

Kansai Electric Power's  
**Global Environmental  
Action Report 2001**

*A Well-Balanced Environment Today and Tomorrow*

# A Message from the President



The 20th century saw Man's wisdom inspire great leaps in science and technology, bringing about hitherto unknown riches and wealth. However, there has been another side to this, too. We now have to grapple with a new kind of problem: global environmental problems such as global warming, ozone layer depletion and acid rain. It was the century that made large-scale production, large-scale consumption and large-scale waste all possible. And now, to create a sustainable 'metabolic' society and to prevent environmental problems threatening the very existence of future generations, we must work persistently to produce results through specific activities aimed at environmental protection in the 21st century.

As an energy company whose role in society is to supply clean electric power, we have always strived our utmost to preserve the environment, with particular attention being paid to the demands of the age. From the '90s onward, in particular, we adopted the 'Kansai Electric Action Plan for Global Environmental Considerations' based on the 'Kansai Electric Five Basic Principles of the Action Plan for Global Environmental Considerations', and have followed these principles in all our areas of business as part of our work toward global environmental protection.

As a result of this, mainly owing to the effects of developing power resources based on nuclear power and the safe and stable operation of such facilities, our company has seen its levels of CO<sub>2</sub> emissions (volume per 1kwh of electricity consumed) fall to 0.3kg-CO<sub>2</sub>/kWh, currently, the lowest among domestic power companies.

Furthermore, we have been applying the three 'Rs' (Reduce, Reuse and Recycle) in all our business activities in our efforts to process waste products. Through this and other such activities aimed at benefiting society as a whole, we are striving, along with all the citizens of the world, to build a society which values its material resources.

We will continue to take a comprehensive view of our operations from the point of view of conserving the environment, obtaining a stable supply of energy and achieving economic viability and continue to pursue the optimum structure for our power resources (the 'best mix'). While striving to maintain and improve current levels of CO<sub>2</sub> emissions in line with the 'New Era Strategy', which constitutes a comprehensive approach to the prevention of global warming, we will continue to work toward the creation of a 'metabolic' society.

This reports describes our policy toward tackling environmental problems, our goals and the current state of affairs with regard to such activities. We recognize our social responsibility as a company to open up information on environmental preservation to the public. As part of this, we believe that, together with obtaining the trust of all our stakeholders, this is an important prerequisite if we are to succeed in managing the environment.

In order to achieve sustainable development throughout the 21st century, we, along with all the citizens of the world, will continue to rise to the challenge of environmental problems, independently and energetically, working ceaselessly to get real results. It is our firm resolve, to strive for environmental management, so please feel free to read this report. We hope that this will give you a better understanding of what we are doing, and we hope that you, in return, will give us your frank opinion and advice on our efforts.

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.

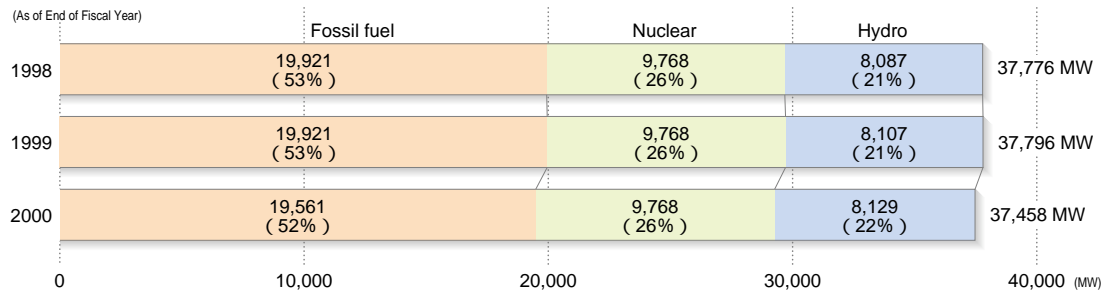
# Overview of Kansai Electric

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 28,681 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.

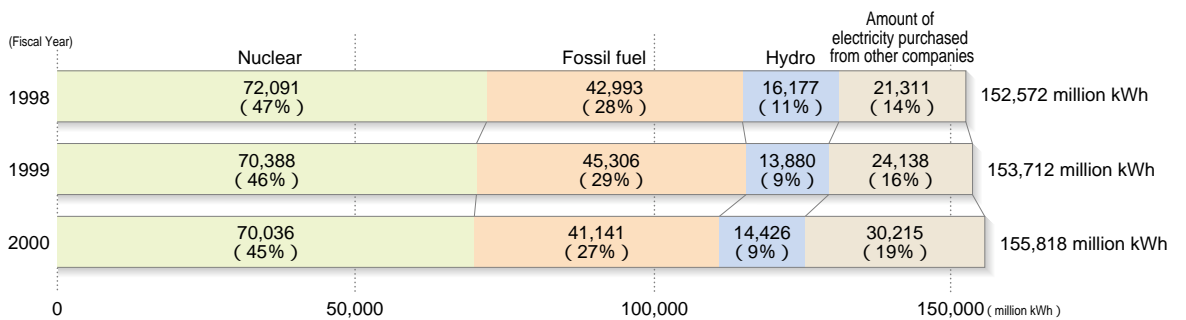
Since its establishment, Kansai Electric has emphasized the development of power sources to meet electricity

demand, which has increased with the growth of the Japanese economy. As of March 31, 2001, the company's capacity for hydroelectric power is 8,129 MW, fossil fuel power 19,561 MW, and nuclear power 9,768 MW, making the total capacity 37,458 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 2000 amounted to 142,852 million kWh, accounting for 17% of the total power sold in Japan, or the second largest amount in Japan, following the Tokyo Electric Power Co., Inc.

## System capacity

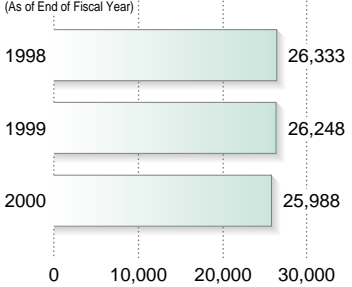


## Percentage of Total Volume of Electricity Produced (figure includes amount produced by other companies as well)

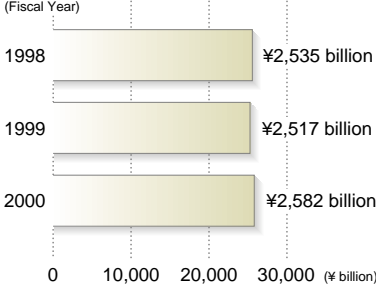


To give a clear picture of the amount of electricity generated and supplied, we have also included the amount of electricity purchased from other companies. These figures show the amount of electricity delivered to customers, including the amount of electricity generated by Kanden as well as that supplied by other companies. (See page 21) Moreover, the ratio of nuclear power within the total amount of electricity produced by this company (total amount of nuclear, fossil fuel and hydroelectric generated electrical power produced by this company, excluding amounts given above for other companies) exceeds 50% each year.

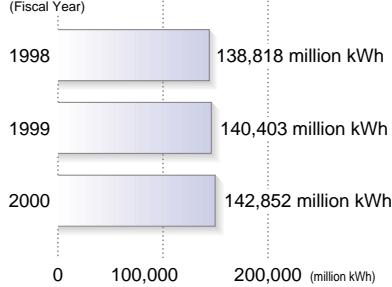
**Number of Employees**



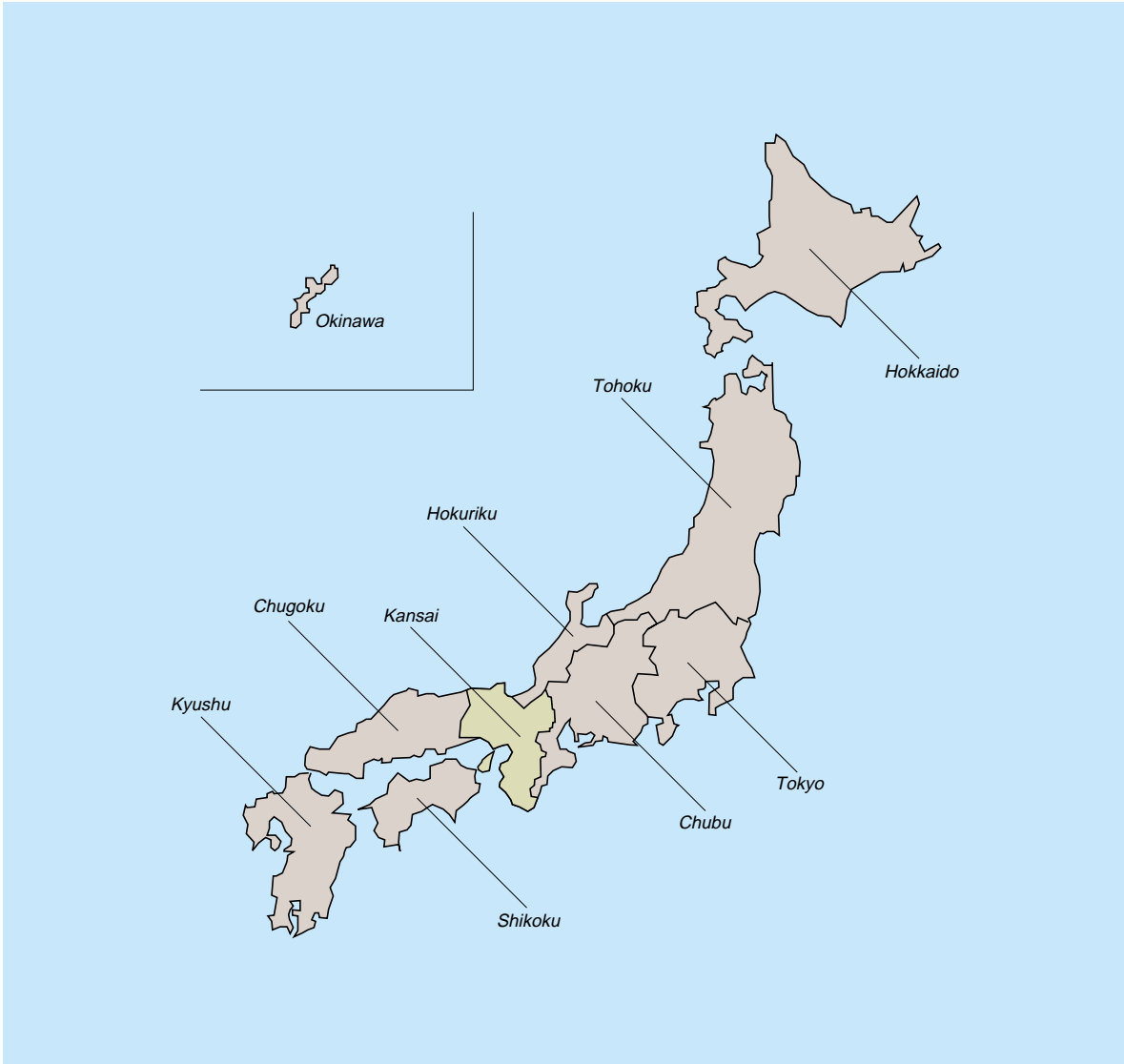
**Volume of Sales**



**Annual power sales**



Service areas of Japan's ten electric power companies



## Outline of Japan's ten major power companies (as of March 31, 2001)

	Capital (billions of yen)	Number of customers (thousands)	Maximum power demand (MW)	Annual power sales (millions of kWh)	Annual revenue from power sales (billions of yen)	Number of employees	System capacity (MW)			
							Hydro	Fossil	Nuclear	Total
Hokkaido Electric Power Co.	114	3,760	5,255	29,111	529	6,381	1,278	3,450	1,158	5,936
Tohoku Electric Power Co.	251	7,522	14,700	74,514	1,320	14,011	2,442	11,206	1,349	15,220
Tokyo Electric Power Co.	676	26,669	59,240	280,651	5,086	41,403	8,508	33,023	17,308	58,843
Chubu Electric Power Co.	375	10,023	26,364	123,037	2,143	18,851	5,213	22,941	3,617	31,771
Hokuriku Electric Power Co.	118	1,960	5,482	25,692	418	5,499	1,806	4,562	540	6,909
Kansai Electric Power Co.	489	12,768	31,060	142,852	2,526	25,988	8,129	19,561	9,768	37,458
Chugoku Electric Power Co.	186	5,109	11,293	54,503	918	11,250	2,893	8,015	1,280	10,908
Shikoku Electric Power Co.	146	2,834	5,613	25,686	463	6,642	1,124	3,730	2,022	6,876
Kyushu Electric Power Co.	237	8,055	16,284	75,251	1,348	14,348	2,371	11,130	5,258	18,966
Okinawa Electric Power Co.	8	746	1,412	6,626	132	1,558	0	1,456	0	1,456
<b>Total</b>	<b>2,600</b>	<b>79,446</b>	<b>176,703</b>	<b>837,923</b>	<b>14,883</b>	<b>145,931</b>	<b>33,764</b>	<b>119,074</b>	<b>42,300</b>	<b>194,343</b>

## New Companies Established Since Year 2000

Our company's goal is to establish an 'all-round living infrastructure-related service group of companies.' Therefore, as the Kansai Electric Group, we have concentrated our activities around the three core areas of the comprehensive energy business, information and communications and the daily life and community development business. We are constantly developing new areas of business through a total of 85 related companies (as currently, at the end of fiscal 2000).

	List of Companies	Outline of Business
Comprehensive Energy Business	eL ENERGY CO., INC. (established May 17, 2000) (sales directly made by this company)	Sales of LNG delivered by tank trunks (commenced April, 2001) Sales of LNG delivered by tank trunks (commenced December, 2000) Sales of gas delivered by pipeline (scheduled for commencement April, 2002)
	SAKAI L.N.G. CO., INC. (established December 20, 2001)	Sakai LNG Plant Construction, Operating Company Construction commencing January, 2002. Scheduled to commence operations in 2005
	KANDEN GAS & COGENERATION CO., INC. (established April 2, 2001)	Gas sales agent, design of optimum systems such as Cogeneration, energy diagnosis, guarantee of energy saving results, etc.
	K-OPTICOM CORPORATION (established June 1, 2000)	Leasing of optical fibers (commenced operations September, 2000) Provision of high-speed, high-volume communications platform (commenced operations June, 2001) Data center business
Information and Communications Business	KANSAI.COM, INC. (established April 20, 2001)	Provisions of content (creation and management of portal sites for subscribers to K-OPTICOM Internet Connection Service) (service commenced in June, 2001)
	KANDEN REAL ESTATE CO., LTD (established July 1, 2001)	Apartments and houses, rental of buildings, hotel business, etc.
Daily Life and Community Development Business	KANDEN E HOUSE CORPORATION (established July 7, 2000)	Sales of housing amenities in conjunction with building contractors Construction and renovation of housing business
	KANSAI HOUSING QUALITY ASSURANCE CO., LTD. (established October 20, 2000)	The evaluation of the soundness of housing in line with the Law for the Promotion of Ensuring Quality in Housing
	KANDEN JOY LIFE CO., LTD. (established October 6, 2000)	Private old people's homes, in-home services First old people's home commenced operating in June, 2001
	(Home security business)	January, 2001 tie-up with security company Plan to commence operations within fiscal 2001

Established in 2000      Established since 2001

# Mid-Term Management Policy

~so that customers will choose the Kansai Electric brand~  
(adopted April, 2000)

## Basic Thrust

For our company, the way to further development lies in continuing to raise our industrial value through providing customer satisfaction. We have always worked on the principle of 'the customer first'. And now, in response to this new age of competition for energy, we will continue to do so at every operational level, concentrating on the concept of 'competitiveness', thereby strengthening our commitment to the customer. Through rising to the challenge of being a business that seeks to 'heighten customer satisfaction', all our employees will share in the sense of achievement brought about by the joy of being relied on and of being chosen by our customers and by the process of dynamic self-reform. Thus, we will leap forward into the 21st century.

## Important Points of Policy for Conduct of Business

- Enhancement of products and services
- Enhancement of sales strength
- Strengthening of cost competitiveness
- Strengthening of overall power as a group
- Dealing firmly with issues of public interest, particularly those related to nuclear energy

## Restructuring of Business and Personnel in order to Implement Policy

- The promotion of the restructuring of our business, utilizing IT as a power resource
- The promotion of the autonomous management of business affairs
- The promotion of a policy toward the energization of human resources that puts weight on selection and self-responsibility
- The creation of a lively work environment

# Special Features of Measures toward Environmental Conservation for Fiscal Year 2000

## Working to the ISO14001 Standard

(P. 12~P. 13)

In order to further strengthen our environmental management system, we are working to create an environmental management system that will conform to International Standard ISO14001 with regard to environmental conservation.

This system was rendered fully operational at the Mihama Power Station (nuclear power) in the fiscal year 2000. Work has also begun on putting such a system in place at various other electric power offices such as those at Kishiwada, Tanabe, Himeji and Kurobegawa.

Furthermore, in order to obtain an objective appraisal of the results we have achieved so far, we have obtained external certification for our Kainan and Himeji No.2 thermal power stations. In addition, the Kishiwada station has also received its first such certification.

## Cooperation with the 'Kansai Green Power Fund'

(P. 30)

Consumers and power companies and businesses involved with providing new electrical energy resources have come together to look at the problems of obtaining new, long-term energy resources. Thus, in October 2000, the 'Kansai Green Power Fund' was established at the Center for Industrial Renovation of Kansai (Foundation), in line with a proposal made by this company.

In addition to looking after money donated by customers through our revenue collection system, we are cooperating with the 'Kansai Green Power Fund' by basically matching all such donations.

## Completion of 'Restoration of Thermal Efficiency to Existing Fossil Fuel Electric Power Stations through Management Reform in the Electricity Generating Authority of Thailand' Project

(P. 41~P. 42)

In 1996, we commenced the 'Power Plant Thermal Efficiency Improvement / Recovery Through Enhanced Operational Management' project at the South Bangkok power station, part of the Electricity Generating Authority of Thailand (EGAT).

This work was completed in March 2000. During this time, we fully implemented our policy toward higher thermal efficiency at the South Bangkok Power Station, with the Japanese side offering the technological know-how, in terms of operational procedures and maintenance gained from operating their own fossil fuel power stations, and with both sides making the most of their fund of knowledge and experience.

The results were analyzed in the fiscal year 2000 and it was confirmed that, over a 30-month period, CO<sub>2</sub> emissions had been reduced to approximately 40,000t-CO<sub>2</sub>.

In February 2001, we received a certificate of thanks from the president of EGAT for the achievements of this project.

## Activities and Business Feasibility Studies for the Future Utilization of the Kyoto Mechanisms

(P. 42~P. 43)

We have taken part in a number of projects. These have included the 'Basic Enquiry into the Promotion of Joint Implementation', sponsored by the New Energy and Industrial Technology Development Organization (NEDO) in its 'Investigation into Improvement in Regional Heating in the city of Tbilisi in Georgia', and also the 'Investigation into the Global Environment and Revitalization of Plant Operation' sponsored by the Japan External Trade Organization (JETRO) in its 'Plan for the Rehabilitation of the Anagukurao Hydroelectric Plant' in the Philippines.

## Boosting Efforts toward Green Purchasing

(P. 59)

This company will continue to purchase highly energy-efficient electric vehicles and other such energy-saving equipment along with eco-label products. In December 1999, we adopted the 'Promotion toward Green Purchasing Policy', in order to boost our efforts in this area.

In the fiscal year 2000, we switched over completely to the use of recycled paper for copy use, and are endeavoring to do the same by using recycled plastic bottles for use as material for working clothes.



# Outline of Global Environmental Action Report

## Policy on Environmental Preservation

(P. 1~P. 2)

We have continually worked to strengthen our structure of policies with regard to the environment. Beginning with the adoption of the Five Basic Principles of the Action Plan for Global Environmental Considerations in fiscal 1990, we have since adopted a number of other such codes of practice and specific plans of action. In fiscal 2001 we adopted the Eco Action 2001 plan as a concrete action plan and are continuing to work toward environmental preservation.

In 1995, in particular, we adopted the New Era Strategy as a set of measures against global warming, to which we are taking a comprehensive approach.

## Goals and Results with regard to Environmental Preservation

(P. 3~P. 10)

As part of our sets of specific measures, we have set numerical targets for tackling such problems as reducing emissions of greenhouse gases and using energy effectively.

With regard to our target for CO<sub>2</sub> emissions, in particular, the numerical target was set at 0.3kg-CO<sub>2</sub>/kWh for the amount of electrical energy used (sold) in the fiscal year 2010. As at fiscal 2000, the actual recorded figure was at 0.28kg-CO<sub>2</sub>/kWh.

We are currently still examining environmental accounting and have compiled figures for the fiscal year 2000.

## Environmental Management System

(P. 11~P. 20)

The company has always worked to educate its employees so that we would be able to conform to the ISO14001 standard, and we are constantly making every effort to strengthen our internal system of environmental management. We are also working to communicate with all our stakeholders through various publications such as this.

## Working to Reduce Load on the Environment

(P. 21~P. 66)

We are working to reduce load on the environment in all our areas of business through implementation of the three 'R's, which constitute our response to global environmental problems, our attitude to regional environmental preservation and policy on waste:

Reduce, Reuse and Recycle.

We are promoting our New Era Strategy as a comprehensive set of measures on dealing with global environmental problems. Our operations are centered on electricity produced by nuclear power. At the same time as reducing the production of greenhouse gases during the process of supplying energy, we are also working toward the more efficient use of energy throughout society as a whole. Such efforts are being made both at home and abroad.

We are also working toward regional environmental preservation. While continuing to take measures to prevent air and water pollution, we are also responding by targeting new problems as they arise such as the adoption of measures toward chemical substances.

In addition, we are also striving for the optimum measures for dealing with waste, from its production right through to the final stages of its processing. Currently, we are able to reuse some 84%, a high standard, of such waste as a new resource (figure for the fiscal year 2000).

## Various Types of Work on Behalf of Society

(P. 67~P. 74)

We are working toward preservation of the environment through exchange and coordination with the people of each area and various organizations. Our aim is to 'Live In Harmony with Local Society'. Therefore, apart from considerations of environmental preservation, we are also concerned with the revitalization of regional areas themselves, care for the aged and work with the physically challenged.

We are also working to create a work environment in which each and every employee will be keen on their work and where they will spontaneously feel the desire to make a contribution to society.







## What the Kansai Electric Group is Doing

(P. 75~P. 78)

Here, at the Kansai Electric Group, we host conferences aimed at enabling various people to share information. These people have been selected from the various companies within the group to sit on the promotion staff of the Related Company for Global Environmental Project. We publish and offer material on what various companies within the group are doing with regard to eco-business in our Eco-Business News. In this and other ways, we are promoting and supporting work toward environmental preservation throughout the entire group.



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## On This Edition of the Global Environmental Action Report

- **Target Organization:** Report centers on The Kansai Electric Power Co., Inc. and a number of other companies within the group
- **Target Period:** Report mainly covers up to end of year 2000
- **Scheduled Publication of Next Issue:** Summer, 2002
- **Areas Covered by Report:** Report centers on the environment, but also looks at certain economic and social matters
- This edition of the Global Environmental Action Report draws mainly on the Year 2000 edition of the Environmental Report Guidelines compiled by the Ministry of the Environment in February 2001. It also contains data specific to our company. Specifically, in order for the public to better understand what we are doing with regard to reducing load on the environment throughout all our areas of business, we have not just included the most important bits of information as designated in the Guidelines, but have also tried to include the most important information on the state of affairs with regard to each type of business we are involved in, where possible.

However, we have not included information on the load on the environment brought about through the marketing of products and services or how such load might be reduced, as our own product, electricity, does not lend itself to such analysis.

# Policies, Goals and Achievements with regard to Conservation of the Environment



## Policies and Thinking

Kansai Electric's most fundamental management policy has always been to contribute to the development and prosperity of the local communities.

As part of this commitment, we have undertaken a range of measures to address environmental issues in our service area, with particular attention to the needs of each community.

Recently, environmental problems causing worldwide damage — global warming, acid rain, ozone layer depletion, vanishing tropical rain forests, and the spread of deserts — have clearly become a serious concern. These

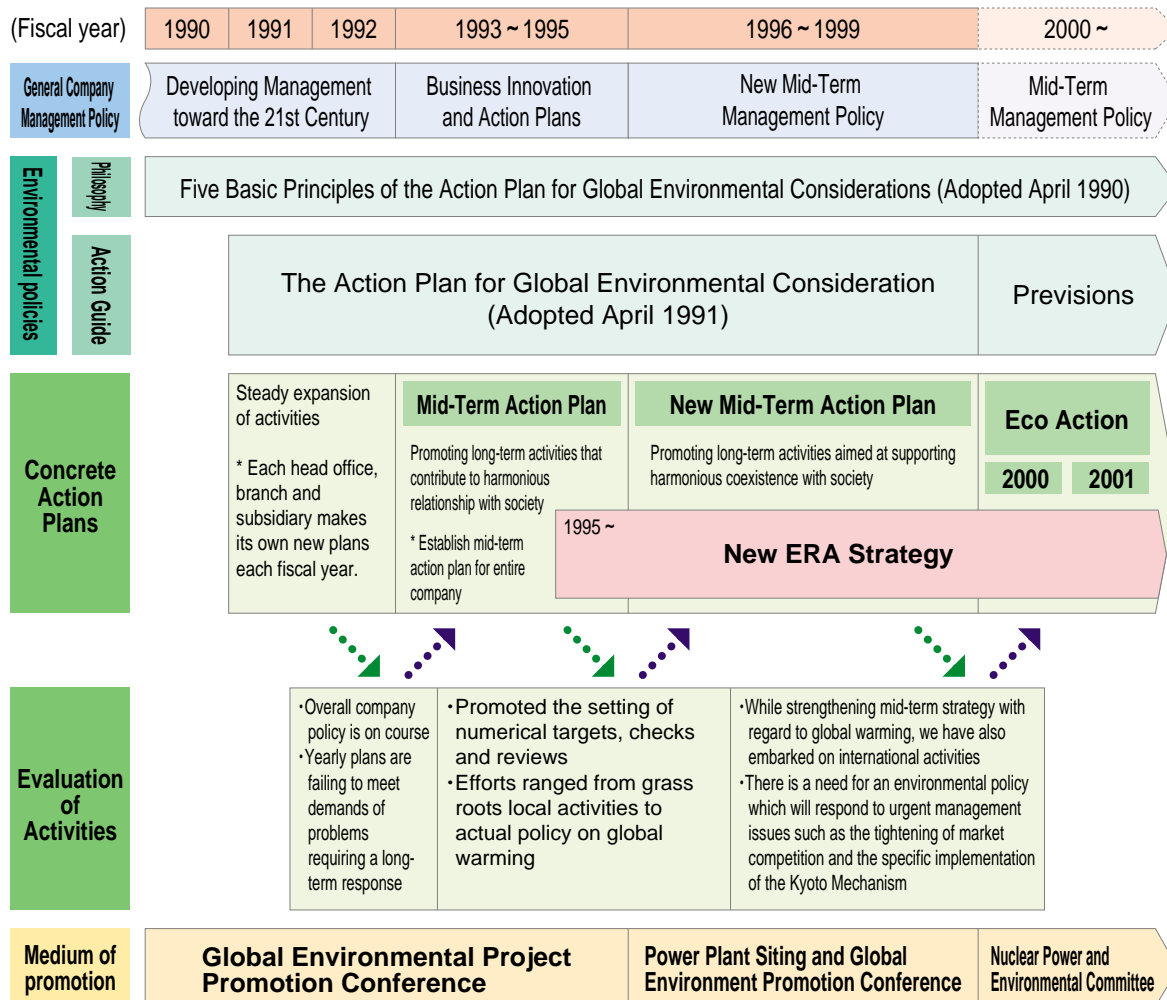
global environmental problems are presenting a new challenge to modern civilization. To effectively address them will require integrated international effort.

Not only technological measures, but changes in many areas, such as social awareness and consumer lifestyles, need to occur on a global scale. In order to achieve sustainable world development, which will require both economic development and global environmental preservation, it is vital for us as global citizens to “think globally and act locally” in our communities.

Realizing that it has an important responsibility as an electric utility and energy supplier, Kansai Electric is strongly committed to supporting global environmental preservation while working to make people's lives more comfortable. In this respect, we are continually studying advanced measures for environmental protection and ways to integrate these into all aspects of our operations. Our policy is to begin by immediately taking action wherever there is something that can be done.

This action has taken concrete form in efforts such as our Five Basic Principles of the Action Plan for Global

### Changes Up to Now in Environmental Policies and Concrete Action Plans





Environmental Considerations, which we drew up in April 1990, and the Kansai Electric's Action Plan for Global Environmental Considerations of 1991. Both of these outline the environmental protection policies that we follow in all areas of our business.

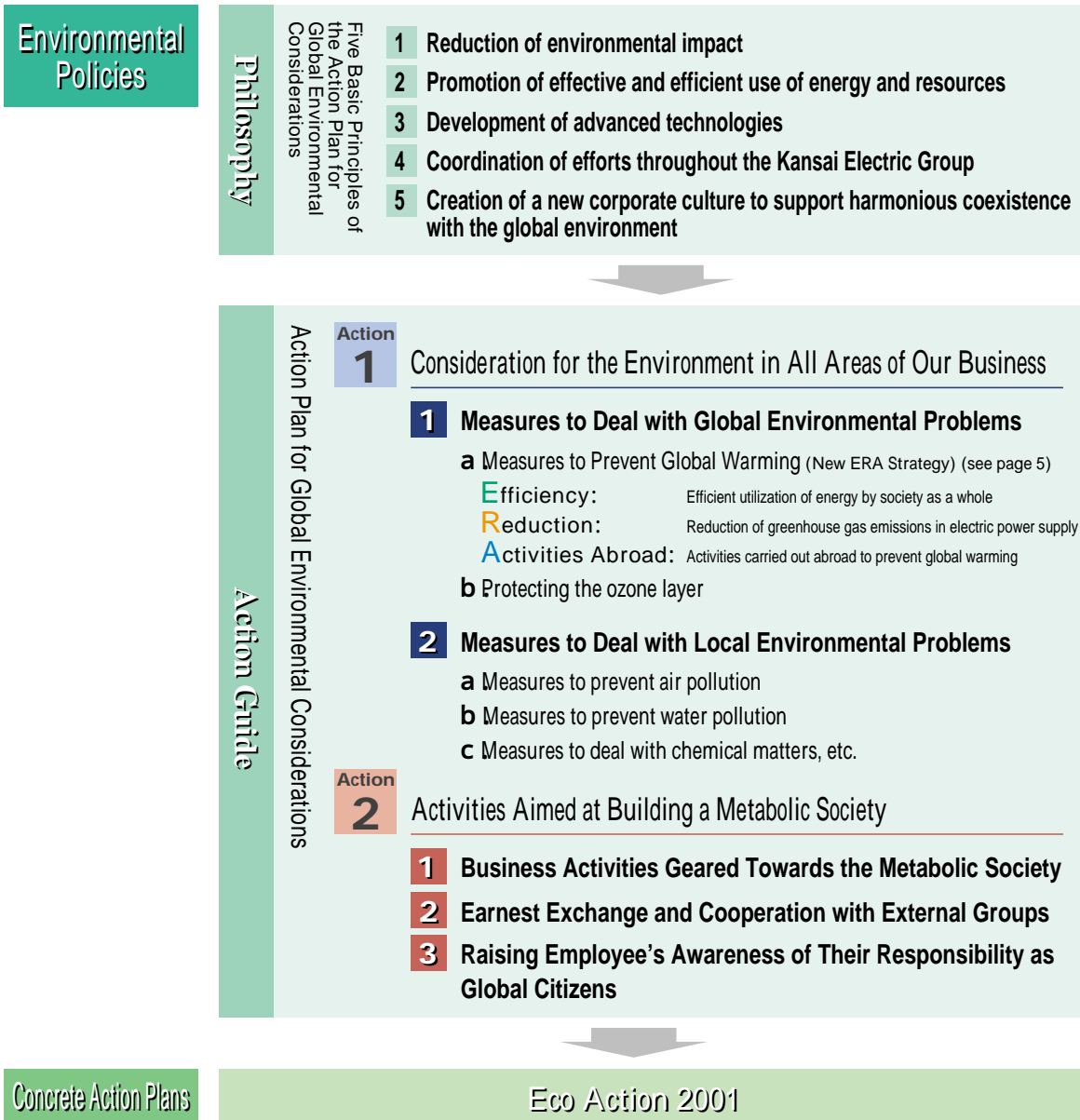
To further boost our efforts, in fiscal 1993 we created the Mid-term Action Plan for Global Environmental Considerations (fiscal 1993-1995), which outlines concrete action plans based on concrete numerical goals. This plan and the New Mid-term Action Plan for Global Environmental Considerations (fiscal 1996-1999), created in fiscal 1996, have guided our environmental protection efforts to the present.

Owing to major changes in the management environment, such as the partial liberalization of retail

energy sales starting in March 2000, we revised the Kansai Electric Action Plan for Global Environmental Considerations in fiscal 2000. At the same time, we created a new plan of action with three-year rolling targets to be set annually, Eco Action 2000. This will replace the old Global Environmental Mid-Term Action Plan. In fiscal year 2001, we are undertaking a set of specific measures known as "Eco Action 2001"

Through Eco Action 2001, we are aiming to take on even more environmental challenges so that we may provide benefits for society and earn its trust by making electricity the best and most environmentally friendly energy source available.

