Reference materials

Report by the Subcommittee to Evaluate System Reforms

May 22, 2006

Electricity and Gas Industry Department

Agency for Natural Resources and Energy

NOTE:

This is an English version of the “Reference materials Report by the Subcommittee to Evaluate System Reforms”. It should be noted that the original Japanese text will prevail over the English in case of conflict.

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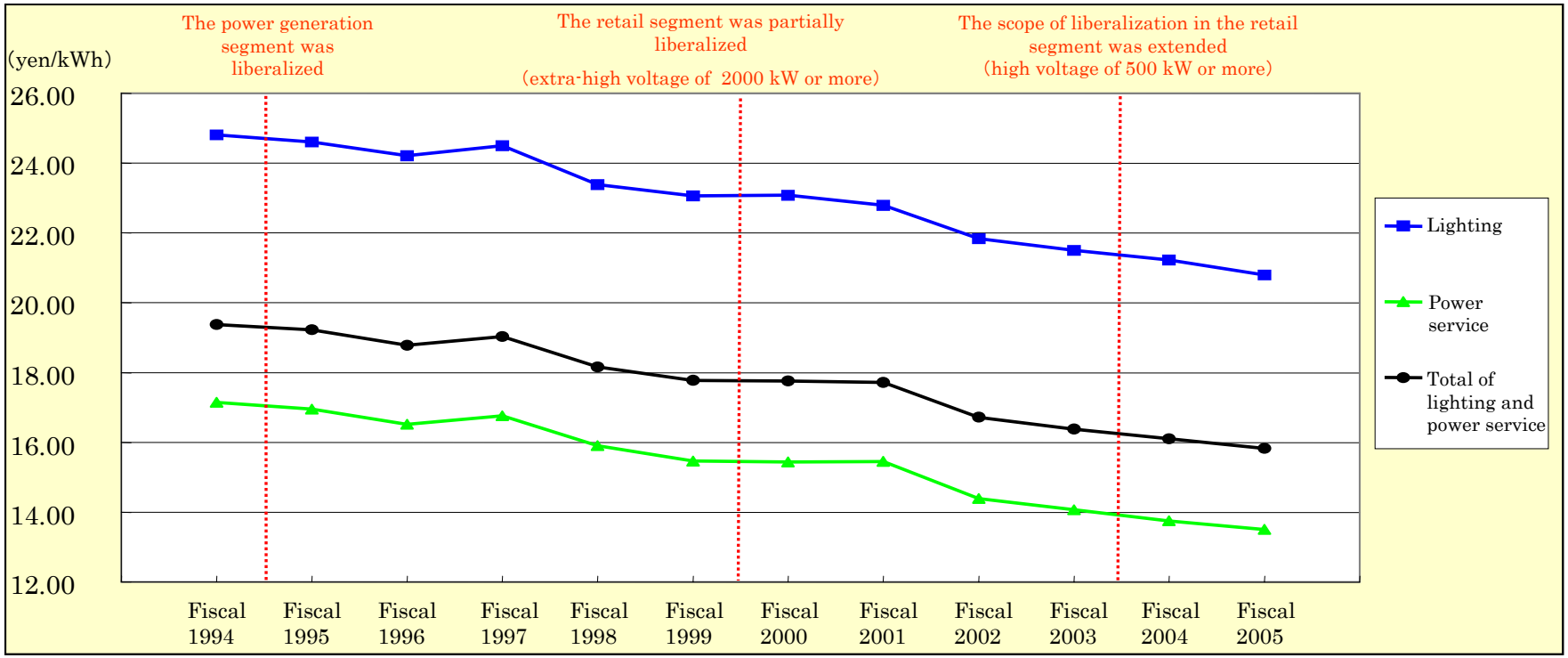
1. Retail market

(1) Price reduction in electricity price in Japan and international comparison —Long-term price trend (fiscal 1994 to 2005)—



・Electricity price for "lighting" refers to the average unit price applied mainly to general households, and electricity price for "power service" refers to the average unit price applied to plants, offices, etc., including customers in the liberalized sector. Unit prices have been calculated by dividing revenues by sales volume (kWh) for lighting charges and power service charges, respectively.

	Fiscal 1994	Fiscal 1995	Fiscal 1996	Fiscal 1997	Fiscal 1998	Fiscal 1999	Fiscal 2000	Fiscal 2001	Fiscal 2002	Fiscal 2003	Fiscal 2004	Fiscal 2005
Lighting	24.81	24.60	24.21	24.49	23.38	23.06	23.08	22.79	21.83	21.50	21.22	20.79
Power service	17.15	16.96	16.52	16.77	15.91	15.47	15.44	15.46	14.39	14.07	13.75	13.51
Total of lighting and power service	19.38	19.23	18.78	19.03	18.16	17.78	17.76	17.72	16.72	16.39	16.11	15.83

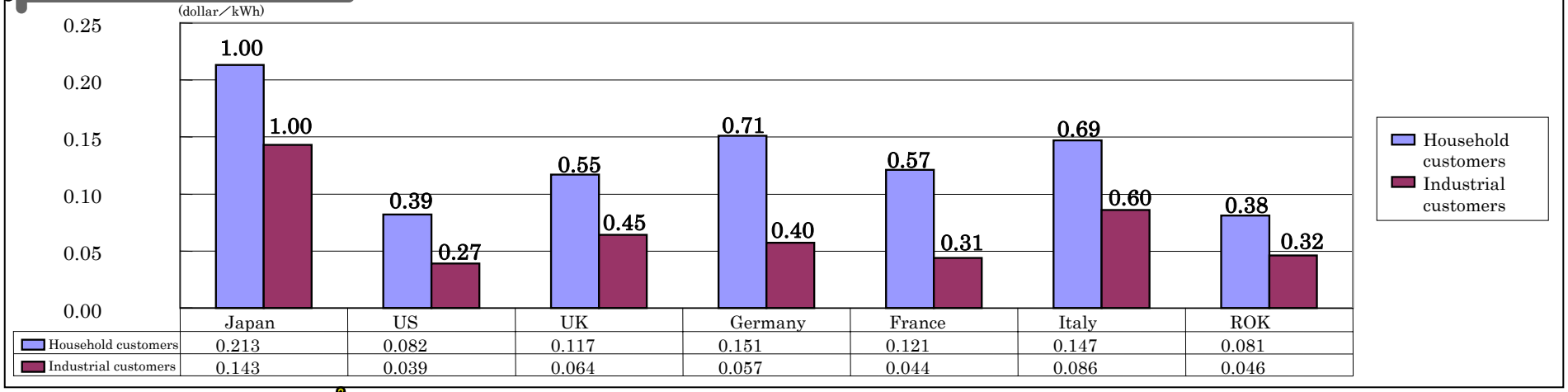
Source: Handbook of Electric Industry, report on power demand (confirmed results) and press releases of GPUs

1. Retail market

(1) Price reduction in electricity price in Japan and international comparison
—International comparison (foreign exchange rate)—

Just before the introduction of market liberalization

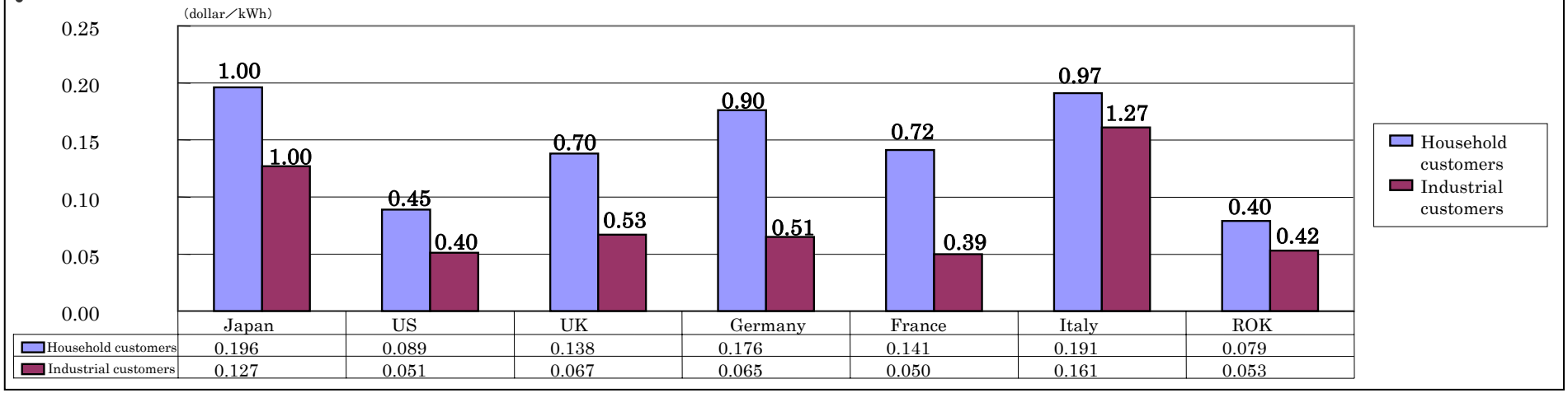
International comparison as of 1999



	Japan	US	UK	Germany	France	Italy	ROK
Household customers	0.213	0.082	0.117	0.151	0.121	0.147	0.081
Industrial customers	0.143	0.039	0.064	0.057	0.044	0.086	0.046

Present

International comparison as of 2004



	Japan	US	UK	Germany	France	Italy	ROK
Household customers	0.196	0.089	0.138	0.176	0.141	0.191	0.079
Industrial customers	0.127	0.051	0.067	0.065	0.050	0.161	0.053

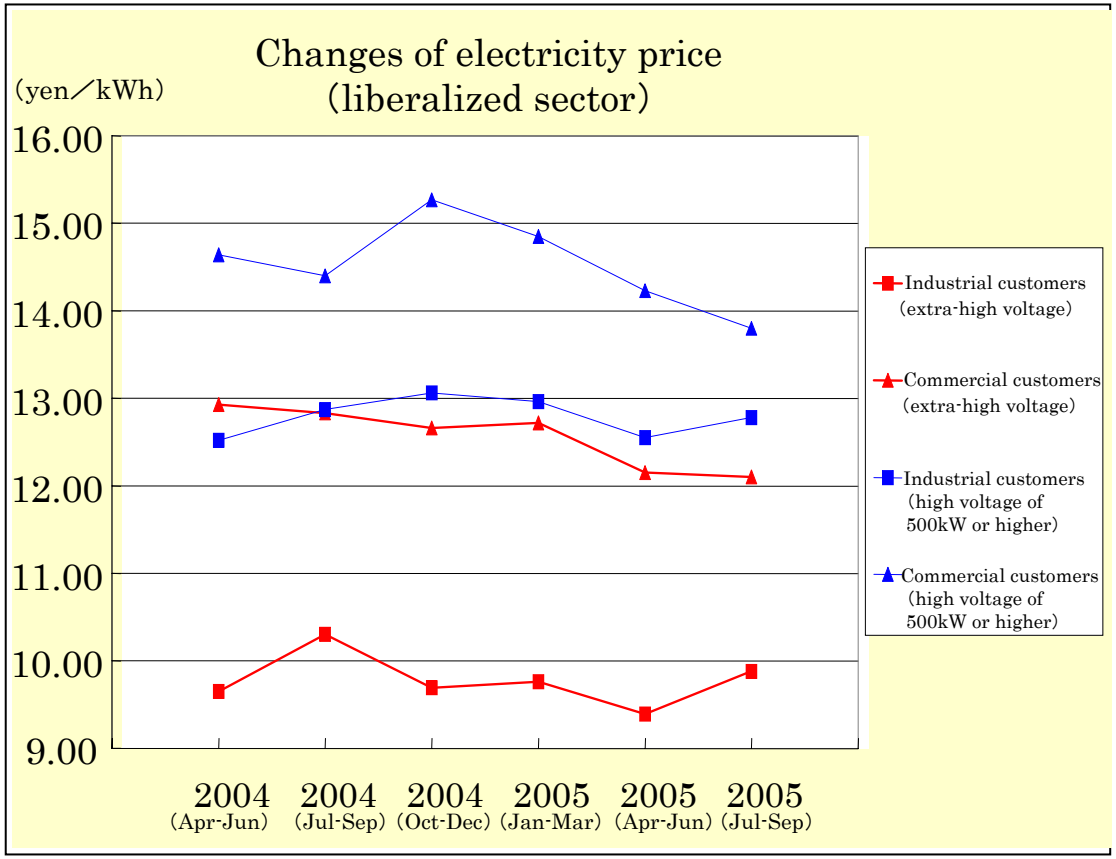
・Source: OECD/IEA, ENERGY PRICES & TAXES 4Q/2005 ・Prices are based on exchange rates applied to the respective countries in 1999 and 2004, respectively (2003 for Germany) ・Prices here refer to the yearly average unit prices regardless of the consumption pattern.

・Some of the prices for industrial customers include prices for commercial customers as well. Japan's prices for industrial customers reflect prices for commercial customers. ・US prices here refer to pre-tax prices.

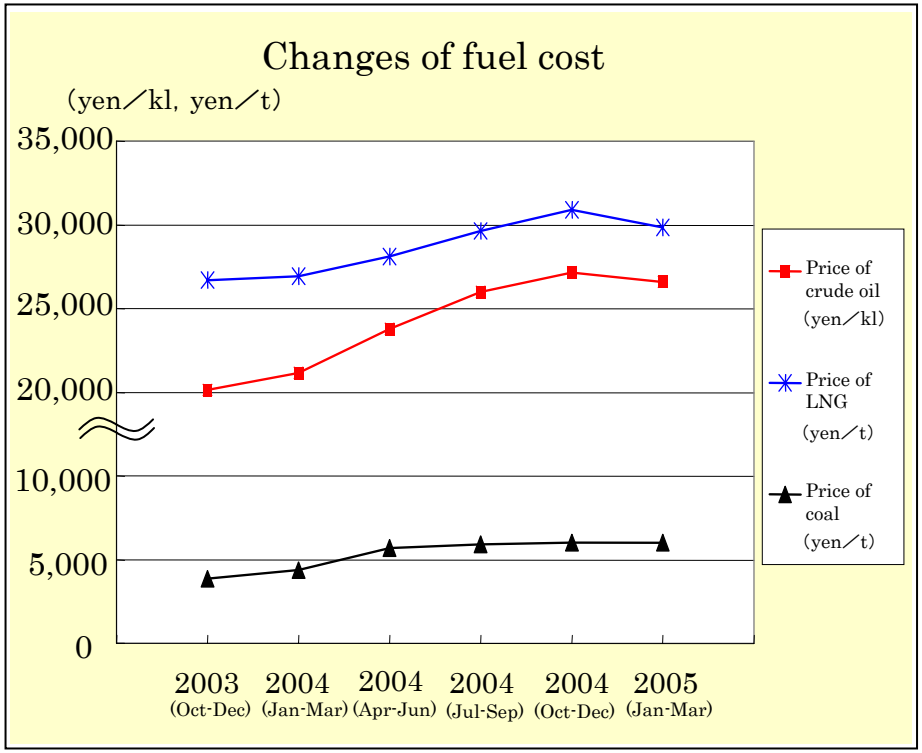
・Figures on top of the bars are relative values indicating a ratio to Japan's value.

1. Retail market

(1) Price reduction in electricity price in Japan and international comparison —Short-term price trend (fiscal 2004 to 2005)—



Source: Survey on electricity demand (price survey)



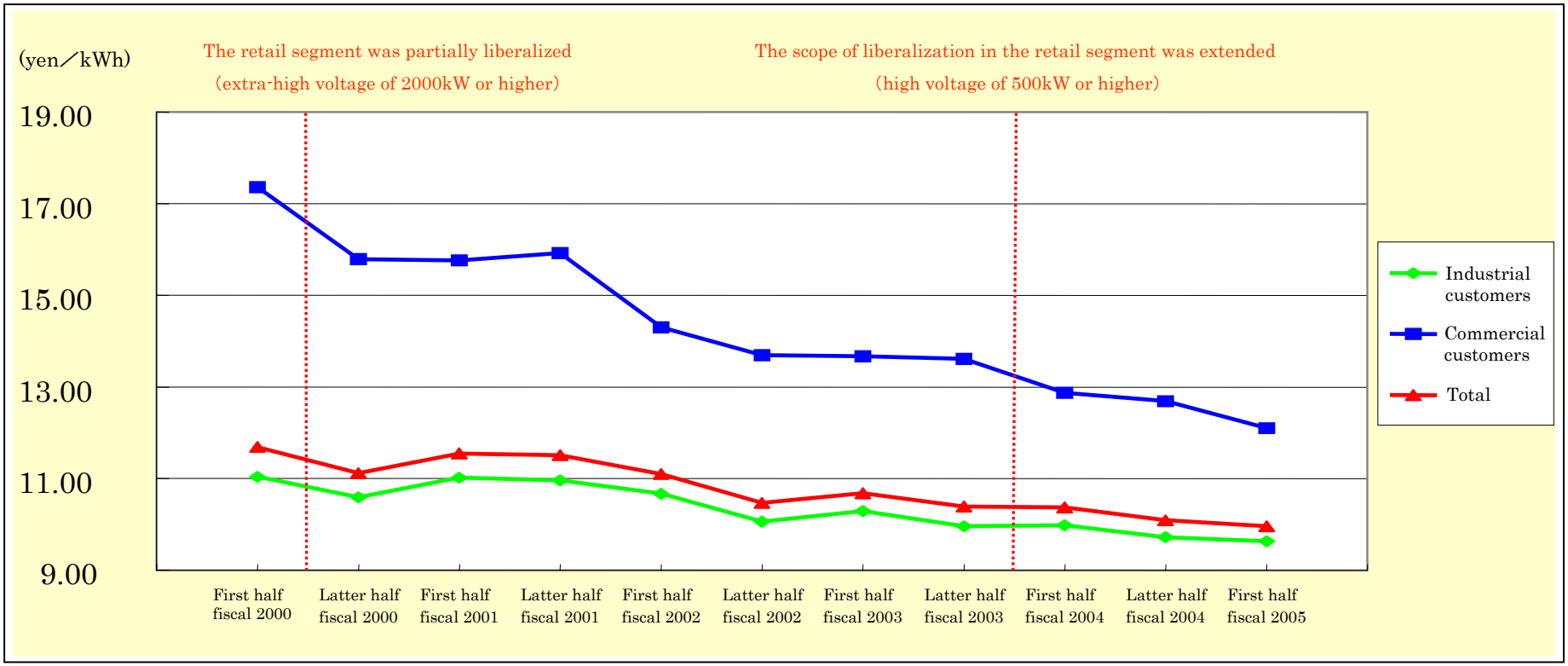
	Oct-Dec average 2003	Jan-Mar average 2004	Apr-Jun average 2004	Jul-Sep average 2004	Oct-Dec average 2004	Jan-Mar average 2005
Exchange rate (yen/dollar)	110	107	109	110	107	104

Source: Trade statistics

(Note: It is assumed that the liberalized sector, like the regulated sector, is subject to a price mechanism where the fuel cost adjustment system would affect the electricity price of a half year later.)

1. Retail market

(2) Reduction in retail price in the liberalized sector —Price changes in the liberalized sector (fiscal 2000 to 2005) —



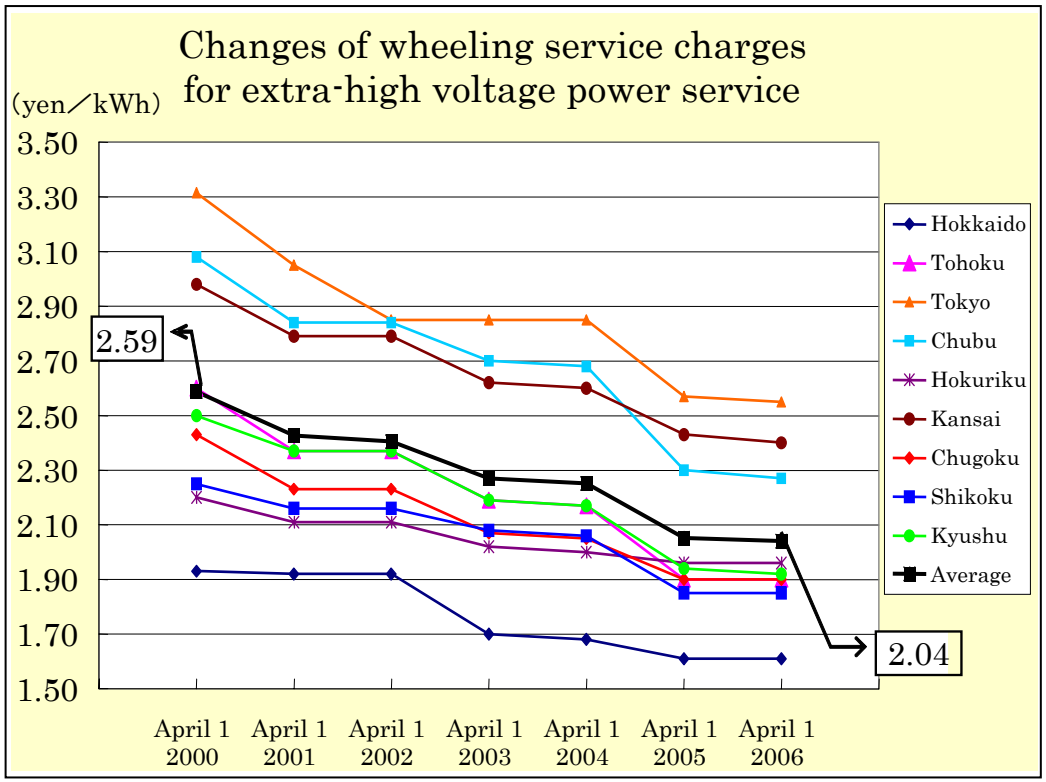
Electricity prices for industrial customers here refer to the average unit prices for plants, etc., and prices for commercial customers refer to the average unit prices for office buildings, etc. (Both refer to prices applied to extra-high voltage power service.)
Average unit prices have been calculated by dividing the total of demand charges and energy charges by purchased volume (kWh).

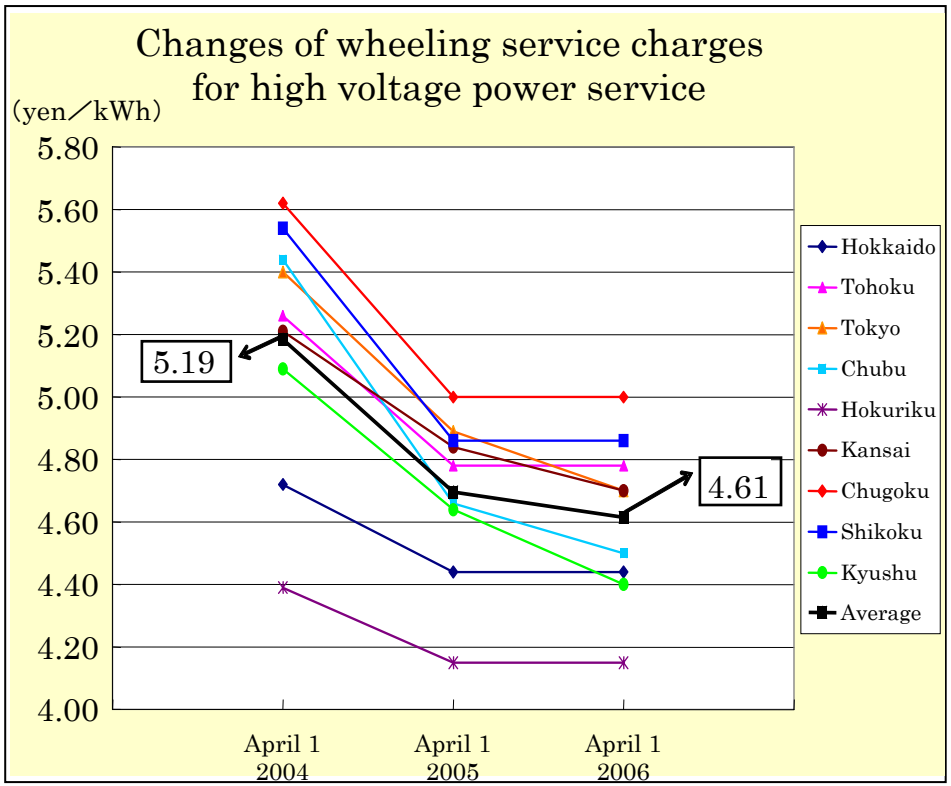
	First half fiscal 2000	Latter half fiscal 2000	First half fiscal 2001	Latter half fiscal 2001	First half fiscal 2002	Latter half fiscal 2002	First half fiscal 2003	Latter half fiscal 2003	First half fiscal 2004	Latter half fiscal 2004	First half fiscal 2005
Industrial	11.04	10.59	11.02	10.96	10.67	10.06	10.29	9.96	9.98	9.72	9.64
Commercial	17.36	15.79	15.76	15.92	14.30	13.69	13.67	13.61	12.87	12.69	12.13
Total	11.69	11.12	11.55	11.51	11.10	10.47	10.68	10.39	10.37	10.09	9.97

Source : Survey on electricity demand (price survey)

1. Retail market

(3) The effect of efficiency improvement over the regulated sector —Changes of wheeling service charges—





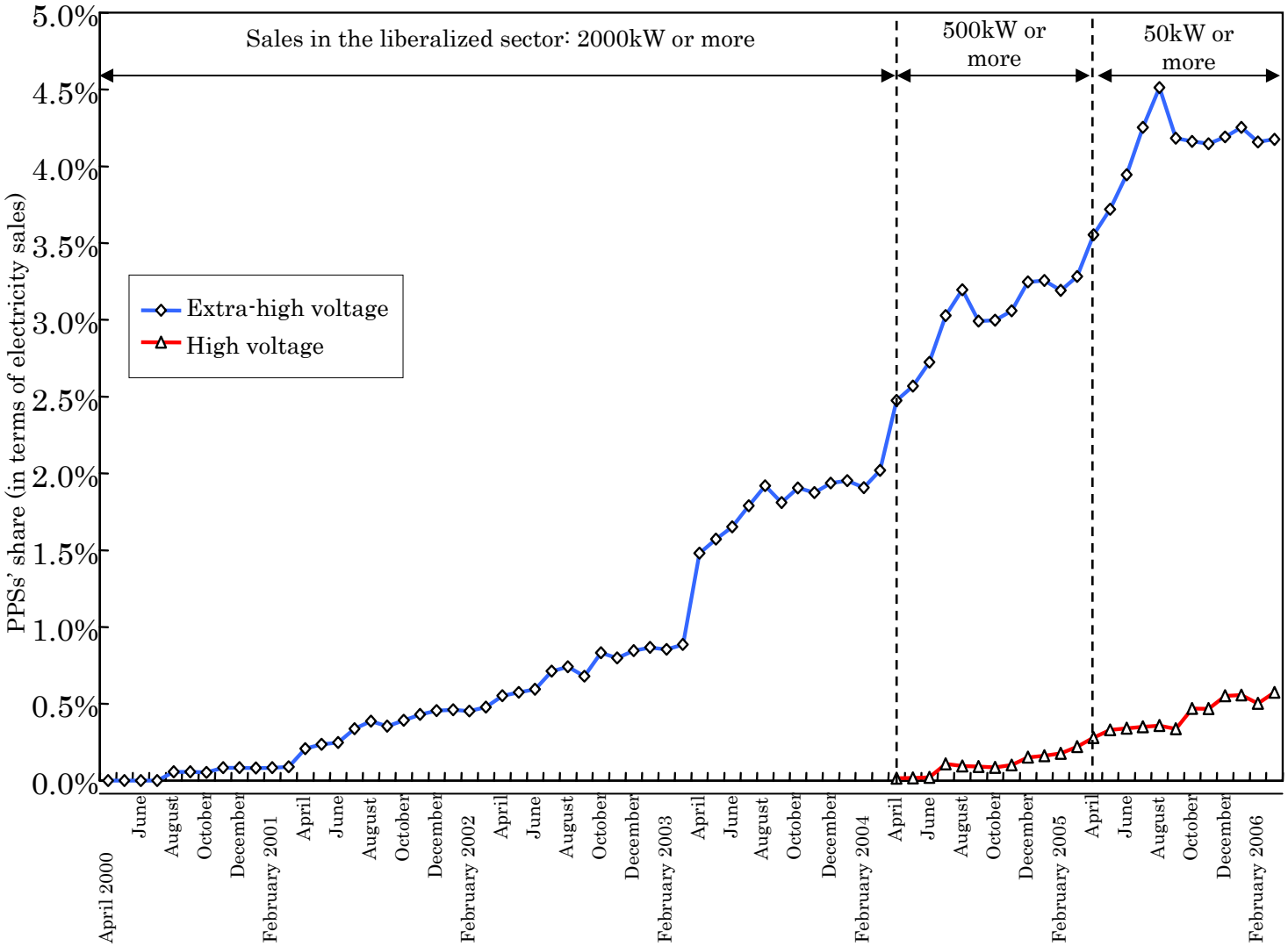
・Wheeling service charges here refer to the average unit prices that have been calculated by dividing the total of basic charges and metered charges by the total amount of wheeling electricity.

・The average wheeling service charge in this chart has been calculated by averaging the charges of nine GPUs, excluding Okinawa Electric Power Company.

Source：Press releases of GPUs

1. Retail market

(4) Competition in the retail market —PPSs' share in terms of electricity sales (nationwide)—



PPSs' share as of March 2006

Entire specified-scale electricity demand: 2.11%

Extra-high voltage: 4.17%

High voltage: 0.57%

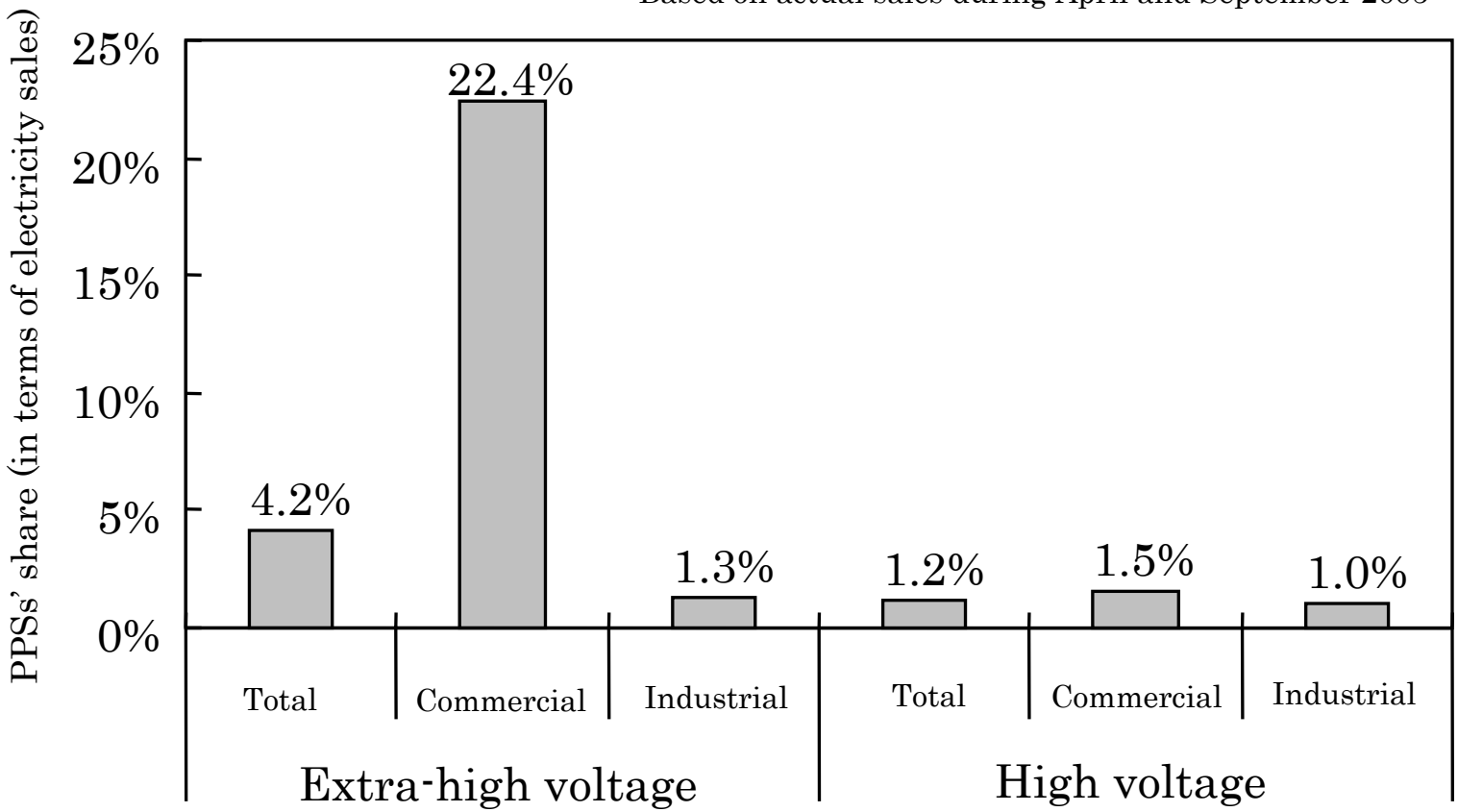
Note: Figures during fiscal 2004 as well as fiscal 2005 in this chart indicate shares in the sales for high voltage power service of 50kW or higher.
(Due to restrictions in statistics, the sales for high voltage power service of 50kw or higher in this chart include all purchases made under applicable clauses.)

