other stakeholders such as housewives so that other persons of the general public may think about energy problems and understand what businesses are doing about the environment. To survive in the future, businesses will need the understanding and support of society.

### NPO E-Being

Senior Advisor Takashi Gunjima (Professor, Doshisha University Faculty School of Economics)

Director Takeo Inoue (Environmental counselor [Consumer/Business], alternate EMS inspector, Eco Stage evaluator)

Major operations: Planning and managing of seminars and events, awareness activities, publication, consulting, research, etc.

Contact information: c/o ATC Green Eco Plaza, 11th floor ITM Wing, ATC Building, 2-1-10 Nankokita, Suminoe-ku, Osaka 559-0034



## Reference Information

### Reference Information Contents

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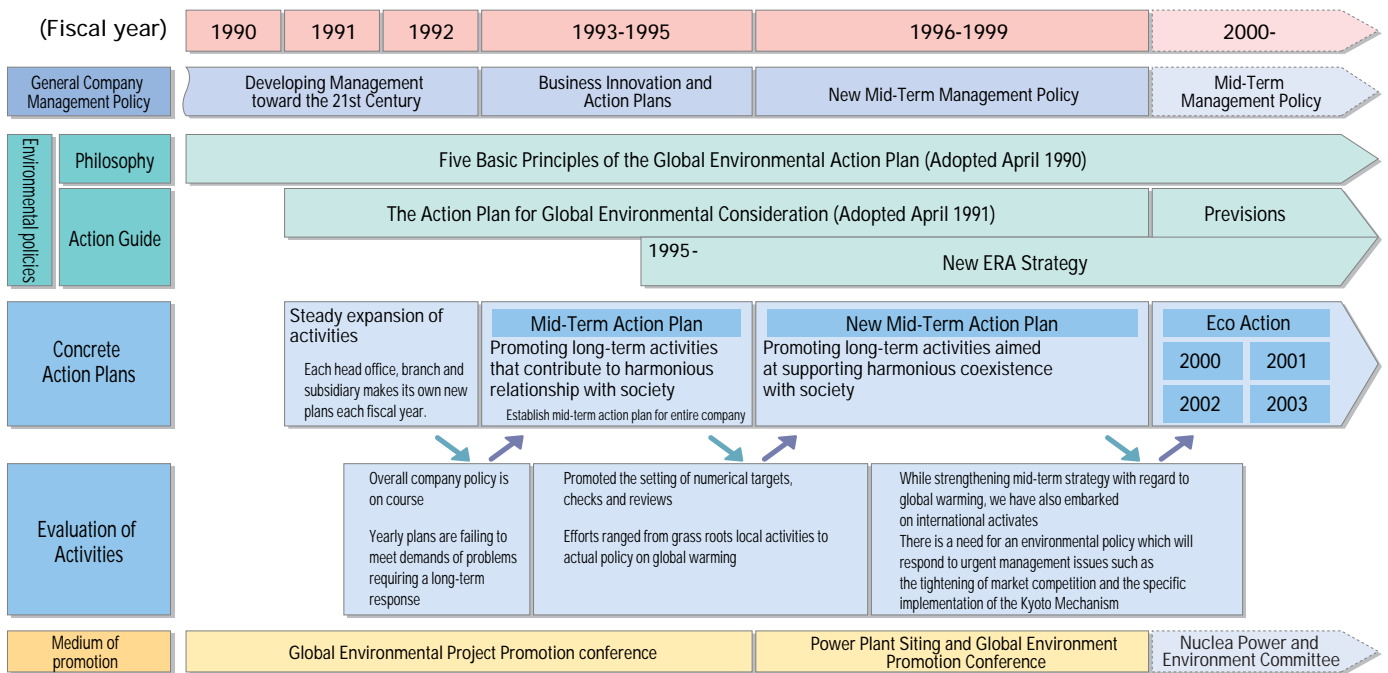
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#### Social Activities

- 74 Exchange with Local Communities (PR Facilities, Environmental Publications, etc.)
- 75 Publication of Site Reports
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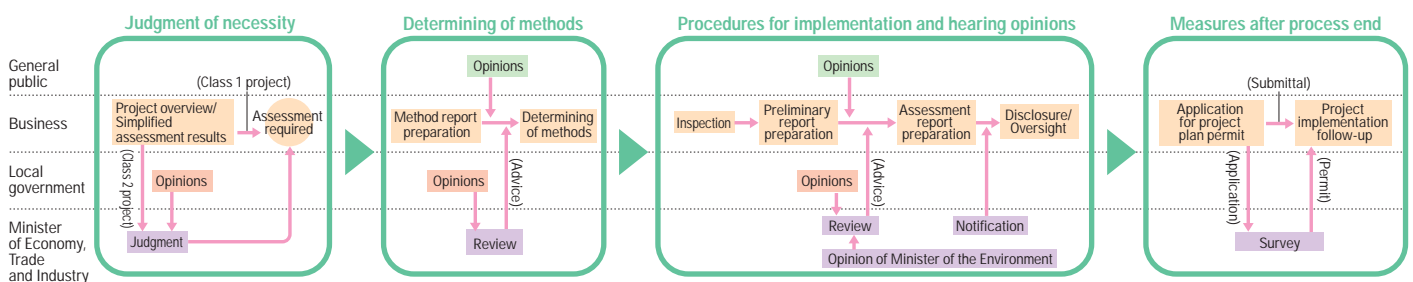
## Transformation in Environmental Policy, etc.

Environmental protection activities at Kansai Electric are based on the Five Basic Principles of the Global Environmental Action Plan that were adopted in April 1990 and the Action Plan for Global Environmental Considerations that was drawn up in 1991. In 2000, because of big changes in our business environment that came after partial liberalization of the power retail market, we revised our Action Plan for Global Environmental Considerations and replaced the Mid-term Plan and New Mid-term Action Plan with a rolling Eco Action plan that sets targets every year for the subsequent three years. By steadfast executing this Eco Action plan, we are voluntarily but aggressively staking a challenge to environmental problems so as to gain the trust of the general public.



## Environmental Assessments for the Construction of Power Stations

An environmental assessment is a process for determining the content of a development project and project plans. It involves surveys, preliminary measurements and assessments on the potential impact on the environment of a project. These results are disclosed to the general public, after which comments are heard from residents and local governments. After all of that, project plans are drawn up from the perspective of environmental protection. In 1997, the Environmental Impact Assessment Law went into force and the Electric Utilities Industry Law was revised adding in particular specific formalities for power stations. Under the new system, project plans must show environmental considerations from the early stages and there are additional mandated procedures for judging whether or not an assessment is needed as well as for selecting evaluation items and methods. Moreover, in order to receive a permit to build a power station, project plans must comply with the environmental impact report. Furthermore, in order to compare the actual situation against assessment results and identify the state of the environment, ex post facto tests are implemented as necessary during construction and before and after operation commences.



## Overview of the RPS System

### System Overview

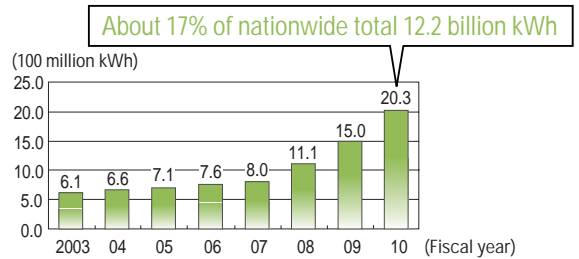
RPS standard for Renewable Portfolio Standard. Based on the Special Measures for Use of New Energy Sources in the Electric Power Industry enforced in April 2003, a certain amount of electricity consumed every year must be generated by new energy sources. The system is directed at electric utility companies and aims to spread the use of new energy sources.

#### Applicable energy sources

<b>Wind power</b>	<b>Solar power</b>	<b>Geothermal</b>	Power generation method that uses ground heat without drastically depleting hot water
<b>Biomass</b>	Excluding crude oil, oil gas, combustible natural gas, coal and products made of these		<b>Hydropower</b>
			Power generation of 1,000 kW or less by water channeling

### Electricity Amount Kansai Electric Obligated to Use

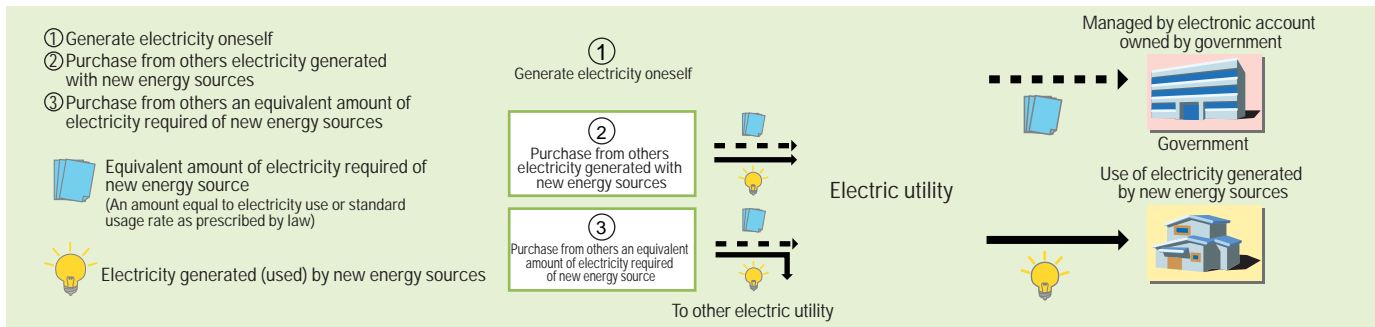
Based on the Special Measures for Use of New Energy Sources in the Electric Power Industry, Kansai Electric's obliged amount is estimated as follows by Natural Resources and Energy Agency.



Source: Material from Natural Resources and Energy Agency (January, 2003)

### Method that Electric Utilities Use to Fulfill Obligations

An electric utility can choose the most advantageous approach to fulfilling RPS obligations from the following three offerings, taking into consideration economic feasibility and other matters. The equivalent amount of electricity generated by new energy sources is managed via an electronic account owned by the government.



## Contributors to the Kansai Green Power Fund (Fiscal 2003)

### Solar power generation (23 contributors)

Contributor	Facility output
Hirakata South Public Center (Hirakata, Osaka Pref.)	20kW
Ibaraki Ai Community Center (Ibaraki, Osaka Pref.)	5kW
No. 6 Welfare Center for the Elderly "Day service Center" (Ibaraki, Osaka Pref.)	12kW
Takatsuki Public Pool and Facilities (Takatsuki, Osaka Pref.)	20kW
Kizu Water Treatment Plant chemical sedimentation pond (Kizu-cho, Soraku-gun, Kyoto Pref.)	50kW (Targeted power: 20 kW)
Hiyoshi Lifelong Learning Center "Yu You Hiyoshi" (Hiyoshicho, Funai-gun, Kyoto Pref.)	4.752kW
Aioi Pumping Station roof (Aioi, Hyogo Pref.)	10kW
Toyooka Imamori Housing Development (Toyooka, Hyogo Pref.)	5kW
Toyooka Hachijo Kindergarten (Toyooka, Hyogo Pref.)	10kW
Asago Town Hall (Asago-cho, Asago-gun, Hyogo Pref.)	10kW
Asago Yamaguchi Elementary School (Asago-cho, Asago-gun, Hyogo Pref.)	10kW
Takeda Castle Ruins parking lot (Wadayama-cho, Asago-gun, Hyogo Pref.)	1.58kW
Agricultural and Industrial Products Center (Inagawa-cho, Kawabe-gun, Hyogo Pref.)	4kW
Sekimiya Elementary School (Sekimiya-cho, Yofu-gun, Hyogo Pref.)	10kW

Contributor	Facility output
Namiga Activity, Support and Welfare Center for the Elderly (tentative name, Namiga-cho, Shito-gun, Hyogo Pref.)	10kW
Shiga Prefectural Office (Otsu, Shiga Pref.)	30kW (Targeted power: 20 kW)
Gamo Higashi Elementary School wood workshop (Gamo-cho, Gamo-gun, Shiga Pref.)	10kW
Eigenji Yamagami Elementary School (Eigenji-cho, Kanzaki-gun, Shiga Pref.)	20kW
Kobe Kaigan Subway Line site and Daimaru Station building roof (Kobe, Hyogo)	2.7kW
Mizuware Park (Hikami-cho, Hikami-gun, Hyogo Pref.)	3.6kW
Flower and Plant Promotion Center (Chuo-ku, Kobe, Hyogo Pref.)	5.76kW
Yasu High School (Yasu-cho, Yasu-gun, Shiga Pref.)	10kW
Omi-ohashi Toll Road Omi Bridge (Kusatsu-cho, Shiga Pref.)	60kW (Targeted power: 20 kW)
<b>Total</b>	<b>324.392kW</b> (Total targeted power: 244.392kW)

### Wind power generation (1 contributor)

Contributor	Facility output
Hotel New Awaji (Nandan-cho, Mihara-gun, Hyogo Pref.)	2.000kW

## Main Electricity Rate Menus

### Office and Building Customers

Plan menu	Description
Contract by Load plan (L PAC)	Enhances load factor (usage factor of customer's power demand equipment). Allows electricity use across 5 inexpensive levels.
Commercial heat storage and adjustment plan	Stocks inexpensive nighttime electricity required for daytime use of heating/cooling systems, water heaters, etc. Can reduce peak daytime power demand. Not only power rate but also base rate is reduced.
Commercial airconditioning system plan	Provided as a set package with the Eco-Ice. By running all air-conditioning with electricity, electricity rate for electric heat pump also becomes lower.
Commercial electric heating plan	Discounts on electricity rates are offered to customers that use all-electric heating systems.
Commercial all-electric plan	By using all-electric appliances (i.e.,Eco-ICE, air-conditioning, heating, water heaters, etc.), electricity rate becomes even lower.

