Environmental Action Plan
By the Japanese Electric Utility Industry

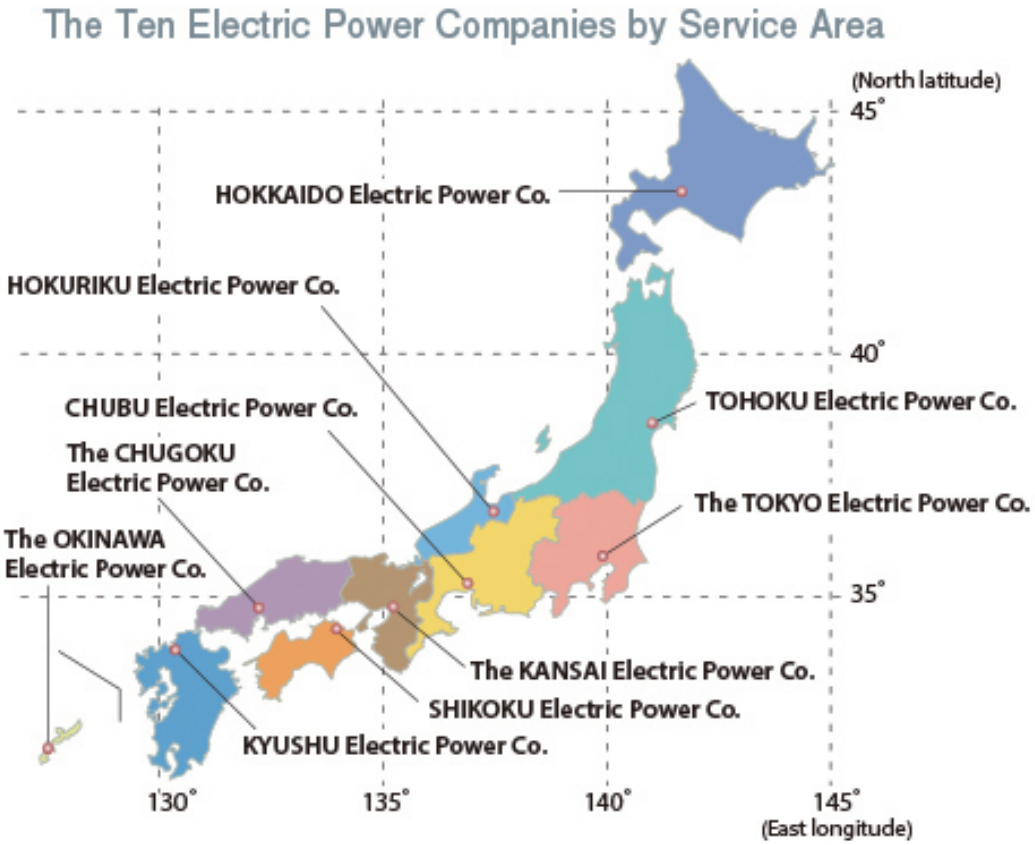
November 2013
The Federation of Electric Power Companies of Japan (FEPC)

1. About us

Electricity supply in Japan is carried out by privately-owned independent regional electric power companies and close cooperation among these companies is essential for efficient operations. In 1952, the nine electric power companies established the Federation of Electric Power Companies (FEPC) to promote smooth operations within the industry.

Since then, FEPC has played an important role as a base for close communication between the electric power companies and as a forum for exchanging views to create the electric power industry of the future. Moreover, FEPC undertakes various activities to ensure stable operations of the electric power industry, with an awareness of its role in the energy industry of Japan.

With the return of Okinawa to Japan in 1972, the Okinawa Electric Power Company rejoined Japan's electric power industry, becoming an FEPC member in March 2000.



2. Basic Policy for Global Warming Issue

<Simultaneous Pursuit of Environmental and Economic Integrity>

Continuous efforts must be made to address global warming by taking advantage of technical innovation and ingenuity under the basic concept that "environmental conservation and economic growth should be achieved simultaneously" in order to reduce greenhouse gases on a global level.