Source: Monthly report on electric power statistics

1. Retail market

(4) Competition in the retail market – PPSs' share in terms of electricity sales (by type of demand) –

Based on actual sales during April and September 2005

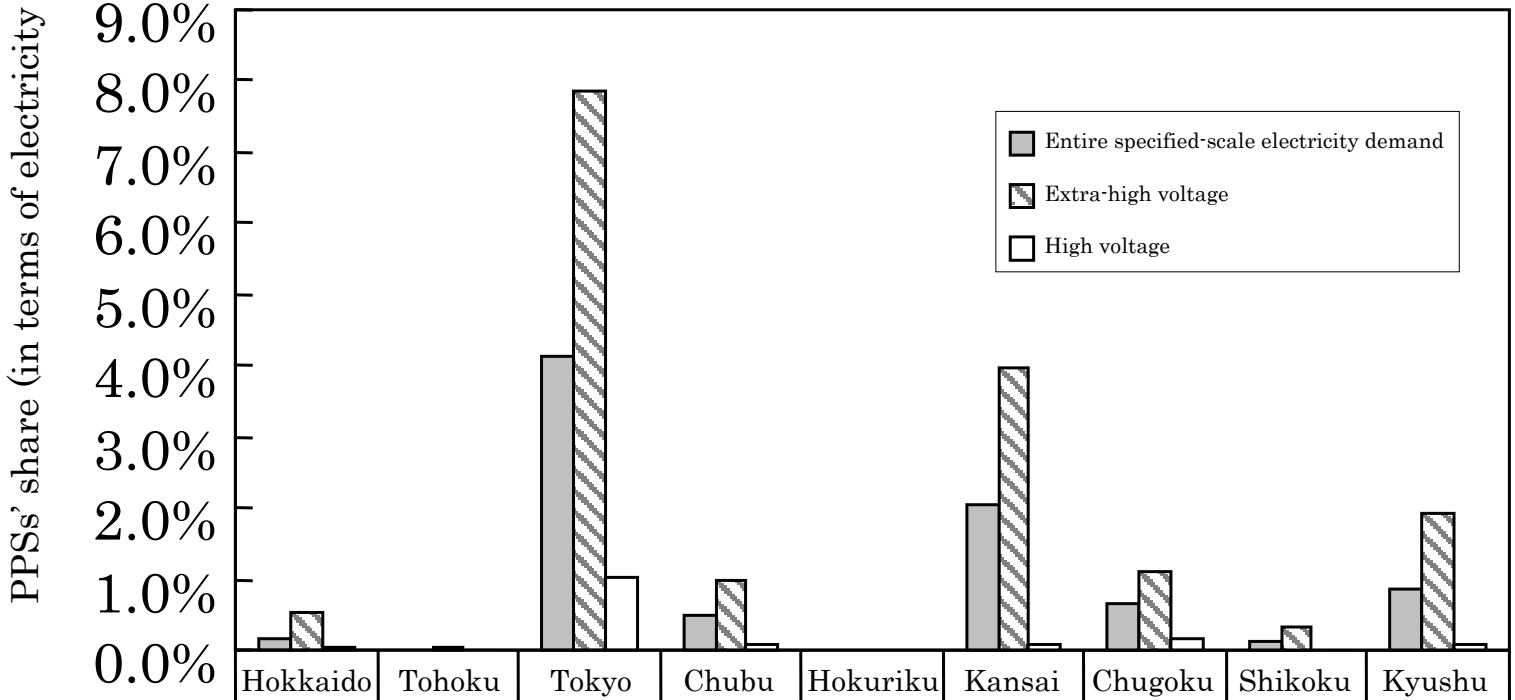


Source: Survey on electricity demand during the first half of fiscal 2005

1. Retail market

(4) Competition in the retail market – PPSs' share in terms of electricity sales (by region)–

Based on actual sales during April 2005 and March 2006

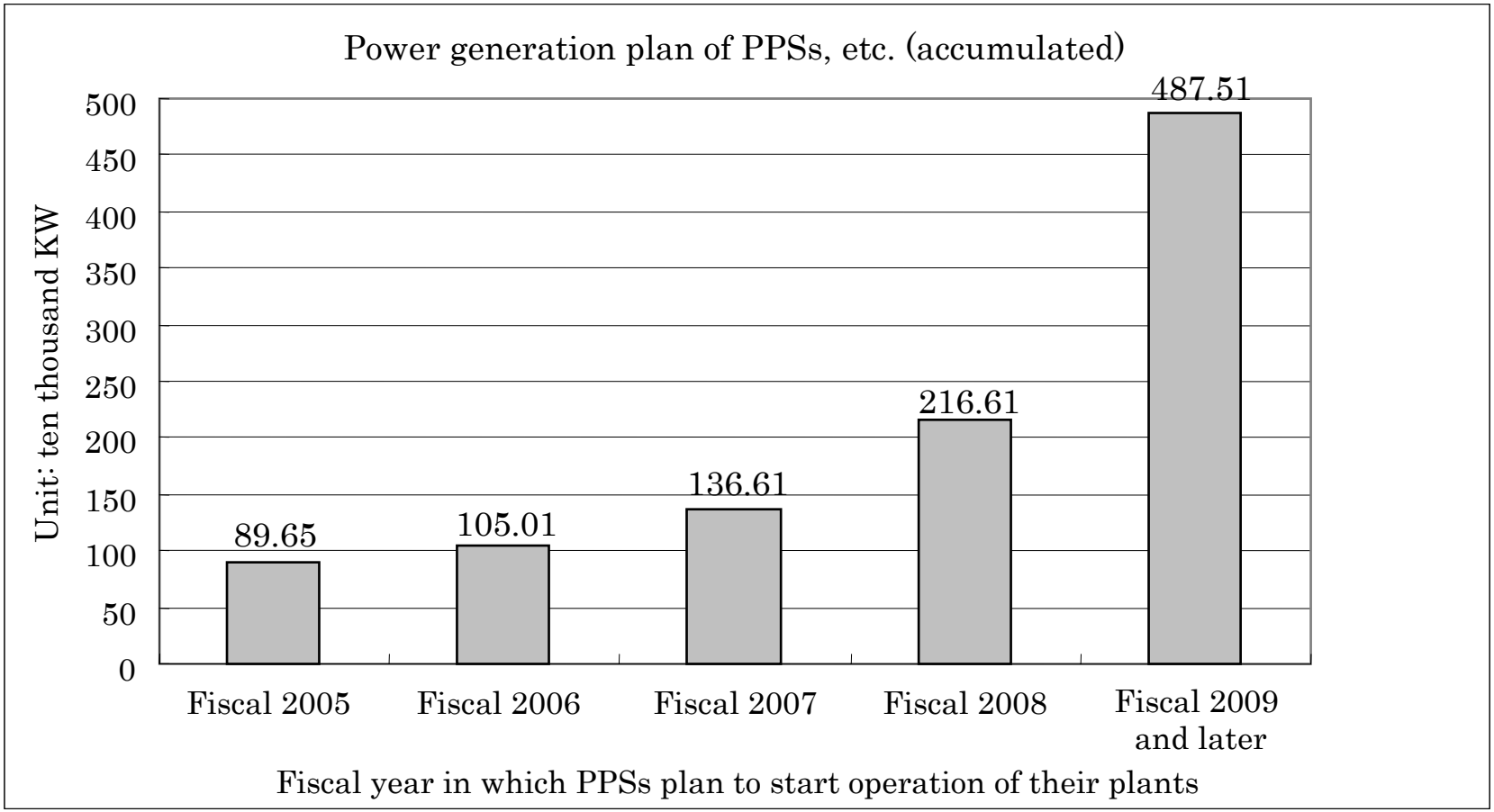


	Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu
Entire specified-scale electricity demand	0.17%	0.01%	4.14%	0.48%	0.00%	2.04%	0.66%	0.12%	0.86%
Extra-high voltage	0.55%	0.02%	7.84%	0.96%	0.00%	3.98%	1.11%	0.34%	1.93%
High voltage	0.02%	0.01%	1.03%	0.07%	0.00%	0.06%	0.16%	0.00%	0.07%

Source: Monthly report on generated and received power

1. Retail market

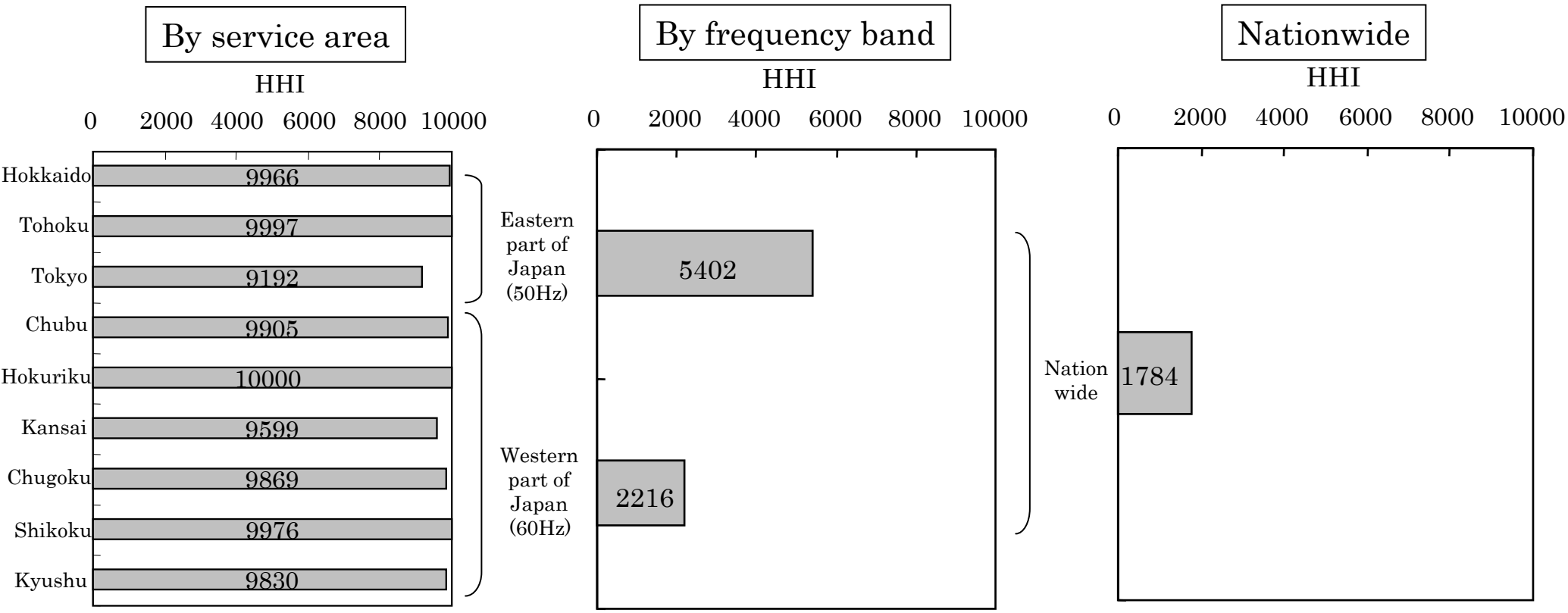
(4) Competition in the retail market —Future construction plans for power sources designed by PPSs—



Source: Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in December 2005)

1. Retail market

(4) Competition in the retail market —Evaluation based on Herfindahl-Hirschman Index (HHI)—



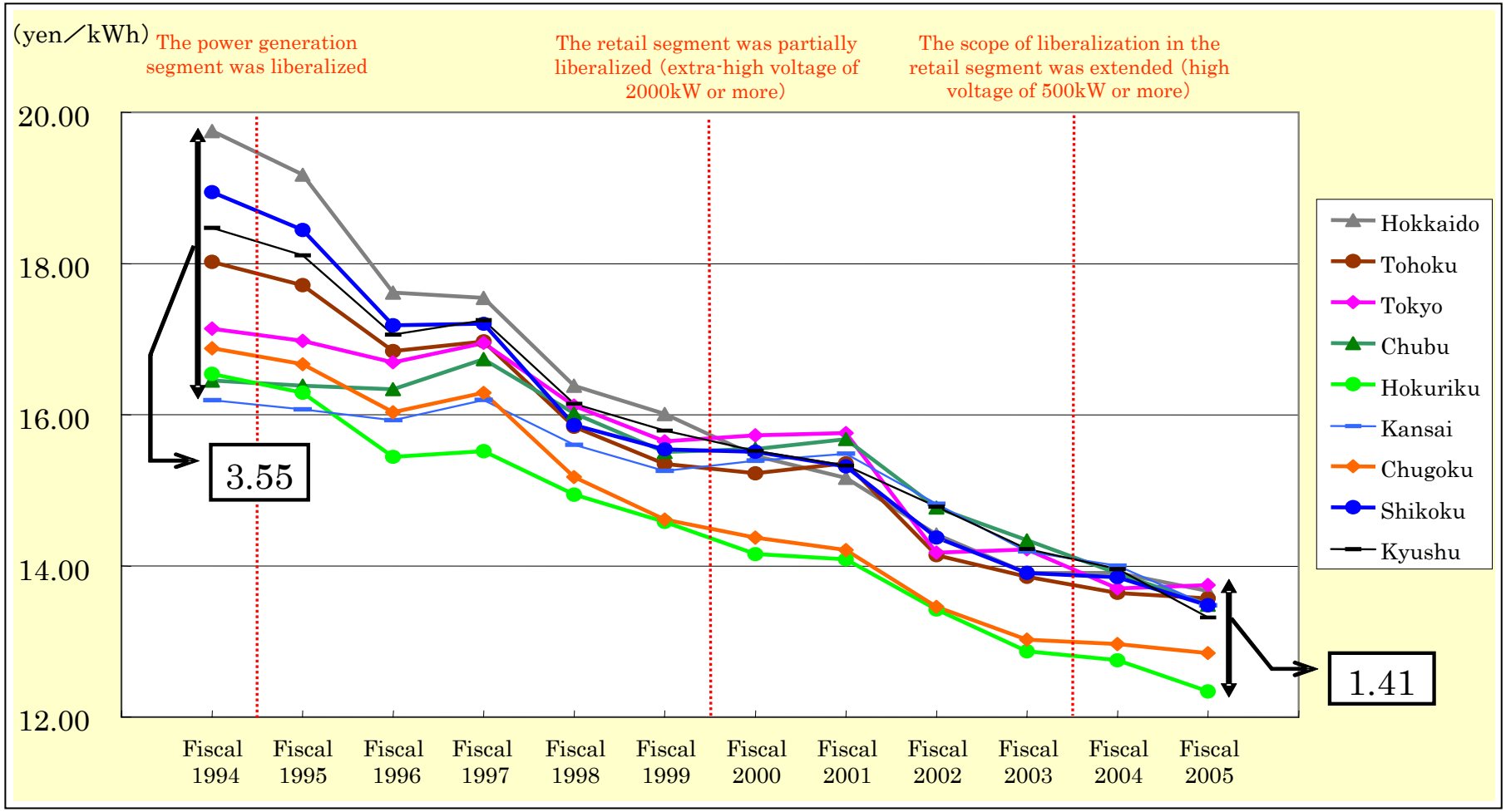
Based on actual sales during April 2005 and March 2006

(Note: An HHI value of 10,000 implies a 100% monopoly, and closer to 0 (zero) means more competition. In the E.U. and the U.S., the range from 1,800 to 1,000 is regarded as implying a slightly concentrated market, and 1,000 or lower is regarded as implying a competitive market.

Source:Monthly report on generated and received power

1. Retail market

(4) Competition in the retail market —Comparison of electricity prices among GPUs—



Electricity prices here refer to the average unit prices that have been calculated by dividing the revenue of power service charges by the total sales volume of power service (kWh).

Source: Handbook of Electric Industry, report on power demand (confirmed results) and press releases of GPUs

1. Retail market

(4) Competition in the retail market —Efforts of electricity industry utilities to improve their customer services—

○Diversification of price menu

- Offer meticulously-designed rate menu to meet customers' needs or load curves

○Development of related services

- Consultation service on energy saving, demand control, package billing system, tenant meter-reading service, electricity price inquiry service, etc.

Source: Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in December 2005)

1. Retail market

(4) Competition in the retail market —Efforts of electricity industry utilities to strengthen their business foundation—

○Technological development for customers

- "EcoCute",development of a high-efficiency heat pump (designed for commercial use in particular), and its introduction into the market
- Development of a demand control system (energy saving through control of the maximum power demand of customers)
- Efficient utilization of existing transformers, development of remote meter-reading technology, etc.

○Entry into foreign markets

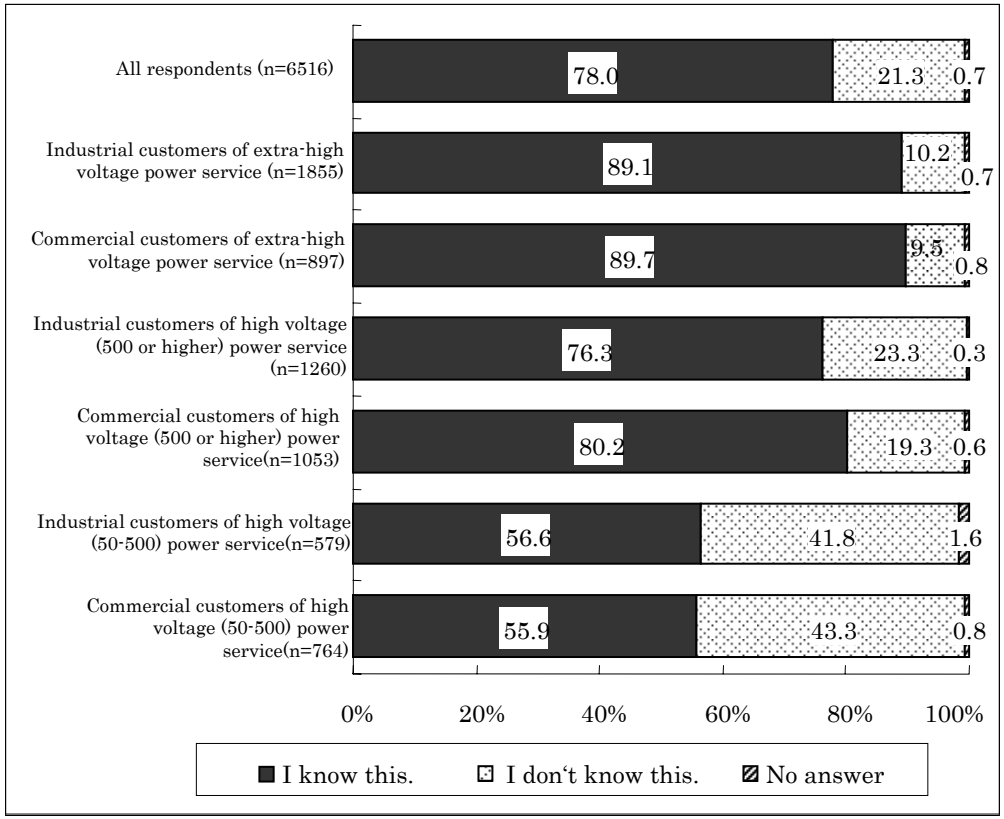
- Implement foreign investment projects (power generation projects and environment-related projects), consultation projects, technological cooperation, etc.

Source: Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in December 2005)

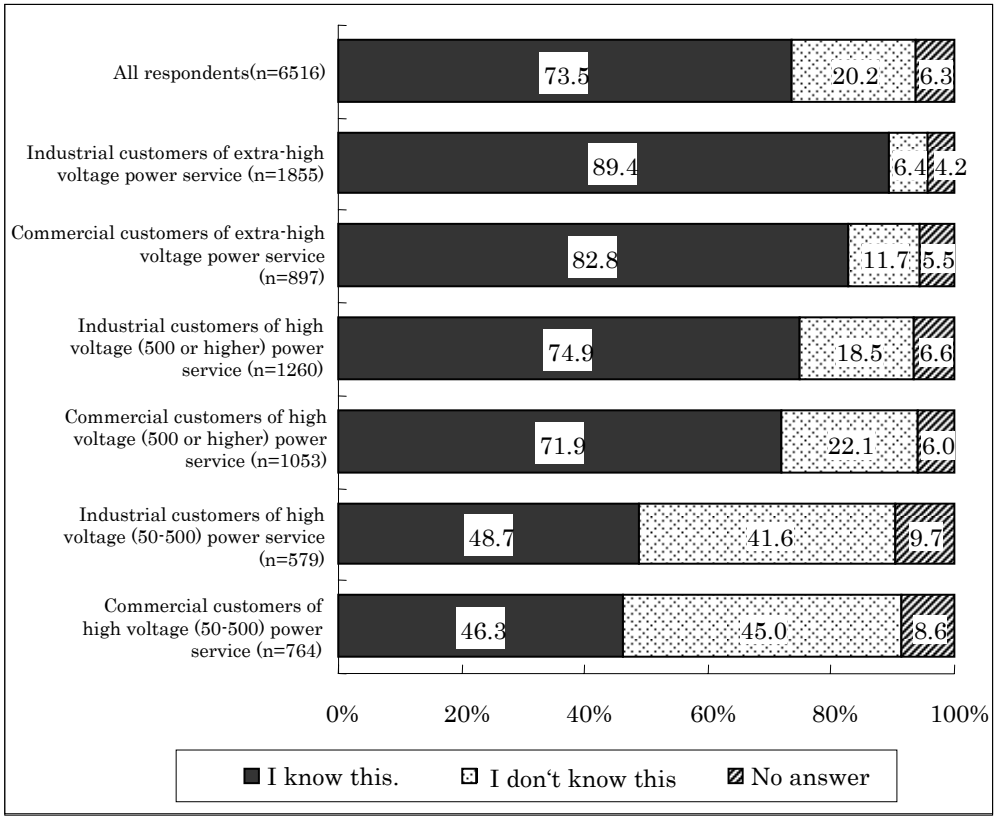
1. Retail market

(5) Options available to customers —Level of customers' awareness of liberalization of the electricity market—

"GPUs are allowed to set their own charges freely"



"GPUs are allowed to make cross-area power supply"



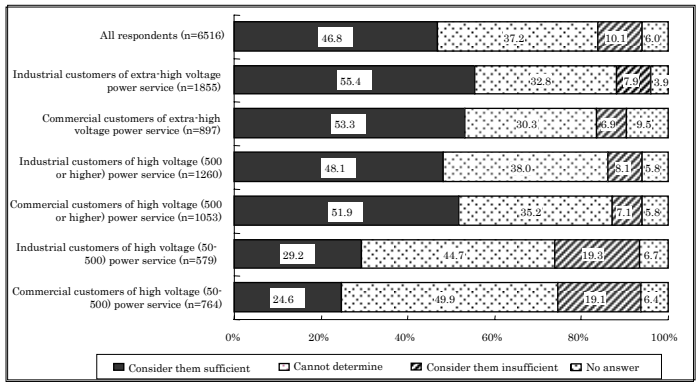
Source: Results of the questionnaire survey on customers conducted by the Ministry of Economy, Trade and Industry (in December 2005)

1．Retail market

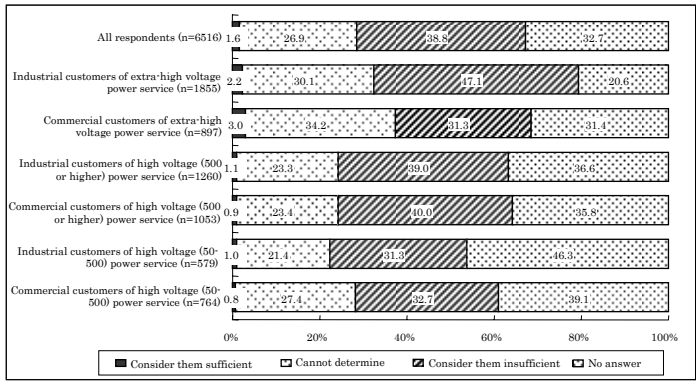
(5) Options available to customers —Ways of providing information by electricity industry utilities—

Contents of information

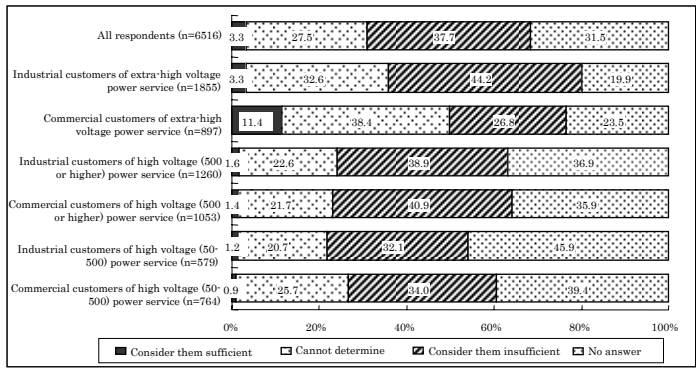
Local GPU



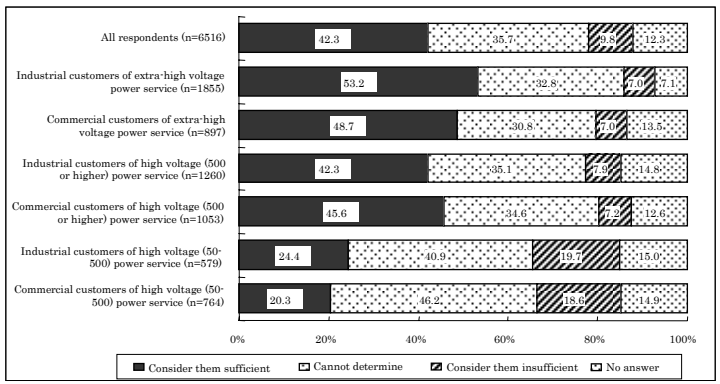
Other GPUs

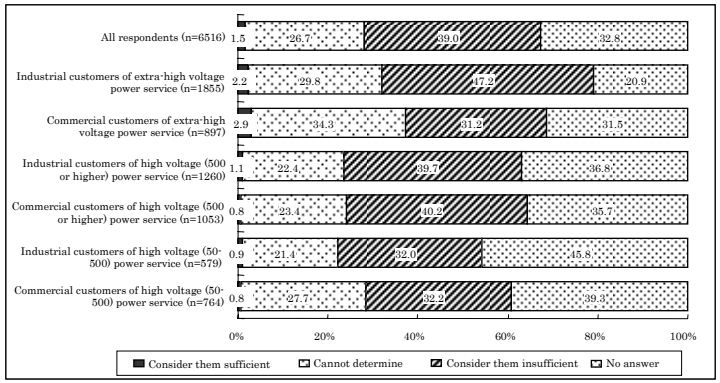


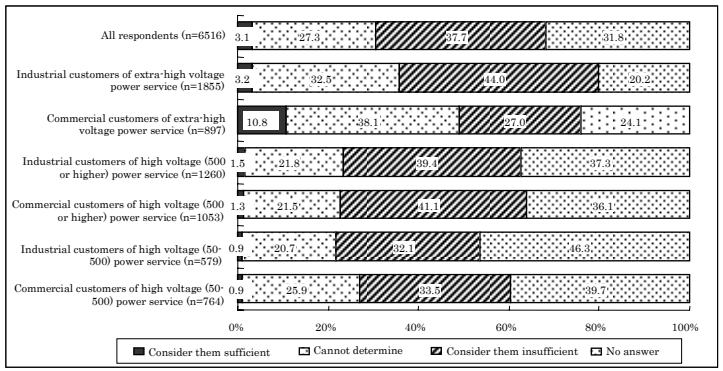
PPSs



Ways of providing information





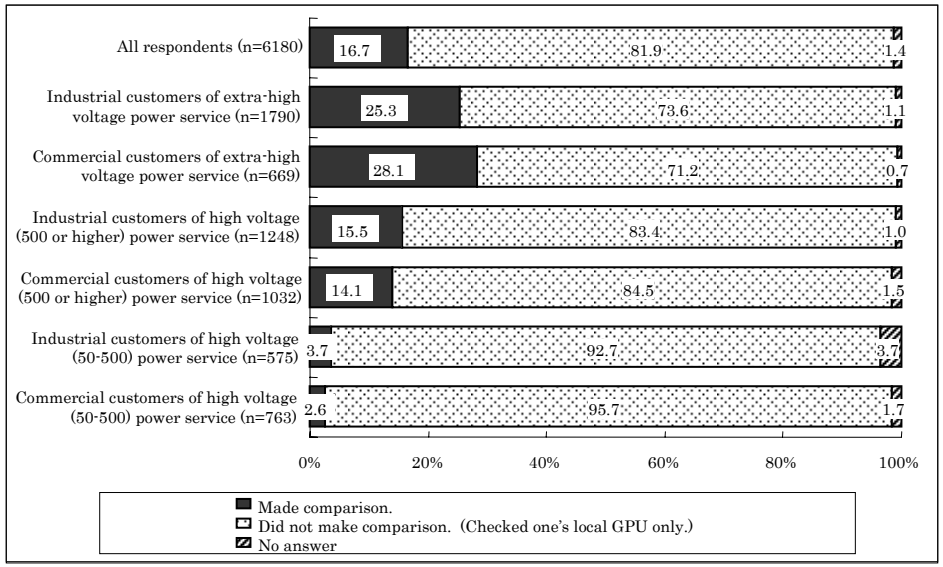


Source: Results of the questionnaire survey on customers conducted by the Ministry of Economy, Trade and Industry (in December 2005)

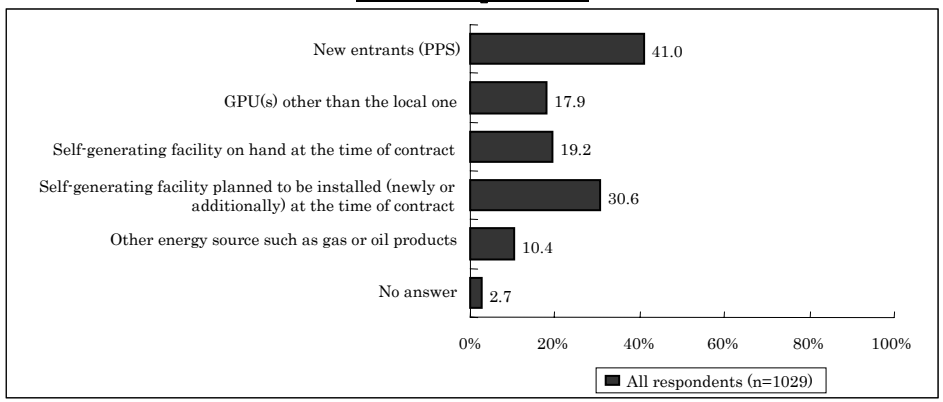
1. Retail market

(5) Options available to customers —Whether customers made comparative evaluation on the utilities in selecting their power supplier—

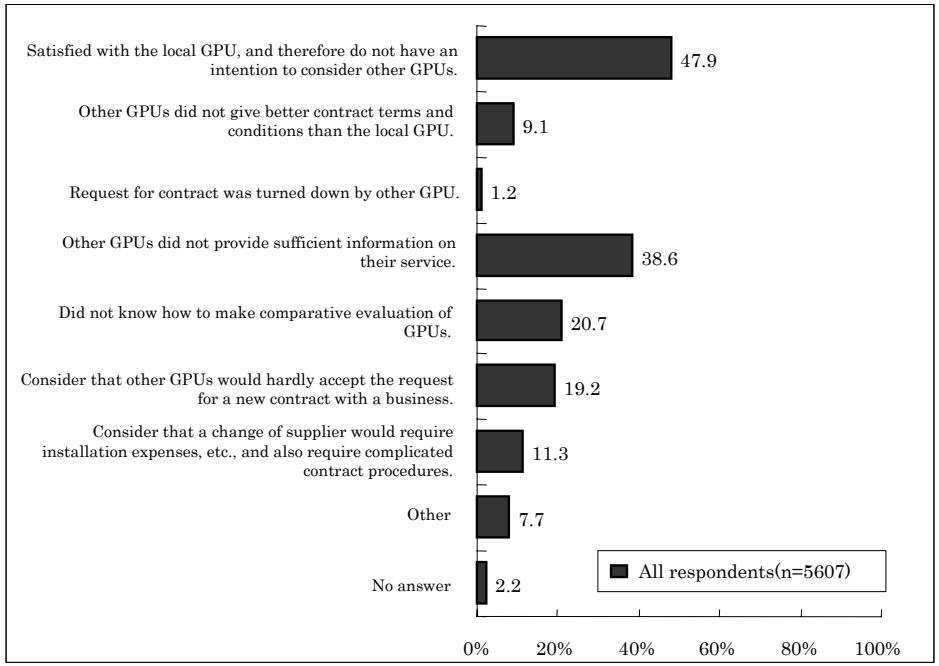
Did customers (6180 respondents) actually compare utilities when selecting the current supplier?



Whom did customers actually compare? (A total of 1029 customers made comparison).



Why customers who maintain their contract with their local GPU determined to do so even after liberalization?

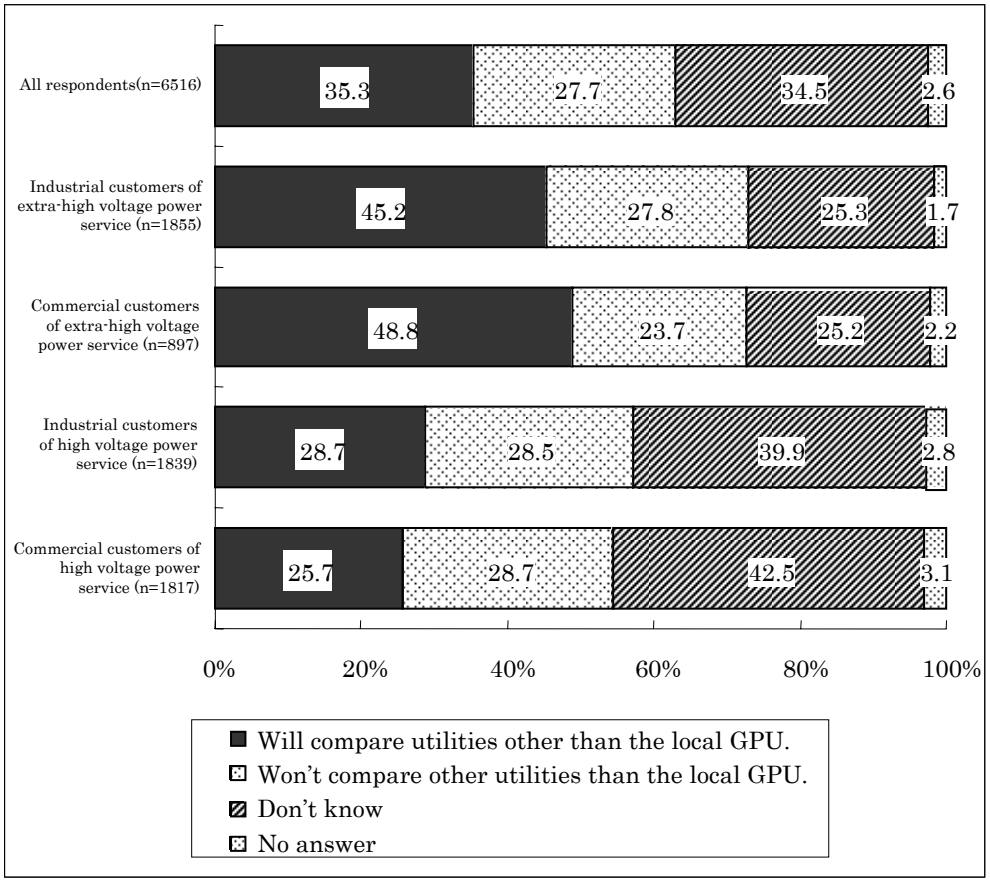


Source: Results of the questionnaire survey on customers conducted by the Ministry of Economy, Trade and Industry (in December 2005)

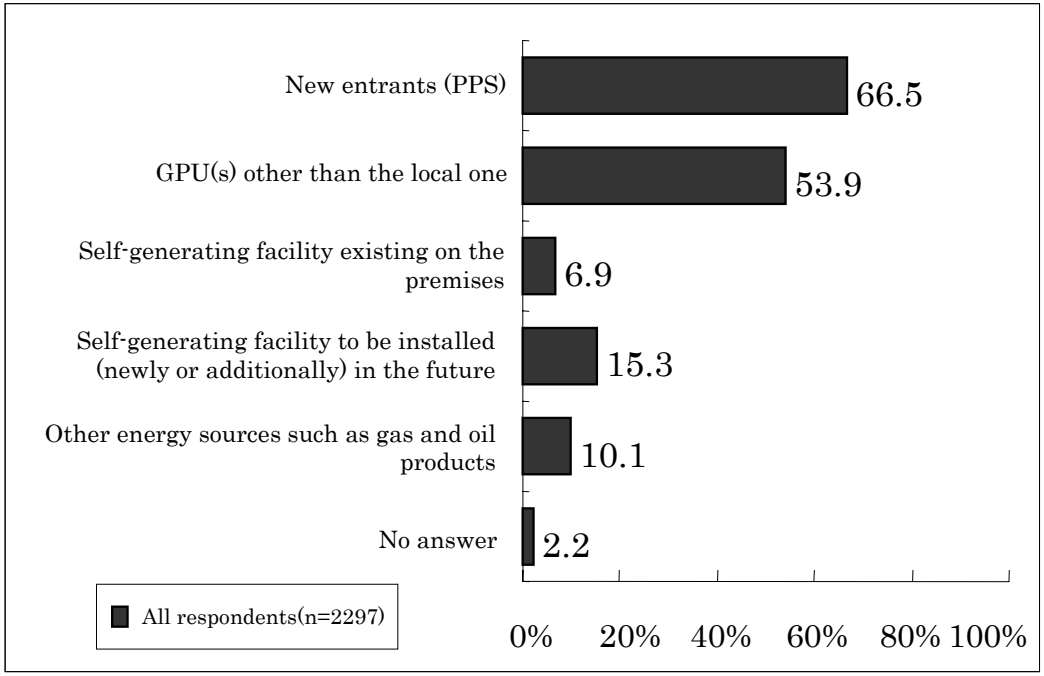
1. Retail market

(5) Options available to customers —Whether customers are considering to make comparative evaluation on the utilities at the time of renewal of the current contract—

Are customers considering to make comparative evaluation on the utilities in the future?



Whom are customers planning to compare?



Source: Results of the questionnaire survey on customers conducted by the Ministry of Economy, Trade and Industry (in December 2005)

1. Retail market

(6) Quantitative analysis on the impacts on the electricity price given by the institutional system reforms

● Analysis method

- Basic idea:

  It can be expected that GPUs, facing institutional system reforms, would take the following two measures.

  ①Cost reduction: GPUs should enhance their efforts to reduce supply costs such as the cost of equipment, operating expenses, etc. in order to improve their structure and increase reserve management power.

  ②Preparation for competition with new entrants: By utilizing the reserve management power mentioned above at ①, etc., GPUs should reduce their electricity price to be prepared for competition with new entrants.

  Quantitative analysis on institutional system reforms intends to identify the net impact of the institutional system reforms, by quantitatively surveying changes made by the above two measures (changes of supply costs and electricity prices) and measuring the size of impacts given by respective exogenous factors (institutional system reforms, reduction in long-term interest rates, change of fuel costs and decelerated increase of energy demand, respectively).
  ※ It is assumed that the net impact of the institutional system reforms can be calculated by reducing impacts made by the other three factors, reduction in long-term interest rates, change of fuel costs and decelerated increase of energy demand.

- Method:

  In measuring GPUs' effort to reduce supply costs, cost changes in the past have been surveyed for respective cost items as a function of energy demand, long-term interest rate, etc., and the existence of the effect of institutional system reforms on cost changes was identified to make quantitative analysis of that effect.

  In surveying changes of electricity price/cost as well as changes of consumer surplus and producer surplus, etc., the electricity-related portion of supply and demand in the market has been picked out, and changes of consumer surplus and producer surplus in such portion and their trend have been calculated by referring to changes of electricity price, cost and volumes of supply and demand. Relative changes of the said two surpluses were identified for the quantitative analysis on the impact of institutional system reforms.

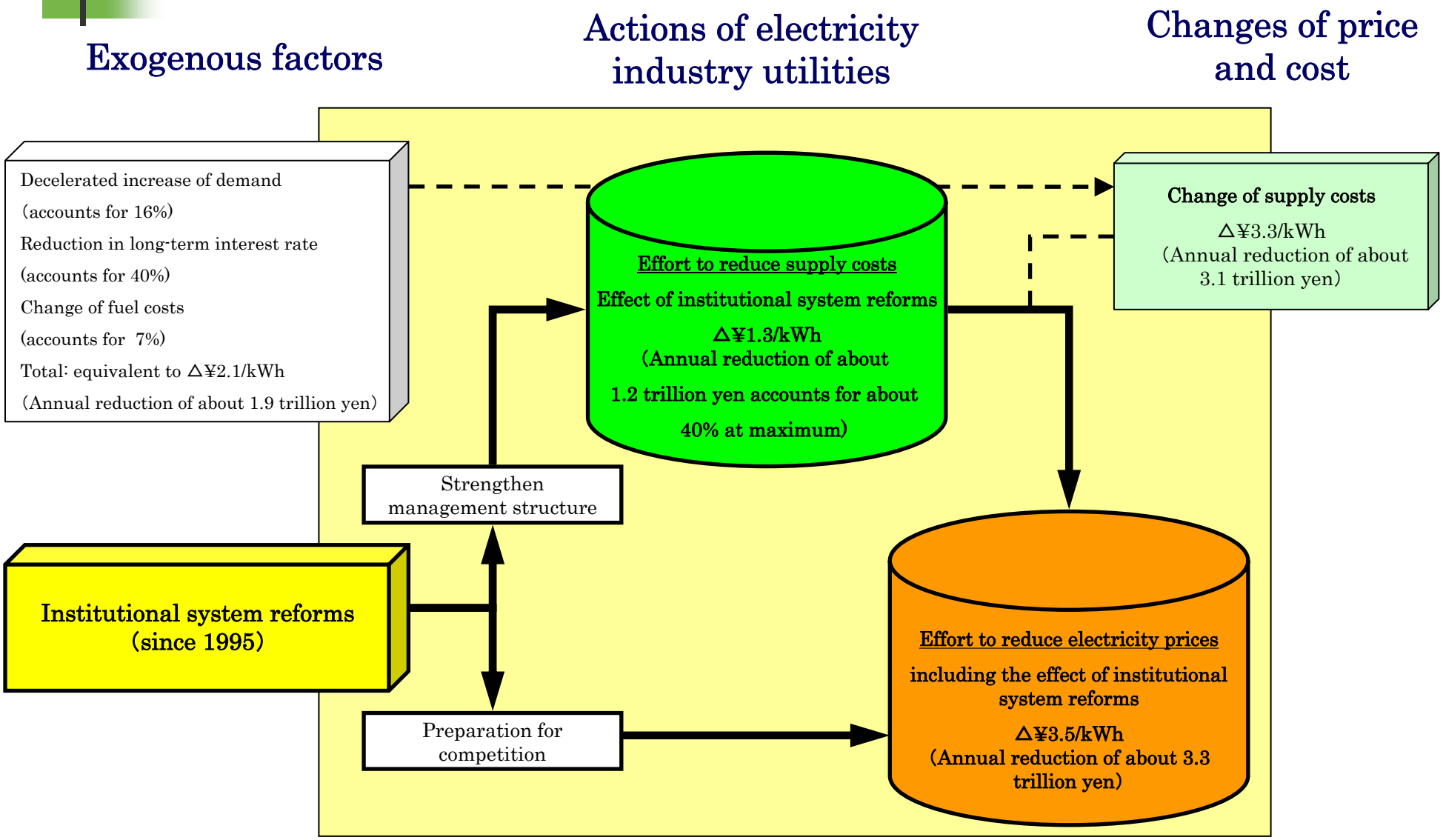
- Subjects of analysis and sources:

  Analysis was made on GPUs' electricity prices for lighting and power service. Reference data comes from financial statements of respective GPUs and government statistics. Nominal values have been substantialized by using the GDP deflator index.

