# Harmoniously Coexisting with the Local Environment

## 1 Environmental Assessment

Three types of environmental surveys are conducted on the premises of Sendai Nuclear Power Station towards the development of new nuclear power facilities in the latter half of the 2010s. The surveys include an environmental impact assessment, geological survey*1 to examine the geologic structure and faults inside and outside the premises, and meteorological survey*2 to examine wind direction and speed above the premises.

### Specifications for the surveys

| | | | |
|---|---|---|---|
| Location | Gumizaki-cho, Satsuma-sendai City, Kagoshima (inside the premises of Sendai Nuclear Power Station) | | |
| No. of units | One unit | | |
| Output | 1.5 million kW-class | Nuclear reactor type | Advanced pressurized water reactor |

*1: Geological survey

Performed to confirm the rock mass has enough seismic stability as a foundation for a nuclear reactor building.

*2: Meteorological survey

Performed to examine how radiation dose and spread changes in and around the power station in the case of accidents, as well as the method to ensure safety against radiation.

### Status of Environmental Assessments

#### Environmental impact assessment scoping document

In August 2005, we submitted an environmental impact assessment scoping document to the Minister of Economy, Trade and Industry, the Governor of Kagoshima Prefecture, and the mayors of Satsuma-sendai and Ichikikushikino Cities.

During the subsequent inspection period, we sought the environmental-protection-related opinions of all involved, and submitted our responses to those in November 2005.

### Opinions received (from 149 reviewers)

| Item | No. received | Opinion subjects |
|---|---|---|
| Business plan | 9 | Necessity of nuclear power, public water body reclamation, underwater discharging, etc. |
| Environment in general | 5 | Co-existence with the environment, environmental impact assessment items, etc. |
| Noise, vibration | 1 | Surveyed items |
| Water environment | 6 | Water temperature survey, thermal pollution impact, impact on fisheries, etc. |
| Fauna and flora habitats | 5 | Bird survey items, impact on marine fauna and flora, etc. |
| View | 1 | Surveyed items |
| Forum for people to experience nature | 1 | Surveyed items |
| Total | 28 | ——— |

Kyushu Electric Power received recommendations from the Minister of Economy, Trade and Industry pertaining to the environmental impact assessment scoping document in February 2006. We subsequently revised the items to be assessed in line with the recommendations.

### Kyushu Electric Power's reaction to the recommendations from the Ministry of Economy, Trade and Industry (METI)

| Recommendations from METI | | Kyushu Electric Power's reaction (reflection in survey of existing conditions) |
|---|---|---|
| Subject | Outline | |
| Addition of items to be assessed for environmental impact | 1. Landfill soil dissolution test and estimate & assessment of water quality impact where this is likely. | Review of assessment items |
| Investigation of survey, estimate, and assessment methods | 2. Estimation & assessment of impact on air quality of nitrogen oxide from working vessels.<br>3. Survey, estimate and assessment of impact on greater spotted eagle.<br>4. Survey, estimate and assessment of impact on sea turtles. | Review of assessment methods |

#### Survey of existing conditions

In light of the recommendations issued to Kyushu Electric Power by the Minister of Economy, Trade and Industry, we reviewed our survey plans and began surveys of existing conditions (literature searches and on-site surveys based on the environmental impact assessment scoping document) in June 2006, and we are looking into estimates and assessments of environmental impact and taking any subsequently necessary environmental protection measures.

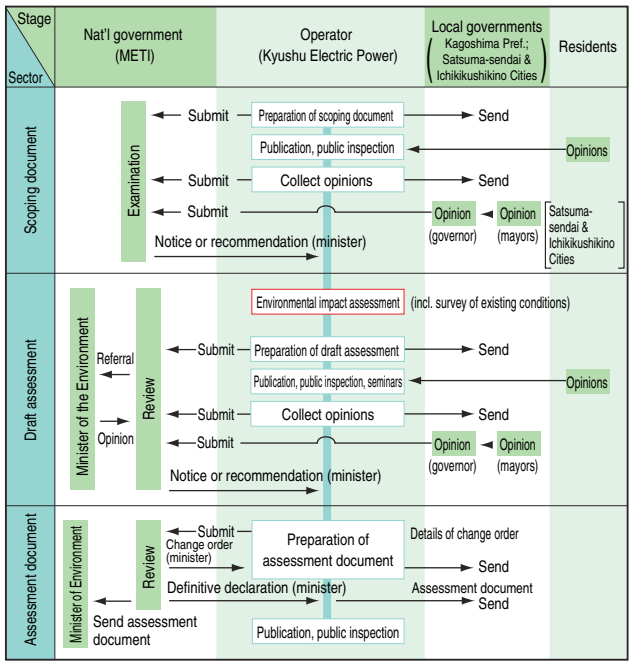
### Main items of the survey for the current situation

