

The 6th session in Tohoku of UNU Global Seminar series
 Title: Electric energy and environmental issues - Ensuring energy security

Tohoku-Electric Power Co.,Inc. Environmental Affairs Dept.

1. Introduction

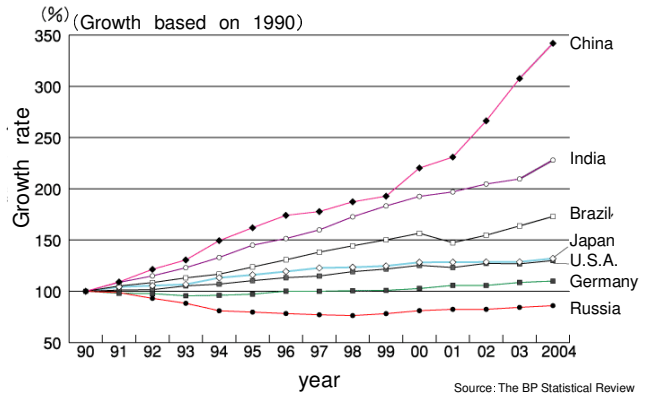
(1) Surging energy demand in the Asia region

- The global energy demand is increasing, in particular in China, India and Brazil. A remarkable growth is seen in Asia driven by China where demand has increased about 3.4 times since 1990 and is expected to expand.
- To solve energy issues in Asian countries, we need to actively promote and strengthen energy cooperation for energy conservation and other areas.

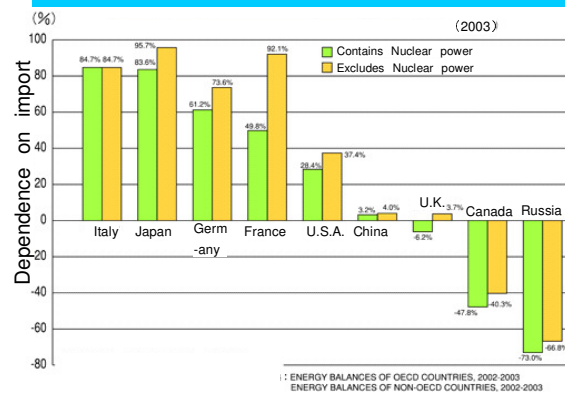
(2) Energy situation in Japan

- With extremely poor in energy resources, Japan depends on imports from other countries for primary energy.
- As energy demands are recently on the rise in Asia, Japan is faced with a crucial challenge of securing energy sources.
- Japan substantially improved energy efficiency by 1990 in the wake of the oil crises. As a result, it boasts as the world's most energy-efficient country.

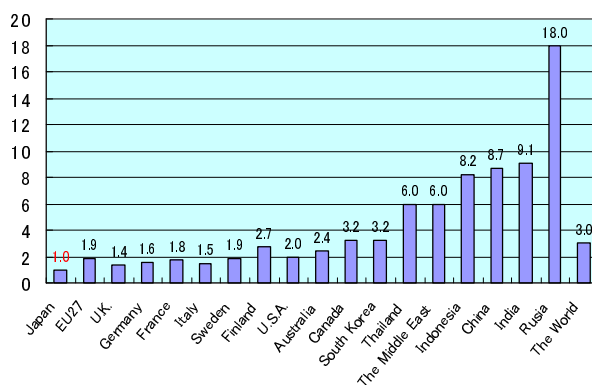
Growth Rate of Power Generation



Dependence on Energy Import

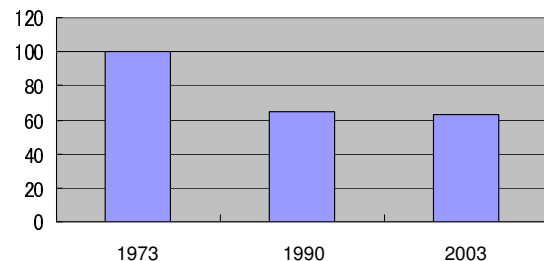


Comparison of Primary Energy Supply per GDP



Japan's Final Energy Consumption Factor per GDP

After the oil crises, Japan improved its energy efficiency factor up to around 37%. Most of it was achieved before 1990.