<Simultaneous Achievement of 3Es on the Basic Premise of S>

The electric utility industry is making great efforts to achieve the Environmental Action Plan and realize a low-carbon society through pursuing an optimal energy mix based on simultaneous achievement of the S + 3Es: energy security, economic stability and environmental conservation, while placing top priority on safety.

<Realizing a Low-carbon Society>

Based on the fundamental goal of "ensuring a stable supply of high-quality and inexpensive electricity", we promote the following activities on both the supply and demand sides in order to realize a low-carbon society. (1) Low-carbonization of supply energy and (2) Efficiency improvement of customers' energy usage by expanding use of highly efficient equipment.

a. Activities to deliver low-carbon energy on the supply-side

We strive to improve the share of non-fossil energy sources, and also work hard to use fossil fuels more efficiently by raising the thermal efficiency of thermal power generation (through the use of nuclear power premised on safety, and renewable energies).

b. Activities to enhance efficiency of energy use by customers

We endeavor to promote energy conservation and CO_2 emissions reduction by expanding use of highly efficient electric equipment through our proposals and consultations to customers in industry, transportation, building, and household sector. We will also lead in the development of innovative next-generation technologies that help to reduce CO_2 emissions and conserve energy use.

3. Measures to suppress CO_2 for fiscal 2008–2012

(1) CO_2 Emissions Suppression Target

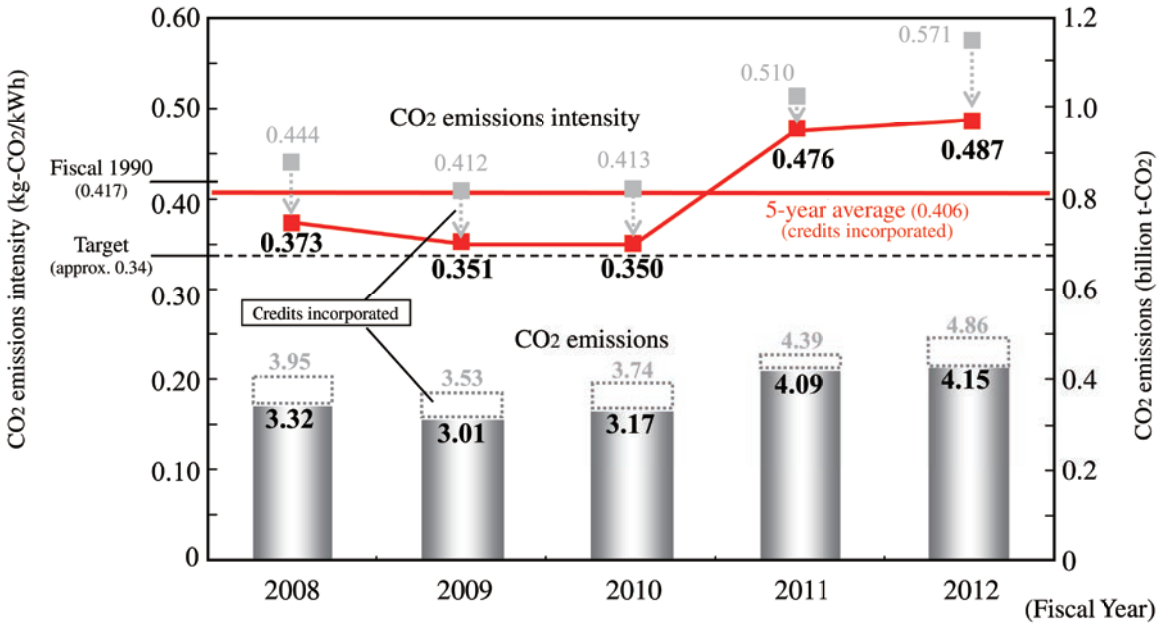
Reducing CO_2 emissions intensity (emissions per unit of user-end electricity) by an average of approximately 20%, about 0.34 kg-CO_2/kWh, from the fiscal 1990 level, between fiscal 2008 and fiscal 2012.