System of Environmental Measures





## Goals, Plans and Results

### Outline of Eco Action 2001 (Companywide action plan)

Item		Fiscal 1999	Fiscal 2001		
		Result	Result	Goals	
Reduction of greenhouse gas	Reduction of CO <sub>2</sub> emissions per unit of electricity used (sold)	0.28kg-CO <sub>2</sub> /kWh	0.28kg-CO <sub>2</sub> /kWh	Approx. 0.3kg-CO <sub>2</sub> /kWh (forecast)	
	Improving capacity factor of nuclear power stations	82.0%	81.8%	More than 80%	
	Maintaining and improving thermal efficiency of fossil fuel power stations	41.9%	42.0%	More than 41%	
	LNG use	5,490,000 t	5,460,000 t	More than 5,000,000t	
	Output expansion through hydro power station renovation (kW)(Total from fiscal 1989 to present)	27,052kW	29,752kW	29,652kW	
	Reduction in overall loss (losses in generation, transmission and distribution)	8.7%	8.3%	Reduce as much as possible	
	SF <sub>6</sub> gas exhaust control (Rate of Recovery of Gas on Inspection of Apparatus)	83%	92.1%	90%	
Efficient use of energy	Levelling off peak load	Increase number of (time-of-use lighting) contracts	95,000 Contracts	115,000 Contracts	110,000 Contracts
		Increase number of (load heat storage adjustment) contracts	2,804 Contracts	3,815 Contracts	3,000 Contracts
		Promotion of peak-cut-type equipment	148,000 Units	200,000 Units	200,000 Units
	Introduction of electric vehicles	162 Units	177 Units	176 Units	
	Use of untapped energy sources	10 Districts	10 Districts	10 Districts	
	Cooperation in helping spread the use of new energy sources	Photovoltaic power generation	5,800,000kWh	11,000,000kWh	We will contribute to the spread of new sources of energy by purchasing excess electricity generated by photovoltaic power, wind power, and the burning of waste material
		Wind power generation		405,000kWh	
Power generation using waste materials		394,000,000kWh	432,000,000kWh		
Reduction of SO <sub>x</sub> and NO <sub>x</sub> emissions per fossil fuel power generation	SO <sub>x</sub>	0.08g/kWh	0.07g/kWh	Maintainig at current reduced level	
	NO <sub>x</sub>	0.15g/kWh	0.15g/kWh	Maintainig at current reduced level	
Improving recycling of industrial wastes	88%	84%	More than 90%		
Usage rate of 100% recycled copy paper		100%	100%		
Compliance with ISO standards	18 Districts	19 Districts	Order in Increase in Number of Places Conforming to Standard		
Effective rate of 100,000 People's Eco-Family Campaign	66% (Result for fiscal 1998)	68%	70%		



Result evaluation and next approach	Goals			Goals and plans of action set for the fiscal year 2010	See page
	Fiscal 2001	Fiscal 2002	Fiscal 2003		
Approximately same level as previous year, as predicted	Approx. 0.3kg-CO <sub>2</sub> /kWh (forecast)	Approx. 0.3kg-CO <sub>2</sub> /kWh (forecast)	Approx. 0.3kg-CO <sub>2</sub> /kWh (forecast)	In order to achieve the targets set for the electricity industry as a whole (bringing levels of CO <sub>2</sub> down to 0.3kg-CO <sub>2</sub> /kWh per unit of energy consumed by the fiscal year 2010), we have set our own target to this level. We are now promoting our New ERA Strategy aimed at maintaining and exceeding this target.	P.24
Although there was an unscheduled stoppage, rate of use exceeded targets owing to the carrying out of short-term inspections. We will continue to build on the efficiency of such inspections to maintain a rate of use in excess of 80%.	More than 80%	More than 80%	More than 80%	We will continue to put reliability and safety first. By striving to increase the efficiency of our periodical inspections, we are aiming for ever-higher operability together with a steady percentage rate of use in the region of 80%.	P.32
We managed to achieve our target for the fiscal year 2000. We will continue to increase thermal efficiency through maintaining a high rate of use of our highly thermal-efficient combination plants and by implementing measures toward the running and equipping of our existing plants.	More than 42%	More than 42%	More than 42%	We will maintain a thermal efficiency of above the current target of 42%.	P.33
In fiscal 2000, we burned off more than was contracted for, taking into serious consideration the predicted decline in consumption that would take place from 2001 onwards. From now on, we will adjust our various operations to take into account the increase in the rate of LNG consumption that will accompany the decline in the consumption of fossil fuels.	Approx. 5,000,000t	Approx. 5,000,000t	Approx. 5,000,000t	While reducing the amounts of electricity produced through burning of fossil fuels, we will adjust all our operations to heighten the ratio of LNG fossil fuel used, as it is excellent from the point of view of the environment.	P.34
Approximately as planned. We will continue moving in this direction.	30,452kW	33,872kW	35,172kW	We are continuing to overhaul our hydroelectric power stations, and are planning to achieve an increase in output amounting to 39,072kW by the fiscal year 2005.	P.34
Rate of loss has been kept to a low level. We will try to maintain this level in our future operations.	Reduce as much as possible			We are making the utmost effort to reduce loss in the layout and running of all our facilities.	P.35
We managed to reach our current goal of 90%. From now on, we will make even greater efforts in cooperation with manufacturers to maintain an even higher level and reach our next goal of 97%.	Rate of recovery of SF <sub>6</sub> gas on inspection of apparatus at 90%.			We will improve our rate of recovery for SF <sub>6</sub> gas at inspections to meet the target of 97% set by the Federation of Electrical Businesses for the fiscal year 2005.	P.37
This was as according to plan. We plan to achieve even wider use in the future centered on houses exclusively using all-electric appliances.	140,000 Contracts	170,000 Contracts	210,000 Contracts	We are making effort to achieve more widespread use	P.25
All goals were achieved in implementing these various measures. We will strive for even more widespread use in future.	5,000 Contracts	6,000 Contracts	7,000 Contracts		
As according to plan. We will continue to strive for ever more widespread use.	250,000 Units	300,000 Units	350,000 Units		
Our achievement here exceeded the numerical target of 176 vehicles for the fiscal year 2000. We will continue to introduce such vehicles in line with market trends and improvements in technology.	177 Units	Unknown	Unknown	We plan to increase the number of such vehicles in use from the current figure, taking into consideration market trends and technological improvements in relation to the balance of cost.	P.28
Measures have been implemented according to plan in the 3 Chome district of Nakanoshima.	11 districts			We will continue to encourage use of unused energy in line with regional development.	P.28
The number of contracts tied up exceeded the previous year by 3,400 to give us a figure of 8,000.	Purchase of excess electricity produced by solar power, wind power and waste and cooperation with the work of the Kansai Green Electricity Fund.			We plan to cooperate as fully as possible, based on social trends	P.29
Our first contract with this company.					
3 more new contracts.					
We planned a reduction in basic units, compared to the previous year, by reducing the number of units of oil to be consumed during operation while increasing the number of units of LNG. We will try to continue in the same direction.	Maintaining at current reduced level (Reference: An average of 0.10g/kWh for the five-year period from fiscal 1996 to 2000)			We maintain at current reduced level	P.47
We will try to continue in the same direction.	Maintaining at current reduced level (Reference: An average of 0.16g/kWh for the five-year period from fiscal 1996 to 2000)			We maintain at current reduced level	P.48
We have a shift toward a high rate of reuse of resources. We saw a reduction of approximately one-third in volume of waste compared to the previous year (approx. 30,000t).	More than 90%			We are promoting the three 'R' s (Reduce, Reuse, Recycle) with regard to industrial waste.	P.55
We switched over completely to the use of recycled paper for use as copy paper at all our places of business. We will continue to use such in the future.	100%			We will continue to implement our policy of using 100% recycled paper for use as copy paper at all our places of business.	P.59
Last year, we built 18 fossil fuel electric power stations conforming to ISO standards. However, Tanagawa and Tanagawa 2 merged, bringing the total to 17. In fiscal 2000, the Mihama and Kishiwada power stations were added to this to give us a total figure of 19.	Order in Increase in Number of Places Conforming to Standard			We plan to strengthen our environmental management system.	P.12
Measures were implemented to heighten awareness. However, as the results were deemed unsatisfactory, we are renewing our efforts in this area in the direction of having individuals themselves work to heighten their own awareness.	Independent activities carried out at each location (items decided independently, with efforts made to achieve over 70% of targets set)			We need to increase awareness with regard to the environment. We shall revise our activities in this area.	P.68



## Kansai Electric's Measures to Prevent Global Warming - New ERA Strategy

Kansai Electric is actively developing its New ERA Strategy, a comprehensive policy on the further reduction of greenhouse gas. We will continue to explore new possibilities that can be integrated in this strategy.

“ERA” is an acronym for

- Efficiency:**            **efficient utilization of energy by society as a whole**
- Reduction:**        **reduction of greenhouse gas emissions in electric power supply**
- Activities Abroad:** **activities carried out abroad to prevent global warming.**

The initials “ERA” also represent our commitment to cultivate a new era in environmental protection (see Figure 1).

The Third Evaluation Report of the IPCC released in March 2001 (Intergovernmental Panel on Climate

Changes) predicts that the average temperature worldwide will rise by as much as 1.4 to 5.30C by the year 2100, and that the impact of global warming on nature and society will appear over a long-term period, with the number of areas affected increasing throughout the whole world.

In order to solve the global warming problem, not only is it vital to take immediate action but also to face the problem with a medium/long-term and global view.

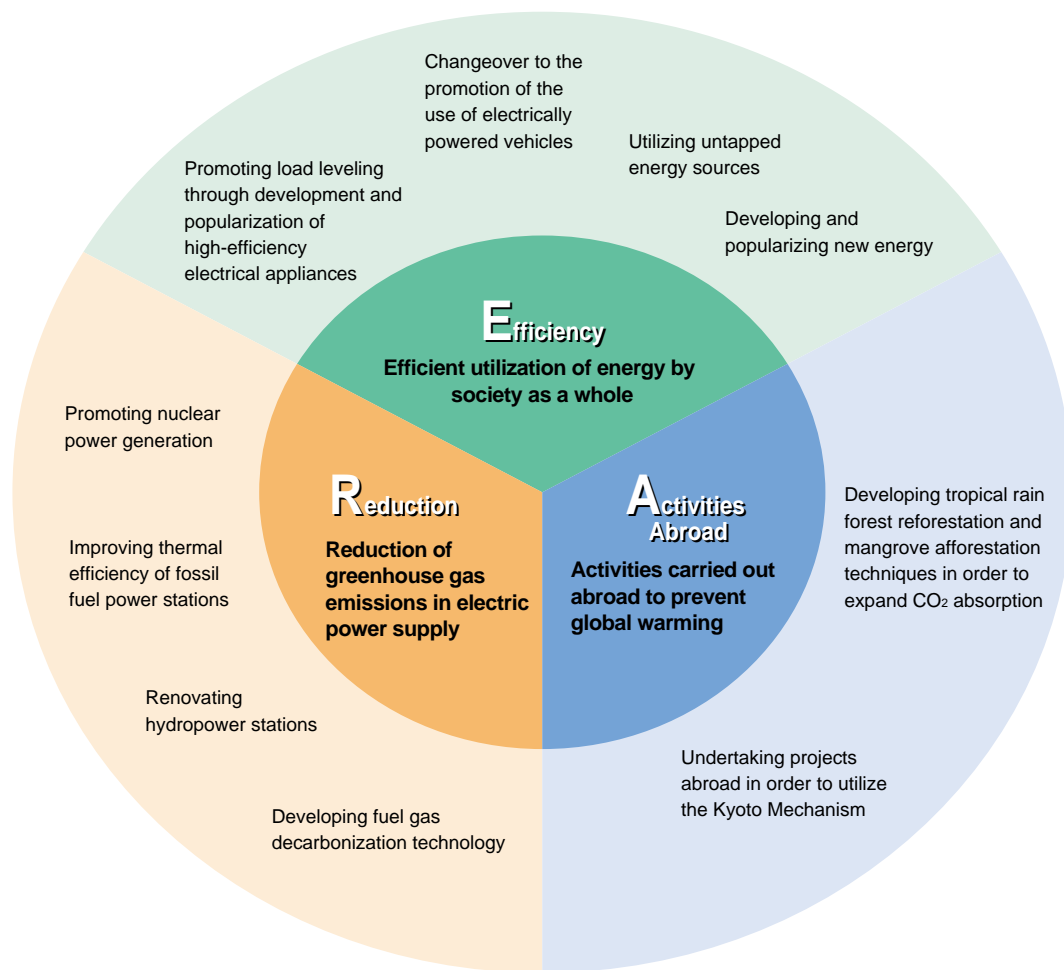
Kansai Electric will continue endeavoring to maintain sustainable development by simultaneously achieving its goals - the 3Es, which are:

- Economical Growth
- Energy Security
- Environmental Preservation

We are working to balance the “E,” “R,” and “A” of our New ERA Strategy in order to propel our long-term endeavor to preserve the global environment.

The various measures included in the New ERA Strategy are described from page 25 onwards.

New Era Strategy (Figure 1)







### Kansai Electric's CO<sub>2</sub> reduction target

Global warming is believed to have been caused by an increase in so-called greenhouse gases such as CO<sub>2</sub>.

Under the New ERA Strategy, we have set a number of numerical goals to reduce CO<sub>2</sub> emissions per kWh (emissions per unit of power consumed) utilized (sold) in fiscal 2010 to 0.3kg-CO<sub>2</sub>/kWh, in accordance with the targets of the electric power industry (see page 24).

As a result of the New ERA Strategy, CO<sub>2</sub> emissions utilized in fiscal 2000 amounted to 0.28kg-CO<sub>2</sub>/kWh, a reduction of approximately 7% over fiscal 1990 despite the 18% increase of electrical power consumed (sold) (see Figure 2).

Kansai Electric's CO<sub>2</sub> emissions per kWh are lower than those of major Western nations, just above France with its high nuclear power ratio and Canada with its high hydropower ratio. We will continue in our efforts to voluntarily and assertively reduce CO<sub>2</sub> emissions based on the New ERA Strategy (see Figure 3).

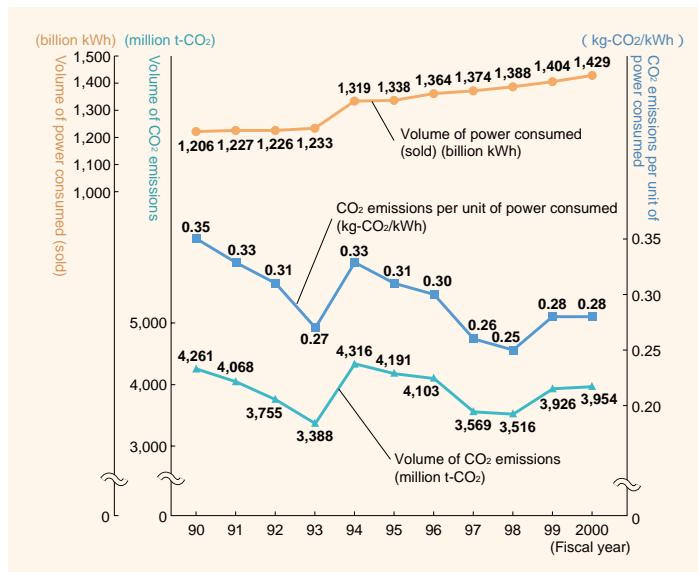
### The effect of CO<sub>2</sub> reduction through the New ERA Strategy

As a result of our efforts, CO<sub>2</sub> emissions saved were approximately 20.3 million t-CO<sub>2</sub> less in fiscal 2000 as compared to fiscal 1990 levels. This is equivalent to approximately 2% of Japan's total CO<sub>2</sub> emissions — 1.23 billion t-CO<sub>2</sub> — in fiscal 1999. Converted into the petroleum equivalent, this amounted to an estimated saving of approximately 7.3 million kl of oil (equivalent to about 80% of our annual fuel consumption).

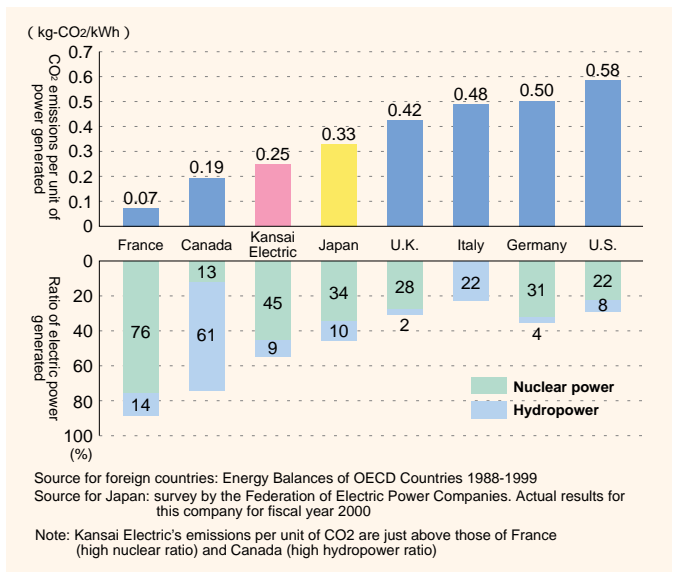
Nuclear power generation accounted for nearly 90% of the total reduction, primarily due to the start-up of Units 3 and 4 at the Ohi Power Station (nuclear) after fiscal 1990 and the increased generation of CO<sub>2</sub>-free nuclear power owing to the improved capacity utilization factor at nuclear power stations.

Other measures to reduce CO<sub>2</sub> emissions include improved thermal efficiency at fossil fuel power stations, use of LNG, and development of hydropower resources (see Figure 4).

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

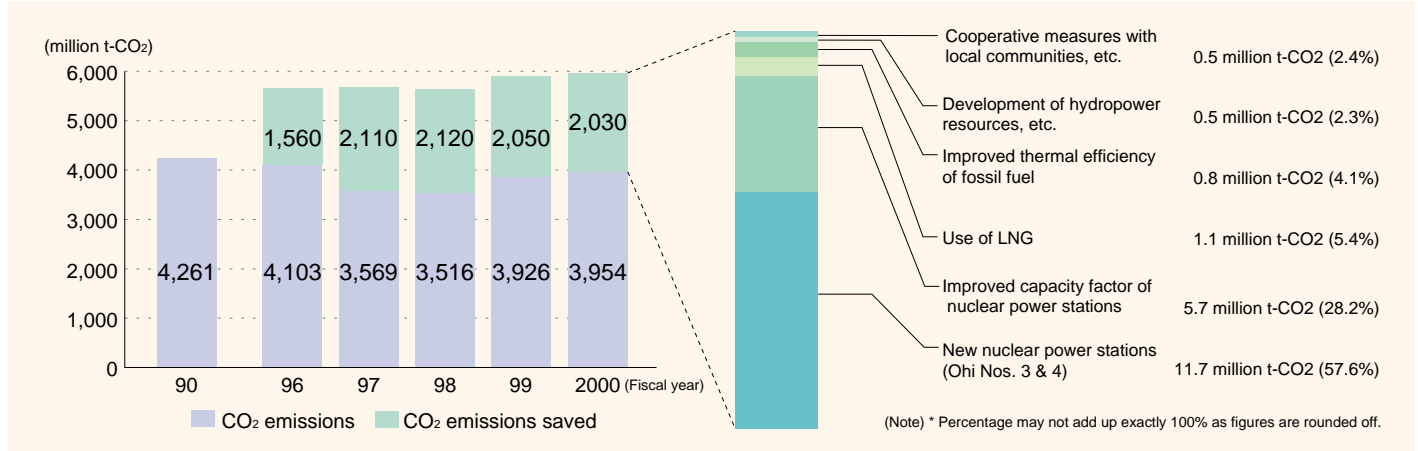


CO<sub>2</sub> emissions per unit of power generated and nuclear/hydropower ratio (1999) (Figure 3)



Source for foreign countries: Energy Balances of OECD Countries 1988-1999  
 Source for Japan: survey by the Federation of Electric Power Companies. Actual results for this company for fiscal year 2000  
 Note: Kansai Electric's emissions per unit of CO<sub>2</sub> are just above those of France (high nuclear ratio) and Canada (high hydropower ratio)

CO<sub>2</sub> emissions saved by New ERA Strategy (Figure 4)



(Note) \* Percentage may not add up exactly 100% as figures are rounded off.



## Environmental Accounting

For the first time, we made public our quantitative understanding of cost and effect in relation to environmental conservation. We drew up a set of accounts with regard to the environment for the year 2000 with the aim of promoting even more cost effective activities in the area of environmental conservation.

The accounts for fiscal year 2000 were drawn up in reference to the 'Accounting Practices toward a System for Environmental Accounting (2000 Report)' released by the Ministry of the Environment, and take into consideration environmental cost and effect for all our companies during the fiscal year 1999.

Since then, we continue to search for ways to enhance our environmental accounting program, basing that search on consultations with and research by electrical industry companies while referring to the opinions of those who have perused our accounts.

The result of these efforts is evidenced in the calculation of result values for the fiscal year 2000, where the categories used to calculate environmental cost were revised to reflect unique electrical industry characteristics as part of the effort to make the process of understanding costs more rational.

In addition, with regard to our method of accounting, we have included costs related to nuclear power generation for which environmental costs can be extracted, such as the costs associated with radiation measurement and control and radioactive waste disposal. These had been excluded from the previous year's calculations as compound costs that would 'have to be considered in the future.'

Furthermore, in relation to the associated economic effectiveness of measures toward environmental conservation, where there was a solid basis for doing so we have increased the number of items included in accounting calculations compared to the previous year.

### Range of total: Entire company Period: April 1, 2000-March 31, 2001

Environmental protection costs		Units: 100 million yen	
Field	Main items	Amount invested	Expenses
I. Cost of environmental management			50.6
1. Cost of environmental management	Compilation of environmental reports, internal education on the environment, obtainment of external ISO certification		0.7
2. Labor costs			49.9
II. Cost of measures against global warming	Measures toward increasing thermal efficiency at existing fossil fuel power stations, purchase of excess electricity from new energy sources	20.3	5.6
III. Cost of conservation of regional environment		274.1	273.0
1. Cost of monitoring and measuring environmental impact	Management of measuring levels of radioactivity, research and measurement of environmental concentrations	4.9	24.4
2. Cost of preventing pollution	Measures for preventing air pollution (measures for extracting sulfur and nitrogen), measures to prevent water contamination	79.5	187.0
3. Cost of protecting nature and harmonizing with environment	Underground maintenance, greening	189.7	61.6
IV. Cost of building a metabolic society		25.7	67.9
1. Cost of disposing of and recycling industrial waste	Processing of industrial waste	0.9	12.9
2. Cost of disposing of and recycling general waste	Subcontracting recycling of old paper		0.3
3. Cost of processing radioactive waste	Processing of radioactive waste	24.7	54.0
4. Cost of green purchasing	Effective use of insulation material scrap in paving, use of recycled road base material	0.1	0.7
V. Cost of technological development	Fixing CO <sub>2</sub> absorption, recycling of waste	0.6	29.2
VI. Other		3.5	18.1
1. Cost of living in harmony with local environment and education on environment	Co-sponsorship for groups and events related to environmental conservation		3.3
2. Cost of environmental advertising	Monthly events related to the environment, PR work on saving energy		2.8
3. Cost of international efforts	Improvement of overseas electrical power stations, research into improvement,	3.5	0.3
4. Cost of environmental subsidies and donations	donations to overseas environmental funds, levies on pollution levels		11.7
<b>Total</b>		<b>324.2</b>	<b>444.4</b>

Amount of Investment: Mainly costs associated with construction and equipment  
Amount of Expenses: Cost associated with maintaining and running equipment, cost of internal education.

Reference		Units: 100 million yen
	Main items	Total amount
Total investment during the related period	Construction of power stations	4,790.2
Total R&D expenses during the related period	R&D to streamline operation of power stations	286.5



Effect of environmental protection activities					
Field		Items (unit)	Result for fiscal 2000		Details
I .Effect in relation to environmental management		Premises that have received external ISO certification (number)	3		5 (Total)
II .Effect in relation to global environmental conservation		CO <sub>2</sub> (kg-CO <sub>2</sub> /kWh)	0.28	Compared to fiscal 1990 $\Delta$ 0.08g/kg-CO <sub>2</sub> /kWh	Total emissions 39,540,000t-CO <sub>2</sub>
III .Effect in relation to regional environmental conservation	Effect in relation to prevention of air pollution	SO <sub>x</sub> (g/kWh)	0.07	Compared to fiscal 1990 $\Delta$ 0.11g/kWh	Total emissions 2,834t
		NO <sub>x</sub> (g/kWh)	0.15	Compared to fiscal 1990 $\Delta$ 0.09g/kWh	Total emissions 6,123t
	Effect on harmonizing with environment, etc.	Extension of underground electric cable (km)	300		12,364 (Total)
		Grid extension (in thousands of km <sup>2</sup> )	13		4,076 (Total)
IV .Effect in relation to building of metabolic society	Introduction of electric vehicles (number of vehicles)		177		
	Percentage of reuse of industrial waste as resource (%)		84		Total emissions 71,000t
	Low-level radiation solid waste (200-liter drums)		2,944		111,205 (Total)
V .Other effects	Planting of trees (units of 10,000)		3.0		26.5 (Since fiscal 1993)
	Beautification activities (no. of cases)		1,521		4,274 (Since fiscal 1996)

Economic effect of environmental protection measures			Units: 100 million yen
Field	Main items	Total amount	
Income from recycling	Flue gas desulfurization plaster	0.1	
Costs saved from energy conservation	Measures to improve the thermal efficiency of thermal power stations*	120.0	
Costs saved from things like reuse and recycling	Reuse of things like transformers	47.0	
Cost of research undertaken	Income from work to reduce CO <sub>2</sub> emissions abroad	0.3	
<b>Total</b>		<b>167.4</b>	

\*With respect to the thermal efficiency of thermal power stations, the reduction in fuel costs for the corresponding year was calculated from the improvement in thermal efficiency derived by adjustment for the base year for environmental protection effectiveness (CO<sub>2</sub>, SO<sub>x</sub>, NO<sub>x</sub>) and comparison with the fiscal year 1990.

## Future Prospects

When it is necessary to derive environment preservation costs from compound cost figures, which include costs beyond those related to environment preservation costs, we are doing our best to grasp (measure) these costs by employing the “Environment Accounting Guideline” method (totals based on balanced sums, proportional sums, and the simple sums method, etc.). However, no method has been established that allows for the extraction of environment preservation costs from all of the related compound costs.

In particular, considering that nuclear power generation is effective from the aspect of environment preservation, as a countermeasure against global warming, and further, that it is important as a measure for energy security, it can be considered that, in the field of energy generation works, nuclear power generation can produce classic examples of compound costs. Thus, we consider that it is essential to handle the matter most carefully when

attempting to add up environment related costs.

Environment preservation costs, such as radiation management, radiation measurement costs and radioactive waste disposal costs, etc., were included in the environment accounting of nuclear power generation costs for the fiscal year 2000. However, other nuclear power generation costs were omitted from these cost calculations due to the fact that there are several varying opinions on the methods that should be employed for the extraction of environment preservation costs.

In regard to the handling of compound costs, including figures for nuclear power generation costs, and the like, we fully intend to conduct continuing studies and make every effort to improve the accuracy of our understanding of environmental protection costs. Furthermore, we are actively engaged in the development of improved environment accounting methods as tools to be employed in the performance of effective environmental measures.



## Segment Test Run of Environmental Accounting for Sakaiko Power Station (Fossil Fuel)

In order to make use of such environmental accounting in our internal management, we ran another set of test figures using the Sakaiko Power Station as our segment model.

We are working to implement the 3 'R's at all our fossil fuel power stations. As part of this, we are in the process of fitting all of them with insulation blocks to fulfill the criterion of Reuse (See p. 56). In the fiscal year 2000, on carrying out a periodical inspection of the boiler re-heating apparatus, we used environmental accounting to

make an evaluation: we made a cost comparison between the usual case, where we replace the insulation material at each periodical inspection, and the case with reusable insulation material. We found that the initial cost of installing block installation would come to 29 million yen. However, that could later be recovered from the saving made at each inspection, giving us a reduction of an estimated 40 million yen at the time of the third inspection. Furthermore, it was found that we would be able to reduce insulation waste by 93t.

Environmental Protection Costs		
Field	Items	Amount (in millions of yen)
Cost of Building a Metabolic Society	Increase in Cost Accompanying Installation of Block Insulation	29

Effect	
Economic Effect (in millions of yen)	Effect of Environmental Protection Activities
•Reduction in Cost of Processing Industrial Waste 3	Volume of Reduction in Industrial Waste 93t
•Reduction in Cost of Periodical Inspections 37	

We will continue to make use of such segment-type analysis in our environmental accounting. In all our areas of operation we will analyze measures toward environmental protection against cost effect. We believe this will be useful in making efficient investment decisions.



## Environmental Accounting in Environmental Report

The global environment is continuing to worsen. Against this background, much is expected of business, which forms the very core of all economic activity, and its taking of a positive and moreover autonomous approach to matters of environmental protection.

However, if this is the case, then it is important that society properly understands such efforts and prepares itself to lend its support as a whole. The Ministry of the Environment has issued a set of guidelines entitled 'Accounting Practices toward a System for Environmental Accounting (2000 report)' with the aim of enabling business to strive for sustainable development while promoting efficient and ever more effective measures toward environmental protection.

Here, we will give a simple outline of what these guidelines contain.

### Domestic and Foreign Considerations

Centered on the Ministry of the Environment and the Ministry of Economy, Trade and Industry, study is still being carried out on environmental accounting through various research organizations and related groups along with other such research bodies. Such work is also being carried out overseas by various international bodies. Recently, since fiscal 1999, the United Nations Sustainable Development Group has been carrying out investigative research into the role of government in the promotion of environmental accounting. Representatives from our own Ministry of the Environment are taking part in this process.

### The Significance of the Environmental Accounting

The Environmental Accounting Guidelines state that: 'With regard to environmental accounting systems, businesses should aim at sustainable development; they should strive to promote efficient and ever more effective measures toward environmental protection while maintaining a good relationship with the larger society; they should achieve a quantitative understanding of the costs and beneficial effects of environmental protection in the process of their business activities as much as possible; they should then analyze and make public these figures'.

### The Function of Environmental Accounting

#### Internal Function

Such accounting will function as a tool by which businesses may obtain a quantitative understanding of cost against effect in undertaking measures toward environmental protection, figures it can then analyze to make efficient investment decisions at the management level.

#### External Function

For society, they constitute a unified framework, providing a valid source of information by which it may understand and evaluate the work a given business is undertaking toward environmental protection.

### A Proper Understanding Through Environmental Accounting

The Guidelines also state that: 'When publishing an environmental report, it is desirable that such figures should be included'. Furthermore, it goes on to say that,

in order to give a proper understanding of environmental accounting information, 'With regard to the current state of affairs in relation to work being carried out by a business toward environmental protection, such material should not just include information drawn from environmental accounting. It should also include relevant information from other sources, too, and that decisions should be made taking a comprehensive approach to this body of information. (Abbrev.) A given business should be understood by taking into consideration what that company is doing against a whole background of knowledge drawn from the comprehensive range of information contained in such an environmental report'.

### An Emphasis on Autonomous Action

The Guidelines state that: 'Currently, the framework for environmental accounting is as yet incomplete. As we are required to respect the autonomy of each business we address, we are therefore necessarily limited by the differing characteristics of those businesses.' The specific methods for grasping information given in the guidelines could also be said to be in the trial stage.

That is to say, companies themselves may be thought of as contributing to the development of the Environmental Accounting System through the various creative measures that each company takes toward the environment in approaching its own environmental accounting.

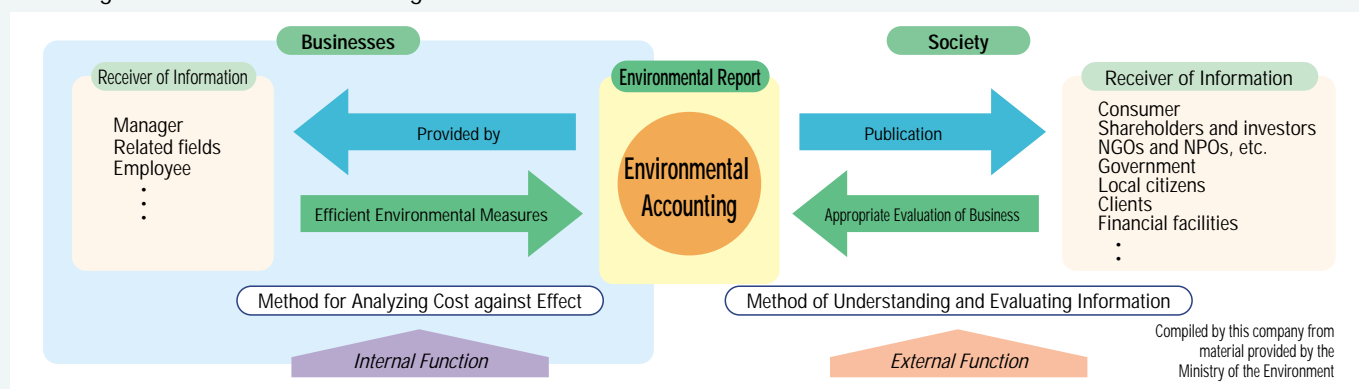
### Further Follow-up

Research into and the introduction of environmental accounting is making steady progress.

The Ministry of the Environment considers the current set of guidelines to be very much applicable to the year 2000 only. It intends to constantly update and bolster its contents through various coordinated research activities and by gathering a wide range of opinion from various related experts. In this way, it hopes to create a set of guidelines that will make a real contribution to environmental accounting.

\*Apart from this, there are a number of other sets of guidelines published which give a breakdown and analysis of the environmental protection costs and provide information on the compilation of environmental reports. For more details, please visit a web sites operated by the Ministry of the Environment (<http://www.env.go.jp>) and the Ministry of Economy, Trade, and Industry (<http://www.meti.go.jp>).

### Ranking of Environmental Accounting



# Environmental Management System



## Environmental Management System

### Kansai Electric's Environmental Management System (Companywide Efforts)

Environmental management at Kansai Electric is based on the principle of TQM (total quality management)\*. In April of 1998, to further bolster our environmental management system, we set out the "Protocol on Environmental Management". This system is outlined below (see Figures 5 and 6).

\*In 1981, we were the first electric power company to introduce a TQC (total quality control) method. In 1984, we received the Deming Prize for contributions to quality and dependability of product. Since then, we have been pursuing consistent and comprehensive activities aimed at improving our environmental performance.

The Nuclear Power and Environmental Committee is chaired by our company president and made up of members of management. Every year, this committee sets concrete action plans for the entire company.

Based on the company's environmental policies and action plans, all divisions, departments, and branches make their own plans and goals that they follow in their environmental improvement activities. They independently check and review the results of these activities.

The Environmental Considerations Department checks and reviews all the various activities carried out throughout the company. When necessary, the Quality and Safety Improvement Audit Department assesses the appropriateness and effectiveness of the environmental management system.

Furthermore, the Environmental Considerations

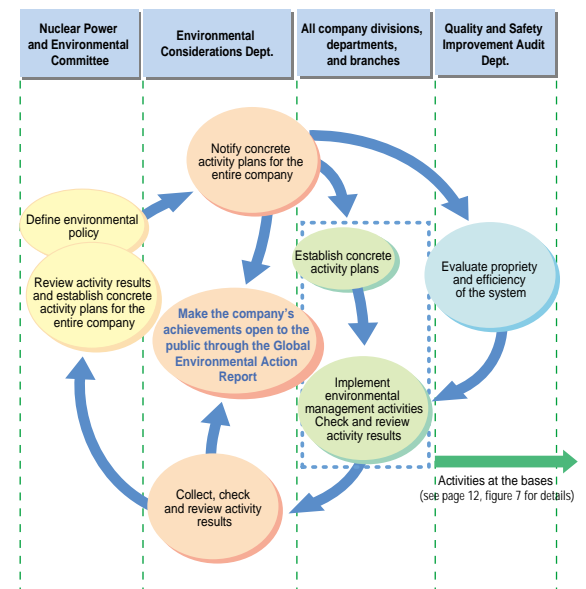
Department reports the results of the check-and-review process to the Nuclear Power and Environmental Committee so that these results can be reflected in the company's concrete action plans for the following year.

The Environmental Considerations Department is the general control center for the operation of the environmental management system. In all divisions, departments, and branches, the Department has set up organizational structures and appointed personnel for the purpose of environmental management.

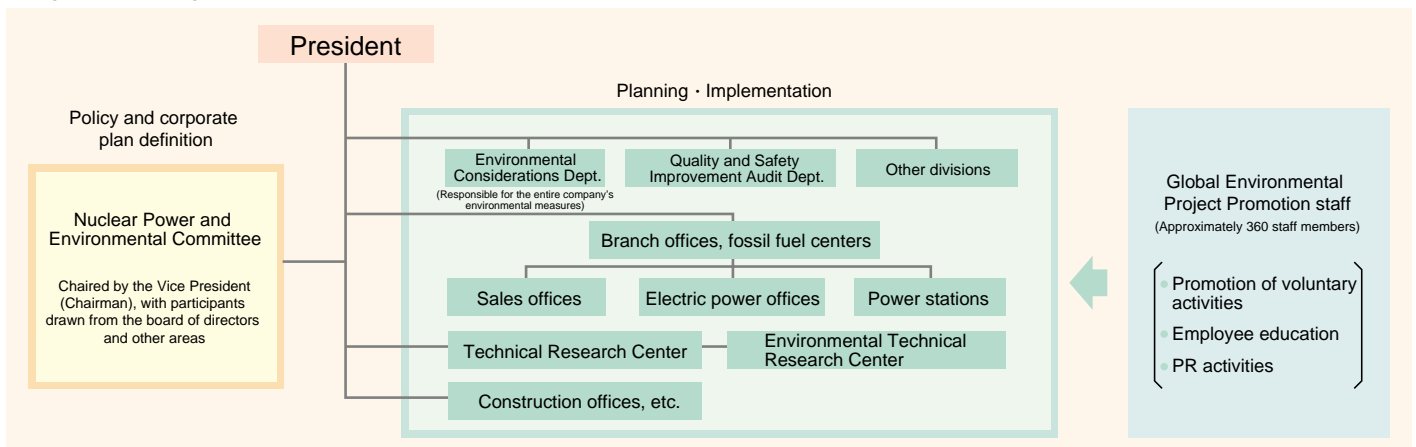
To boost independent efforts in all workplaces throughout the company, we have appointed about 360 environmental project promotion staff members, whose job it is to carry out activities such as internal education and training and external public relations for their own part of the company.

Every year, we publish for the general public the Kansai Electric's Global Environmental Action Report, which outlines the state of our environmental management activities.

PDCA Cycle (Figure 6)



Organization (Figure 5)





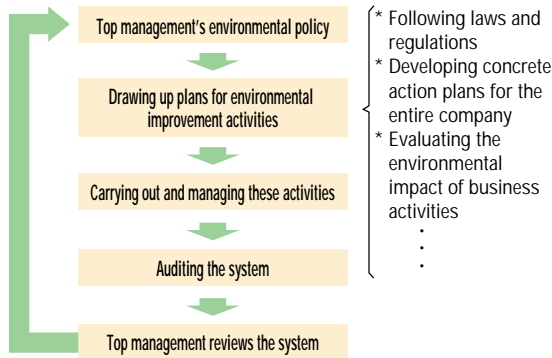


## Environmental Improvement Activities Based on ISO 14001 (Examples from our facilities)

### Efforts at Facilities to Create a Comprehensive Environmental Management System

In order to enrich the company’s environmental management system, in 1997 we began building an environmental management system compliant with ISO 14001, an international environmental management standard, starting with our fossil fuel power stations (see Figure 7).

ISO 14001 compliance activities (Figure 7)



As a result, we have seen even greater effort toward saving energy resources along with a heightening of awareness with regard to the environment in our staff.

Based on this result, we completed the introduction of an environmental management system at our Mihama Power Station (nuclear) in fiscal 2000 and began introducing the same at our electric power offices at Kishiwada, Tanabe, Himeji and Kurobegawa.

From fiscal 2001, we plan to further develop this at other nuclear power stations (Ohi Power Station) (see Table 1).

Facilities Conforming to ISO14001 Standard (Table 1)

Type of Facility	Power offices	Fossil fuel power stations	Nuclear power stations
Self-declared	0( 3 )	13	1( 1 )
Externally certified	1	4	0

Those in parentheses under construction (noted separately)

### Specific Operations

The following gives information on how those facilities that have instituted an environmental management system in line with the ISO14001 Standard are putting it into practice.