(3) Energy and environmental issues

- Issues that energy policies should address are largely divided into two categories: "environmental measures to deal with global warming" and "energy security to respond to growing energy demand."
- Toward the goal of sustainable development managing both environmental concerns and economic progress, it is important to simultaneously achieve 3Es, Economic Growth, Environmental Protection and Energy Security.

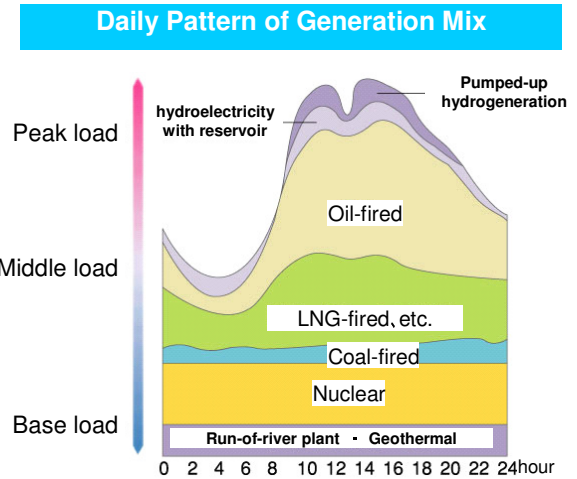
2. Electric energy system

(1) Characteristics of electric energy system

- Power consumption varies by the time of day and by the season. In the recent years with the spread of air conditioners, power demand peaks around two o'clock in the afternoon during summer when the daily highest temperature is normally marked.
- Electricity, different from other energy, cannot be stored. Electricity must be flowed constantly at any moment from power generation to consumption. It means that for a stable power supply generation facilities have to be developed to meet peak demand.

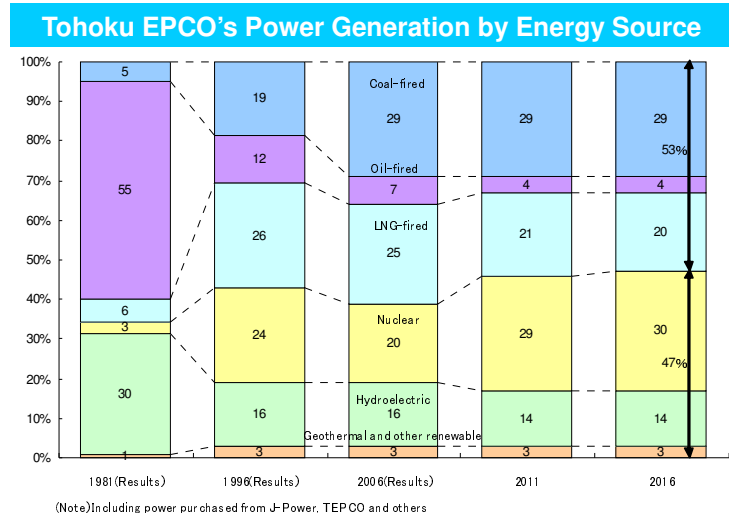
(2) Power supply based on characteristics of generation sources

- As mentioned before, power consumption changes by the day and by the season. Each of power companies in Japan supplies electricity with balanced combination of generation sources so that they can respond to moment-to-moment shifting demand.
- **Base load** Supplied by nuclear power, coal-fired and hydroelectric power generation (run-of-river plant) taking into consideration generation costs and environmental impacts.
- **Peak load** Power supply increases during daytime when demand is high. Peak load is covered mainly by oil-fired and LNG-fired thermal generation and pumped-up hydro generation due to their advantage of flexible response to demand variation.