### Factory Customers

Plan menu	Description
Contract by Load plan (L Pac)	Enhances load factor (usage factor of customer's power demand equipment). Allows electricity use across 5 inexpensive levels.
By season and time slot	Special rates are offered to customers that use large quantities of electricity at night or on Sundays and holidays.
Voltage Power WE (Weekend)	Special rates are offered to customers that use large quantities of electricity on Saturdays, Sundays and holidays.
Industrial heat storage and adjustment plan	Stocks inexpensive nighttime electricity required for daytime use of heating/cooling systems, water heaters, etc. Can reduce peak daytime power demand. Not only power rate but also base rate is reduced.

### Households and Store Customers

Plan menu	Description
Happy Time	Inexpensive rate for family living time: morning, evening and holidays. About 1/3 of regular rate for nighttime. All-electric homes can receive an even lower rate.(Happy Time)
Time-specific Electricity Contract plan	Electricity rate is divided into daytime and nighttime, and measured to compute total. Nighttime electricity is inexpensive, whereas daytime electricity is expensive. Therefore, the higher nighttime electricity usage is, the lower electricity rate is. Customers with electric water heaters can neat again daytime electricity.
Low voltage heat storage and adjustment plan	Stocks inexpensive nighttime electricity as "ice" and "hot water". Customers can look at using the Eco-Ice and Eco-Ice Mini for daytime cooling and heating.

## Cascade Refrigerator

In cooperation with Mayekawa MFG Co., Ltd., Kansai Electric developed a high efficiency commercial refrigerator for super low temperatures of -40 - -55°C. It uses a natural refrigerant that does not destroy the ozone layer or cause global warming. It is used by the frozen food industry, etc.



Cascade refrigerator

### Features of the Cascade Refrigerator

Item	Feature
Environmental-friendliness and safety	Uses a natural refrigerant (low temperature side: CO <sub>2</sub> , high temperature side: Ammonia), thus helping prevent ozone layer destruction and global warming. Since CO <sub>2</sub> is used as refrigerant on the low temperature side, it is safe for food processing plants and cold storage.
Cost	Is 20% or more efficient than existing systems. (COP 1.2 * or higher)
Reliability	Adopts a reliable industrial, oil-injected screw compressor. First time used anywhere in the world. The evaporator exhibits maximum heat transfer performance without oil stagnation even around -56°C.
Other	Winner of the 21st Energy-saving Equipment Award of Excellence of the Japan Association of Refrigeration and Air-conditioning Contractors. Winner of 16th Technical Award of the Japan Society of Energy and Resources.

\* COP (Coefficient of Performance) indicates how much heat (in multiples) can be used per unit of power consumption.



## Eco Cute

Eco Cute is a new generation water heater that uses a natural refrigerant (CO<sub>2</sub>). It is very environment-friendly and uses energy very efficiently. Besides saving energy, the Eco Cute features low running costs because it runs on nighttime electricity. Kansai Electric expects it to diffuse widely in the future.

Eco Cute System



### Features of the Eco Cute

Item	Feature
Environmental-friendliness	Uses a natural refrigerant (CO <sub>2</sub> ) in the place of CFC. Ozone destruction factor of 0 Global warming factor that is 1/1700 of CFC
Energy-saving	Uses a heat pump. Yearly average COP * of 3
Cost	Greatly reduces running costs. Special rate plan in Happy Plan High efficiency equipment (COP 3 or higher)

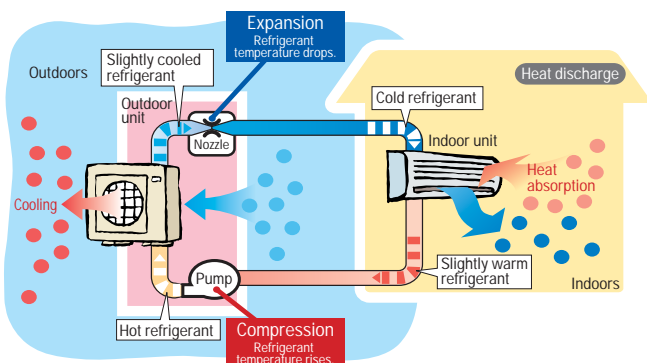
\* COP (Coefficient of Performance) indicates how much heat (in multiples) can be used per unit of power consumption.

## Working Principle of Heat Pump

Family air-conditioning uses the principle of a heat pump. An air-conditioner consists of an indoor unit and an outdoor unit with liquid flowing between them, as shown below. For cooling, a cold substance is needed, but cooling is possible by expanding the liquid flowing through the system. (This is why the liquid is called a "refrigerant".) To expand the liquid, pressure must be raised to compress the refrigerant, but pressurization inversely raises temperature. Therefore, to ensure good quality cooling when the refrigerant expands, the hot compressed refrigerant must be cooled by the outdoor unit fan. This is why the air exhausted by the outdoor unit during cooling is hot.

All in all, the refrigerant flowing through the air-conditioner robs the room of its heat and discharges that heat outside of the room. (The indoor unit cools, while the outdoor unit discharges the heat.) Because this process of sucking the heat from the room and discharging it outside is similar to a pump, it is called a "heat pump". (In heating, the cold air from the room is discharged outside.)

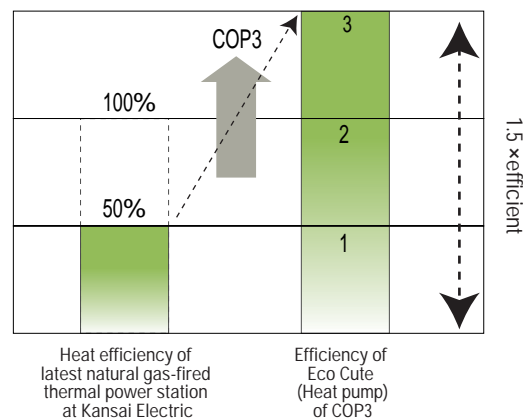
### Working Principle of the heat Pump (Air-conditioner)



## Heat Pump Performance

So, how much heat can be sucked out of room? How many more times heat is sucked out of a room than the energy put into doing that is called the "Coefficient Of Performance" or COP. For example, the Eco Cute has a COP of 3, meaning it makes available 3 times as much heat as the energy put into it.

### Ratio of Available Energy to Energy Input

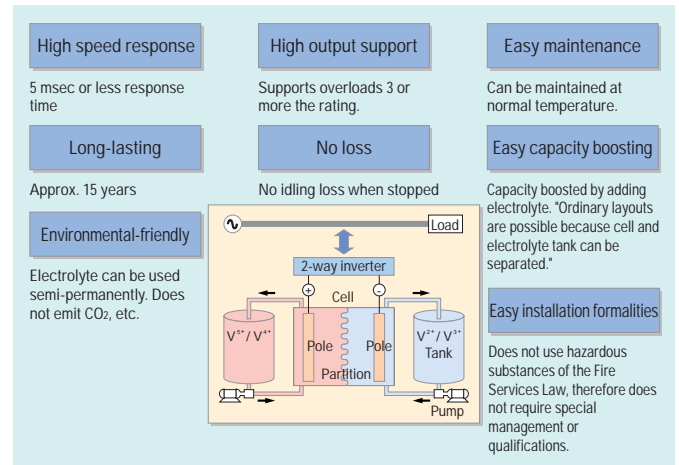


The efficiency of the latest natural gas-fired thermal power station at Kansai Electric is about 50%. What that means is that, for every 1 unit of energy input, we get out about 0.5 units of electricity. With the Eco Cute and its COP of 3, using the approximate 0.5 units of electric energy generated, we get 1.5 units of heat (0.5 x 3). In other words, it is 150% efficient as we get about 1.5 times more heat than the energy we input.

## Development of Advanced Technology

### Redox Flow Battery

A redox flow battery is a power storage battery that reduces costs by cutting peak energy use. It charges on inexpensive nighttime electricity and discharges (is used) during the day. It is clean, long-lasting and has a high degree of design freedom. And, as a highly functional product with instantaneous voltage drop compensation capabilities, it is gradually becoming popular amongst customers. Research continues in search for even higher performance.



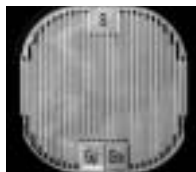
### Next Generation Semiconductor Device

Silicon (Si) wafer semiconductors are used as the circuit element of most equipment that controls electric power. But, performance has reached its limits because of high energy loss, etc.

At Kansai Electric, development is underway on a silicon-carbide (SiC) semiconductor device of superb performance: i.e., high withstand voltage, low loss, etc. Its potential as a next generation semiconductor device is reason for high expectations.



SiC diode of 6.2 kV withstand voltage

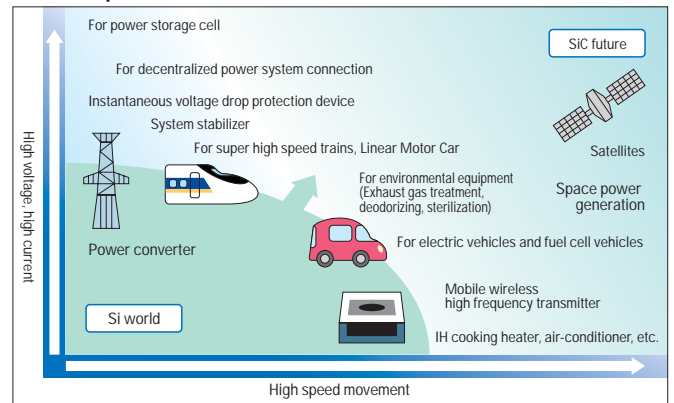


SiC switching transistor of 4.5 kV super low loss



High temperature, high speed SiC diode module for high current power (5 kV, 200A; 3 kV, 600 A)

### Future possibilities of SiC



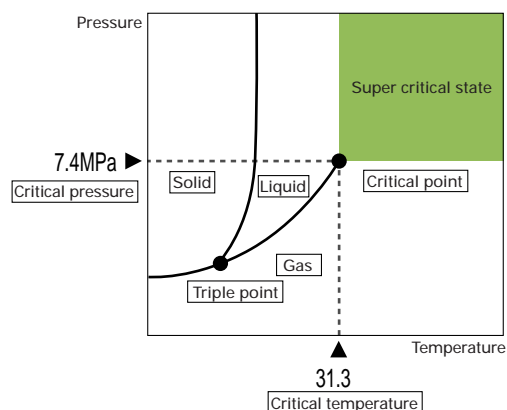
### Use of Super Critical CO<sub>2</sub>

One technology for the effective use of absorbed CO<sub>2</sub> is the use of super critical CO<sub>2</sub> as solvent or material. Research and development is underway on substances for pharmaceuticals. This new technology brings hopes of environmental load reduction compared to conventional methods that employ highly toxic organic solvents.

(What does "super critical" mean?)

A given substance exists as a solid, liquid or gas depending on temperature and pressure conditions. A super critical state is a high density phase beyond the critical temperature and critical pressure. It is a phase that exists between liquid and gas, and does not liquefy no matter how high pressure is.

### CO<sub>2</sub> temperature - pressure curve



## Activities and Feasibility Studies for Kyoto Mechanism Projects (Activities before tiscal 2001)

### Participation in Activities Implemented Jointly (AIJ) Japan Program

The UN Framework Convention on Climate Change introduced the concept of "joint implementation" whereby multiple countries could work together to reduce emissions of greenhouse gases. To promote the idea, Japan created the AIJ Japan Program under which Kansai Electric has implemented two projects.

#### Outline of the project with the Electricity Generating Authority of Thailand (EGAT)

	Contents
Project name	Power Plant Thermal Efficiency Improvement / Recovery Through Enhanced Operational Management
Participating Japanese companies	Kansai Electric, Electric Power Development, Chubu Electric
Cooperative body	Electricity Generating Authority of Thailand (EGAT)
Project description	The four companies named above have been promoting improvement of their power plants' thermal efficiency, and have developed various energy-saving techniques. Based on this technical experience and expertise, the parties jointly and cooperatively implement the project to improve/recover the power plant thermal efficiency.
Site	South Bangkok Power Station
Duration of the project	Fiscal 1996-Fiscal 1999 (including monitoring)
Expected effect (project total)	CO <sub>2</sub> emission reduction : 40,000t-CO <sub>2</sub> / thirty months

#### Outline of the project in Indonesia

	Contents
Project name	Installation of Renewable Energy Supply Systems in Indonesia*
Participating Japanese companies	Kansai Electric, Tokyo Electric
Cooperative body	The Directorate General of Electricity and Energy Development of the Ministry of Mines and Energy of the Republic of Indonesia (DGEED)
Project description	To cooperate in ways contributing to sustainable energy supply through installing renewable energy supply systems including the implementation of solar home systems, microhydropower and hybrid system (photovoltaic and wind power) in rural areas in Indonesia.
Site	Rural areas in Indonesia
Duration of the project	Fiscal 1996-Fiscal 2000 (we have been providing support for management of maintenance activities since the beginning of 2001)
Expected effect (project total)	CO <sub>2</sub> emission reduction : 1,200 t-CO <sub>2</sub> / year

\*This project will be implemented in the name of "e7".