(※ This analysis was made in cooperation with Mr.Kaino, researcher of the Research Institute of Economy, Trade and Industry.

1. Retail market

(6) Quantitative analysis on the impacts on the electricity price given by the institutional system reforms



(※ This analysis intends to determine the amount of price/cost reduction and the share of respective factors affecting the price/cost reduction after the introduction of institutional system reforms (fiscal 1996 to 2003) on the basis of interest rates and demand growth rate before the reform introduction (fiscal 1989 to 1996). Figures in the above chart show the said amount and share as of fiscal 2003. Note that all figures could include an estimated error margin of 10 to 20%.)

1. Retail market

(6) Quantitative analysis on the impacts on the electricity price given by the institutional system reforms

- Impact on the reduction in electricity prices

[Analysis of the factors contributing to the reduction of electricity prices and supply costs after the introduction of institutional system reforms]

(yen/kWh)	State of reference	Actual results in 2003	Change		Factors
Average price	20.6	17.1	△3.5		
Total costs	18.7	15.3	△3.3(100%)		
			Breakdown of changes	△1.3(37%)	Institutional system reforms
				△1.3(40%)	Reduction in interest rates
				△0.2(7%)	Change of fuel costs
				△0.5(16%)	Change of demand, etc.

(※ State of reference: "Total costs" under the state of reference shows estimated supply costs that should have been registered in fiscal 2003 if interest rates, fuel costs and demand change remained as they were in the period between fiscal 1989 and 1996 and no institutional system reforms were introduced. "Average price" under the state of reference has been calculated by referring to the correlation between total costs and average price before the reform introduction. Note that all figures could include an estimated error margin of 10 to 20%.)

1. Retail market

(6) Quantitative analysis on the impacts on the electricity price given by the institutional system reforms

- Impact on change of economic welfare

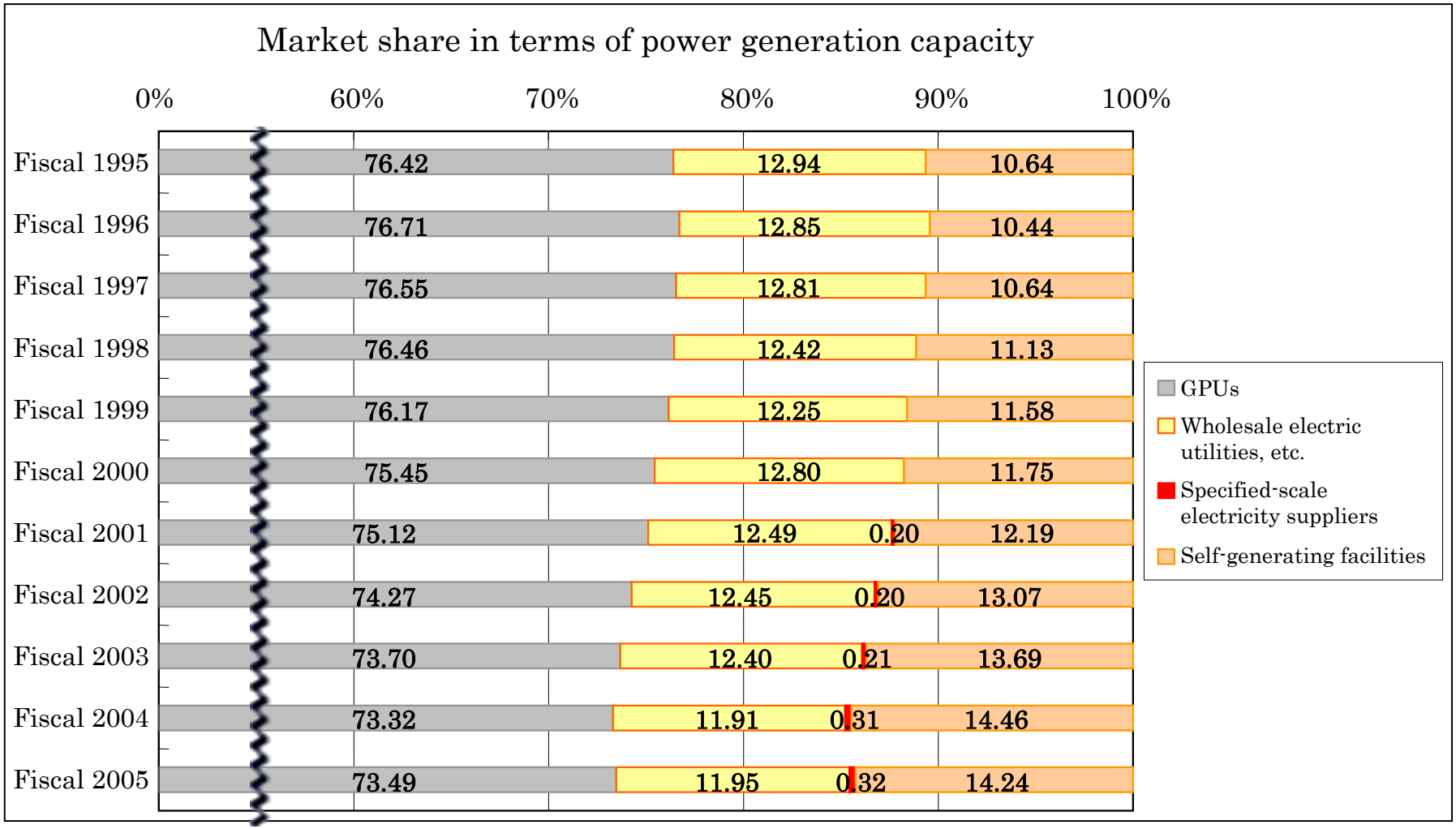
[Change of economic welfare in the electricity market, etc. as a result of institutional system reforms]

		Change before reform (%)	Change after reform (%)
Breakdown	Total surplus	+5%	+11%
	Consumer surplus	+7%	+7%
	Producer surplus	−2%	+4%

(※ Change of economic welfare (%) shows the ratio of the size of "change before reform (fiscal 1989 to 1996)" and the size of "change after reform (fiscal 1996 to 2003)," respectively, to the market size as of fiscal 2003.

2. Wholesale power market

(1) Structure of the power generation market —Market share in terms of power generation capacity—

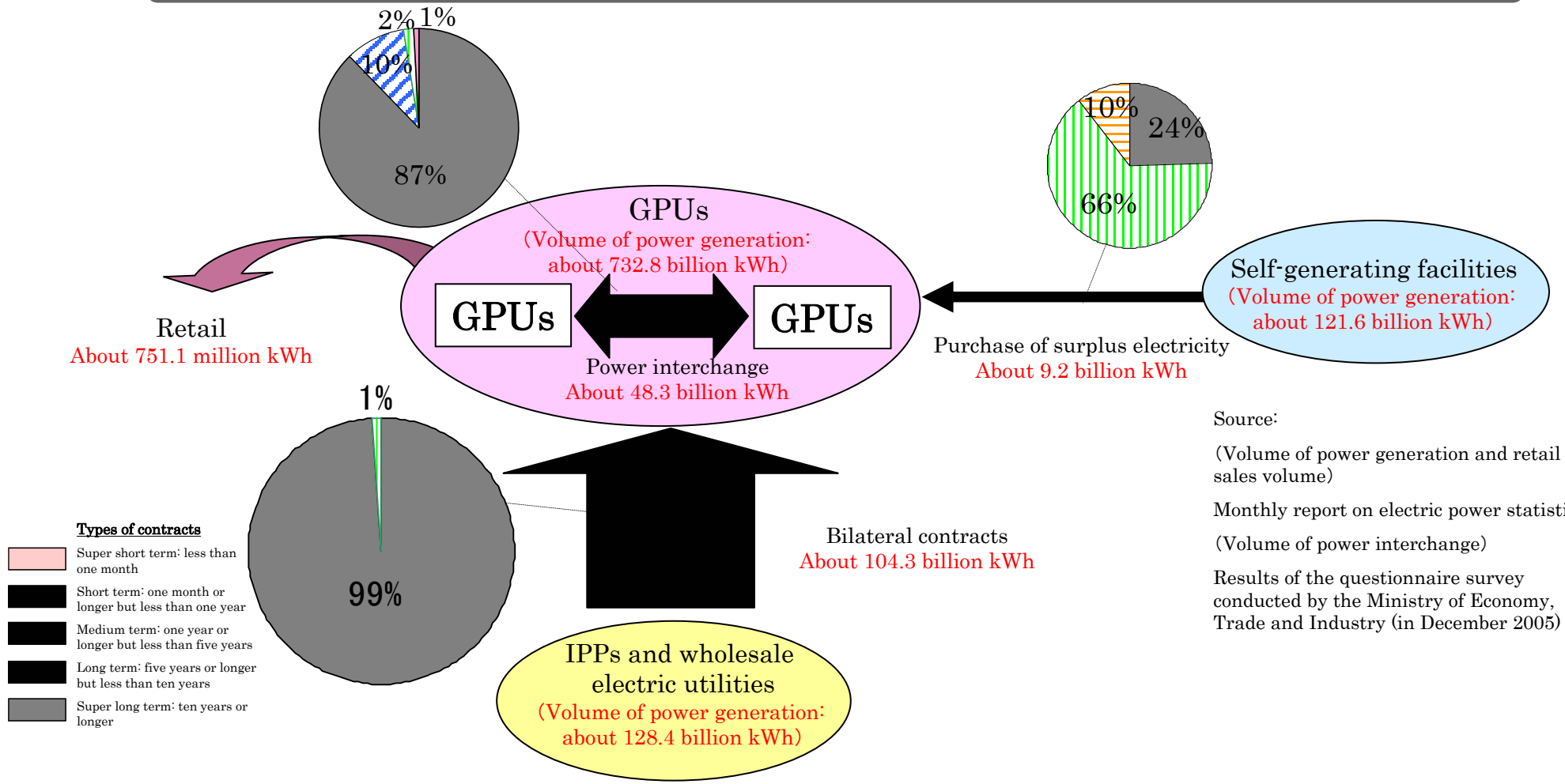


Source: Monthly report on electric power statistics
(Fiscal 2005 data is as of the end of October 2005)

2. Wholesale power market

(2) Structural changes of the wholesale power market —Change of market structure—

- Fiscal 1995:
  Introduction of IPPs (Independent Power Producers) and the obligatory bidding system for development of thermal power. (Introduction of the principle of competition to the power generation segment)



Source:

(Volume of power generation and retail sales volume)

Monthly report on electric power statistics

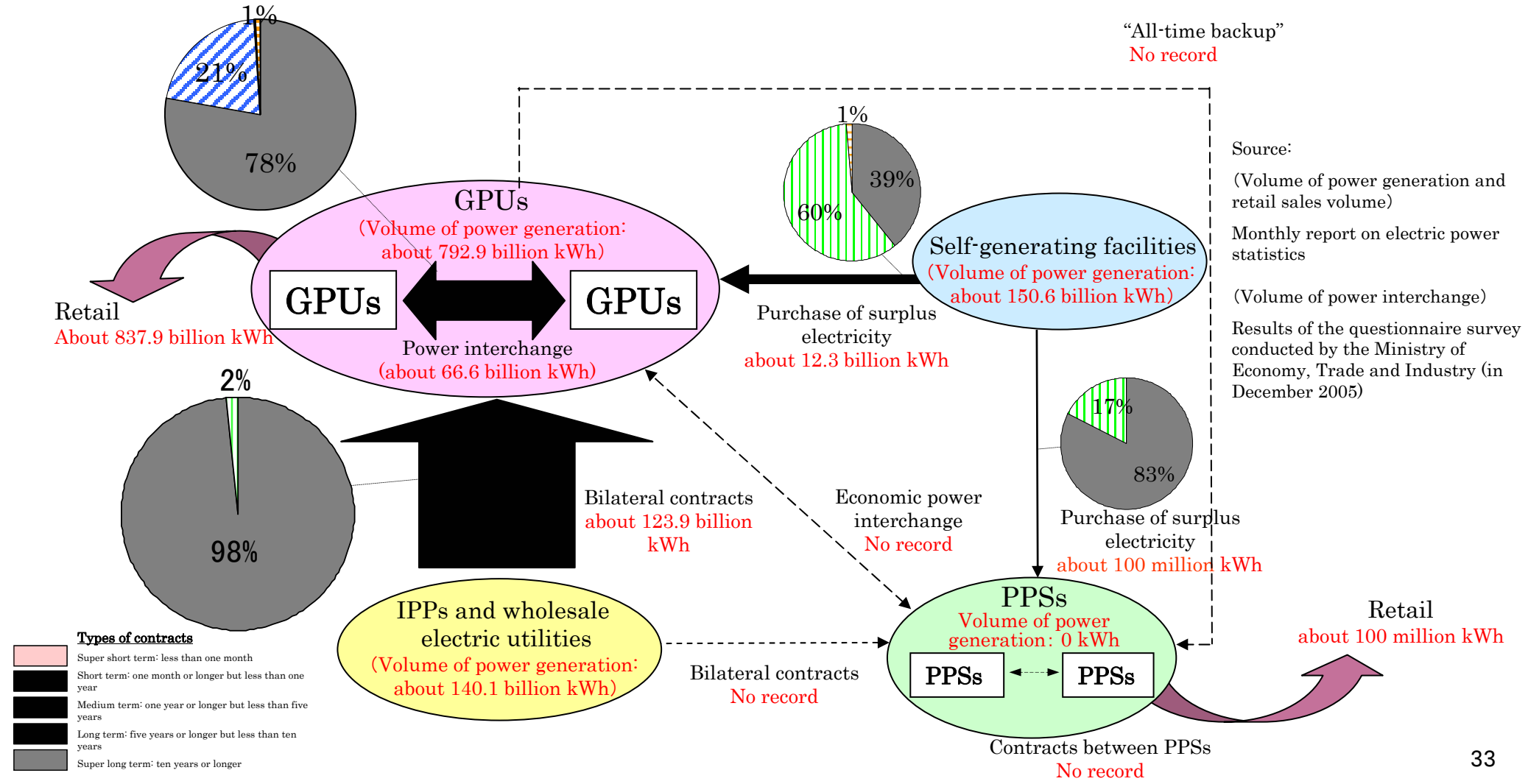
(Volume of power interchange)

Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in December 2005)

2. Wholesale power market

(2) Structural changes of the wholesale power market —Change of market structure—

- Fiscal 2000: Introduction of the specified-scale electricity supply system (PPS:Power Producer and Supplier)



Source:

(Volume of power generation and retail sales volume)

Monthly report on electric power statistics

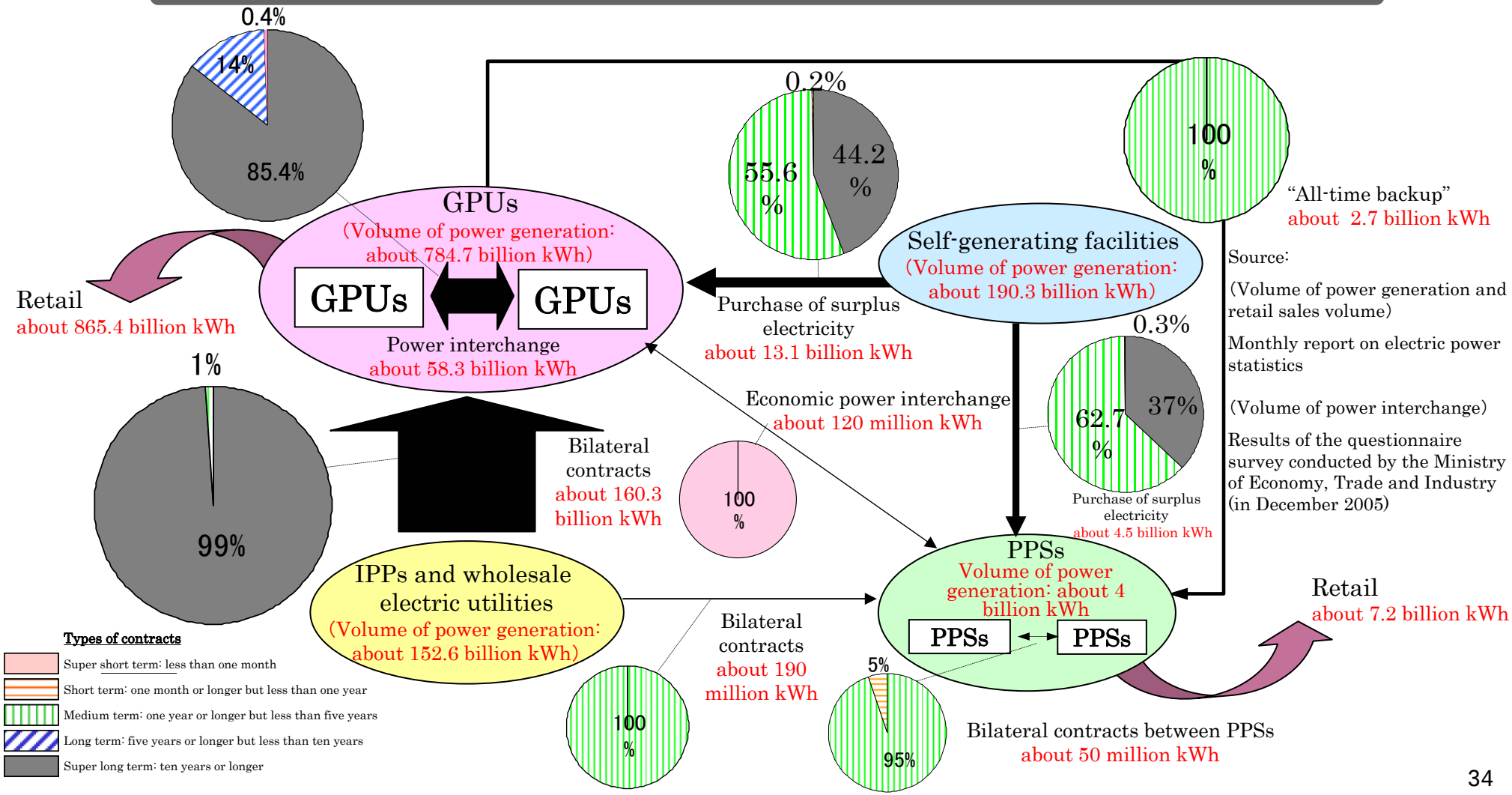
(Volume of power interchange)

Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in December 2005)

2. Wholesale power market

(2) Structural changes of the wholesale power market －Change of market structure－

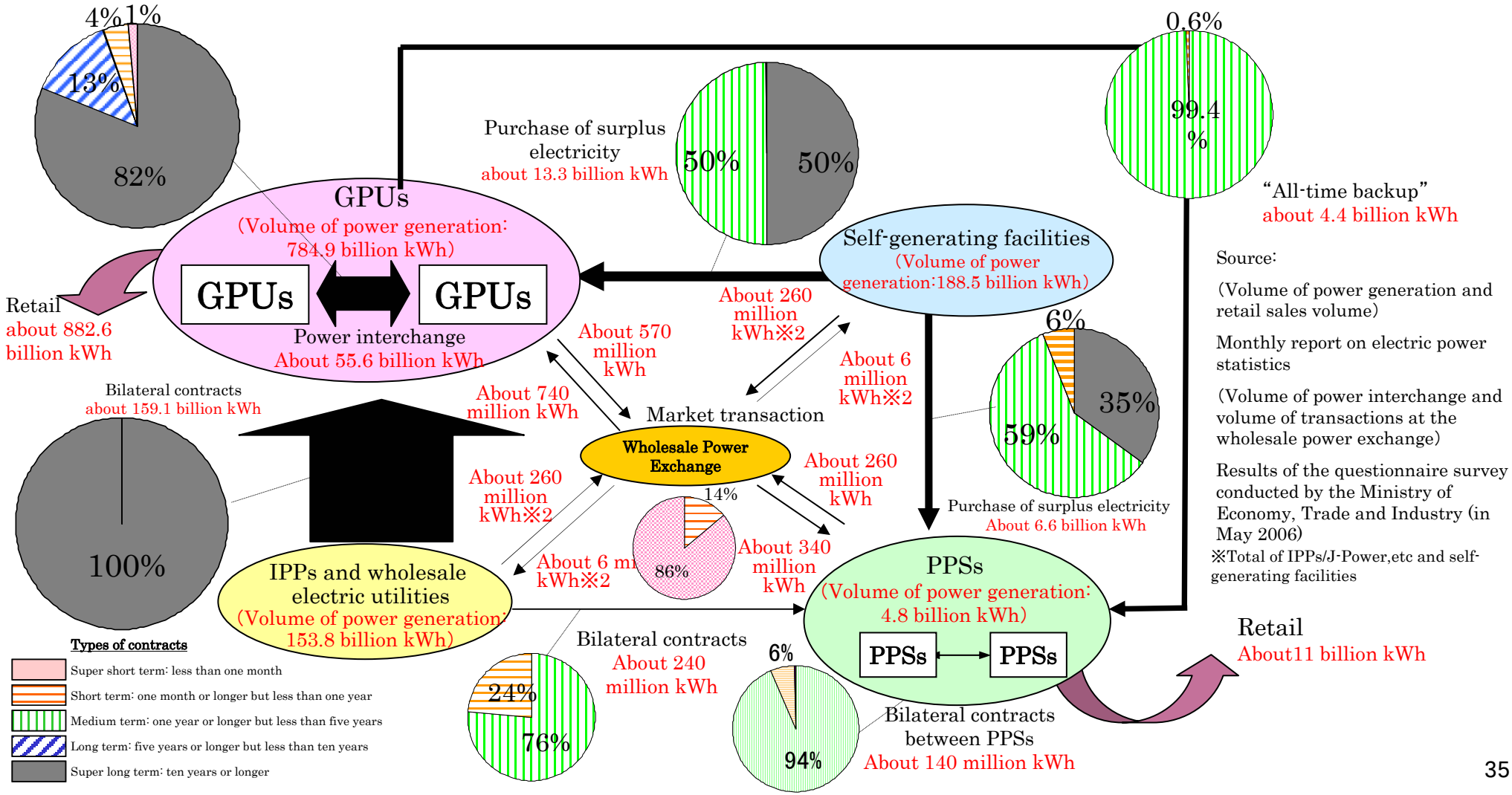
- Fiscal 2004: The scope of liberalization in the retail segment was extended (Expansion of the specified-scale demand)



2. Wholesale power market

(2) Structural changes of the wholesale power market －Change of market structure－

- Fiscal 2005:
  Establishment of the Wholesale Power Exchange, abolishment of the obligatory bidding system for thermal power, and abolishment of economic power interchange



Source:

(Volume of power generation and retail sales volume)

Monthly report on electric power statistics

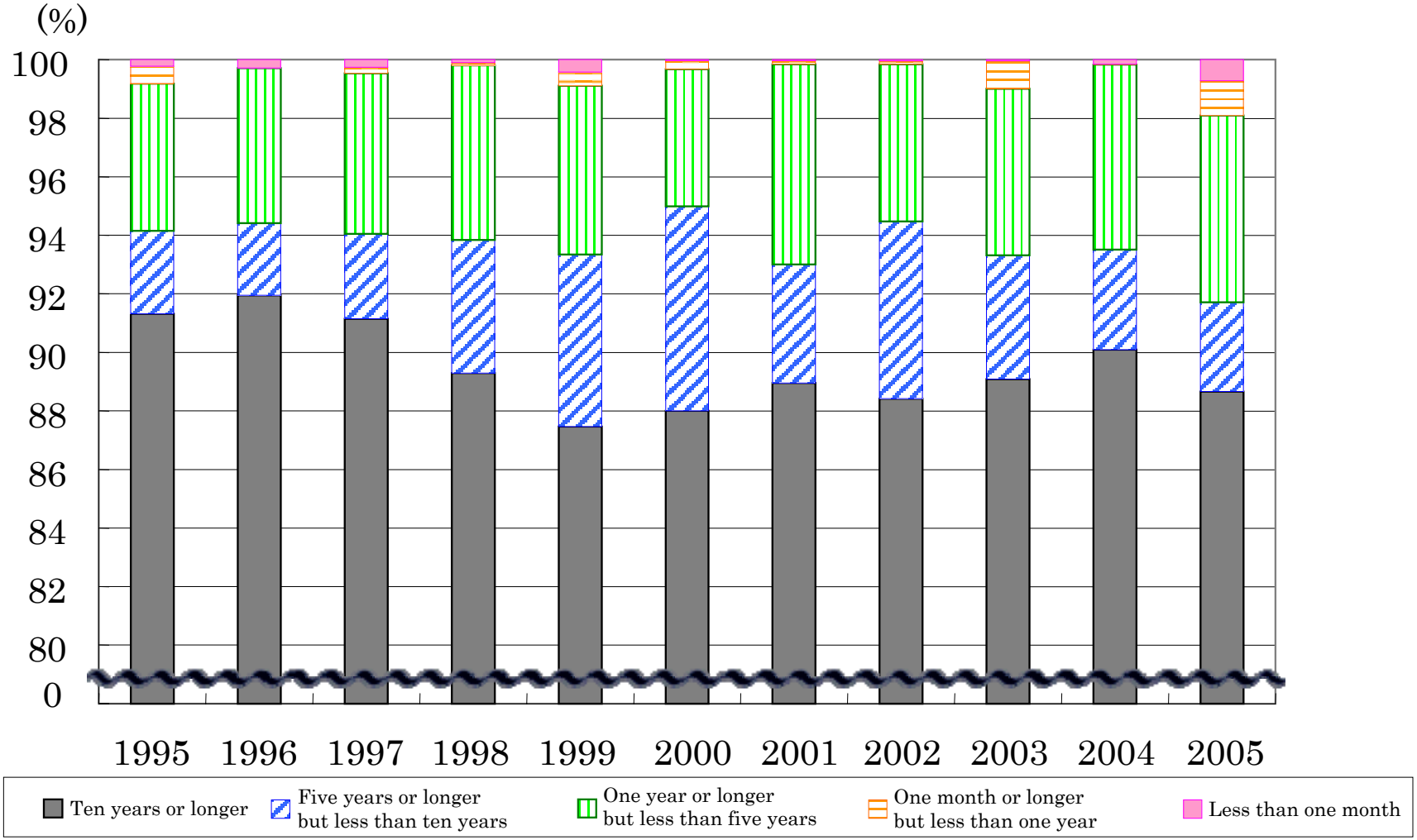
(Volume of power interchange and volume of transactions at the wholesale power exchange)

Results of the questionnaire survey conducted by the Ministry of Economy, Trade and Industry (in May 2006)

※Total of IPPs/J-Power,etc and self-generating facilities

2. Wholesale power market

(2) Structural changes of the wholesale power market —Change in the wholesale power distribution ratio by contract term—



Chapter 2 Evaluation from the viewpoint of stable supply

1. Capital investment
   (1) Decreasing capital investment and sufficient facility capacity
   (2) System reliability
   (3) Future estimates on supply margin based on supply plan

2. Interconnection lines

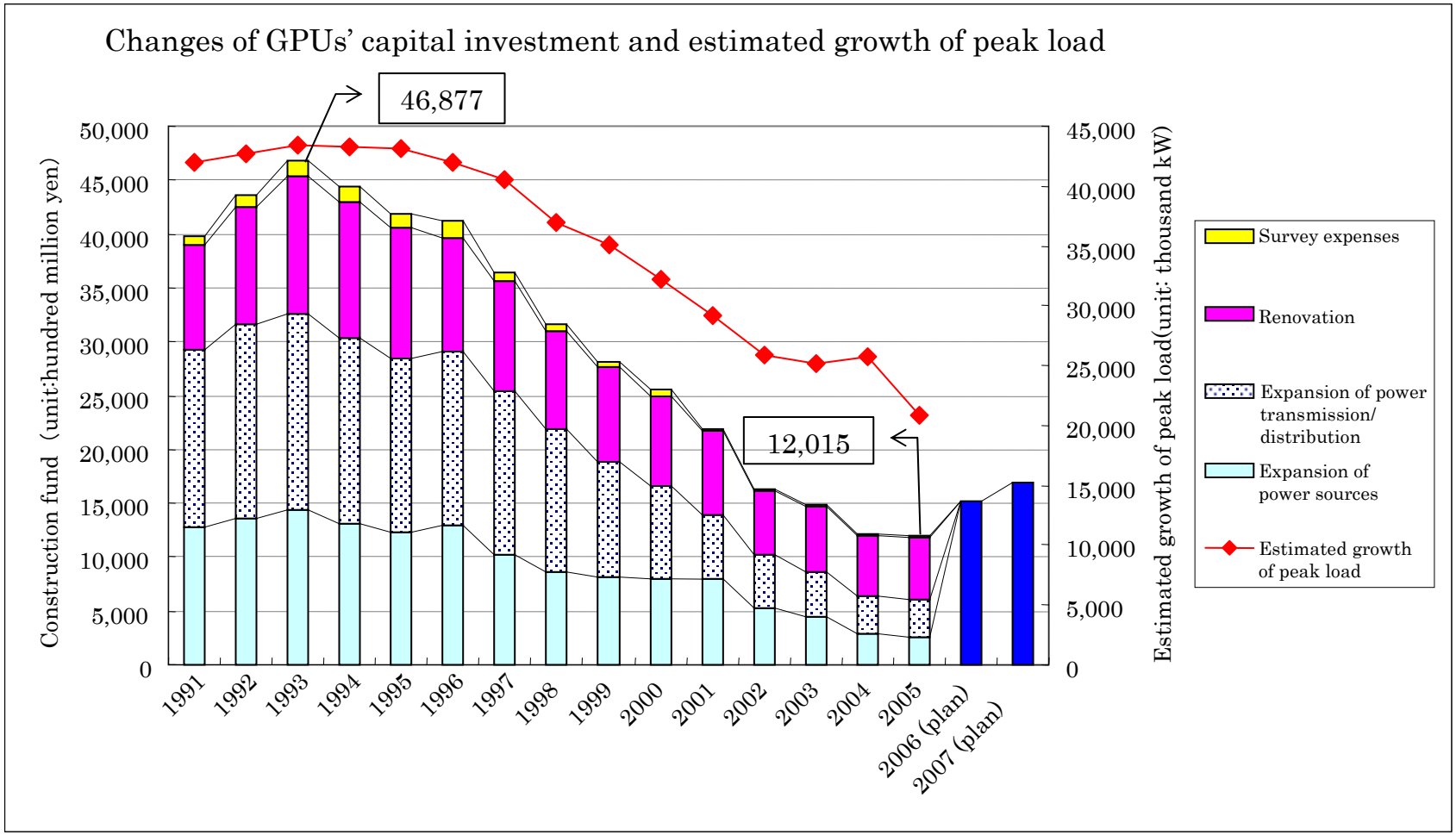
3. System operation

4. Preservation of security and restoration from disasters
   (1) System for maintenance and security preservation
   (2) Preservation of and restoration from disasters

5. Research and development

1. Capital investment

(1) Decreasing capital investment and sufficient facility capacity —Comparison between change of capital investment amount and estimated growth of peak load—



※"Estimated growth of peak load": Difference between the estimated peak load in the tenth year and the previous year's peak load
(The value of peak load in each year, excluding that in 1991 and 1992, is through temperature compensation)
※The values in 2006 and 2007 show the total amount of planned investment.

[Source] Construction fund: Handbook of Electric Power Industry (～2003), annual report on capital fund (2004 and 2005), outline of management plan of respective GPUs (2006～)
Estimated growth of peak load: Detailed statements of electricity supply-demand

1. Capital investment

(1) Decreasing capital investment and facility capacity —Change of estimated peak load based on supply plan—

Supply plan ※1	Yearly average growth rate of peak load(kW) for the next ten years	
		After temperature compensation ※2
Fiscal 1996	1.8%	2.3%
Fiscal 1997	1.8%	2.2%
Fiscal 1998	2.0%	2.0%
Fiscal 1999	2.1%	1.8%
Fiscal 2000	1.9%	1.7%
Fiscal 2001	1.7%	1.6%
Fiscal 2002	1.4%	1.4%
Fiscal 2003	0.9%	1.2%
Fiscal 2004	0.9%	1.1%
Fiscal 2005	1.3%	1.1%
Fiscal 2006	0.8%	0.8%

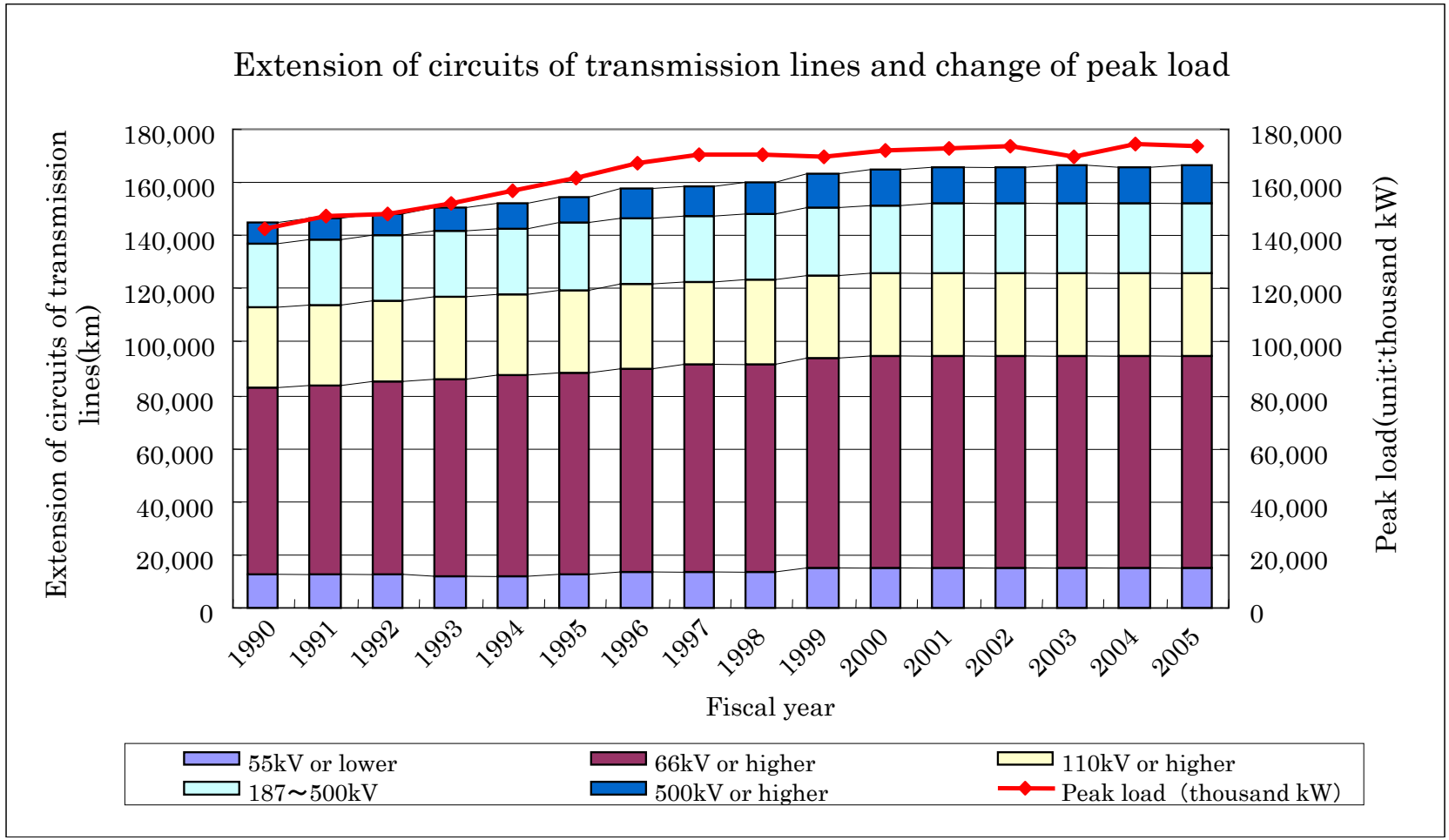
※1 Supply plan is a mandatory report to be submitted by ten GPUs and two wholesale electric utilities to the Minister of Economy, Trade and Industry by March each year in accordance with paragraph 1, Article 29 of the Electricity Utilities Industry Law.

※2 Temperature compensation intends to get rid of influences of fluctuations in the air conditioner load owing to excessively hot or cool summer, for the purpose of determining the demand based on usual temperatures.

[Source]Outline of electricity supply plans

1. Capital investment

(1) Decreasing capital investment and facility capacity —Present state of distribution facilities (extension of circuits of transmission lines)—

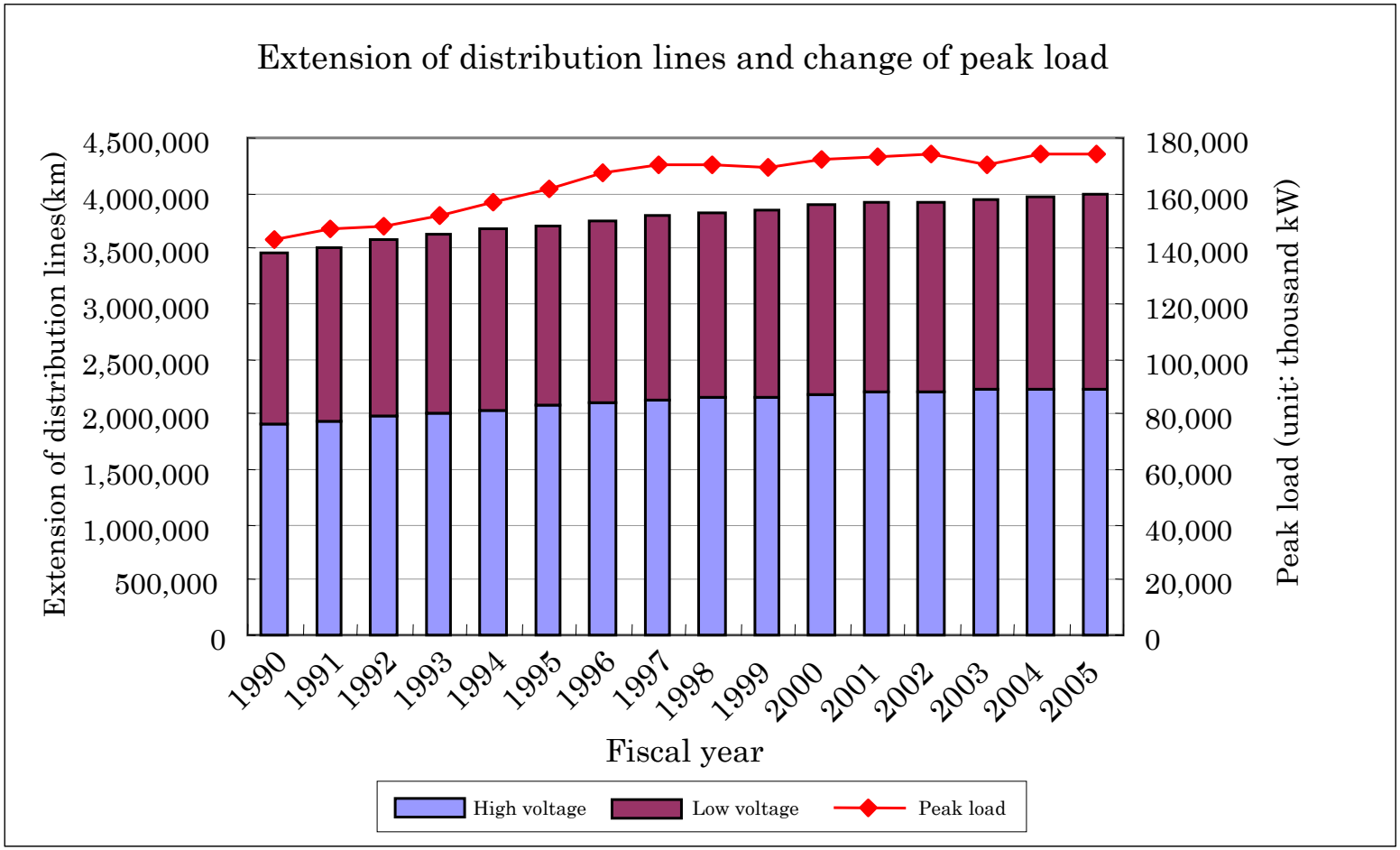


※The values of peak load in and after 1992 are through temperature compensation.
※The value for 2005 is an estimate.