| Items | Content |
|---|---|
| Atmospheric environment | Nitrogen oxides, noise, vibration, etc. |
| Water environment | Water temperature and quality, etc. |
| Marine organisms | Marine algae and seaweed, fish, plankton, etc. |
| Terrestrial organisms | Animals, plants and ecosystem |
| Social environment (literature study) | Status of population, industry and land use, etc. |

Survey of noise and vibration

Survey on water environment (quality)

### Environmental assessment procedures



## 2 Prevention of Air, Water and Noise Pollution

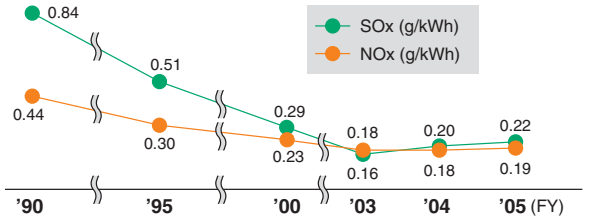
In operating our power stations and other facilities, we conform not only to laws and regulations, but also to environmental conservation agreements concluded with related local governments.

### Air Pollution Measures

We have adopted various measures to minimize sulfur oxides (SOx) emissions from our thermal power stations.

| | |
|---|---|
| Measures for reducing sulfur oxides (SOx) | ○Use of heavy and crude oil with a low sulfur content<br>○Promotion of the use of sulfur-free liquefied natural gas (LNG)<br>○Installation of desulfurization facilities that remove SOx from exhaust gas<br>○Adoption of the in-furnace desulfurization method, which removes SOx within the boiler. |
| Measures for reducing nitrogen oxides (NOx) | ○Combustion method improvement for boilers, etc.<br>• Adoption of the two-stage combustion method<br>• Adoption of the exhaust gas recirculation combustion method<br>• Adoption of low NOx burner and combustors<br>○Installation of denitration facilities that remove NOx from exhaust gas |
| Measure for reducing particulates | ○Promotion of LNG use that does not generate particulates<br>○Installation of high-efficiency precipitators that remove particulates from exhaust gas |

### SOx and NOx emissions intensity (per kWh thermal electric power production)



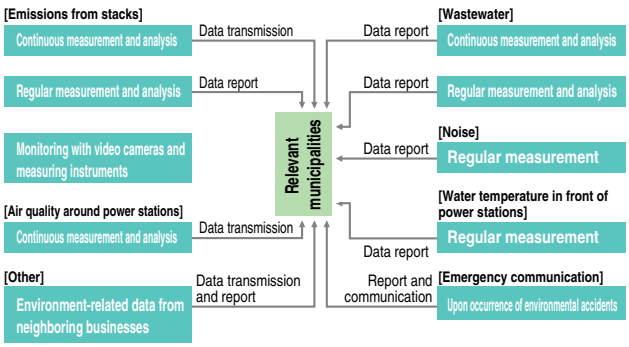

## 3 Environmental Protection Management

Environmental monitoring and chemical substance control, etc. are strictly managed to ensure environmental protection at our power stations.

### Environmental Monitoring

The environment surrounding our power stations are rigorously managed in cooperation with relevant municipalities and neighboring businesses.

### Environmental monitoring and reporting




### Environmental radiation monitoring around nuclear power stations

At nuclear power stations, the ambient radiation dose and the level of radioactivity in the environmental samples of seawater and agricultural and marine products are measured in addition to regular environmental monitoring. Similar measurements are also performed in prefectures where nuclear power stations are located.