#### Environmental Policy

The Chief of each facility bears the ultimate responsibility for environmental management. They have each defined their own individual policies with regard to the environment based on company policy and the special features of each

facility. This policy has been communicated to all staff and made open to the general public.

#### Planning

##### *Environmental Aspect*

As many as several thousand environmentally significant elements have been identified in the activities of our facilities. Elements that have potentially, or have a significant impact on the environment, such as the use of certain raw materials, emissions of CO<sub>2</sub> and NO<sub>x</sub>, and the disposition of waste materials, have been specified as “Significant Environmental Aspects.”

##### *Objectives and Targets*

We have set environmental goals to be met as part of our activities toward improving the environment. These are based on environmental policy, legal requirements, and our own set of Significant Environmental Aspects. Furthermore, with a view to achieving those targets, each relevant section has set its own specific targets and has developed plans of action and schedules. In this way, we are working to establish an environmental management program.

#### Implementation and Operation

##### *Staff Training*

We are running basic education programs for all our staff at our facilities concerning the environmental management system. Furthermore, we are checking the abilities of those staff that are performing tasks which can have significant environmental impacts by providing specialist education and requiring both written and practical examinations.

We are also training for an emergency at our facilities.

##### *Communication*

In addition to offering education on energy and the environment at schools on request, we are also working toward greater communication with local communities through setting up PR facilities and putting on events open to the public at our various facilities.

##### *Operational Control*

Operations and activities related to the environmental management program and Significant Environmental Aspects are under constant control based on a set of working procedures that stipulate operational criteria.

#### Checking and Corrective Action

##### *Monitoring and Measurement*

We monitor and measure all boiler gas emissions and waste water from our facilities where there is the potential for significant environmental impact. In the





event of any irregularity occurring, there is a set of procedures to be followed. Furthermore, the current state of our environmental management program is regularly evaluated by the Environmental Committee.

### Internal Environmental Auditing

Each facility puts together a team made up of its own staff to carry out an environmental audit each year on a regular basis.

The audit covers conformance with the ISO14001 Standard, compliance with laws and regulations, environmental performance and so on. This audit is mainly carried out by internal auditors that have been trained at auditor training institutes. This, therefore, serves to heighten impartiality and transparency. Furthermore, such auditors are seconded to other sections other than their own to even further heighten objectivity.

Moreover, improvements are being carried out to rectify flaws that these internal audits have identified in the amendment of organizational naming of various types of documentation and in security at closed waste disposal incinerator facilities.

### Review by top management

Top management of each facility carries out a complete review of the results of internal audits: how far targets have been met with regard to the environmental management program, whether legal requirements are being strictly adhered to and system reorganization at the

end of each year. It then examines whether this will entail any improvements or revisions being made. Based on the result of this activity, Chief of each facility then determines the plan for the following year. In this way, we are undertaking continual improvement activities.

### Acquiring External Certification

In fiscal 1999, the Miyazu Energy Research Center and Himeji No. 1 Power Station achieved ISO 14001 certification from third party institutions. This will ensure even more objective assessment of our activities.

In fiscal 2000, the Kainan Power Station, Himeji No. 2 Power Station, and, for the first time at one of our electric power offices, the Kishiwada Electric Power Office all received external certification (see Table 2).

We will continue to work to enhance a safe system of environmental management, and at the same time will continue to strive for external certification.

Facilities that have been awarded external certification (Table 2)

Name of facility	Date of Registration
Miyazu Energy Research Center (Fossil Fuel)	March 24, 2000
Himeji No.1 Power Station (Fossil Fuel)	March 24, 2000
Kainan Power Station (Fossil Fuel)	October 27, 2000
Himeji No. 2 Power Station (Fossil Fuel)	March 23, 2001
Kishiwada Electric Power Office	March 23, 2001

## Environmental Management System at the Miyazu Energy Research Center



The Miyazu Energy Research Center (fossil fuel power) works to protect the environment, following all laws and regulations and preventing pollution before it happens. It also carries out research into new sources of energy.

**環境基本方針**

1. 所員一人ひとりの環境安全に係わる意識向上を図り、環境安全活動の推進体制を確立し、環境管理システムの継続的改善に努めます。
2. 法令及び関係自治体との協定を遵守し、積極的かつ継続的な環境保全活動を推進します。
3. 環境保全設備の性能の維持ならびに循環型社会に適合した事業活動の推進により、環境安全の実現化に努めるとともに、教育訓練の実施により真実時の対応体制の維持に努めます。
4. 発電熱効率の維持向上、省エネルギー活動の推進に努めます。
5. 進排水利用研究、新・省エネルギー研究を通じ、地域環境保全と地球環境保全に努めます。
6. 地域共生活動などに積極的に関わり、当所の環境安全活動を社外に積極的にPRするとともに、PR施設において環境安全に関する提言を通じて、地域環境保全活動に努めます。

制定 平成9年11月28日  
最新改定 平成12年5月16日  
関西電力株式会社  
宮津エネルギー研究所  
所長 高橋 康博

By doing away with a special bus that used to take employees to work and having them instead take public transportation, the Miyazu Energy Research Center has cut costs and taken a contributor of exhaust fumes off the road.

This has allowed the public bus system, which used to operate in the red, to increase the number of buses and lengthen routes. Public transportation now takes people as far as our office and the Tango Watch-Kan, a public exhibit which houses an aquarium.

This expansion of the bus system has meant more convenience for local senior citizens and students traveling to school. The local municipality no longer has to subsidize underused bus routes, the bus companies have more passengers to keep them in business, and there are fewer cars on the road. Locals have praised the Miyazu Energy Research Center for energizing public transportation and creating convenience in the local community.

The Miyazu City Eco Network, formed by the city and major local groups, has called for companies in the area to be ISO 14001 compliant. By being the first company to do so, the Miyazu Energy Research Center has made itself the city's leading corporate citizen.



Miyazu Energy Research Center



## Education of Company Employees

We plan to promote even greater activity toward environmental protection throughout all our areas of business. Therefore, we believe it is necessary to continually educate our personnel. This is done at each place of work according to role and level of responsibility, so that each employee may become ever more autonomous and positive in their approach to the environment.

We will continue to run various internal education programs. These will be aimed at giving each employee in charge of, or responsible for, implementing any given policy on the environment in the workplace an understanding of domestic and international trends with regard to various environmental issues, a knowledge of the company's own specific measures with regard to each problem and the directionality of those measures.

In the year 2000, we gave staff newly responsible for dealing with environmental issues and staff at the deputy-chief level the necessary basic knowledge to reach an understanding of our company's environmental policies and of how to positively promote them; and we gave them the necessary knowledge and ability to function as internal inspectors in order to facilitate a smooth introduction of the ISO14001 standard. In this way, we ran a highly effective and practical program of study (see Table 3).

We intend to continue to enhance our employee education program so that we may further promote environmental protection, starting by giving our staff the practical knowledge to deal with the requirements and implementation of the ISO14001 standard.

Staff Education Programs Currently Available (Table 3)

Type of Education	Date	Content	Staff Targeted	Number of Staff Attending
Course on Inspection of Internal Environment	2000/10	This aims at educating environmental inspection staff at each place of business; it aims to give them the knowledge of the requirements and inspection methods demanded by the ISO standard, and aims at leveling up their abilities. This is to accompany the introduction of internal inspection with regard to the environmental management system.	Internal Inspectors at each Plant (Deputy Chief, Manager level)	23
Course for Staff Responsible for Environmental Management	2000/9	This aims to raise levels of ability and knowledge relating to the requirements and management methods within the ISO standard, and is targeted at those staff in charge of implementing environmental management.	Each Deputy Chief, Chief Manager and Manager at headquarters and branches	93
Course for Staff Responsible for Environment	2000/9	This is intended to give staff knowledge of the company's environmental policy, external and internal trends associated with environmental issues, environmental management methods within the ISO14001 standard and the greening of the environment	Staff Newly Responsible for the Environment	47

## Award for Excellence in Promoting Action Plan for Global Environmental Consideration in Workplace

In order to raise staff awareness of environmental protection and to encourage related activities, we established a system of awards in fiscal 1992 to commend branches for excellence in this field. Commendation is not just restricted to those who have commenced a new plan of action for that year: it is also given on a comprehensive

## Emergency Measures

The "Air Pollution law" defines an emergency as that in which air pollution reaches the level, which may cause damage to human health and the living environment.

In such cases, the governors of municipal governments are to issue public announcements such as forecasts and warnings according to the degree of the state of emergency.

All our fossil fuel power stations are equipped with computerized on line systems in which real time observations are possible. In the event of an emergency, appropriate actions are taken quickly (see Figure 4).

In the photochemical smog emergency, we take measures meeting the local government's request to reduce nitrogen oxides (NOx) by raising efficiency of denitrification facilities, and restricting out put of power and converting to good quality (low-nitrogen content) oil.

We submit the reduction plans in emergency to relevant prefectural authorities during the early fiscal year.

Number of Measures Taken to Reduce NOx Emissions in the Photochemical Smog Emergency (Number for year 2000) (Table 4)

Number of measures taken to reduce NOx emissions at our fossil fuel plants concerned	Number of photochemical smog warnings issued	
	Forecast	Warning
41	44	54

\*The difference of the number caused from not operation our plants concerned when the warnings issued.

evaluation of such work where it has been carried out with great conscientiousness over an extended period of time.

Example of Work Carried out at an Award-Winning Workplace in Fiscal 2000



Nara Electric Power Office  
For cooperation with Elementary School,  
in building of biotope

## Monitoring and Measuring of Environmental Impact

### • Monitoring and Measuring of SOx and NOx

In addition to promoting environmental measures throughout all our stations, we also carry out regular inspections and periodical measurements to ascertain whether such measures are actually taking effect. In particular, we conduct inspections and measurements at all of our power stations involving levels of air pollution, water pollution, and noise and vibration in agreement with relevant governing bodies.

Particularly, the amounts of SOx and NOx in flue gas are transmitted to such monitoring centers, in addition, we report the measuring results of quality in waste water such as chemical oxygen demand and suspended solids.

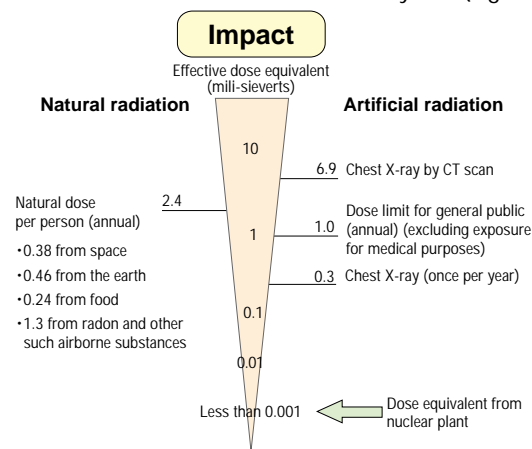
Finally, we also conduct monitoring survey to make a comprehensive assessment of our impact in the vicinity of our power stations. No particularly impact has been observed.

### • 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 (see Table 5).

The amounts of radiation given off from radioactive waste from our nuclear power stations are almost always below the limits of detectability. Therefore, the yearly amount of radiation that reaches the local population is less than 0.001 milli-sieverts. A comparison will show that this amount is far lower than the amount of natural radiation that the public would be exposed to in one year, which would be 2.4 milli-sieverts (see Figure 8).

Level of Radiation Encountered in Daily Life (Figure 8)



Evaluation Value of Radiation in the Power Station Surrounding Area (Table 5)

(Milli-Sieverts per year)

Power Station	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Mihama	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001
Takahama	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001
Ohi	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001	below 0.001

Siebert: Unit denoting degree of impact of radioactivity on human body



## Technological Development for Environmental Protection

Our company is involved in a wide range of research activities. In order to isolate CO<sub>2</sub> as the main factor of global warming, collect, fix and turn it into a resource, we are conducting research utilizing chemicals, organic matter and plant life. We are also researching

environmental problems familiar to us all, reducing waste, promoting reuse and planting trees around the power plants. (See p. 27, p. 35, p. 36, p. 39 ~ p. 40)



## State of Environmental Communication

### Communication with the Local Society

We are keen that all our employees use the information and opinions they hear from our customers and from members of the public as they go about their daily lives and business to the best advantage at their place of work. We call this our 'Face to Face' policy on communication with the public.

Where necessary, information received in such a way will be responded to by that place of business, and, at the same time, such information will be disseminated throughout the company via our LAN system as 'The Voice of Danbo'. In this way, all our employees are able to see this information. Please allow us to introduce a few examples with regard to environmental protection.

- It is extremely significant that corporate bodies should take the initiative in tackling environmental problems. Please continue the good work. (male)
- I didn't know that Kansai Electric was involved in tree planting. I realize it might not sound much, but I was very impressed. (female)
- I would like to see you working to promote not just nuclear power, but solar and wind power, too. (male)

**Our company's response:** We are indeed working to develop and popularize new energies through introducing a system of purchasing excess electricity and by cooperating with the work of the Kansai Green Energy Fund.

- I approve of the Green Energy Fund, but at 500 yen per month I can't help feeling it might be too high for some people. (male)

**Our company's response:** From April of 2001 this will be cut to 100 yen per month.

- I saw one Kansai Electric vehicle which had been parked with the engine still running despite having a sticker calling on people to switch off when they stop. (female)

**Our company's response:** We are working to remind all our staff to be aware of the need to switch off their engines when they stop.

Furthermore, we are using public calls for feedback to gather 'Electric Monitor' opinions using surveys, informal discussion meetings, lectures, educational tours and so on. In all these ways we are working to promote a deeper understanding of our company's activities within the general public.

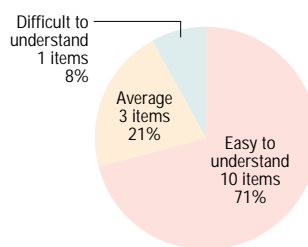
Moreover, apart from carrying out questionnaires on our customers, we are also working to further boost communication through exchange of opinion with experts from other fields and people with their finger on the regional pulse. This is being done at 'Informal Talks on Energy' held at our various branches and 'Informal Discussions on Services' at our offices.

### Communication by means of Environmental Reports

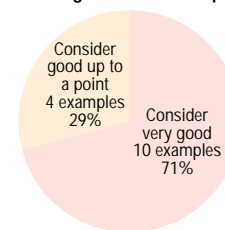
Each year the company publishes its 'Kansai Electric Power's Global Environmental Action Report' (this report), which gives information on the company's policies with regard to measures toward environmental protection, goals and the current state of such activities. This is the 9th such report. (In fiscal 1998, we received the Prize for Excellence from the Environmental Reporting Prizes jointly sponsored by Toyo Keizai, Inc. and the Green Reporting Forum)

The year 2000 edition amounted to 28,000 copies. From a questionnaire that was attached to the back of this same report, we were able to gather answers on 14 items. The figure below gives the main content.

Impression of the report



Impression of our company's work in tackling environmental problems



'Cannot really say' or 'Cannot say': no answers to these

In response to the items 'What would you like to know about in more detail?' and 'What do you think our company should do next?', we received 6 answers bringing up 'the development and popularization of new energies'. Therefore, in this edition of the report, we have included more information on how we are tackling these issues at the moment.

Furthermore, in order to get input from an even larger number of people, we have decided to make a gift of eco-goods to those who send in their responses.

Starting in fiscal 1998, we have also set up an environmental homepage on the Internet, which carries our Global Environmental Action Report. Since its inception, we have boosted its content by also publishing press releases with regard to our environmental protection activities and information on the environmental events that we sponsor.

In fiscal 2000, we received some 108 requests and questions via the Internet. The most important ones along with our responses are given in the table below.

<b>Content</b>	Request for copy of Global Environment Action Report	69 items (63%)
<b>Response</b>	It has been sent (except where out of stock in the case of back numbers)	
<b>Content</b>	Questions regarding the Kansai Green Electricity Fund	7 items (6%)
<b>Response</b>	We gave an explanation of how the fund was organized and its purpose	
<b>Content</b>	Questions about our measures for dealing with NOx, SOx and air pollution.	5 items (5%)
<b>Response</b>	We answered questions on the data we had published.	

We also received questions regarding units of CO<sub>2</sub> emissions, new energies, our overseas activities in working to prevent global warming and so on. We responded to all of these as appropriate and are still working to facilitate ever better communication with the public.



## 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, community relations facilities have been built on power station sites, where people can familiarize themselves with our operations and equipment.

Kansai Electric has major plans to build facilities with exhibits that introduce the public to our environmental policies and where they can see working models of things like solar energy systems and thus learn about new energy sources.

### Wakasa Takahama ELdoland



Tropical Wonder

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

**Hours** From 10:00 a.m. to 6:00 p.m. (winter 5:00 p.m.)  
(Closed Mon. and 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

**Contact information** Wakasa Takahama Eldoland  
Tel: (0770) 72-5890

<http://www.kepco.co.jp/pr/eldoland/index.htm>

### 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

**Hours** From 9:00 a.m. to 5:00 p.m.  
(Closed Dec. 29 to Jan. 3)

**Contact information** Mihama Nuclear Power Plant Community Relations Center  
Tel: (0770) 39-1210

<http://www.kepco.co.jp/pr/mihama/index.htm>

### 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

**Hours** From 9:00 a.m. to 5:00 p.m.  
(Closed Dec. 29 to Jan. 3)

**Contact information** Ohiri-kan, EL Park Ohi  
Tel: (0770) 77-3053

<http://www.kepco.co.jp/pr/ohi/index.htm>



## 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

**Hours** From 10:00 a.m. to 5:30 p.m.  
(Closed 3rd Thurs. of every month, Dec. 29 to Jan. 3)

**Contact information** EL City Nanko  
Tel: (06) 6613-7458  
<http://www.kepco.co.jp/pr/elcity/index.htm>

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



Aquarium



Darrius wind turbine power generator

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

**Hours** From 9:00 a.m. to 5:00 p.m.  
(Closed Dec. 29 to Jan. 3)

**Contact information** Tango Watch-kan  
Tel: (0772) 25-2026  
<http://www.kepco.co.jp/pr/miyazu/index.htm>

## 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

**Hours** From 10:00 a.m. to 5:30 p.m.  
(Closed 2nd Mon. of every month, Dec. 29 to Jan. 3)

**Contact information** EL Village Okawachi, Okawachi Power Station  
Tel: (0790) 35-0888  
<http://www.kepco.co.jp/pr/okawachi/index.htm>

## 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 hydroelectric power.

**Address** 483-1, Unazuki-machi, Shimonikawa-gun, Toyama Prefecture

**Hours** From 7:30 a.m. to 6 p.m. 20 April to 30 November  
From 9 a.m. to 4 p.m. December 1 to April 19 (closed Tuesdays between December 1 and April 19)

**Contact information** Kurobegawa Electricity Memorial Hall  
Tel: 0765 (62) 1334  
<http://www.kepco.co.jp/pr/kurobe/index.htm>



# Observance of Environmental Regulations

## Environmental Assessment for Power Station Construction

Since 1973, the Ministry of International Trade and Industry (MITI) (currently, the Ministry of Economy, Trade and Industry) has required that an environmental impact assessment be conducted whenever a power station is constructed. In accordance with the ministerial council's 1977 document entitled "Strengthening of Environmental Impact Reviews in Power Plant Siting," we have carried out 16 environmental assessments to date in order to contribute to environmental protection.

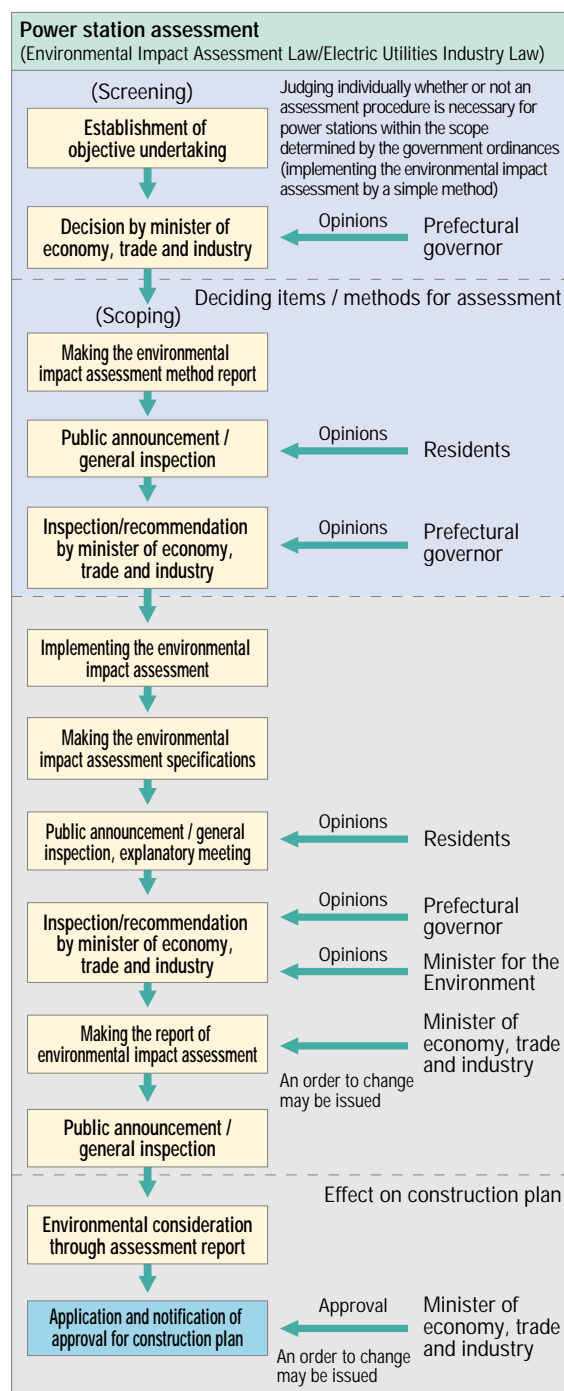
In 1997, the new Environmental Impact Assessment Law was passed, and revisions of the Electric Utilities Industry Law were implemented in June 1999. Under the Environmental Impact Assessment Law, before implementing large-scale development projects, corporations conduct their own environmental impact assessment to determine the procedures for implementing environmental assessment with consideration to environmental preservation. Specific procedures for power stations have been determined additionally under the Electric Utilities Industry Law.

Under the new system, environmental consideration is required from the early stages of the project, and procedures to judge whether assessment is necessary or not and determine contents and method of the assessment have been added. For the construction of power stations, the result of the assessment becomes the requirement for the approval of the construction plan (see Figure 9).

Moreover, we carry out surveys both during construction work and after commencement of operations in order to ascertain whether predicted results and effects of steps for environmental conservation fall in line with those found in the evaluation report.

Based on this environmental assessment system, Kansai Electric will endeavor to construct and operate power plants with consideration to the environment.

Power station assessment system in accordance with the law (Figure 9)



(Note)   Procedures which have been added in accordance with the enactment or amendment of a law.  
  Clauses complying with assessment report have been added to approval conditions for construction plans.





## Legal Regulations Pertaining to the Environment

The Environmental Protection Agreement contains the various legal restrictions, bylaws and various items mutually agreed with local bodies and businesses with regard to the running of our facilities. As yet, there have been no examples of any of these restrictions being broken.

### Main Statutes Regarding to the Environment

Title	Contents (Aims)	Material and/or behavior concerned
Air Pollution Control Law	Restrictions pertaining to emissions of soot, smoke and particulate from the business activities of factories and business establishments, and also emissions of particulate while buildings are being demolished	Restrictions pertaining to concentration of hydrogen ions and volumes of chemical and biological oxygen demands, suspended matter, etc.
Water Pollution Control Law	Restrictions pertaining to effluent discharged by factories or establishments into the Public Water Areas or underground	Restriction pertaining to the maximum permissible levels of noise within boundaries of factories or other types of work sites
Noise Regulation Law	Restrictions pertaining to noise generated by the operation of factories and other types of work sites as well as construction work affecting a considerable area	Restriction pertaining to permissible levels of vibration within boundaries of factories or other types of work sites
Vibration Regulation Law	Restrictions pertaining to vibration generated by the operation of factories and other types of work sites as well as construction work affecting a considerable area	Restriction pertaining to concentrations of offensive odor materials within boundaries of factories or other types of work sites
Offensive Odor Control Law	Restrictions pertaining to offensive odors generated in the course of business activities at factories or at other places of business	Deals with control of production and processing of domestic wastes and industrial wastes including ashes and sludge
Waste Management and Public Cleansing Law	Controls waste discharge and appropriate sorting, storage, collection, transport, recycling, disposal, etc. of wastes	Deals with control of production and processing of garbage, general waste materials, ashes and sludge resulting from industrial waste
Natural Parks Law	This law was enacted to preserve natural scenic sites, facilitate usage, enhance the health of the citizens and their opportunities for recreation, and contribute to the education of the public in regard to the natural environment.	Additions, improvements, and new construction of facilities in specially designated areas

### Main Ordinances

Title	Contents (Aims)	Materials and/or behavior targeted
Ordinance Pertaining to the Protection of Living Environment in Osaka Prefecture(Osaka Prefecture)	Sets out duty of prefecture and local government, businesses and citizens with regard to protection of the habitat. Lays down and promotes prefectural policy on this; enforces protection against environmental pollution	Mostly equivalent to general laws pertaining to water and the atmosphere. Its restrictions on waste materials are the same as or stricter than the standard
Ordinance Pertaining to the Protection and Creation of Environment (Hyogo Prefecture)	A comprehensive and planned approach to promoting the protection of a healthy and rich environment; a consensual policy on behalf of the citizens of the prefecture, based on the unique characteristics of Hyogo prefecture, toward the creation of a beautiful and comfortable environment	As above
Law on the Protection and Fostering of the Environment of Kyoto Prefecture (Kyoto Prefecture)	Contributes toward the firm establishment of the protection of a rich and comfortable environment in which people and nature may co-exist in harmony and enjoy a rich and proud history and culture; and to a healthy and cultural lifestyle both now and in the future through the creation of a pleasant and comfortable environment in which to live	As above
Ordinance Pertaining to the Prevention of Environmental Pollution in Wakayama Prefecture	Contributes to the comprehensive and planned promotion of policy toward environmental protection through the establishment of basic items of policy on such; thus contributes toward the firm establishment of a healthy and cultural lifestyle for both now and the future.	As above
Ordinance Pertaining to the Prevention of Environmental Pollution in Fukui Prefecture	Contributes toward the health and protection of the prefectural citizens and the protection of their living environment by laying down the necessary restrictions and measures to be taken with regard to the prevention of environmental pollution	As above

### Main Agreements

Each of our power stations has had an agreement concerning environmental protection between the local governments. Such an agreement contains stringent values compare to those standards set by laws and ordinances, for the purpose of achieving environmental protection.

Title	Power Plant Targeted	Party
Agreement on Pollution Prevention Concerning Construction of Tanagawa No.2 Power Station	Tanagawa, Tanagawa No.2	Osaka Prefecture
Agreement on Pollution Prevention at Nanko Power Station	Nanko, Sakaiko, Sanpo, Osaka, Kasugade	Osaka Prefecture
Agreement on Pollution Prevention	Amagasaki Higashi, Amagasaki No. 3	Hyogo Prefecture and Amagasaki City
Agreement on Pollution Prevention	Takasago	Hyogo Prefecture and Takasago City
Agreement on Environmental Protection	Himeji No. 1, No. 2	Hyogo Prefecture and Himeji City
Agreement on Pollution Prevention	Aioi	Hyogo Prefecture and Aioi City
Agreement on Environmental Protection	Akoh	Hyogo Prefecture and Akoh City
Agreement on Pollution Prevention	Kainan	Wakayama Prefecture and Kainan City
Agreement on Environmental Protection at Gobo Power Station and Gobo No. 2 Power Station	Gobo, Gobo No.2	Wakayama City/Gobo City and Mihama Town
Agreement on Pollution Prevention at the Miyazu Energy Research Center	Miyazu Energy Research Center	Kyoto Prefecture and Miyazu City
Agreement on Environmental Protection at Maizuru Power Station	Maizuru	Maizuru City and Takahama City
Agreement on Environmental Protection at Wakayama Power Station	Wakayama	Wakayama Prefecture and Wakayama City
Agreement on Environmental Safety for Area around Nuclear Power Station	Mihama	Fukui Prefecture and Mihama Town
Agreement on Environmental Safety for Area around Nuclear Power Station	Ohi	Fukui Prefecture and Ohi Town
Agreement on Environmental Safety for Area around Nuclear Power Station	Takahama	Fukui Prefecture and Takahama Town

# Working to Reduce Load on the Environment

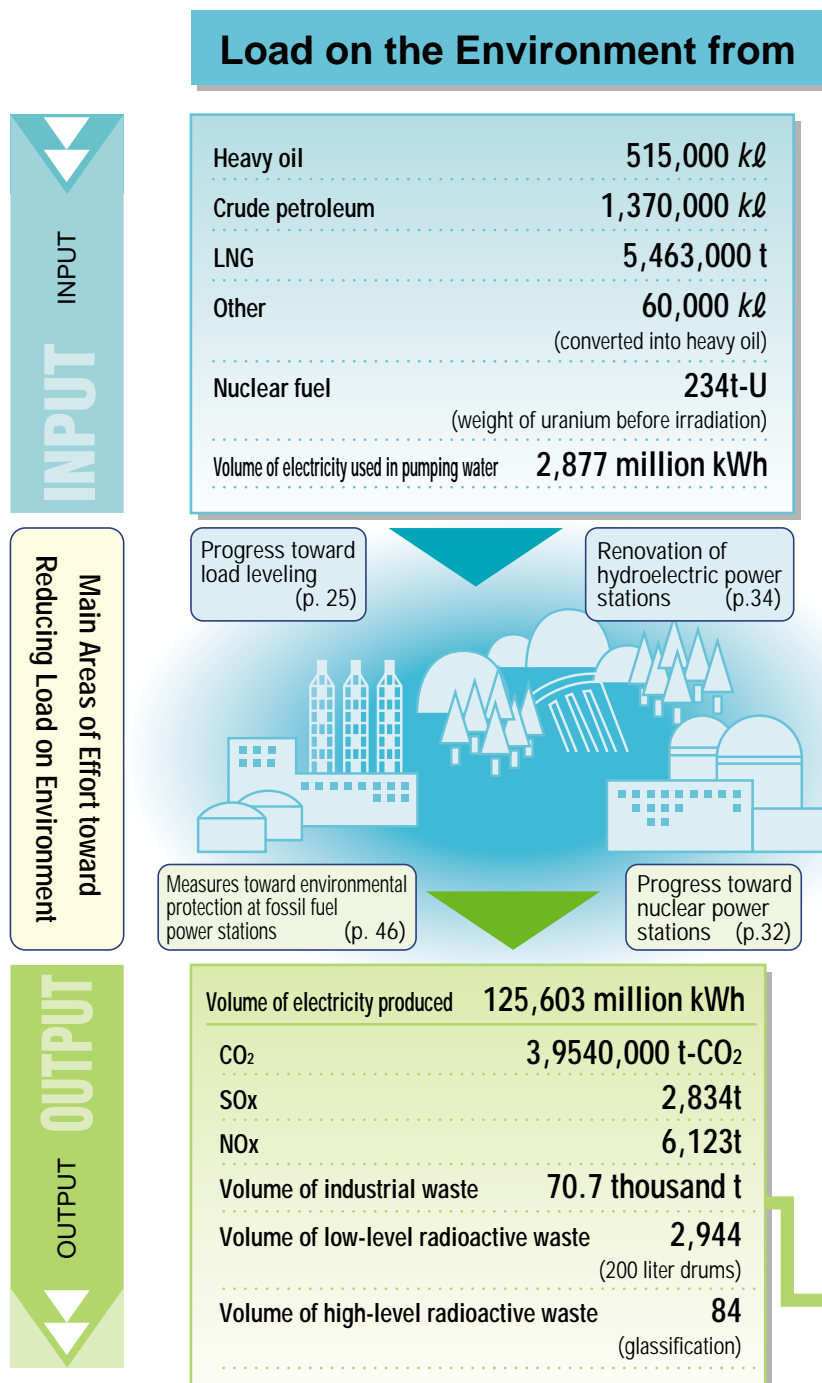


## Observance of Environmental Regulations

(Results for the Fiscal Year 2000)

We are to deliver electricity to our customers. Therefore in order to produce good quality electricity, we have to consume various types of fuel at our power stations (input). In providing services to our customers, we also consume gasoline in our vehicles and electricity and water in our offices. These are all limited resources and we do our best to use them wisely by undertaking various measures to keep the amount of CO<sub>2</sub> and other types of industrial waste (output) produced as a result of our business activities down to the absolute minimum.

To help us in our efforts to obtain real reductions in environmental impact in all our areas of business, we have built up a general picture of the load our operations exert on the environment. As far as possible, we have tried to obtain a quantitative picture in order to better grasp and understand the situation.



The number of barrels from this company accepted at Rokkasho village, high-level radioactive waste disposal plant in Aomori prefecture in the year 2000



## Supplying Electricity

Volumes purchased from other companies

Volume of electricity  
33,092 million kWh

Alternative forms of energy

Solar energy 11 million kWh  
Wind power 405,000 kWh  
Waste 432million kWh

## Load on environment through service activities for our company

Electricity 122 million kWh  
Water 640,000 m<sup>3</sup>  
Gasoline 3,794 kl  
Light oil 1,188 kl

Market permeation of alternative forms of energy (p. 29)

Reduction of transmission and distribution loss (p. 35)

Reduction in volume of water used (p. 61)

Introduction of electric vehicles (p. 28)

Reduction in exhaust gas from vehicles (p. 61)

Volume of internal consumption and transmission/distribution loss  
1,296 million kWh

Volume of electricity sold  
142,852 million kWh

Volume of CO<sub>2</sub> emissions from use of vehicles  
11,902 t-CO<sub>2</sub>

(per thousand t)

Volume recycled as new resource	Volume used for reclamation	54.9
	Volume of thermal energy harvested	4.8
Reduction in volume treated mid-process		1.7
Final volume processed		9.4





# Responding to Global Environmental Problems

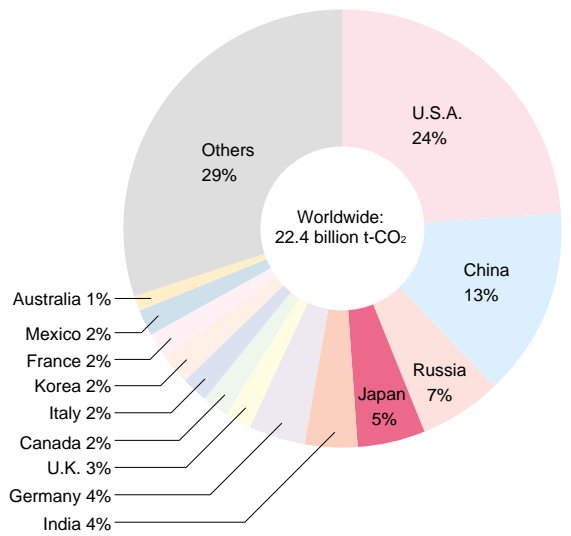
## CO<sub>2</sub> Emissions Worldwide and in Japan

Worldwide CO<sub>2</sub> emissions amounted to approximately 22.4 billion t-CO<sub>2</sub> (result for fiscal 1998), with Japan accounting for 5% of the total (see Figure 10).

Looking at CO<sub>2</sub> emissions in Japan by sector, the industry sector accounted for 40%, the domestic sector (households) 13%, the commercial sector 12%, and the transportation sector 21% (see Figure 11).

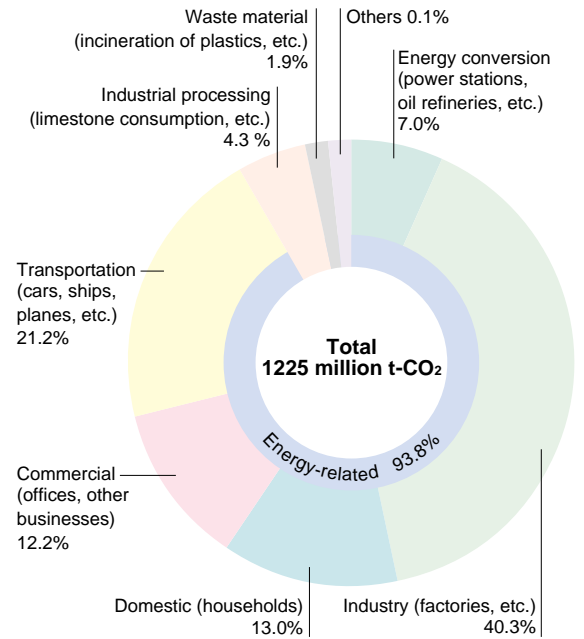
Of the increase in CO<sub>2</sub> emissions caused by energy generation in each sector since fiscal 1990, the industrial sector has seen an increase of 1%, the commercial sector an increase of 17% and the transportation sector a marked increase of some 23% (see Figure 12). This is mainly due to the increase of energy consumed with the growth of amenities in the commercial sector, as well as the increase in number and size of private cars in the transportation sector.