[Source] Extension of circuits of transmission lines: Handbook of Electric Industry
(The value for 2005 was reported by the Federation of Electric Power Companies of Japan),
Peak load: Outline of electricity supply-demand

1. Capital investment

(1) Decreasing capital investment and facility capacity —Present status of distribution facilities (extension of distribution lines) —

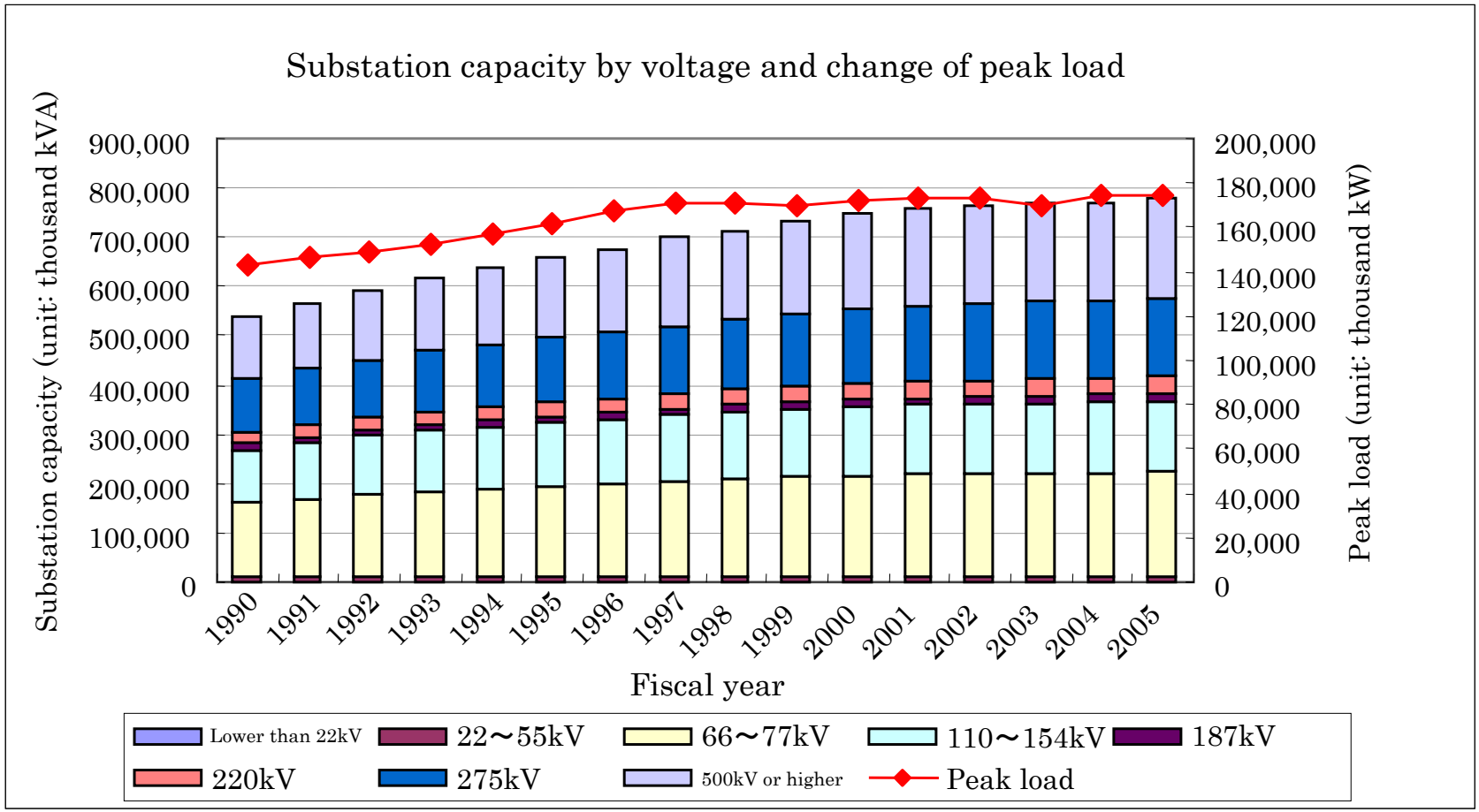


※The values of peak load in and after 1992 are through temperature compensation.
※"High voltage" includes "extra-high voltage" values.
※The value for 2005 is an estimate.

[Source] Extension of distribution lines: Handbook of Electric Industry
(The value for 2005 was reported by the Federation of Electric Power Companies of Japan),
Peak load: Outline of electricity supply-demand

1. Capital investment

(1) Decreasing capital investment and facility capacity —Present status of distribution facilities (Change of substation output capacity)—

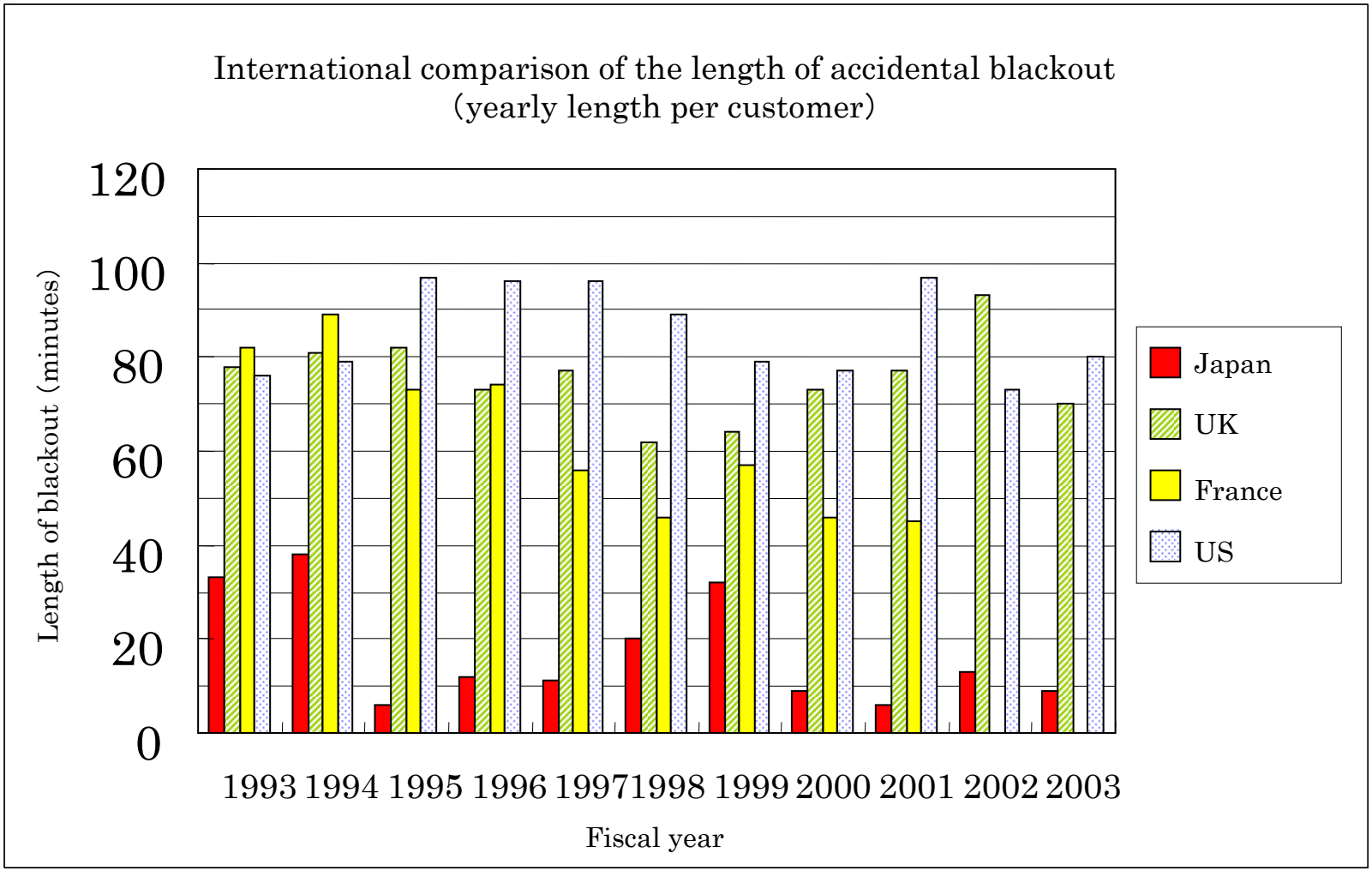


※The values of peak load in and after 1992 are through temperature compensation.
※The value for 2005 is an estimate.

[Source] Extension of circuits of transmission lines: Handbook of Electric Industry
(The value for 2005 was reported by the Federation of Electric Power Companies of Japan),
Peak load: Outline of electricity supply-demand

1. Capital investment

(2) System reliability －International comparison of blackout length－



[Source] Federation of Electric Power Companies of Japan

※UK：OFGEM statistics,　France：Yearly report of EDF（No data in 2002 and 2003）

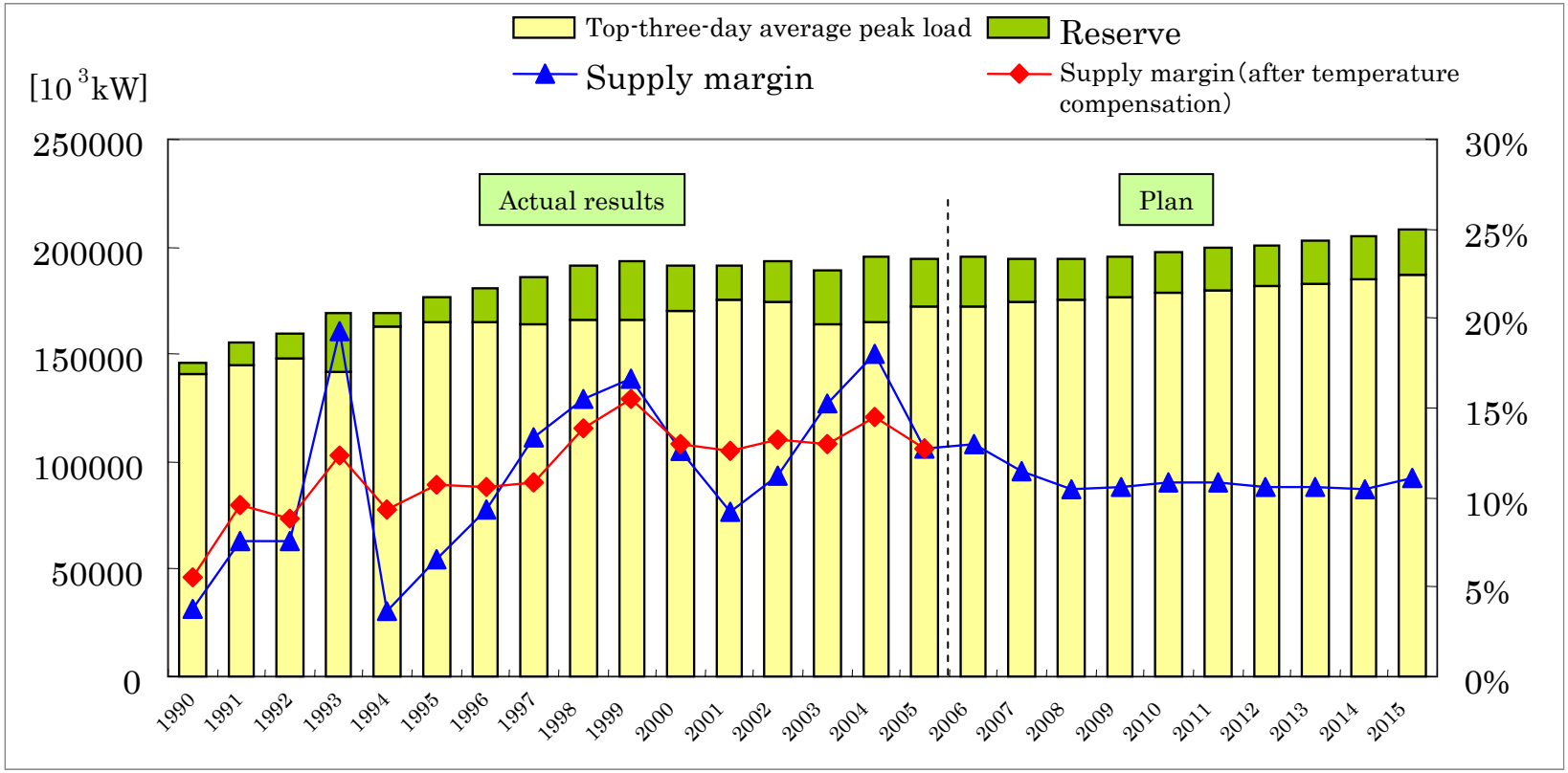
US：Average (yearly accidental blackout length per customer) of Consolidated Edison, Florida Power & Light, NStar, Pacific Gas & Electric and Southern California Edison

1. Capital investment

(3) Future estimates on supply margin, etc. based on supply plan —GPUs—

Desirable facility construction for the stable supply (generating facilities):

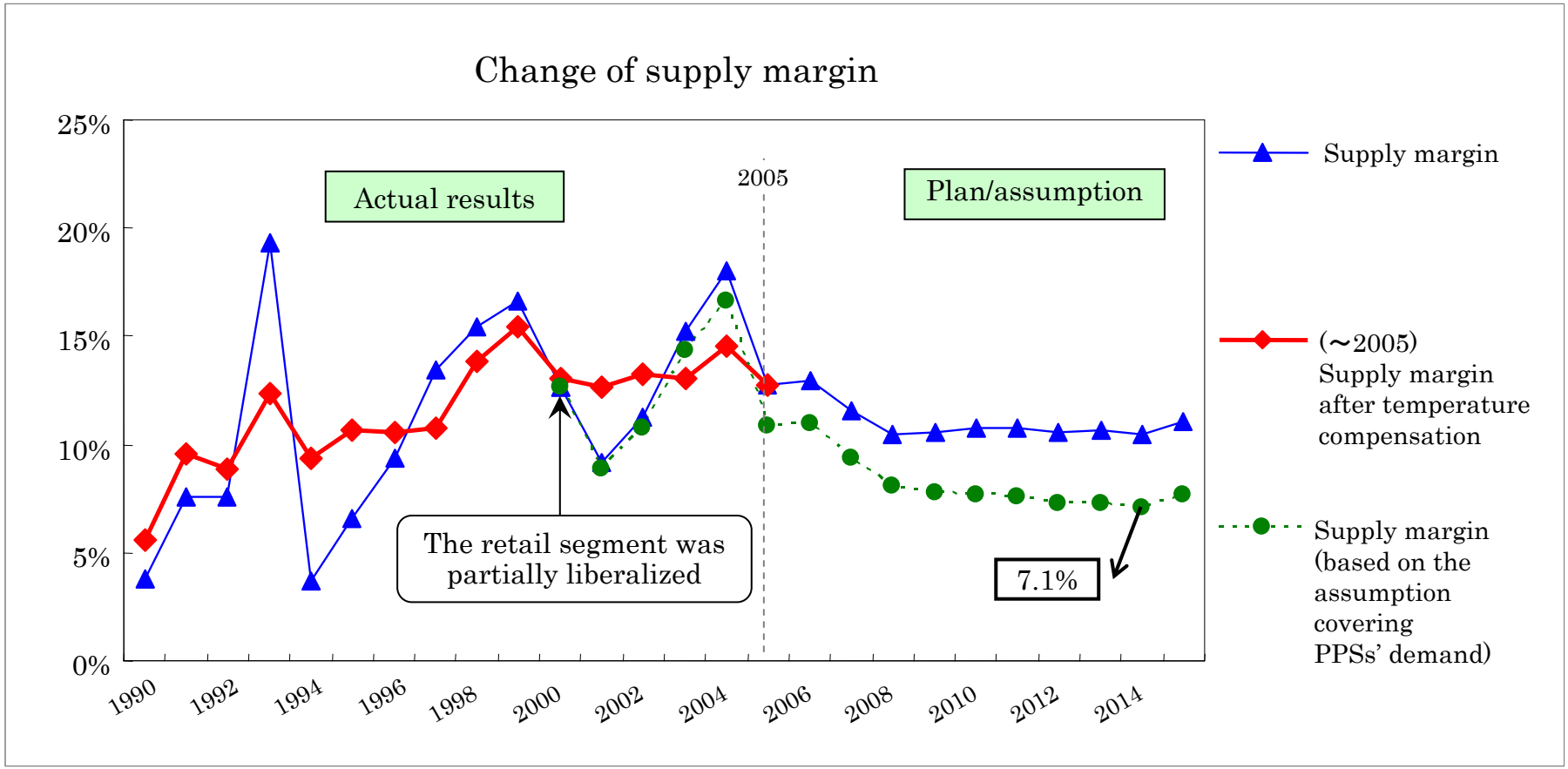
To secure 8-10% or more supply margin, supported by an appropriate power source structure from the viewpoint of energy security, taking into consideration trend of demand, trend of fuel demand/price, wide-area operation, etc.



[Source] Outline of electricity supply-demand and outline of electricity supply plans

1. Capital investment

(3) Future estimates on supply margin, etc. based on supply plan
—Reserve including demands of PPSs—



【Note】・The values of "supply margin" (in and after fiscal 2006) are estimates based on GPUs' supply plans.
・The values of "supply margin (based on the assumption covering PPSs' demand)" are based on the assumption that the estimated future demand of PPSs would be fully covered by GPUs' supply capacity.

[Source] Estimates calculated from outline of electricity supply plans, outline of electricity supply-demand, monthly reports on generated and received power,and results of the survey conducted by The Japan Electric Power Survey Committee.

〔Note〕The evaluation report on system reliability released in March 2006 by the Electric Power System Council of Japan states that the estimated supply margin in 2010 and 2015 would be 11.0% and 11.6%, respectively, which reflects the expected PPSs' supply capacity.

2. Interconnection lines －Desirable capacity of interconnection lines－

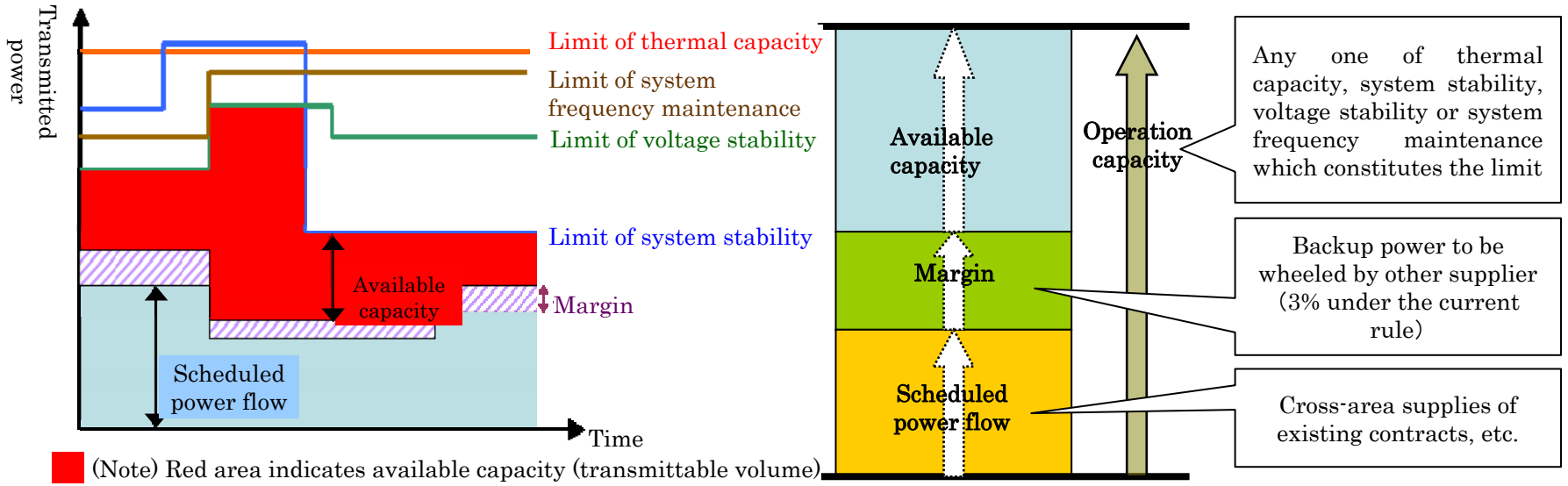
- Limiting factors of operation capacity：・There are four limiting factors including limitation of thermal capacity, limitation of system stability, limitation of voltage stability and limitation of system frequency maintenance.

  ・Limitation of thermal capacity mainly derives from “thickness” of a transmission line, while other limitations vary with the system structure, demand volume, etc.

  ・Of those limitations, the most severe limit would be regarded as a value of operation capacity. Therefore, operation capacity is not necessarily equal to transmission capacity.

- Calculation of available capacity： Available capacity＝Operation capacity－Margin－Scheduled power flow

- Margin：Margin is supposed to be 3% of the entire system capacity, or any amount enough to ensure system stability even at the time of the drop of the largest power source unit.（See Ⅱ-2-(4)）



(Note) Red area indicates available capacity (transmittable volume)

3. System operation －Flowchart of system operation works－

Annual plan

- Supply-demand coordination plan
  - Estimation of demand
  - Adjustment of power source maintenance plan
    - Secure sufficient supply capacity
  - Adjustment to take into consideration large-scale shutdown plan of distribution facilities
    - Timing adjustment of maintenance plan would be necessary when any constraint against system operation is expected.
  - Economics-conscious distribution of power supplies and fuel procurement plan
- System operation plan
  - Establishing targets of system structure and voltage operation
    - Evaluate security based on the supply/demand control plan
    - Power source maintenance plan would be readjusted in case of any problem.

Semiannual/monthly plan

- Coordination plan and operation plan are reviewed by taking into consideration any changes of the annual plan
  - Utilization of hydroelectric power, review of thermal power generation cost, fuel procurement plan, etc.

Weekly plan

- Monthly plan is reviewed by taking into consideration any changes of near-term conditions such as expected weather change.
  - Change of maintenance plan for power sources or distribution facilities might be necessary according to supply-demand conditions.
- Operation/shutdown plan of thermal power plants
  - Establish weekly operation/shutdown plan, securing necessary operational reserve
- Establish the operation plan of pumping-up power plants and their power sources

Day-ahead planning

- Weekly plan is renewed, based on the latest data of the estimated demand. Confirm the operation status of power sources

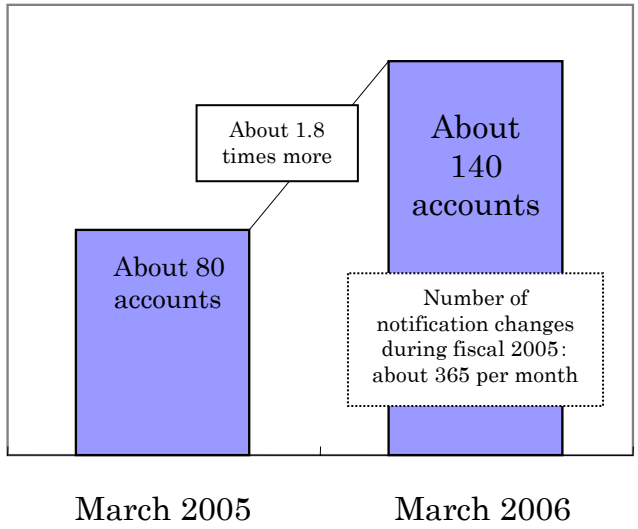
Actual operation

3. System operation －Change of the volume of system operation works－

Change of the work volume as a result of the introduction of institutional system reforms

	Before reform	After reform
Use of interconnection lines	・Limited to GPUs, etc.	・Increased as a result of the establishment of the wholesale power exchange
Number of wheeling service and notification changes to the wheeling segment	・Not many	・Both have been increased
Contacts	・Limited to relevant in-house departments, other GPUs and wholesale electric utilities	・PPSs and ESCJ have been added.
Security of the balance between supply and demand	・Need to secure the balance mainly for oneself.	・Need to secure the balance not only for oneself but also for PPSs

Change of the number of wheeling service using interconnection lines



[Source] Electric Power System Council of Japan

※Electric Power System Council of Japan (ESCJ) has been established for the purpose of improving fairness and transparency in the use of interconnection lines.

3. System operation －Works of central dispatching offices－

1. Traditional responsibilities

- System operation
  - Establishment of system operation plan
  - Supervision and control of power system
- Supply-demand coordination
  - Establishment of Supply-demand coordination plan
  - Adjustment of supply and demand
- Deal with accidents

2. New or increased responsibilities

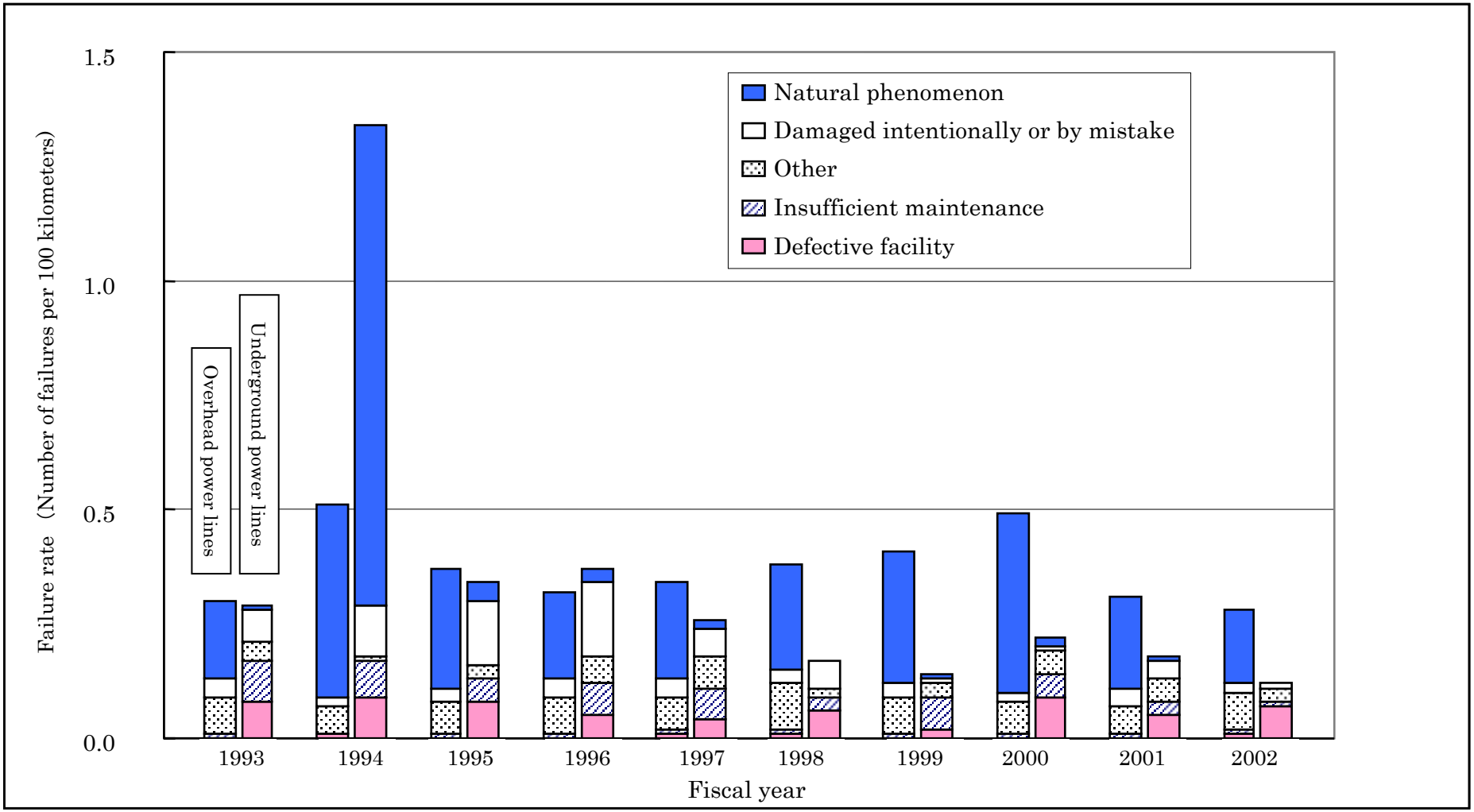
- System operation
  - Judgment of power transmittability for forward transaction, bilateral contracts and spot transactions
  - Confirmation of margin
  - Deal with notification changes
- Supply-demand coordination
  - Area management of the supply-demand balance
- Other
  - Contacts with PPSs and ESCJ

In response to these increased responsibilities, many GPUs have increased the workforce of their central dispatching offices by deploying one to six additional workers.
There is a GPU that increased by one team on night duty.

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation－Change of sustainability of electric power facilities (transmission lines and extra-high voltage distribution lines)-

Change of failure rate of electric power facilities
(transmission lines and extra-high voltage distribution lines)

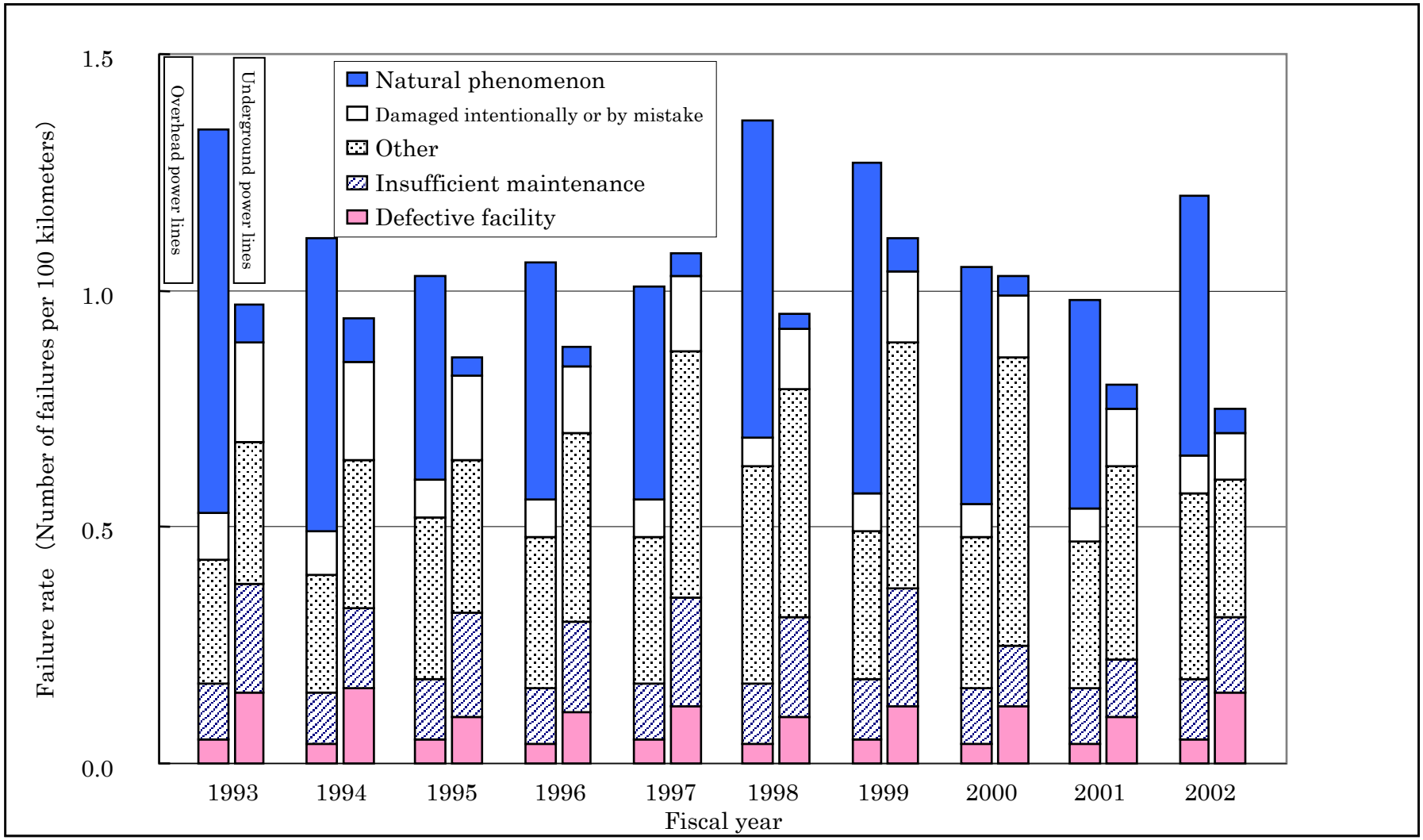


[Source]Statistics on safety of electricity (by the Nuclear and Industry Safety Agency in July 2004)

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation－Change of sustainability of electric power facilities (High voltage distribution lines)－

Change of failure rate of electric power facilities (high voltage distribution lines)

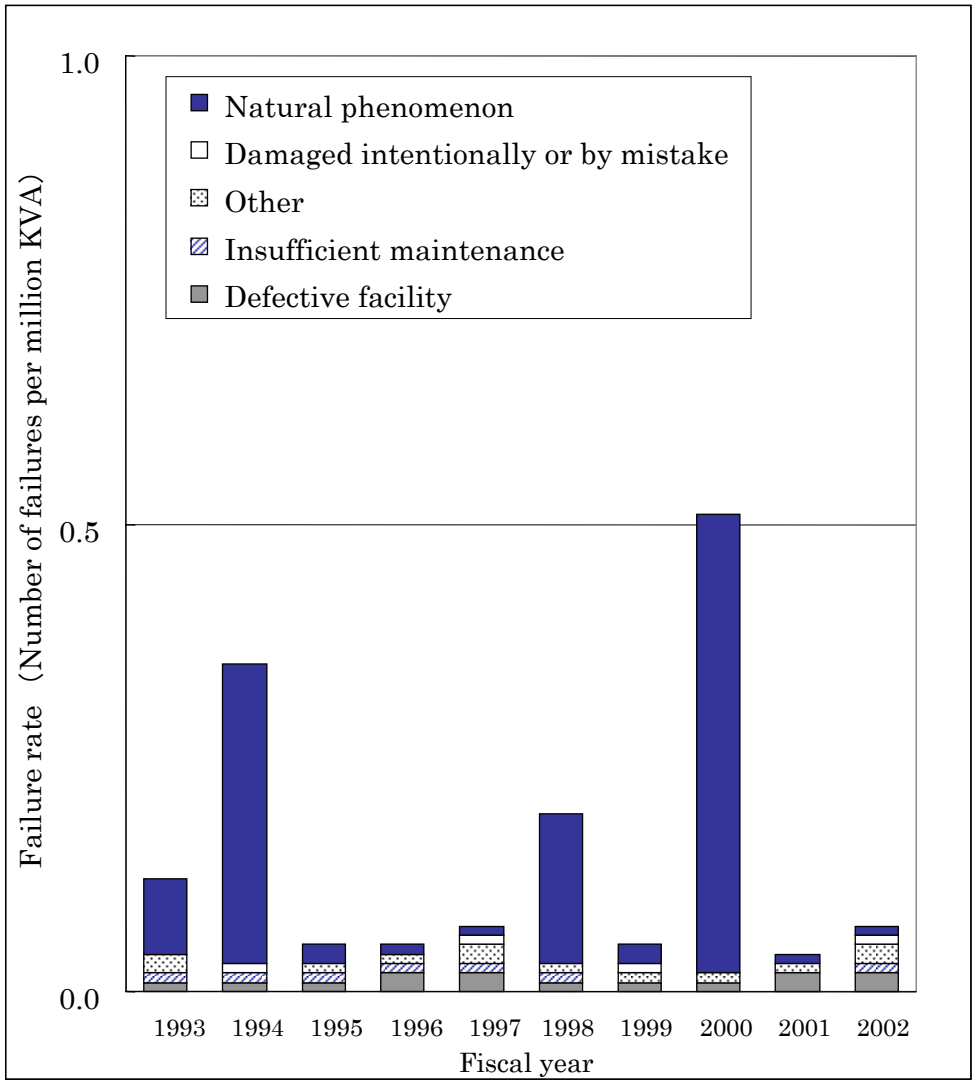


[Source] Statistics on safety of electricity (by the Nuclear and Industry Safety Agency in July 2004)

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation — Change of sustainability of electric power facilities (Failure rate of substations) —

Change of failure rate of electric power facilities (substations)

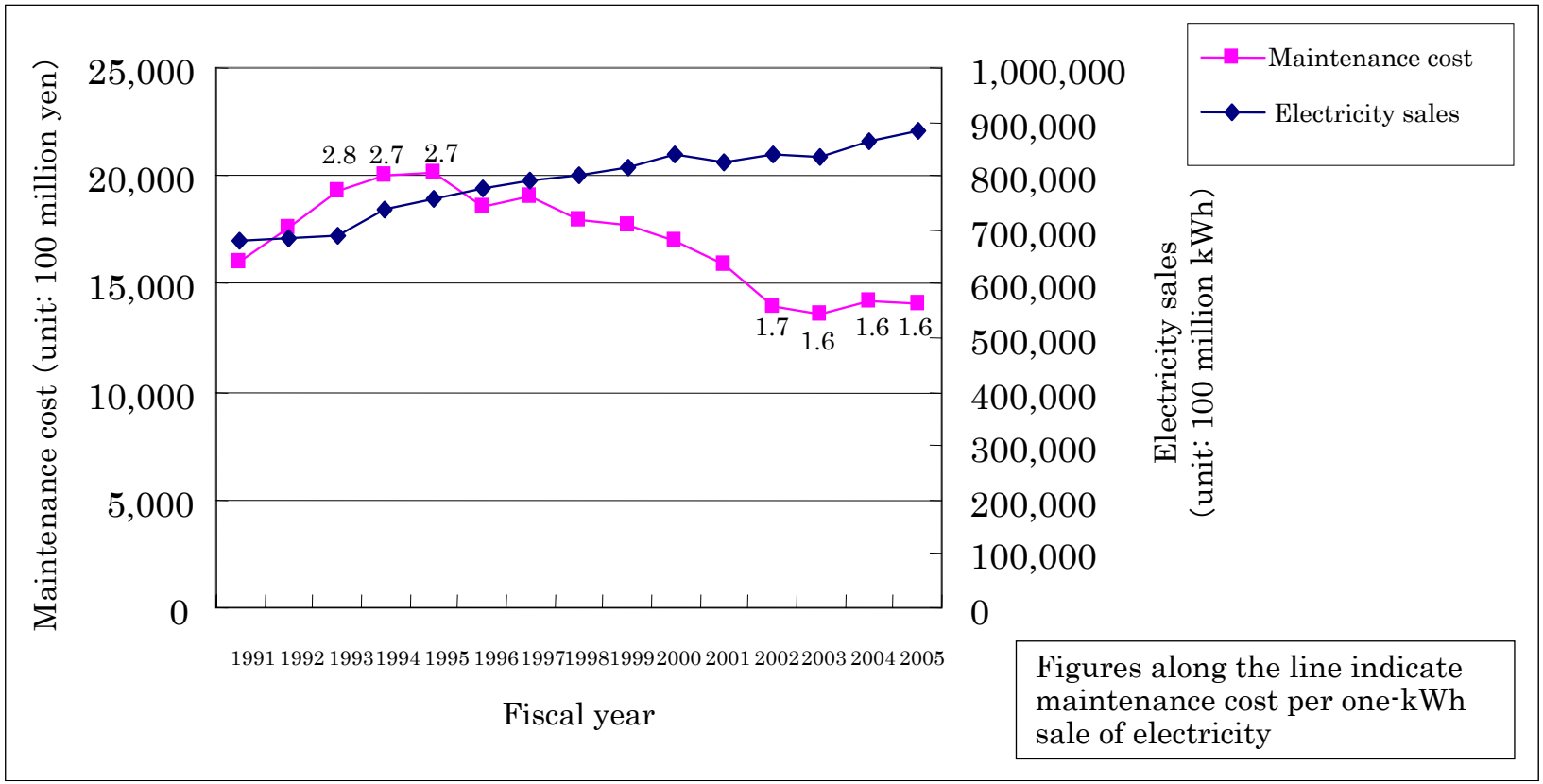


[Source] Statistics on safety of electricity (by the Nuclear and Industry Safety Agency in July 2004)

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation —Change of facility maintenance cost—

Change of maintenance cost



※The values for 2005 are estimates.