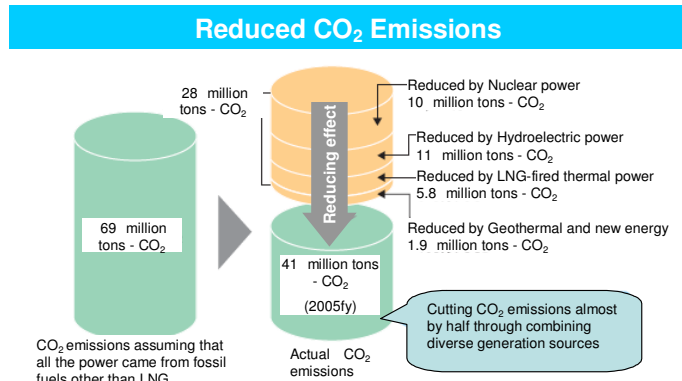


3. Tohoku EPCO's environmental activities

- Thermal power plants account for one quarter of the Japan's total CO₂ emissions. It shows that the electricity industry has an important role to play in CO₂ emissions reduction. As energy demand is drastically growing, particularly in Asia, ensuring a secure electricity supply requires risk diversification in fuels procurement. To address both energy and environmental challenges, our company has been working to increase the installation of power produced from wind power and other renewable energies on top of nuclear energy and natural gas. Thus we have developed "the best mix" of power generation sources while considering their economic efficiency and environmental properties, and reducing consumption of fossil fuels at thermal power plants.



- CO₂ emissions in fiscal 2005 were 40.83 million t- CO₂. This represents around 60% of CO₂ emissions produced if we had generated all the power in the year by using fossils fuels other than LNG.



- In addition, we are very proactive in international efforts. Through the Kyoto mechanism we are making efforts to tackle with global warming and to control CO₂ emissions.

(1) Taking advantage of nuclear power generation

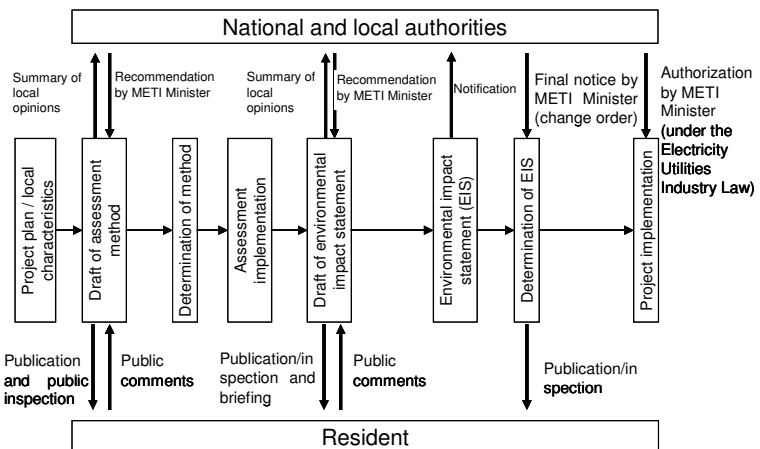
- Nuclear energy has advantages of supply stability and economic efficiency. It also contributes to mitigating global warming because it doesn't emit CO₂ in generation.
- While giving top priority to ensuring safety, we are now working to develop new nuclear generation plants, No.2 unit at Higashidori Station and one in the site of Namie-Odaka as well as to improve capacity factors in existing plants, No.1 to No. 3 units at Onagawa station and No. 1 unit at Higashidori station.

(2) Replacing aged thermal plants to natural gas-fired combined cycle plants

- Natural gas-fired thermal power generation is effective in CO₂ emissions control with low CO₂ emissions in combustion. And also, it is environmentally friendly as it does not generate Sulfur Oxides or particulates.
- To improve thermal efficiency factors at aging thermal power plants, we are promoting the replacement to the natural gas-fired combined cycle facilities with high efficiency, which leads to CO₂ emissions reduction.

【Environmental Impact Assessment】

- We have a plan to introduce a natural gas-fired combined cycle generation unit with an output of 446 MW to replace aging facilities in the Sendai thermal power station. Those facilities have been in operation for more than 40 years.
- In constructing a new plant, we have to go through the environmental assessment in line with the Environmental Impact Assessment Law and the Electricity Utilities Industry Law.