- We have been reporting the results of measurement to relevant prefectures. The prefectures in turn review and evaluate the reports under guidance and with advice of academic experts, and publicize the findings periodically in their public relations magazines.
- The radiation dose on people living near power stations is less than 0.001 milisievert (mSv) per year, which is much lower than the statutory dose limit of the 1mSv per year and the annual 0.05mSv target set by the Nuclear Safety Commission.

### Water Quality Control

Wastewater from equipment, and other internal wastewater, is processed using treatment systems at all of the company's thermal and nuclear power stations, and are discharged after quality confirmation. Quality analysis is conducted regularly for reservoir water at hydroelectric power stations. We endeavor to protect water quality by treating it for eutrophication, freshwater red tide, and selective water intake when water gets turbid, as well as supporting projects for improving devastated neighboring forests.

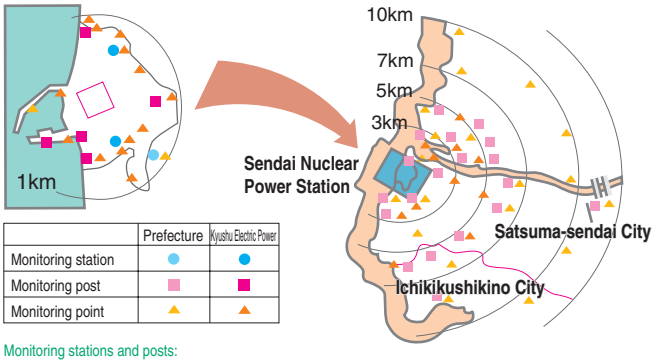
### Measures against Noise and Vibration

We address noise and vibration problems by adopting low-noise, low-vibration equipment, employing mufflers and soundproofing walls, and installing noise-producing equipment indoors.

### Measures against Land Pollution

We prevent discharge and leakage of toxic substances into the ground, and conduct voluntary surveys on soil contamination for sites sold or purchased in order to avoid risks from land pollution. Existing company-owned land is no exception, either: we take steps to prevent pollution by conducting groundwater contamination surveys based on government survey results in possibly contaminated areas in the vicinity of company-owned land. The findings revealed there was no groundwater contamination attributable to Kyushu Electric Power.

### Radioactivity inspection in vicinity of Sendai Nuclear Power Station




Monitoring stations and posts:
conducted sequential measurements of ambient radiation.

Monitoring points:
conducted measurements of the accumulated radiation for a certain period.

## Management and Disposal of Radioactive Waste

Radioactive waste includes low-level radioactive waste incurred at nuclear power stations and high-level radioactive waste incurred in the process of spent fuel reprocessing, each requiring different management and disposal methods.

Plutonium and uranium recycled through reprocessing are reused as useful compounds in MOX and uranium fuel.

Kyushu Electric Power held approximately 2.1 tons of fissile plutonium as of the end of FY2005.

### ■Low-level radioactive waste

Of the waste products generated at nuclear power stations, those with minimal levels of radioactivity are called "low-level radioactive waste management." Its volume is reduced by incineration or compression, and sealed in drums, which are stored securely in the solid waste storage facility located within power station sites. They are then transferred to the Low-level Radioactive Waste Disposal Center of Japan Nuclear Fuel Limited (located in Rokkasho-mura, Aomori Prefecture) where they are buried and stored until the waste ceases to have any effect on the human living environment.

**Accumulated amount of radioactive solid waste stored (as of the end of FY2005)** ☑

Unit: container (each equivalent to one 200-liter drum)

| | Waste stored in power station sites | Waste transferred* |
|---|---|---|
| Genkai Nuclear Power Station | 25,728 (23,495) | 6,536 (6,536) |
| Sendai Nuclear Power Station | 11,748 (11,740) | — |
| Total | 37,476 (35,235) | 6,536 (6,536) |

Note: Parentheses denote as of the end of FY2004 figures.
*Waste transferred to the Low-level Radioactive Waste Disposal Center

### ■Disposal of high-level radioactive waste

The high-level radioactive liquid waste generated in the process of spent fuel reprocessing is mixed with glass matrix and solidified. High-level radioactive waste is stored at the High-level Waste Storage Management Center of Japan Nuclear Fuel Limited in Rokkasho-mura, Aomori Prefecture, for cooling storage for 30 to 50 years. As of the end of FY2005, the High-level Waste Storage Management Center had accepted a cumulative total of 95 canisters of glass-solidified waste from Kyushu Electric Power.