[Source] Handbook of Electric Industry (The values for 2005 were reported by the Federation of Electric Power Companies of Japan)

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation －Efforts to improve efficiency of maintenance and repair works－

Examples of efforts to improve efficiency of system maintenance (maintenance and repair works)

○Rationalization through improvement of functions and introduction of new materials, new construction method, etc.

・Reduce tree felling expenses through the use of wear-resistant insulated wires for overhead distribution lines

・Reduce construction expenses to prevent short-circuit failure of transmission lines through the use of advanced arc-horns (wire protection facility)

○Rationalization through introduction of facility diagnosis technologies, etc.

・Introduce external diagnosis techniques through the use or improvement of facility diagnosis technologies and optimize the inspection cycle

→Rationalize inspection of the internal structure of the GCB (gas circuit breaker) or OLTC (on-load tap changer) of transformers through the use of facility diagnosis technologies (Traditionally, inspections of the internal structure of substation facilities had to be conducted periodically, but the introduction of external diagnosis techniques that do not require dismantling of the facilities has made it possible to rationalize inspections that now can be carried out flexibly, only when possible degradation is detected.)

・Improve efficiency through the introduction of risk management techniques for facility maintenance

4. Preservation of security and restoration from disasters

(1) System for maintenance and security preservation —System for maintenance and security for the stable supply—

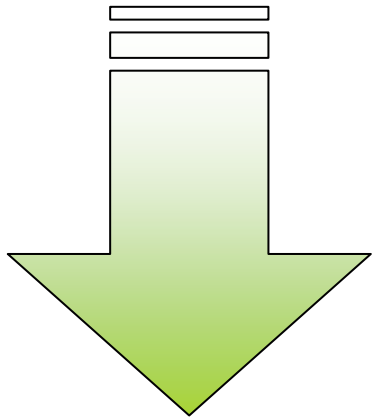
- Electricity industry utilities establish their own system for maintenance and security centered on voluntary efforts.
- The department in charge of supervising maintenance and security in each utility establishes in-house safety rules and regulations, to ensure that the rules and regulations satisfy requirements of each utility, and such rules and regulations are to be submitted to the government.
- The government (Nuclear and Industrial Safety Agency) confirms the adequacy of the submitted rules and regulations, and issues an order for change of the rules and regulations when necessary.

- **Matters prescribed in the safety rules and regulations**
  - Duties and organization of those persons who are responsible for supervising construction, maintenance and operation of power facilities
  - Safety education with regard to construction, maintenance and operation of power facilities
  - Safety patrol, inspection and examination on construction, maintenance and operation of power facilities
  - Operation and handling of power facilities
  - Method of maintenance in case of long-term shutdown of a power plant
  - Counter-disaster measures and emergency measures
  - Preservation of safety records regarding construction, maintenance and operation of power facilities
  - Scheme of implementation of statutory inspections binding businesses using power facilities and preservation of inspection records
  - Other safety matters necessary for construction, maintenance and operation of power facilities

4. Preservation of security and restoration from disasters

(2) Prevention of and restoration from disasters

- Electricity industry utilities have their own scheme for prevention of and restoration from disasters in accordance with the relevant laws or ordinances to address disasters.
- As part of the wide-area operation of electricity industry, utilities have established a wide-area restoration/assistance scheme through measures to make any necessary materials or resources available to the damaged in a time of emergency (The Central Electric Power Council, which has been established to take care of necessary works for the wide-area operation of the electricity industry, makes efforts for the effective implementation of the scheme).



○Everyday efforts

・Establishment of the counter-disaster scheme, improvement/inspection of relevant facilities, implementation of counter-disaster training, etc.

○Measures at the time of disaster

・Establishment of the counter-disaster headquarters, dispatch of repair personnel, delivery of necessary materials or resources to the damaged, etc.

- In the past typhoon disaster events, swift restoration activities were carried out, with GPUs playing the central role. (See Figures ① and ②)
- At the time of the Great Hanshin-Awaji Earthquake in January 1995 and the Niigata Chuetsu Earthquake in October 2004, wide-area restoration/assistance activities were carried out. (See Figures ③ and ④)

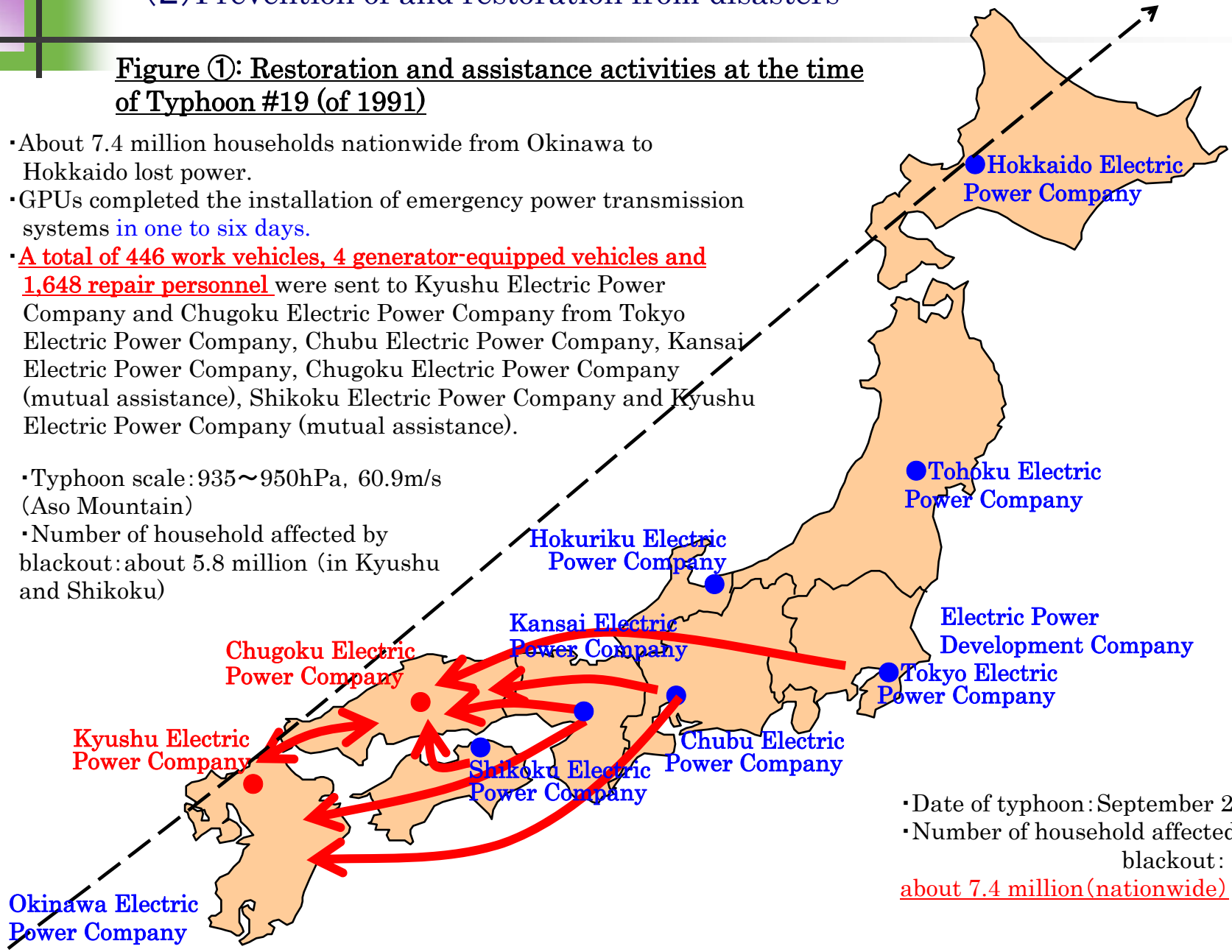
4. Preservation of security and restoration from disasters

(2) Prevention of and restoration from disasters

Figure ①: Restoration and assistance activities at the time of Typhoon #19 (of 1991)

- About 7.4 million households nationwide from Okinawa to Hokkaido lost power.
- GPUs completed the installation of emergency power transmission systems in one to six days.
- A total of 446 work vehicles, 4 generator-equipped vehicles and 1,648 repair personnel were sent to Kyushu Electric Power Company and Chugoku Electric Power Company from Tokyo Electric Power Company, Chubu Electric Power Company, Kansai Electric Power Company, Chugoku Electric Power Company (mutual assistance), Shikoku Electric Power Company and Kyushu Electric Power Company (mutual assistance).

- Typhoon scale: 935～950hPa, 60.9m/s (Aso Mountain)
- Number of household affected by blackout: about 5.8 million (in Kyushu and Shikoku)



- Date of typhoon: September 26 to 28, 1991
- Number of household affected by blackout: about 7.4 million (nationwide)

4. Preservation of security and restoration from disasters

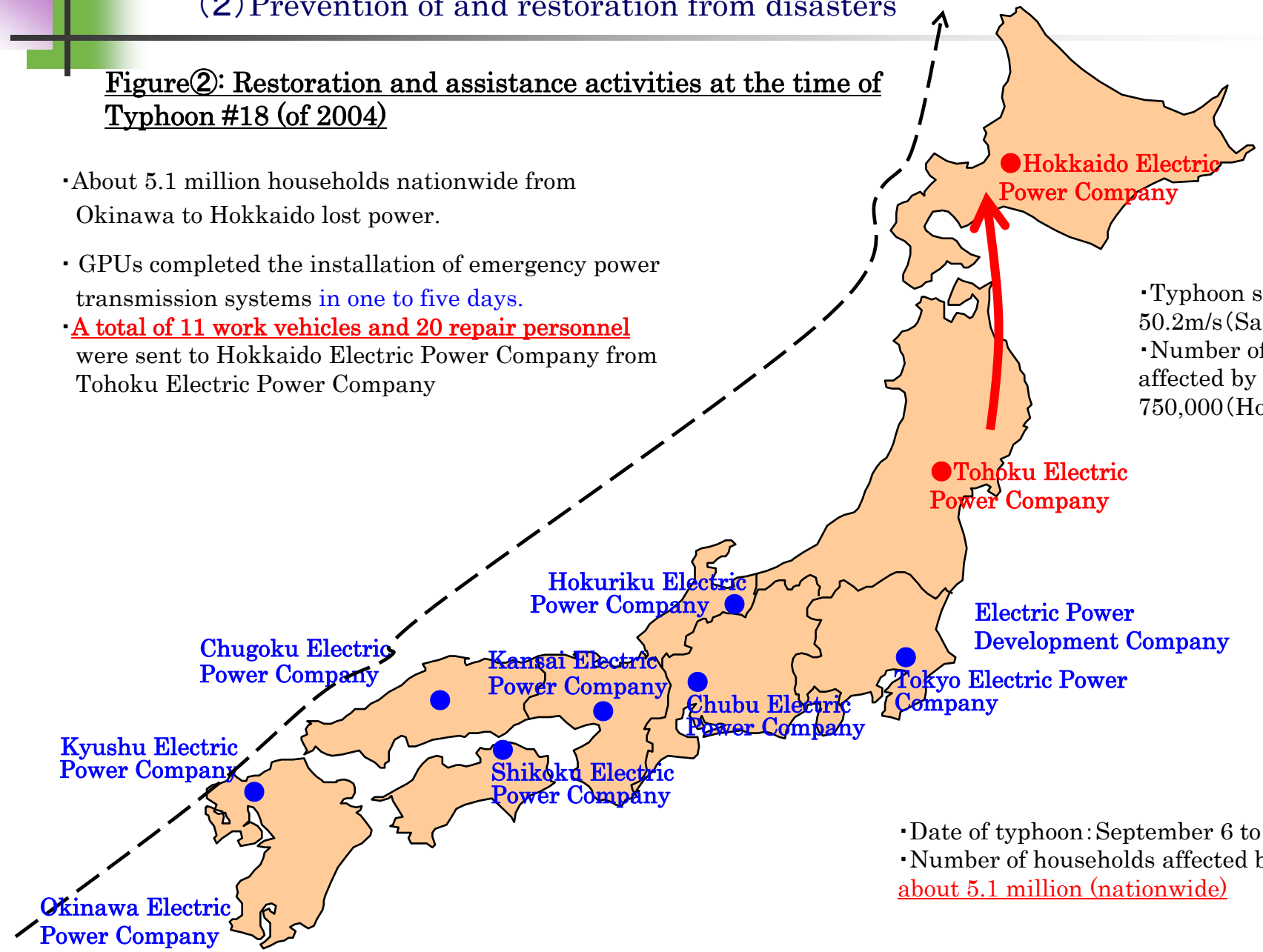
(2) Prevention of and restoration from disasters

Figure②: Restoration and assistance activities at the time of Typhoon #18 (of 2004)

・About 5.1 million households nationwide from Okinawa to Hokkaido lost power.

・ GPUs completed the installation of emergency power transmission systems in one to five days.

・A total of 11 work vehicles and 20 repair personnel were sent to Hokkaido Electric Power Company from Tohoku Electric Power Company



・Typhoon scale：970hPa, 50.2m/s（Sapporo）
・Number of households affected by blackout：about 750,000（Hokkaido）

・Date of typhoon：September 6 to 8, 2004
・Number of households affected by blackout：about 5.1 million (nationwide)

4. Preservation of security and restoration from disasters

(2) Prevention of and restoration from disasters

Figure③: Restoration and assistance activities at the time of the Great Hanshin-Awaji Earthquake (1995)

(Restoration and assistance activities conducted at the time of the Great Hanshin-Awaji Earthquake)

- A total of 52 generator-equipped vehicles, 77 work vehicles and 326 repair personnel were sent from GPUs from Tohoku to Kyushu.
- Also, materials necessary for restoration and daily necessities such as water, foods, etc. were dispatched.
- Installation of emergency power transmission systems was completed in seven days.

- Time/date of earthquake: 5:46a.m. on January 17, 1995
- Magnitude: M7.3
- Number of households affected by blackout: about 2.6 million within the service area of Kansai Electric Power Company

4. Preservation of security and restoration from disasters

(2) Prevention of and restoration from disasters

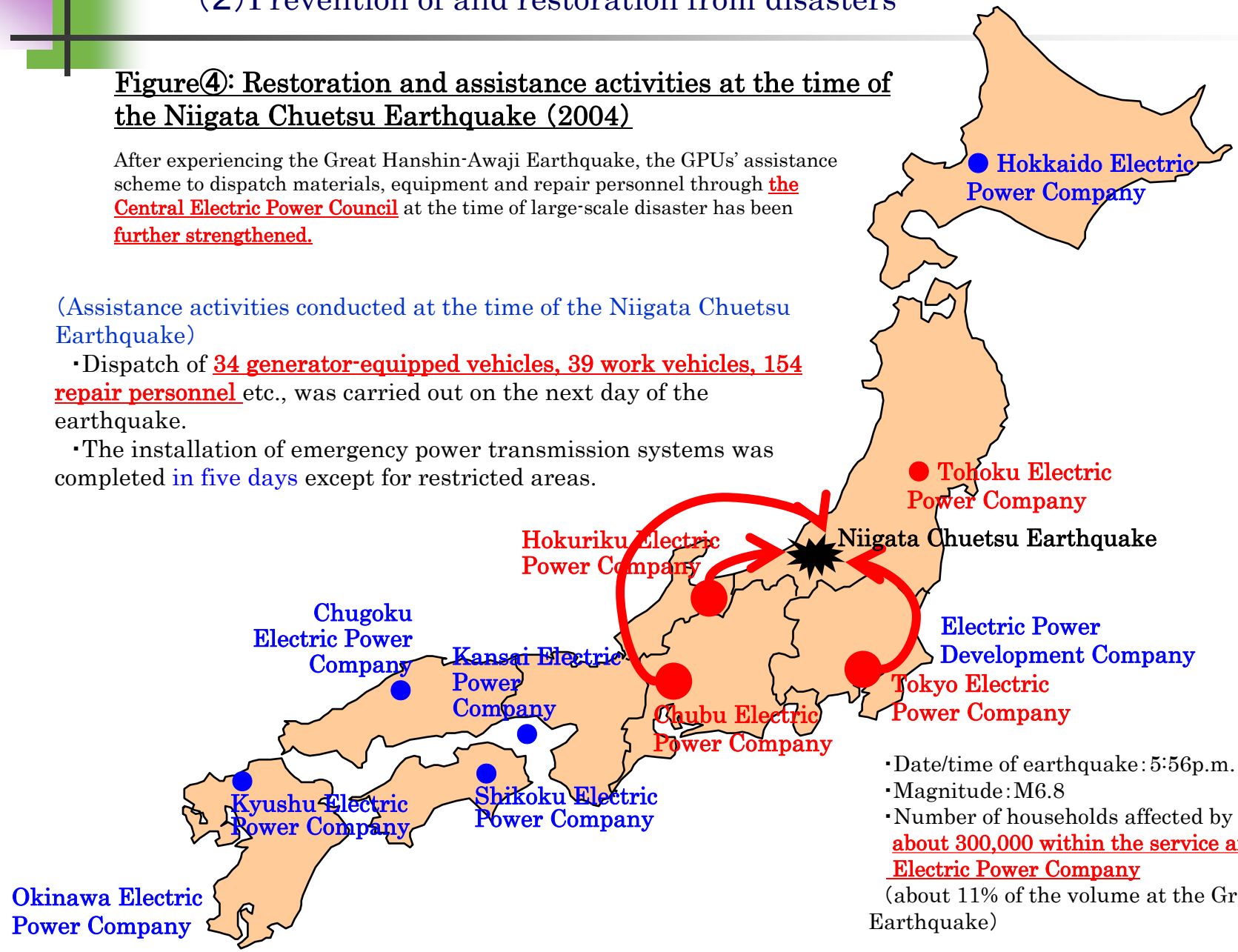
Figure④: Restoration and assistance activities at the time of the Niigata Chuetsu Earthquake (2004)

After experiencing the Great Hanshin-Awaji Earthquake, the GPUs' assistance scheme to dispatch materials, equipment and repair personnel through the Central Electric Power Council at the time of large-scale disaster has been further strengthened.

(Assistance activities conducted at the time of the Niigata Chuetsu Earthquake)

・Dispatch of 34 generator-equipped vehicles, 39 work vehicles, 154 repair personnel etc., was carried out on the next day of the earthquake.

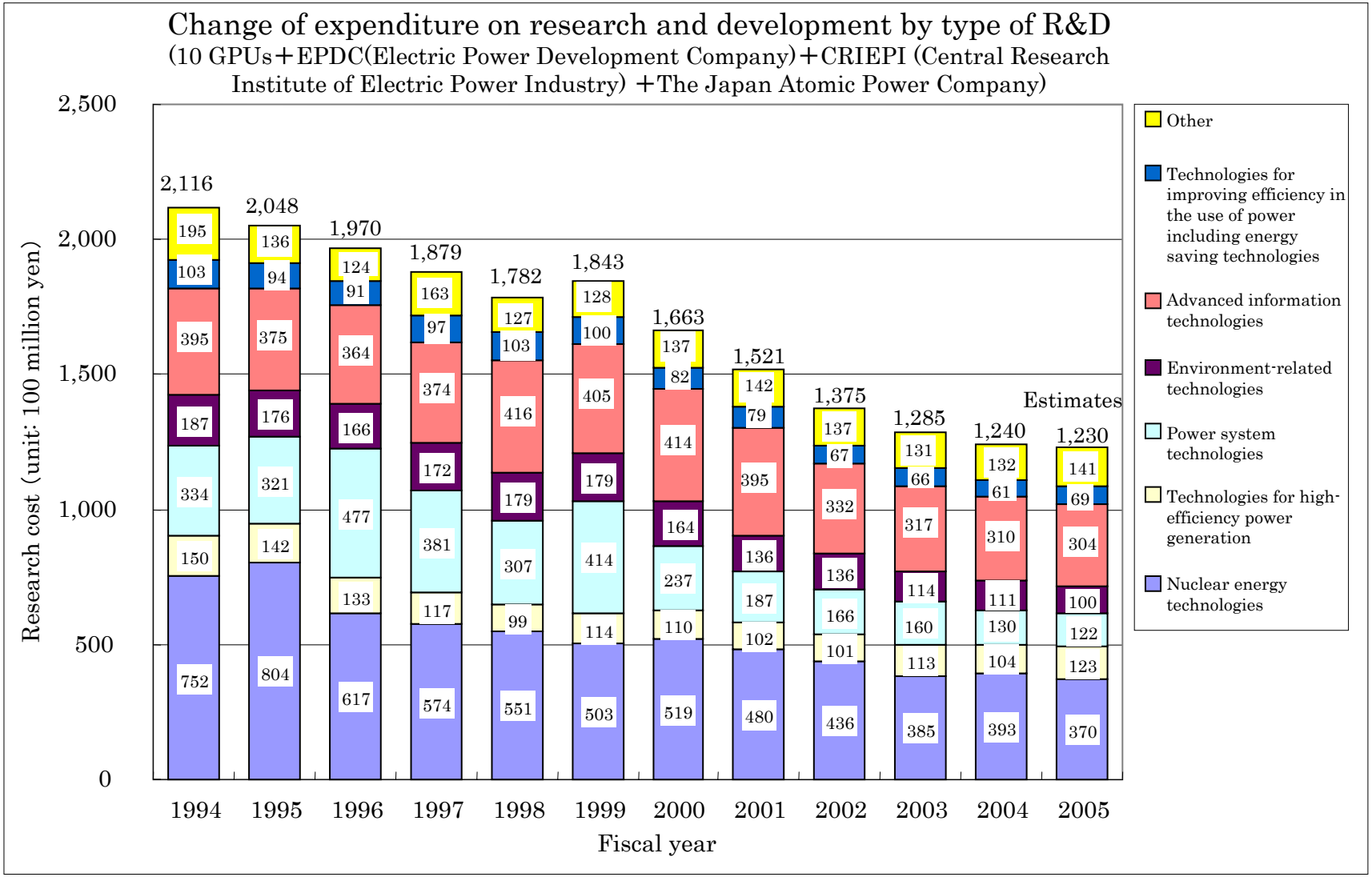
・The installation of emergency power transmission systems was completed in five days except for restricted areas.



・Date/time of earthquake：5:56p.m. on October 23, 2004
・Magnitude：M6.8
・Number of households affected by blackout：
about 300,000 within the service area of Tohoku Electric Power Company
(about 11% of the volume at the Great Hanshin-Awaji Earthquake)

5. Research and development

－Change of expenditure on research and development－



[Source] Central Electric Power Council

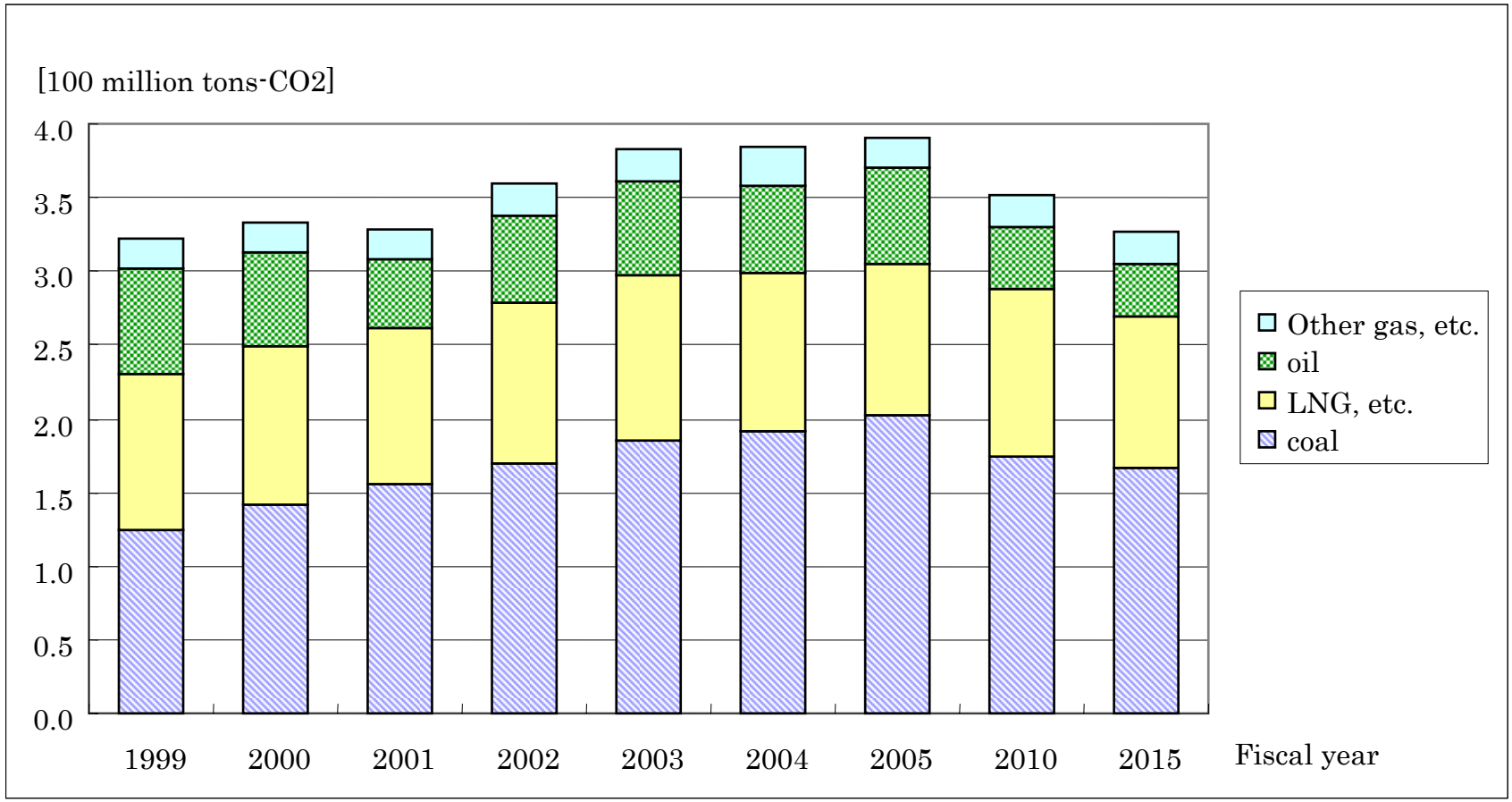
Chapter 3 Evaluation from the viewpoint of environmental protection

1. Trend of CO2 emission

2. Customer needs for environmental adaptability

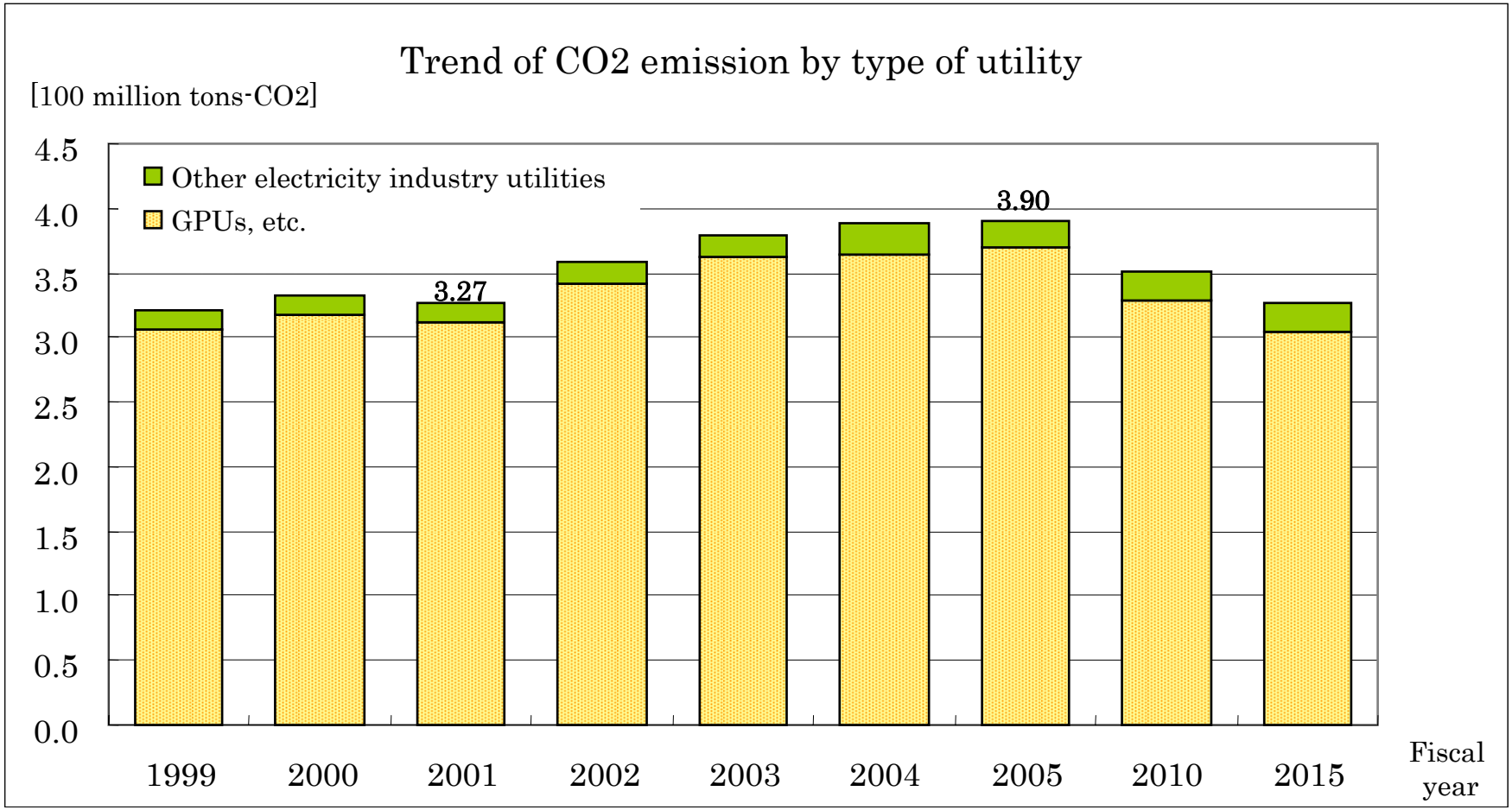
1. Trend of CO2 emission －by type of fuel source－

Trend of CO2 emission by type of fuel source



[Source] Results of the survey conducted by The Japan Electric Power Survey Committee were used to calculate the values in this chart.

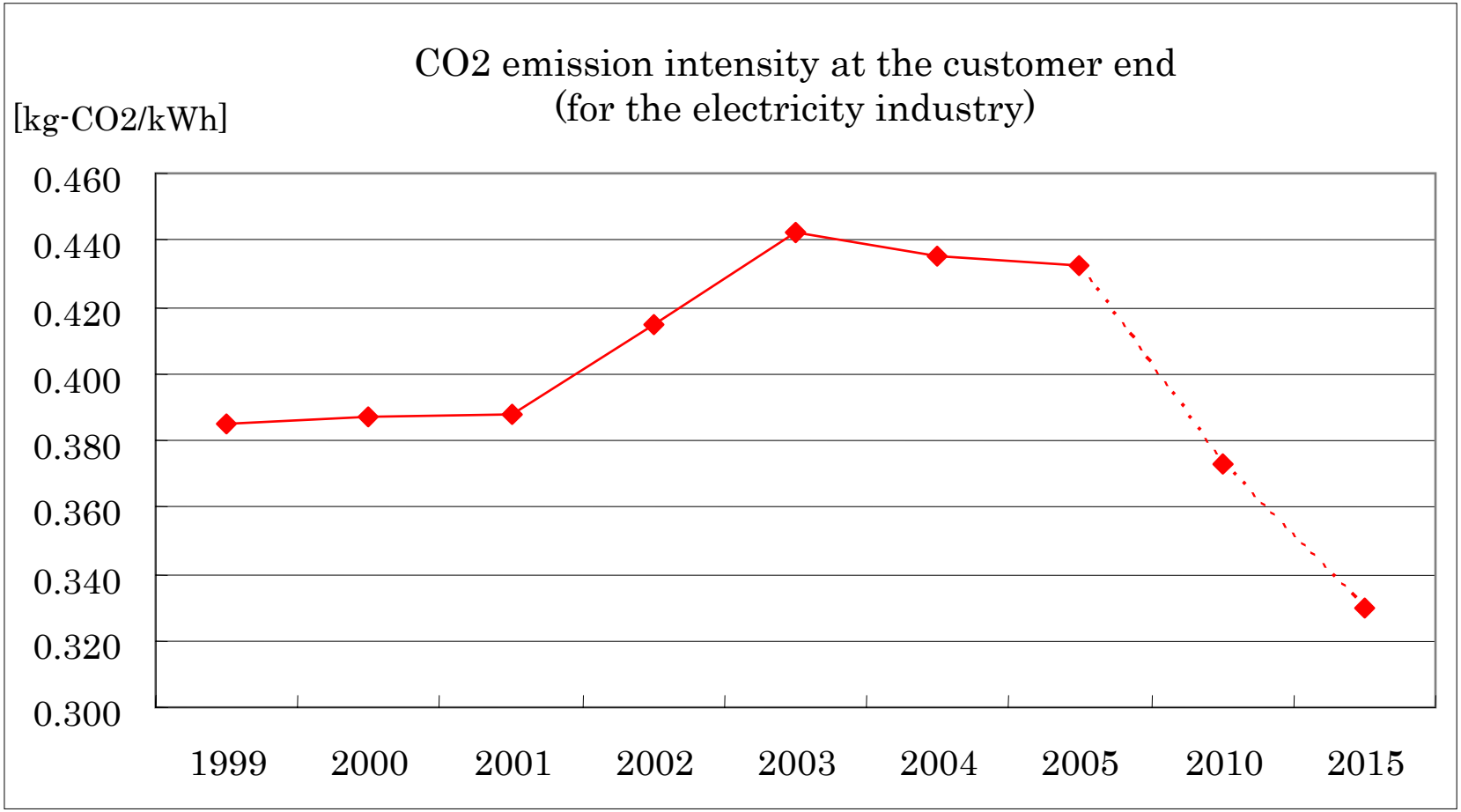
1. Trend of CO2 emission －by type of utility－



※ "Other electricity industry utilities" refer to the total of specified-scale electricity suppliers, specified electric utilities and quasi-wholesale electric utilities.

[Source] The Federation of Electric Power Companies of Japan (～2005), Results of the survey conducted by The Japan Electric Power Survey Committee were used to calculate the values in this chart.