(2) CO_2 Emissions for the Five Years from Fiscal 2008 to 2012

Electric power consumption was 852 billion kWh in fiscal 2012, while CO_2 emissions* totaled 415 million t-CO_2 and user-end CO_2 emissions intensity* was 0.487 kg-CO_2/kWh. As a result, the average user-end CO_2 emissions intensity* for the five years was 0.406 kg-CO_2 kWh.

* CO_2 emission intensity and CO_2 emissions reflect the credit in the way stipulated in the "Law Concerning the Promotion of Measures to Cope with Global Warming." The figures for 2012 and the five-year average may improve slightly when the additional credits currently outstanding due to the delay in review by the UN have been incorporated (to be announced when they are fixed).

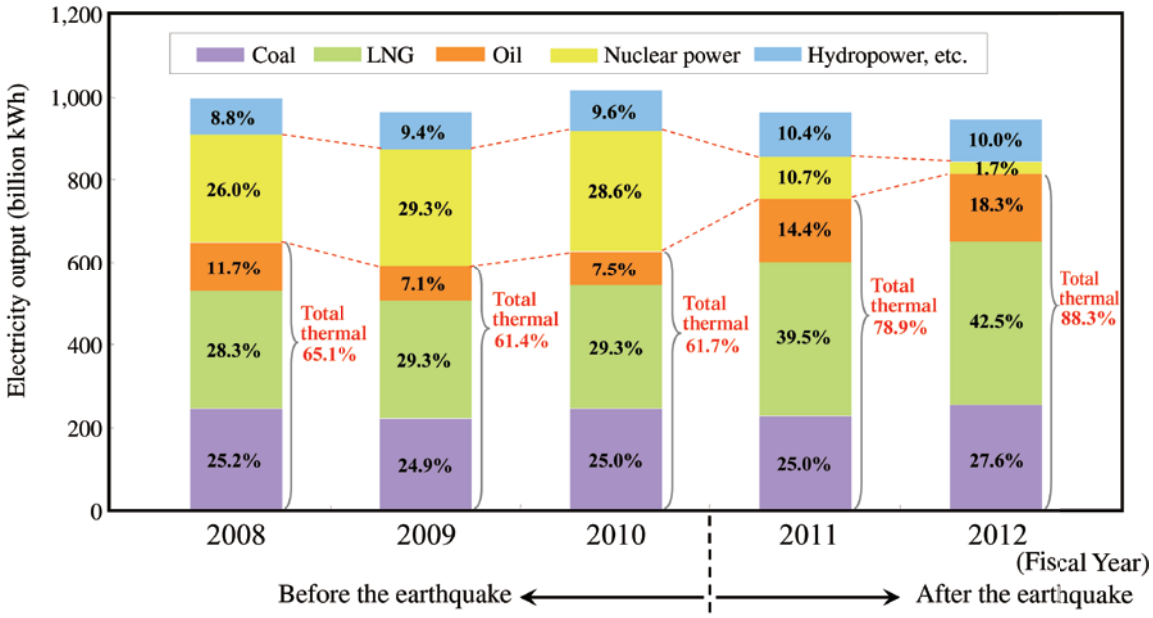
■ **Trend of CO_2 emissions and CO_2 emissions intensity**



In order to achieve the CO_2 emissions suppression target, the electric utility industry has constantly made utmost efforts, including using nuclear power, developing and promoting renewable energies, and improving the thermal efficiency of thermal power plants, as well as using the Kyoto Mechanism. However, due to the long-term shutdown of nuclear power plants after the Great East Japan Earthquake in March 2011, the 5-year average of user-end emissions intensity between 2008 and 2012 (credits incorporated) reached no further than 0.406 kg-CO_2/kWh (down 2.6% from 1990 levels).

This is due to the drop in the proportion of nuclear power generation, which is recognized as a major countermeasure against global warming, from 30% before the earthquake disaster to 10% or less, and the increase in thermal power generation to 80 to 90% from approximately 60%.