The glass-solidified waste is to be finally disposed of in a stable geological stratum more than 300 meters below ground. The Nuclear Waste Management Organization of Japan (NUMO), a METI-approved organization, will implement the final disposal.

Final disposal is scheduled to begin in around 2035, and applications have been sought from municipalities nationwide for preliminary survey sites since December 2002 for the purpose of selecting a suitable final disposal site.

### ■Reducing radioactive waste by reducing the use of fuel assemblies

By using high burnup fuel (55,000 MWd/t), which has a higher concentration level of uranium 235, we contribute to the extension of the fuel life and, by reducing the amount of spent fuel produced, minimizing the amount of radioactive waste generated.

**Status of spent fuel storage (as of the end of FY2005)** ☑ Unit: pieces

| | Accumulated generation | Accumulated emission | Quantity stored | |
|---|---|---|---|---|
| | | | Quantity stored as of the end of FY2005 | Storage capacity |
| Genkai NPS | 2,859 | 1,217 | 1,642 | 3,278 |
| Sendai NPS | 1,900 | 374 | 1,526 | 2,374 |
| Total | 4,759 | 1,591 | 3,168 | 5,652 |

## Chemical Substance Control

Chemical substances we use at power stations are properly managed at each site in full accordance with related laws and regulations.

### ■Pollution Release and Transfer Register (PRTR) system

We investigate, collect and voluntarily disclose data on the amounts of designated chemical substances emissions and transfers.

**PRTR investigation results (FY2005)** ☑ Unit: kg [dioxins: mg-TEQ]

| Index No. | Chemical substance | Applications | Qty. handled | Qty. released into the air | Qty. transferred |
|---|---|---|---|---|---|
| 30 | Bisphenol A type epoxy resin | Coating material for equipment | 4,400 | 88 | 0 |
| 40 | Ethylbenzene | Coating material for equipment | 3,800 | 3,800 | 0 |
| 63 | Xylene | Coating material for equipment | 16,500 | 16,500 | 0 |
| 179 | Dioxins | Waste incinerator | — | 69 | 6.2 |
| 253 | Hydrazine | Feed water processing agent | 30,800 | 1.5 | 0 |
| 304 | Boron and boron compounds | Reactivity control in nuclear reactors | 2,300 | 0 | 0 |
| 353 | Tris phosphate (dimethyl phenyl) | Turbine control oil | 6,400 | 0 | 4,600 |

Note: Aggregated the data for one ton or more of Class 1 Designated Chemical Substances and 0.5 tons or more of Specific Class 1 Designated Chemical Substances handled by business sites annually (effective digits aggregated: 2 digits). All dioxins are calculated regardless of the amount.

### ■Dioxins

We endeavor to reduce the use of waste incinerators, which are considered contributing to dioxin emissions. We possessed three incinerators at the end of FY2005, two of which were not in use. The remaining one unit is operating with emissions level below the emission regulation index set forth in the Law Concerning Special Measures against Dioxins.

### ■Polychlorinated biphenyl (PCBs) ☑

Equipment held by Kyushu Electric Power utilizing PCBs (1,511 units of high-voltage transformers, capacitors, and the like) is stored and administered strictly in special storage areas pursuant to the Waste Disposal and Public Cleaning Law. We plan to treat the equipment and render it harmless between 2007 and 2013 in the PCB waste treatment facilities established by the Japan Environmental Safety Corporation under the supervision of the national government.

The national investigation committee has been discussing basic policies to address the issue of minute amounts of PCBs that seep into insulation oil of heavy electrical equipment such as transformers. Since equipment with traces of PCBs cannot yet be identified, we conduct examinations to detect the presence of PCBs whenever handling insulation oil, for instance when dismantling equipment. So far we have discovered 1,485 contaminated pieces of equipment, and these are kept under strict control in accordance with pertinent regulations.