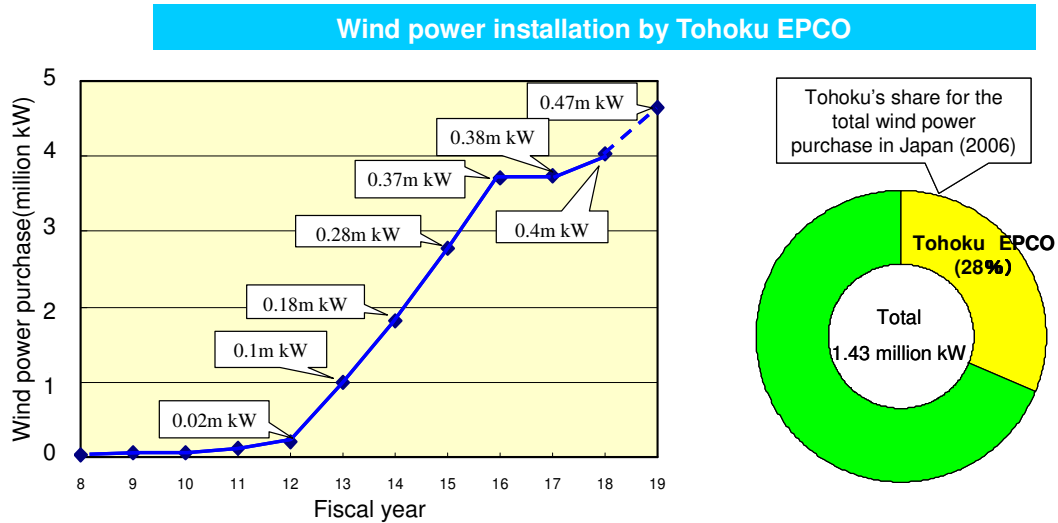


In the assessment, we will implement a status survey on air quality, water environment, flora and fauna, landscapes and other elements. Based on the results, we decide conservation measures and carry them out so as to avoid or reduce as much as possible impact on surrounding environments. We incorporate those measures in the projection and evaluation of environmental effects by the construction during work and after operation start-up. Key environmental protection measures include:

- Streamlining and downsizing work by making the best use of existing facilities to reduce environmental impacts during construction
- Reducing nitrogen oxides emitted to the atmosphere by adopting the low-NOX combustor and the flue gas denitrification facilities
- Paying attention to harmony with the natural environment, specifically regarding the height, shape and color of the stack due to its location near Matsushima, a place of scenic beauty
- Allowing the new stack to serve as a perch for birds (duck hawks) as they have been sitting on the existing ones

(3) Installation of renewable energy

- Renewable energy is free from concern for depletion as it doesn't need generation fuels, and it has environmental benefits with emitting no CO₂ in generation. On the other hand, it has challenges to overcome in terms of cost and supply stability because of its dependence on natural conditions.
- In 2006, installed wind power capacity by Tohoku EPCO amounted to around 400,000 kW. This accounts for approximately 28% of the Japan's total wind power capacity.



(4) International efforts through the Kyoto mechanism

- In addition to measures on facilities including the development and installation of nuclear power and natural gas-fired thermal power generation, we are stepping up our international efforts to address global warming through the Kyoto mechanism.

[Kyoto mechanism application]

- As taking effect in February 2005, the Kyoto mechanism is clearly recognized as the international framework to curb global warming. Therefore, we are making international effort toward the goal through the Kyoto mechanism.
- For example, we are participating in a CDM(*) project in China where energy demand is increasing remarkably. The project is designed to lower the consumption of fossil fuels by introducing hydroelectric power generation with no CO₂ emissions.

(*NB) CDM: Clean Development Mechanism: One mechanism under the Kyoto mechanism, a scheme to achieve GHG reduction targets through international cooperation. Developed countries can offset their domestic emissions with GHG reduction from projects they implement in developing countries.

4. Conclusion

- Electric power is one of our essential lifelines to support sustainable economic growth and indispensable in our daily life. Electricity power companies are responsible to supply quality electric power, at affordable prices. At the same time, we as energy providers well recognize how fundamental our roles are in the social system. We are committed, therefore, to simultaneously achieving 3Es, Economic Growth, Environmental Protection and Energy Security, and contributing to sustainable development maintaining economic progress and environmental conservation in harmony.
- Today as environmental issues are becoming serious and complex social problems that extend from global to regional scale, each of us needs to enhance awareness about environmental challenges. In addition, companies as a social citizen must make earnest and persistent efforts toward the solution of environmental problems.