Proportion of power sources in the generation mix



Despite not reaching the CO_2 emissions suppression target of 0.34 kg-CO_2/kWh (20% lower than fiscal 1990 levels), the efforts to reduce CO_2 were continued even during the prolonged shutdown of the nuclear power plants after the disaster. Furthermore, the use of the Kyoto Mechanism credits surpassed the 5-year target set before the earthquake disaster, reaching approximately 270 million t-CO_2.

We recognize that our intensive efforts have contributed to achieving the national target for Kyoto Protocol.

CO_2 emissions suppression effect of nuclear power generation

The CO_2 emissions suppression effect of one nuclear power plant (1000 MW) is approximately 5 million t-CO_2 higher than that of oil-fired thermal power per year (at a nuclear plant capacity factor of 85%). This difference is equal to the annual emissions of 1.4 million general households.

This is why the stable operation of nuclear power, which does not emit CO_2 when generating power, is important for fighting global warming.

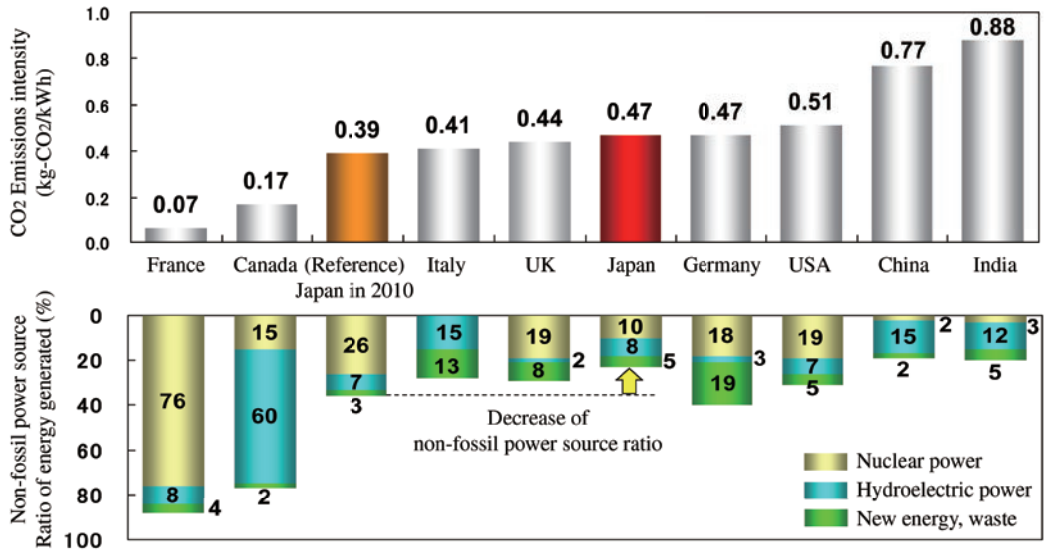
Country-to-country comparison of CO_2 emissions intensity (gross)

CO_2 emissions intensity in Japan is low in comparison with major European and North American countries, although not as low as France (which has a high ratio of nuclear power generation) and Canada (a high ratio of hydroelectric power generation).

Thus, it can be said that the electric utility industry of Japan has sought to implement the optimal combination of energy low carbonization by the suppliers and the efficiency improvement on the user side.

However, in 2011, CO_2 emissions intensity increased by approximately 20% compared to before the earthquake disaster due to the long-term shutdown of nuclear power plants which caused the ratio of non-fossil fuels to drop.

Country-by-country comparison of CO_2 emissions intensity (gross) provisional calculation by FEPC



* Fiscal 2011 figures
* Including household power generating installation in Japan
* Including CHP plant (combine heat and power)
* Source: IEA Energy Balances of OECD Countries 2013 Edition/
Energy Balances of Non-OECD Countries 2013 Edition

4. Promotion of the Action Plan for Achieving a Low-Carbon Society

So far, the electric utility industry has focused on reducing global warming CO_2 emissions as the key to tackling global warming.

