

8. Tokyo Electric Power Company, Inc. (TEPCO)

1. Company Profile

For more than half a century since its establishment in 1951, the Tokyo Electric Power Company, Inc. (TEPCO) has continued to deliver a stable supply of high-quality electricity, through an integrated system of power generation, transmission and distribution.

TEPCO supplies electricity to the Tokyo metropolitan region. Though only covering about 10% of Japan's total land area, this region is home to one-third of its population, and is the political and economic heart of the nation.

TEPCO's electricity sales in the term ending March 2004 totaled 276 billion kWh in volume. As well as being the largest in Japan, accounting for about one-third of the national total, this was more than the equivalent amount for the whole of Italy.

2. Environmental Activities

Considering our involvement in the energy supply, achieving harmony between environment, energy and economy is an unending task for TEPCO. We are making maximum efforts to achieve that harmony, under our business philosophy of "With optimal energy services, we can offer our customers a better lifestyle and a more comfortable environment".

In Japan, a country of meager natural resources, we will set prices and create services to win through market competition, while guaranteeing energy security and a stable supply of power. And together with society, we will strive to improve the efficiency of energy use and curb carbon dioxide emissions by drawing on our technological strengths to build a clean society that values energy. I feel such efforts are the road to achieving our management concept.

3. OBJECTIVE

- TEPCO has been wrestling with the measurement and evaluation of Eco-efficiency Indicators comparing economic values (sales) with environmental burdens or resource consumption in order to analyse the relationship between business performances and environmental impacts in terms of ecological efficiency.
- EcoIndicator 99 (EI99) has been used to measure environmental impacts, which is a integrated method to weight a number of substances such as CO₂, SO_x and NO_x by degree of ecological impacts of each substance and aggregate them into one unit.
- However, as EI99 is a integrated method developed in Europe (Netherlands), TEPCO is now reviewing the adoption of other methods applicable to Japanese environmental situations.
- JEPIX is a integrated method contrasting the distance to target of Japan with actual

- flows of the emissions of environmental impact substances. Study is made on the possibility of JEPIX as the Eco-efficiency Indicators applicable to TEPCO as compared with EI99.

4. Subjects for Evaluation

- Figure 8.1 shows the relationship between the input of energies and resources and the output of environmental impact substances associated with the business performances of TEPCO in the fiscal year 2002. Based on the Figurer, evaluation is made on environmental impact substances as far as possible applied by JEPIX such as CO₂, SO_x, NO_x, CFCs and others.