World CO<sub>2</sub> emissions from fossil fuel combustion (1998) (Figure 10)



Source: Outline of Energy and Economic Statistics 2001  
Japan Energy and Economic Research Institute

Japan's CO<sub>2</sub> emissions by sector (Fiscal 1999) (Figure 11)



(Note)

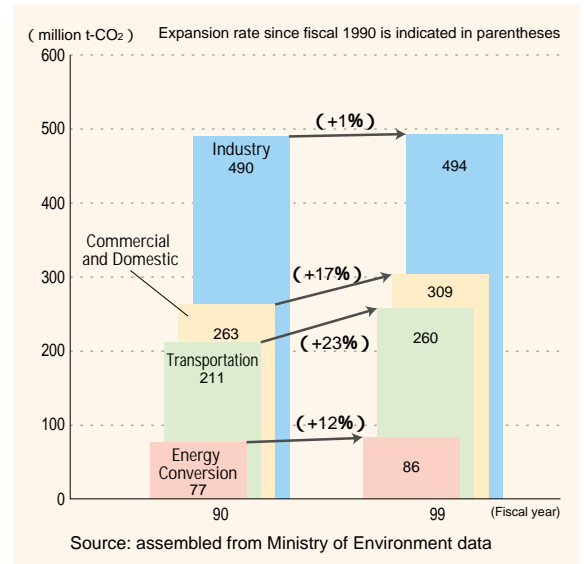
\* Figures indicate percentage of total emissions by power plants allotted to various sectors by their final demand in proportion to their power usage.

\* Figures in this graph indicate percentage of total emissions

\* "Others" includes statistical errors as well as the consumption of lubricants.

Source: assembled from Ministry of Environment data

Japan's CO<sub>2</sub> emission trend by sector (Figure 12)



Source: assembled from Ministry of Environment data



## Measures to Reduce CO<sub>2</sub> Emissions in the Electric Power Industry

To reduce CO<sub>2</sub> emissions resulting from power generation, we must attack the problem from both the supply side and the demand side.

$$\text{CO}_2 \text{ emissions (kg-CO}_2\text{)} = \text{Power consumption (kWh) Quantity of electricity consumed} \times \text{CO}_2 \text{ emissions per unit of power generated (kg-CO}_2\text{/kWh) CO}_2 \text{ emissions unit}$$

In order to achieve this, electric utility companies have taken a number of measures to reduce CO<sub>2</sub> emissions per kWh, by working to achieve the optimum generation capacity mix with a focus on nuclear power and improve the efficiency of facilities at fossil fuel power stations.

We are also promoting load leveling to achieve efficient energy use by developing and popularizing equipment that has high energy efficiency.

## The Electric Power Industry's Environmental Plan of Action

The Federation of Electric Power Companies of Japan published the Environmental Plan of Action for the Electric Power Industry in November 1996, in order to step up voluntary efforts to solve problems such as global warming. The fourth review was conducted in September 2001.

The plan sets the following target: "By fiscal year 2010, we will try to reduce the number of units of CO<sub>2</sub> emitted by as much as 20% of the real figure for fiscal year 1990 (by as much as 0.3kg-CO<sub>2</sub>/kWh)".

Accordingly, even though gross electric power output is expected to increase by 150% by 2010, CO<sub>2</sub> emissions are expected to increase by around 120%, based on fiscal 1990 levels.

$$\text{CO}_2 \text{ emissions approx. 330 million t-CO}_2\text{ (1.2 x 1990 levels)} = \text{Power consumption approx. 964 billion kWh (1.5 times)} \times \text{CO}_2 \text{ emissions per unit of power generated approx. 0.3kg-CO}_2\text{/kWh (20\% reduction)}$$

## Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3)

Approximately 10,000 people from fields such as government, NGOs, and media in 161 countries participated in the Third Session of the Conference of the Parties to the UNFCCC (COP3) held in Kyoto, December 1-11, 1997.

Although assertions from each country were strongly divided over the goals for greenhouse gas reduction, the conference ended by adopting the

Kyoto Protocol to determine concrete numerical goals for advanced nations.

At the reconvention of COP6 held in Bonn in July 2001, in Germany, a basic agreement on carbon sinks was reached, but the details still remain to be settled following COP7 held in October of the same year.

### Main Contents of the Kyoto Protocol

Target Period	Five years between 2008 and 2012 (First Phase)		
Target Gas	CO <sub>2</sub> , methane, nitrous oxide, HFC, PFC, SF <sub>6</sub> (note 1)		
Base Year	1990 (1995 may also be selected for HFC, PFC, SF <sub>6</sub> )		
Emission Reduction Target	At least 5% reduced from the base year by advanced nations (note 2) as a whole EU 8%, U.S.A. 7%, Japan 6%, Russia 0%, Australia +8%, etc.		
Sinks	Resulting from land use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, were considered.	Basic agreement was reached, but the details remain to be worked out	
Kyoto Mechanism	Emissions Trading		The difference between numerical goals and actual emission can be traded as an "emission right."
	Joint Implementation		If the greenhouse gas reduction project is performed among advanced nations, emission reductions from the project can be transferred and/or obtained.
	Clean Development Mechanism (between advanced nations and developing nations)		The greenhouse gas reduction project will be performed between advanced nations and developing nations. Advanced nations can obtain their reduced amount through a certain authentication procedure. Developing nations also receive profit from the project activities.

(note 1) HFC (hydrofluorocarbons) and PFC (perfluorocarbons) are substitution gases for specific chlorofluorocarbons. SF<sub>6</sub> (sixth fluorination sulfur) is insulation gas.

(note 2) Advanced nations: Annex B countries to the Kyoto Protocol (OECD member nations as well as the former Soviet republics and Eastern European nations): 38 countries, 1 international organization (EU)



## Measures to Prevent Global Warming – New ERA Strategy –

Here at Kansai Electric we are actively developing our New ERA Strategy as a comprehensive policy aimed at the reduction of greenhouse gases. ERA stands for Efficiency, Reduction and Activities abroad as well as carrying the meaning of epoch. It embodies our aim of beginning a new age (see page 5).

# Efficiency

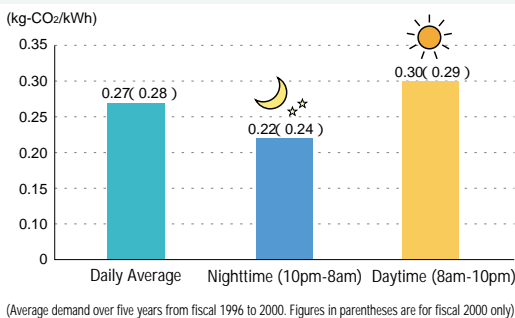
Efficient utilization of energy by society as a whole



### Promoting Load Leveling

Kansai Electric promotes the use of off-peak nighttime electricity. Such electricity emits less CO<sub>2</sub>, a substance that contributes greatly to global warming (see Figure 13).

Kansai Electric's CO<sub>2</sub> emissions per electricity sold (Figure 13)



To achieve this, we have been striving to spread the use of our ice (water) storage air-conditioning systems and electric water heaters. In addition, we introduced a system of cheaper electricity rates in the evenings in an attempt to shift some of the use from the peak daytime period and thus lessen the

above-mentioned electricity gap between day and night.

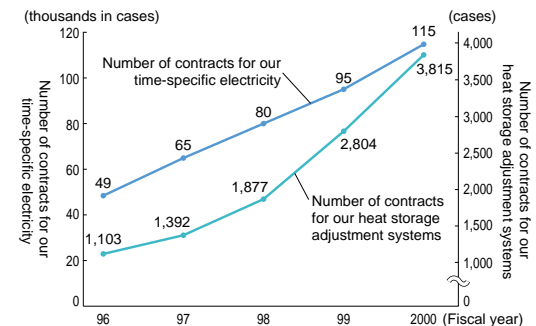
These are some of the benefits of our nighttime electricity use devices and system:

- (1) Customers achieve substantial savings by using cheaper nighttime electricity.
- (2) We can improve our operation efficiency by reducing power generation costs because the gap between daytime and nighttime demand can be leveled off.
- (3) Through the use of nighttime power, with its high nuclear power generation ratio and low CO<sub>2</sub> emissions, we are contributing less to global warming.

That is to say, by recommending that our customers make use of nighttime electricity, we can play a role in preventing global warming at the same time as providing them with a cheaper alternative.

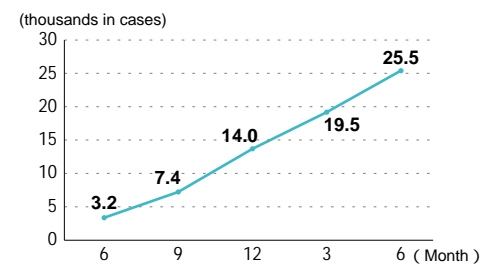
As a result of the promotion of these programs by Kansai Electric and other manufacturers, there has been a steady increase in the number of contracts for our “heat storage adjustment system” and “time-specific electricity” (see Figure 14).

Number of contracts for our heat storage adjustment systems and time-specific electricity (Figure 14)



In particular, when customers make use of the “Happy Time” we introduced in March 2000 (a reduction on charges for mornings, evenings and holidays, when the whole family gets together), and when they go for all-electric housing in addition, then we can offer even greater cost reductions. Since its inception, this system, “Happy Plan”, has spread rapidly (see Figure 15).

Number of households using “Happy Plan” (Figure 15)





In October 2000, we introduced the “L PAC”, or “Contract by Load” option, which offers an advantage to those customers that bear a heavy load in terms of consumption. This was intended to further level out the distribution of burden among our customers (see Table 6).

Not only are we bolstering our own system of electricity charges, but from fiscal 2001 we will also offer consultation to factories and business premises on energy conservation, which will serve to supplement use of the national system of energy charge subsidies. We are proposing ways in which the public may efficiently use energy through such means as the use of energy storage tanks and the utilization of nighttime energy.

Moreover, we are working hand in hand with local government to promote the use of such systems through various activities. These include the annual “Let’s Store Heat” event held every year in July organized by the Heat Pump/Energy Storage Center (Foundation). Our own company offers the “Kanden Customers’ Forum”, the “Storage Heat Air Conditioning Fair” and the “Eco Ice Campaign”.

Furthermore, in the fiscal year 2000, we received the Encouragement Prize for our “Environmentally-Friendly Efforts Centered on Storage Heat-Type Air Conditioning Systems” in the business division of the Osaka Environment Prizes held by the prefecture of Osaka.

#### New Menu on Offer from October 2000 (Table 6)

	Outline
L PAC, Contract by Load	New type of service offering 5-tier charge reduction plan for efficient and consistent customers
Electricity for business purposes, WE Type High-Voltage Electricity, WE Type	Special service on offer to customers who use large amounts of electricity at weekends and on public holidays

#### Leveling out of Distribution of Burden, Spreading and Enlarging the System

In 1998, electricity companies and manufacturers launched the Eco-Ice Mini that they had jointly developed. This was mainly targeted at business premises and shops around 50-200m<sup>2</sup> in size. It is an ice heat storage air-conditioning system and is being recommended widely to our customers (see Figure 16).

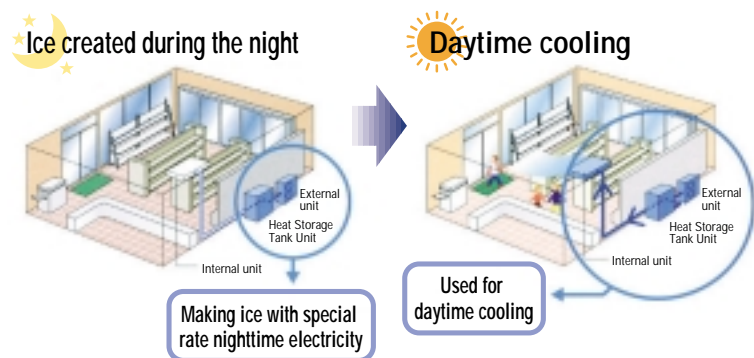
In 1999 another such joint project launched the “Ice-Storage Freezing Water Condensing System”. With this, customers can make pure ice by freezing waste-water produced at night, thus enabling them to cut down on amounts of waste water. At the same time, they can also use this ice in their air conditioning systems or use it when melted as sprinkling water. We expect this system will catch on even more in the future.

Moreover, we are now developing the “Hot Water Supply Natural Air-Conditioning Heat Pump” in conjunction with various manufacturers and have scheduled its launch for the fall of 2001.

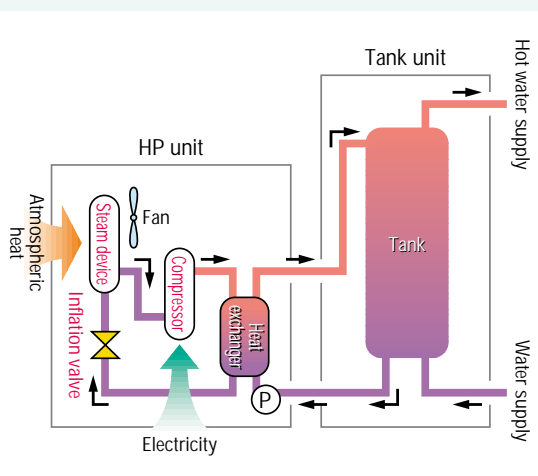
This hot water supplier utilizes a natural cooling medium (CO<sub>2</sub>). This means that it doesn’t threaten the ozone layer and serves to cut down on the emission of greenhouse gases at the same time. Moreover, it has excellent heating capabilities. Without external heating, it can boil water up to a temperature of 90oC, making it far more efficient than conventional devices (a yearly average of over COP\*3.0). It is extremely effective in terms of saving energy. Furthermore, through this energy saving effect and use of nighttime electricity, running costs can be reduced by between 1/2 and 1/4 (value estimated by amount of heat in pipeline of Kansai Electric). In this way, it realizes environmental conservation, energy saving and economic viability all at the same time. It could be said to be the hot water supplier of the future (see Figure 17).

\*COP (Coefficient of Performance): this gives the heating and cooling capabilities of a given amount of electrical power. Therefore, the larger the value, the higher the level of efficiency.

#### How to Use the “Eco-Ice Mini” (Figure 16)



#### Hot Water Supply Natural Air Conditioning Heat Pump System (Figure 17)





## Developing Technology for Highly Efficient Energy Use

Generating constant output is more energy-efficient and economical than starting up and shutting down the power station to adjust to fluctuations between nighttime and daytime demand.

Accordingly, Kansai Electric is researching and studying power storage batteries which will enable nighttime power to be stored during the nighttime and then put to use during the daytime. In particular, it has been decided to introduce redox flow batteries at the Kansei Gakuin University Kobe Sanda

Campus in 2001, following a demonstration carried out at our own business premises in February of 2000. This is one of the ways in which we have achieved the wider use of such batteries. Furthermore, such batteries can be expected to be useful in improving voltage dip and for emergency power supply systems, as well as in helping bring about the



Redox flow batteries

load leveling mentioned above. Therefore, we are making every effort to research further such functions.

In addition, we are also working to develop technologies aimed at even greater efficiency and cost effectiveness such as those of the “Eco-Ice Mini” and the “Hot Water Supply Natural Air Conditioning Heat Pump System” mentioned above.

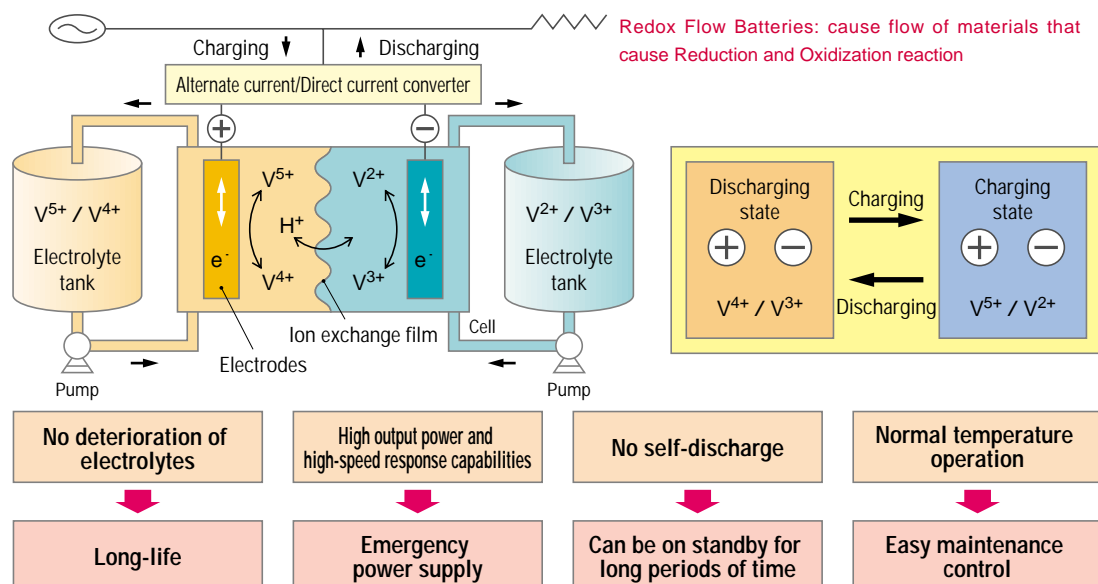


Eco-Ice Mini



## Principle and Special Features of Redox Flow Batteries

Redox Flow Batteries use Vanadium solution in the electrolyte fluid at the negative and positive poles of the battery. As this electrolyte fluid circulates within the battery cell, it charges or produces electricity through changes in the ionization value.





## Promoting the Spread of Electric Vehicles

Electric vehicles are more energy-efficient than gasoline vehicles, as they emit only 1/3 of the amount of CO<sub>2</sub>, even when taking into consideration the loss during power generation. The amount of CO<sub>2</sub> emissions is further reduced when the batteries are charged at night.

At present, Kansai Electric is aggressively promoting the use of electric vehicles within the company. We have also placed 177 electric vehicles (excluding vehicles solely for use on the premises) mainly at five sales offices located in major cities, and are using them on a daily basis.

Furthermore, through participation in and presentations at a variety of events, we are promoting the spread of awareness in regard to electric vehicles.



Electric vehicle



## Utilizing Untapped Energy Sources

A large amount of energy in municipal areas disappears without being used.

Recycle-type regional heating services which make effective use of such untapped energy contribute to environmental preservation.

We are making efforts to convert untapped energy from sources such as steam from fossil fuel power stations, waste heat exhausted from office buildings and computers, and the regional heat supply, by taking advantage of the differences between river or seawater temperatures and atmospheric temperatures. At the end of fiscal 2000, as part of our efforts to promote regional heating and cooling systems, we established 10 regional heating services (see Table 7).

In April 2001, we introduced a regional heat supply to the Osaka Konohana Rinkai district (USJ District). Moreover, we are now planning to introduce a regional heating supply that makes use of river water and waste heat from substations in the Osaka Nakanoshima 3-chome district.



Osaka Nanko Cosmo Square

### Projects for Practical Use of Untapped Energy (Table 7)

Area		Osaka Nishi Umeda	Osaka Honjo Higashi	Nakanoshima 6-chome Nishi	Osaka Nanko Cosmo Square	Kansai International Airport	Wakayama Marina City	Kobe Research Park Kanoko-dai	Tenmabashi 1-chome	Rinku Town Area	Sannomiya Station
Started		Apr. 1991	Jan. 1992	Nov. 1992	Apr. 1994	Apr. 1994	Jul. 1994	Nov. 1994	Jan. 1996	Sep. 1996	Apr. 1999
Service area (ha)		11	6	2	21	511	49	15	5	49	1
Energy source		Waste heat from cogeneration	Waste heat from computers and buildings	Waste heat from buildings	Sea water temperature, waste heat from cogeneration and buildings	Waste heat from power stations	Extracted steam from power stations	Waste heat from computers and buildings	River water temperature, waste heat from cogeneration	Waste heat from substations	Waste heat from buildings and cogeneration
Facility capacity	Low temperature heat (RT)	3,217	3,041	2,740	17,700	26,380	5,050	10,460	6,600	5,550	2,150
	High temperature heat (Gcal/h)	9.0	5.1	5.2	49.5	77.1	18.0	6.6	25.1	25.8	5.5

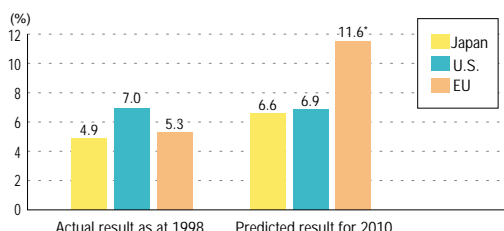


## Developing and Popularizing New Energy Sources

Hydroelectric power, geothermal power, photovoltaic power and wind power, the so-called “reusable” energies, are all energy sources that do not produce CO<sub>2</sub> when generating electricity. We believe it important to promote the development of such energies. The rate of introduction of such reusable energy into Japan’s primary energy supply, its achievements so far and prospects for the future stand comparison well with that of other countries (see Figure 18). Even though they could replace petrol, their use has not been widespread because they aren’t economically viable. Since April 1997 the government has worked to promote the use of such energies.

Among such reusable energies, photovoltaic and wind power and waste-generated power have been designated in

Rate of introduction of reusable energy in the primary energy supply (Figure 18)



\*Source: Target value set by European Commission  
Assembled by Kansai Electric from documentation provided by General Energy Chosakai's New Energy Meeting

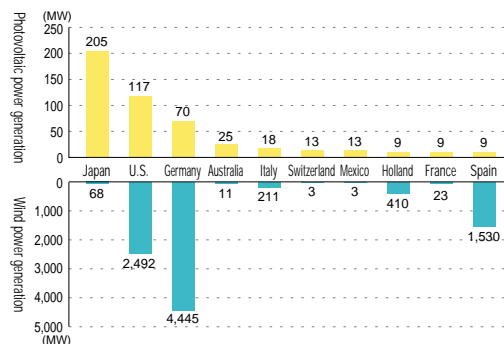
particular. In terms of practical application, they are being considered for use in clean energy automobiles, temperature differential energy and fuel-cell batteries.

### Photovoltaic and wind power generation

Although natural energy sources such as photovoltaic and wind power are CO<sub>2</sub>-free, energy density is low, power generation is unstable due to changeable weather conditions, and the generation cost is higher than for traditional forms of energy. However, in Japan, which lacks natural resources, these new energy sources are being developed assertively, and the volume of photovoltaic power generation introduced is the highest in the world. Meanwhile, in the United States and Europe, which enjoy far more favorable wind conditions, the use and introduction of wind power facilities is making progress (see Figure 19).

Under the auspices of NEDO (New Energy and Industrial Technology Development Organization, the Ministry of Economy, Trade and Industry), our Rokko Test Center had installed equipment for photovoltaic power generation (500 kW) and wind power generation (33 kW). Trial tests were being conducted up to March 2001 on the effect of photovoltaic generation on power quality and safety when numerous photovoltaic power systems are connected to our power grid, as well as countermeasures and technology to improve utilization merit.

Photovoltaic and wind power introduced (Figure 19)



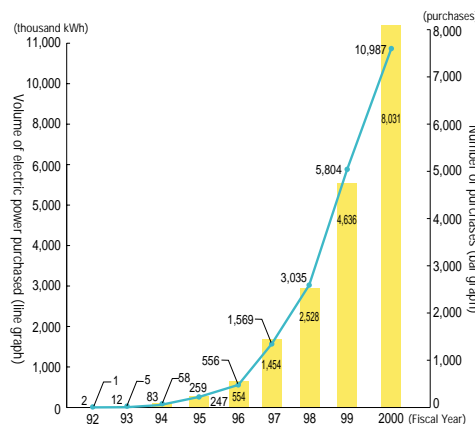
Source: Assembled by Kansai Electric from the IEA PVPS Report and WIND POWER report.  
Note: Photovoltaic power as at end of fiscal 1999 and wind power as at end of 1999

Photovoltaic cells are expected to become an important auxiliary energy source in years to come. Therefore, we install more photovoltaic facilities when building or renovating our buildings. To date, we have had photovoltaic power generation systems installed capable of generating 760kW, and in fiscal 2000 we generated 557,000 kWh of power.

Kansai Electric has also installed a low wind velocity power generator to conduct verification tests and deepen our knowledge of actual operation. At the end of fiscal 2000, equipment with a combined capacity of 154kW had been installed.

We have been promoting an institutional program for new energy sources such as photovoltaic power since April 1992. Customers who install power generation equipment for new energy sources to produce household electricity and hope to sell surplus power can have their equipment linked to our power grid. In fiscal 2000, we bought 405,000 kWh of electricity generated by wind power. To encourage the early development and use of this new technology, the purchase price of such surplus power is set equivalent to the ordinary sales price (see Figure 20).

Purchase of surplus power from photovoltaic generation (Figure 20)



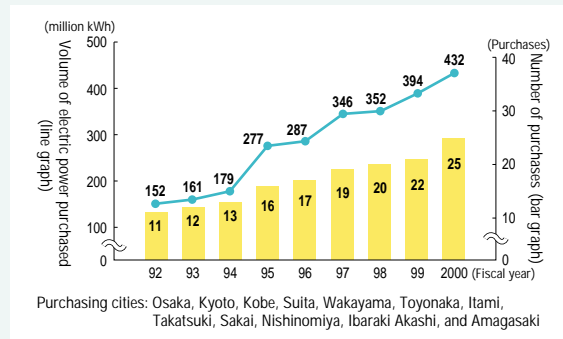
Furthermore, in order to promote the use of large-scale wind power generation and photovoltaic power generation, we have introduced the Kansai Green Electric Fund in cooperation with our customers (see page 30).



### Power Generation Using Waste materials

Electric power from waste is generated by using combustion heat from waste as a heat source. Since there is no additional burden on the environment from this system, Kansai Electric purchases from local governments waste-generated power at a higher price than surplus power from other independent power producers and at a similar price to Kansai Electric's unit selling price (see Figure 21).

Purchase of surplus power from waste generation (Figure 21)



## Kansai Green Power Fund

We have been working in various ways to promote the use of alternative forms of energy such as solar power and wind power, for example, buying up surplus electrical power. However, these forms of energy are subject to changes in weather conditions and so are unstable. They are also expensive. Both of which factors are hindering the spread of such alternative energies.

Therefore, various consumers, power-producing companies and alternative energy businesses have come together to create a unified social body whose aim is to develop long-term, alternative energy sources. And so, in October 2000 the Kansai Green Power Fund (Foundation) was established in the Center for Industrial Renovation of Kansai (CIRK) under our proposal.

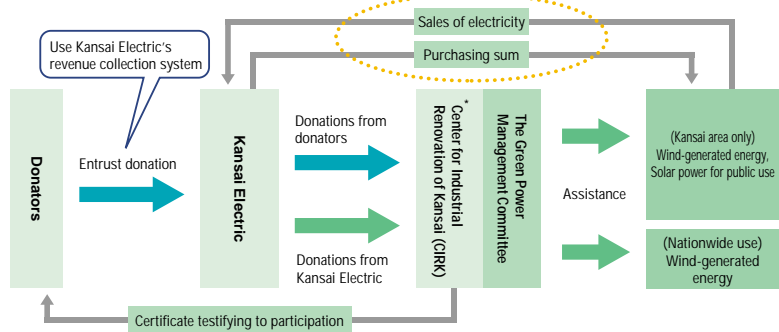
Members of the public may make donations (each donation must be made in units of 100 yen, although the number of such units donated is up to the discretion of the participant) to this fund via bank transfer on paying their electricity bills. On so doing, our

company both undertakes to look after the deposited sum and basically match it with a donation of our own. We are also working positively to promote the fund through newspaper advertisements, radio commercials, information given on the back of electricity bills and through other organs for the dissemination of social information.

Money coming into the fund is managed by the Center for Industrial Renovation of Kansai. A 'Green Power Management Committee', made up of experts employed at the center, works to select projects to receive help. These include various projects such as large-scale wind power operations and solar power generation for public use.

In fiscal 2001, 5 solar power projects (100kW) and 1 wind power project (4,500kW) are to receive assistance.

### Structure of Kansai Green Power Fund



Certificate of participation



\*Center for Industrial Renovation of Kansai (CIRK)  
The Center for Industrial Renovation of Kansai (CIRK) is a corporate body that was established in October 1987 with the aim of strengthening development in the Kansai region. It has been involved in a number of activities toward the revitalization of business in the Kansai region such as formulating a grand design for such, research into major projects, and the hosting of symposiums and seminars.

### Structure of Kansai Green Power Fund

Area	Projects receiving assistance	Output Capacity of Facility
Solar energy	Kyoto Prefectural Uji Water Purification Plant (Kyoto Prefecture)	40kW
	Shiga Prefectural Hikone Engineering High School (Shiga Prefecture)	20kW
	Ashiya City Iwazono Elementary School (Hyogo Prefecture)	20kW
	Yao City Kitayamamoto Elementary School (Osaka Prefecture)	10kW
	Toyooka City Higashi Day Service Center (Hyogo Prefecture)	10kW
Wind-generated energy	Taikoyama Wind Power Station (Kyoto Prefecture)	4,500kW



Image of Taikoyama Wind Power Station

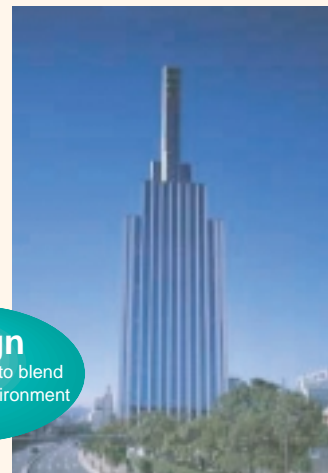




## An Environmentally Friendly Resource Saving Building (The Kobe Kansai Electric Building)

The Kobe Kansai Electric Building was rebuilt in line with the concept of having a structure that would be robust against disaster, highly safe and reliable while exceptionally environmentally friendly and gentle on resources at the same time.

As part of this, by way of being adapted to the environment, it makes positive use of solar power, well water and other such natural energies. It has superb energy-saving capabilities and is extremely economical, incorporating an air conditioning system that utilizes heat storage in order to cut down on CO<sub>2</sub> emissions (Eco Ice). In these and other ways it aims to use energy and resources effectively.



### Design

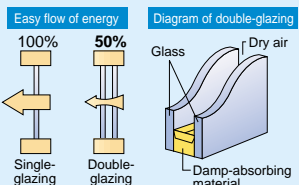
Design chosen to blend in with local environment

### Capturing light

Generation of solar power. Solar energy panels capable of generating 18kW of power.

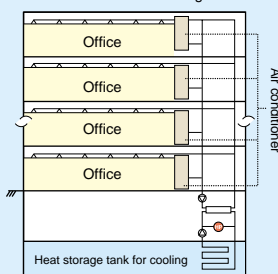
### Cutting off heat

The windows are double-glazed. This cuts down on the amount of heat entering and leaving the building, thus saving the amount of energy required for air conditioning.



### Treating energy with respect

The building uses the Eco Ice system. Demand for air conditioning has moved 100% to night time only. Using the relatively cheaper night time electric power, heat is stored in a tank using a heat pump. This is then used during the day to provide air conditioning. This has allowed drastic cuts in running costs.



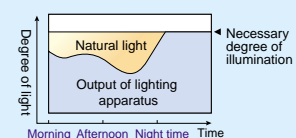
### Capturing wind

Using the wind power captured via the radio tower, the whole building may be ventilated

### Treating energy with respect

The building is designed to allow the effective use of natural light in providing lighting for the rooms. Light sensors work to adjust the energy output of lighting apparatus, allowing energy to be saved.

#### Diagram of light adjustment system



### Treating resources with respect

The filler for the panels in the OA room were created using old glass bottles and glass waste rendered into powder and reconstructed.

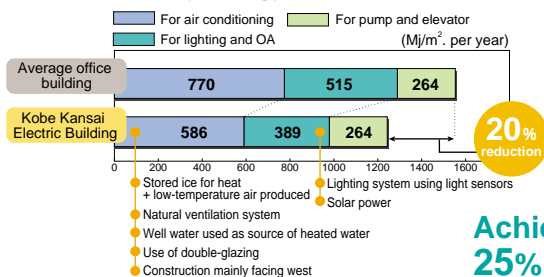
On construction of the underground foundations (slabs, walls), a high-strength plastic frame was used so as to raise the rate of possible reuse

### Treating water with respect

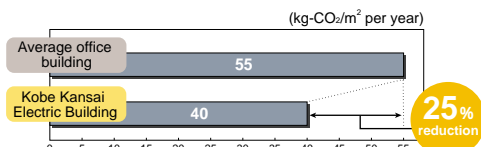
Well water is used for the air conditioning system and general use

## Main energy-saving effects

### Primary energy consumption



### Volume of CO<sub>2</sub> emissions



Achieved an approximately 25% reduction in emissions of CO<sub>2</sub>

# Reduction

## Reduction of greenhouse gas emissions in electric power supply



### Promoting Nuclear Power Generation

#### Improving capacity factor of nuclear power stations

Kansai Electric plans to increase electrical power generation using nuclear energy, a power source that does not emit CO<sub>2</sub>, while making every possible effort to improve the reliability and capacity factor of our nuclear power stations.

We have been making every effort to even further strengthen our traditionally high level of quality control and cut down on accidents and trouble occurring at our nuclear power stations. At the same time, we are working to maintain reliability at all our facilities and ensure quality through the regular inspections that have been carried out over recent years. In addition, we have brought about greater efficiency by revamping our operation systems in the various areas. This means that since 1997, the capacity factor at our nuclear power stations has kept a steady 80% level.

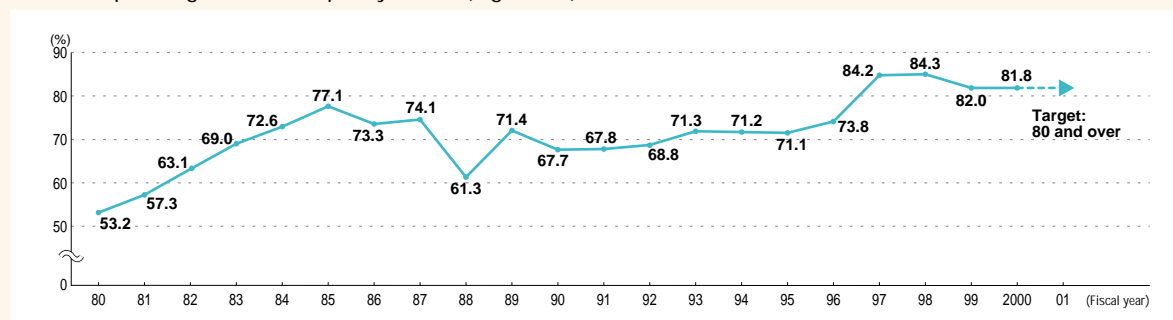
We will continue to maintain and improve inspection efficiency through our system of regular inspections, always putting safety first. We intend to increase efficiency through the planned integration of various types of special work to be carried out during such inspections. Thus, we aim to ensure an even higher rate of operation as well as a steady rate of 80% of our nuclear power generation (see Figure 22).

#### Activities Aimed at Gaining Trust

Recently, because of the JCO uranium processing plant criticality accident and the exposure of the falsification of data regarding MOX fuel at BNFL (British Nuclear Fuels Ltd.), public trust in the nuclear power industry has declined. There have been delays in the national Pluthermal plan and the situation continues to be tough. In response to this situation, the nuclear power industry as a whole has launched the “Nuclear Safety Network” or “NS Net” in order to restore public trust. Members of this network (electric power companies, fuel processing plants, manufacturers, etc.) are now engaged in the mutual sharing of information and in the support of education toward and research on safety.

Furthermore, in October 2000, universities and businesses with nuclear power related facilities in the Kansai area came together to establish “Kansai Atomic Power Information Net-Surfing”. This organization works to mutually enhance safety in the nuclear power business. At the same time, one of its main theaters of activity is that of working to obtain a correct understanding of nuclear power itself among the public. To date, it has opened booths at a number of events such as the Joint Disaster Drill held by Osaka prefecture and Kumatori-cho (October 2000), the “So this nuclear power!” exhibition held at Kinki University (November 2000), the “Open Day at the Energy Resource Department” in Kobe (March 2001) and the “General Open Day” at the Kumatori Branch of the Nuclear Fuel Industries, Ltd. (April 2001). In this way, it has been working to open up information to the general public. It will continue to engage in such activities aimed at restoring public trust in and understanding of nuclear power, including the nuclear fuel cycle, by effectively using its members’ facilities and personnel.