1. Trend of CO2 emission －Trend of the CO2 emission intensity－

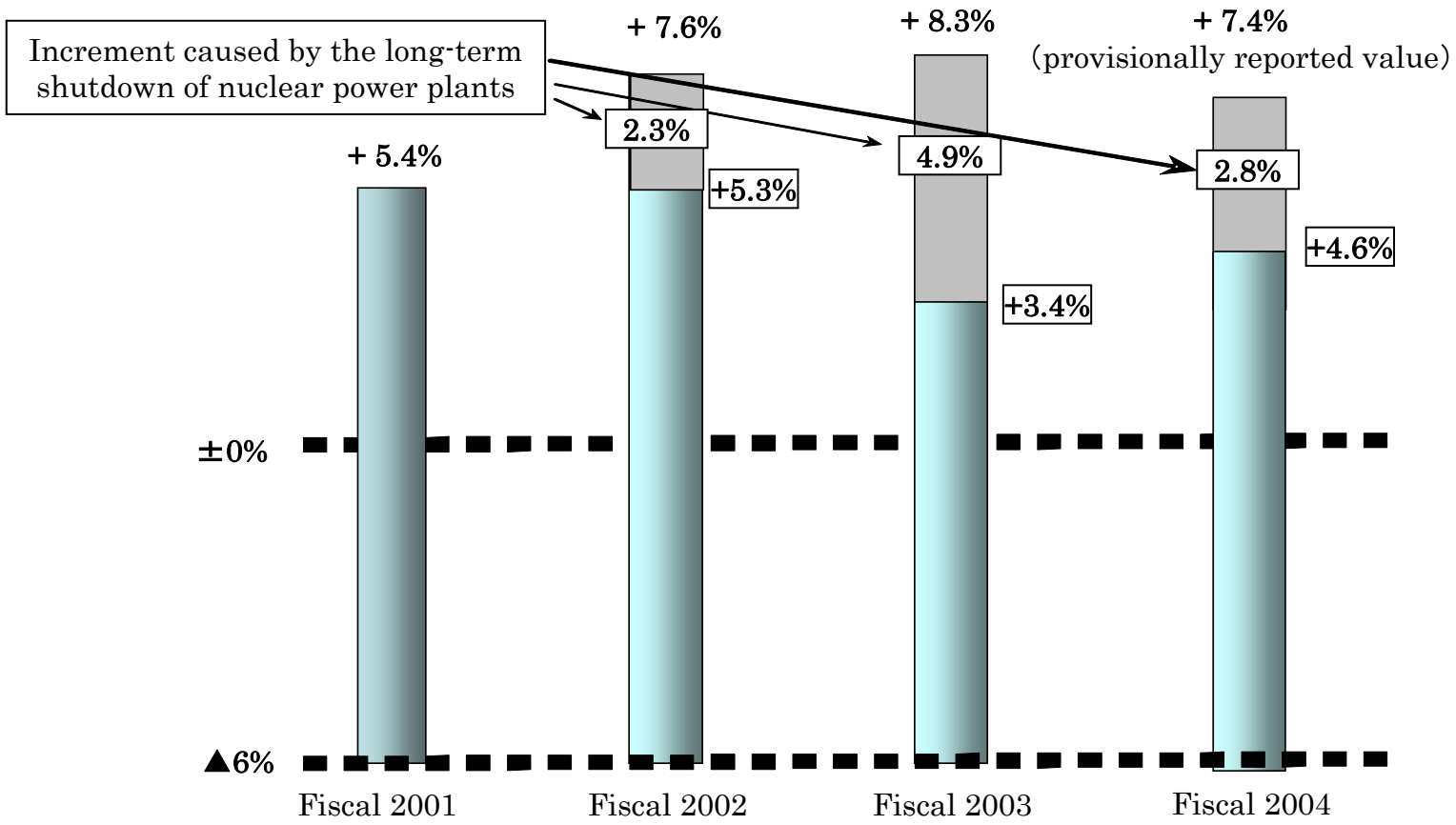


[Source] The Federation of Electric Power Companies of Japan(～2005), Results of the survey conducted by the The Japan Electric Power Survey Committee were used to calculate the values in this chart.

1. Trend of CO2 emission

—Influence of the shutdown of nuclear power plants—

- The shutdown of nuclear power plants affected the volume of CO2 emission, resulting in an increase of 28 million tons in fiscal 2002, 60 million tons in fiscal 2003, and 35 million tons in fiscal 2004. (These increases are respectively equivalent to 2.3%, 4.9% and 2.8% in terms of the ratio to the total CO2 emission in the base year of the Kyoto Protocol.)



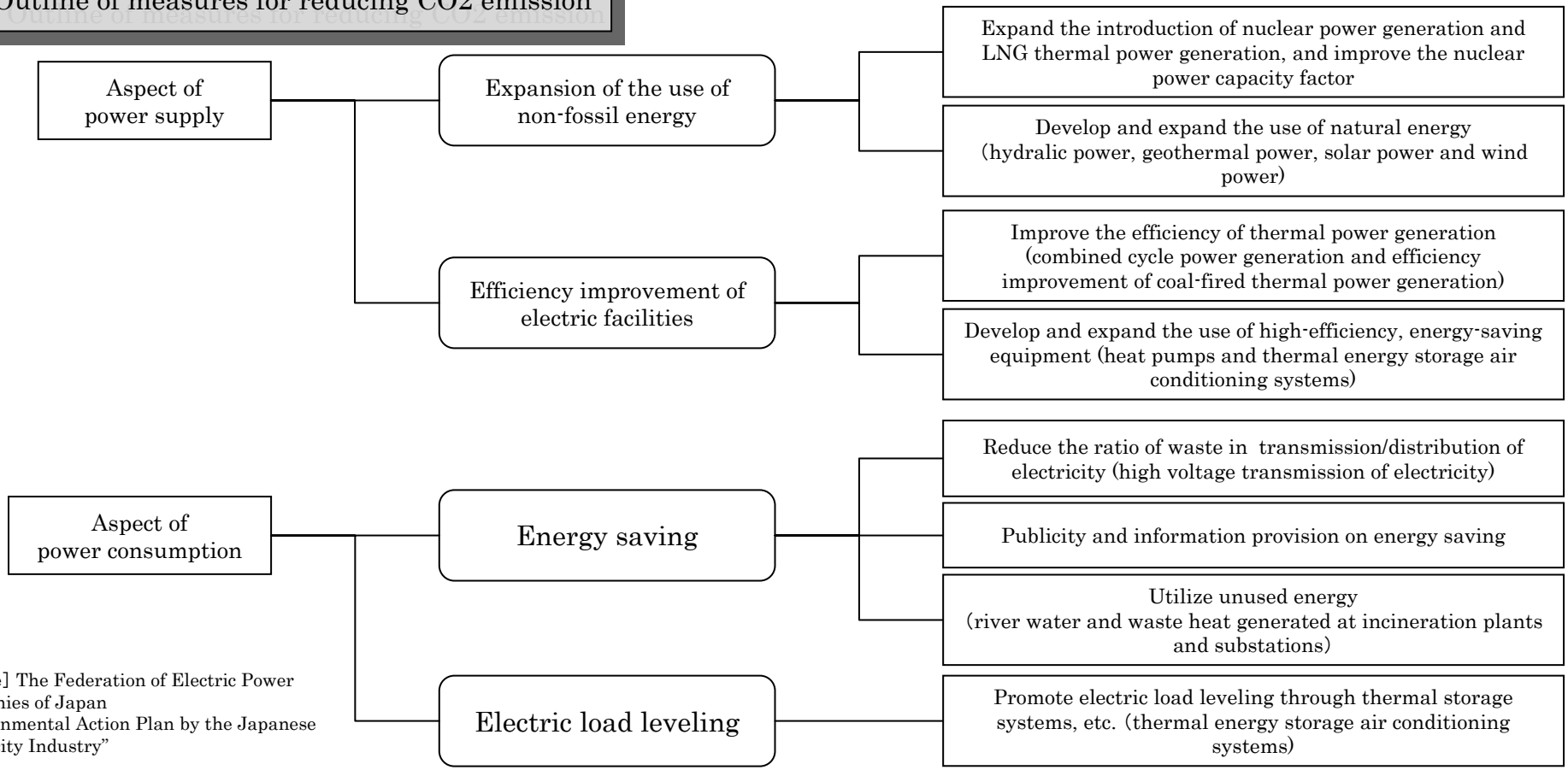
[Source] The values have been calculated by the Agency for Natural Resources and Energy based on the data from the Ministry of the Environment and the Federation of Electric Power Companies of Japan. (※The value of greenhouse gas emission for 2004 is a provisionally reported value.)

1. Trend of CO2 emission

—"Environmental Action Plan in the Japanese Electricity Industry"—

➢The Action Plan was established and released to the public in October 1996 by twelve companies including GPUs, Electric Power Development Co.,Ltd. and The Japan Atomic Power Company, and the Plan shows the targets to be attained by those companies as part of the efforts to address environmental issues such as global warming.
➢The Plan set the target of reducing the CO2 emission intensity at the customer end by about 20% from fiscal years 1990 to 2010.

Outline of measures for reducing CO2 emission



[Source] The Federation of Electric Power Companies of Japan
"Environmental Action Plan by the Japanese Electricity Industry"

2. Customer needs for environmental adaptability

Extract from the report submitted by Takashimaya Co., Ltd. to the second meeting of the Subcommittee to Evaluate System Reforms

As one of their social responsibilities, companies are supposed to pay close attention to their CO2 emission intensity from an environmental perspective. In the course of promoting this scheme, those companies who purchase electricity from a PPS of high CO2 emission intensity would have to abandon the contract with PPSs unless they establish the mechanism of making "cost reduction and environmental protection" compatible. In promoting this scheme, companies are required to take into full consideration from the aspect of "cost and environment." Here, global-scale measures, such as emission trading, would be necessary to have this scheme take root.

2. Customer needs for environmental adaptability

－System of announcing the value of CO2 emission coefficient of individual businesses－

1. Outline of the revised Law Concerning the Promotion of Measures to Cope with Global Warming（enforced from April 1, 2006）

The revised Law introduced the system to oblige those businesses (plant owners, etc.) who emit a large volume of greenhouse gas to calculate their emission
volume and report the calculated volume to the government, and also to oblige the government to sum up all reported values and release the results to the public.

・The volume of CO2 emission in electricity consumption = Volume of electricity consumed × Volume of CO2 contained in 1-kWh consumption (CO2 emission coefficient)
・CO2 emission coefficient to be applied for the calculation can be either
① the value prescribed by the ministerial ordinance（0.555kg-CO2/kWh）or
② the observed value

（Note） The value of 0.555kg-CO2/kWh corresponds to the typical amount of CO2 emission in power generation by self-generating facilities.

2. System of announcing the value of CO2 emission coefficient of individual businesses

The Minister of the Environment and the Minister of Economy, Trade and Industry assist those businesses in calculating the coefficient based on the value ② defined above. Also, for the purpose of promoting the incentive to reduce CO2 emission, the Ministers collect and confirm reports on CO2 emission coefficient, etc. submitted by electric power companies and PPSs, and also release to the public such report of CO2 emission coefficient only when the reported coefficient is lower than the value prescribed by the ministerial ordinance (0.555).

Chapter 4. Evaluation from the viewpoint of individual reform programs

1. Abolishment of the cross-area wheeling service charge
   (the "rate-pancaking" system)
   (1) Vitalization of wide-area distribution
   (2) Adverse influence from the abolishment of the "rate-pancaking" system

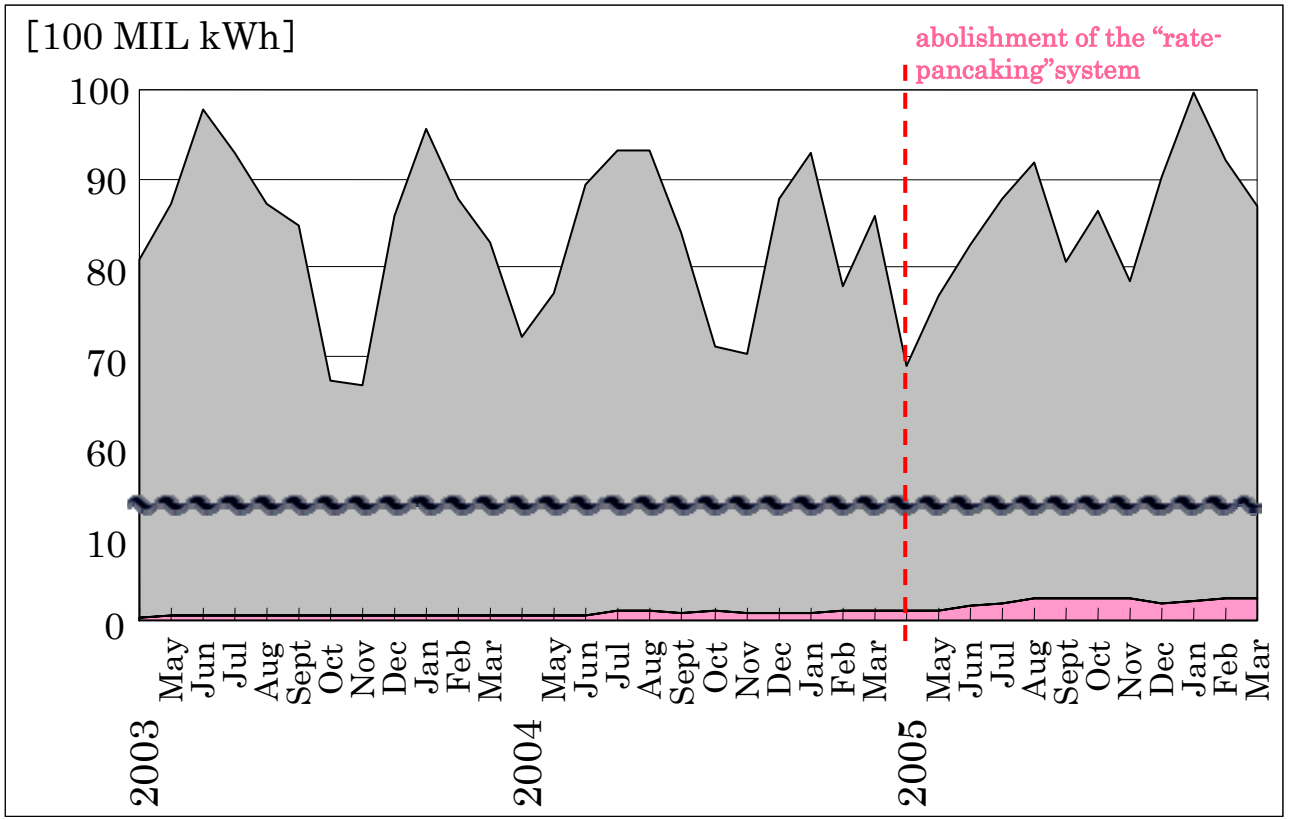
2. Imbalance charge system

3. Establishment of a Neutral System Organization
   (organization to support transmission, distribution and other related operations)

4. Wholesale power exchange
   (1)Volume of transactions
   (2) Verification on the function of indicating reference index price
   (3) Market Splitting

1. Abolishment of the cross-area wheeling service charge (the "rate-pancaking" system)

(1) Vitalization of wide-area distribution – Trends in the utilization of interconnection lines –

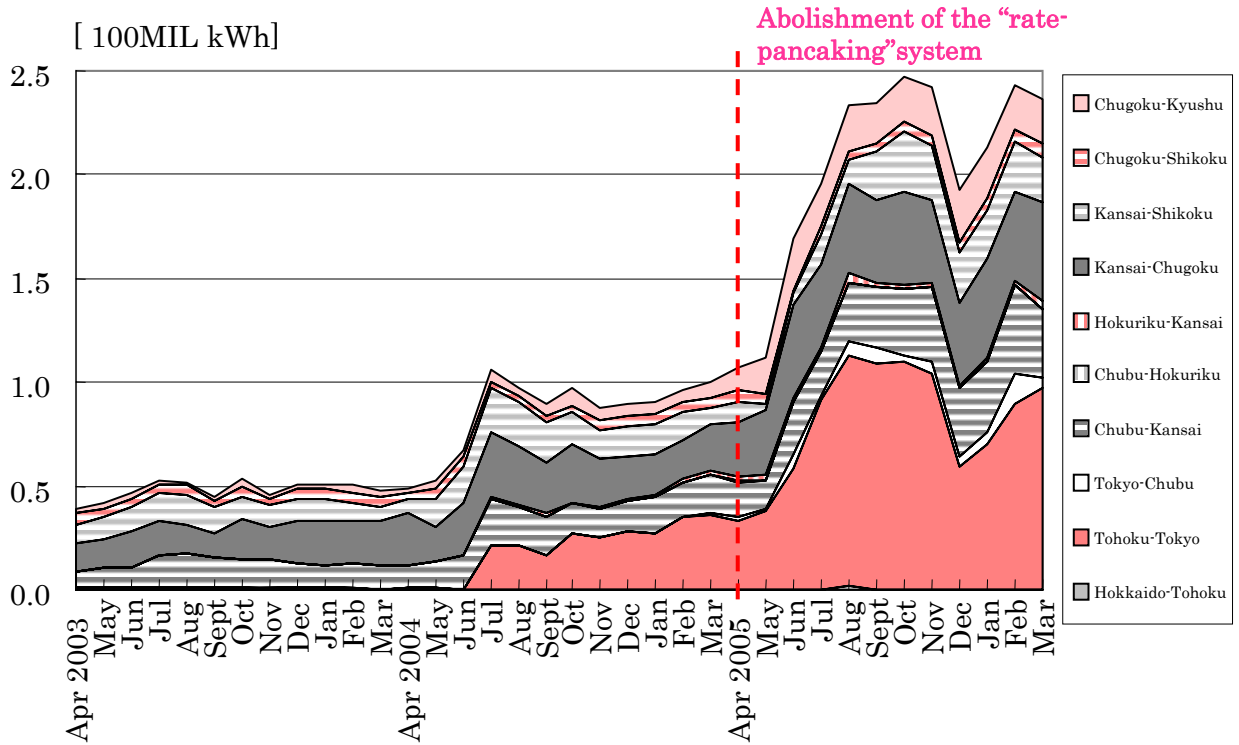


Source: Questionnaire survey by the Ministry of Economy, Trade and Industry (May 2006)

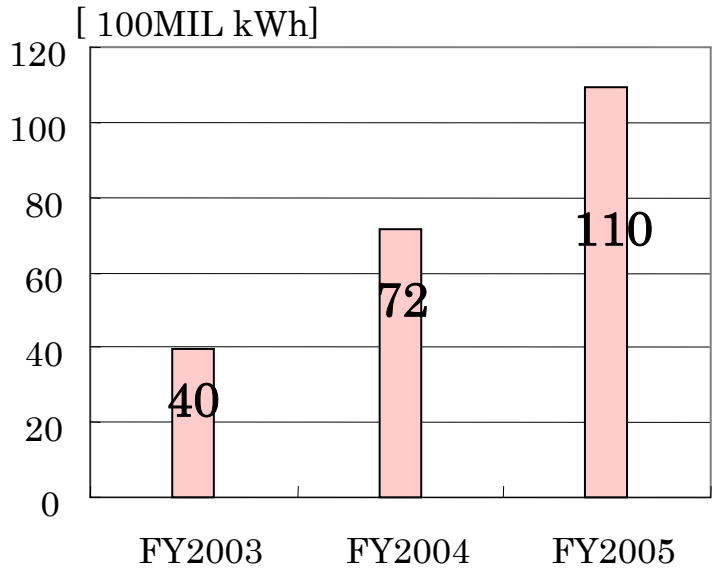
1. Abolishment of the cross-area wheeling service charge (the "rate-pancaking" system)

(1) Vitalization of wide-area distribution – Trends in the utilization of PPS interconnection lines –

Trends in the utilization of PPS interconnection lines



Trends in the volume of electricity sales of PPSs



※The volume of interconnection lines used is the integrated value of the contract value of outward and homeward cross-area wheeling service.

Source: Questionnaire survey by the Ministry of Economy, Trade and Industry (May, 2006), monthly report on electric power statistics

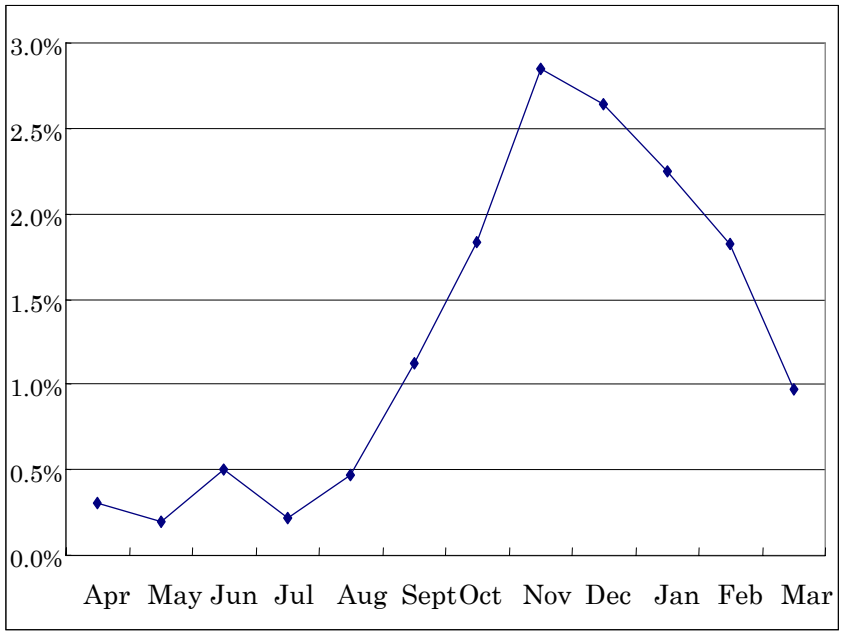
1. Abolishment of the cross-area wheeling service charge (the "rate-pancaking" system)

(1) Vitalization of wide-area distribution

– Status of the utilization of interconnection lines of spot transactions –

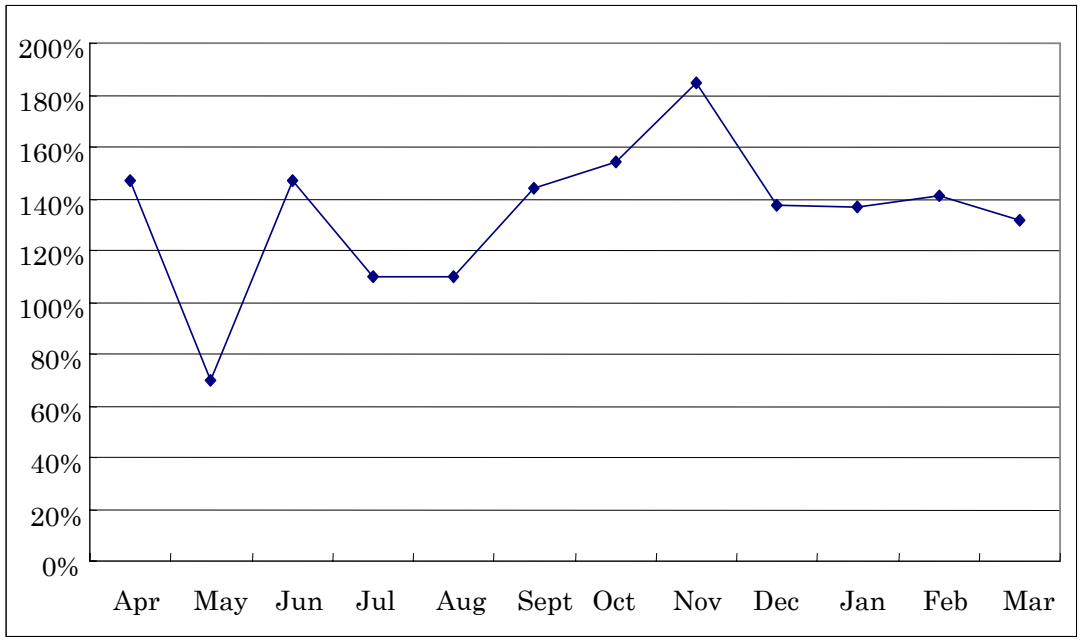
FY2003

Trends in the percentage of spot transactions in the whole volume of utilized interconnection lines



Percentage of utilized interconnection lines in spot transactions in 2005

(Total interconnection lines utilization of spot transactions / Volume of spot transactions)



Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Annual average
147	70	147	110	110	144	154	185	138	137	141	132	143

Source: Electric Power System Council of Japan website (ESCJ data)

1. Abolishment of the cross-area wheeling service charge (the "rate-pancaking" system)

(2) Adverse influence from the abolishment of the "rate-pancaking" system
－ remote power sources of PPSs－

Future plan for PPS' power source construction

	Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu	Nation wide
FY2006	0	6	4	0	0	0	0	0	5	15
FY2007	0	15	17	0	0	0	0	0	0	32
FY2008	0	0	80	0	0	0	0	0	0	80
After FY2009	0	40	120	0	0	111	0	0	0	271
Total	0	61	221	0	0	111	0	0	5	398

Unit: 10,000 kW

※As the transmission lines of power sources outside power companies' limits are considered power source line and become a particular burden, there are disincentives for remote power sources construction.

Questionnaire survey by the Ministry of Economy, Trade and Industry (December 2005)

1. Abolishment of the cross-area wheeling service charge (the "rate-pancaking" system)

(2) Adverse influence from the abolishment of the "rate-pancaking" system

－Effects on the burden on customers in the regulated sector caused by the financial settlement system among utilities－

(Sen /kWh)

	Hokkaido	Tohoku	Tokyo	Chubu	Hokuriku	Kansai	Chugoku	Shikoku	Kyushu
Influence of cross-area wheeling service for PPSs	-	0.00	0.18	0.13	-	0.21	0.12	0.00	0.04
Influence of interchange among GUPs	0.00	0.00	▲0.08	▲0.01	0.00	▲0.04	▲0.02	0.01	0.02
Total	0.00	0.00	0.10	0.12	0.00	0.17	0.10	0.01	0.06

Questionnaire survey by the Ministry of Economy, Trade and Industry (February 2006)

Formula for calculating the influence on the burden on customers in the regulated sector of the financial settlement system among suppliers

Influence on the unit price of burden on customers in the regulated sector in each utility's service area through the introduction of the financial settlement among suppliers:

- Influence PPS' cross-area wheeling service has on customers in the regulated sector in each utility's service area.
- Influence interchange between power companies has on customers in the regulated sector in each utility's service area.

Accounting the balance when ① It is a specific burden (old system) and ② It is a general burden for each case.

・Influence of PPS' cross-area service (=②－①)= $\frac{Cp}{Qp+Qg}$ － 0

※Under the old system, the burden on customers in the regulated sector is nil with regards to the costs (Cp) associated with PPS' cross-area wheeling service.

・Influence of interchange among power companies

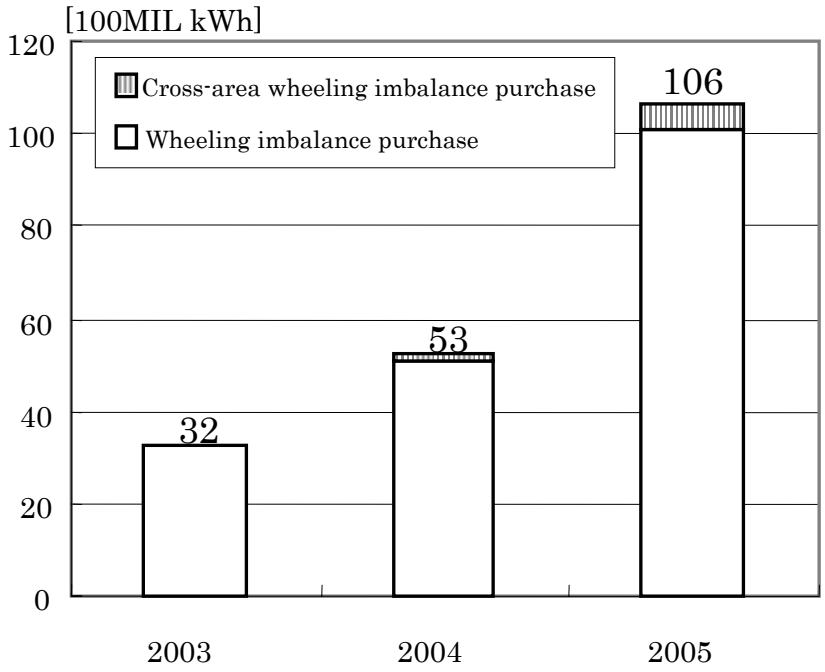
(=②－①)= $\frac{Cg}{Qp+Qg}$ － $\frac{Cg}{Qg}$

Cp ：Total of cross-area wheeling service charge and wheeling loss supplementation associated with PPS' cross-area wheeling service.
Cg ：Total of cross-area wheeling service charge and wheeling loss supplementation associated with interchange among GUPs.
Qp ：PPS's Electric Energy Demand of each service area.
Qg ：Electric Energy Demand of power companies of each service area.

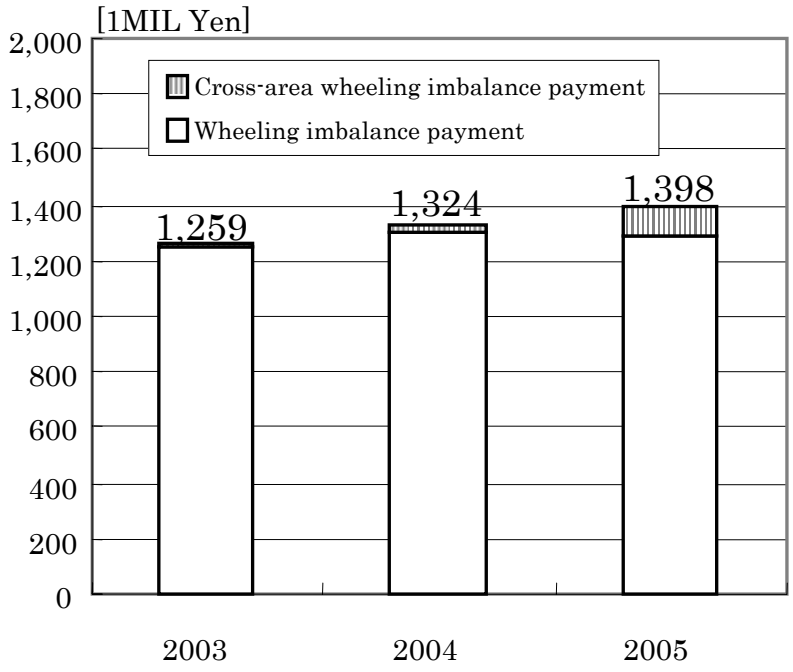
2. Imbalance Charge System

– Trends in the occurrence of PPS' imbalance

Purchased volume of PPS for imbalance



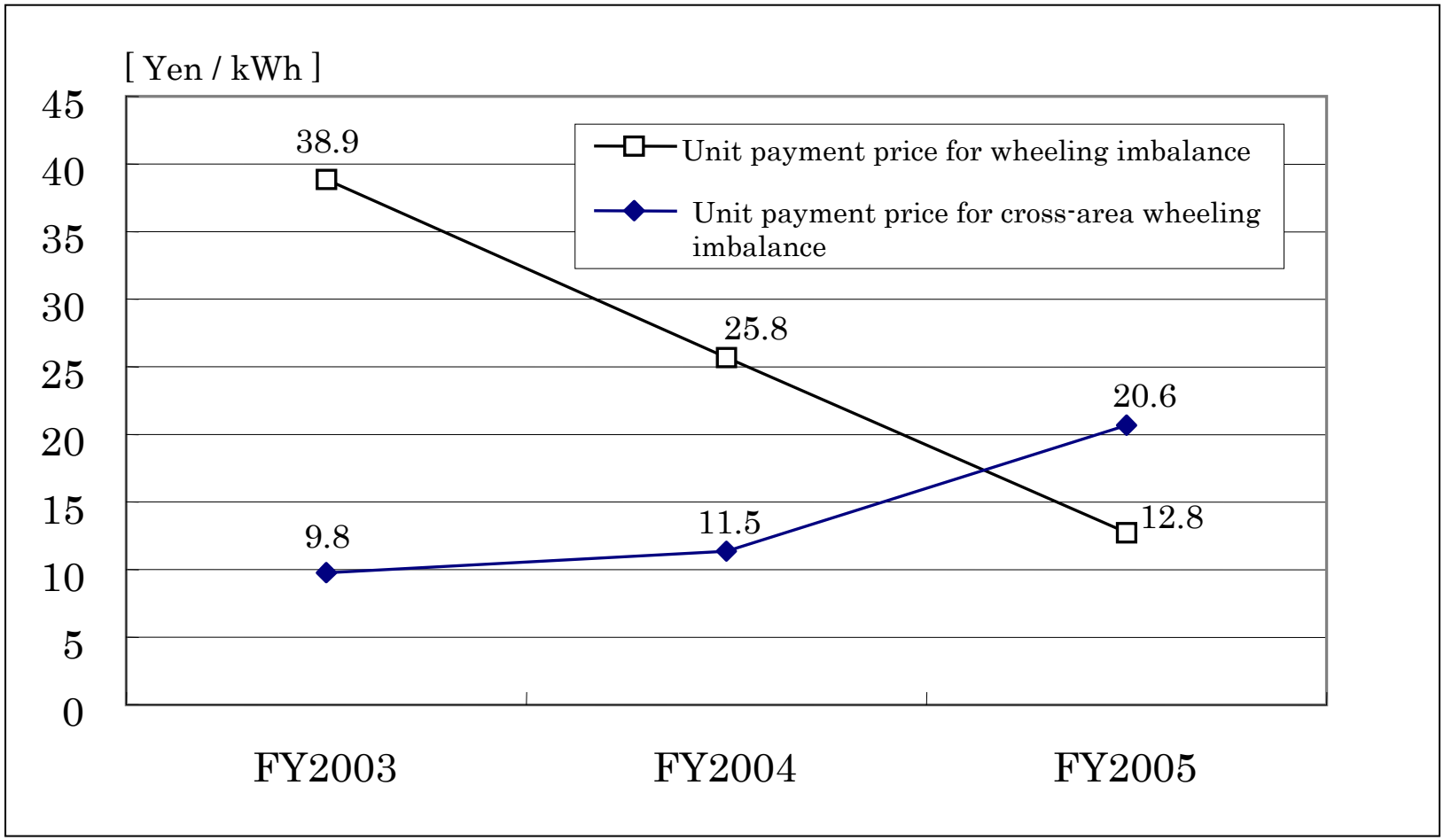
Imbalance payment



Questionnaire survey by the Ministry of Economy, Trade and Industry (May 2006)

2. Imbalance charge system

– Trends in achieved unit price of imbalance charge–



Questionnaire by the Ministry of Economy, Trade and Industry (May 2006)

The margin and its reevaluation

①Margin

Capacity secured for the interconnection lines of each area for the transmission sector of ordinary power suppliers to receive electricity with other areas covered by respective GPUs through inter-regional interconnection lines or for stably maintaining the system in response to system abnormality and a specific light load.

※From the ESCJ rules

②Capacity to secure as a margin (old view)

As a general rule, **3% of the system capacity** or any volume enough to ensure system stability should be secured for a case where the principal power source unit fails.

※From the ESCJ rules

In accordance with the expectation for a neutral system organization to discuss the reorganization of the ideas on the reserve supply strength through interconnection facilities based on the conventional concept, noted in the Committee's report, a reevaluation of the 3% margin capacity was initiated in FY 2005.

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

3. Establishment of the neutral system organization (organization to support transmission, distribution and other related operations)

—Reevaluation of the margin of inter conection lines(2)—

③Status of revaluation in 2005

・It was reported that it would be appropriate to ensure a 3% margin for the interconnection lines as a result of recalculating the margin capacity by referring to the latest data according to traditional concepts based on the statement in the Committee report.

・On that note, ESCJ will continue to discuss whether the various criteria to support the 3% margin are adequate.

・However, regardless of the outcome of the discussion, the margin for the interconnection lines will be reduced to the extent that there is enough reserve strength for the regional supply to keep the system stability.

Specifically, the convenience for system users has been improved by offering allowance to reduce of margin to spot transactions two months ahead, although only day-ahead offer was allowed before.

⇒The Council's rules were revised in accordance (March 2006)

※Interconnection lines considered for margin reduction: Hokkaido-Mainland Japan interconnection facilities (Hokkaido to Tohoku), Soma Futaba Trunk Line (Tohoku to Tokyo), and three Frequency Converter lines (2-way). Reduction will be implemented during the Summer (Jun-Sept) when the secured margin is at its maximum, but the interconnection lines and the implementation period subject to reduction will be extended if necessary.

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

Improvement of the utilization of the FC

①Constraint on the utilization of the FC so far

- Step restriction of 20,000kW
- Lowest power flow constraint of 40,000kW

Before the liberalization of the retail market, the main objective of the FC was to respond to such emergencies as unexpected changes in supply and demand capacity, and these restricitions were not exposed, since a lot of power flow had flowed in this instance.

These restrictions became evident as the need for small-scale use of FC increased by the progress of the liberalization of the retail market, and particularly, the establishment of the wholesale market.

Discuss measures to improve the utilization of the FC

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

3. Establishment of the neutral system organization (organization to support transmission, distribution and other related operations)

－ Improving the utilization of the Frequency Converter (FC) (2) －

②Measures to improve the utilization of the FC

a. Higashishimizu FC

・Operation began by the end of March 2006 as an emergency measure.

・The constraint of the FC in general were improved during the operation of the Higashishimizu FC (however, there may be operational restrictions with the Higashishimizu FC, depending on how the nearby hydroelectric plants are operating).

b. Shishinano #2 FC

・Upgrade of the control unit of Shinshinano #2 FC will be carried out in the Summer of 2006 so that the FC restrictions are eased, even if there are restrictions placed on the operation of the Higashishimizu FC (the restrictions on the Shinshinano #1 FC will not change after the upgrade).

c. Shinshinano #1 FC

・Due to aging, the facilities of Shinshinano FC will be replaced around June 2009 (the restrictions of the entire Shinshinano FC will be improved by the replacement).