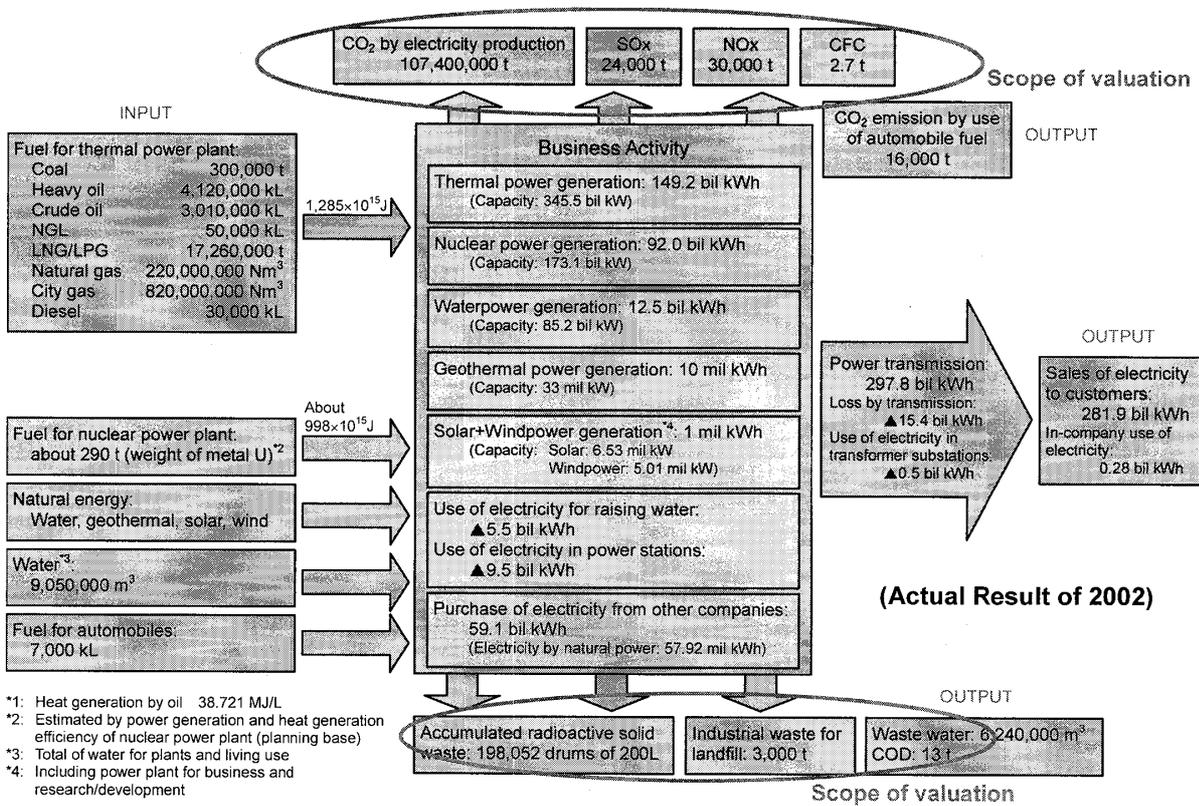


Figure 8.1: Area of analysis

5. Premises

- Evaluation is made on annual amounts of emissions and care is not taken on life cycles of substances.
- Figure 8.2 shows the annual trends of major environmental impacts and electricity sales. According to the Figurer, the emissions of NO_x and SO_x have decreased since the late 1970's as a result of fuel countermeasures and the end-of pipe type of air pollutants countermeasures.

- On the other hand, CO₂ emissions usually increase with the growth of the electricity generation of thermal power because there is no cost-effective way of eliminative countermeasures on CO₂ as compared with those of air pollutants.
- Nevertheless, the growth of CO₂ emissions has been constrained at relatively low rate of increase due to the improvement of supply-side efficiency such as the promotion of nuclear power generation, the improvement of the energy efficiency of thermal power and the decrease of the loss rate at the time of the transmission and distribution of electricity.

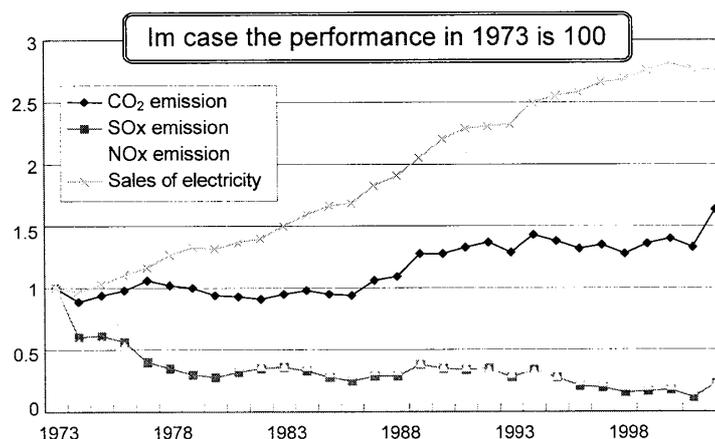


Figure 8.2: Transition of principal environmental impact and sales of electricity

6. Evaluation results

▼ Ratio of Environmental Impacts by JEPIX (by substance in fiscal year 2002)

- Figure 8.3 shows the results of the integration of environmental impacts associated with business performances of TEPCO by using JEPIX, and it indicates that CO₂ accounts for 98% and NO_x 1.5% and the rest only below 0.2%.
- The result seems to be caused by the fact CO₂ emissions are very large in absolute quantity in the electric industry.