## Asbestos

We use some products that contain asbestos in our buildings and facilities. Most of these are non-dispersing.

Places in which spray-on asbestos (which is considered to be dispersing) are used are machine rooms, transformer rooms, and other places where people other than pertinent staff have no access. Therefore, we believe that our use of asbestos has no impact on the surrounding environment.

When dismantling buildings and facilities, we implement extremely thorough measures in line with relevant laws and regulations to prevent dispersion of asbestos particles, and go about disassembly, removal of materials and treatment in the most appropriate manner. Furthermore, we are steadily replacing products that contain asbestos with alternatives.

As of the end of FY2005, three former Kyushu Electric Power employees had applied for worker's compensation for asbestos-related illnesses.

### Major asbestos use in buildings and facilities (as of the end of FY2005)

| Category | | Location | Current status (usage, etc.) | Notes (measures, etc.) |
|---|---|---|---|---|
| Sprays containing asbestos | | Used in wall and ceilings of some machine room and transformer room, etc. as sound and heat insulation, fire-proofing | • Ascertaining all areas of use and implementing measures systematically.<br>• Company buildings: 27; transformer sound insulation: 7. | • Regular inspections; notice of locations of asbestos use; protective gear worn during inspections.<br>• Places where use or non-use of asbestos is unclear are being checked.<br>• Measures in such locations as stated left scheduled to be implemented by FY2007. |
| Products containing asbestos | Building materials | Fire-proof boards and flooring in buildings | • Thought to be included in materials used up to October 2004. Since then, we have not used products containing asbestos. | • As molded products, these do not disperse asbestos particles in normal conditions. Therefore, these will not be replaced with non-asbestos products urgently, but upon repairs or other work performed in the pertinent locations. |
| | Sound insulation | Transformer sound insulation (transformation units, hydro power generators) | • Approx. 70 | |
| | Asbestos cement pipes | Material for subterranean wiring pipes (transmission and distribution lines) | • Length: approx. 180 km | |
| | Heat insulation | Generation facilities (thermal and nuclear) | • Remaining products containing asbestos: approx. 30,000 $m^3$ (around 30% of total) | |
| | Sealant, joint sheets | Generation facilities (thermal and nuclear) | Remaining products containing asbestos:<br>• Thermal: approx. 380,000 (around 80% of total)<br>• Nuclear: approx. 170,000 (around 90% of total) | • As molded products, these do not disperse asbestos particles in normal conditions. Therefore, these will not be replaced with non-asbestos products urgently, but upon repairs or other work performed in the pertinent locations.<br>• Switch to non-asbestos products is to be carried out upon technical assessment. |
| | Shock absorber | Suspension insulators (transmission lines) | • Suspension insulators: approx. 1.47 million (around 40% of total). (Products containing asbestos are used as shock absorbers inside suspension insulators, but are not used in the magnetic portion of the insulator surface.) | • As molded products sealed inside insulators, these do not disperse asbestos particles in normal conditions. Therefore, these will not be replaced with non-asbestos products urgently, but upon repairs or other work performed in the pertinent locations. |
| | Thickener | Wire for overhead power lines (transmission lines) | • Wire anti-corrosive; length: approx. 17 km (approx. 0.2% of total overhead power line length) | • Because the asbestos is integrated into the anticorrosive grease, it does not disperse asbestos particles in normal conditions. Therefore, these will not be replaced with non-asbestos products urgently, but upon repairs or other work performed in the pertinent locations. |

## 4 Harmony with the Surrounding Environment

When designing facilities, we take into consideration the natural environment and urban landscapes of the surroundings areas, and implement environmental measures such as tree planting.

Since FY1986, we have been promoting the underground power distribution system for the benefit of urban landscape and to ensure safe and pedestrian-friendly pavements. It has been a systematic undertaking with the close cooperation of related road administrators, other local parties involved, and distribution line administrators.