Nuclear power generation capacity factor (Figure 22)







## Improving and Maintaining Thermal Efficiency of Fossil Fuel Power Stations

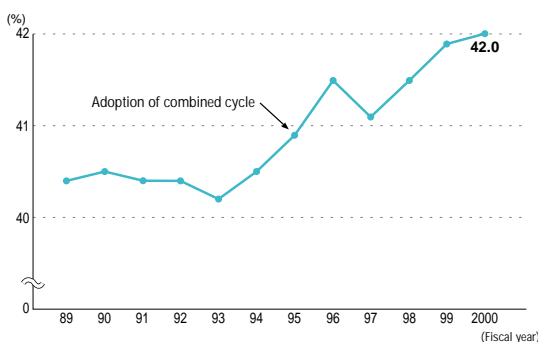
### Measures to improve thermal efficiency using combined cycle generation

By improving thermal efficiency at fossil fuel power stations, we are able to conserve fossil fuel which enables us to control CO<sub>2</sub> emissions. We have introduced highly efficient combined recycle generation (thermal efficiency 54%) at our Himeji No. 1 Power Station. As a result, we have raised the total thermal efficiency for fossil fuel power stations by maintaining a high utilization factor (see Figure 23).

In combined cycle power generation, hot exhaust from a gas turbine is routed to a heat recovery steam generator, 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.

We are also working to maintain and improve thermal efficiency by adopting improvement measures for both equipment and operation at steam turbine plants, an existing generation method.

Kansai Electric's fossil fuel power gross transmission thermal efficiency (Figure 23)



In recent years, we have introduced highly efficient combined cycle power generation with thermal efficiency of 54%. By operating existing equipment, gross thermal efficiency is approximately 41% at all fossil fuel power stations.

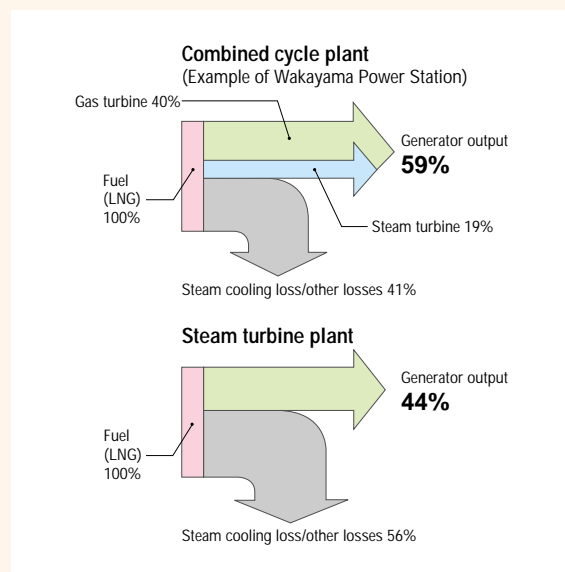
### Combined cycle generating system with state-of-the-art gas turbines

We are planning to adopt a combined cycle power generation at 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, about 59%, and will reduce CO<sub>2</sub> emissions from electricity generation by about 25% compared to conventional LNG power generation (see Figure 24).

Thermal efficiency is shown at a lower heating value.

Gross thermal efficiency of combined cycle generating system (Figure 24)





**OUTPUT**

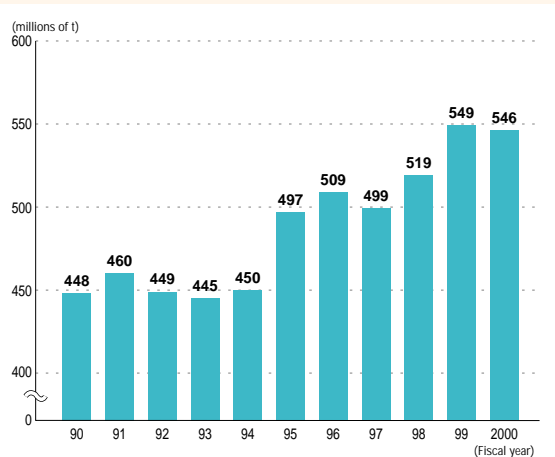
## Using LNG

Since carrying out trials with LNG in fiscal 1973, we started importing this fuel, first from Indonesia in fiscal 1977, then from Western Australia in fiscal 1989, from Malaysia in fiscal 1995, and from Qatar in fiscal 1999. In fiscal 2000, we used a total of 5.46 million tons of LNG (see Figure 25). This accounts for approximately 79% of fuel used for thermal reactors (heavy oil conversion ratio), making it the major source of fuel for our company. LNG has minimal impact on the environment: it contains almost no sulfur or nitrogen, and it emits far less CO<sub>2</sub> than fossil fuels like oil and coal. We plan to continue making LNG our main fuel for our fossil fuel power stations.



LNG Ship  
(Ship carrying LNG produced from Qatar)

Amount of LNG consumed (Figure 25)



**INPUT**

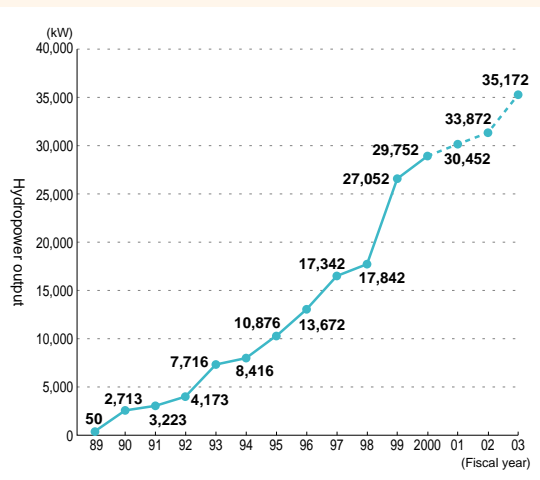
## Renovating Hydropower Stations

It has become increasingly difficult to conduct large-scale hydropower development, since undeveloped areas are mainly small in scale. However, because hydropower is a clean energy resource that is purely domestic, we are developing this power source as much as possible.

When we replace obsolete facilities in already-existing power stations, we use more efficient water turbines. In rivers with an ample amount of water, we strive to produce as much electricity as possible by using the maximum amount of water for power generation. From fiscal 1989 through fiscal 2000, output had increased to 29,752 kW at hydropower stations as a result of plant renovation.

We plan to further increase output by 5,420 kW, or five more units, from fiscal 2001 through fiscal 2003 (see Figure 26).

Increase in hydropower output from facility renovation (Figure 26)



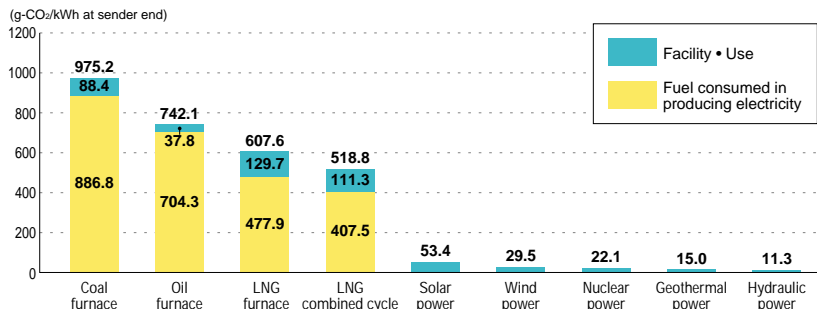
## Units of CO<sub>2</sub> Emissions by Type of Electricity Source

The graph on the right gives and compares units of CO<sub>2</sub> emissions by type of electricity source for Japan.

**(Explanation)**

It has been calculated taking into account all the energy consumed, not just the fuel burnt in producing the electricity. This includes energy consumed in obtaining the basic fuel for construction of facilities, transportation of fuel, refining, use and protection. In calculating for electricity produced by nuclear energy, we have included spent fuel that is currently planned for reprocessing domestically and use in Pluthermal (on the premise of one recycling only) along with high-level radioactive waste intended for disposal.

Units and Comparison of CO<sub>2</sub> Emissions in Japan by Type of Electricity Source



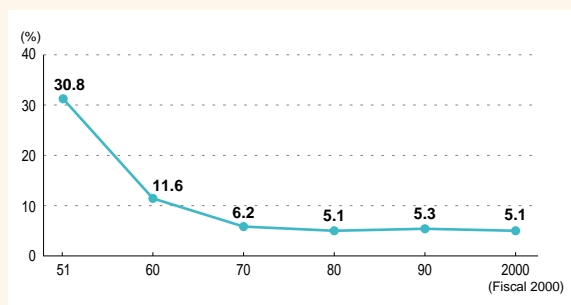
(Taken from the Report of the Central Research Institute of Electric Power Industry)



## Reducing Transmission and Distribution Losses

We have managed to reduce and maintain a low loss ratio for many years now at transmission and distribution facilities by developing and introducing technology such as higher transmission voltage and greater volumes of power transmitted and distributed (see Figure 27). We will continue to work to ensure that distribution facilities are structured so as to ensure low transmission and distribution losses and that we operate facilities with the same goals.

Ratio of transmission and distribution losses (Figure 27)



## Technological development with the Goal of reducing CO<sub>2</sub> emissions

### Developing Flue Gas Decarbonization Technology

With the goal of eliminating CO<sub>2</sub> from flue gas at fossil fuel power stations, we have been researching chemical absorption methods since 1991, by operating a flue gas CO<sub>2</sub> recovery pilot plant at Nanko Power Station. We have succeeded in reducing the amount of energy required to recover CO<sub>2</sub> by using newly developed absorbent liquids, and we are evaluating the optimum system configuration based on these results (see Figure 28).

With regard to the technology used for the recovery of CO<sub>2</sub>, there are still a number of technical problems at the present time, which we are working hard to overcome. These include the problems of further decreases in energy for recovery of CO<sub>2</sub> and the evaluation of environmental impact on the disposal of recovered CO<sub>2</sub>.

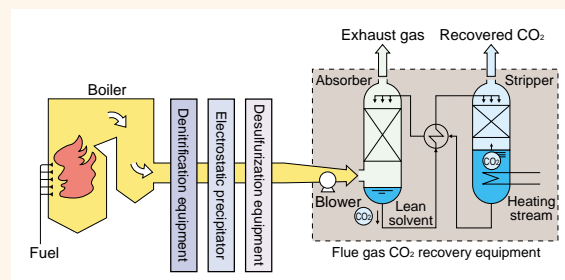
We have applied for a patent for the results of our research so far in Japan, the United States, Europe and Asia, and many countries have recognized the patent. Using these results, highly efficient CO<sub>2</sub> recovery equipment has been adopted at Malaysian companies.

Also, we are conducting comprehensive CO<sub>2</sub> recycling studies, such as synthesizing methanol and dimethyl ether from CO<sub>2</sub> and using water electrolysis with solar batteries to produce the hydrogen necessary for synthesis.



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

Mechanism of flue gas CO<sub>2</sub> recovery equipment (chemical absorption method) (Figure 28)



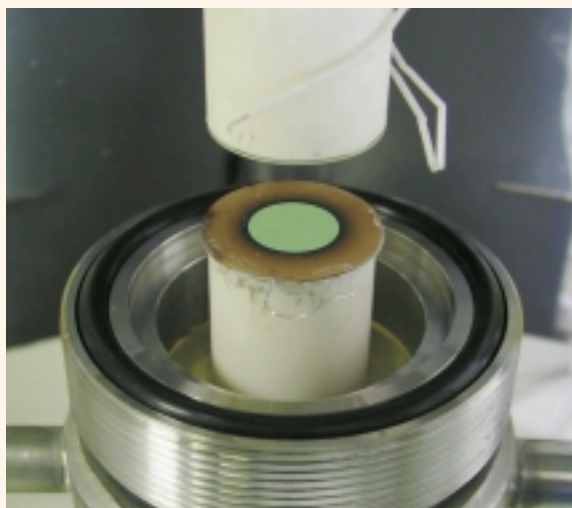


## Developing Advanced Energy Supply Technology for the Future

### R&D on next-generation fuel cells

Fuel cells, a system which generates electricity directly through a hydrogen and oxygen chemical reaction, are expected to develop into a new power generation system. This is an efficient method of low energy conversion loss, enabling fuel diversification using fuels such as natural gas, methanol, and coal.

Kansai Electric is conducting a technical development of the Polymer Electrolyte Fuel Cell, the Molten Carbonate Fuel Cell and the Solid Oxide Fuel Cell, next-generation fuel cells with high power-generation capacity and superior utilization of exhausted waste heat.



Experimental Apparatus for Solid Oxide Fuel Cell (SOFC)

### Research on electric power applied superconductivity technology

Superconductivity technology could potentially bring about a revolution in all areas of future society. Superconducting generators improve efficiency over traditional generators and also improve power system stability. Accordingly, incorporating superconducting generators leads to resource conservation by reducing the use of fossil fuels and contributes to energy conservation through improved stability of electric power systems, thereby enhancing transmission capacity.

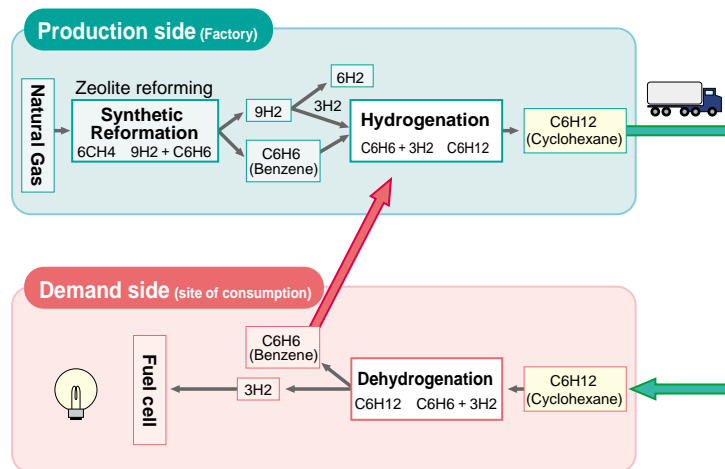
We are also engaged in basic research to determine the possibility of applying superconductivity technology in power generation apparatus, in preparation for a superconduction power generation system in the 21st century, and participating in the government's superconductivity development project for the purpose of finding solutions to utilize superconducting generators.

### R&D into New Types of Fuel

Many new kinds of fuel, kind to the environment, are in the process of being developed such as hydrogen, DME (dimethyl ether) and GTL (liquid fuel using natural gas as its base). In particular, hydrogen is regarded as the favorite to replace oil as a source of energy.

We are carrying out extensive research and investigation centered on the possibilities of hydrogen from the viewpoints of its production, supply, use and the infrastructure it would require. For example, as one hydrogen system for the future, we are conducting research into a supply system that would transport hydrogen that had been produced by methane as chemical hydride in liquid form at normal temperature and pressure. The hydrogen would then be extracted at the site of delivery and transferred to fuel cells and so on (see Figure 29).

### Transporting hydrogen as chemical hydride (Figure 29)



### Toward joint R&D on nuclear fusion

Nuclear fusion is the use of energy generated when plural nucleuses fuse into one, as opposed to nuclear fission. It is expected to become a permanent source of energy due to its superior features - it provides a stable supply of fuel resources (its fuel - heavy hydrogen - is contained richly in the sea), a fundamentally high safety level (reaction terminates immediately by stopping the fuel supply), and advantages to environmental preservation (reaction does not emit CO<sub>2</sub> or SO<sub>x</sub>). In Japan, R&D on nuclear fusion is underway at many institutions.

Designating nuclear fusion as one of the energy supplying methods for the next generation, we are cooperating with research at Japan Atomic Energy Research Institute, National Institute for Fusion Science, Institute of Advanced Energy Kyoto University, and Institute of Laser Engineering Osaka University Nuclear Fusion Center.



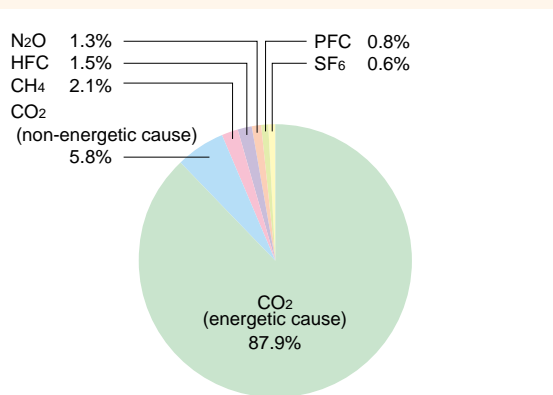
## Reducing Emissions of Greenhouse Gases other than CO<sub>2</sub>

At COP3 in Kyoto in December 1997, reduction goals were determined for greenhouse gases including carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbon (HFC), perfluorocarbon (PFC), and sixth fluoridation sulfur (SF<sub>6</sub>).

CO<sub>2</sub> has more emissions than other greenhouse gases, more than 90% of Japan's total, and over 99% of Kansai Electric's total (see Figures 30 and 31).

Apart from CO<sub>2</sub>, although we do produce small amounts of SF<sub>6</sub>, which we use in insulation in electrical equipment, we use almost no other greenhouse gases.

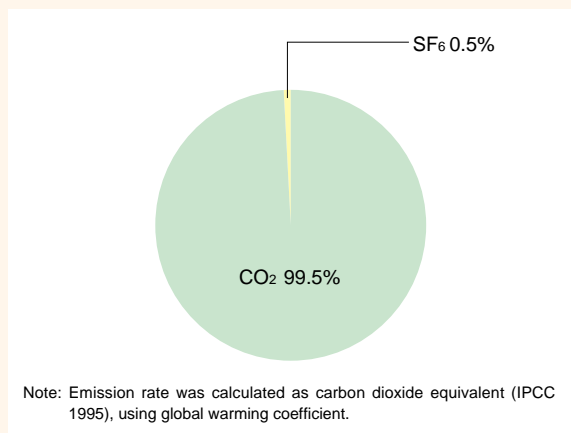
Emission rate of greenhouse gases in Japan (Fiscal 1998) (Figure 30)



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

Source: assembled from Environment Agency data

Emission rate of greenhouse gases at Kansai Electric (Fiscal 2000) (Figure 31)



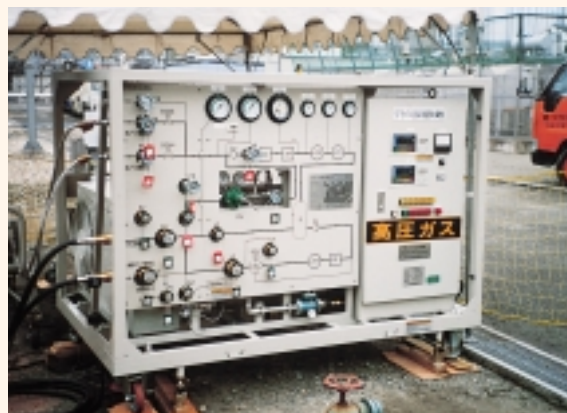
Note: Emission rate was calculated as carbon dioxide equivalent (IPCC 1995), using global warming coefficient.

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

SF<sub>6</sub> is widely used in electric apparatus, namely gas circuit breakers and gas-insulated switchgears, because it is a highly efficient insulation gas which helps to make the electric apparatus lightweight and compact, and does not cause harm to human health. The SF<sub>6</sub> gas insulator has been indispensable to electric enterprises because, (1) the substation sites can be greatly reduced, (2) it is harmonious with the environment as it does not require a large site and (3) it enables construction of underground substations in urban areas.

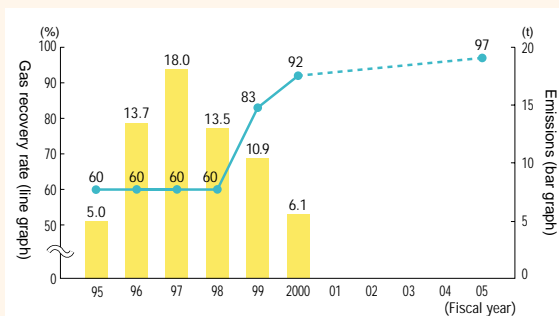
SF<sub>6</sub> gas, such as that used for electric insulators, is normally used hermetically and there is almost no leakage while the apparatus is in operation. However, SF<sub>6</sub> gas is known to have been emitted during complete inspections of the insulating parts, which are required every 18 years.

We will continue to use SF<sub>6</sub> in the future since currently there is no other alternative in terms of performance, handling, safety and economy. However, we are endeavoring to control emissions during use. We were able to recover 83% of the SF<sub>6</sub> during inspection in fiscal 1999, and attained 92% in fiscal 2000. Through even greater cooperation with manufacturers, we intend to raise this to 97% by fiscal 2005 (see Figure 32).



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

SF<sub>6</sub> gas recovery rate during apparatus inspection (Figure 32)



# Activities Abroad

## Activities carried out abroad to prevent global warming

The United Nations Framework Convention on Climate Change (FCCC) is emphasizing international cooperation in the fields of technology, funding, and research into climate change. At the third session, COP3, in 1997 in Kyoto, members agreed to introduce the Kyoto Mechanisms — Emissions Trading, Joint Implementation,

and the Clean Development Mechanism — to complement the goals each of them set for reduction of greenhouse gasses in their own countries (see page 24).

We believe that the Kyoto Mechanisms is the method to reduce CO<sub>2</sub> emission in a cost effective way. By utilizing Kyoto Mechanisms, we can contribute to solving the social problem of global warming while at the same time carrying out our business in an environmentally-friendly manner.

It is to this end that we are developing our international business with the aim of applying the Kyoto Mechanisms. We are using our advanced technology built up over many years and our know-how gained through dedicated survey and research in order to invest in and start business on a global scale.

## Activities Abroad

(Activities carried out abroad to prevent global warming)

### Research and Development to Expand Natural Resources

Tropical Rainforest Restoration Technology Development Project	Indonesia
CO <sub>2</sub> Absorption and Fixation Research Through the Use of Coastal Ecosystems	Australia, Thailand
Tropical Rainforest Restoration Technology Development Project	Thailand
Open-cut Coal Mine Rehabilitation Project	Australia

### Activities and Business Feasibility Studies for the Future Utilization of the Kyoto Mechanisms

Power Plant Thermal Efficiency Improvement/Recovery Through Enhanced Operational Management	Thailand
Installation of Renewable Energy Supply Systems in Indonesia	Indonesia
Basic Study on Reconstruction and Modernization of Konakovo Thermal Power Station	Russia
Basic Study on Reconstruction and Modernization of Symferopoloskaya Thermal Power Station	Ukraine
Renovation and Rehabilitation of District Heat Supply System	Georgia
Ambuklao Hydropower Plant Rehabilitation Plan	Philippines

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

San Roque Multipurpose Project (115MW x 3 units)	Philippines
Institutional Transfer and Technical Consulting Services for Hydropower Development Projects	Myanmar
Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P.	Eastern Europe



## Research and Development to Expand Natural Resources

Increasing the scale of nature's CO<sub>2</sub> absorbing capacity, such as the tropical rainforests, is an important and cost-effective way to achieve reduction of greenhouse gases. That's why, from early 1990s, we have been carrying out research and development on technology that can fully apply the principles of the Kyoto Mechanisms such as the Joint Implementation, and the Clean Development Mechanism projects.

### Developing technology to restore the rainforests through large-scale afforestation

Every year, 12.6 million hectares of tropical rainforest — an area roughly one-third the size of Japan — disappear.

Although we tend to think that tropical rainforests can replenish themselves quickly, this is unfortunately not the case. Because the temperature in the tropics is high, organic matter dissolves quickly and is dispersed into the air as substances such as CO<sub>2</sub> and CH<sub>4</sub> (methane). This means there is only a thin layer of soil with few nutrients. For example, the lauan only bears fruit once every three to five years since doing so every year would drain its nutrients and cause it to die. Accordingly, restoration of the rainforests requires the help and guidance of people.

Against this background, 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. As well, they have found that the fungi have been effective in doubling tree size growth and in increasing the number of trees by five times (see Figure 33).

In fiscal 1998, the experimental forest area was increased further by 60 hectares, and in this forest researchers have been

testing technology for improved afforestation, developing afforestation support technology such as "Agroforestry" (a method of afforestation in which the forest is managed while planting and harvesting agricultural crops so as to eliminate the necessity of slash and burn farming), and attempting to improve soil by confining CO<sub>2</sub> using charcoal.

Furthermore, in Indonesia, we have held seminars on the subject of the restoration of tropical forests, and through the dissemination of its results, etc., we have been enhancing the research being conducted in Indonesia.



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

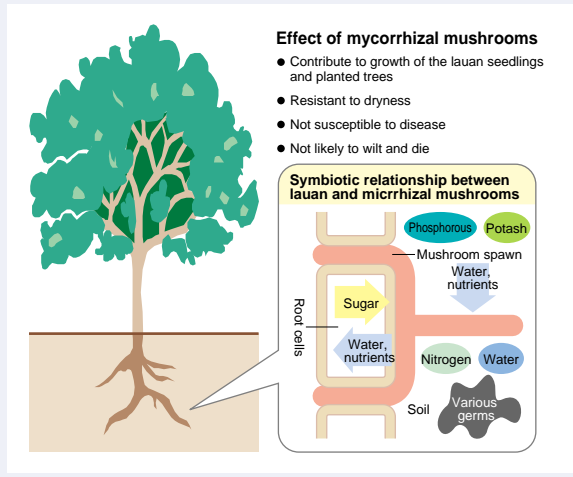


Pilot plantation Afforestation field test (Sumatra, Indonesia): 30cm lauan seedlings obtained a height of 8m over a 5-year period

### 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 contents	Develop technology for reforestation of lauan, a native tree, in order to restore the tropical rainforests, which act to absorb CO <sub>2</sub> .
Site	Java and Sumatra, Indonesia
Duration of the project	July, 1992-March, 2002

### Symbiotic relationship between lauan and mycorrhizal mushrooms (Figure 33)



### Developing technology for planting mangroves in devastated lands for the sake of local improvement

Mangrove is a general term for the tropical region vegetation that exists in the coastal regions where sea water and fresh water meet and mix. Mangrove forests provide an ideal habitat for marine life, and also play an important role in providing local residents with food and wood resources (see Figure 34).

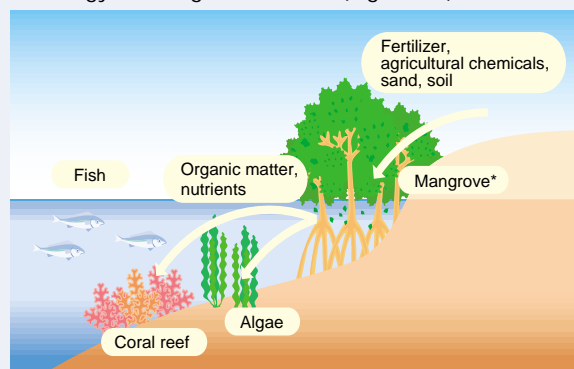
However, mangrove forests have been rapidly disappearing in Southeast Asia due to expanded shrimp cultivation and tin mining.

For four years from 1996 to 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 better at absorbing and fixing CO<sub>2</sub> than tropical rainforests. As well, it was discovered that the areas where sea and fresh water meet contain very little oxygen and thus things like falling leaves are not decomposed but rather accumulate as organic carbon. This means that these coastal areas hold promise as storage areas 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 started in 2000.

The aim of this research is to restore the mangrove forests, which have been devastated by industries like shrimp cultivation, and develop reforestation technology that can sustain the mangrove forests and thus contribute to the local improvement in a sustainable way. We are planting approximately 250,000 mangrove trees covering an area of roughly 80ha. In addition, we are looking into the possibility of creating a “Silvo-fishery system” combining forestry and fishery related activities.

#### Ecology of Mangrove Forests (Figure 34)



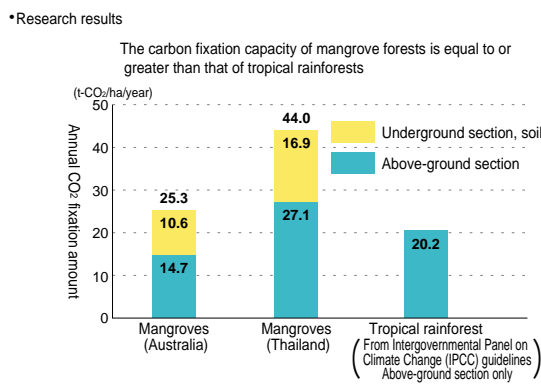
\* "Mangrove" is the general term for thickets of salt-resistant plants distributed throughout tropical and subtropical regions in the brackish waters of coastal and estuarial intertidal regions. In these swamps, leaves and twigs fall continuously from plants, then decay and are consumed by plankton, which are in turn eaten by fish. Thus, a mangrove swamp plays an important role, forming the center of an entire food chain.



Mangrove forest in Thailand

#### 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 contents	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	March, 1996-March, 2000



#### Outline of project with Thailand Royal Forest Department

Contents	
Project name	Tropical Rainforest Restoration Technology Development Project
Participating Japanese companies	Kansai Electric Kansai Environmental Engineering Center
Cooperative body	Royal Forest Department in Thailand
Project contents	Development of technology to plant trees in a devastated mangrove forest, which is a promising CO <sub>2</sub> pool
Site	Samuth Songkram, and other locations in Thailand
Duration of the project	October, 2000-March, 2004



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

In October 2000, a joint body was formed from Kansai Electric, Japan Coal Energy Center, Idemitsu Kosan Co., Ltd. and Electric Power Development Co., Ltd. It was entrusted with conducting joint experimental testing of newly developed technologies aimed at the rapid and reliable creation of forests with high CO<sub>2</sub> absorption capabilities in open-cut coal mine in Australia by the New Energies and Industrial Technologies Comprehensive Development Organization (NEDO). This work is being carried out in collaboration with the Australian authorities.

Currently, only grass can be grow in such areas. It is believed that the planting of trees and creation of forests in such areas would contribute greatly to the mitigation of global warming.

Under the current experiment, approximately 13,000 eucalyptus seedlings have been planted over an area of roughly 28ha on the site of an open-cut coal mine. Their condition of growth and ability to absorb CO<sub>2</sub> is now being evaluated.

The study area gets little rain and is classified as savannah. The Kansai Electric Group hopes to make the most of the technologies it has developed to enhance the plant growth using mycorrhizal mushrooms and charcoal.

### 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 Corp., Electric Power Development
Cooperative body	Commonwealth Scientific and Industrial Research Organization (CSIRO)
Project contents	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 the effective use of such new technologies.
Site	Australia's Ensham and Ebenezer Mines
Duration of the project	October, 2000-2005 (scheduled)



Site of Rehabilitation Project

## Activities and Business Feasibility Studies for the Future Utilization of the Kyoto Mechanisms

The Framework Convention on Climate Change introduces the concept of joint action (Joint Implementation) being taken by countries in tackling the problem of reducing the production of greenhouse gases. Wanting to be involved in promoting AIJ (Activities Implemented Jointly), Japan created a basic framework called the AIJ Japan Program. Our company has already undertaken two such projects, the "Power Plant Thermal Efficiency Improvement/Recovery Through Enhanced Operational Management in Thailand" and the "Installation of Renewable Energy Supply Systems in Indonesia".

Regarding the project in Thailand, various Japanese electric power companies are offering their experience and know-how with regard to the running of power stations and safety management. The aim is to raise the thermal efficiency of the South Bank Power Station (fossil fuel fired plant) in cooperation with the Electricity Generating Authority of Thailand (EGAT) through making the most out of a mutual exchange of knowledge and experience.

Research into the current state of operations and into measures to be taken was carried out in April 1996. These measures were then put into effect between October 1997 and March 2000. The resulting improvement in thermal efficiency exceeded that planned for. Over a 30-month period, we were able to obtain a savings effect of approximately 170 million yen for roughly 13,000t of heavy oil as fuel. This meant that we were able to reduce CO<sub>2</sub> emissions by approximately 40,000t.

We would like to consider to conduct same sort of activities as Clean Development Mechanism and Joint Implementation (the Kyoto Mechanisms) projects by using this valuable experience.

In February 2001, we received a certificate of thanks from the President of EGAT for our work in Thailand.



Ceremony for Receiving Certificate of Thanks



### 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 contents	The four companies named above ("the parties") 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	April, 1996-March, 2000 (including monitoring)
Expected effect (project total)	CO <sub>2</sub> emission reduction: 40,000 t-CO <sub>2</sub> /thirty months



South Bangkok Power Station

### 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 contents	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	June, 1996-December, 2000 (we have been providing support for management of maintenance) (activities since the beginning of 2001)
Expected effect	CO <sub>2</sub> emission reduction: 1,200 t-CO <sub>2</sub> /year

\* This project will be implemented in the name of "E7". "E7" is a group consisting of some of the world's major producers and distributors of electricity (see page 71), which was organized in 1992 to hold global consultations on environment issues.



Explaining the Solar Home System at the local level

In order to develop new projects for the future utilization of the Kyoto Mechanisms, Kansai Electric implemented the Basic Survey for Joint Implementation Project, under a publicly recruited Feasibility Study organized by NEDO, to replace the generation system at Konakovo Thermal Power Station in Russia in fiscal 1998, and at Symferopoloskaya Thermal Power Station in the Ukraine in fiscal 1999.

In fiscal 2000, we participated in the Feasibility Study on Renovation and Rehabilitation of District Heat Supply System in Tbilisi, Georgia. Furthermore, we also took part in the Ambuklao Hydropower Plant Rehabilitation Project in the Philippines under a publicly recruited Feasibility Study called the Study for Environment and Plant Rehabilitation Projects, organized by JETRO (the Japan External Trade Organization).

### 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 Corp.
Cooperative body	United Power System of Russia
Project contents	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



Konakovo Thermal Power Station (Moscow)

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

	Contents
Project name	Basic Study on Reconstruction and Modernization of Symferopoloskaya Thermal Power Station
Participating Japanese companies	Kansai Electric, Sumitomo Corp.
Cooperative body	Krymenergo
Project contents	The project would improve the total plant thermal efficiency of Symferopoloskaya 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	Symferopoloskaya Thermal Power Station (Crimea)
Expected effect	CO <sub>2</sub> emission reduction: 0.7 million t-CO <sub>2</sub> /year



Symferopoloskaya Thermal Power Station (Crimea)

## 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 Corp.
Cooperative body	Ministry of Fuel and Energy, Tbilisi
Project contents	To improve regional heating plant through restoration of existing hot water boilers and construction of new gas turbines for power plants.
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)



District Heating Plant in Tbilisi, Georgia

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

	Contents
Project name	Ambuklao Hydropower Plant Rehabilitation Plan
Participating Japanese companies	Kansai Electric, NEWJEC
Cooperative body	Philippine National Power Company (NPC)
Project contents	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 Hydroelectric Power Plant (Benguet Province, Luzon Island)
Expected effect	CO <sub>2</sub> emission reduction: 0.3 million t-CO <sub>2</sub> /year



Ambuklao Hydro Electric Plant (Benguet Province, Luzon Island)

Furthermore, in the fiscal year 2001, we are now also conducting a “Study on the Rehabilitation of the Binga Hydropower Plant in the Philippines” and a “Study on Thermal Efficiency Improvement Works at the Garbadani Power Plant in Georgia,” as part of public recruited Feasibility Study organized by JETRO and NEDO, respectively.

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

In April of 1998, Kansai Electric decided to participate in a hydropower generation project in the Philippines. This was the first time that a Japanese power company committed its resources to full-scale investments and participation in an electric power generation project abroad, known as the San Roque Multipurpose Project. This will be one of the biggest hydropower generation projects in the Philippines, and we are jointly investing and participating in the project with Marubeni Corp. and Sithe Energies, Inc.

Furthermore, in August of 2001, we entered into a consultation contract with Myanmar Electric Power Enterprise (MEPE), to facilitate our electric power development projects.

According to this agreement, our company will be engaged, in technical guidance to Myanmar Electric Power Enterprise employees, along with NEWJEC Inc. for the following three-year period.

This project was initiated by the government of Myanmar, being troubled by chronic power shortages, and employing the country’s rich hydropower resources, it will develop power generation plants (12 locations) capable of generating 2 million kW of power in the period from 2001 to 2005.

We consider that participation in this type of renewable hydropower development is significant in terms of its contribution to the mitigation of global warming.



### Outline of the project in the Philippines

Contents	
Project name	San Roque Multipurpose Project (115MW x 3 units)
Implementing corporation	San Roque Power Corporation*
Project contents	Construct a hydropower plant, and hand over the ownership of the plant to the 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: 0.3 million t-CO <sub>2</sub> /year

\* Kansai Electric will begin by establishing wholly owned company Kanden International Co., Ltd., then establish subsidiary KPIC Singapore Ltd. in Singapore. KPIC Singapore will invest in San Roque Power Co., Ltd.