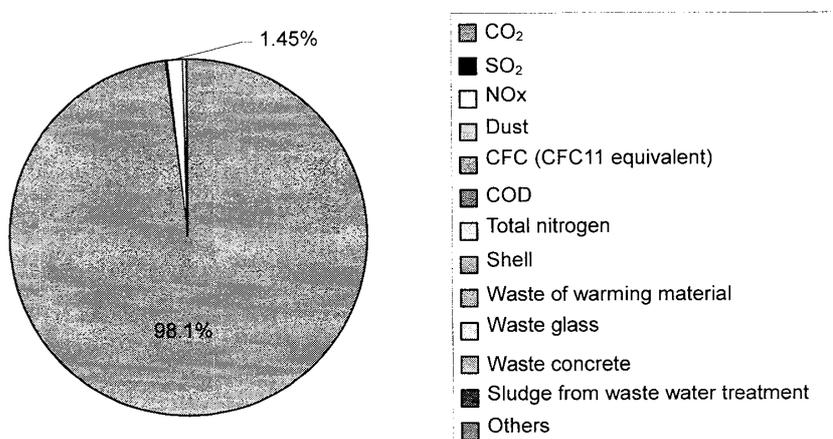


Figure 8.3: Share of environmental impact of JEPIX (2002)

(Reference) The breakdown of CO2 emissions by industry in Japan

- The share of CO₂ emissions by TEPCO is relatively large as a single firm in the whole industry (Figure 8.4).

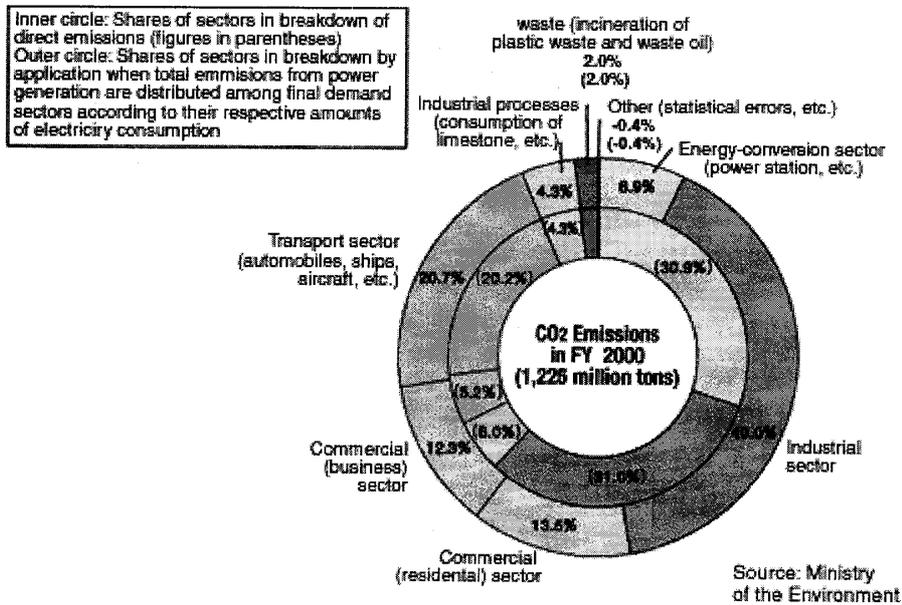


Figure 8.4: Japan's CO₂ emissions, broken down by sector (2002)

▼ Analysis of Eco-efficiency (by using Eco-efficiency Indicators)

- The concept of eco-efficiency was proposed by World Business Council for Sustainable Development (WBCSD) and it can be evaluated by eco-efficiency indicators calculated by the following formula:

$$\text{Eco-efficiency indicators} = \frac{\text{product or service value}}{\text{environmental influence}}$$

- TEPCO calculates eco-efficiency indicators by substituting sales for product or service value and by adopting total environmental impacts associated with business performances as environmental influence.
- Figure 8.5 shows the annual trends of eco-efficiency indicators calculated by using JEPIX and EI99 in order to grasp the whole picture of environmental impact substances.