### Test and Analyses for Business Development

Kansai Electric has conducted 4 studies under a publicly recruited feasibility study organized by the New Energy and Industrial Technology Development Organization (NEDO), aimed at developing business opportunities within the Kyoto Mechanism. Kansai Electric also took part in two projects under another publicly recruited feasibility study called the Study for Environment and Plant Rehabilitation Projects that was organized by the Japan External Trade Organization (JETRO).

#### Outline of the business feasibility study with Russia (Fiscal 1998)

	Contents
Project name	Basic Study on Reconstruction and Modernization of Konakovo Thermal Power Station
Participating Japanese companies	Kansai Electric, Mitsubishi Corporation
Cooperative body	United Power System of Russia
Project description	The project would improve the total plant thermal efficiency of Konakovo Thermal Power Station by introducing a modern gas turbine combined cycle power plant which would substantially reduce the plant's CO <sub>2</sub> gas emissions.
Site	Konakovo Thermal Power Station (suburb of Moscow)
Expected effect	CO <sub>2</sub> emission reduction : 2.3 million t-CO <sub>2</sub> / year

#### Outline of the business feasibility study with Ukraine (Fiscal 1999)

	Contents
Project name	Ambuklao Hydropower Plant Rehabilitation Plan
Participating Japanese companies	Kansai Electric, NEWJEC
Cooperative body	Philippine National Power Company (NPC)
Project description	In addition to using Japan's experience and technology in repairing stalled hydropower facilities, plan and carry out measures to quickly get the facilities back up and running. Diagnose the facilities and repair and replace intake mechanisms and deteriorated machinery
Site	Ambuklao Hydropower Plant (Benguet Province, Luzon Island)
Expected effect	CO <sub>2</sub> emission reduction : 250,000 t-CO <sub>2</sub> / year

#### Outline of the business feasibility study with Ukraine (Fiscal 1999)

	Contents
Project name	Basic Study on Reconstruction and Modernization of Symferopolskaya Thermal Power Station
Participating Japanese companies	Kansai Electric, Sumitomo Corporation
Cooperative body	Krymenergo
Project description	The project would improve the total plant thermal efficiency of Symferopolskaya Thermal Power Station by introducing a modern gas turbine combined cycle power plant which would substantially reduce the plant's CO <sub>2</sub> gas emissions.
Site	Symferopolskaya Thermal Power Station (Crimea)
Expected effect	CO <sub>2</sub> emission reduction : 0.7 million t-CO <sub>2</sub> / year

#### Outline of the business feasibility study with the Philippines (Fiscal 2001)

	Contents
Project name	Binga Hydropower Plant Rehabilitation Plan in Philippine
Participating Japanese companies	Kansai Electric, NEWJEC
Cooperative body	Philippine National Power Company (NPC)
Project description	To maintain the proper operation of power plants, a plan to apply maintenance experiences and technologies used at power plant in Japan to power stations where sand deposition in reservoirs in progress is designed
Site	Binga Hydropower Plant (Benguet Province, Luzon Island)
Expected effect	CO <sub>2</sub> emission reduction : 260,000 t-CO <sub>2</sub> / year

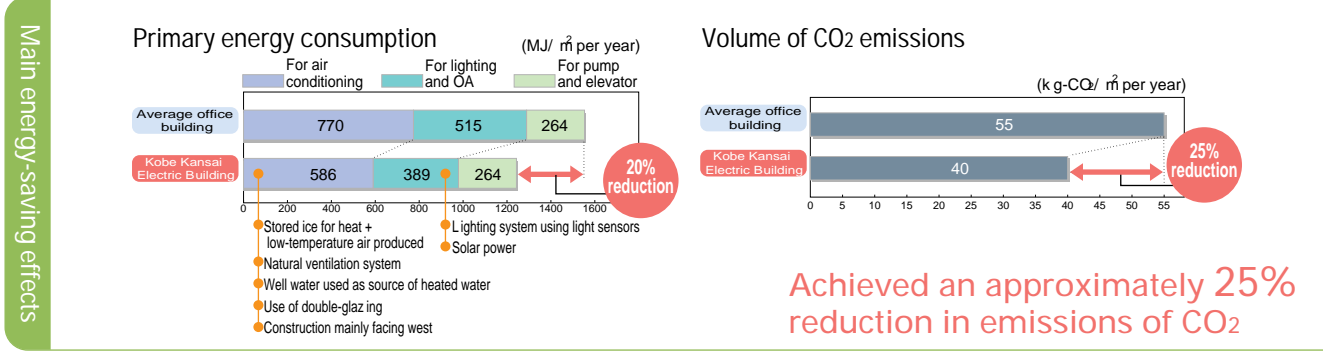
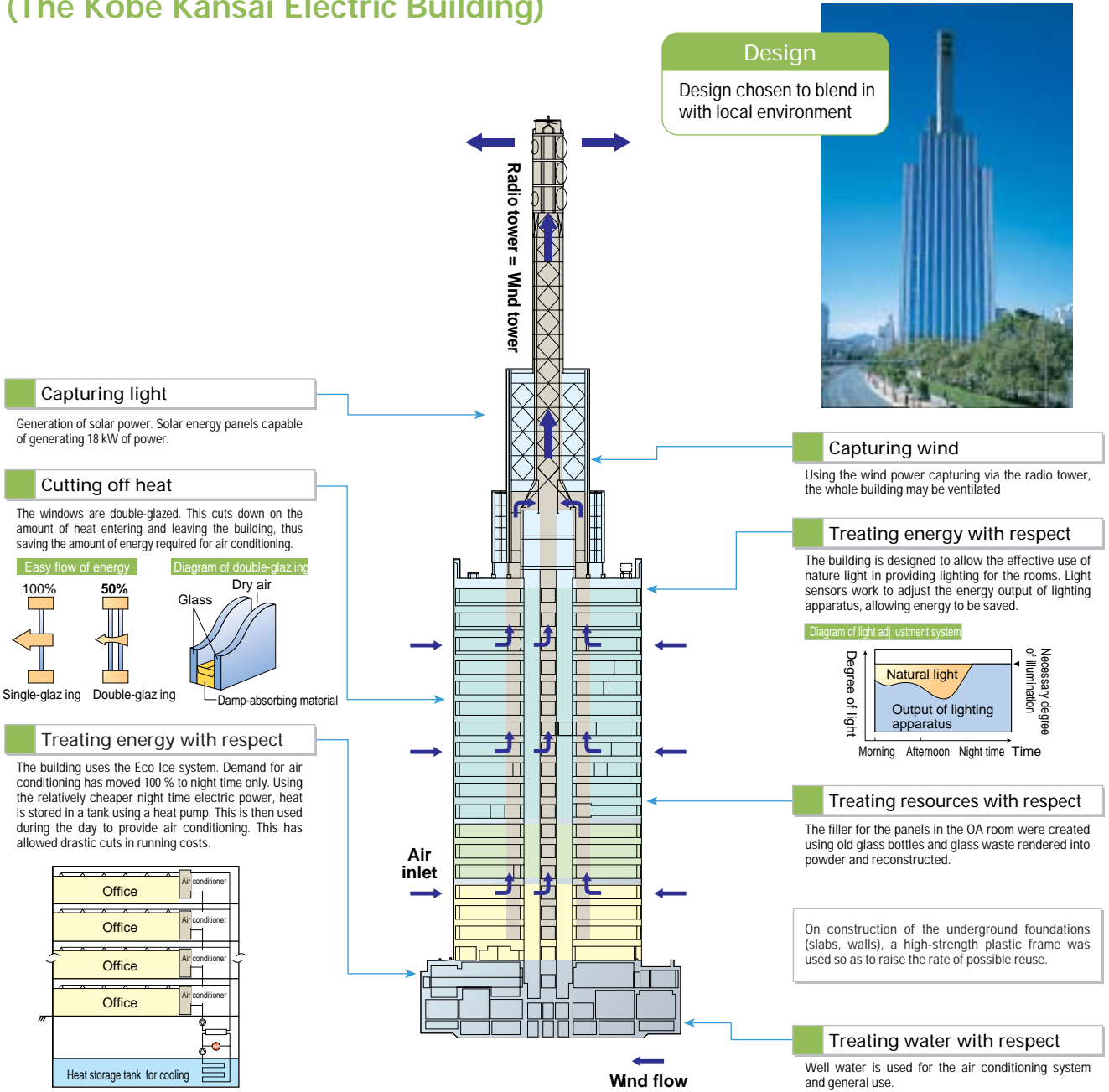
#### Outline of the business feasibility study with Georgia (Fiscal 2000)

	Contents
Project name	Renovation and Rehabilitation of District Heat Supply System
Participating Japanese companies	Kansai Electric, Shimizu Corporation
Cooperative body	Ministry of Fuel and Energy, Tbilisi
Project description	Introduce thermoelectric supply system into existing heat supply plant and study ways to reduce energy consumption across entire plant.
Site	District Heating Plants in Tbilisi
Expected effect	CO <sub>2</sub> emission reduction: 50,000 t-CO <sub>2</sub> /year (Highest value case where optimum plan for achieving highest reduction in CO <sub>2</sub> has been used)

#### Outline of the business feasibility study with Georgia (Fiscal 2001)

	Contents
Project name	Basic Study on Reconstruction and Modernization of Garbadani Power Plant in Georgia
Participating Japanese companies	Kansai Electric, Kawasaki Heavy Industries, Shimizu Corporation
Cooperative body	Ministry of Fuel and Energy
Project description	Enable combined cycling by high efficiency gas turbine in 3 seriously aged steam turbine at power plant, reduce energy use with improved energy efficiency and reduce CO <sub>2</sub> emissions.
Site	Garbadani Power Plant, Rustabi
Expected effect	CO <sub>2</sub> emission reduction: 570,000 t-CO <sub>2</sub> /year (total for 3 units)

# An Environmentally Friendly Resource Saving Building (The Kobe Kansai Electric Building)



## Energy and Resource Conservation (Home Energy Management System [HEMS])

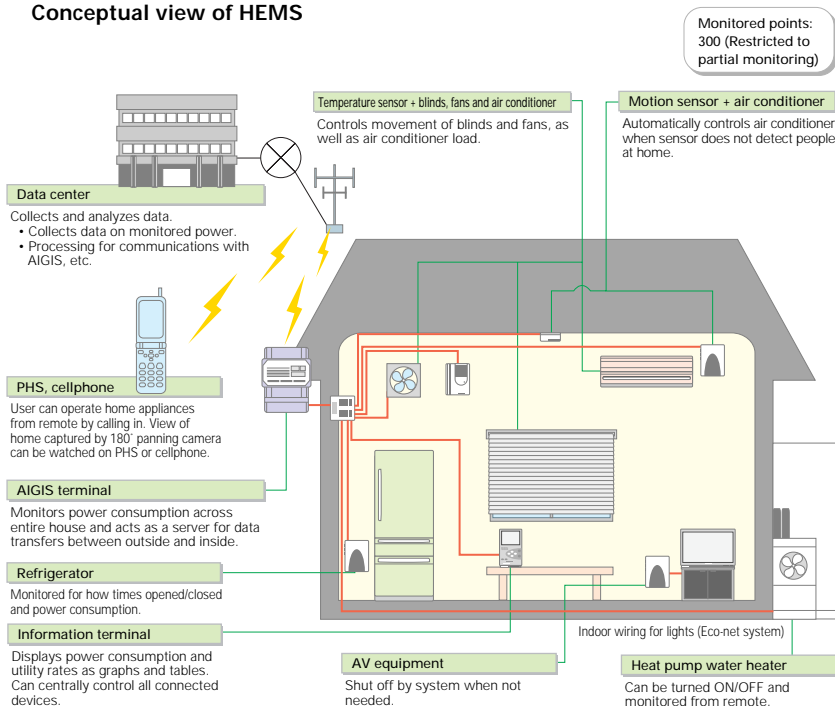
In cohort with Matsushita Industrial Equipment and Hitachi, Kansai Electric formed EL-Quest Company Inc. in November 2001. The new venture is conducting validation tests \*2 of a new home energy demand management system (HEMS) that uses information technology (IT) such as power line communication and AIGIS \*1, which provides automatic metering via a sophisticated power meter and total life services.

The system connects home appliances such as air-conditioners to a network through the power meter. It provides a solution to forgetting to shut off units by enabling remote control, and adds an energy-saving effect through interlocked proximity sensors that detect human presence. It also measures power consumption of the entire home and individual appliances, and informs the user of consumption with easy-to-understand graphs and tables, which aims to make consumers more aware of energy conservation. In 2002 tests, CO<sub>2</sub> emissions in monitored homes was - after compensating for weather phenomena and other compounding factors -- reduced by about 7% over the previous year.

\*1 AIGIS (Advanced Intelligent Gate-keeper for Integrated Service): Total life services that Kansai Electric is working on using a next generation sophisticated power meter

\*2 These validation tests are part of a project subsidized by the New Energy and Industrial Technology Development Organization (NEDO).