Construction site for San Roque Project

### Outline of the Project in Myanmar

Contents	
Project name	Institutional Transfer and Technical Consulting Services for Hydropower Development Projects
Companies involved	Kansai Electric NEWJEC
Partner Organization	Myanmar Electric Power Enterprise (MEPE)
Project contents	The Kansai Electric Power Company will support Myanmar to develop hydropower plants and transfer engineering technique obtained through its over-century experience by means of OJT (On the Job Training) in Myanmar and training programs in Japan.
Site	Sittang Valley and others in Myanmar. 12 sites (2000MW)

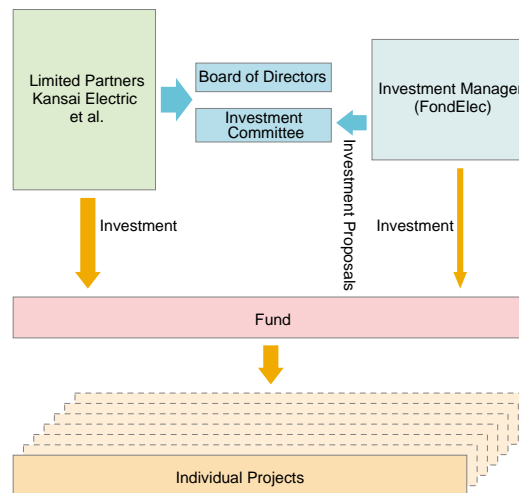


Ceremony for the Signing of the Consultant Contract

Furthermore, in January 2000, our company made the decision to participate in the “Dexia-Fond Elec Energy Efficiency and Emissions Reduction Fund, L.P.,” an environmental fund put together by the European Bank for Reconstruction and Development (investment: 10 million euros). The purpose of this fund is to invest in energy businesses involved in such areas as electricity, heat supply, and gas supply in the 26 Eastern European countries which are candidates for loans from the European Bank for Reconstruction and Development, thereby reducing the emission of greenhouse gases at the same time as increasing revenues through improved efficiency, while aiming for the eventual acquisition of emission reduction credits of greenhouse gases.

### Outline of the investment fund in Eastern Europe

Contents	
Name	Dexia-FondElec Energy Efficiency and Emissions Reduction Fund, L.P.
Investor	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)
Description of Businesses	To invest energy businesses involved in electricity, heat supply, and gas supply in 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 of greenhouse gases.
Size of fund	Established at 71 million euros. Additional fundraising to a maximum of 150 million euros
Duration	2000-2009 (extended a maximum of two years)



Scheme for the Investment Fund for Energy-Conserving Businesses in Eastern Europe





## Protecting the Ozone Layer

Kansai Electric works to protect the earth from ultraviolet rays.

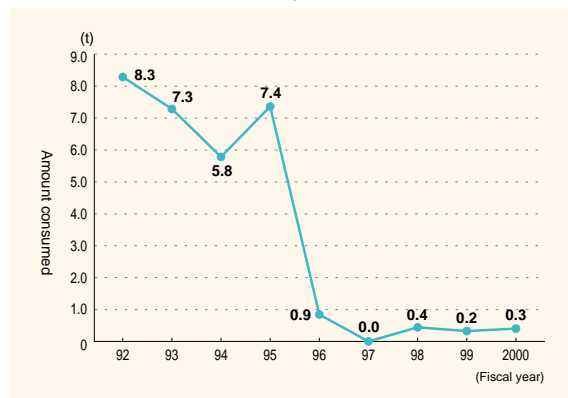
CFCs and halon gas destroy the ozone layer in the stratosphere, causing an increased amount of ultraviolet rays to reach the earth's surface. Since ultraviolet rays are harmful to humans and animals, the destruction of the ozone layer has a significantly negative impact on ecological systems. For this reason, production limits on these materials are being set under international control.

We are taking every possible measure to abolish the use of specified CFCs, with the aim of aggressively promoting the Japanese government's measures to protect the ozone layer.

CFCs have mainly been used as air conditioning coolants. However, all new air conditioners installed after 1996 have been using CFC substitutes. Existing air conditioners are being replaced as necessary with new models using CFC substitutes. During inspection of air conditioners, recovery equipment is being used to keep CFCs from escaping into the air (see Figure 35).

In the past, fire-extinguishing equipment at power stations (fossil fuel and nuclear) were designed to use halon gas. However, fire-extinguishing equipment at new facilities now uses CO<sub>2</sub> or powder extinguishing material instead of halon gas. Existing extinguishers will be replaced by those using halon substitutes as soon as regulations allowing their use are approved, as they are only used in fire emergencies.

Consumption of CFCs (Figure 35)

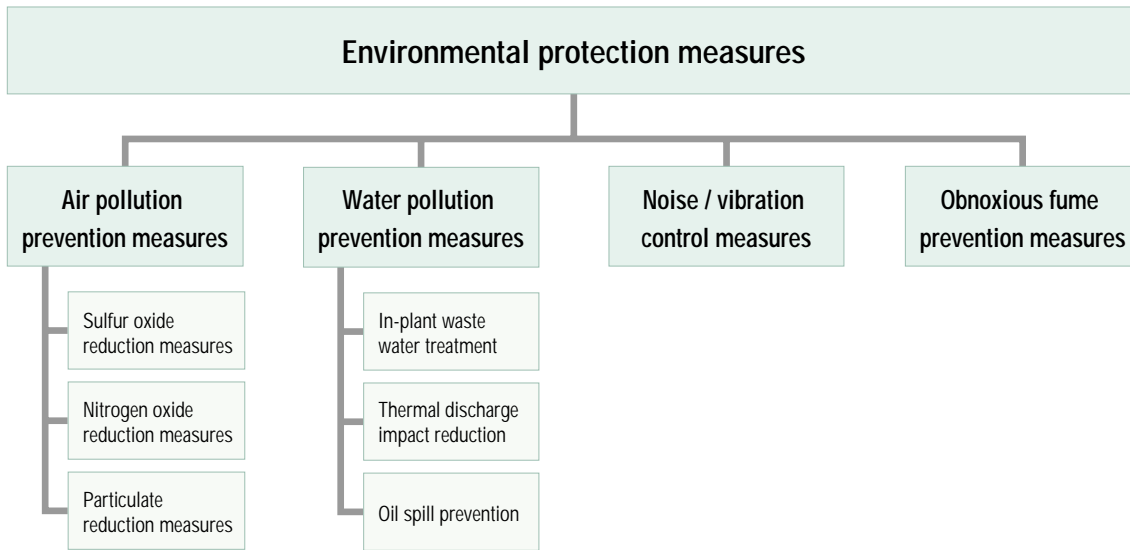




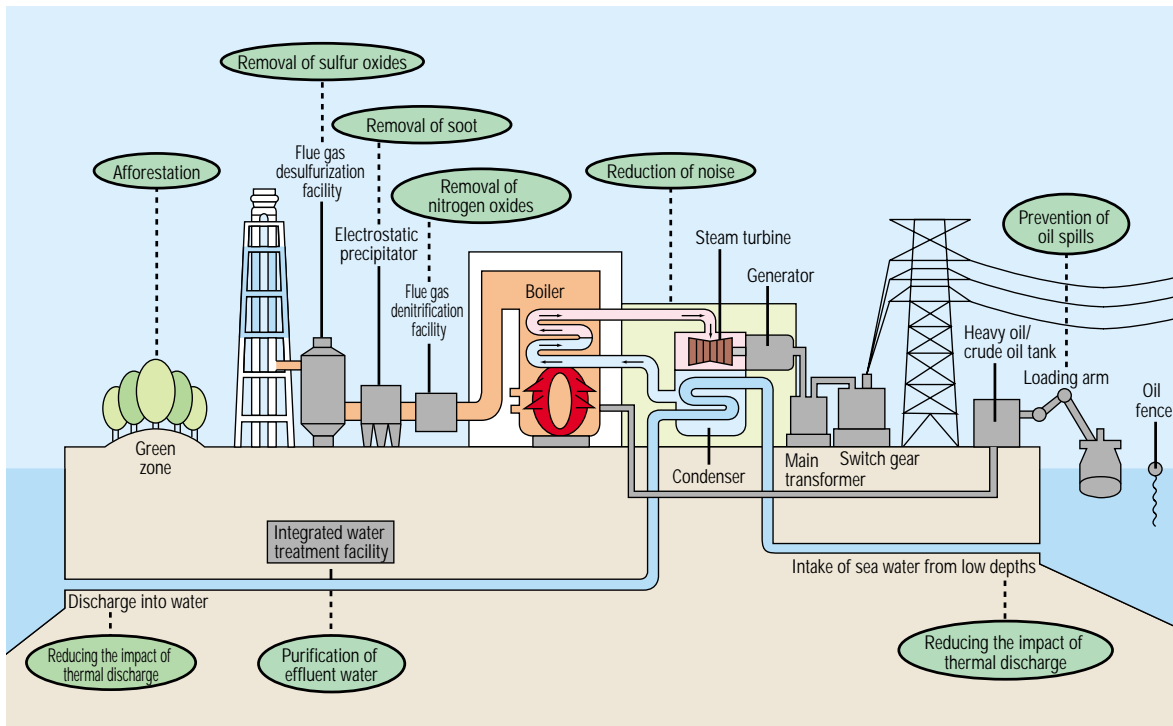
# Working to Protect the Environment

In accordance with the Environmental Protection Agreement, thorough care is taken at fossil fuel power stations in not only implementing countermeasures against

air pollution, water pollution, noise and vibration, but also in observing how these measures are working (see Figure 36).

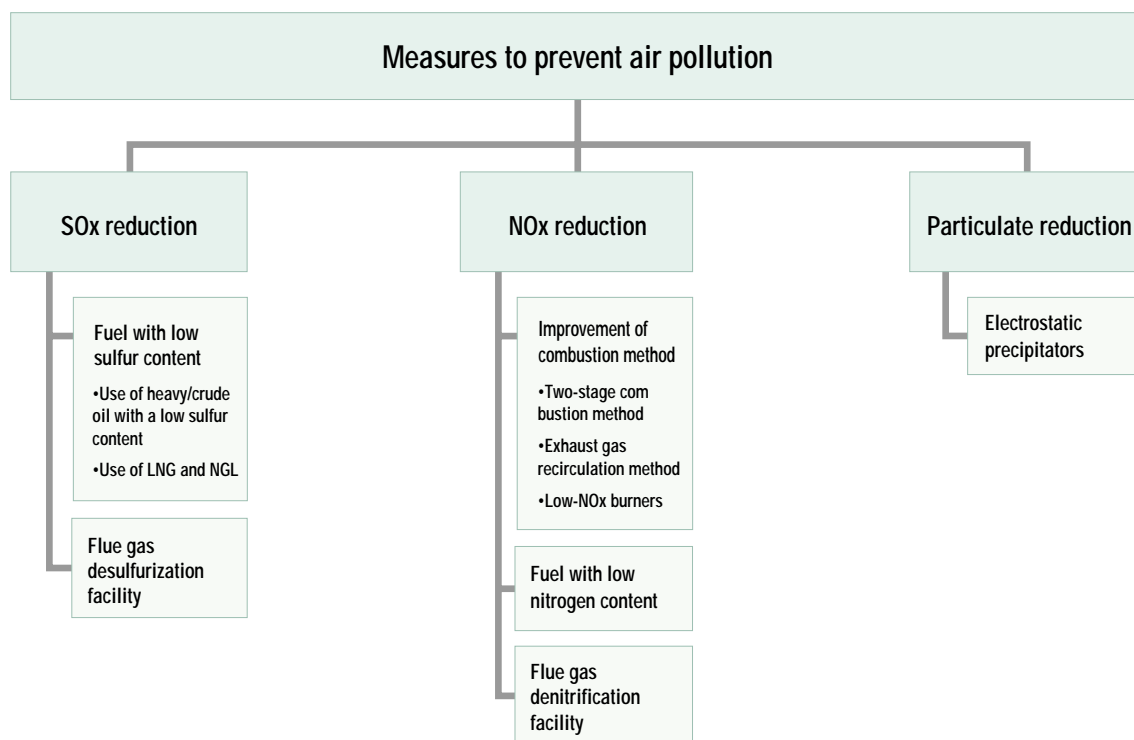


Environmental protection system in a fossil fuel power station (Figure 36)





## Measures to prevent air pollution



### Reducing sulfur oxides (SOx)

To reduce SOx emissions, Kansai Electric has promoted the following methods:

- Use of heavy/crude oils with low sulfur content
- Use of LNG (liquefied natural gas) and NGL (natural gas liquids)

We have also adopted flue gas desulfurization facilities to remove SOx from flue gas, thus reducing SOx emissions with both fuel- and facility-related measures.

#### Use of heavy / crude oil with a low sulfur content

SOx is generated when fuel is combusted and the sulfur content comes into contact with oxygen. Therefore, reducing the sulfur content in fuel leads to SOx reduction. For this reason, Kansai Electric uses heavy oil or crude oil low in sulfur content, which is an important anti-sulfur oxide measure.

#### Use of LNG (liquefied natural gas) and NGL (natural gas liquids)

Kansai Electric uses clean LNG and NGL, which are completely sulfur-free. LNG consumption in fiscal 2000 totaled approximately 5.46 million tons, accounting for 79% of the total fossil fuel power generation.

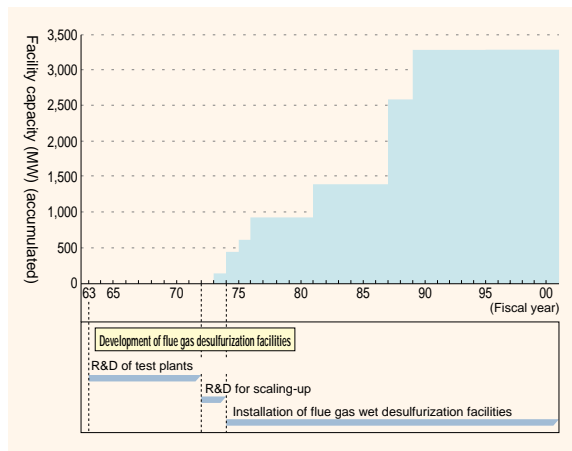


### Installation of flue gas desulfurization facilities

Kansai Electric has conducted extensive research and development on flue gas desulfurization facilities to reduce SOx emissions.

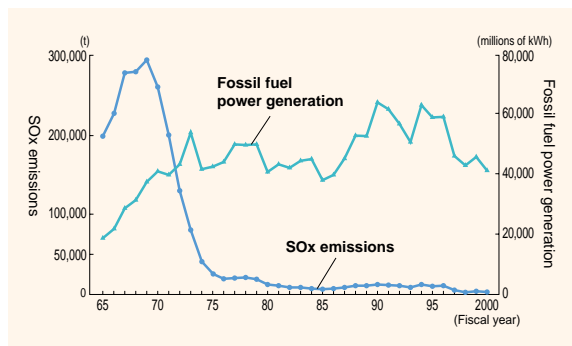
As of the end of fiscal 2000, we have installed a total of 10 flue gas desulfurization facilities at power stations with a total generating capacity of 3,330 MW. Together with the use of low sulfur content fuel, these facilities are contributing greatly to the reduction of SOx emissions (see Figure 37).

Installation of flue gas desulfurization facilities (Figure 37)



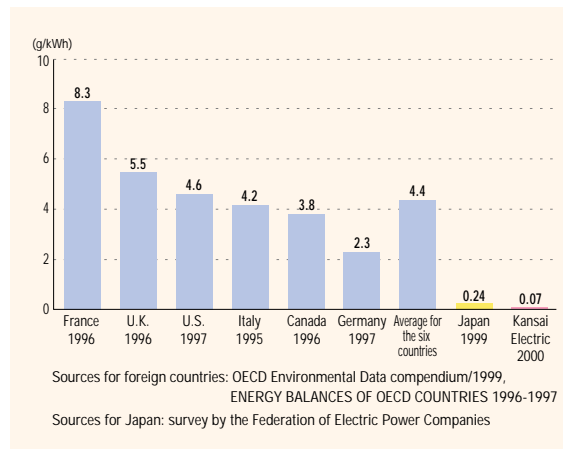
By implementing the above measures, the annual SOx emissions in fiscal 2000 have been reduced to approximately 1.4% compared to fiscal 1965 (see Figure 38).

SOx emissions and fossil fuel power generation (Figure 38)



The rate of SOx emissions per unit of fossil fuel power generation achieved by Japanese power companies is considerably lower than that of major Western countries (USA, Germany, UK, France, Canada and Italy). The Japanese average is 0.24g/kWh as opposed to their combined average of 4.4g/kWh. Kansai Electric's level is even lower than the Japanese average (see Figure 39).

SOx emissions per kWh from fossil fuel power generation (Figure 39)



### Reducing nitrogen oxides (NOx)

NOx is generated when nitrogen in fuel and in the air react chemically with oxygen in the air. It is said that the higher the combustion temperature becomes, the more NOx is generated. To reduce NOx emissions, our fossil fuel power stations are implementing the following measures.

#### Improving the combustion system

To reduce NOx emissions through the improvement of the boiler combustion system, three methods are available - the two-stage combustion method, the exhaust gas recirculation combustion method, and the use of low-NOx burners.

Kansai Electric has made improvements on boilers to enable them to simultaneously use both the two-stage combustion method and the exhaust gas recirculation combustion method. For an even greater reduction in NOx emissions, we have also installed low-NOx burners, which have been developed based on the principles of these methods.



### Use of fuels with low nitrogen content

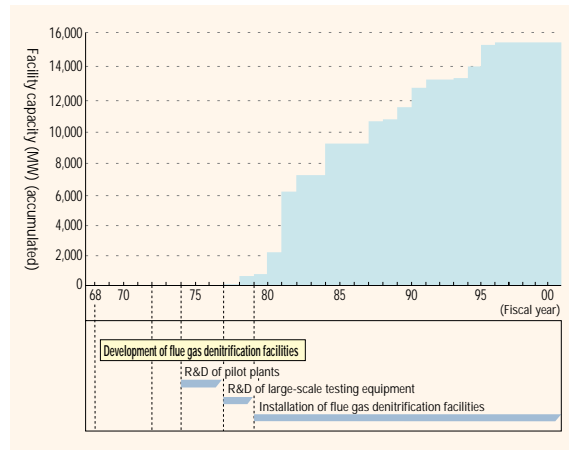
As of the end of fiscal 2000, Kansai Electric has converted the boilers at 14 out of 17 existing fossil fuel power stations to use LNG or high quality oils such as NGL, which contain little nitrogen.

### Installation of flue gas denitrification facilities

Kansai Electric has focused much effort on the research and development of flue gas denitrification facilities to reduce NOx emissions and on their introduction to plants.

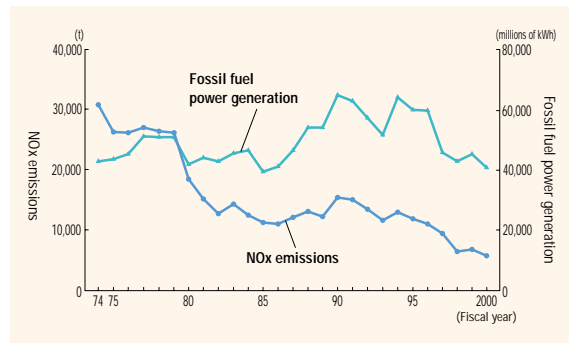
As of the end of fiscal 2000, we have 46 denitrification facilities with a total capacity of 15,380 MW (see Figure 40).

Installation of flue gas denitrification facilities (Figure 40)



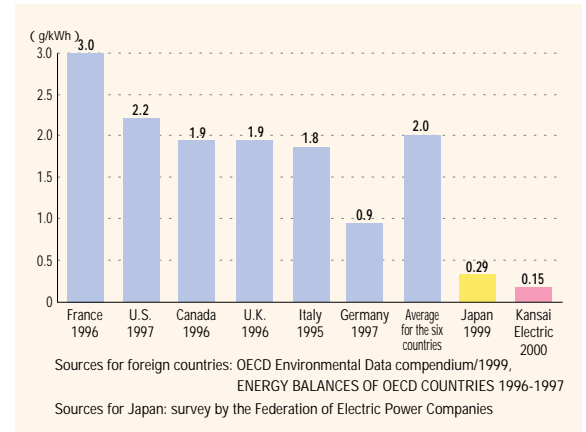
By implementing the above measures, the annual NOx emissions in fiscal 2000 have been reduced to approximately 20% compared to fiscal 1974 (see Figure 41).

NOx emissions and fossil fuel power generation (Figure 41)



In addition, average NOx emissions per unit of fossil fuel power generation in Japan is 0.29g/kWh, a figure considerably lower than the 2.0g/kWh combined average of the USA, Germany, the UK, France, Canada and Italy. Kansai Electric's level is even lower than that of the Japanese average (see Figure 42).

NOx emissions per kWh from fossil fuel power generation (Figure 42)



### Reducing particulates

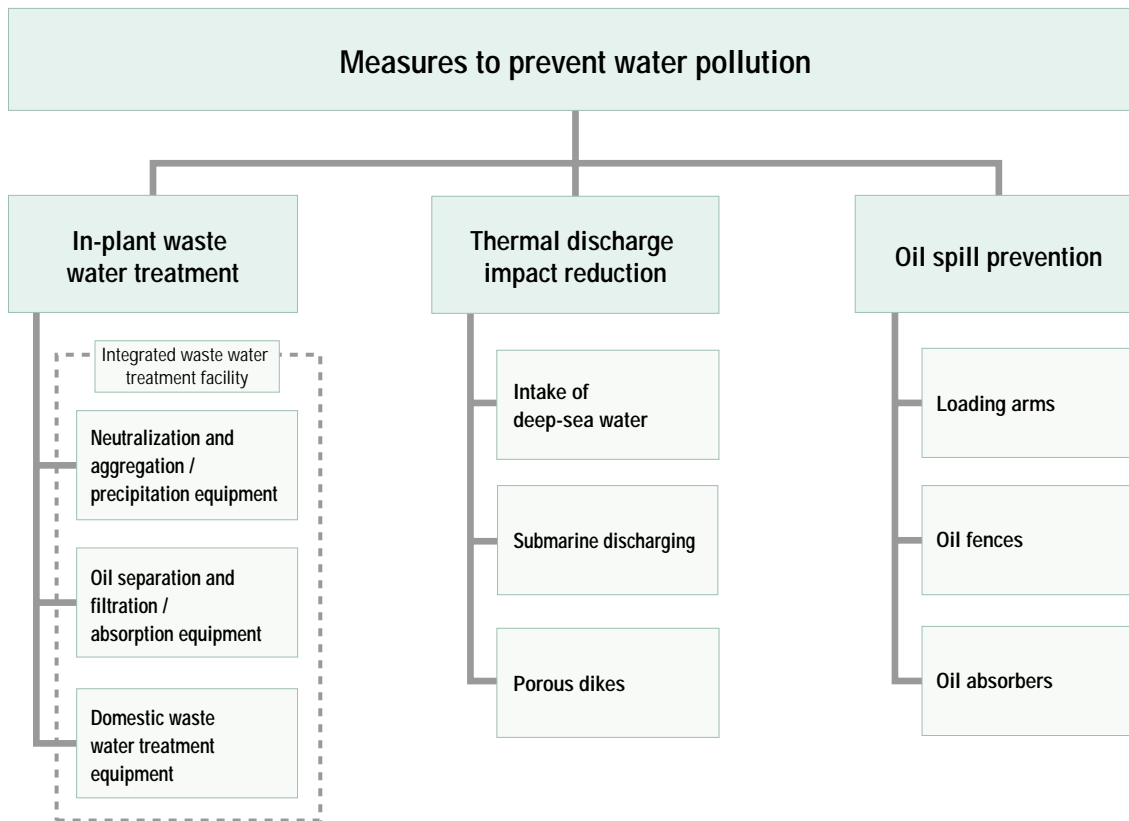
All boilers for crude and heavy oil are equipped with high efficiency electrostatic precipitators in order to achieve the lowest possible level of particulates.



Electrostatic precipitator (Kainan Power Station)



## Measures to prevent water pollution



### In-plant waste water treatment

In-plant waste water produced from operations at fossil fuel power stations contains small amounts of acid, alkali, suspended solids, oil and other substances. Machine cleaning during annual boiler and turbine overhaul inspections also produces waste water. All the waste water is specifically treated based on its respective condition by using neutralization and aggregation/precipitation equipment and oil separation equipment for purification. It is then purified using filtering and adsorption treatment facilities.

Also domestic waste water from employee facilities is purified using specifically designed treatment facilities before being discharged.

### Thermal discharge impact reduction

At fossil fuel and nuclear power stations, turbine generators are driven by high-pressure, high-temperature steam which is cooled by seawater in a condenser in order to return it to a liquid state. The temperature rise (thermal discharge) of the seawater is kept at 7°C or less.

In order not to affect sea life, deep-sea intake and submarine discharge is used, and their locations are carefully selected by the characteristics of each station's location in order to minimize the area in which heated water is dispersed.





### Oil spill prevention

Oil brought in by tankers is unloaded at docking facilities on power station sites. To avoid oil spills, we use a loading arm, which directly and firmly connects an intake valve on the pier with an outlet valve on the tanker.

During the unloading of oil, absorbers are kept on hand, and an oil fence is in place to prevent oil from spreading in the rare case that a spill occurs.

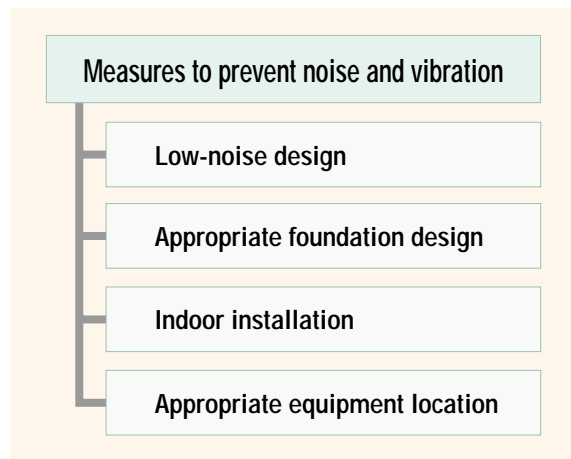
When the loading arm is in operation, the area is under intense surveillance by trained staff. Oil retaining dikes are also installed around fuel tanks to prevent any spilled oil from spreading.



Oil fence at unloading dock



### Measures to prevent noise and vibration



### Noise prevention

In power stations and substations, various devices such as draft fans, transformers, turbine generators, and pumps are usually in operation. To prevent noise, we generally place these facilities inside buildings. When they must be built outdoors, these facilities are specially equipped with

silencers and soundproof walls to minimize noise and are located in isolated places in order not to disturb residential areas.

### Vibration prevention

Facilities that may cause vibrations at power stations and substations are installed on a solid base. They are also located as far as possible from the station's outer boundaries in order to minimize vibration levels outside the power stations.



### Measures to prevent Noxious Fumes

We deal with the substance ammonia at our power stations, and this gives off noxious fumes. These ammonia fumes are sucked into smoke and particulate extraction apparatus and electrically operated dust chambers. This equipment functions automatically and works to continually absorb the appropriate amount of fumes. Ammonia concentrations in the smoke are kept down to a low level and periodical measurements of those levels are also carried out. These facilities use apparatus that conforms to the technological standards stipulated by 'High Pressure Gas Control Law'. This equipment is regularly inspected and the appropriate maintenance is carried out to prevent leakage.



## Measures to Deal with Chemical Matters

### Pollutant Release and Transfer Register (PRTR)

The Pollutant Release and Transfer Register is a system which states that a company must notify the government of the amount of potentially harmful chemical matter it emits into the environment and the amount of waste material that it transfers. The government will then make this information public. The purpose of the system is to improve the independent management of chemical matters by companies, decrease the amount of emissions, and control the amount of waste.

Major countries in Europe and North America have already introduced the PRTR system and legalized. The

PRTR system was enacted as the Bill Concerning Reporting, etc. of Release to the Environment of Specific Chemical Substances and Promoting of the Improvements in Their Management (Japan's PRTR Law) in July 1999 in Japan, and in March 2000, the government instituted a list of the chemical matters and the types and scale of businesses to which the law applies. Since April 2001, companies have been legally obligated to provide the authorities with data on emissions, to be submitted by the end of June 2002.

Even before this, Kansai Electric had been independently monitoring emission of chemical substances into the environment and had ascertained that the volumes of such emissions were extremely small. This data has been included in this report since last year (see Table 8).

Kansai Electric's data related to the Pollutant Release and Transfer Register (fiscal 2000) (Table 8)

Chemicals	Use	Amount handled (t/year)	Amount emitted (t/year)	Where emitted	Amount transferred as waste (t/year)
2-aminoethanol	Water supply processing agent	28.6	0		0
Toluene	Power generation fuel (contained in naphtha and NGL)	30.5	0		0
Xylene	Power generation fuel (contained in NGL)	36.0	0		0
Hydrazine	Water supply processing agent	104.8	0		0.22
HFC-225	Cleaner	6.6	6.6	Into the atmosphere	0
Thiourea	Chemical agent used in cleansing boiler acid	4.5	0		0
Dioxins	Waste disposal incinerator	0 (mg-TEQ/year)	99.5 (mg-TEQ/year)	Into the atmosphere	0.1 (mg-TEQ/year)

### Measures to deal with Dioxins

Levels of dioxins are mainly regulated using waste product incinerators (capable of incinerating more than 50kg/h) in line with the 'Waste Management Law' and the 'Law Concerning Special Measures Against Dioxins'.

We are working to reduce the amounts of material we have to incinerate by keeping waste product levels down and by recycling. At the same time, we are in the process of decommissioning such equipment. As a result of this, the number of incinerators employed was reduced from approximately 430 in 1997 to 43 by the end of fiscal 2000, and reports are available for 37 incinerators. These incinerators are being used as appropriate and our measurements of dioxin concentrations show that we have achieved levels far below

the standard stipulated by law. (See Table 9)

As for the boilers at our fossil fuel power stations, we are also taking steps beyond those called for in the regulations laid down in the Law Concerning Special Measures Against Dioxins. Our incineration operations are adequate, with material being completely combusted at high temperatures of above 1200°C. In addition to this, our fuel is almost completely free of chlorine so practically no dioxins are produced at all.

Furthermore, in carrying out voluntary inspections with regard to dioxin levels, we ascertained that dioxin discharges from our fossil fuel plants were virtually zero. We believe that this should give us a very low impact factor in terms of atmospheric pollution. (See Table 10,11)

Results of Measurements on Dioxin Levels in Reported Facilities and Discharged Gases (as of March, 2001) (Table 9)

Waste Product Incinerator	Combustion Capacity	Number of Facilities (End of Fiscal 2000)	Results of Measurements on Concentrations of Dioxins (Fiscal 2000)	Standard Value
	Over 200kg/h	3	0.022 ~ 0.05	80
	Over 50kg/h, Less than 200kg/h	34	0.022 ~ 23	

Level of Dioxin Discharges in Japan (Table 10)

Source	Amount Discharged (g-TEQ / year)		
	1997	1998	1999
Incineration Facilities	6,840-7,091	2,990-3,241	2,319-2,521
Furnaces for use in manufacture of copper goods	228.0	139.9	141.5
Electric furnace for use in manufacture of steel and copper goods, sintering	135.0	113.8	101.3
Zinc collection operations	42.3	20.4	18.4
Aluminum alloy manufacturing business	21.3	19.4	13.6
Electricity companies and fossil fuel power stations	1.63	1.55	1.64
Other	27.3-30.0	27.4-30.1	18.3-21.0
Total	7,300-7,550	3,310-3,570	2,620-2,820

Source: Compiled by this company from records of levels of dioxin discharges (June 2000, Environment Agency)

Results of Measurements on Dioxin Levels in Discharged Gases from Fossil Fuel Plants in Japan (Table 11)

	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, Environment Agency)

Reference: Level of atmospheric concentrations for fiscal year 1999 was 0.000065-0.001ng-TEQ/m<sup>3</sup> (Source: Environmental White Paper, fiscal 2001)



OUTPUT

### Control of Radioactive Waste

When operating a nuclear power station, radioactive waste is produced. However, we take thorough steps to ensure that the impact on the environment is kept down to the minimum.

Gaseous waste products emitted from our nuclear power stations are stored in tanks where their radioactivity is then depleted. After being percolated through a filter, they are then released into the atmosphere through a flue after they have been monitored to check that concentrations of radioactive material are sufficiently low. With liquid waste

products, they are evaporated and concentrated and then filtered. After this, they are either reused as distilled water or discharged via pipes into the sea after being monitored to ascertain whether concentrations of radioactive material are low enough. The concentrated liquid substance left over from the process of evaporation and concentration is also solidified into asphalt and sealed in drums. After its volume has been reduced by condensation or incineration it is safely stored along with other solid waste products contained in drums in warehouses specifically built for such purposes.

Some gaseous and liquid waste products are released into the environment after being processed. However, this material has a level of radioactivity well below the standard value for such. (See Table 12 and Figure 43)

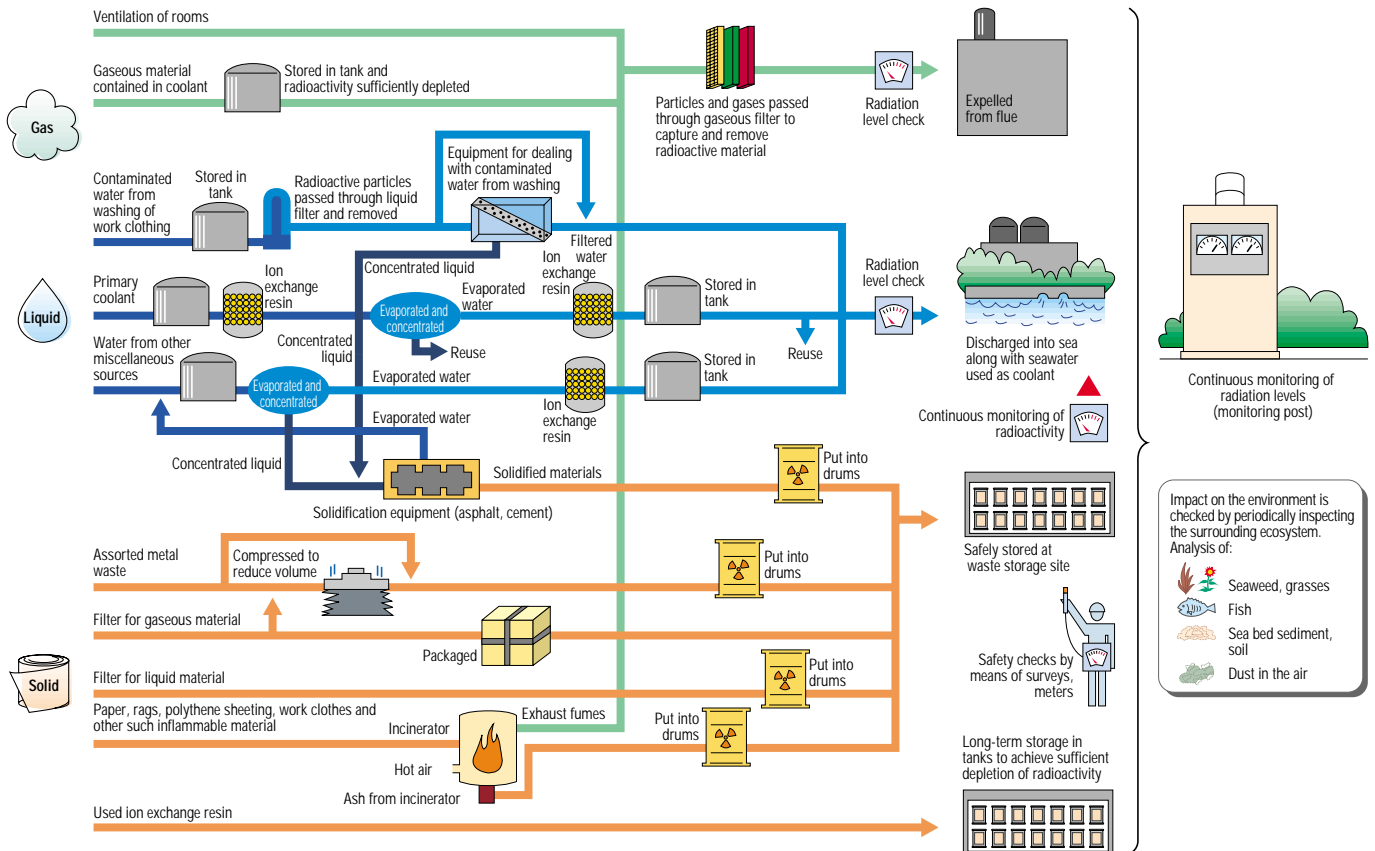
Discharge of Radioactive Gaseous and Liquid Waste Materials (Table 12)

(Becquerels)

Gaseous Waste Products	Power Station	Standard Value for Discharge	fiscal 1991	fiscal 1992	fiscal 1993	fiscal 1994	fiscal 1995	fiscal 1996	fiscal 1997	fiscal 1998	fiscal 1999	fiscal 2000
			Rare Gases	Mihama	$2.1 \times 10^{15}$	$2.8 \times 10^{11}$	$1.1 \times 10^{12}$	$2.0 \times 10^{11}$	$1.1 \times 10^{11}$	$1.6 \times 10^{11}$	$1.9 \times 10^{11}$	$1.9 \times 10^{11}$
Iodine	Takahama	$3.3 \times 10^{15}$	$1.8 \times 10^{12}$	$4.4 \times 10^{11}$	$6.2 \times 10^{11}$	$2.0 \times 10^{11}$	$2.1 \times 10^{11}$	$3.3 \times 10^{11}$	$3.7 \times 10^{11}$	$4.2 \times 10^{11}$	$4.0 \times 10^{11}$	$1.6 \times 10^{10}$
	Ohi	$3.7 \times 10^{15}$	$5.6 \times 10^{11}$	$5.3 \times 10^{11}$	$4.7 \times 10^{11}$	$6.0 \times 10^{11}$	$5.1 \times 10^{11}$	$4.3 \times 10^{11}$	$4.3 \times 10^{11}$	$6.1 \times 10^{11}$	$1.2 \times 10^{11}$	$5.7 \times 10^{10}$
	Mihama	$7.4 \times 10^{10}$	$6.1 \times 10^6$	$1.9 \times 10^7$	$1.0 \times 10^7$	$2.7 \times 10^5$	$1.6 \times 10^5$	N.D.	$1.8 \times 10^6$	$2.4 \times 10^6$	$3.2 \times 10^6$	$3.2 \times 10^5$
Liquid Waste Products (except Tritium)	Takahama	$6.2 \times 10^{10}$	$2.2 \times 10^4$	$4.3 \times 10^7$	$4.4 \times 10^5$	$3.1 \times 10^5$	$2.4 \times 10^5$	N.D.	$3.8 \times 10^6$	$9.9 \times 10^6$	$2.7 \times 10^5$	$2.7 \times 10^5$
	Ohi	$1.0 \times 10^{11}$	$1.1 \times 10^6$	$3.4 \times 10^6$	$2.8 \times 10^5$	$2.2 \times 10^5$	N.D.	N.D.	$8.6 \times 10^5$	$1.2 \times 10^5$	$1.6 \times 10^5$	$1.6 \times 10^5$
	Mihama	$1.1 \times 10^{11}$	$5.1 \times 10^5$	$3.0 \times 10^6$	$3.4 \times 10^5$	$1.1 \times 10^5$	$4.8 \times 10^5$	N.D.	N.D.	N.D.	N.D.	N.D.
	Takahama	$1.4 \times 10^{11}$	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
	Ohi	$1.4 \times 10^{11}$	N.D.	$7.8 \times 10^4$	$1.4 \times 10^5$	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.