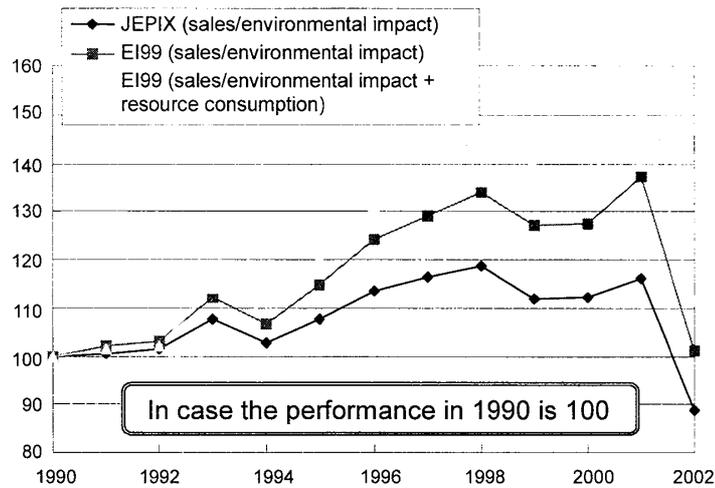


Figure 8.5: Transition of eco-efficiency indicators of JEPIX and EI99

- As shown in Figure 8.5, the eco-efficiency indicators up to the fiscal year 2001 have been improved at 20% ~ 50% as compared with the fiscal year 1990 calculated by both JEPIX and RI99.
- However, the eco-efficiency indicators of the fiscal year 2002 decreased down to the level of the fiscal year 1990 as a result of the increase of CO₂, SO_x and NO_x emissions caused by the growth of thermal electricity generations while sales were reduced in that year.

▼ Environmental Impacts calculated by using JEPIX (Annual Changes)

- Figure 8.6 shows the annual changes of the emissions CO₂, SO_x and NO_x, dust and CFCs (after the year 1990) integrated by using JEPPIX going back to the year 1970's. As shown in the figure, it is made clear that the environmental impacts of SO_x and NO_x have decreased due to the air pollution countermeasures since the 1970's.

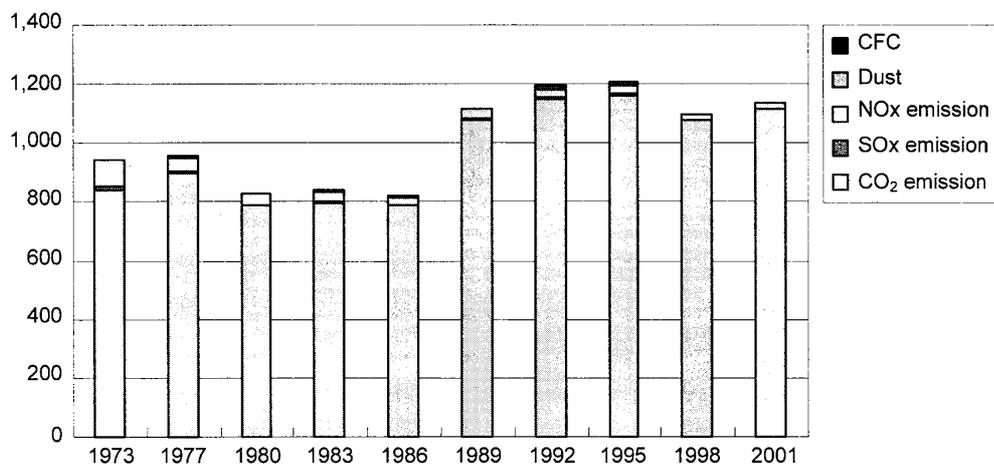


Figure 8.6: Transition of environmental impact using JEPIX

▼ Environmental Impacts calculated by using EI99

- As for the reference, the same evaluation procedure as mentioned above was made by using EI99 which was adopted in the environmental reports of TEPCO so far. As shown in Figure 8.7, NOx exhibits the declining tendency since the 1970's.