### Conceptual view of HEMS



## Business Site Awards

### Greenery Awards

Award	Year received	Power station
Prime Minister's Award for Efforts in Greenery Promotion	92	Himeji No. 2
Ministry of Economy, Trade and Industry Award for Factory Greenery Promotion	02	Miyazu Energy Research Center
	82	Tanagawa No. 2
Ministry of International Trade and Industry Award for Factory Greenery Promotion	88	Himeji No. 2
	95	Kainan
	83	Ohi
Bureau of International Trade and Industry Award for Factory Greenery Promotion	84	Himeji No. 2
	86	Kainan
	93	Gobo
	94	Miyazu Energy Research Center
Japan Greenery Research and Development Center Chairman's Award for Factory Greenery	83	Himeji No. 2
	84	Nankai
	89	Sakaiko
	90	Gobo
	93	Aioi
Osaka Prefecture Factory Greenery Competition - Gold Medal	78	Tanagawa No. 2
	88	Sakaiko
Osaka Prefecture Factory Greenery Competition - Silver Medal	78	Sakaiko
	76	Takasago
Hyogo Prefecture Factory Greenery Competition - Award of Excellence	77	Amagasaki No. 3
	77	Higashinada Gas Turbine
	82	Himeji No. 2
	89	Ako
	90	Aioi

### Scenery Awards

Award	Year received	Power station
Japan Color Institute Public Color Award	90	Nanko
American Lighting Society International Lighting Award	91	Nanko
Good Design Award of Ministry of International Trade and Industry	94	Nanko
Himeji City Urban Scenery Award	90	Himeji No. 1
	97	Himeji No. 2

### Energy Conservation Awards

Award	Year received	Power station
Ministry of International Trade and Industry for Factory Energy Management	86	Sakaiko
	93	Himeji No. 2
	96	Tanagawa No. 2
	75	Sakaiko
	89	Himeji No. 2
Agency of Natural Resources and Energy Award for Factory Energy Management	92	Tanagawa No. 2
	94	Kainan
	95	Himeji No. 1
	97	Aioi
Bureau of International Trade and Industry Award for Factory Energy Management	89	Tanagawa No. 2
	90	Aioi
	91	Gobo
	92	Ako
	94	Miyazu Energy Research Center
95	Nanko	

### Recycling Awards

Award	Year received	Office
Ministry of International Trade and Industry Award for Recycling Promotion	95	Head Office
	94	Head Office
	97	Osaka Power Station
	98	Kiso Substation
	99	Kishiwada Substation
Person of merit Council Award for Recycle Promotion	00	Kasugade Substation, Central Office for Transmission and Substations
	01	Head Office, Maizuru Thermal Power Station Construction Office
	02	Himeji No. 2 Power Station

### Other Awards

Award	Year received	Office
Global Environment Award of Ministry of International Trade and Industry	93	Head Office
Environmental Report Award of Excellence	98	Head Office
	00	Head Office
Osaka Environment Award	02	Head Office
	03	Head Office
	00	Ohi Power Station
Local Environmental Protection Award of Excellence	03	Shiga Office



## Exchange with Local Communities (PR Facilities, Environmental Publications, etc.)

### PR Facilities

Kansai Electric's PR facilities introduce company environmental activities through exhibits and panels. They provide an opportunity for getting closer to Mother Nature.

#### Wakasa Takahama ELdoland

At Wakasa Takahama ELdoland, Kansai Electric's community relations facility, visitors can observe all kinds of tropical plants and various tropical fish in the Tropical Wonder greenhouse. Exhibits placed around the site assist in teaching people about environmental problems and energy issues.



**Address** 4-1 Aoto, Takahama-cho, Ohi-gun, Fukui Prefecture **Inquiries** TEL.(077 072- 5890)  
**Hours** 10:00 - 18:00 (winter 17:00)(Closed Mondays Dec. 29 to Jan. 3)  
\*If closing day falls on a national holiday, following weekday is holiday in lieu. Open Apr. 29-May 5, Jul. 20-Aug. 31

#### Mihama Nuclear Power Community Relations Center\*

The Mihama Nuclear PR center at the Mihama Power Station features models of a nuclear reactor and power station and various exhibits on nuclear power, giving visitors the chance to enjoy while learning.



**Address** Niu, Mihama-cho, Mikata-gun, Fukui Prefecture **Inquiries** TEL.(077 039- 1210)  
**Hours** 9:00 - 17:00(Closed Dec. 29 to Jan. 3)

#### Ohiri-kan, EL Park Ohi (Ohi Power Station)\*

At the Ohiri-kan, visitors can see the actual workings of a nuclear power station at the Nuclear Power Theater, a model of a nuclear reactor containment built to one-third scale. They can also view the plant's actual radiation management section through a glass barrier.



**Address** Tsutsumishita 40, Oshima, Ohi-cho, Ohi-gun, Fukui Prefecture **Inquiries** TEL.(077 077 - 3053)  
**Hours** 9:00 - 17:00(Closed Dec. 29 to Jan. 3)

#### EL City Nanko (Nanko Power Station)\*

A great place to experience the freshness of the wilderness in Osaka, the EL City Nanko community relations center boasts surrounding forested hills with walking trails, an open grass field, and a brook for playing or relaxing.



**Address** 7-3-8 Nanko Minami, Suminoe-ku, Osaka **Inquiries** TEL.(06)6613- 7458  
**Hours** 10:00 - 17:30 (Closed Thursdays, Dec. 29 to Jan. 3)

\*To tour a power station, contact your nearest Kansai Electric sales office. (-> P. 91)

#### Tango Watch-kan (Miyazu Energy Research Center)\*

The Tango Watch-kan community relations center at the Miyazu Energy Research Center has an aquarium with fish and shellfish native to the coastal areas near the site as well as a "petting pool" where kids can reach in and touch the fish. Visitors can also see a wind-powered generator and solar-powered house.



**Address** 1001 Oda Shukuno, Miyazu, Kyoto **Inquiries** TEL.(077 225- 2026)  
**Hours** 9:00 - 17:00 (Closed Dec. 29 to Jan. 3)

#### EL Village Okawachi (Okawachi Power Station)\*

The EL Village Okawachi community relations facility has log house style buildings that fit in perfectly with the surrounding mountains and forests. The buildings house a library where visitors can learn about nature and plants of the world and a center where guests can receive advice on planting their own flowers and gardens.



**Address** 34-1 Nitta Hase, Okochi-cho, Kanzaki-gun, Hyogo Prefecture **Inquiries** TEL.(07 90)35- 0888  
**Hours** 10:00 - 17:30 (Closed 2nd Mondays, Dec. 29 to Jan. 3)

#### Kurobegawa Electricity Memorial Hall

Let us introduce you to the fierce beauty of the Kurobe canyon and the drama of the people who have forged a life here, the courage and wisdom of our ancestors. Please see how our company has harnessed hydropower.



**Address** 483-1, Unazuki-machi, Shimoniikawa-gun, Toyama Prefecture **Inquiries** TEL.(07 65)62- 1334  
**Hours** 7:30 - 18:00 / 20 April to 30 November  
 9:00 - 16:00 / December 1 to April 19 (closed Tuesdays between December 1 and April 19)

#### Kobe Lamp Museum

The museum has taken over and upgraded the Akagi Collection of the former Kitano Lamp Museum, therefore visitors can enjoy the culture of lighting amidst a unique retro setting.



**Address** 2nd/3rd floor Create Kobe Bldg., 80 Kyomachi, Chuo-ku, Kobe **Inquiries** TEL.(07 0)333- 5310  
**Hours** 10:00 - 17:00 (Doors close at 16:30)  
(Closed Mondays and Dec. 28 - Jan. 4. Day after national holidays if regular closing day falls on a national holiday)

### Environmental Publications

Kansai Electric constructively supports the environmental education of elementary and junior high school children. We create animated children's videos that explain about global environmental problems in an easy-to-understand manner, as well as pamphlets that introduce the eco-systems of wildlife children know or may come to know in their life.

#### List of Environmental - related Publications by Kansai Electric

	Title	Main Contents
	Kansai Electric's Global Environmental Action Report	An annual report on the progress of our environment-related activities.
	A Well-Balanced Environment Today and Tomorrow	An annual report in English on the progress of our environment-related activities.
	Kansai Electric Environmental Report	Digest of Kansai Electric Global Environmental Action Report (Annual publication)
	Our Declaration of concern for the Environment	Introduction to our company's work in tackling environmental problems.
	Grandma's Earth-friendly Ideas	Collection of ideas. Presents traditional earth-friendly wisdom collected from community residents.
	The Eco-family's Way to Live and Be kind to the Earth	Q&A format on how to live in harmony with the environment.
	Our Friends on the Earth	Easy introduction to every day fauna and flora.
Video	As a business that continues to care about the environment - Kansai Electric's activities to fight global environmental problems	Introduction to our company's work in tackling environmental problems.
	Mako-chan's Parrot - What's the Global Environment? (Animated cartoon)	Explanation of global environmental problems for the next generation (for elementary school students).

## Publication of the Site Report

Alongside the publication of this Global Environmental Action Report 2003, Kansai Electric is releasing the first time the Site Report from our Himeji No. 2 Power Station, to report in detail and subsequently gain a greater understanding of the environmental protection activities of our business sites amongst residents in the local communities where we operate. Here following is an overview of that report.



Himeji No. 2 Power Station

### Environmental Report from Himeji No. 2 Power Station (Beetle Power Station)

The Himeji No. 2 Power Station is the largest thermal power station in Kansai Electric, with 6 units producing 2,550 MW of power and a 750,000 m<sup>2</sup> site including the Himeji LNG Management Office. It is known amongst the local population as the "Beetle" power station because atlas beetles are raised in a beautiful forest that was created on the site through "ecological planting" and there are opportunities for people to come see them.



Recycle class staged by a beetle club

Since going online, this power station has dedicated a lot of energy to developing and improving environmental protection activities. To show for this, the station acquired ISO14001 certification in March 2001. In fiscal 2003, a 3-year update review is to be done with the target of further improving our environmental protection activities. More specifically, the station is looking to develop activities for dealing with important issues as described here below.

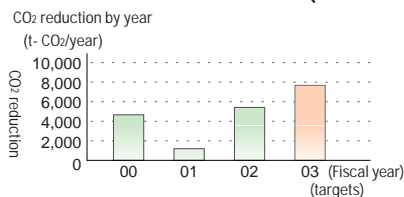
#### 1 Reduction of CO<sub>2</sub> emissions (Promotion of energy conservation)

Reduction in boiler fuel consumption  
Reduction in site power consumption

#### 2 Challenge to zero emissions

Promotion of the 3 R's (reduce, reuse and recycle) initiative

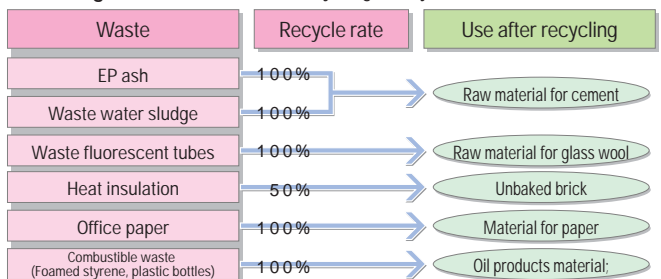
### Reduction of CO<sub>2</sub> emissions (Promotion of energy conservation)



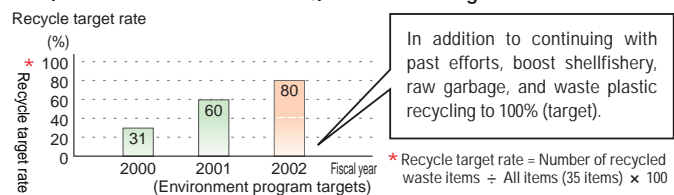
#### Specific Activities for Attaining Fiscal 2003 Targets

Example activity	CO <sub>2</sub> reduction
Reduce fuel consumption of boiler by changing operating method.	7,088 t-CO <sub>2</sub> /yr
Reduce fuel consumption by shutting down No. 3 boiler auxiliary steam system. (System will be reserved for backup operation.)	337.2 t-CO <sub>2</sub> /yr

#### Challenge to zero emission Recycling of major waste (Fiscal 2002 performance)



#### Specific Activities for Attaining Fiscal 2003 Targets



### ~ Working for the Creation of a Recycle-Based Society ~

Even though we are faced with a very serious business environment, Kansai Electric must reduce our environmental load more while continuing to provide a stable supply of energy. At the Himeji No. 2 Power Station, we are promoting business activities to simultaneously attain environmental, energy and economic goals. Amidst these efforts, we are aggressively continuing with activities to "reduce CO<sub>2</sub> emissions", "promote the 3 R's initiative" and "maintain equipment reliability and improve operability". Like now, we will continue to promote long-term environmental protection activities aimed at creating a recycle-based society so that we can gain the understanding and support of the community that hosts us.

General Manager, Himeji No. 2 Power Station Noriya Shingu



## Activities for Providing Information on Electromagnetic Field

### Effects of Electromagnetic Field

An electromagnetic field is the combination of an electric field and a magnetic field, therefore it is generated wherever electricity flows. For this reason, an electromagnetic field is produced not only around power equipment like power lines but also the everyday home appliance such as the TV, vacuum cleaner and drier.