(Note 1) Becquerels are units which denote the depletion of one atomic nucleus per second in radioactive material  
(Note 2) N.D. stands for Not Detectable and means that the value is too low to be detected

Method for Processing of Radioactive Waste (Figure 43)

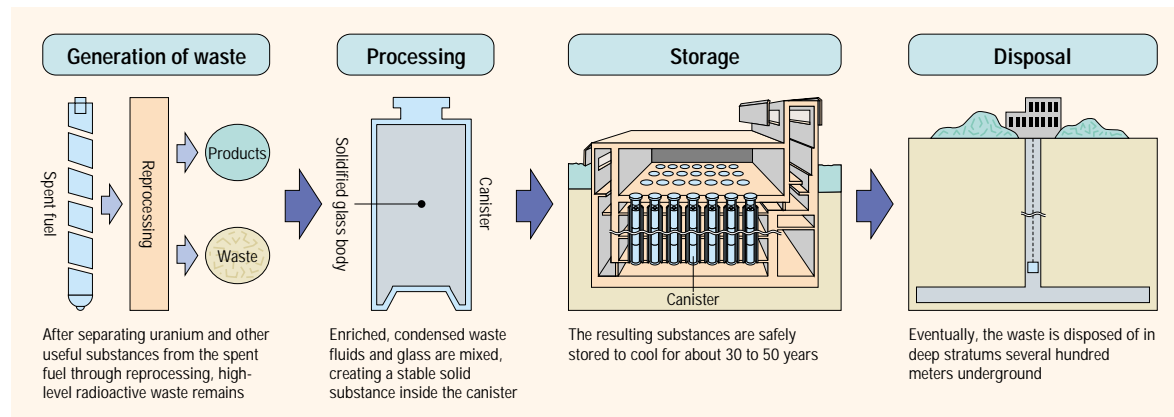




After separating valuable substances such as uranium through reprocessing of spent fuel from nuclear power stations, remained high-level radioactive waste is stored safely for approximately 30-50 years for cooling and disposed of several hundred meters underground. In May 2000, the “Law on the Final Disposal of Specified Radioactive Waste Products” was formulated. The

“Nuclear Waste Management Organization of Japan” was also established in the same year and work was commenced on designating sites for disposal and securing the necessary funds. Nuclear power is being produced with reliable disposal of waste in consideration of future generations (see Figure 44).

Processing and Disposal of High-Level Radioactive Waste (Figure 44)





# Promotion of Measures Concerned with the Circulation of Resources

## Promotion of Measures Concerned with the Circulation of Promotion of the 3 'R's

(Reduce: keeping production down, Reuse: using resources again, Recycle: reclaiming resources)

In May 2000, work was begun toward the creation of a metabolic society and the basic law governing the promotion of such a structure, the Law on Waste Products and the Recycling, was amended.

We are continuing to keep down the production of, reuse and reclaim industrial waste products as part of our effort to make metabolic use of our resources. And, at the

same time, we are careful to process material that cannot be reclaimed in the appropriate fashion. (See Figure 45)

We intend to continue to strive toward the creation of a metabolic society through ever stronger promotion of the 3 'R's.

Industrial waste measures (Figure 45)



## Reusing Resources

We try to use resources effectively by reusing apparatus for producing and transforming electricity where possible and reusing all-purpose electronic parts from wattmeters for electrical power.

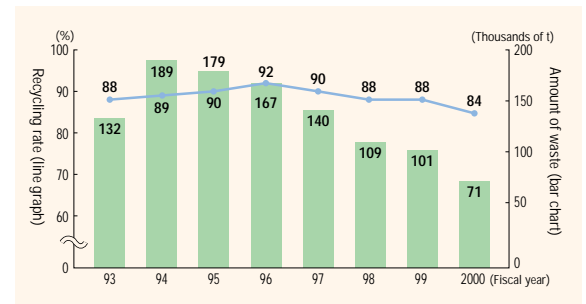
## Recycling Resources

When running a fossil fuel power station using heavy and crude oil as fuel, soot and plaster sludge are created. Most of this we recycle as a source of cement, fuel or as construction material. Again, the wasted concrete created on replacing concrete telegraph poles is mostly recycled as foundation material for roading.

## The Production of and Recycling of Industrial Waste

The volume of industrial waste created in the fiscal year 2000 came to approximately 70,000t, showing a reduction of 30% compared to the previous year. Furthermore, the recycled resource ratio for the fiscal year 2000 has changed slightly, but it has maintained a high standard, with an overall figure over 80%. (See Figure 46, 47)

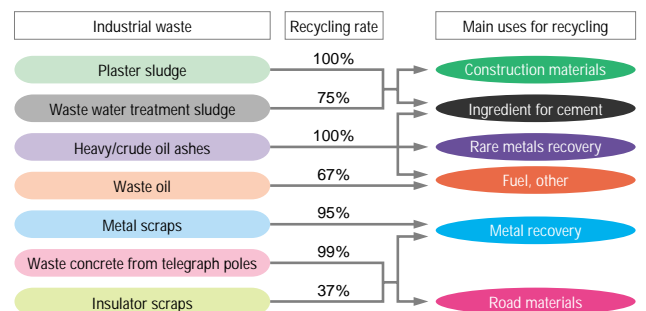
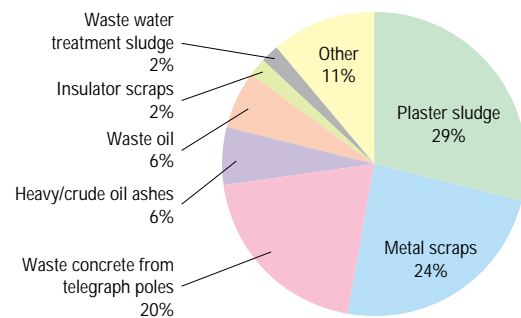
## The Production and Reuse as a New Resource of Industrial Waste (Figure 46)



## Reducing Resources

We are engaged in efforts to reduce the production of industrial waste materials through the employment of long-term usage designs for power plants and transformer facilities and equipment, extension of the time period between replacements, size reductions in plants and facilities resulting in the reduction of resource usage, prefabricated construction methods, and simplification of packaging.

The Production of Industrial Waste (Figure 47)







## Examples of Effective Use of Resources

### 3R

#### Taking up the Challenge of Zero Emissions

Since fiscal 1998, we have been working in various ways at the Kasugade Power Station (fossil fuel) to meet the challenge of zero emissions by using equipment aimed at keeping the production of waste materials down and setting up 'sorted waste collection corners'. These have enabled us to segregate and collect such material to be used as fertilizer and solid fuel, and to increase the range of uses for recycling. The use of these procedures is now spreading and they are being adopted at the Miyazu Energy Research Center (fossil fuel), and at the Himeji No.1 and No.2 Power Stations (fossil fuel).



Cultivating corn using fertilizer compost

### 3R

#### The 3 'R's and Paper for Office Use

We are making every effort to keep down the creation of waste paper and reuse where possible through using electronic means and electronic notice boards for all our company paperwork and conference materials, and by trying to use less paper and reuse the back of old paper as much as possible. At the same time, used paper is collected to be recycled as cardboard via used paper boxes that have been set up in our offices. Each office is doing what it can independently to work toward the realization of the 3 'R's in dealing with paper.



Conference on how to cut down on use of paper

### Reduce

#### Changing Over to Block Insulation Materials

In order to prevent loss from heat dispersal at our fossil fuel power stations, we are covering all our valves and pipes with insulation material.

We used to have to break up and dismantle such material on each valve and pipe inspection. Therefore, we have started to use block insulation material that can be dismantled piece by piece, allowing for reuse. This helps us to cut down on the creation of waste from insulation materials and to effectively use our resources.



Insulation material for piping at power station

### Reuse

#### Reuse of Wattmeters for Electrical Power

There are a total of approximately 11 million wattmeters fitted for our customers throughout the areas we supply with electricity. These are used to measure the amount of electricity consumed. The period during which such apparatus may be effectively used is fixed, and when this period is up they are removed. These are then checked and repaired with a view to their effective use as materials. After being officially approved for use as wattmeters, they are refitted. We aim to reuse approximately 1,100,000 such wattmeters each year.



Checking and repairing wattmeters for reuse (Kansai Keiki Kogyo, Inc.)



## Reuse Effective Use of Resources through Reuse of Equipment

We are planning to decommission 15, small output fossil fuel power stations in the fiscal year 2001. We have decided to reuse suitable equipment from these at other existing power stations or stations under construction by way of aiming at efficient use of resources. These will include some 54 such items, which will give us approximately 2,000 pieces of equipment. This is expected to enable us to make a saving of approximately 2 billion yen compared to if we were to invest in new equipment.

Equipment for Reuse (representative examples)

<b>Electrical and meter type</b>	Control equipment Circuit breakers Control center Direct current circuits, etc.
<b>Machinery type</b>	Air conditioners Electrically powered fire fighting pumps Electrically powered hoists, etc.

With regard to transformer equipment, we also decommissioned the Nishi-Harima 220,000V transformer station by way of renewing our power line facilities, which allowed us to effectively reuse this equipment. In order to quickly restore the railway company equipment destroyed in the March 2001 Geiyo earthquake, first we undertook the removal work that needed to be done and then we provided the bushing from our decommissioned 220,000V transformer.



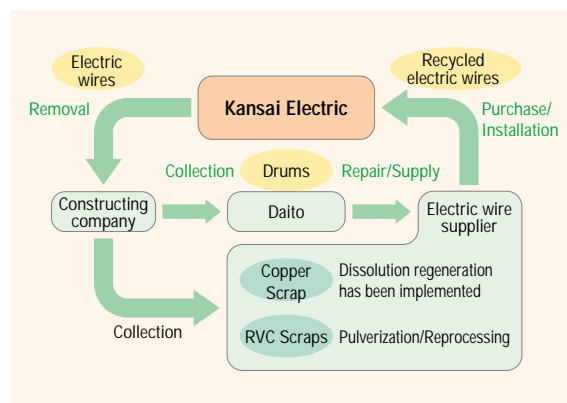
Removal of bushing from transformer (Nishi-Harima Transformer Substation)

## Recycle Utilizing recycled low-voltage wires

Hitherto, only copper waste produced on removing low-voltage copper wire had been recycled. However, since fiscal 1998, the PVC (polyvinyl chloride) covering of such wire has also been broken down and reconstructed for use in recycled electrical wiring. Furthermore, we are also working together with one of our related companies, Daito Co., Ltd., to develop light resin drums for use as drums for carrying such wiring, as they are suitable for reuse.

We have adopted the LCA method (Life-Cycle Assessment) for analyzing and evaluating environmental impact, right from the procurement of basic materials stage through to the wastage stage with regard to all our products. Thus, we are working to reduce both the costs associated with raw materials and the costs associated with the processing of industrial waste (see Figure 48).

Recycling system of low-voltage electric wires (Figure 48)



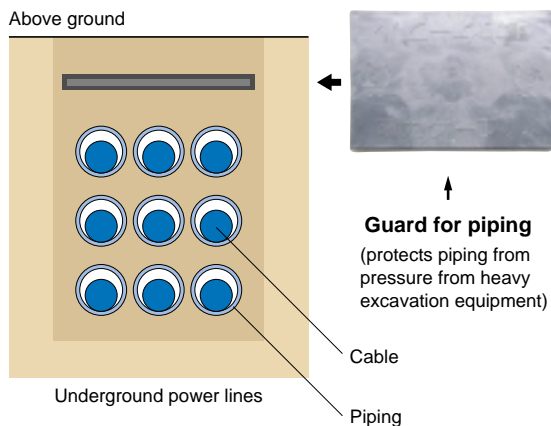
## Recycle Effective Use of Waste Plastic as High-Temperature Furnace Reduction Agent

We used to bury waste plastics produced at our power stations. However, from January 2001, waste plastic produced at the Takasago and Akoh power stations (fossil fuel) has been begun to be effectively used as an alternative (reduction agent and heat source) to the usual coke and coal particles used in furnaces at steelworks. We are currently looking at expanding this practice to other power stations.



## Recycle Development and Construction of Regenerated Plastic Guards

At the Kishiwada electric power office, we have been using scrap from high-voltage wire piping that had hitherto just been buried as industrial waste. This scrap is being mixed with scrap obtained from other manufacturers to create something new. We have been developing methods to effectively use such material for guards for underground power lines. These regenerated plastic guards offer higher functionality than concrete guards, are lighter and are cheaper to make. Therefore, we are currently in the process of adopting such guards throughout all our companies.



## Recycle Making water-permeable and other pavement materials from insulator scraps

As a result of our research and development on practical uses for insulator scraps, in fiscal 1993 we developed a commercial water-permeable pavement material made with an energy-efficient manufacturing process. This material can mitigate the heat island effect in densely populated urban areas by maintaining the ambient temperature at a comparatively low level. In fiscal 1995, we also began to provide a light-colored asphalt pavement material that keeps pavement temperatures low in the summer and is resistant to damage from tire chains in the winter.



Water-permeable pavement from insulator scraps (Amagasaki Techno-land)

## Recycle Making unbaked bricks

Unbaked bricks are made out of more than 80% recycled material. These bricks are manufactured using a special non-baking process patented by the Kamei Pottery Manufacture Co., Ltd. They are both hard enough and meet the Ministry of the Environment's safety standards. We plan to form a new company together with three of our related companies, the Kansai Environmental Engineering Center, Kinki Concrete Industries Co., Ltd. and Kamei Pottery Manufacture Co., Ltd. to be called "Kyosei" Co., Ltd. The plan is to commence the manufacture of blocks from October 2001, using insulator scrap from our fossil fuel power stations and various waste products from the Kanden Group along with such waste from other industries and bodies. Commencing such a business will create a recycling network uniting our company and related companies together with other industries and bodies, bringing both producers and users together as one.



Seemingly warm walkway utilizing unbaked bricks (the area around JR Nishinomiya Station)





## Recycle Recycling insulating oil

Due to its high toxic content, polychlorinated biphenyl (PCB), which was being used as insulating oil for electrical apparatus such as transformers, was banned from both use and production under administrative guidance in 1972. Furthermore, in 1974, when the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances was enforced, PCB manufacture, importation and use became illegal in principle, and it was mandatory for manufacturers and enterprises to keep it under strict control. Kansai Electric has kept PCB in exclusive storage under close surveillance.

In 1976, the “Law Concerning Waste Treatment and Cleanup” was established and the high temperature incineration of PCB was sanctioned. However, only limited experimental incineration of this sort was attempted domestically, and various new chemical methods of disposal technology have been developed to take its place.

Kansai Electric and Kansai Tech Corporation have jointly developed a new chemical treatment disposal technique to replace high temperature incineration disposal. The government has recognized the practicality of this technique, which generates no combustion gas and basically completes the reaction process in a closed cycle.

Needless to say, in the future, strict control of PCB should be realized at the earliest stage of disposal and we are presently earnestly engaged in efforts to realize this goal.

Furthermore, in July 2001, the “Law regarding Special Measures to Promote the Appropriate Disposal of Polyvinyl Chloride Waste Products” came into effect. Through this, the whole country has become positively involved in a system to enhance the disposal of PCB.



Model Chemical Disposal Plant

## Promotion of Green Purchasing

We have always purchased energy-saving equipment and eco-label products such as electric vehicles with excellent energy efficiency, low-loss transformers and other such electrical appliances. However, in fiscal 1999, we formally adopted the Green Purchasing Promotion Policy and are now actively putting this into practice throughout all our companies.

We are making every effort to raise the level of such activity. For example, in April 2001, we established the “Green Purchasing Guidelines”. These set out standards that focus on the purchase of office materials and OA that conforms to national standards with regard to environmental conservation. Numerical targets of 100% and 50% have been set for the purchase of copy-paper and OA, and stationary, respectively.

Furthermore, we are actively working in conjunction with other companies and groups such as the Kansai Economic Federation and the Green Purchasing Network in this respect.



Work clothes made from recycled PET bottles



## Recycling of Used Fuel Pluthermal Plan

Under the Pluthermal Plan, plutonium which has been collected by reprocessing spent fuel is mixed with uranium to form MOX fuel (mixed oxide fuels) and then reused in nuclear reactors (light-water reactor; thermal reactor). (The word “pluthermal” comes from the “plu” of plutonium and the “thermal” of “thermal reactor.”) Countries such as Germany, France, and the United States have reported successful results with this program.

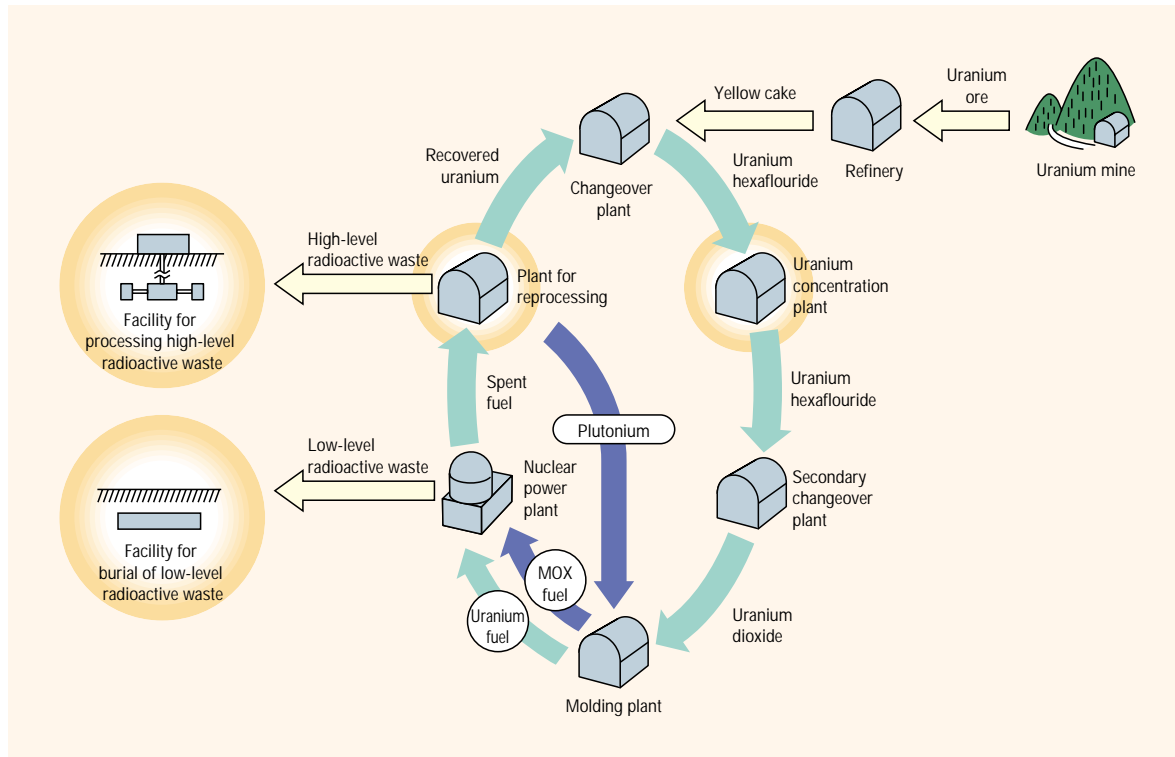
With limited natural resources, Japan’s basic energy policy is to recycle any spent fuel that can possibly be reused. In line with this policy, Kansai Electric is proceeding with its own Pluthermal Plan (see Figure 49).

Regarding the problem in 1999 with MOX fuel produced at BNFL (British Nuclear Fuels Ltd.), our BNFL MOX Fuel Issue Investigation and Examination Committee, with the help of outside experts, is thoroughly

investigating the causes of the problems and creating measures to prevent recurrence. In June 2000, the Committee presented its final report to the related organizations including the then Ministry of International Trade and Industry (now, the Ministry of Economy, Trade and Industry) and the Fukui Prefectural Government. As a result of discussions with BNFL, it was agreed that BNFL would recall the eight assemblies of MOX fuel currently stored at the Takahama Power Station and compensate Kansai Electric for its damages.

Furthermore, considering the recent difficult situation in regard to nuclear power, in June of this year, we established the “Pluthermal Promotion Council,” with the company president as chairman, in order to enhance the organization for the promotion of Pluthermal. We consider that this council will function as a strong driving force for those activities designed to deepen understanding across a wide range of people in both the local and the consumer districts.

Nuclear Fuel Cycle (Figure 49)







## Measures to Reduce Water Consumption by Increasing the Use of Recycled Water

We are making every effort to treat our water resources with respect. The use of water at washbasins and sinks throughout all our places of business is kept to a minimum and effort is being made to prevent water being used wastefully when washing vehicles.

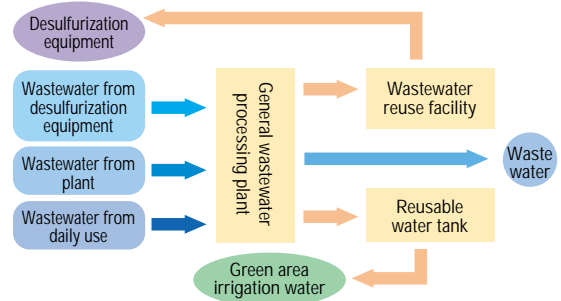
Furthermore, wastewater produced on the premises of our power stations is recycled to facilitate effective use and help keep consumption down.

The following are some of our main efforts in this area:

- Water for daily use is piped to a reusable water tank after being cleaned and used to irrigate green areas within the power stations.

- Wastewater that has already been finally processed is piped to a reusable wastewater storage facility to be used in the desulfurization process.

Flow of Main Wastewater



## Reduction in Exhaust Gases from Work Vehicles

The staff that drive our company vehicles are all given training in safe driving. This training is aimed at not only teaching safe motoring and the prevention of accidents, but is also designed to reduce the burden on the environment.

For example, we train them to check the air pressure in the tires before they set off. This means that the vehicles will consume less fuel when they are moving. Again, we

show them how to be careful when they park so as not to obstruct other vehicles. In this way, they avoid causing traffic congestion, and this helps avoid the production of excess exhaust gas.

Furthermore, we encourage our drivers not to leave their engines running when they park somewhere or temporarily stop. And we also ask visitors to our facilities to do the same.

The following shows the amount of fuel consumed in running our company's vehicles for the fiscal year 2000:

Type of Fuel	Volume Consumed (kℓ)	Distance Driven (in thousands of km)	Volume of CO <sub>2</sub> emissions (t-CO <sub>2</sub> )
Gasoline	3,794	37,616	8,765
Light oil	1,188	7,333	3,138



## Reduction in Amount of Lumber Used from Tropical Forests

One global environmental problem is that of the disappearing tropical rainforests. Japan imports the most lumber from such tropical forests of any country in the world. Much of this is accounted for by wood used in making frames for pouring concrete into in the construction industry. To make matters worse, the number of times such lumber may be used is small. Therefore,

it is believed that reducing the amount of tropical wood used for such frames is an important step in taking protective measures toward protecting the tropical rainforests. Our company, too, uses many such frames for pouring concrete. However, in order to reduce the amount of wood used from tropical rainforests, we are now using metal and plastic frames instead.



## Easing of Load on Environment with regard to Pollution of Stock and Use of Soil

### Measures against Soil Pollution

In recent years, pollution of the soil has come in for close attention. In 1977, in line with a departmental decision on behalf of the then Ministry of Trade and Industry, an environmental assessment system was introduced at all our power stations and the current conditions of the soil with regard to pollution were ascertained. We have since continued to strictly observe regulations (Water Pollution Control Law, Waste Management and Public Cleansing Law, PRTR Law, etc.) concerned with soil pollution.

We will continue to pay such laws the strictest attention and do all we possibly can to protect the environment through taking the appropriate measures where necessary.

Moreover, the site selected for the construction of the Wakayama Power Station was once a landfill site of waste. Therefore, we voluntarily undertook our own survey of the site. The results showed that dioxin was present in some of the ash and sludge at the site, so, from now on, whenever construction work is to be carried out, the appropriate steps will be taken to contain such waste material and prevent it being scattered.

### Measures to modify and reduce of the Area of Undeveloped Land to Be Modified and its Reduction

We are doing everything we can to conserve the natural environment in the construction of our power stations by keeping the area of land to be developed and trees to be removed down to a minimum.

For example, we have the Maizuru Power Station, a fossil fuel power station, under construction in Maizuru City in Kyoto Prefecture. There, part of the land to be used is designated as Wakasa-wan Quasi National Park. We have taken advantage of the topographical undulations of the site to undertake a two-tier construction. At the same time, by using silo storage towers for coal we have managed to greatly reduce the area of sea needed for reclamation and land to be altered.

Moreover, we aim to keep the amount of deforestation to the minimum by preserving some of the existing trees and tangerine orchards.

With regard to hydroelectric power stations, we have the Kaneihara power station that will straddle Ikagun Kinomoto town in Shiga Prefecture and Ibi-gun Sakauchimura in Gifu Prefecture. Here, part of the planned site and its surrounding area are designated as belonging to Ibi Prefectural Park and are rich in natural beauty. Therefore, an underground design has been chosen for the waterway and power station itself, with part of the road being contained in a tunnel. This will help reduce the area of land that will have to be altered and keep the impact on the local environment and wildlife down to a minimum.



# Harmonizing with the Local Environment

## Green zoning measures

Our company aims to create forests which are as close to nature as possible highly effective in preserving the environment. In order to achieve this at an early stage, we are using saplings compatible with the original local environment, which we are close-planting and mixing (ecological greening method) with existing trees. In this way, we are working to create and manage green areas.

As a result, we have managed to create rich wooded areas. Various species of wild bird, insects and small animal have come to live in these green areas at many of our business premises.

### Rate of Greening at Main Electric Power Facilities (as at end of fiscal 2000)

Fossil Fuel Power Stations	34%
Nuclear Power Stations	79%
Substations	33%

Furthermore, with ecological greening as our theme, we have planted the representative city flower and city tree at each of our power stations and have opened these areas up to the use of the general public.

Those efforts of ours have come in for praise, and in 1992 the Himeji No. 2 Power Station (fossil fuel) received the Prime Minister’s Award for “excellent green zoning activities” with the Kainan Power Station (fossil fuel) receiving the Trade and Industry Minister’s Award in 1995.

Moreover, so that the people living around our power stations might enjoy the green areas they provide, we are also working to create an environment that will be suitable as a habitat for dragonflies, lightning bugs and other such insects.

In addition, we are also making every effort to create rich, safe and pleasant green areas that everybody can enjoy in the open spaces around our city substations.

As at the end of fiscal 2000, we had managed to create green areas amounting to some 4.08 million square meters of space, including those areas that had been restored as far as possible to their original condition after being altered.



Ecological greening (Himeji No. 2 Power Station)



Pond habitats for dragonflies (Osaka Power Station)



Green space in open area around city substation (Uehonmachi Substation)



## Electric power facilities in harmony with the environment

When we plan to build and maintain an electric power facility, we take municipal and regional development plans into consideration. We thoroughly examine the surrounding area and choose an appropriate facility design that blends in with the landscape and is harmonious with the local environment.

By thoroughly understanding the importance of blending in with the local environment, it is our top management priority to achieve mutual understanding and a harmonious coexistence with the regions where we operate.

### Power stations representing local areas

Before constructing a power station, we thoroughly investigate the condition of the surrounding area and receive advice from experts in many fields in order to make facilities into symbolic images of the region and in harmony with the local environment.

When constructing Nanko Power Station (fossil fuel) in Suminoe-ku, Osaka, for example, which began operation in 1991, we placed great emphasis on a design compatible with the urban surroundings. In particular, the stack was designed to be a local landmark shaped like a monument. At night it is illuminated by solar power, with the colors changing from season to season. Well-integrated into its environment, Nanko Power Station received the Color Prize for Public Utilities from the Japan Color Laboratory and an International Illumination Design Award (Lighting Section Award) from the North American Illumination Institute. It was also selected as a Good Design Institution (normally called G Mark) by the Ministry of International Trade and Industry.

The stacks of Himeji No. 1 Power Station Units No. 5 and No. 6, which commenced operation in April 1995 and May 1996 respectively, are also illuminated at night. Changing lighting effects and a flashing strobe light create a seasonal atmosphere, and even provide information on the tide position, air temperature, and time of day. These stacks are enjoyed as a symbol of the waterfront area and received the Urban Spectacle Award from Himeji City.

The Sakaigawa Power Station (hydro) which commenced operation in 1993, located in Kamitaira in Toyama Prefecture, was modeled after a house in the gassho-zukuri style, with a steep roof and prominent top beam. Kamitaira is located near a village noted for its many gassho-zukuri houses which are recognized as a UNESCO World Heritage Site. The power station blends well with the beautiful surroundings.



Nanko Power Station



Himeji No. 1 Power Station



Sakaigawa Power Station





### Substation designs in harmony with surrounding city buildings

At substations, radiators and other equipment are hidden from view and trees are planted to enhance the landscape. The design and color of the buildings are also coordinated with surroundings.

For example, the Hoshida Substation (Katano City, Osaka), which is in a residential area, has been designed as a low building with the external appearance of a residential house in order to blend in with the local environment .



Hoshida Substation

### Power distribution methods to upgrade local amenities

We intend to contribute to the overall upgrading of amenities in the areas where our distribution facilities are located by designing them to match the shapes and colors of city buildings and their surroundings.

With this in mind, while assuring a stable power supply, we plan to improve both the quality and look of power distribution facilities by using an effective power distribution method that conforms to the way electricity is used and by choosing designs that conform to city planning concepts. We determine the shape of buildings and their color schemes by considering the size of the roadside buildings and various city design regulations.



The area around Osaka International Conference Center (underground power lines)

One method of improving scenery in a city is burying power distribution lines underground. Hitherto, we had concentrated such effort on office areas, areas around mainline stations and areas of outstanding scenery. However, recently we have begun to undertake such work and examine the possibilities for such work in medium-size shopping precincts, housing developments and alongside trunk routes as well.

In deciding which areas are suitable for laying underground distribution lines we take into consideration a number of factors, starting with those areas with the greatest need and which offer the greatest advantages in terms of maintenance. Such factors include:

- Whether it is a skeletal trunk route in an area used by an undetermined number of users
- Whether such work may be carried out effectively in terms of the layout of city blocks and redevelopment, together with other types of maintenance work
- Whether that locality is working toward improvement of its own scenery, and
- Whether there is a stable demand for electrical power along that route.

Furthermore, in undertaking such work, we are moving forward while trying to work in harmony with the special features of each local environment.

This we are doing in cooperation with those responsible for route management, electric power line management (Kansai Electric, communication common carriers, etc.) and the local community, the three groups working together as one.

In many cases even the steel towers that support transmission lines have been designed so that their shape and color blend in with the surroundings.



The electric transmission tower of the Himeji Power Station (fossil fuel)





## Efficient utilization of thermal discharge

Using thermal discharge from fossil fuel and nuclear power stations, we have been cultivating fish and young shellfish with regional characteristics such as Kuruma prawn and abalone and conducting research on their growth. We are working to establish such technology and verify the effectiveness and safety of thermal discharge. In addition to utilizing the technologies we have developed, we are also releasing cultivated fish and shellfish into the ocean, thus helping to promote the local fishery industries.

We have been growing orchids at the Takahama Power Station (nuclear power) using a heat pump with heated water as the heat source. The Miyazu Energy Research Center (fossil fuel) has been conducting tests centered on flower, vegetable and other such plant cultivation. In this way, we are contributing to the revitalization of the local farming industry (see Table 13).

Furthermore, we have set up a facility where local people interested in our work may come and learn about what we are doing and are endeavoring to ascertain the needs of the local community.



Kuruma prawn (Tanagawa No. 2 Power Station, Miyazu Energy Research Center)



Abalone fixed to oyster shells and released (Takahama Power Station)



Inspection of strawberry cultivation by related local groups and farmers (Miyazu Energy Research Center)

### Current Situation with regard to Experimentation and Research (Table 13)

	Location of Activity	Type of Activity	Cumulative Total Released
Fisheries Related	Takahama Power Station (1977 ~)	Black abalone and turbo were released into the sea around the power station as an experiment in breeding and farming	Black abalone 800,000 Turbo 200,000
	Tanagawa No. 2 Power Station (1977 ~)	Prawns and white shrimps were released into the sea around the power station as an experiment in breeding and farming	Prawns 33,000,000 White shrimps 60,000,000
	Miyazu Energy Research Center (1989 ~)	Black abalone and prawns were released into the sea around the power station as an experiment in breeding and farming	Black abalone 600,000 Prawns 12,000,000
Farming Related	Takahama Power Station (1977 ~)	Experiment in breeding temperate zone plant life, 8 varieties comprising 840 orchids used	Loaned to public facilities for exhibitions
	Miyazu Energy Research Center (1989 ~)	Experiment in adapted breeding of plant life Ornamental plants: Turkish Bellflower, etc. Vegetables: strawberries, etc.	Distributed to visitors viewing harvest

# Various Types of Work on Behalf of Society



## Exchange and Cooperation with External Bodies toward Environmental Conservation

### Spreading Awareness on Saving Energy

In order to deepen understanding of energy conservation, Kansai Electric, at the request of local governments, women's groups, and consumer associations, cosponsors lectures and courses targeted at housewives on the basics of electricity and its efficient use. Our widespread education campaigns also include running special energy conservation supplements in major newspapers and in our in-house publication and cosponsoring exhibitions on effective energy use with outside groups like the Energy Conservation Center. Furthermore, our meter-readers give customers a statement that compares the amount of electricity used each month with the same month of the previous year.

We also try to make our information pamphlets and publicity goods as entertaining and interesting as possible so that learning about energy conservation can be more fun for more people. At the same time, we have also established an enjoyable energy-saving section on our company's website entitled "Energy-saving Solutions: Housewife Challenger" to facilitate the spread of awareness of energy-saving issues.

Website  
"Energy-saving Solutions:  
Housewife Challenger"



Energy conservation pamphlets and publicity goods

### Everyone's Eco-Friendly Campaign

Since fiscal 1993, all Kansai Electric employees have 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. For this effort, our company received a Ministry of International Trade and Industry Award in fiscal 1995 for outstanding contributions to the promotion of recycling.

This success led to the start in fiscal 1996 of the New Everyone's 1-2-3 Campaign, which comprises the three activities of tree planting, resource and energy conservation in the office, and community beautification.

In fiscal 2000, we started the Everyone's Eco-Friendly Campaign, in which employees continue to contribute to the protection of the local environment through our previous activities by working in cooperation with the local community.

### Tree planting

Kansai Electric advertises the importance of keeping and cultivating greenery by planting the saplings cultivated in its nurseries in cooperation with local residents. We planted 30,000 saplings in fiscal 2000, giving us a cumulative total of 265,000 saplings planted in public facilities such as schools and parks since fiscal 1993.



Tree planting with elementary school children



## Community beautification

For some time Kansai Electric has been promoting environmental beautification programs together with the local community. Based on this experience, we have been promoting companywide environment beautification with the cooperation of the local community since fiscal 1996. In fiscal 2000, we carried out 1,521 such activities to give us a cumulative total of 4,274 since fiscal 1996.



Community beautification activity near an office

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

There has been a drastic increase in CO<sub>2</sub> emissions in households and the transportation sector in recent years. The call for people to change their lifestyles in order to save energy is growing stronger. It is also important for enterprises to tackle the global warming problem in cooperation with the local community.