・"Step restriction" is resolved (20,000kW→1,000kW)

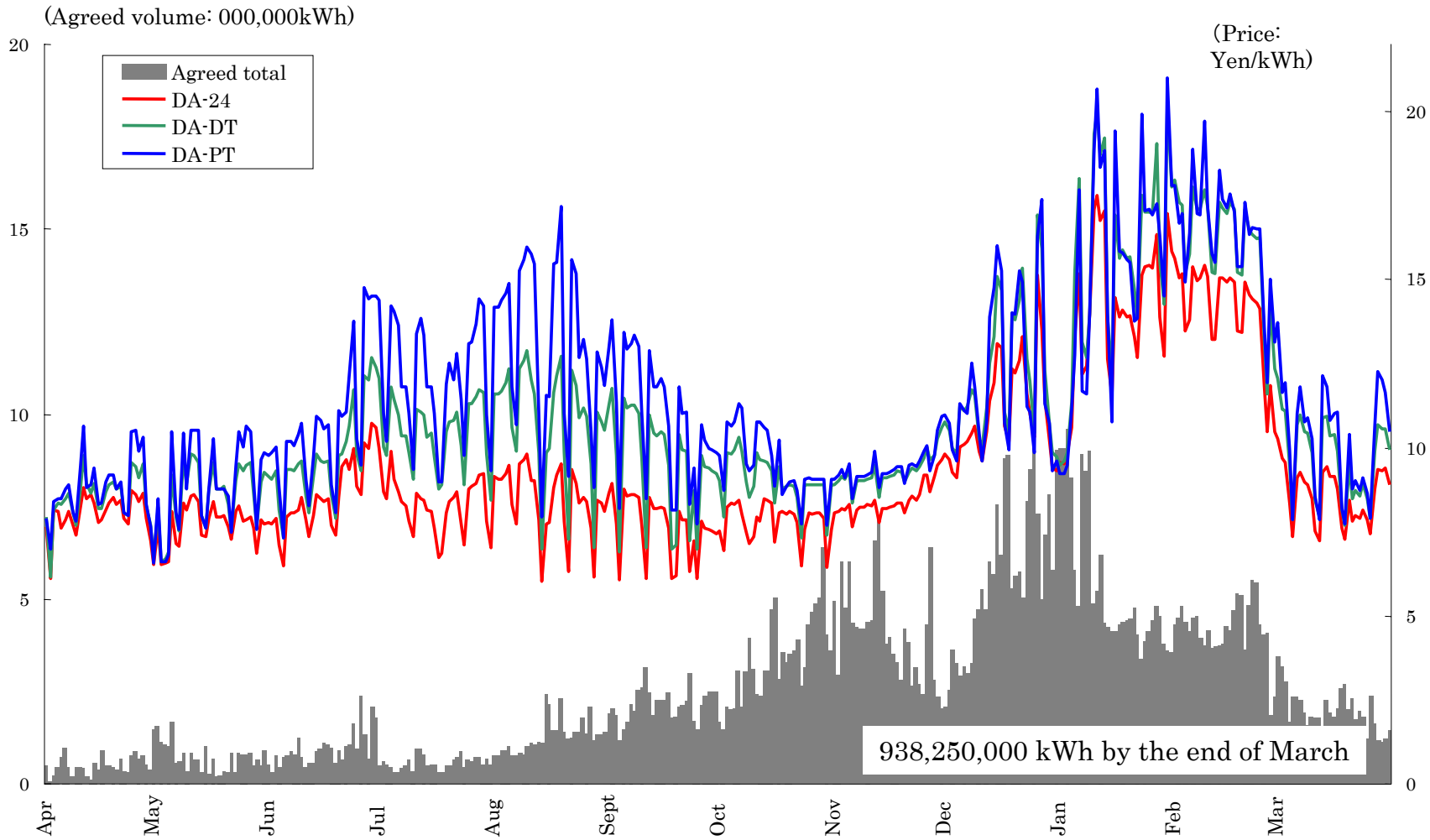
・"Lowest current constraint" is reduced (40,000kW→30,000 kW)

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

4. Wholesale Power Exchange

(1) Volume of transactions —Trends of the volume of spot transactions—

Record of transactions



Source: Japan Electric Power Exchange

4. Wholesale Power Exchange

(1) Volume of transactions —Trends of the volume of forward transactions—

Record of transactions

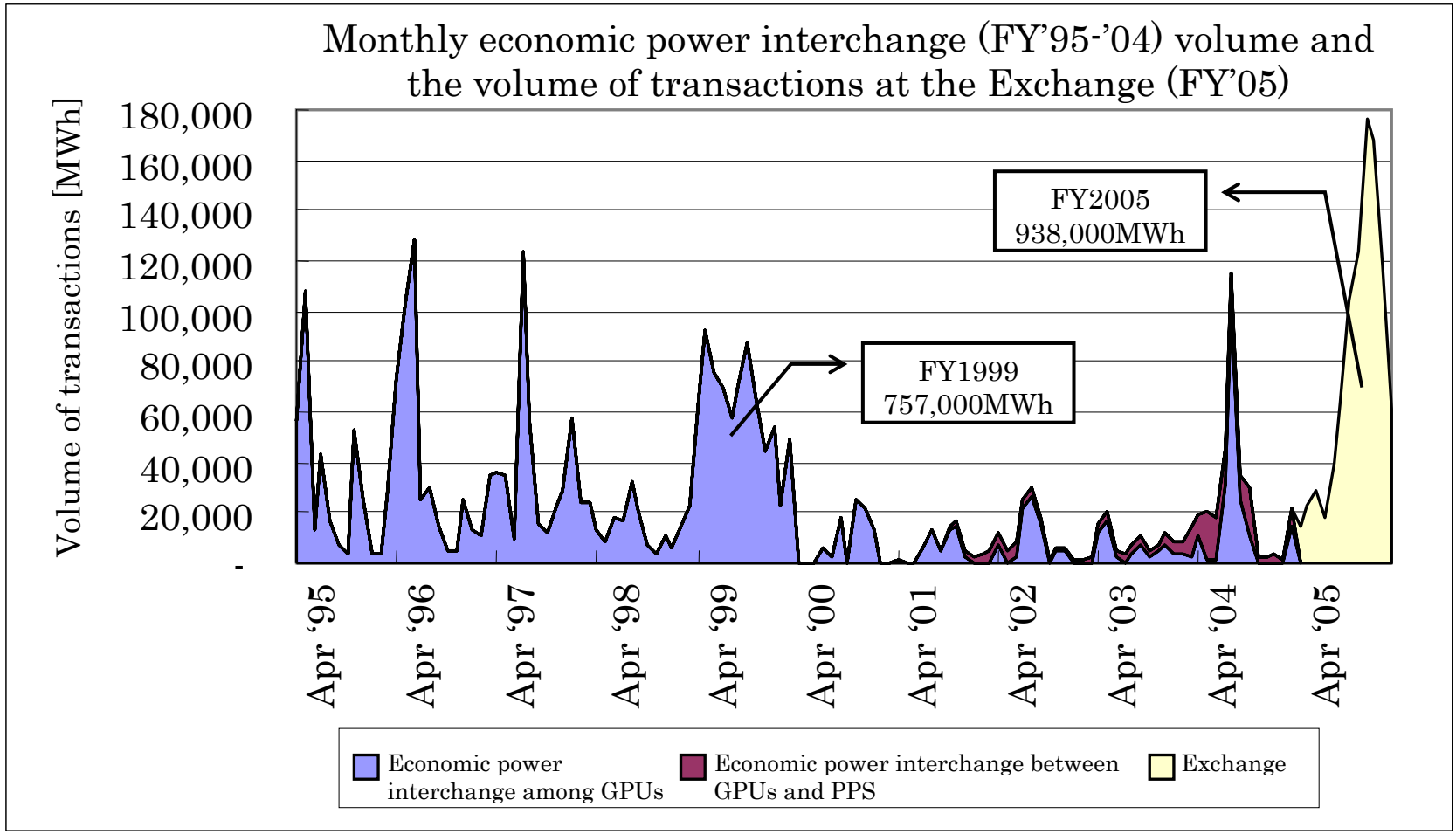
Commodities		Average agreed price (Yen/kWh)	Agreed volume (kWh)	Agreed number
Jun	Day type	11.96	7,280,000	5
Jul	Day type	16.33	3,150,000	3
Aug	Day type	15.40	1,890,000	1
Sept	Day type	13.75	1,344,000	1
Nov	24hr type	8.40	7,200,000	1
Dec	Day type	11.71	336,000	1
Jan	24hr type	11.05	29,760,000	1
Jan	Day type	12.87	18,676,000	3
Feb	24hr type	10.62	3,360,000	1
Feb	Day type	14.06	44,758,000	9
Mar	24hr type	14.05	29,760,000	1
Mar	Day type	16.40	2,912,000	1
Total		13.40	150,426,000	28

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

4. Wholesale Power Exchange

(1) Volume of transactions

—Trends of economic power interchange and transactions at the Exchange—



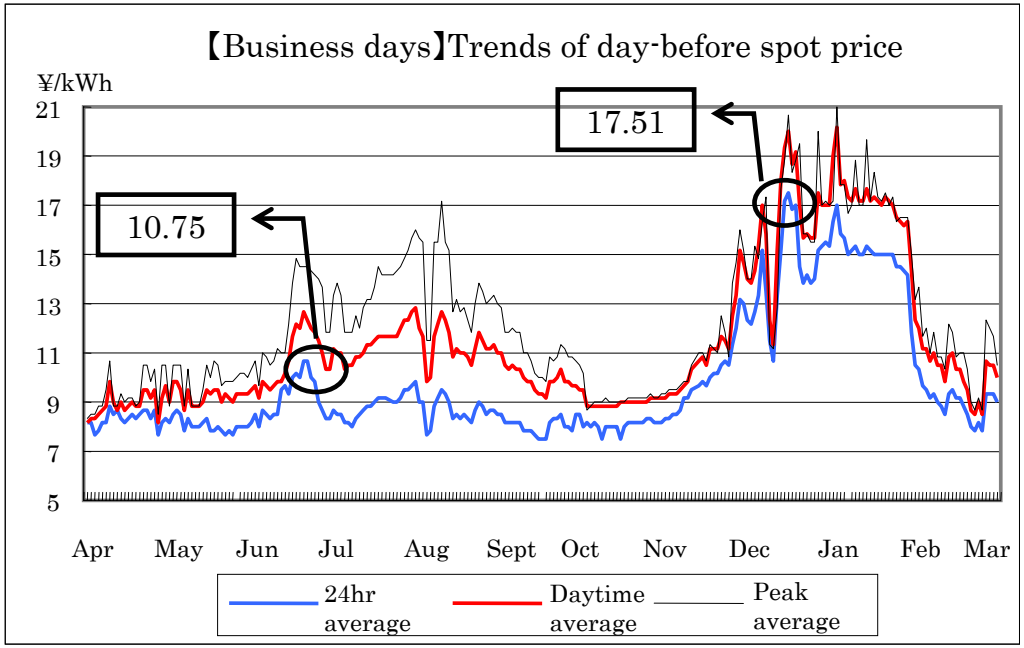
Source: Japan Electric Power Exchange website and the questionnaire survey by the Ministry of Economy, Trade and Industry (May 2006)

4. Wholesale Power Exchange

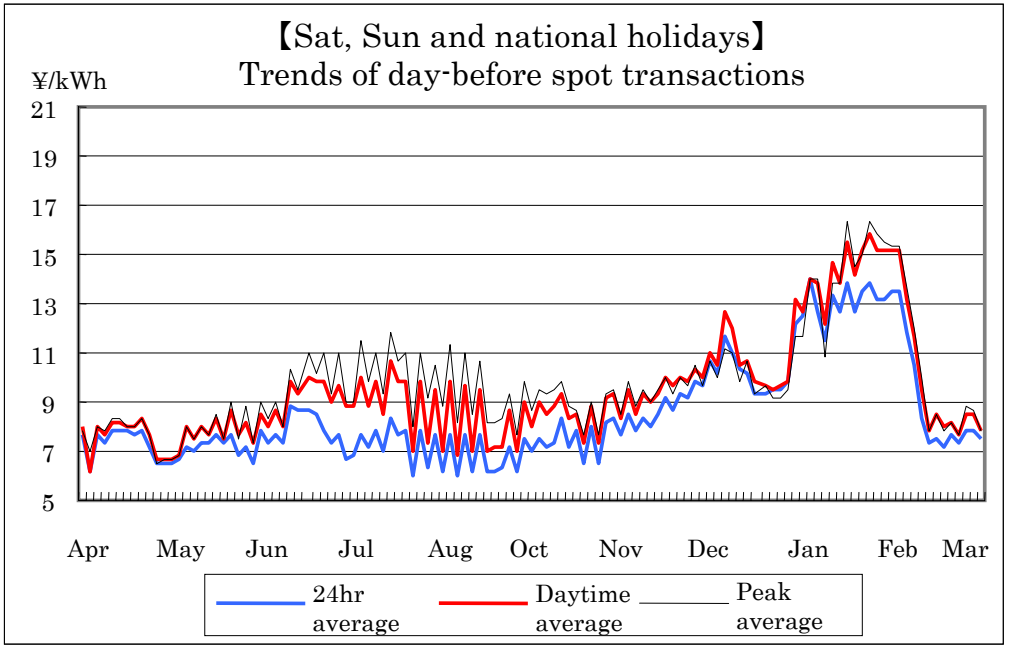
(2) Verification on the function of indicating reference index price

– Prices of spot transactions ("system price")–

Business days



Non-business days



※*Daytime: 8:00～22:00, Peak hours: 13:00～16:00*

Source: Japan Electric Power Exchange website

4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
—Simulation based on optimum power source composition model —

● Price valuation analysis method of the wholesale power market

➢ Method:

Build an optimum power source composition model and recreate the operation of the power source by month, day and region. By comparing the average and marginal cost, with the agreed price of the Wholesale Power Exchange on the model, evaluate and analyze the wholesale power market.

➢ Cautions:

・In calculating the marginal cost, fuel cost between April and October 2005 (Customs statistics), capacity composition by region and type of generating facility at the end of FY'03 (Monthly report on electric power statistics), and the variable operation cost by type of generating facility, estimated by the cost reported on the financial statements of each power company between FY'89 and '03 are used.

・In calculating the average cost, use the lifetime average cost based on a hypothesized rebuilding of all power sources used at each time point.

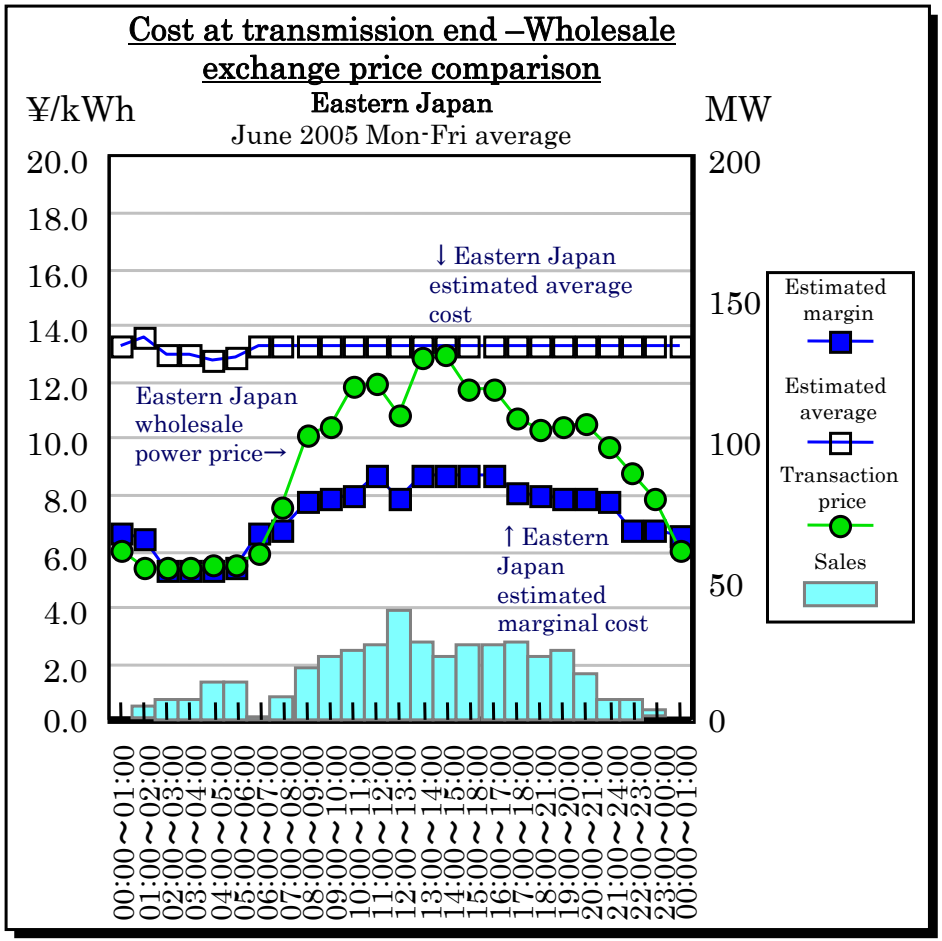
・Moreover, since there are times when the transaction price substantially differs in any given week, depending on the month, sometimes a statistically significant test result may not be obtained.

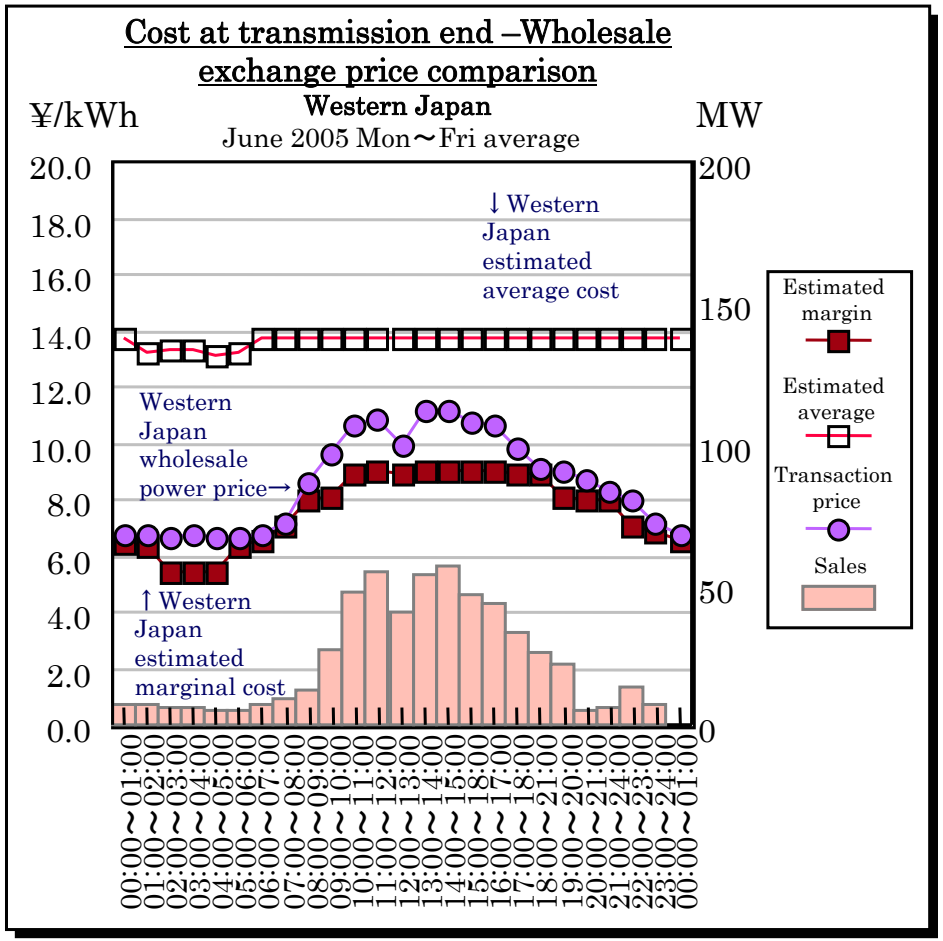
(※ This analysis was made with the cooperation of Mr. Kaino, research fellow at the Research Institute of Economy, Trade and Industry, as part of a commissioned study)

4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
—Simulation based on optimum power source composition model—

- Estimation results of business days in June 2005

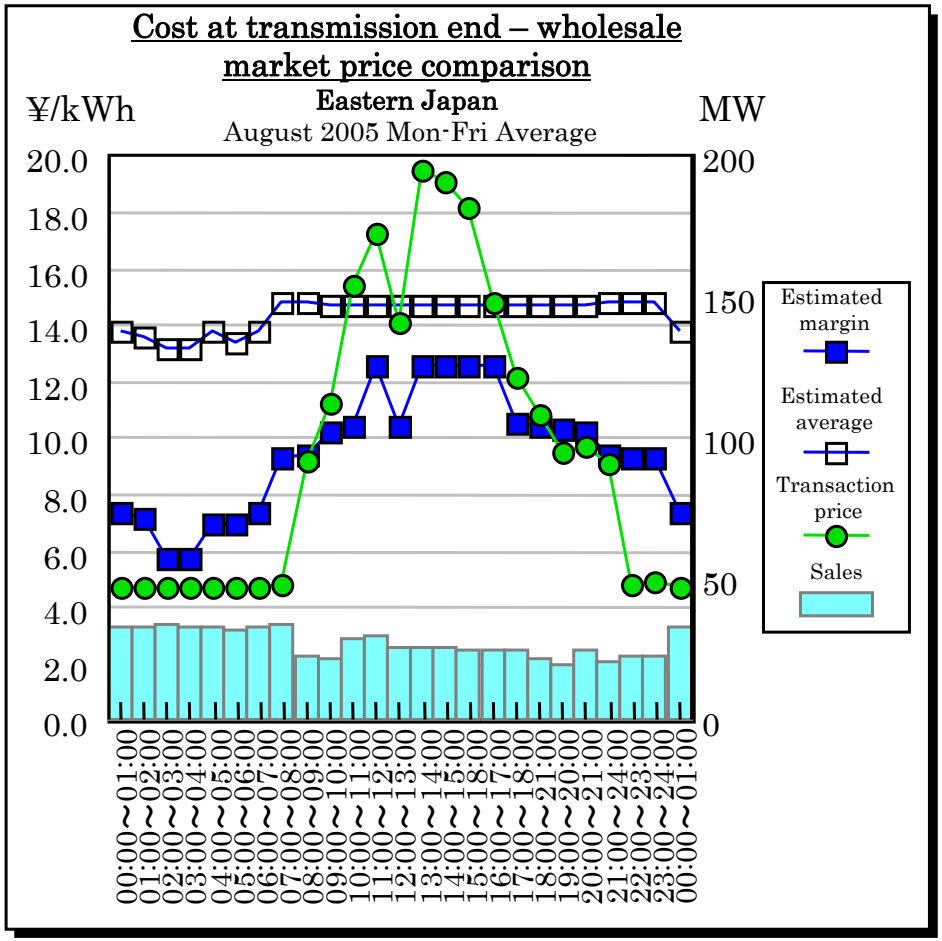


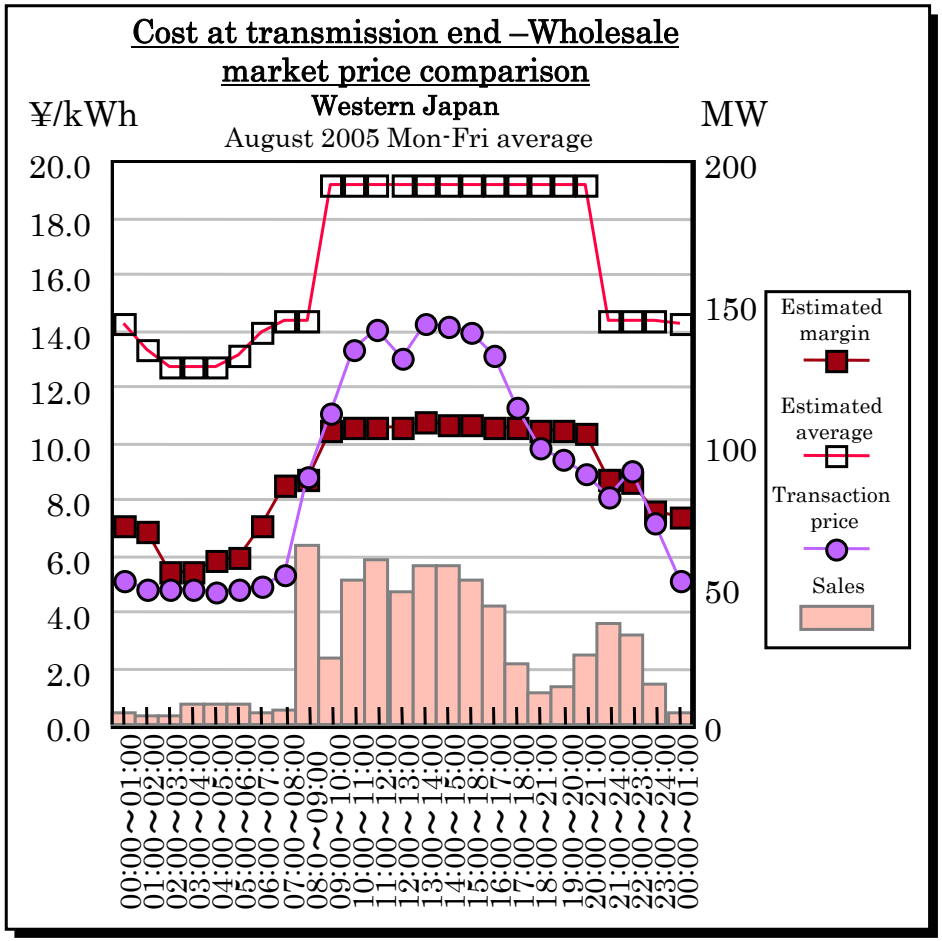


4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
—Simulation based on optimum power source composition model—

- Estimate results of business days in August 2005

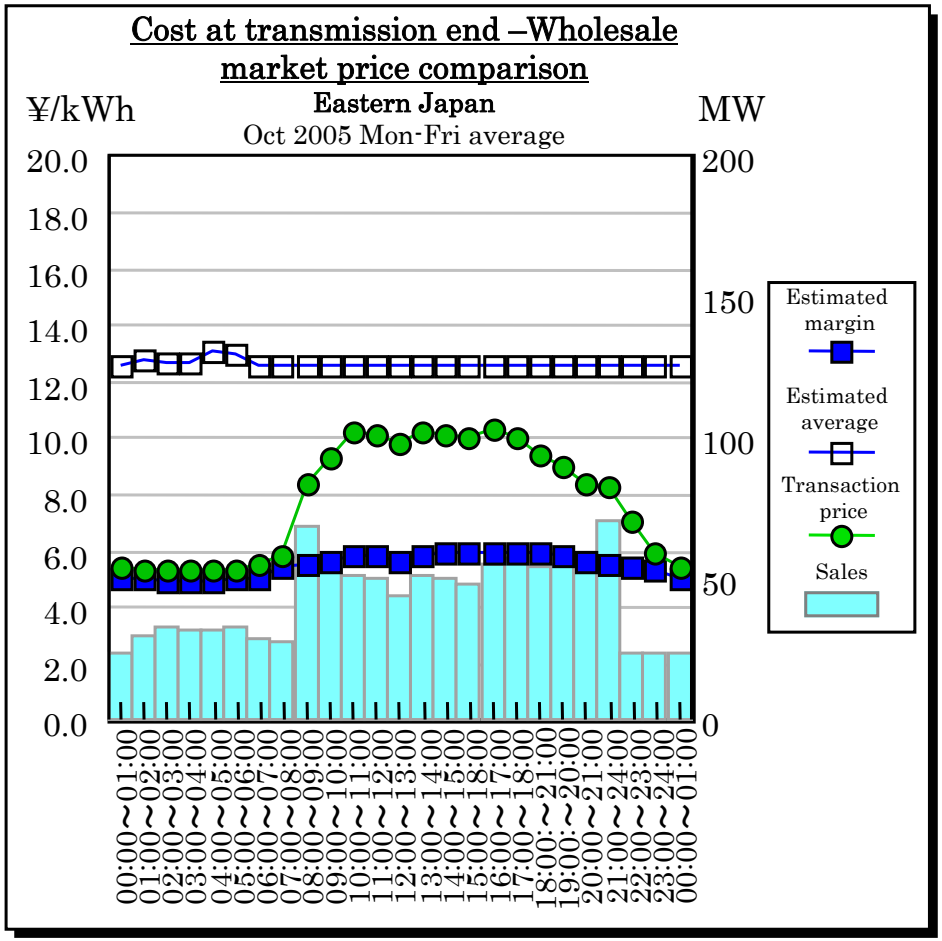


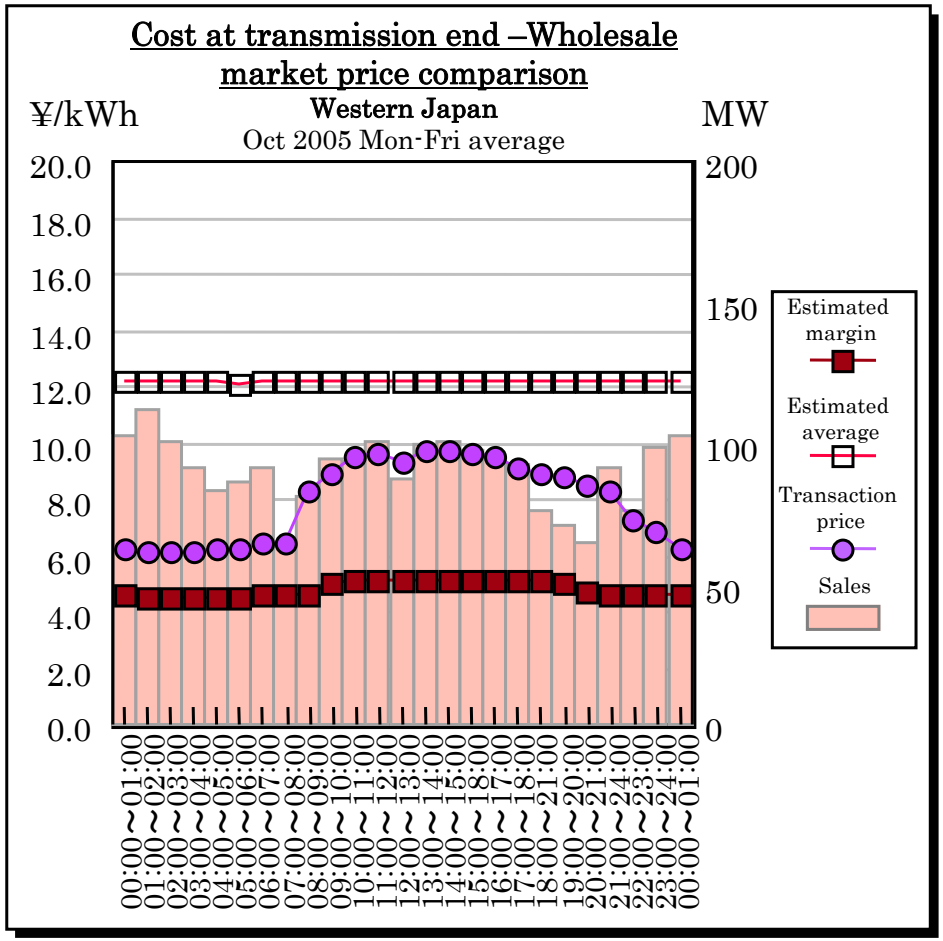


4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
—Simulation based on optimum power source composition model—

- Estimate results of business days in October 2005





4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
—Market monitoring and verification at the Japan Electric Power Exchange(1)—

The secretariat constantly monitors the action of the traders, and examines their transactions by holding the committee for monitoring market transactions and the special Committee for verification of market transactions almost every month based on all transaction data.

Overview of the monitoring by the secretariat

Spot transaction: Monitor the bids by trade participants on all commodities (48) per day.
Forward transaction: Monitor the bid behavior (bid price, volume and timing) during market opening.

Overview of the monitoring by the the committee for monitoring market transactions

①Spot transaction

- Have monitored the presence of spot transaction price manipulation such as deliberate price-fixing during supply-demand crisis by suppliers with a great market share in the power generation market.

②Forward transaction

- Have monitored the presence of price manipulation such as self-dealing, bogus dealing and false-bit, and violation of antitrust laws such as cartels (carry out a promising transaction after colluding with another trader in advance).

The name of the supplier and the details of the violations it committed are made public if a violation is verified, but there has been no such case so far as a result of the monitoring activities.

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

4. Wholesale Power Exchange

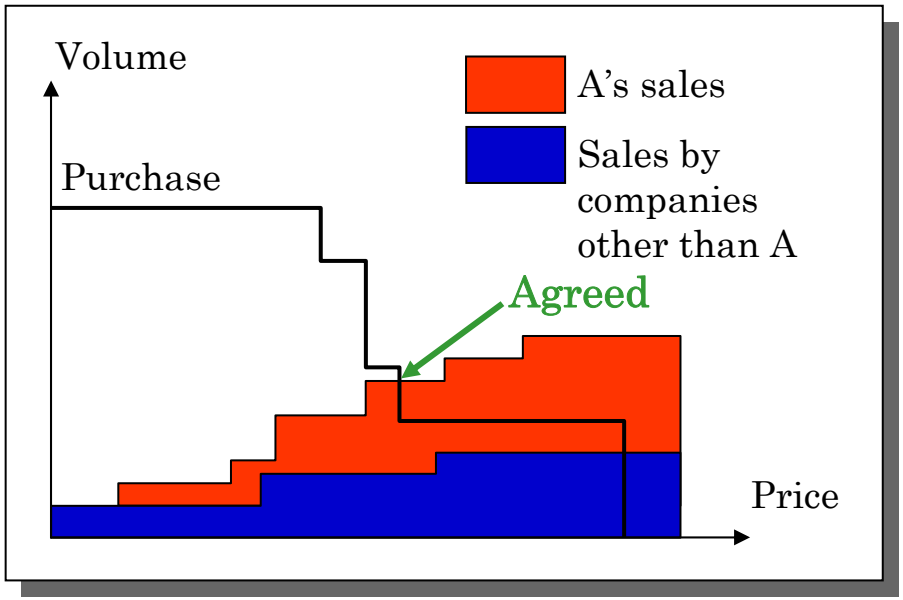
(2) Verification on the function of indicating reference index price

– Market monitoring and verification at the Japan Electric Power Exchange(2) –

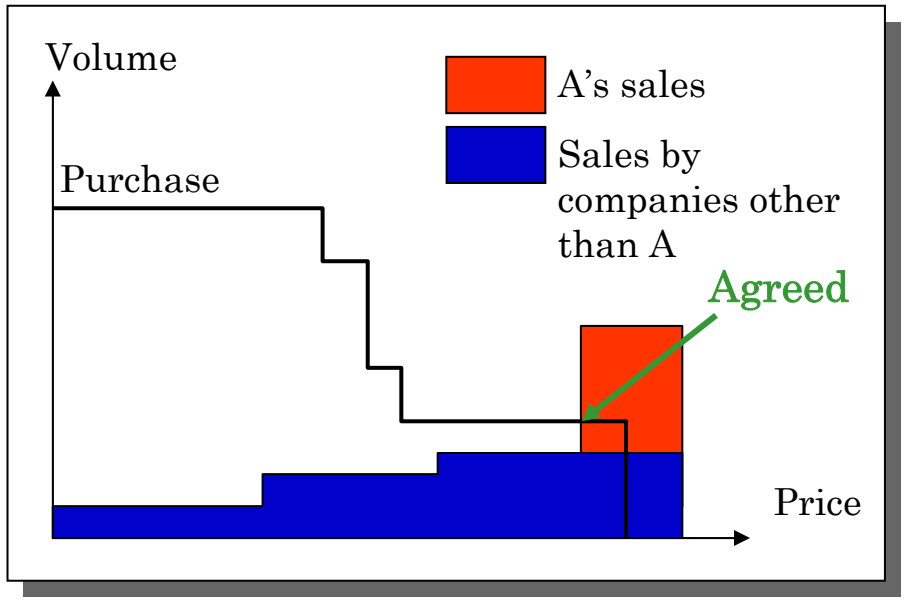
(Example of a potential violation)

Unjust high price-fixing after recognizing the substantial impact one's company would have on the market.

Usually



Market price-fixing by exercising the market power



Although the sales and purchase by companies other than A have not changed, the commitment is priced high since A has changed its bidding.

A went ahead with a sale at a high price by narrowing down the sale after recognizing that the the volume of purchase absolutely needed is not enough with just other companies (confirmed its impact on the market.)

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

4. Wholesale Power Exchange

(2) Verification on the function of indicating reference index price
— Market monitoring and verification at the Japan Electric Power Exchange (3) —

Overview of monitoring by the special committee for verification of market transactions

Verifying the appropriateness of the input by GUP's into the Exchange in terms of consistency with their declaration to the Electricity Industry Committee.

①Spot transactions

- Checks to see if the volume of sales exceeds the volume of purchase for all commodities (48 commodities per day, each time zone). Also discloses the volume of input by each commodity and their respective volume of sales and purchase on the website.
- If the criteria are not met, it interviews the GPUs with a small volume of sales about their power unit incidents and supply-demand crisis.
- At the same time, it conducts hearings with GPUs on the method of formulating next-day power generation plans for the purpose of contributing to validating the adequacy of future input.
- On the aspect of price, it verifies if liquidity is being ensured by comparing the sales bid volume and purchase bid volume in an effective price range.

②Forward transaction

- Examines to see that each commodity (normally the next 12 months x 2 types (24-hr, daytime) is being offered without leaving a gap in the time period.
- By making comparison with the spot rate, it evaluates the agreed price and volume, and checks to see if the sales price diverged substantially at the stage when the price of commodities that do not reach an agreement comes close towards the closing of trading.

If any problems are found as a result of an examination, they are disclosed along with the names of the utilities, but so far there has been no such case.

Source: Document submitted at the 6th Subcommittee to Evaluate System Reforms, ESCJ.