Reports on the effects of 50/60 Hz electromagnetic field generated by power equipment and home appliances have been released by the World Health Organization (WHO), the National Academy of Science, Japan's Agency of Natural Resources and Energy, Japan's Ministry of the Environment and others.

Based on a comprehensive evaluation of multiple papers written on the subject of electromagnetic field, these reports conclude that there is "no evidence to suggest electromagnetic field in the living environment causes harm to human health".

As for the possibility of electromagnetic field causing cancer, UK's National Radiological Protection Board (NRPB) and the International Association for Cancer Registries (IACR) both reported in 2001 that there was no conclusive evidence that would indicate electromagnetic radiation causes cancer.

### Activities at Kansai Electric

Until now, Kansai Electric has been collecting scientific knowledge on the effects of electromagnetic field on health, while also publishing pamphlets, producing videos and launching even a website on the subject in an effort to provide the general public with correct information.

With the objective of gathering scientifically reliable data, Kansai Electric jointly researched the topic with other power companies from 1996 to 2000. We continued research on our own from 1997 to 2001. These studies failed to did not produce data that would suggest harmful effects from electromagnetic radiation, and Kansai Electric announced these results to academic societies in Japan.

Based on past reports from experts, Kansai Electric has decided, for now, that "electromagnetic radiation from power equipment does not adversely effect human health", but we will continue to study the issue and provide information.



Website page on electromagnetic field

### Reports on Electromagnetic Field from Expert Organizations (1987 - 2002)

Organization	Title of report	Summary
World Health Organization (WHO)	Environmental Health Criteria 69 (1987)	No harmful biological effects were detected under electromagnetic field of 50,000 milli-Gauss, nor any biological effects were detected under 5,000 milli-Gauss.
Agency of Natural Resources and Energy	Investigative Report into the Effects of Electromagnetic Radiation (1993)	Presently, no evidence has been found of commercial frequency electromagnetic field in the living environment having an effect on human health.
Ministry of Environment (formerly Environment Agency)	Investigative Research into the Health Effects of Electromagnetic Radiation (1995)	Nothing new that would correct the information reported by WHO has been reported.
The National Academy of Science	Effects of Electromagnetic Radiation in the Living Environment on Health (1996)	Current important information does not indicate that electromagnetic field harms human health. In particular, there is no decisive or consistent evidence that would indicate cancer, harmful effects on nerves or behavior, or any sort of effect on reproduction and growth from electromagnetic field in the living environment.
National Radiological Protection Board (NRPB)	Extremely Low Frequency Electromagnetic Field and the Risk Cancer (2001)	In laboratory tests, sufficient evidence that would indicate electromagnetic field causes cancer was not obtained, while epidemiological research suggested as well that does not cause cancer in general. There is some epidemiological evidence suggesting a relationship between high level electromagnetic field and infantile leukemia, but the evidence is not strong enough to justify conclusions that electromagnetic field causes infantile leukemia.
International Agency for Research on Cancer (IARC)	Evaluation of Human Cancer Risk from Monograph Static and Extremely Low Frequency Electromagnetic Fields (Evaluation from 2001)	<p>Evaluation results</p> <ul style="list-style-type: none"> <li>•Extremely low frequency (ELF) electromagnetic fields "may be cancerous (Group 2B)".</li> </ul> <p>Overview of evaluation - Reason for categorizing ELF electromagnetic fields as Group 2B</p> <ul style="list-style-type: none"> <li>•In epidemiological pool analyses, a near consistent statistical correlation was seen between infantile leukemia and exposure to ELF electromagnetic fields of 0.4 microtelsa. This correlation cannot be considered accidental, but there is the possibility of selective bias.</li> <li>•With regard to infantile leukemia, there is limited epidemiological proof that ELF electromagnetic fields are carcinogenic.</li> <li>•With regard to all other types of cancer, there is inadequate proof that ELF electromagnetic fields are carcinogenic.</li> <li>•There is inadequate proof from animal tests suggesting that ELF electromagnetic fields are carcinogenic.</li> </ul>

# Data

## Data Contents

- 78** Environmental Data
- 81** Reference Data
- 82** Data by Thermal Power Station
- 84** History of Energy and Environmental Issues

# Environmental Data

Global environmental protection							
Fiscal Year		1998	1999	2000	2001	2002	Unit
CO <sub>2</sub> emission		3,516	3,926	3,954	3,688	3,684	10,000 t-CO <sub>2</sub>
CO <sub>2</sub> emission per unit of power consumed *1		0.25	0.28	0.28	0.26	0.26	
Nighttime (22:00 - 8:00) *2		0.19	0.22	0.24	0.23	0.24	k g-CO <sub>2</sub> / k Wh
Daytime (8:00 - 22:00) *3		0.28	0.31	0.29	0.28	0.27	
CO <sub>2</sub> emission per unit power generated *4		0.23	0.25	0.25	0.24	0.23	k g-CO <sub>2</sub> / k Wh
Reference)	World CO <sub>2</sub> emission *5	226	229	235	-	-	100 million t-CO <sub>2</sub>
	Japan CO <sub>2</sub> emission *6	11.92	12.33	12.37	-	-	100 million t-CO <sub>2</sub>
	Electric power industry CO <sub>2</sub> emission *7	2.85	3.07	3.17	3.12	-	100 million t-CO <sub>2</sub>
	Electric power industry CO <sub>2</sub> emission per unit of power consumed *7	0.356	0.375	0.378	0.379	-	k g-CO <sub>2</sub> / k Wh
Capacity factor of nuclear power stations *8		84.3	82.0	81.8	84.5	90.5	%
Thermal efficiency of thermal power stations *9		-	41.9	42.0	42.2	42.4	%
Fossil fuel consumption	Coal	-	-	-	-	-	1,000t
	Heavy oil	747	656	515	202	224	1,000kℓ
	Crude oil	1,914	2,053	1,370	767	715	1,000kℓ
	LNG	5,190	5,485	5,463	5,286	3,799	1,000t
Renovating hydropower stations (Increased output since 1989)		17,842	27,052	29,752	30,452	34,752	k W
Transmission and distribution loss rate *10		5.6	5.3	5.1	5.2	5.5	%
SF <sub>6</sub> gas emission		13.5	10.9	6.1	0.9	0.7	t
SF <sub>6</sub> gas recovery		60.0	83.0	92.1	96.4	97.1	%
Number of electric vehicles introduced (Accumulative total at year end)		144	162	177	173	175	Vehicles
Use of untapped energy sources (Heat supply locations)		9	10	10	11	11	Locations
Progress of new energy source development and use (Accumulative total at year end)		831	899	914	919	919	
Solar power generation		667	740	760	765	765	k W
Wind power generation		164	159	154	154	154	
Purchased power generated by new energy sources	Purchased amount	355,433	400,298	442,520	569,254	588,445	1,000k Wh
	Number of purchases	2,549	4,659	8,058	11,823	17,926	Purchases
Solar power generation	Purchased amount	3,035	5,804	10,987	18,522	26,880	1,000k Wh
	Number of purchases	2,528	4,636	8,031	11,793	17,888	Purchases
Wind power generation	Purchased amount	-	-	405	2,227	6,250	1,000k Wh
	Number of purchases	-	-	1	3	7	Purchases
Waste-fired power generation	Purchased amount	352,377	394,485	431,123	548,505	555,315	1,000k Wh
	Number of purchases	20	22	25	26	30	Purchases
Fuel cells	Purchased amount	21	9	5	0	0	1,000k Wh
	Number of purchases	1	1	1	1	1	Purchases
Participants in Kansai Green Power Fund (At fiscal year end)		-	-	3,010	13,881	13,151	Participants
Equipment output from Kansai Green Power Fund		-	-	-	4,600	70	
Solar power generation		-	-	-	100	70	k W
Wind power generation		-	-	-	4,500	-	
Energy and resource conservation (Offices)	Office electricity consumption	-	-	118.5	116.6	113.2	1 million k Wh
	Domestic water consumption	-	-	1,045.6	978.4	900.7	1,000m <sup>3</sup>
	Vehicle fuel	-	-	9.14	9.16	9.41	k mℓ
	Copy paper consumption	-	-	1,000.5	934.9	919.4	t
Designated CFC consumption		0.4	0.2	0.3	0.3	0.2	t

\*1 CO<sub>2</sub> emission per unit of power consumed = CO<sub>2</sub> emission ÷ Power consumed

\*2 Nighttime (22:00 - 8:00) = Nighttime CO<sub>2</sub> emission ÷ Nighttime power consumed

\*3 Daytime (8:00 - 22:00) = Daytime CO<sub>2</sub> emission ÷ Daytime power consumed

\*4 CO<sub>2</sub> emission per unit of power generated = CO<sub>2</sub> emission ÷ Power generated

\*5 World CO<sub>2</sub> emission: "Energy and Economic Statistics", The Institute of Energy Economics, Japan

\*6 Japan CO<sub>2</sub> emission: Greenhouse Gas Inventory Office (Center for Global Environmental Research, National Institute for Environmental Studies)

\*7 Electric power industry CO<sub>2</sub> emission and Electric power industry CO<sub>2</sub> emission per unit of power consumed: Environmental Plan of Action for the Electric Power Industry, The Federation of Electric Power Companies of Japan

\*8 Nuclear power stations usage factor = Power generated ÷ (Permitted output x Running hours) x 100

\*9 Thermal efficiency of thermal power stations = (Transmitted and distributed power x Heat load per k Wh) ÷ Total heat load input

\*10 Transmission and distribution loss rate = 1 - (Power consumed + Substation power) ÷ (Total power - Kansai Electric power station power)



Local Environmental Protection							
Fiscal Year		1998	1999	2000	2001	2002	Unit
SOx emission		3,607	3,807	2,833	1,438	1,332	t
SOx emission per unit of power generated	Per unit of power generated *1	0.03	0.03	0.02	0.01	0.01	g/ k Wh
	Per unit of thermal power generated *2	0.08	0.08	0.07	0.04	0.05	
NOx emission		6,319	6,626	6,123	4,801	3,740	t
NOx emission per unit of power generated	Per unit of power generated *3	0.05	0.05	0.05	0.04	0.03	g/ k Wh
	Per unit of thermal power generated *4	0.15	0.15	0.15	0.13	0.14	
Greenery rate *5 (At fiscal year end)	Thermal power station	34	34	34	34	34	%
	Nuclear power station	77	77	79	79	78	
	Substation	34	33	33	32	28	
Buried rate of transmission cable *6 (At fiscal year end)		13.4	13.5	13.8	13.9	14.1	%
Buried rate of distribution cable *7 (At fiscal year end)		9.0	9.1	9.3	9.3	9.4	%

\* 1SOx emission per unit of power consumed = SOx emission ÷ Power generated

\* 2SOx emission per unit of thermal power generated = SOx emission ÷ Thermal power generated

\* 3NOx emission per unit of power consumed = NOx emission ÷ Power generated

\* 4NOx emission per unit of thermal power generated = NOx emission ÷ Thermal power generated

\* 5Greenery rate = Business site greenery area ÷ business site total area x 100

\* 6Buried rate of transmission cable = Extended length of buried cable ÷ (Extended length of overhead cable + Extended length of buried cable) x 100

\* 7Buried rate of distribution cable = Extended length of buried cable ÷ (Total length of overhead cable + Extended length of buried cable) x 100

Waste and Resource Recycling							
Fiscal Year		1998	1999	2000	2001	2002	Unit
Industrial waste discharge		109.0	101.0	70.7	63.7	49.7	1,000t
Desulfurizing gypsum		49.1	44.3	20.2	15.7	5.5	
Metal scraps		18.0	17.8	17.0	16.5	15.9	
Waste concrete utility poles		21.3	16.0	14.5	15.3	16.1	
Heavy/ crude oil ashes		6.0	6.5	3.9	2.3	1.7	
Waste oil		1.1	4.8	3.9	4.5	2.1	
Insulator scraps		1.9	1.6	1.5	1.7	1.2	
Waste water treatment sludge		1.9	1.5	1.5	1.2	0.7	
Other		9.7	8.5	8.2	6.5	6.5	
Landfill of industrial waste		12.0	10.1	9.4	6.7	6.8	1,000t
Metal scraps		1.2	1.1	0.7	0.5	0.7	
Waste oil		0.0	0.0	0.0	0.0	0.0	
Insulator scraps		0.8	1.1	1.0	0.8	0.7	
Waste water treatment sludge		0.4	0.2	0.4	0.3	0.2	
Other		9.6	7.7	7.3	5.1	5.2	
Recycling rate of Industrial wastes *1		88	88	84	87	85	%

\* 1Recycling rate of Industrial wastes = (Recycled amount + Amount sold) ÷ (Industrial waste discharge + Amount sold) x 100