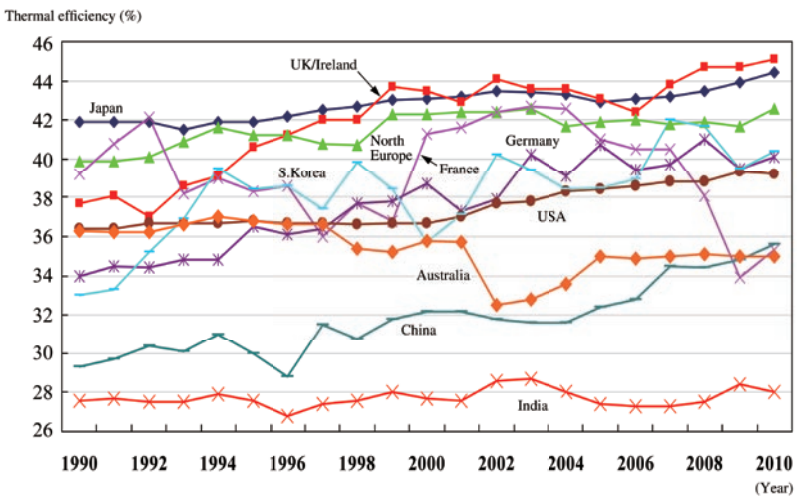
Beyond 2013, the companies will participate in the Action Plan for Achieving a Low-Carbon Society announced by the Keidanren in January 2013, and will continue to actively address global warming through efforts on both the supply and demand sides of electricity based on simultaneous achievement of the S + 3Es: energy security, economic stability and environmental conservation, while placing top priority on safety, in order to achieve a low-carbon society.

Efforts in domestic business activities	**Expanding the use of non-fossil energy sources**	Using nuclear power with safety as a major premise
		Using renewable energies
	Improving the efficiency of power facilities	Improving the efficiency of thermal power
Strengthening the collaboration between the supply and demand sides including customers	**Energy conservation**	Promoting high-efficiency electrical devices to enhance the efficient use of electricity
		PR activities and providing information on energy-saving and CO_2 reduction
		Introducing smart meters for the efficient use of electricity
	Efforts by electric utility industry as users	Efforts in office-use energy conservation and the use of company-owned vehicles
Promoting international contributions	**International efforts**	Assisting developing countries to reduce carbon through international partnership (GSEP) activities
		Reducing carbon in all parts of society through international efforts
Developing innovative technologies	**Research and development**	Clean coal technology, CCS, next-generation power transmission and distribution technology
		Ultra-high-efficiency heat pump, EV-related technologies

Country-by-country comparison of thermal efficiency

Japan's electric utilities work to maintain thermal efficiency through thermal efficiency management and efforts including increasing the combustion temperatures of gas turbines used in LNG combined-cycle power generation and raising the temperature and pressure of the steam in boiler and turbines. As a result, the thermal efficiency of Japan's thermal power plants is at the highest level in the world.

Comparison of thermal power plant efficiency in Japan with other countries



* Thermal efficiency is the gross generating efficiency based on the weighted averages of efficiencies for coal, petroleum and gas (lower heating value standard).
* Comparisons are made after converting Japanese data (higher heating value standard) to lower heating value standard, which is generally used overseas. The figures based on lower heating value are around 5 - 10% higher than the figures based on higher heating value.
* Private power generation facilities, etc. not covered.
* Figure is based on fiscal year for Japan
Sources: INTERNATIONAL COMPARISON OF FOSSIL POWER EFFICIENCY AND CO_2 INTENSITY, 2013 (Ecofys)

5. Promoting International Contributions

The Global Superior Energy Performance Partnership was established in July 2010 as a successor to the Asia-Pacific Partnership on Clean Development and Climate (APP).*

Through the GSEP's activities such as coal thermal facility diagnosis and CO_2 emissions reduction activities, Japan plans to transfer and grant electricity technologies to developing countries to reduce their carbon emissions. According to the Energy White Paper 2008, Japan's technologies have the potential to reduce carbon dioxide by 130 million t-CO_2 if applied to the coal-fired thermal power plants of the US, China and India.