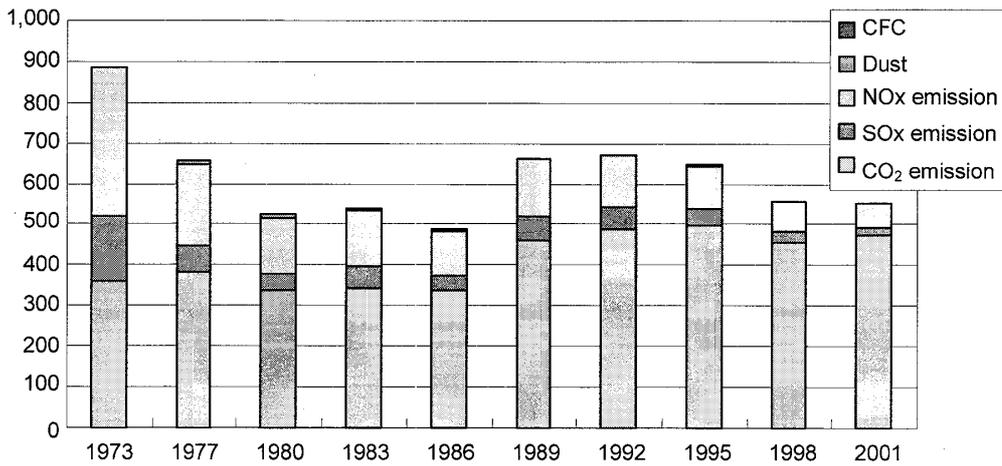


Figure 8.7: Transition of environmental impact using EI99

(Reference) Comparison of coefficients of JEPIX with EI99 (Figure 8.8)

- As shown in Figure 8.8, a weighted value of NOx assuming CO₂ coefficient of JEPIX as one unit shows the value 53. However, the value turns to be 504 calculated by EI99 coefficient which is larger than that of JEPIX in one figure.

	JEPIX		Eco-indicator 99	
	Point/kg	(CO ₂ = 1)	Point/t	(CO ₂ = 1)
CO ₂	12.8	(1)	5.45	(1)
CFC11	429,282	(33,538)	27,300	(5,009)
SOx	2,168	(169)	1,501	(275)
NOx	676	(53)	2,745	(504)
Dust	5,053	(395)	18,200	(3,339)

Figure 8.8: Comparison between JEPIX and EI99

7. Conclusion

Transition of eco-efficiency indicators

The eco-efficiency indicators (sales / environmental impacts) of TEPCO in the 1990's showed an increasing tendency by both JEPIX and EI99 as integration techniques of environmental impacts. However, the indicators of the fiscal year 2002 decreased down to the level of the fiscal year 1990.

Result of JEPIX-Forum activities

We learned successfully the way to apply JEPIX method to our business activities. We could re-evaluate our environmental efficiency indicators with a new method other than Eco-indicator 99. The basic result found is the very large share of CO₂, which is no surprise for us. But, it means much for us to have been able to recognize the seriousness of the upward tendency of CO₂ emission with another method.

As a problem to consider, we find that by integrating the various kinds of environmental impacts with JEPIX, the share of CO₂ in all the impacts is almost always more than 90%, which could hide the effect of reducing the other impacts like air pollution (SO_x, NO_x etc.). About this effect, a further theoretical study ought to be made.

As a whole, a more holistic evaluation from the standpoint of CSR including social responsibility other than environment and economy would surely be necessary, which Prof. Miyazaki strongly recommended. By making such comprehensive evaluation really possible, we hope a further development and enlargement of JEPIX impact assessment system which can include environmental and social aspects about atomic energy, greening, contribution to the local societies.