Radioactive Material and Waste								
		Fiscal Year	1998	1999	2000	2001	2002	Unit
Evaluated dosage in public area around power station	Mihama Power Station		>0.001	>0.001	>0.001	>0.001	>0.001	Millisievert/ year <sup>*2</sup>
	Takahama Power Station		>0.001	>0.001	>0.001	>0.001	>0.001	
	Ohi Power Station		>0.001	>0.001	>0.001	>0.001	>0.001	
Radioactive gas waste release (Noble gas)	Mihama Power Station		1.7E+11	2.3E+11	1.6E+10	1.4E+10	1.1E+10	Becquerel <sup>*3</sup>
	Takahama Power Station		4.2E+11	4.0E+11	1.6E+10	1.8E+10	1.2E+10	
	Ohi Power Station		6.1E+11	1.2E+11	5.7E+10	1.5E+10	2.8E+10	
Radioactive gas waste release (Iodine)	Mihama Power Station		2.4E+06	3.2E+05	N.D.	9.9E+04	3.8E+05	*1 Becquerel <sup>*3</sup>
	Takahama Power Station		9.9E+06	2.7E+05	N.D.	1.8E+05	3.4E+05	
	Ohi Power Station		1.2E+05	1.6E+05	1.1E+06	2.7E+05	N.D.	
Radioactive gas waste release (Tritium excluded)	Mihama Power Station		N.D.	N.D.	N.D.	N.D.	N.D.	Becquerel <sup>*3</sup>
	Takahama Power Station		N.D.	N.D.	N.D.	N.D.	N.D.	
	Ohi Power Station		N.D.	N.D.	N.D.	N.D.	N.D.	
Solid radioactive waste generation (200ℓ drum can)			6,956	5,831	7,045	9,112	7,301	Drum cans
Mihama Power Station			1,479	1,843	1,651	3,504	3,135	
Takahama Power Station			2,271	1,315	1,593	1,375	1,440	
Ohi Power Station			3,206	2,673	3,801	4,233	2,726	
Solid radioactive waste reduction (200ℓ drum can)			5,397	2,559	4,741	7,423	8,439	Drum cans
Mihama Power Station			1,170	689	526	2,540	3,423	
Takahama Power Station			3,983	1,102	1,160	797	743	
Ohi Power Station			244	768	3,055	4,086	4,273	
Solid radioactive waste accumulative storage (200ℓ drum can)			79,132	82,404	84,709	86,398	85,260	Drum cans
Mihama Power Station			25,492	26,646	27,772	28,736	28,448	
Takahama Power Station			30,077	30,290	30,723	31,301	31,998	
Ohi Power Station			23,563	25,468	26,214	26,361	24,814	

\*1N.D. (Not Detectable) the value is too low to be detected E+ : × the the power of 10

\*2Millisievert (Effective dose equivalent): Unit for expressing effect of radiation on human body

\*3Becquerel : Unit for expressing radioactive substance destroyed by 1 atomic nucleus per sec

Environmental Management								
		Fiscal Year	1998	1999	2000	2001	2002	Unit
ISO14001 certified locations (At fiscal year end)			18	18	19	20	19	Locations
Relisted for external certification acquisition			0	2	5	11	12	
Thermal power stations			18	18	17	14	13	
Relisted for external certification acquisition			0	2	4	7	7	
Nuclear power stations			0	0	1	2	2	
Relisted for external certification acquisition			0	0	0	0	1	
substation			0	0	1	4	4	
Relisted for external certification acquisition			0	0	1	4	4	
Participants in environmental education program	ISO14001 Staff Training		-	-	-	30	26	Persons
	Internal Environmental Audit Training		24	23	23	21	21	
	New Environmental Staff Training		31	39	47	41	37	
Environmental accounting <sup>*1</sup>	Environmental protection investment		-	498	324	380	354	¥100 million
	Environmental protection expenditure		-	905	444	428	390	
	Economic effect of environmental protection efforts		-	37	167	159	130	

\*1The method for computing environmental accounting was slightly changed after fiscal 2000.

Other								
		Fiscal Year	1998	1999	2000	2001	2002	unit
Planting activities (At public facilities)			3.4	3.3	3.0	2.9	2.5	10,000 trees
Beautification activities (Area cleanups, etc.)			730	801	1,521	1,027	850	Instances

## Reference Data

Equipment and Power Supply-Demand								
		Fiscal Year	1998	1999	2000	2001	2002	Unit
Power generation equipment output (Kansai Electric at fiscal year end)			3,778	3,780	3,746	3,559	3,543	10,000 kW
Hydropower			809	811	813	813	813	
Thermal			1,992	1,992	1,956	1,769	1,753	
Coal			-	-	-	-	-	
Oil, etc.			1,152	1,152	1,152	970	954	
LNG and other gas			840	840	804	799	799	
Nuclear			977	977	977	977	977	
Total power			1,526	1,537	1,558	1,525	1,549	100 million kWh
Self-generated			1,313	1,296	1,256	1,222	1,199	
Hydropower			162	139	144	137	154	
Thermal			430	453	411	362	271	
Nuclear			721	704	700	723	774	
Received from other company			122	113	172	203	243	
Circulating			120	153	159	134	155	
Power for pumping			28	25	29	34	48	
Power consumption			1,388	1,404	1,429	1,398	1,418	100 million kWh
Lighting			425	436	444	443	456	
Electricity			963	968	984	954	962	

Finances								
		Fiscal Year	1998	1999	2000	2001	2002	Unit
Non-consolidated base	Sales revenue		25,348	25,172	25,814	25,178	24,827	¥100 million
	Lighting rate		9,747	9,880	10,109	9,937	9,954	
	Electricity rate		15,030	14,775	15,152	14,778	14,263	
	Other		569	515	552	462	609	
	Business expenses		22,365	22,019	22,453	22,061	21,671	
	Operating profit		2,982	3,152	3,360	3,117	3,155	
	Recurring profit		1,288	1,694	1,807	1,635	1,865	
	Net profit for current term		509	436	954	1,370	972	
	Equipment investment		7,548	6,122	4,790	4,105	3,265	
	Total assets		69,145	71,668	72,125	70,434	67,723	
Outstanding interest-bearing debts		46,316	46,752	45,653	43,271	40,754	%	
Shareholder equity rate		15.45	16.67	18.62	18.99	19.56		
Consolidated base	Sales revenue		25,970	25,883	26,479	26,515	26,151	¥100 million
	Business expenses		22,864	22,778	23,072	23,322	22,895	
	Operating profit		3,105	3,105	3,406	3,193	3,255	
	Recurring profit		1,385	1,673	1,693	1,595	1,747	
	Net profit for this term		524	523	1,227	1,284	804	
	Equipment investment		7,697	6,289	4,895	4,678	3,868	
	Total assets		71,767	75,009	75,508	75,075	74,023	
	Outstanding interest-bearing debts		46,522	47,536	46,165	44,483	43,541	
Shareholder equity rate		17.61	18.66	20.79	21.06	20.91	%	

Employees and Safety								
		Fiscal Year	1998	1999	2000	2001	2002	Unit
Number of employees	Kansai Electric		26,333	24,903	24,539	23,971	21,920	Persons
	Kansai Electric Group		-	33,018	32,589	37,911	35,554	
Accident rate *1			0.19	0.19	0.09	0.22	0.16	%

\*1 Accident rate: Number of accidents per 1 million hours of operation

# Data by Thermal Power Station

## Thermal Power Station Environmental Protection Performance (Fiscal 2002)

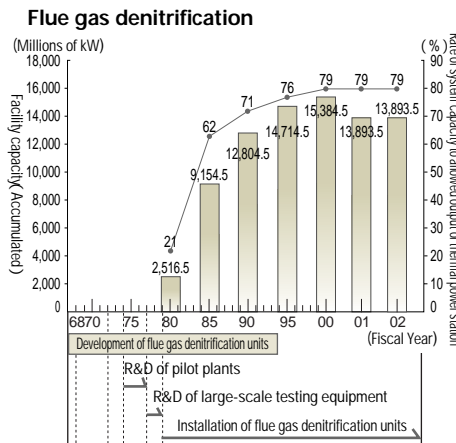
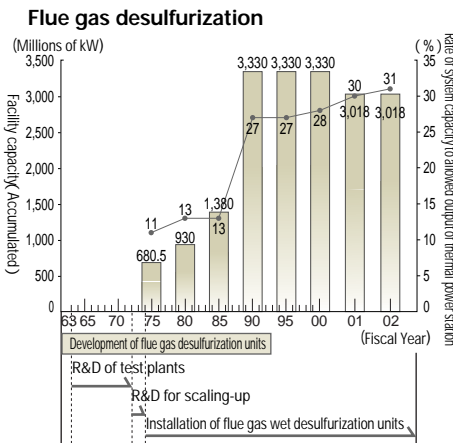
Item		Sakai				Osaka		Sanpo	Tanagawa No.2	Nankai	Miyazaki Energy Research Center				
Primary fuel		L / H / C				L / H / B		H/BFG	H / C	L	H / C				
Air quality	SOx	Emission per hour (m <sup>3</sup> N/ h)	APC Law (total emissions) 390				77		44	587	98	*5 306			
		Value agreed to	-				-		-	-	-	112			
		Actual value	80				4		Not recorded	159	0	31			
		Emission per day (t/day)	Value agreed to 10.1				3.8		1.6	9.3	-	-			
		Actual value	1.5				0.1		Not recorded	7.3	0	-			
		Emission per year (t/year)	Value agreed to 940				615		240	3,020	-	492 x 10 <sup>3</sup> m <sup>3</sup> N			
	Actual value	62.2				1.7		Not recorded	438.3	0	10 x 10 <sup>3</sup> m <sup>3</sup> N				
	NOx	Emission per hour (m <sup>3</sup> N/ h)	APC Law (total emissions) 613				118		66	*2 398	255	Outside designated area			
		Value agreed to	-				-		-	-	-	58			
		Actual value	116				11		Not recorded	155	30	22			
		Emission per day (t/day)	Value agreed to 7.7				2.2		0.9	7.2	1.8	-			
		Actual value	3.1				0.3		Not recorded	5.6	0.9	-			
Emission per year (t/year)		Value agreed to 1,420				320		180	2,100	400	244 x 10 <sup>3</sup> m <sup>3</sup> N				
Actual value	461.7				10.8		Not recorded	461.2	151.5	5 x 10 <sup>3</sup> m <sup>3</sup> N					
Dust	Emission concentration (g/ m <sup>3</sup> )	APC Law, ordinances *4 0.050				*4 0.050		*4 0.050	0.070	0.030	0.050				
	Value agreed to	0.020				0.020		0.020	0.020	-	0.014				
	Actual value	0.006				0.003		Not recorded	0.006	0	0.001				
Water quality	H ion concentration	WPC Law, ordinances	Discharge gate	C-oil	D-oil	E-oil	Sewerage discharge	NO <sub>2</sub> -oil	5.8 ~ 8.6	5.8 ~ 8.6	*3 5.0 ~ 9.0	5.0 ~ 9.0			
		Value agreed to	5.8 ~ 8.6				*3 5.0 ~ 9.0	*4 5.8 ~ 8.6	-	-	-	5.8 ~ 8.6			
		Actual value	7.5 ~ 8.3	6.3 ~ 7.4	6.1 ~ 7.3	6.2 ~ 7.5	6.9 ~ 8.1	6.8 ~ 7.7	7.7 ~ 8.3	6.8 ~ 8.0	6.0 ~ 8.3	6.4 ~ 8.1			
	COD	Max. concentration (mg/ℓ)	WPC Law, ordinances	12				30		*3 200	*4 14	12	50	*3 200	160
			Value agreed to	-				-		-	-	-	15	200	15
			Actual value	9	2	2	2	5	4	4	8	20	2		
		Pollutant load (kg/day)	WPC Law, ordinances	388.4				-		-	55	-	-		
			Value agreed to	-				-		-	14	-	20.8		
			Actual value	15	-	-	-	-	-	5.2	-	2			
	SS	Max. concentration (mg/ℓ)	WPC Law, ordinances	50				*3 200	*4 90	50	100	*3 200	200		
			Value agreed to	-				-		-	20	200	20		
			Actual value	10	10	6	8	8	2	8	9	44	1.2		
n-hexane extracts	Max. concentration (mg/ℓ)	WPC Law, ordinances	2				*3 4	*4 4	2	4	*3 4	5			
		Value agreed to	-				-		-	1	4	1			
		Actual value	< 1	< 1	< 1	< 1	1	1	< 1	0.2	< 1	< 0.5			

APC Law: Air Pollution Law, WPC Law: Water Pollution Control Law, L: LNG, B: Bituminous coal, H: Heavy oil

\*1: k value regulation \*2: Value reported to Osaka Prefecture under Guidelines on NOx Reduction from Fixed Sources \*3: Value under Osaka Municipal Ordinance on Sewerage Regulations

\*4: Osaka Prefectural Ordinance on Living Environment Protection \*5: Kyoto Prefectural Ordinance on Environmental Protection

## Installation of flue gas desulfurization and denitrification systems



## Dioxin Analysis of Thermal Power Station Exhaust Gas in Japan

	Concentrations in discharged gases (ng-TEQ/ m <sup>3</sup> N)
Oil power	0 - 0.0097
LNG power	0 - 0.0008
Coal power	0 - 0.0092

Source: Record of levels of dioxin discharges (June 2000, Environmental Agency)

Reference: level of atmospheric concentrations for fiscal year 2001 was 0.00090-0.0017ng-TEQ/m<sup>3</sup> (Source: Environmental White Paper, fiscal 2003)