* The Asia-Pacific Partnership on Clean Development and Climate (APP) was a regional partnership of public and private sectors among the United States, Australia, China, India, South Korea, and Japan formally established in January 2006. APP aimed to tackle environmental pollution, energy security, and climate change issues while meeting increasing energy demand in the Asia-Pacific region. (Canada officially joined in October 2007.)

Peer Review Activities by the GSEP

In January 2013, the first workshop (WS) was held in Jakarta, Indonesia to share the best practices in electricity generation, distribution and demand management technologies. Forty-seven participants from Japan, the US, China, Europe and Indonesia joined the meeting for a seminar on electricity generation, distribution and demand management technologies, as well as a quick peer review at a coal-fired thermal power plant (Suralaya Thermal Power Plant), and actively exchanged views on operation and maintenance (O&M).

Overview of Suralaya Thermal Power Station

- Four 400 MW units
  (Start of commercial operation: Unit 1: 1984, Unit 2: 1985, Unit 3: 1988, Unit 4: 1989)
- Three 600 MW units (Start of commercial operation: Unit 5: 1996, Units 6 & 7: 1997)

Result of the review

- Confirmed an efficiency reduction of about 2% based on the amount of fuel and the output (64,000 tons of fuel saved annually, reducing CO_2 by 150,000 tons)
- Identified a reduction of equipment performance based on plant operation data
- Commented on the need for regular calibration of measuring instruments and regular inspection for minor drain leakage

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		Details of the Plan
1. Reduction targets for 2020 for domestic corporate activities	Target level	With a realistic national energy policy yet to be formulated, and with no clear prospects for restarting the nuclear power stations, it is difficult for the electric power companies to set numerical targets, so they will continue to consider the targets and how they should be set. Regarding the fight against global warming, the electric utility industry will continue its efforts to reduce CO_2 emissions by pursuing an optimum energy mix based on the "S+3E's policy", which means simultaneously achieving safety, which is a major premise, and energy security, environmental conservation and economic efficiency.
	Basis of the target	❍ Utilizing nuclear power with safety as a major premise • Implementing thorough safety measures in nuclear power stations based on the lessons and knowledge learned from the Fukushima Daiichi accident • Making utmost efforts for safe and stable operation of the nuclear plants that have been proven to be safe once they are restarted ❍ Utilizing renewable energies • Utilizing hydropower, geothermal, solar and wind power, and biomass • Advancing the research and development of technologies for controlling the output fluctuations of renewable energies - Considering ways of controlling the output fluctuation of solar power - Considering expanded introduction of wind power using the inter-region connection networks ❍ Improving the efficiency of thermal power • In developing thermal power, adopting the highest level of technology suitable for the size of the plant • Appropriately maintaining and controlling the thermal efficiency of existing plants
2. Strengthening the collaboration between the supply and demand sides including customers (reduction by 2020 through the promotion of low-carbon products and services)		❍ Reducing the CO_2 emissions of customers by improving the efficiency of their electricity consumption through the use of high-efficiency electric appliances, and through energy saving and CO_2 reduction activities ❍ Introducing smart meters to improve the efficiency of electricity consumption by customers
3. Promoting international contributions (reduction by 2020 outside of Japan by promoting energy conservation technologies)		❍ Transferring and granting Japanese electricity technologies by means of coal thermal facility diagnosis and CO_2 emissions reduction activities through GSEP, to assist developing countries ❍ Reducing carbon throughout society by developing and introducing advanced and feasible electricity technologies through international efforts such as the International Electricity Partnership (Reference) Japan's technologies have the potential to reduce carbon dioxide by 130 million t-CO_2 if applied to the coal-fired thermal power plants of the US, China and India.
4. Developing innovative technologies		❍ Developing technologies in the areas of supply, demand and environmental preservation (clean coal technology, next-generation transmission and distribution technology, CCS, ultra-super-high-efficiency heat pumps, EVs)

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