### Underground distribution system installation (within Kyushu Electric Power's jurisdiction)

| | Underground Distribution System Installation Plan | | | New Underground Distribution System Installation Plan | Pole-free Power Distribution Promotion Plan | Cumulative total |
|---|---|---|---|---|---|---|
| | 1st phase (1986-1990) | 2nd phase (1991-1994) | 3rd phase (1995-1998) | 4th phase (1999-2003) | 5th phase (2004-2005) | |
| Underground distribution line installed (km) | 97 | 73 | 117 | 210 | 54 | 551 |

### Landscape before/after system installation (Kagoshima Prefecture)

Before

After

TOPICS

### Ota Power Station designated a Civil Engineering Heritage Site by the JSCE

In October 2005, the Ota Power Station, a hydroelectric power station located in Ijuin-cho, Hioki City, Kagoshima, was designated as the Japan Society of Civil Engineers choice as Civil Engineering Heritage Site for 2005. The JSCE Civil Engineering Heritage system was established in 2000 with the aim of contributing to the preservation of historical civil engineering structures by presenting awards to such heritage sites. FY2005 saw 20 such sites nationwide added to the list.

The Ota Power Station came on line in 1908 as the home power plant of the Shimazu estate; Kyushu Electric Power took over operation in 1951. It is a stone structure and features a hexagonal turret on the purlin of the gabled roof, making it unique anywhere in Japan. The gable wall displays the Shimazu family crest, which features a bridle motif.

Ota Power Station

# 5 Environment-related Research and Development

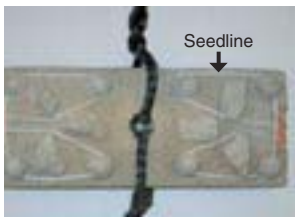
## Research on Environmental Restoration of Seas

It is generally known that algae forms a community and functions to foster the growth of marine animals, sequester $CO_2$ and purify water. However, due to various reasons including global warming, a decrease of algae communities known as rocky-shore denudation has become a grave issue.

In order to restore the disappearing algae communities, we are conducting research on technologies for the rehabilitation of the natural environment to address this situation. Already, we have confirmed algae growing on the environments we created, and the supply of seeds and the budding of baby algae.

Furthermore, in line with our stance to encourage recycling in the community, we make effective use of coal ash by using cultivation plates generated from our thermal power stations.

Interim status of cultivation




Start

At 4 months
(up to 20cm)

At 14 months
(up to 70cm)

At 23 months
(up to 80cm)

## Research into Treatment Technology to Render Asbestos Harmless

At present, most asbestos recovered is disposed of in landfills. However, increasing paucity of final disposal sites means that new treatment methods are in needs.

In light of this, we are engaged in research with the aim of contributing to ongoing environmental protection for the future by looking into technology to render asbestos harmless and carrying out technical feasibility of the process.

Removal of spray-on asbestos

Double packaging for waste asbestos

**We aim to replenish stocks of rare plants through my research.**

**Kunio Oyama** Agricultural Product Cultivation Group Manager, Bioresources Research Center, Research Laboratory

## VOICE ● Research into cultivation of rare and native plants

The protection of endangered plants is a challenge for all of mankind. The calanthe, Cymbidium Kanran Makino and other members of the orchid family that used to abound throughout the countryside are now scarce. Their flowers are a major attraction for botanists and so are deliberately picked and plundered, thus leading to their current predicament. We are engaged in research that aims to restore rare plants in order to bring back the true enjoyment that the countryside can offer.
I hope the day will come soon when we can once again see calanthe decorating the mountain landscape.

## Research on Rare Plant and Native Plant Cultivation

There are 1.4 million species of known living organisms on this earth. When those species unknown to us are included, the estimated total extends to 3 million to 30 million species. Among them, approximately 40,000 species are said to become extinct every year, which makes the preservation of threatened wild species an urgent issue requiring worldwide attention.

We survey existing rare plants in the company-owned forests and research technology for their cultivation and propagation for the purpose of species preservation.

We also collect and cultivate around 30,000 acorns a year from native trees found in Kyushu, and offer the seedlings for tree planting in the Kyushu Homeland Forestation Project. We have also created an exhibition garden of the 27 species of acorn found in the local countryside. In these ways, we are committed to using these natural teaching aids for cultivation research and environmental education.

Growth survey of Cymbidium Kanran Makino

The acorn exhibition garden at the Bioresources Research Center, Research Laboratory