Item			Kainan	Gobo	Himeji No.1	Himeji No.2	Takasago	Aoi	Akō		
Primary fuel			H/ C	H/ C	L	L / H/ C	H/ C	H/ C	H/ C		
Air quality	SOx	Emission per hour (m <sup>3</sup> N/ h)	APC Law(total emissions) 646	*1 7,800	112	780	344	*1 3,054	*1 2,146		
		Value agreed to	310	264	-	58	155	165	180		
		Actual value	131	85	0	0	Not recorded	46	52		
		Emission per day (t/day)	Value agreed to	-	-	-	-	-	-	-	
		Actual value	-	-	-	-	-	-	-		
		Emission per year (t/year)	Value agreed to	1,760 × 10 <sup>3</sup> m <sup>3</sup> N	1,390 × 10 <sup>3</sup> m <sup>3</sup> N	-	400 × 10 <sup>3</sup> m <sup>3</sup> N	2,492	885 × 10 <sup>3</sup> m <sup>3</sup> N	650 × 10 <sup>3</sup> m <sup>3</sup> N	
	Actual value	172 × 10 <sup>3</sup> m <sup>3</sup> N	63 × 10 <sup>3</sup> m <sup>3</sup> N	0	0.4 × 10 <sup>3</sup> m <sup>3</sup> N	Not recorded	21 × 10 <sup>3</sup> m <sup>3</sup> N	11 × 10 <sup>3</sup> m <sup>3</sup> N			
	NOx	Emission per hour (m <sup>3</sup> N/ h)	APC Law(total emissions) Outside designated area	Outside designated area	Outside designated area	Outside designated area	Outside designated area	Outside designated area	Outside designated area		
		Value agreed to	450	110	104	463	320	85	94		
		Actual value	175	50	63	393	Not recorded	29	38		
		Emission per day (t/day)	Value agreed to	-	-	-	-	-	-	-	
		Actual value	-	-	-	-	-	-	-		
		Emission per year (t/year)	Value agreed to	2,400 × 10 <sup>3</sup> m <sup>3</sup> N	560 × 10 <sup>3</sup> m <sup>3</sup> N	590 × 10 <sup>3</sup> m <sup>3</sup> N	2,263 × 10 <sup>3</sup> m <sup>3</sup> N	1,620 × 10 <sup>3</sup> m <sup>3</sup> N	390 × 10 <sup>3</sup> m <sup>3</sup> N	340 × 10 <sup>3</sup> m <sup>3</sup> N	
	Actual value	87 × 10 <sup>3</sup> m <sup>3</sup> N	23 × 10 <sup>3</sup> m <sup>3</sup> N	226 × 10 <sup>3</sup> m <sup>3</sup> N	930 × 10 <sup>3</sup> m <sup>3</sup> N	Not recorded	11 × 10 <sup>3</sup> m <sup>3</sup> N	16 × 10 <sup>3</sup> m <sup>3</sup> N			
Dust	Emission concentration (g/ m <sup>3</sup> N)	APC Law, ordinances	0.070	0.070	0.050	0.050	0.070	0.070	0.050		
	Value agreed to	0.050	0.010	-	-	0.050	0.015	0.015			
	Actual value	0.004	0.001	0	0	Not recorded	0.003	0.003			
Water quality	H ion concentration	WPC Law, ordinances	Site waste water treatment Main building oil treatment Tank yard oil treatment	5.0 ~ 9.0	5.0 ~ 9.0	5.0 ~ 9.0	5.0 ~ 9.0	5.0 ~ 9.0	5.0 ~ 9.0		
		Value agreed to	5.8 ~ 8.6	5.8 ~ 8.6	5.8 ~ 8.6	5.8 ~ 8.6	5.8 ~ 8.6	5.8 ~ 8.6	5.8 ~ 8.6		
		Actual value	7.1 ~ 7.8	6.4 ~ 7.7	6.4 ~ 7.7	6.4 ~ 8.0	6.9 ~ 7.6	6.7 ~ 7.9	6.0 ~ 8.0	6.6 ~ 7.7	6.6 ~ 7.6
	COD	Max. concentration (mg/ℓ)	WPC Law, ordinances	10	160	70	70	130	70	70	
			Value agreed to	10	10	15	15	20	15	15	
			Actual value	6	3.8	2	3.5	2.5	7	4	2
		Pollutant load (kg/day)	WPC Law, ordinances	187.7	-	40	105	102	66	84	
			Value agreed to	50	34.4	15.2	35	34	18	22.4	
			Actual value	5.6	3.5	2.11	13.4	7.4	1.6	2.6	
	SS	Max. concentration (mg/ℓ)	WPC Law, ordinances	40	200	90	90	150	90	90	
			Value agreed to	20	20	20	20	20	20	20	
			Actual value	5.1	2.6	2	2	3	10	< 1	3
	n-hexane extracts	Max. concentration (mg/ℓ)	WPC Law, ordinances	1	5	5	5	5	5	5	
			Value agreed to	2	1	1	1	1.5	1	1	
Actual value			0.1	0.1	0.1	0.3	0.1	0.2	0.1	0.1	0.2

## Discharge and transfer of substances cited under PRTR Law (Fiscal 2002)

Substance	Use	Handled quantity (t/ year)	Discharge (t/ year)			Transfer (t/ year)	
			Air	Public water area	Soil	Sewerage	Waste
2-amino ethanol	Water supply treatment agent	100	< 0.1	0	0	0	0.3
Asbestos	Piping insulation, etc.	22	0	0	0	0	22
Bisphenol A epoxy resin	Paint	2.5	0	0	0	0	0
Ethylbenzene	Paint	3.5	3.5	0	0	0	0
Xylene	paint, power generation fuel, equipment washing	88	46	0	0	0	< 0.1
Dichloropentafluoropropane (HCFC-225)	Washing	4.0	4.0	0	0	0	0
Toluene	Paint, power generation fuel	54	10	0	0	0	0
Lead and lead compounds	Cable connection soldering	1.3	0	0	0	0	0
Hydrazine	Water supply treatment agent	87	< 0.1	< 0.1	0	< 0.1	< 0.1
Benzene	Power generation fuel	9.5	< 0.1	0	0	0	0
Trisdimethylphenol phosphate	Power generation turbine control oil	12	< 0.1	0	0	0	8.0
Dioxin	Waste incinerator	-	160 mg-TEQ/ year	0.011 mg-TEQ/ year	0	0	5.4 mg-TEQ/ year

This table rounds off handled quantity to t/ year for Type 1 Specified Chemical Substances and to 0.5 t/ year for Special Specified Chemical Substances (dioxins excluded).

\* 0 is indicated if nothing was discharged.

\* < 0.1 is indicated if discharge was less than 0.1 t/ year.

Dioxins are given only for discharge and transfer from Specially designated Facilities (waste incinerators, etc.). Handled quantity, is therefore, not given.



# History of Energy and Environmental Issues

	Kansai Electric	Japan	World
1950s	1951 Kansai Electric Power co., Inc. established.		
1960s	1962 Direct burning of crude oil begun. 1963 R&D on flue gas desulfurization begun.	1962 Law Concerning Flue Gas Control enacted. 1967 Anti-Pollution Basic Measures Law enacted. 1968 Air Pollution Control Law enacted.	
1970s	1971 Public Pollution Investigation Department established. 1972 Exhaust gas recirculation and two-stage combustion methods introduced. Use of naphtha begun. 1973 Public Pollution Investigation Department reorganized as Environmental Affairs Department. Use of NGL and LNG begun. 1974 Practical use of flue gas desulfurization facility begun. R&D on flue gas denitrification facility begun. 1975 Environmental Month introduced as an annual event. 1977 General Office of Plant Siting & Environmental Considerations reorganized 1979 Low-NOx burners introduced.	1970 Water Pollution Control Law enacted. Law Concerning Waste Treatment and Cleanup enacted. 1971 Environment Agency established. 1974 Total pollutant load control for SOx introduced. 1977 Strengthening of Environmental Impact Reviews in Power Plant Siting determined by MITI's Ministerial Council. 1979 Law Concerning Efficient Use of Energy enacted.	1972 Limitation of Growth Report presented by the Club of Rome. United Nations Conference on the Human Environment held in Stockholm. 1973 First oil crisis. 1979 Second oil crisis. Accident at Three Mile Island Nuclear Power Plant in USA.
1980s	1980 Flue gas denitrification facility implemented. 1984 Deming Award for TQC activities received. 1988 New corporate management plan Vision for the Year 2030 released. 1989 Development of Management toward 21st century adopted.	1981 Total pollutant load control for NOx introduced. 1984 Details on environmental impact assessment determined by the Cabinet. 1989 Ministerial Committee on Global Environmental Protection established.	1985 Vienna Convention for Protection of the Ozone Layer adopted. 1986 Accident at Chernobyl Nuclear Power Plant in former USSR. 1987 Montreal Protocol adopted. 1988 Intergovernmental Panel on Climate Change (IPCC) established.
1990s	1990 Global Environmental Project Promotion Conference established. Five Basic Principles of Action Plan for Global Environmental Considerations adopted. Environmental Technology Research Center opened. Research and development of flue gas carbon dioxide recovery system begun. 1991 Kansai Electric Power co., Inc. Action Plan for Global Environmental Considerations adopted. 1992 Started joint research into rain forest recycling technology with Gadjah Mada University (Indonesia). 1993 Adopted Business Innovation Action Plan. Kansai Electric's Mid-Term Action Plan for Global Environmental Considerations adopted. Published Global Environment Action Report. 1995 New ERA strategy formulated.	1990 Action Program to Arrest Global Warming adopted. Global Environmental Forum Kansai established. 1991 Global Environment Charter adopted by Keidanren (the Federation of Economic Organizations). Law Concerning Promotion of Reprocessed Resource Use enacted. Law Concerning Waste Treatment and Cleanup revised. Act Charter adopted by Global Environment Forum Kansai. 1992 Law on Protection of Endangered Flora and Fauna enacted. 1993 Temporary Law Concerning the Promotion of Business Activities in Regard to Economizing the Use of Energy and the Utilization of Recycled Resources adopted. Basic Environmental Law adopted. 1994 Action plans for each country presented, based on Framework Convention on Climate Change. Basic Environment Plan formulated. 1995 Law on the Classified Collection of Container and Packaging Waste, and the Promotion of Recycling adopted. AIJ Japan Program launched.	1990 Second World Climate Conference held (IPCC's interim assessment report presented). 1991 Intergovernmental Negotiating Committee of the Framework Convention on Climate Change begun. 1992 United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro. 1994 Framework Convention on Climate Change (FCCC) effected. 1995 First Conference of Parties (COP1) to the FCCC. IPCC Second Assessment Report presented.

	Kansai Electric	Japan	World
1990s	<p>1996 "New Mid-Term Management Plan" adopted Power Plant Sites/Global Environmental Promotion Conference established. (Global Environmental Project Promotion Conference abolished.) New Mid-Term Action Plan for Global Environmental Considerations adopted.</p> <p>1998 Adopted Environmental Management Notice.</p> <p>1999 Introduced environmental accounting. Adopted Green Purchase Promotional Policy.</p>	<p>1996 JIS Environment Management System and Environment Auditing established. Environmental Action Program of Electricity Utilities Industry formulated.</p> <p>1997 Environmental Impact Assessment Law enacted. (Amended Electric Utilities Industry Law.) Federation of Economic Organization's Environmental Autonomy Action Plan formulated.</p> <p>1998 Amended Law on Energy Rationalization (Energy Conservation). Adopted Prospectus on the Promotion of Countermeasures to Global Warming. Enforced Law Concerning Measures to Cope with Global Warming.</p> <p>1999 Basic Policies Relating to Global Warming determined by Cabinet. Law Concerning Special Measures Against Dioxins enacted. Japan's PRTR Law enacted. JAccident at JCO uranium processing plant.</p>	<p>1996 Second Conference of Parties (COP2) to the FCCC. ISO Environment Management System and Environment Auditing established.</p> <p>1997 UN General Assembly Special Session on Environment. Third Conference of the Parties for Framework Convention on Climate Change (Global Warming Prevention Conference in Kyoto: COP3).</p> <p>1998 Fourth Conference of the Parties for Framework Convention on Climate Change (COP4).</p> <p>1999 Fifth Conference of the Parties for Framework Convention on Climate Change in Bonn (COP5).</p>
2000s	<p>2000 Adopted Mid-term Business Policy. Kansai Electric's Action Plan for Global Environmental Considerations revised. Eco Action 2000 adopted. Nuclear Power and Environmental Committee established. (Power Plant Sites/Global Environmental Promotion Conference abolished.) Restructured as Environment Considerations Department. Started Kansai Green Power Fund. Acquired ISO14001 certification at Miyazu Energy Research Center and 2 other sites. Started technical development project for mangrove restoration in Thailand.</p> <p>2001 Acquired ISO14001 certification at Himeji No. 2 Power Station and Kishiwada Substation. Formed Committee for Recycle Activities Promotion. Adopted Green Purchasing Guidelines for office supplies.</p> <p>2002 Acquired ISO14001 certification at Sakaiko Power Station and 6 other sites. Started CFC project in Indonesia. Started forestation project in Australia. Adopted Green Purchasing Guidelines for power equipment.</p>	<p>2000 Metabolic Society Creation Promotion Law enacted. Cabinet decision on Basic Environment Plan. Long-term plan regarding research into nuclear power and development and its use (New Long-Term Plan) enacted.</p> <p>2001 Ministry of Environment launched. Special Measures Law on the Promotion of Proper Treatment of PCB enacted.</p> <p>2002 Prospectus on the Promotion of efforts to prevent Global Warming revised. Soil Contamination Law enacted. Law Concerning Promotion of Measures to Cope with Global Warming (Global Warming Action Law) enacted. Kyoto Protocol signed. Special Measures for Use of New Energy Sources in the Electric Power Industry (RPS Law) enacted. Law Concerning the Rational Use of Energy amended. Law for the Recovery and Destruction of CFC from Special Products (CFC Recovery Law) enacted. Formed Federation on Kyoto Mechanism Use. Started accepting JI/CDM applications.</p> <p>2003 Cabinet determined Basic Plan for the Establishment of a Recycle-Oriented Society.</p>	<p>2000 Sixth Conference of the Parties for Framework Convention on Climate Change in Hague (COP6).</p> <p>2001 Reconvening of the Sixth Conference of the Parties for Framework Convention on Climate Change.</p> <p>2001 IPCC 3rd assessment report presented. Sixth Conference of the Parties (COP6) to the FCCC in Bonn. Seventh Conference of the Parties (COP7) to the FCCC in Marrakech.</p> <p>2002 World Summit on Sustainable Development in Johannesburg. 8th Convention on Climate Change held in New Delhi, India.</p>

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## About This Report

Kansai Electric publishes this Global Environmental Action Report to let our customers the many stakeholders who support our company know what our policy and targets are for dealing with environmental problems, and to report on the progress we have made with related activities.