4. Wholesale Power Exchange

(3)Market splitting －Spot transactions (1)－

Market splitting (1/2)

Period (month)		4	5	6	7	8	9	10	11	12	1	2	3
Number of commodities		1,392	1,488	1,440	1,488	1,488	1,440	1,488	1,440	1,488	1,488	1,344	1,488
Frequency of splitting by area-area	Hokkaido-Tohoku		292	162	86	22	38						
	Tohoku-Tokyo												
	Tokyo-Chubu	690	1,184	1,230	1,368	1,349	1,299	1,405	1,345	1,368	1,434	1,301	1,267
	Chubu-Kansai												
	Hokuriku-Kansai												
	Chubu-Hokuriku												
	Kansai-Chugoku												
	Chugoku-Shikoku				27		1		1				
	Chugoku-Kyushu			1					2			12	
Total frequency of splitting		690	1,476	1,393	1,481	1,371	1,338	1,405	1,348	1,368	1,434	1,313	1,267

※ All splittings between Hokkaido and Tohoku are Hokkaido⇒Tohoku

Refer to the next page for splitting between Tokyo and Chubu

All splittings between Chugoku and Shikoku are Shikoku⇒Chugoku

All splittings between Chugoku and Kyushu are Kyushu ⇒Chugoku

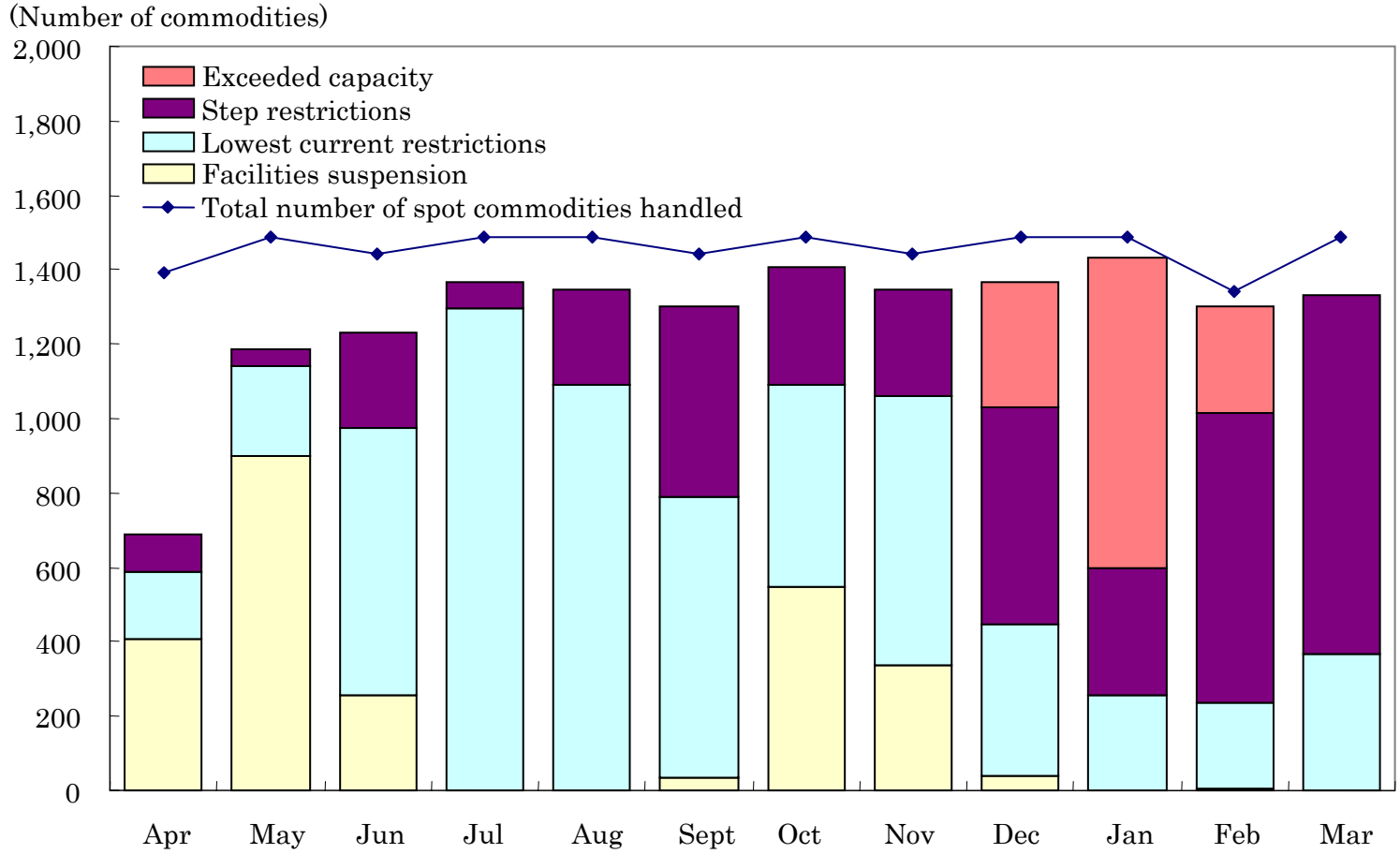
Source: Japan Electric Power Exchange

4. Wholesale Power Exchange

(3) Market splitting －Spot transactions (2)－

Market splitting (2/2)

Market splitting by the FC (by contributing factors)



Source: Japan Electric Power Exchange

Chapter 5 Evaluation on institutional system reforms of the electricity industries in foreign countries

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe
(1) Trend of the system reform in the EU
(2) Increasing prices and competition policy
(3) Stable supply
(4) International connection lines

2. Trend and evaluation of the institutional system reforms of the electricity industry in the U.S.
(1) Trend of the system reform in the U.S.
(2) Market design
(3) Stable supply and nuclear energy
(4) Liberalization of the retail market

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

(1) Trend of the system reform in the EU

Trend of liberalization in the EU

Early 1990's
Liberalization of electric power initiated in GB and Northern Europe.

1996: EU's electricity power directive

To form a single electric power market in the region, improved the system access and carried out partial liberalization from 1999.

2003 New EU electricity directive
Complete a legal unbundling of the transmission /distribution segment as well as full liberalization of the retail market by July 2007.

Recent environmental changes

Delay in the implementation of the 2003 EU electricity directive
18 member states could not comply to the July 2004 deadline in the provision of domestic law. 4 states have yet to implement the directive at this time.

Concerns for stable supply
・2000-01 Power crisis in California

・2003 The blackout in North America, and the large scale blackout in GB, Italy and Northern Europe.

Soaring of the price of electricity from 2004

Price of electricity rose rapidly from 2004 triggered by the rise in the price of oil.

Policy responses on the EU level

Progress study concerning the formation of a unified electric power market

In November 2005, the interim report was released. Compile the final report including the evaluation of the implementation of the EU electricity directive by each country at the end of 2006.

Security of supply and infrastructure Directive

Dec 2003 Draft directive released
Dec 2005 Directive adopted
Dec 2007 To go into effect

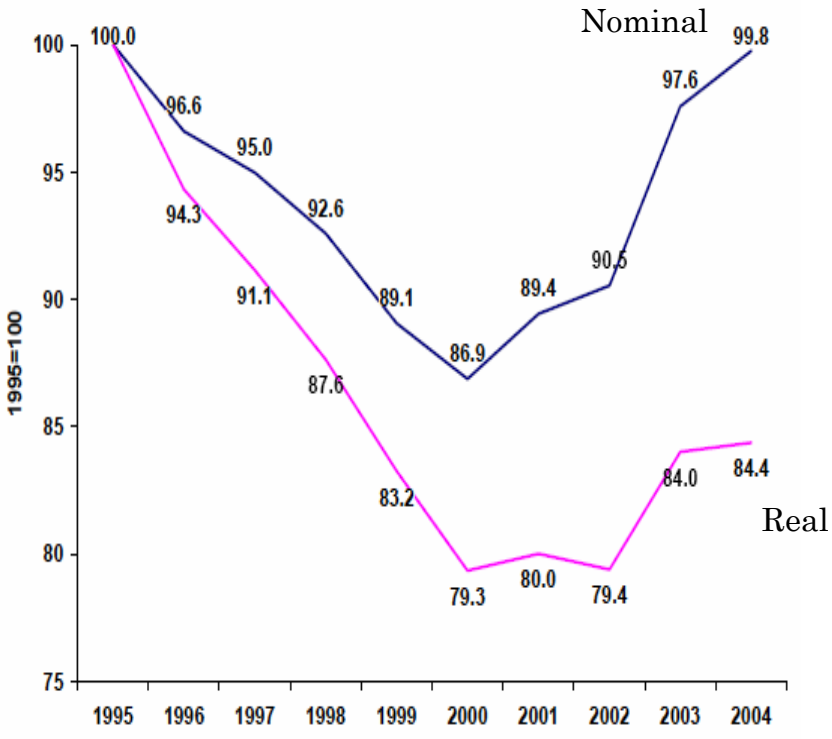
Study on the competition of the electricity and gas sectors

Nov 2005 Interim report released
End of 2006 Compile the final report

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

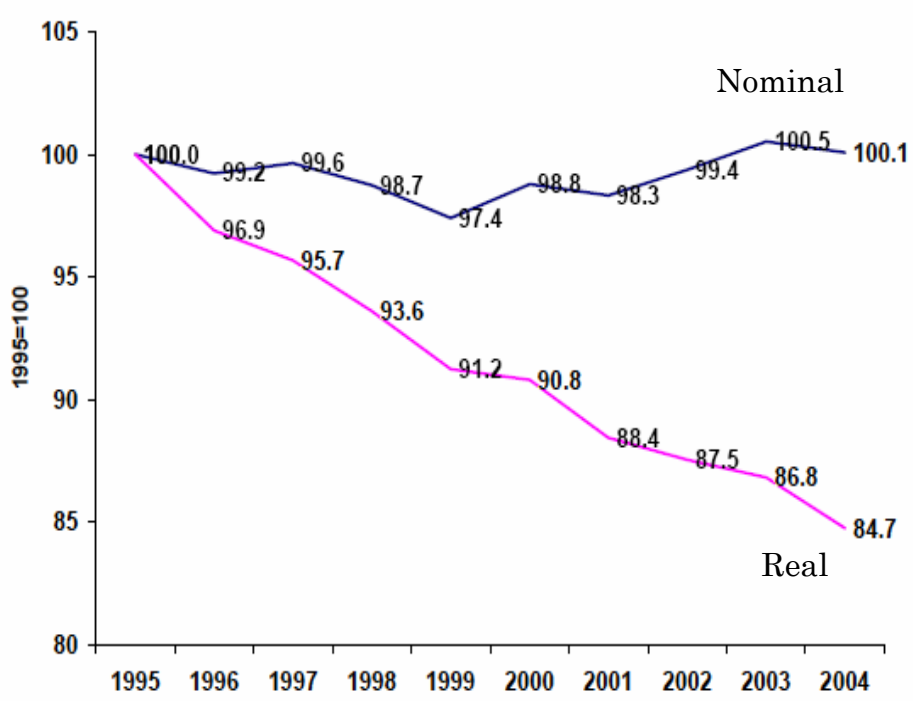
(2) Increasing prices and competition policy

—Trends of the electricity price after the introduction of liberalization (1995-2004) —



Industrial customers

Subject nations: Belgium, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Norway, Portugal, Spain and Great Britain



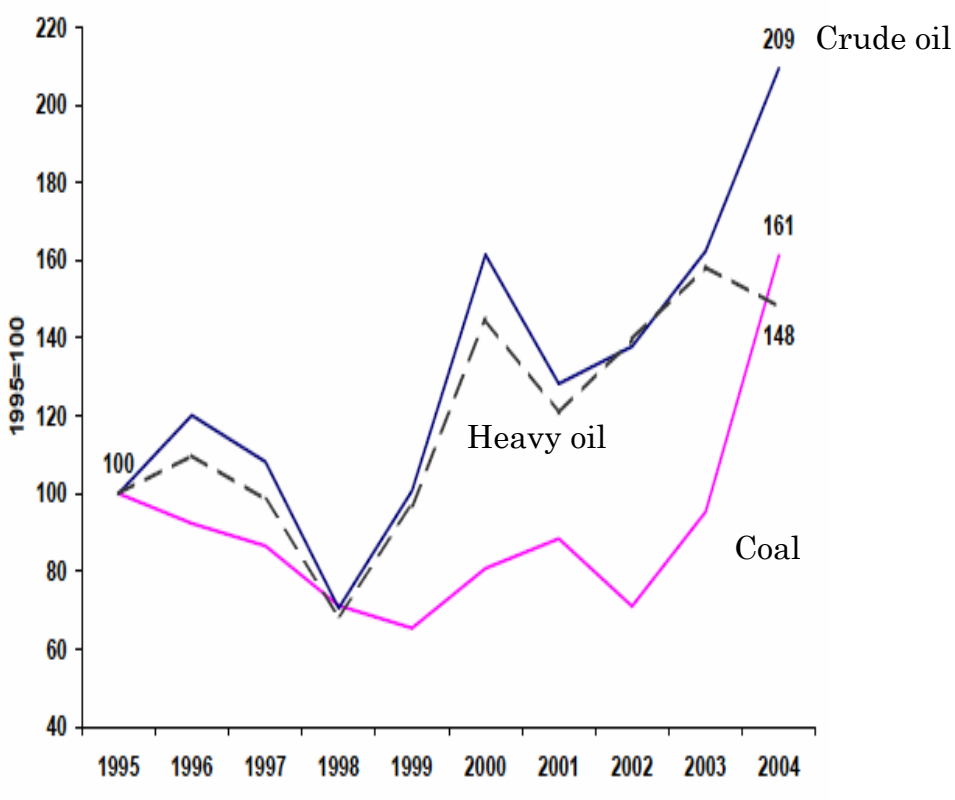
Domestic customers

Subject nations; 15 EU member states as of 1995

(Source) Eurelectric、"Electricity Markets: Getting the Picture Straight and Boosting Market Integration"

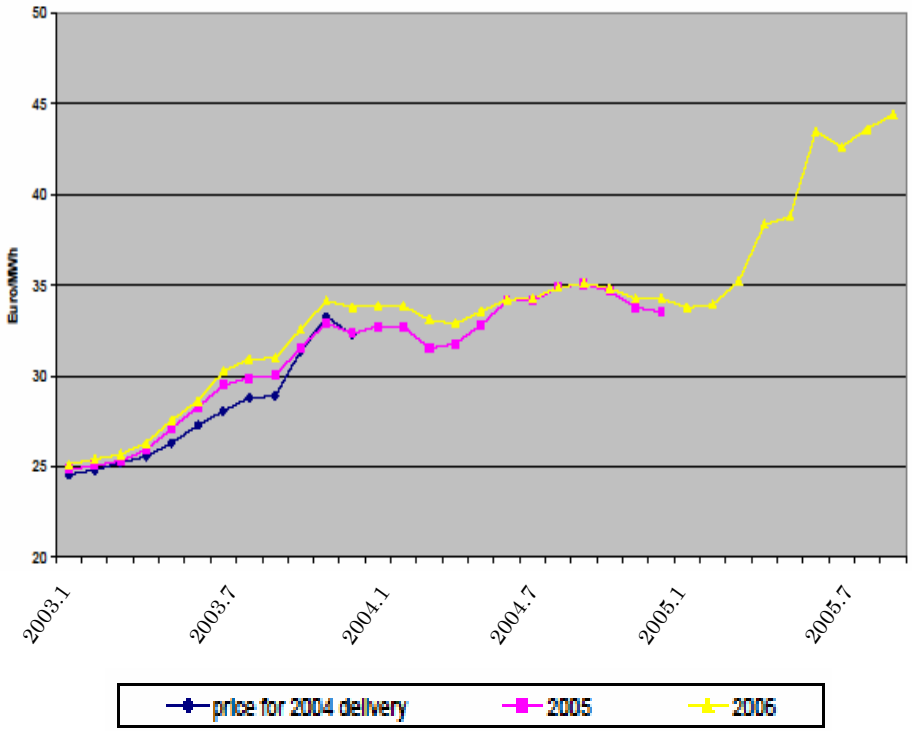
1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

(2) Increasing prices and competition policy －Upward tendency of the electricity price－



Trends in fuel prices

Source：KEMA



Trends in wholesale price (one-year forward price for 2004-2006 delivery)

Source: EEX Leipzig

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

(2) Increasing prices and competition policy－ Energy sector inquiry －

Energy Sector Inquiry (Sector Inquiry)

- The Directorate General of EU Competition evaluated the competition in the EU market from June to October 2005 after receiving complaints about the dramatic increase in the latest electricity wholesale price, barriers to entry and limited consumer choices.
- In November 2005, the interim report was released.
- The report pointed out that the following issues were interfering with the competition in EU's energy market.
  - ➢Market concentration ratio
    - → The market concentration ratio in the power generation market is high and it is influencing the market price.
  - ➢Vertical integration
    - → The vertical integration between power generation and retail, long-term bilateral contract, and the insufficient unbundling of the network sector are creating the illiquidity of the market.
  - ➢Lack of market integration
    - → It is important to hold discussion between TSOs concerning the giving of incentives for building international interconnection lines and the establishment of a distribution mechanism of interconnection line capacity.
  - ➢Lack of transparency
    - → There is a lack of transparency in the wholesale power market. Disclosure of information by a regulatory body is required.
  - ➢Cost issue
    - → There is a lack of credibility concerning fare competition in the wholesale power market. Also, the coexistence of the regulatory sector and liberalization sector is creating discrepancies.
- The EU aims to reach a final report after public comment at the end of 2006, and plans to discuss and propose legal measures concerning competition.

Large-scale blackouts in Europe and the U.S. in recent years

	England	Northern Europe	Italy	North America
Date (2003)	August 28	September 23	September 28	August 14-16
Area of blackout	South London	Southern Sweden and eastern Denmark	Whole of Italy	Northeastern U.S. and area around the Great Lakes of Canada ・U.S.: 8 states including New York and Michigan ・Canada: 2 states such as Ontario
Scale of blackout	724MW	4,850MW	Approx. 20,000MW	Approx. 61,800MW
Duration (Time it took to restore power)	37min	Approx. 6.5hrs	Approx. 18hrs	Over 29hrs (About 2 days for full restoration)
Households effected by blackout (Number of people)	410,000 households	4-5 million households	Approx. 57 million people	Approx. 51 million people

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

(3)Stable supply －The EU's Security of Supply and Infrastructure Directive －

UCTE

Proposed to establish binding reliability criteria

Responded to the progress of institutional reforms and diversity of market participants

Implemented the operation in sequence

Presented the supply security package

- System operation handbook
- Multilateral agreement (Jul '05)
- Compliance monitoring and execution program

Florence Forum

2001. 5 Debate on the California power crisis

2002. 2 Proposed the formulation of the common rules on supply security and supply reliability criteria.

2002.10 Formulated the common rules on reliability criteria.

2003. 7 Formulated the common rules on reliability criteria.

2004. 9 Formulation of the common rules on reliability criteria, and cooperative relationship between the building of international interconnection lines and the regulatory body.

2005. 9 Formulation of the common rules on reliability criteria, and cooperative relationship between the building of international interconnection lines and the regulatory body.

European Committee

2001.12 Energy Infrastructure Package

2003.12 Draft of Security of Supply and Infrastructure Directive

- Clarified the responsibilities and obligations on network security.
- Made the building of the framework for maintaining the balance of supply-demand compulsory.

Dec 2005 Directive adopted

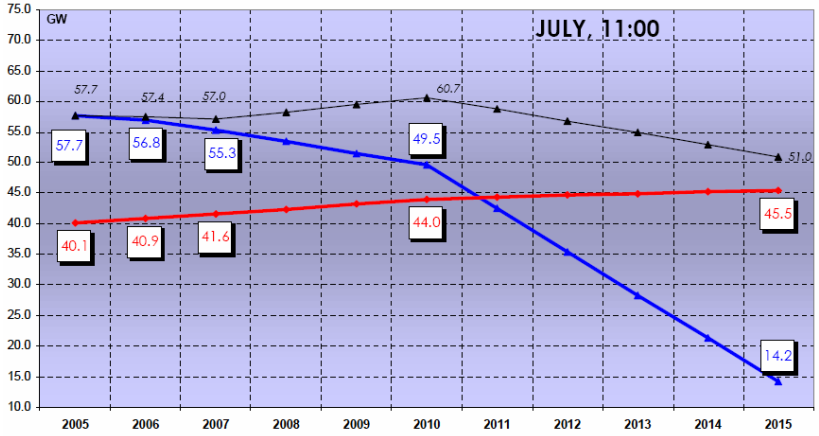
The EU's Security of Supply and Infrastructure Directive to come into effect in December 2007

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

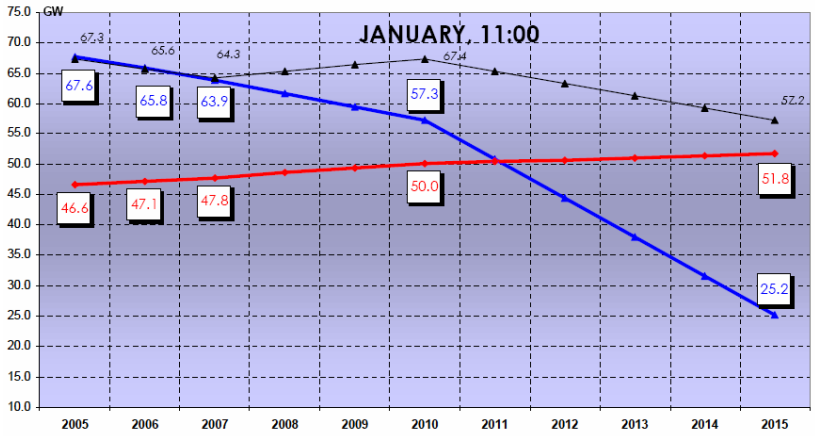
(3) Stable supply – Future prospects of excess supply capacity –

Prospects of excess supply capacity on the European continent

(Summertime peak)



(Wintertime peak)



: Excess supply capacity for peak load (conservative scenario)

: Excess supply capacity required for supply stability (5% of total power generation capacity)

: Excess supply capacity for peak load (optimistic scenario)

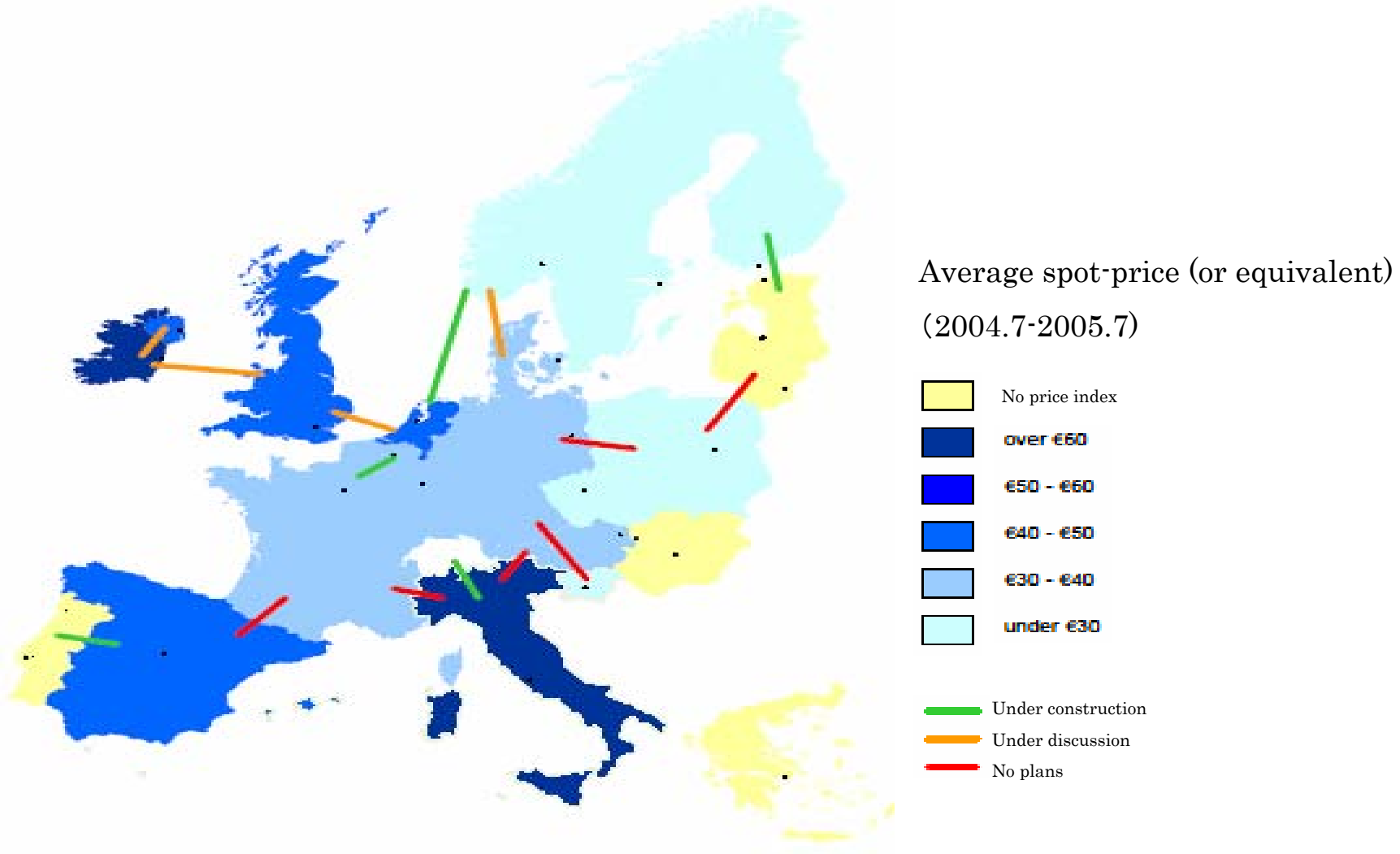
- Excess supply capacity refers to the margin of supply capacity estimated during peak load, and it is estimated by subtracting the estimated peak load and system service reserve from the supply capacity.

(Source) UCTE, "UCTE SYSTEM ADEQUACY FORECAST (2005-2015)"

UCTE: Trade association of transmission companies in which 23 European nations and 33 TSOs participate. The power consumption of the regions covered by UCTE is about 80% of the whole of Europe.

1. Trend and evaluation of the institutional system reform of the electricity industry in Europe

(4) International connection lines —Market unification—



Source: European Committee "Report on progress in creating the internal gas and electricity market"

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

(1)Trend of the system reform in the U.S.

Competition introduced by the states

1997 Partial liberalization in the state of Rhode Island

1998 Full liberalization in the states of California and Massachusetts.

1999 Partial liberalization in the state of Pennsylvania

2001 Partial liberalization in the state of Texas

Due to concerns about the soaring of the prices, there has not been an increase in the number of states that carry out the regulatory reforms (retail liberalization) and the progress has been slow.

Main Events

Activation of wholesale power trade

Stable operation of a wide-area system became an issue

2000-2001 California power crisis
2001 Collapse of Enron Corp.

Prevention of market manipulation and realization of stable supply became policy issues

Northwest and Southeast opposed

2003 Blackout in the Northeast of North America

Maintenance of supply reliability and security of investment in transmission of electricity became policy issues

Competition introduced by the federal government

1992 Energy policy act
Market entry of IPPs. Elimination of the barriers and wholesale wheeling service obligation for power companies.

1996 Orders 888・889
Compulsory open access for transmission lines

1999 Order 2000
RTO's voluntary establishment demanded

2002 Draft of SMD rules

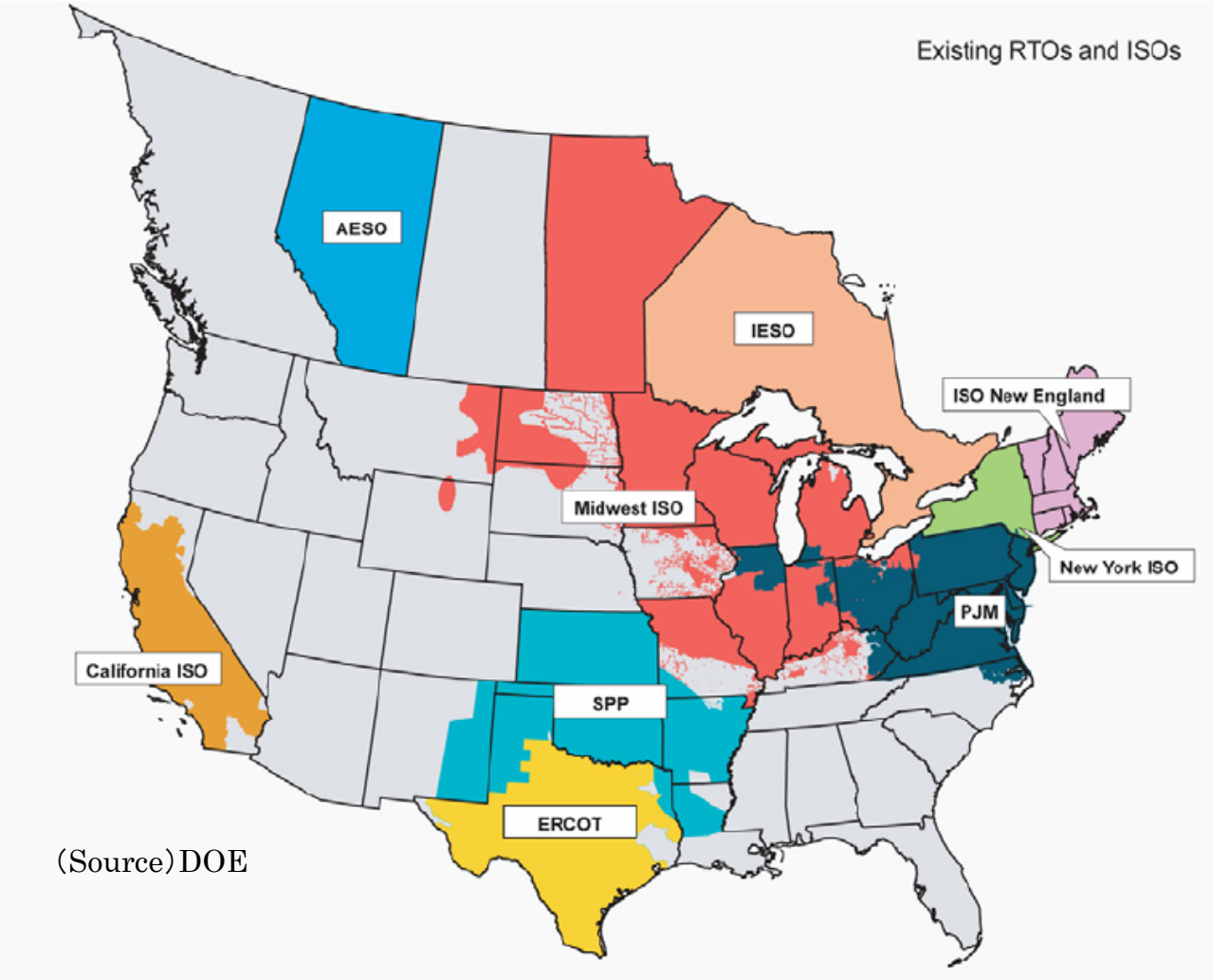
2003 SMD whitepaper released

2005 Withdrawal of the draft of SMD rules

Energy policy act
Reinforcement of efforts for stable supply

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

(2) Market design—Establishment of RTO and records of applications (August 2005)—



(Source) DOE

- Midwest ISO, PJM ISO, and SPP and ISO New England have been approved as RTO (=SMD) from FERC in 2001, 2002 and 2004 respectively.
- In addition, the New York ISO, California IO and ERCOT are operating as ISO (Only ERCOT has not been approved by FERC, as it is outside FERC's jurisdiction)

- ISO (Independent System Operator):
  Stipulated in Order 888, and a system operation function of the transmission sector is performed by an independent organization.
- RTO (Regional Transmission Organization):
  Proposed in Order 2000, and is a style in which 1. Extensiveness and 2. Responsibility for formulating the plan for expanding the transmission are added to the ISO functions as prerequisites.
- SMD (Standard Market Design):
  Proposed in the SMD-proposed rules, and the following are added to the RTO:
  1. Operation of LMP style energy market,
  2. Reinforcement of the market monitoring function,
  3. Operation of the FTR market (Financial Transmission Right), and
  4. Participation by the states, etc.

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

(3) Stable supply and nuclear energy －Compulsory reliability criteria－

- Establishment of the ERO (Electric Reliability Organization) (SEC. 1211)
  - FERC specified as the main body that formulates the compulsory reliability criteria.
  - Penalties imposed on violations of reliability criteria.
  - NERC (North American Electric Reliability Council), a voluntary regulatory organization established in 1968, is due to change as the ERO.
- In September 2005, the FERC released proposed rules on ERO's principles (RM05-30-000).

  - Rules on the establishment of an ERO that proposes and enforces the reliability criteria.
  - Enforcement procedures by an ERO and FERC.
  - Steps for an ERO to delegate authority to a local organization that enforces the reliability criteria.
  - Procedures for the establishment of Regional Advisory Bodies that which provide advice to the FERC, the ERO or a Regional Entity on matters of governance, applicable Reliability Standards, and the reasonableness of proposed fees within a region, and conduct any other responsibilities assigned by the FERC. (Establishment of a local advisory committee)
  - Rules on the regular release of reliability evaluation by the ERO.
  - Regulations pertaining to the funding of the ERO.

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

(3) Stable supply and nuclear energy －Construction of transmission lines－

DOE's (Department of Energy) efforts

- Designation of the transmission routes that could contribute to state interest (SEC. 1221)
  - Designate the "transmission routes contributive to state interests" after conducting a study on transmission congestion every three years and considering an alternative solution.
- Adjustment of the approval of transmission line locations by the federal regulatory body (SEC. 1221)
  - Conclude an MOU with relevant federal departments and agencies, and implement necessary adjustments.
  - It is also possible to ultimately look to the President for a decision.
- Building of transmission lines through regional authorities (SEC. 1222)
  - Regional authorities can construct, own, operate and participate in the "transmission routes contributive to state interests"

FERC's (Federal Energy Regulatory Commission) efforts

- Backstop Siting Authority(grant of rights to construct interstate transmission lines) (SEC. 1221)
- Establishment of the local advisory committee (SEC. 1221)
  - A committee consisting of state representatives appointed by a state governor, which debates the issues on the construction of transmission lines and reliability criteria.
- Provision of incentives for constructing the transmission lines (Subtitle D)
  - Formulation of the rules for providing incentives in making investment in transmission facilities that strengthen the reliability.

Although a certain degree of effect is anticipated with regard to sorting out the confusion of federal and state regulations on the construction of transmission lines and the promotion of investment, there is no explicit response on the scheme for securing an appropriate reliability .

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

(3) Stable supply and nuclear energy—Support for nuclear power generation—

- Compensation for construction delays of new nuclear power plants (SEC. 638)
  - For power companies that construct new nuclear power plants, the government is to pay an additional contribution of up to $500M per unit for delays caused by licensing procedures (for 6 units.) The first 2 units are to receive 100% compensation (maximum $500M), and the remaining 4 units are to receive 50% compensation (maximum $250M.)
- Loan guarantee for advanced nuclear power plants (Title XVII—Incentives for Innovative Technologies)
  - The federal government is to give a maximum of 80% loan guarantee (targeted for advanced technology projects such as renewable energies.)
- Production tax incentives for advanced nuclear power plants (SEC.1306)
  - For advanced nuclear power plants, provide a tax deduction of 1.8 cents/kW according to electric power generation for eight years from the start of operation. The maximum would be $125M per 1 million kWh, and a total of 6 million kWh.
- Extension of the Price Anderson Law that stipulates the liability for damage in case of a nuclear accident to 2025 (SEC. 602)

2. Trend and evaluation of the institutional system reform of the electricity industry in the U.S.

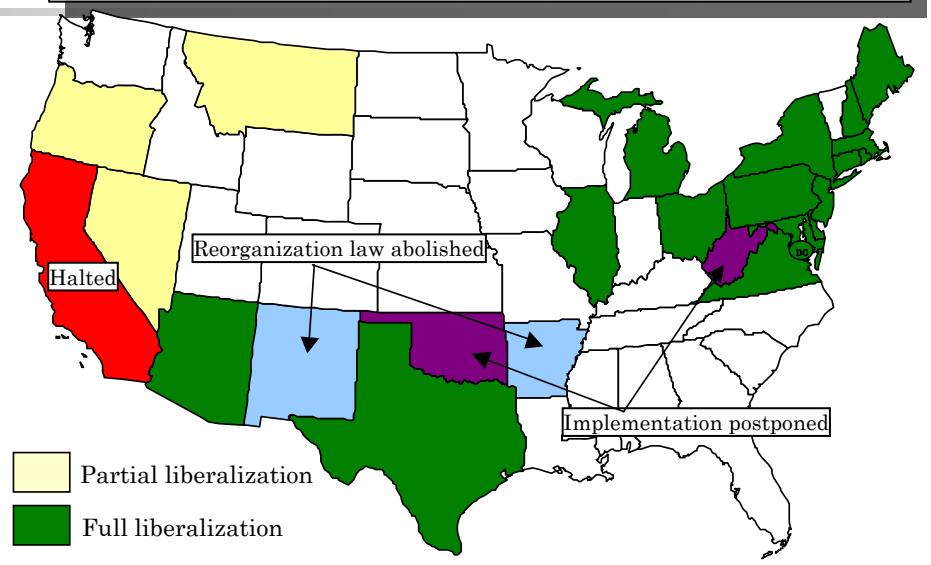
(4) Liberalization of the retail market

Start time of liberalization in main states

	Domestic	Commercial / Industrial	Full liberalization	ESP share	Note
California	98/03	98/03	98/03	27.6%	Froze the liberalization in Sept '01 after the power crisis
Illinois	02/05	99/10	02/05	15.4%	
Massachusetts	98/03	98/03	98/03	16.4%	
Michigan	02/01	02/01	02/01	9.3%	
New Jersey	99/11	99/11	99/11	8.8%	
New York	98/05～01/07	98/05～01/07	01/07	30.4%	Start time for liberalization is set up by each power company
Ohio	01/01	01/01	01/01	16.0%	
Oregon	N/a	02/03	－	0.0%	
Pennsylvania	99/01	99/01	00/01	8.8%	
Rhode Island	97/07	97/07	98/01	9.0%	
Texas	01/07	01/07	02/01	－	

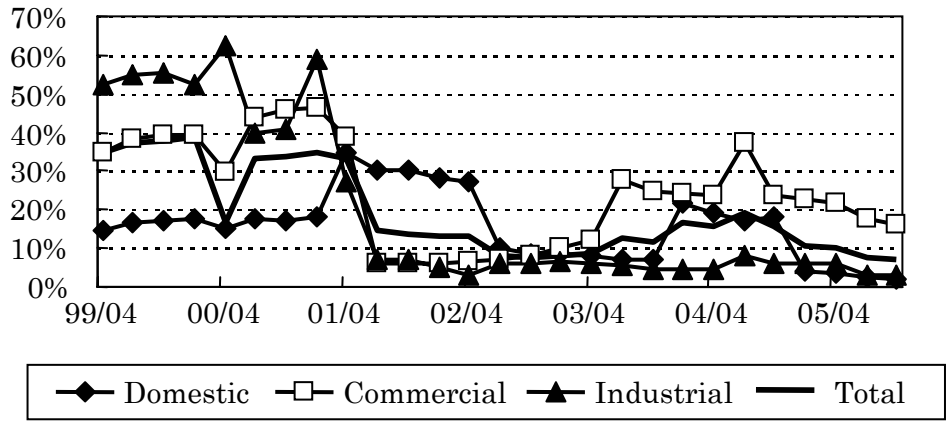
(Note) ESP (Energy Service Provider) refers to new participants from retail liberalization.
(Source) The start time of liberalization was compiled from the EIA's "Status of State Electric Industry Restructuring Activity -- as of February 2003 –", and the ESP share was compiled from the DOE's information bureau data.

Retail liberalization of each state (As of October 2004)



(Source) Compiled from the February 2005 issue of Overseas Electric Power by the Japan Electric Power Information Center, Inc.

Pennsylvania PECO's rate of changing suppliers



(Source) Pennsylvania Office of Consumer Advocate、" Pennsylvania Electric Shopping Statistics"