We have been promoting the 100,000 People's Eco-Family Campaign since fiscal 1998 to become environmentally friendly in our homes. Simple ways to conserve energy include turning off the TV at the mains when not in use, not running idle car engines and using public transportation as much as possible.

Since fiscal 1999, we decided to promote Green Purchasing, encouraging everyone to purchase eco-friendly products such as recycled toilet paper.

Moreover, with the aim of further raising the level of such activities, in fiscal 2000, we set numerical targets to be reached.

Looking at the levels of improvement obtained for the same items covered in the study we carried out in fiscal 1998, we found a figure of 68% as against only 66% for the fiscal year 1998, showing a positive result for our efforts in these areas. Although this figure fell below the

70% target that had been set, an overall improvement could still be seen. We believe this can be seen as a reflection of the strengthening of independent effort in this regard at each place of operation and work toward raising overall awareness of the issues involved.

While continuing to make the most of these results, we will work to achieve ever more independent activity, thus promoting a change for the better in the way we live.

We will continue making efforts to spread this circle of activity in the local community through PR campaigns, well-timed events, and cooperation with PTAs and local municipalities.

Furthermore, the activities conducted in this campaign have received high praise, and in February 2000, it was chosen for presentation to all attending the G8 forum on the future of the environment as one of the best practice examples (superior examples) of measures against global warming conducted in Japan.



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





## Cooperation with the Local Community

### Symposium on global environmental issues

We regularly hold symposiums, supported by the Osaka city and prefectural governments, that focus on global environmental issues. This is an important opportunity to consider and act on these issues together with the local community.



Environmental Month Symposium

### Environmental events and cooperation with local governments

During Kansai Electric's "Environment Month" and "Customer Service Month," our branches and offices hold a variety of events with environmental themes, such as flea markets and recycling fairs, in exchange and affiliation with the local community through local governments.



Ecofesta 2001 (Osaka Kita Branch)

### Supporting environmental education

For elementary and junior high school students, we have produced an animated video titled "Mako-chan's Parrot: What is the Global Environment?" that explains global environmental issues and a booklet titled "Our Friends on the Earth," an easy-to-understand guide to the ecology of everyday fauna and flora.

A number of other environment-related publications are in wide use (see Table 14).

List of Environment-Related Publications by Kansai Electric (Table 14)

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	
Our Declaration of Concern for the Environment	Introduction to our company's work in tackling environmental problems	
Grandma's Earth-Friendly 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 everyday fauna and flora	
Videos	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)	Explanation of global environmental problems for the next generation (for elementary school students)

These materials are distributed free of charge while stocks last. Inquiries should be directed to: Environment Department, Environmental Management Group  
Phone: 070-5772-9668 (direct line)



## Promotion of Extensive Exchange

If we are to protect the environment, then the country itself, each local governmental body, business and the citizens themselves must each play their role. Recent years have seen an increase in the number of citizens and organizations working toward environmental protection.

A survey was carried out by the Japan Environmental Association (Foundation) from November 1996 to June 1997 targeting NGOs concerned with the environment (private citizens' groups involved in activities concerned with environmental protection on a non-profit basis). There was found to be some 11,595 such groups\* (from the White Paper on the Environment, 2000 edition).

We are looking into what kind of partnership would be best for our company to have with such groups through various kinds of exchange. We are already working together with a number of groups who have shown a positive understanding and willingness to cooperate with us.

\*According to the White Paper on the Environment, 2000 Edition, there are many other such groups too small to appear in the statistics or functioning on a non-permanent basis, making it difficult to give an accurate figure.



Class on recycling in cooperation with an NPO (Nara branch)

Further, in June of 2000, in the Suminoe District of Osaka City, the Green Eco-Plaza was opened at the ATC (Asia and Pacific Trade Center). Established as a general display area, the plaza will function to introduce the latest environment related businesses, on a wide scale, providing a stimulus to this budding business field, and also as a forum for recycling and community planning.

Through close cooperation and liaison between each of the companies in the organization, we are aiming for “the creation of a better environment.” Active in the introduction of a variety of new technological advances and the like, on a group-wide basis, our intention is thus to contribute to the development of local districts.

## Work in Cooperation with Local Groups

### Cooperation with the Kansai Economic Federation and others

The Kansai Economic Federation has projects like the Green Purchasing Promotion and the Summer Energy Conservation Fashion Statement, in which employees are encouraged, “appropriate air conditioning advertisements,” to dress lightly in the office so that the temperature can be kept at the ideal cooling temperature of 28 degrees.

These projects are part of activities geared towards the Construction of an Eco-cyclical Society and Shift to a New Lifestyle, which is one of the action plans of the Kansai Economic Federation’s Kansai Revitalization Plan adopted in December 1999. Kansai Electric is participating in these activities in earnest, practicing green purchasing by buying things like 100% recycled paper and having employees dress energy-wise in the office to save on air conditioning. We are also participating in the “appropriate air conditioning advertisements” movement.

We are also taking active part in the Toward a Metabolism-Oriented Society, an initiative advocated by the Global Environment Forum — Kansai whose members include academics, economists, representatives from government, and labor and women’s groups, as well as aiding outside independent research through our Kansai Research Foundation for Technology Promotion.



Proposals of the Global Environment Forum-Kansai





## International Cooperation

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

In order to address critical issues the international society facing today, such as “the global warming” and “sustainable development”, we recognize that it is indispensable to expand our cooperation activities to worldwide scale.

Expectations are growing for our further contribution, since the Japanese electric utilities can especially play a greater role among the private sectors in providing technology transfer related to these issues (e.g. nuclear generation, energy conservation and environmental protection).

Based on these circumstances, the Kansai EPCO aggressively involves in multitude of international projects that can contribute to mitigate climate change, with an emphasis on using our field-proven technical expertise. Our activities are consisting mainly of:

- participating proactively in international associations and groups that seek to promote sustainable energy development
- Involving in activities implemented jointly (AIJ) with Developing Countries to reduce Green House Gas (GHG) emissions.
- Carrying out Human Capacity Building activities related to electricity and the environment.

### Highlights of our activities

The Kansai EPCO’s affiliations such as:

- E7 (an international collaboration of nine of leading electric utilities in the G7 countries)
- WBCSD (World Business Council for Sustainable Development) are good examples of our dedication to the responsibility in the international society.

These organizations are active stakeholders that work to promote sustainable development and improved environmental performance in the international community.

E7 (a group of leading electric utilities in the G7 countries)

Established	1992
Objective	To play an active role in protecting the global environment and promoting sustainable development through efficient generation and use of electricity
Outline of Activities	<ul style="list-style-type: none"> <li>• Enhancing the quality of international debate on global environment policy issues by sharing its experience and perspectives.</li> <li>• Taking initiative to organize international cooperation for actions to curb and reduce greenhouse gas emissions in developing countries, such as AIJ projects in Indonesia and Jordan.</li> </ul>
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)

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”
Membership	This coalition represents about 130 companies from 30 countries

The Kansai EPCO is engaged in the promotion of international cooperation to assure of a global nuclear safety and for environmental protection, Nuclear energy will become increasingly more important to develop worldwide and country-level initiatives toward reducing the emission of greenhouse gases.

Nuclear energy can provide a realistic solution to us. Many nations share this view, and indeed active moves toward new nuclear power plants are being launched in Asian nations, as well as the U.S. and some European nations.

Especially China, we have many exchange visits with the Qinshan Nuclear Power Station in the field of the construction, operation and maintenance, etc. from 1985 to now.

### Activities related Human Capacity Building during FY2000

Period of Implementation	Title	Country	Dispatched or Received
May /2000	Delegation to Nuclear Power Plant Training Course	Russia and Bulgaria	Dispatched
Jun	Nuclear Power Plant Maintenance Personnel and Inspectors Training Course	Russia and Lithuania, the Ukraine and others	Received
Jun	JICA Training Course for Environmental Impact Assessment	Vietnam, Turkey, Kenya and others	Received
Jul	Long-term dispatch of experts to Laos for basic maintenance of electric power facilities	Laos	Dispatched
Jul	JICA Training Course on Environmental Management	Thailand, the Philippines, Indonesia and others	Received
Sept	JICA Training Course on Distribution of Electricity	Syria, Saudi Arabia, Indonesia and others	Received
Oct	Nuclear Power Plant Maintenance Personnel and Inspectors Training Course	Russia, the Ukraine and Bulgaria	Received
Oct	Nuclear Power Plant Manager and Supervisor Training Course	The Czech Republic and Hungary	Received
Nov	Regular Information Exchange Meeting with East China Electric Power Group Corporation	China	Dispatched
Jan/ 2001	Nuclear Power Plant Manager and Supervisor Training Course	Slovakia and Rumania	Received
Feb	Short-term dispatch of experts to Laos for basic maintenance of electric power facilities	Laos	Dispatched
Mar	Training Course for Experts in Basic Maintenance of Electrical Power Facilities in Laos	Laos	Received
Mar	Completion of E7 Rural Electrification Project in Indonesia	Indonesia	Dispatched
Mar	E7 Workshop on Air Pollution Management in Thailand	Thailand	Dispatched
Mar	E7 Workshop on Management and Technical Strengthening for the New Bangladesh Distribution Companies	Bangladesh	Dispatched



Workshop on nuclear power plant operation (Qinshan Power Station)



## Activities to Benefit Local Society

As a company that lives in step with the local society, we are involved in various types of activity aimed at enabling us to 'Live in Harmony with the Local Community'.

### Toward the Revitalization of the Local Community

We are involved in the production, transmission and delivery of electricity, an activity that has deep roots in local society. We have many head offices, branch offices, headquarters and moreover sales outlets, electric power offices and power stations spread around various locations. All these operations work to hold events, support and take part in local festivals and other such events. Believing communication with the local people to be important, we also open our facilities to the public and contribute to the development and revitalization of the local community.



Kobe Luminaire

### Welfare for the Elderly

By the year 2015, it is predicted that 1 in 4 people will be a senior citizen and that we will have arrived at the 'Gray Society'. This will bring about a variety of problems for local communities.



Inspection of electrical equipment at home of elderly person living alone

We are involved in improving the quality of welfare for the elderly within the local community in a number of ways. Our company is active in the setting up of general facilities for the aged; we carry out inspections of electrical appliances and lend IH cooking equipment free of charge; and we donate electrical water heaters and IH equipment to old-folks centers. Moreover, we also work to suggest ways of living safely and comfortable through the use of electricity so that each individual may enjoy a settled lifestyle.

### Welfare for the Physically and Mentally Challenged

Our wish is for a society in which everyone, whether they be physically or mentally challenged or not, may experience the joy of living. Our activities here range from those undertaken personally on behalf of the surrounding community to those where the entire company is involved in an event. As one example of such work, we have set up Kanden L-Heart Co., Ltd. facility as a place where the physically challenged may enjoy doing a variety of worthwhile work (Multi-Purpose Work Center for the Severely Physically Challenged).

We want to continue with such work into the future as part of our aim for a 'No Barriers Between Hearts' society.



Lively festival



Kanden L-Heart



### Support for Arts, Culture and Sports

Arts, culture and sport all serve to vitalize a community and give each member of that community courage. They serve to uncover new talents and to educate, and they create and widen new bonds of exchange between communities.

Every year, we hold classic concerts in each community where local citizens may enjoy famous works of classical music and opera. We also cosponsor the FLASHBOWL series in the Kansai Collegiate American Football Association by way of encouraging junior sport. We are taking a comprehensive approach toward the promotion of arts, culture and sports at the local level.



Classical concert

### Fostering Health in the Young

Our wish is that children, who will shoulder the burden of the next generation and build the future, may be raised to be healthy. Therefore, we are working in various ways and through exchange to help children to acquire social vision; we are working to engender a rich sensitivity in them. We go into the classroom to give informal talks on the various environmental issues we all face in relation to energy, and we provide classrooms where they may conduct scientific experiments.

One example of such work is the Kanden Youth Soccer Tournament. Together with the Osaka Soccer Society we annually cosponsor this event so that children may enjoy soccer at a first-class venue.



Kanden Youth Soccer Tournament



FLASHBOWL

### Support for Volunteer Activities by our Staff

Many of our staff are involved in volunteer work. This work is purely voluntary. They do it because they wish to contribute to the local community. In order to support such work, we have a system whereby we allow staff to take time off work or be absent during such activities. We also loan company facilities and equipment, and host seminars aimed at encouraging such activity.

Through such volunteer activities, our staff come into contact with many of the local residents. In this way, they gain various perspectives that they wouldn't get just from corporate culture itself. This strengthens their sense of being a member of the local community. We hope that this will help them become good and highly humane members of society.



Volunteer seminar





## Safety and Sanitation Activities

### Aiming to Create a Workplace with Safety and Health in Mind

It goes without saying that for the people who work there, the ability to work in a safe and healthy environment is of the utmost importance. Recently, we have seen a major stiffening in competition in the electricity business. Therefore, if we are to have people choose our company for their supply of electricity, then it is indispensable that our staff energetically go about their work with enthusiasm and that they display their abilities to the utmost.

One of our mid-term management policy goals is that of 'creating a lively work environment', and in order to achieve this, not just the company itself, but every single employee has joined forces to work toward safety and sanitation with the objective of ensuring the safety and health of all our staff.

Based on this concept, we are making every effort to promote safety and health activities aimed at creating a safe and healthy work environment. Therefore, we have adopted the 'Policy on the Management of Safety and Sanitation' as part of our mid-term policy, and the 'Plan for the Management of Safety and Sanitation' as our plan for the coming year.

FY 2001 ~ 2004

Main Points of the Kansai Electric 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 toward boosting safety in cooperating companies

#### Sanitation Related

1. Promotion of mental health care for the competitive age
2. Promotion of supportive measures toward personal responsibility for health
3. Strengthening of base for health support system

### Safety and Sanitation Activities

As far as company attitude to safety and sanitation goes, we are aware that the safety and health of our employees are valuable assets for our 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 legislation on this, such as the Industrial Safety and Health Law and other related regulations, but we have also set down our own company standards and are involved in independent activities toward such goals.

### Management of Safety

#### (1) Education and Events Related to Safety

In order to prevent accidents occurring while staff are carrying

out their duties, we provide facilities and equipment which enable all our employees, whoever is carrying out a particular operation, to work in safety. We also provide education and hold events aimed at raising awareness of

safety issues. As a result, our company's annual rate of accidents at work is lower than the national level. (See Figure 50)

#### (2) Measures with regard to Human Factor

A thorough analysis is carried out in the event of an accident occurring and we examine measures aimed at preventing a recurrence. This activity is carried out throughout the entire company. Particular emphasis is given toward such activity with regard to instances where the cause of the problem was psychological. For example, one of our policies is to hold regular monthly meetings at all our work places where small groups meet to discuss the human factor.

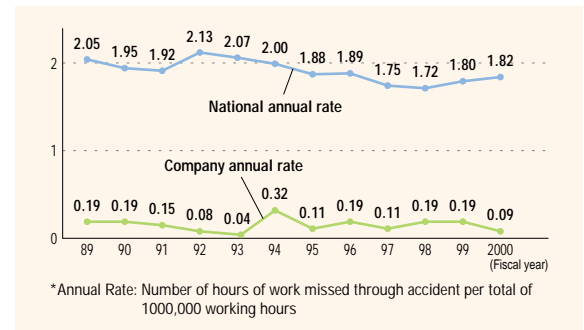
#### (3) Designation System for Drivers

Our company has its own system of designation for drivers. If an employee is to drive a company vehicle, then they must take a prescribed course. Their driving ability is checked before they are given permission to drive, and this is followed up with other regular tests. The company has a well-developed policy on the management of safe driving.

#### (4) Safety Activities Company-wide

Safety activities aimed at improving the management of safety at cooperating companies and among our subcontractors take place throughout the entire Kansai Electric Group. These activities include the sharing of information on safety matters, providing advice and giving instruction.

Annual Rate of Accidents at Work (Figure 50)



### Management of Sanitation

#### (1) Promotion of Mental Health Care

Recently, much attention has been paid to the problem of stress in the workplace and the importance of creating a healthy frame of mind has grown in significance. Therefore, we are working to encourage education toward dealing with stress and have set up a system where people may discuss their problems.

#### (2) Promotion of Supportive Measures toward Personal Responsibility for Health

We are involved in a number of activities aimed at the prevention of illness resulting from personal lifestyles. We offer information on such issues aimed at improving people's exercise and eating habits: for example, we provide guidance on health matters and offer support to those who wish to give up smoking.

# What the Kansai Electric Group Doing



## Related Company Global Environmental Project Conference for Promotional Staff

Here at the Kansai Electric Group, we select “Promotional Staff for the Related Company Global Environmental Project” (approximately 50 names) from throughout the group in order to promote efforts toward environmental conservation and have been holding the “Conference for Promotional Staff for the Related Company Global Environmental Project” every year since fiscal 1994.

At this conference, we invite academics and such from various universities to give lectures on the very latest information pertaining to the environment. In addition, members of our staff introduce examples of eco-business activities and there is a mutual sharing of information. In this way, we are working to achieve a sharing of information throughout the group.

### Contents of Main Activities over Past 3 Years

	Lecture		Introduction of eco-business	
	Lecturer	Theme	Group companies	Theme
2000/11	Koichiro Chiba Industrial Research Section, The Industrial Bank of Japan, Ltd.	Evaluation of efforts on behalf of businesses toward environmental conservation as viewed by financial institutions	Organization for the Certification of International Standards	Regarding inspection and registration related in management system for international standards
1999/10	Katsuhiko Kokubu Associate Professor, Economics Research Department, Graduate School of Kobe University	On environmental accounting	Social Welfare Corporation, Kanden Welfare Business Group	L-Home Ashiya, General Welfare Facility for the Elderly based on the concept of living in harmony with the environment
1998/10	Tetsuhiko Yoshimura chairman, Department of Family Resource Management, Kinran College	New developments in the recycling industry	Kansai Tech Corporation	Development of “Nobotan”, contributing to the beautification of
			Kanden L-heart Co., Ltd.	Promoting the sale of Eco-goods

(Titles omitted. Post as at that time)



## Promoting Eco-Business Throughout the Kansai Electric Group

In recent years eco-businesses (environment-related industries), which provide recycling equipment and technology, low-pollution vehicles, and eco-friendly products, have been the object of public attention. As well as being a major contributor towards creating a sustainable

society with lower environmental impact, eco-businesses are expected to become the driving force for economic development and innovation. We anticipate much growth in this area.

Our goal is to establish a groupwide eco-business strategy that will contribute to environmental conservation by mobilizing the diverse technological expertise of the Kansai Electric Group to promote and support eco-business efforts in various ways, such as providing market information through a regular newsletter Eco-Business News (see photo right). Several of Kansai Electric’s affiliated companies which are currently in the process of developing innovative eco-business products and services are introduced on pages 76 to 78.



Eco-Business News



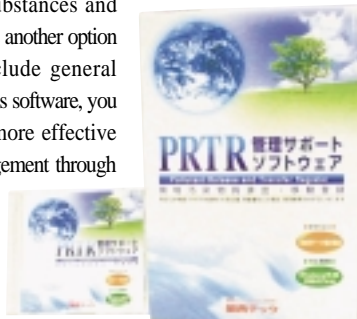


**KANSAI TECH CORPORATION**

**Development and Sales of Support Software for Management of PRTR**

At Kansai Tech Corporation as part of our environment-related business activities, we are developing and selling user-friendly CD-ROM software which will enable our customers to deal more easily with the drawing up of reports in relation to the PRTR Law (law dealing with the improvement and promotion of procedures to do with ascertaining and managing volumes of specially designated chemical substances to be released into the environment).

This law came into effect as of April 2001 and makes it legally obligatory for all businesses concerned to file an annual report with their local authorities on the amounts released and movement thereof of all the substances specified therein. Using our software on their PCs, customers can easily draw up this report giving details on the daily management of these substances and composite statistics relating to each item. It also has a supplementary pharmaceuticals stock managing function, which enables you to manage both substances and goods. In addition, there is another option that allows you to include general business data. By using this software, you can expect to achieve more effective environmental risk management through greater efficiency and strict accuracy in taking care of your business affairs.



Support software for PRTR management

**KANSAI TECH CORPORATION**

**Development and Sales of GTI High Capacity Incinerator**

Here at Kansai Tech Corporation, we build and sell high capacity gas, two-stage incinerators for medium-sized plants that conform well with the new standards set for emissions of dioxins.

This incinerator combines a gas-type incinerator with a two-stage incinerator to dispose of waste in a two-stage process enabling you to burn highly molecular waste such as plastics, wood, paper and liquids safely and efficiently.

It completely incinerates these types of waste product, allowing you to keep the level of dioxins in the fumes given off down to below a mere 1ng-TEQ/m<sup>3</sup>N.

Our customers have included the Osaka Prefectural Government, which chose our incinerator for its No.1 Furnace after the amendment of the Waste Disposal and Public Cleansing Law. We are proud to say that our incinerators have been evaluated as exceeding the new standards set for environmental impact and that we have a proven track-record in the design, installation, testing and maintenance of such machinery.



GTI High Capacity Incinerator

**Kanden L-Garden, Co., Ltd.**

**Tom's Garden**

Kanden L-GardenCo., Ltd. runs a garden center called Tom's Garden which aims to offer a comfortable shop environment and gardening therapy to the elderly and the physically challenged. We are also involved in research into 'barrier free' gardening.

That is to say that, at Tom's Garden, at the same time selling ornamental flowers, trees and gardening materials, we also give advice on how people confined to wheelchairs may enjoy flowers and greenery and advise on gardening styles and garden creations that everyone can enjoy. In addition, we also gather and display gardening tools that may be used by anyone, regardless of disability. We develop and sell wooden flowerbeds for use by people with wheelchairs and shovels for those who have trouble using their hands. And we also sell tableware with plant, flower or green motifs and miscellaneous interior goods imported from Italy so that people may enjoy the world of flowers and greenery in their own homes.



Flower beds and shovels that are easy on the wrist for people confined to wheelchairs

**TOKO SEIKI INC.**

**Development and sale of simple electricity volume display devices**

In February 1999, Toko Seiki released the Ecowatt, a simple electricity volume display device that encourages consumers to be energy-conscious by allowing them to see how much power their home appliances are using.

The Ecowatt shows the accumulated electricity costs, electricity consumed, and amount of time used for each appliance in the home, making it easy for anyone to see the amount of electricity and electricity costs of their home appliances.

For example, you can raise or lower the temperature on your air conditioner or heater and see, in actual electricity costs, how much you will save by doing so. This makes it possible to save energy and electricity costs and see just how much they are contributing to protecting the Earth's environment.



Ecowatt



### KINDEN CORPORATION

Recycling coal ash as filler for propulsion pipes for underground electric lines

Kinden Corporation has taken the coal ash generated at coal-powered fossil fuel power stations and is using it to fill the propulsion pipes that are used to run electric wires underground.

Previously, companies made underground electrical pipe lines using non-cut-and-cover conduit excavation technology, placing many porous electrical pipes inside the propulsion pipe and then securing this by filling the pipe with a hardening agent such as mortar. However, with the increasing congestion of facilities underground, demand arose for a filler that generated little heat and that had high fluidity in order to make effective use of the propulsion pipes and cope with the long distances to be filled.

In addition to generating little heat and having high fluidity, the newly developed filler makes good use of coal ash, a designated by-product of coal-powered electricity.



Filling work

### NIHON ARM CO., LTD.

Manufacture and sale of steel pipe pillars for soft underground construction

Nihon Arm Co., Ltd. builds steel pipe pillars with built-in cables for high and low tension power lines. The company has built these all over Japan, in city centers, residential areas, and in historical and tourist sites, always ensuring that their products match the particular needs and scenery of each location.

The company used its experience to develop a steel pipe pillar suitable for use in the type of “soft underground construction” based on the New Power Line Underground Plan, which was created by various government agencies and ministries at the end of fiscal 1998.

Soft underground construction is a flexible underground wiring method in which various types of wiring can be combined, such as joining overhead lines with back street power lines and incoming lines. The goal is to match the wiring and power lines to the specific situation of the location.

Nihon Arm will manufacture and sell low-cost, compact steel pipe pillars for soft underground construction that blend in with outdoor lighting and match the surrounding environment.



Steel pipe pillar in Kobe's Chinatown

### TOKAI DENGYO CO., LTD.

Manufacture and sale of bamboo charcoal

As one way to make efficient and environmentally friendly use of the bamboo trees that are cut down to make way for electrical power lines, Kansai Electric contracted Tokai Dengyo Co., Ltd. to carry out research on carbonizing bamboo to create a new kind of charcoal called “bamboo charcoal.”

The research revealed the possibility of manufacturing this superb bamboo charcoal, which boasts the same quality as the extremely popular Bincho charcoal. In 2000, the company began full-fledged manufacture and sale of the product, called Chikutan, which comes in two types: one for cooking and another for bath freshening and deodorizing. The company hopes that its bamboo charcoal can contribute to saving the earth by effectively reusing valuable resources.



Bamboo charcoal

### KANDEN L-FARM

Making effective use of dam driftwood

Established as the first start-up company in January 2000 under Kansai Electric Entrepreneurial Opportunity System, Kanden L-Farm takes unused natural wood, such as that trapped by dams at hydroelectric power stations, and disposes of it using the environmentally friendly bioregion method.

Bioregions are a key to creating metabolic societies on a local scale. As part of its own management policy, companies consider things like ecology, geography, microorganisms, and local artisans, all those valuable resources that make each region unique. Companies thus work independently to contribute to the creation of a metabolic society.

The company's main products include barn bedding that is easy on the environment and livestock, raw material for compost, and soil improvement agents for gardening. The company also operates a farm for the purpose of studying the idea of returning wood products to the soil.





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

**Study on Overseas Business related to Afforestation**  
 In 1999, the Kansai Environmental Engineering Center embarked on a feasibility study, the CFC (Carbon sequestration Project by Forestation and Carbonization), which aims at afforestation to achieve sustainable timber production at the same time as sequestered CO<sub>2</sub> sinks.

By making afforested tree into charcoal, which is semi-permanently deactivated the CO<sub>2</sub>, and by using charcoal as medium to improve the soil and to purify water, we can make lumber industry being more sustainable. The Kansai Electric Group has determined that this research can be put to practical business use, as the technology involved is simple and expectations with regard to this project are high.

From 1999 to 2000, under a commission from the Environmental Agency (now, the Ministry of the Environment) we carried out a business feasibility study targeting Malaysia (see Figure 51).

Furthermore, we will also carry out a similar feasibility study on the use of biomass in carbonization and the power generation in Indonesia under a commission from the Ministry of the Environment.

#### Outline of business feasibility study in Malaysia

	Contents
Project name	Business feasibility study on CO <sub>2</sub> fixation afforestation that makes possible sustainable manufacturing using carbonization
Participating Japanese companies	Kansai Environmental Engineering Center Co., Ltd.
Cooperative body	Ta-Ann Group, Malaysia
Project contents	Feasibility study of afforestation business, which makes possible a sustainable lumber industry and CO <sub>2</sub> fixation by making afforested tree into charcoal, which is semi-permanently deactivated the CO <sub>2</sub> , and by using charcoal as medium to improve the soil and to purify water.
Site	Sarawak Province, Malaysia
Duration of the project	September, 1999-February, 2001

#### Outline of business feasibility study in Indonesia

	Contents
Project name	Feasibility study on carbonization and in production of electric power utilizing biomass
Participating Japanese companies	Kansai Environmental Engineering Center Co., Ltd.
Cooperative body	Mushiperusada Inc., Indonesia
Project contents	Finding effective use for the large amounts of waste wood left over by Indonesia's large-scale forestry industry. Working on carbonization and the production of electricity. Study on feasibility of employing biomass in the power generation business as alternative source of energy.
Site	Province of South Sumatra, Indonesia
Duration of the project	August, 2001-February, 2002

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

**Participation in Project to Tackle Global Warming through Forest Carbonization**

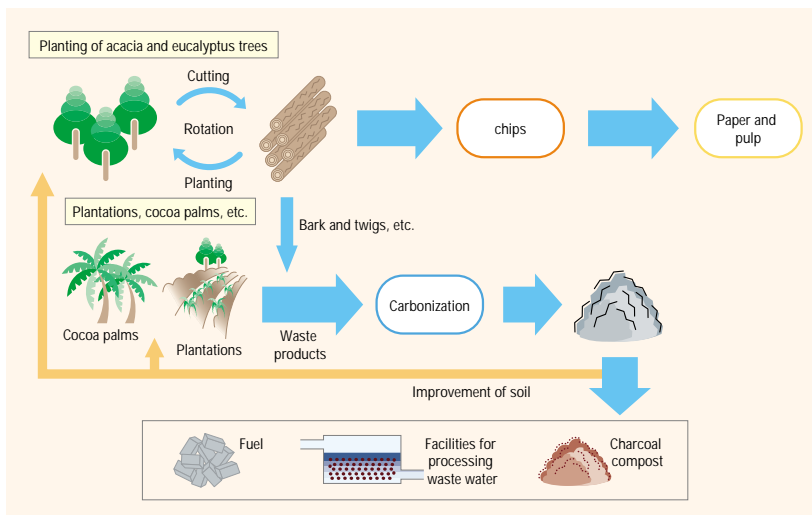
In October 2000, in consideration of future business activities overseas, the Kansai Environmental Engineering Center sent researchers to the Research Institute of Innovative Technology for the Earth (RITE), which is conducting the Development of Technology for Creating Compound Environment Measures such as Preventing Global Warming Through Tree Carbonization. This work is taking place under the framework on guidance research related to environmental industry technology, which is run by the New Energy and Industrial Technology Development Organization (NEDO). Among the responsibilities of our members are selecting carbon fixing plants and developing effective charcoal compost manufacturing methods.

#### Outline of project to create anti-warming measures through carbonization of things like trees

	Contents
Project name	Development of Technology for Creating Compound Environmental Measures such as Preventing Global Warming through the Carbonization of Things like Trees
Implementing organization	Research Institute of Innovative Technology for the Earth (RITE)
Participating companies, etc.	Kansai Environmental Engineering Center Co., Ltd. Wood Research Institute, Kyoto University Ebara Corporation
Project contents	In order to gather, fix, and deactivate large amounts of CO <sub>2</sub> , confine carbon long-term by carbonizing the carbon fixed within plants, and develop effective uses for charcoal such as purifying water and improving soil. In addition to this long-term deactivation of CO <sub>2</sub> , carry out basic research that will be useful in creating measures for things like preventing pollution and protecting the environment.
Duration of the project	September, 2000-March, 2003 (planned)

In addition to this, the Kansai Environmental Engineering Center Co., Ltd. is also developing other businesses that will make a positive contribution to global environmental problems by activities such as investing in companies like Natsource, a carbon trader.

#### Conceptual illustration of CO<sub>2</sub> fixation afforestation business that makes possible sustainable manufacturing using carbonization (Figure 51)



## [Reference] History of Energy and Environmental Issues

	Kansai Electric Power	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 Environment Month introduced as an annual event. 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.	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. 1993 Kansai Electric's Mid-Term Action Plan for Global Environmental Considerations adopted. 1995 New ERA Strategy (Global Warming Prevention Measures) formulated. 1996 Power Plant Sites/Global Environmental Promotion Conference established. (Global Environmental Project Promotion Conference abolished.) New Mid-Term Action Plan for Global Environmental Considerations adopted.	1990 Action Program to Arrest Global Warming adopted. Global Environment 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 Global Environment Forum-Kansai reorganized. 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 the Parties (COP1) to the FCCC. IPCC Second Assessment Report presented. 1996 Second Conference of the Parties (COP2) to the FCCC. ISO Environment Management System and Environment Auditing established. 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). 1998 Fourth Conference of the Parties for Framework Convention on Climate Change (COP4). 1999 Fifth Conference of the Parties for Framework Convention on Climate Change in Bonn (COP5).



	<b>Kansai Electric Power</b>	<b>Japan</b>	<b>World</b>
1990s		<p>1996 JIS Environment Management System and Environment Auditing established.</p> <p>Environmental Action Program of Electricity Utilities Industry formulated.</p> <p>1997 Environmental Impact Assessment Law enacted.</p> <p>Federation of Economic Organization's Environmental Autonomy Action Plan formulated.</p> <p>Electric Utilities Industry Law amended.</p> <p>1998 Law Concerning the Rational Use of Energy amended (enacted April 1999).</p> <p>Outline for Promotion of Efforts to Prevent Global Warming decided.</p> <p>Law Concerning Promotion of Measures to Cope with Global Warming formulated (enacted April 1999).</p> <p>1999 Basic Policies Relating to Global Warming determined by Cabinet.</p> <p>Law Concerning Special Measures Against Dioxins enacted.</p> <p>Japan's PRTR Law enacted.</p> <p>Accident at JCO uranium processing plant.</p>	
2000s	<p>2000 Kansai Electric's Action Plan for Global Environmental Considerations revised.</p> <p>Eco Action 2000 adopted.</p> <p>Nuclear Power and Environmental Committee established.</p> <p>(Power Plant Sites/Global Environmental Promotion Conference abolished.)</p>	<p>2000 Metabolic Society Creation Promotion Law enacted.</p> <p>Cabinet decision on Basic Environment Plan</p> <p>Long-term plan regarding research into nuclear power and development and its use (New Long-Term Plan) enacted.</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>



# Independent Opinion on Environmental Report

## Regarding Kansai Electric's Opening up of Information on the Environment to the Public



**Takashi Gunjima**

Professor of Doshisha University

It is said that the environmental problems faced by the advanced industrialized nations all stem from the 'the trilemma of the 3 Es'. That is to say, the problem is one of how to achieve a balance between economic growth, energy resources and the environment.

Efforts on behalf of business in every sphere, both at home and abroad, have been redoubled in response to the environment and the problems it faces around the globe. And this includes the work Kansai Electric has undertaken in relation to regional environmental problems. Their effort in this direction has been conceptualized in a clear policy toward the environment. They have drawn up an action protocol and have steadily achieved real results based on a plan of behavior that lays down specific numerical goals. Greenhouse gases (the problem of global warming), which find their origin in the problems of energy and resources, and waste products (the creation of a metabolic society) present us with the most serious of issues among the global environmental problems we face today. Efforts have, therefore, placed emphasis on these very issues. The problem is one of how to achieve a coaxial compatibility (mutual compatibility between business and global management) between running a business whose main aim is to ensure a stable supply of electricity to local residents and managing the environment at the same time (easy to say, difficult to do). It could be said to be the challenge of whether it is possible to develop as a business while reducing the greenhouse gases that are produced in supplying electricity.

This issue is being addressed through the New ERA Strategy. This is a strategy toward ever-greater efficiency in the production and use of electrical energy; toward cutting down on the production of greenhouse gases through the adoption of a 'best mix' strategy; and of achieving zero emissions of CO<sub>2</sub> both at home and abroad. While giving priority to this particular strategy, we also have 'Eco Action 2001' which is a plan of action that addresses the whole range of environmental issues.

The Year 2001 edition of the Environmental Report, the 'Global Environmental Action Report', offers a unique examination of the issues faced. It combines a look at the various activities that Kansai Electric has been involved in as an entire group and the way those activities have been conducted on a multi-lateral, multi-directional platform with a very easy to understand picture of how efforts as a whole have conformed to the guidelines laid down in the Ministry's own environmental report. To achieve a streamlined report of such a plethora of material is by no means an easy task. This, however, is one such example of the gathering and opening up of such information to the public.

✂

## **Please give us your thoughts and impressions**

This report has been written in detail to help as many people as possible learn of the efforts Kansai Electric is taking to protect the environment. There may be, however, some points that are hard for the reader to understand, places where the information is insufficient, or other deficiencies.

We would like to ask you to read this report and give us your frank opinions and impressions so that we may use them for future reference. When you have finished reading the report, please fill out the questionnaire on the back and fax it to the company's Environmental Management Group.

We shall be sending some eco-goods free to all those who return this questionnaire  
Thank you very much.

Environmental Management Group  
Environmental Considerations Department  
Kansai Electric Power Co., Inc.  
FAX: 81-6-6441-3549

**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.

I think this report is:

Easy to understand      Average      Difficult to understand

( Reason: )

What do you think about Kansai Electric's approach to environmental problems?

Very good      Fairly good      Not very good      Not good

( Reason: )

Do you want to know more details? Please tell us the page number and describe what you want to know more about.

Page	Detailed description	Page	Detailed description

If there is something that you think does not need to be written in this environmental report, please tell us what it is.

( Please write the page number and give a description of the information. )

If there is something that should be emphasized more or for which more PR is required, please tell us.

( In detail: )

What in particular should Kansai Electric do in the future to protect the environment?

( In detail: )

From what perspective are you reading this report?

A customer of the company      Investor/shareholder  
A party doing business with the company      Government employee  
Affiliated with an environment-related NPO      Mass media-related person  
Corporate environment-related person      Student  
Other (Explain: )

From where did you learn about this report?

Newspaper/magazine      The company's website  
Heard from one of the company's employees  
Heard from a friend or acquaintance      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):

Cut along dotted line

## Main Places of Business

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