In publishing this 2003 edition of the report, we reflected heavily on the valuable comments many people offered us in regards to the previous report and worked hard over the year to make additions and improvements that would foment a better understanding of our position on the environment and the action we are taking for it. In the future as well, we will continue to improve our environmental protection activities as well as this report with the hope of gaining even greater approval of our efforts. We welcome your comments and any requests you might have in regards to this year's report. You will find a questionnaire at the end of this publication.

### Scope of 2003 Report

**Period Covered:** This report covers fiscal 2003 (April 1, 2002 - March 31, 2003), but anywhere we mention continuing activities or targets from the past, future plans or the latest information prior to publication of the report, the time period is clearly stated.

**Business Scope:** This report is on Kansai Electric Power Co., Inc., but it also contains information on the Kansai Electric Power Group.

**Applicable Fields:** In addition to environmental protection, the report also takes a look at society with information concerning the local community and occupational safety and hygiene.

**Scope of Environmental Impact:** This report focuses on the environmental load caused by the production, distribution and sale of electricity, and related service activities.

### History of Publication and Next Edition

Kansai Electric has published a Global Environmental Action Report every year since 1993. We plan to release a 2003 edition in summer of 2003.

**The below tools are also available for your pleasure.**

**(You can view the below information at our website at  <http://www.kepco.co.jp/english/index.html>)**

Annual Report

Fact Book

Company Profile

# Eco Leaf "Eco Leaf Environmental Labeling" Certification Acquired

On July 31, 2003, Kansai Electric became the first Japanese power company to receive the "Eco Leaf Environmental Labeling" certification promoted by the Japan Environmental Management Association for Industry\*1 (JEMAI), a public corporation run by the Ministry of Economy, Trade, and Industry.

JEMAI is promoting the "Eco Leaf Environmental Label" in order to encourage active display of the Type III Environmental Labeling\*2, which is independently certified and therefore very reliable, as a way of letting the consumer know that quantitative data regarding the environmental impact of a product has been calculated according to the LCA (Life Cycle Assessment) method\*3, which is based on the ISO 14040 series international environmental certifications.

\*1 The Japan Environmental Management Association for Industry (JEMAI)

A public interest corporation begun in 1962 and active in various areas of environmental management. Currently involved in surveys and research regarding global warming and LCA and promotion of the ISO 14040 series of certifications.

\*2 Life Cycle Assessment (LCA) Method

A method for assigning a quantitative figure to the burden placed on the environment throughout the life cycle of a product or service, from procurement of raw materials and manufacturing through distribution, use, disposal, and recycling.

\*3 Type III Environmental Labeling

A label which displays a product's environmental characteristics in a quantitative fashion based on the LCA method and designed to avoid making particular judgments, leaving any and all judgments up to the consumer.



Product Environmental Aspects Declaration (PEAD)

**Product Environmental Aspects Declaration**

**Grid Electricity**

Product name / Grid Electricity	Specification	2003 Quantity
Product name / Grid Electricity	Specification	2003 Quantity

**LCA assessment (LCA) of raw material energy demand**

Material / Energy demand	CO2 equivalent	CO2 equivalent
Material / Energy demand	CO2 equivalent	CO2 equivalent

**CO2 emissions from power generation (by CO2/Wh)**

CO2/Wh	CO2/Wh	CO2/Wh
CO2/Wh	CO2/Wh	CO2/Wh

The top five power plants by 2002 CO2/Wh (from left to right) are: 1. 0.04, 2. 0.087, 3. 0.090, 4. 0.091, 5. 0.091.

**CO2 emissions (CO2/Wh)**

0.04 0.087 0.090 0.091 0.091

**Environmental management information:**

- Environmental management information: Kansai Electric Power Co., Ltd. (Kansai Electric Power Co., Ltd.)
- Environmental management information: Kansai Electric Power Co., Ltd. (Kansai Electric Power Co., Ltd.)

Product Environmental Information Data Sheet (PEIDS)

**Product Environmental Information Data Sheet (PEIDS)**

Product Name	Material	Quantity	CO2/Wh	CO2/Wh
Product Name	Material	Quantity	CO2/Wh	CO2/Wh

Product data sheet

**Product data sheet**

Product Name	Material	Quantity	CO2/Wh	CO2/Wh
Product Name	Material	Quantity	CO2/Wh	CO2/Wh



## **Let us know your thoughts and impressions.**

**This report contains some specifics of environmental activities at Kansai Electric and is intended to gain an understanding of these efforts from as many people as possible. Nevertheless, we imagine some of the readers will find certain points hard to understand, information to be insufficient and other disappointments. Therefore, we would like to use your frank thoughts and impressions as reference for future activities. To do this, we ask that you respond to the questionnaire on the back cover. Thank you in advance.**

**Environmental Management Group,  
Environmental Considerations Department  
The Kansai Electric Power Co., Inc.  
TEL (070) 5772-9668**

# Please give us your thoughts and impressions

FAX : 81-6-6441-3549

To : Environmental Management Group, Environmental Considerations Department, Kansai Electric Power Co., Inc.

Please check the items that most closely match your opinions or impressions.

## ① I think this report is :

- Easy to understand     Average     Difficult to understand

Reason: \_\_\_\_\_ )

## ② How would you rate Kansai Electric's environmental activities?

- Very highly     Good     Not very good     Not good

Reason: \_\_\_\_\_ )

## ③ Was there anything in this report that you want to know more about or are interested in? (Check all applicable boxes.)

- Message     Management Policy and Environmental Policy     Highlights from 2002  
 Targets and Performance     Conceptual View of Our Environmental Load

Environmental Management

- Environmental Improvement Activities     Environmental Accounting

Addressing Global Environmental Problems

- New ERA Strategy     Efficiency     Reduction     Activities Abroad     Protecting the Ozone Layer

Addressing Local Environmental Problems

- Efforts for Local Environmental Protection     Measures to Prevent Air Pollution  
 Measures to Prevent Water Pollution, Noise and Vibrations, and Offensive Odors  
 Measures Against Chemical Substances     Harmonizing with the Local Environment

Promoting Business Activities Suitable for a Recycle-based Society

- Promotion of Resource Recycling Measures     Promotion of Green Purchasing  
 Energy Conservation and Resource-saving Activities with Office Supplies     Treatment of Radioactive Waste

Cooperation with the Local Community

- Interaction and Cooperation Outside the Company in Environmental Protection Efforts  
 Activities to Benefit Local Communities     Animating the Workplace

Activities of The Kansai Electric Group

- Activities of The Kansai Electric Group     Group-wide Activities  
 Developing the Eco-Business

- Environmental Communication     Reference Information     Data

## ④ Comment on anything that impressed you in particular or anything that seemed to be lacking in information.

\_\_\_\_\_ )

## ⑤ What else should Kansai Electric do to protect the environment?

\_\_\_\_\_ )

## ⑥ From what perspective did you read this report? (Circle the number box that best applies.)

- As a customer of the company     As an investor     As a party who does business with the company  
 As a government employee     As someone affiliated with an environment-related NPO     As someone in the mass media  
 As someone involved in corporate environment activities     As a student     Other  
 Other (Explain : \_\_\_\_\_ )

## ⑦ How did you learn about this report?

- Newspaper/magazine     The company's website     From a company employee     From a friend  
 Other (Explain : \_\_\_\_\_ )

Thank you very much for your cooperation. If you do not mind, please also fill in the following information.

Name :

Gender :  Male     Female

Age :

Address :

Occupation (Company name or organization) :

## Main Places of Business

### Head Office and Branch Offices

Head Office	3-3-22Nakanoshima, Kita-ku, Osaka 530-8270	TEL : 06-6441-8821
Osaka Kita Branch	3-9-3 Honjohigashi, Kita-ku, Osaka 531-8588	TEL : 06-6373-1541
Osaka Minami Branch	3-9-5 Hamaguchinishi, Suminoe-ku, Osaka 559-0006	TEL : 06-6672-1301
Kyoto Branch	579 Higashi-shiokojicho, Karasuma Nishi-iru, Shionokoji-dori, Shimogyo-ku, Kyoto 600-8216	TEL : 075-361-7171
Kobe Branch	6-2-1 Kanou-cho Chuo-ku, Kobe 650-0001	TEL : 078-391-7211
Himeji Branch	117 Junishomae-cho, Himeji, 670-8577	TEL : 0792-25-3221
Nara Branch	48 Omoricho, Nara 630-8548	TEL : 0742-27-1237
Shiga Branch	4-1-51 Nionohama, Otsu, 520-8570	TEL : 077-522-2626
Wakayama Branch	40 Okayama-cho, Wakayama 640-8145	TEL : 073-422-4150
Wakasa Affiliated Branch	8 Yokota, 13 Goichi, Mihama-cho, Mikata-gun Fukui 919-1141	TEL : 0770-32-3500
Tokai Affiliated Branch	2-27-14 Izumi, Higashi-ku, Nagoya 461-8540	TEL : 052-931-1521
Hokuriku Affiliated Branch	1-2-13 Higashi-denjigatamachi, Toyama 930-8513	TEL : 076-432-6111
Tokyo Affiliated Branch	c/o Fukoku Seimei Building 2-2-2 Uchisaiwai-cho, Chioda-ku, Tokyo 100-0011	TEL : 03-3591-9261
Thermal Power Center	c/o Dai Building 3-6-32 Nakanoshima, Kita-ku, Osaka 530-6591	TEL : 06-6459-0433
Kansai Electric Hospital	2-1-7 Fukushima, Fukushima-ku, Osaka 553-0003	TEL : 06-6458-5821

### Main Sales Offices

Kujo Office	TEL : 06-6582-2881	Fukuchiyama Office	TEL : 0773-22-3101	Yashiro Office	TEL : 0795-42-0260
Ogimachi Office	TEL : 06-6373-3131	Maizuru Office	TEL : 0773-62-2540	Nara Office	TEL : 0742-36-1201
Ikeda Office	TEL : 072-752-5070	Miyazu Office	TEL : 0772-22-2112	Takada Office	TEL : 0745-53-1131
Mikuni Office	TEL : 06-6391-1061	Mineyama Office	TEL : 0772-62-0051	Shiga Office	TEL : 077-522-2611
Hokusetsu Office	TEL : 06-6384-1131	Obama Office	TEL : 0770-52-0890	Hikone Office	TEL : 0749-22-0080
Takatsuki Office	TEL : 072-676-3131	Takahama Office	TEL : 0770-72-1212	Yokaichi Office	TEL : 0748-22-2111
Moriguchi Office	TEL : 06-6908-4731	Mihama Office	TEL : 0770-32-0025	Wakayama Office	TEL : 073-422-8111
Hirakata Office	TEL : 072-841-1131	Kobe Office	TEL : 078-392-6200	Shingu Office	TEL : 0735-22-5211
Nanba Office	TEL : 06-6631-4101	Akashi Office	TEL : 078-912-2651	Tanabe Office	TEL : 0739-22-1212
Higashi Sumiyoshi Office	TEL : 06-6700-3131	Awaji Office	TEL : 0799-22-0605	Gobo Office	
Higashi Osaka Office	TEL : 06-6787-5011	Hanshin Office	TEL : 06-6481-3961 TEL : 0798-67-3131 TEL : 0797-85-0201	Hashimoto Office	TEL : 0736-32-1245
Habikino Office	TEL : 0729-56-3381	Sanda Office	TEL : 079-563-2484		
Minami Osaka Office	TEL : 072-238-8681	Himeji Office	TEL : 0792-92-3131		
Kishiwada Office	TEL : 0724-22-4701	Kakogawa Office	TEL : 0794-21-3201		
Kyoto Office	TEL : 075-491-1141	Aioi Office	TEL : 0791-22-0730		
Sonobe Office	TEL : 075-611-2131	Toyooka Office	TEL : 0796-22-3131		
Fushimi Office	TEL : 0771-22-0149				
	TEL : 0774-72-0029				

The above information on sales offices is valid as of June 30, 2003.