

391st Regular Research Session

**“ Current status and Evaluation of
Electricity market liberalization in Japan,
USA and Europe “**

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Contents of the Report

1. Background and whole picture
2. Comparison of liberalization model
3. Status of price gap between Japan and foreign countries
4. Customer choice switch rates
5. Reliability of power grid system
6. Summary

* This study is based on the 2004 contract research, “Evolutionary status and Evaluation of Electricity and Gas Market Liberalization (Comparisons between Japan, USA and Europe)” from the Comprehensive Energy Promotion Committee.



1. Background and whole picture

(1) Background of the issue

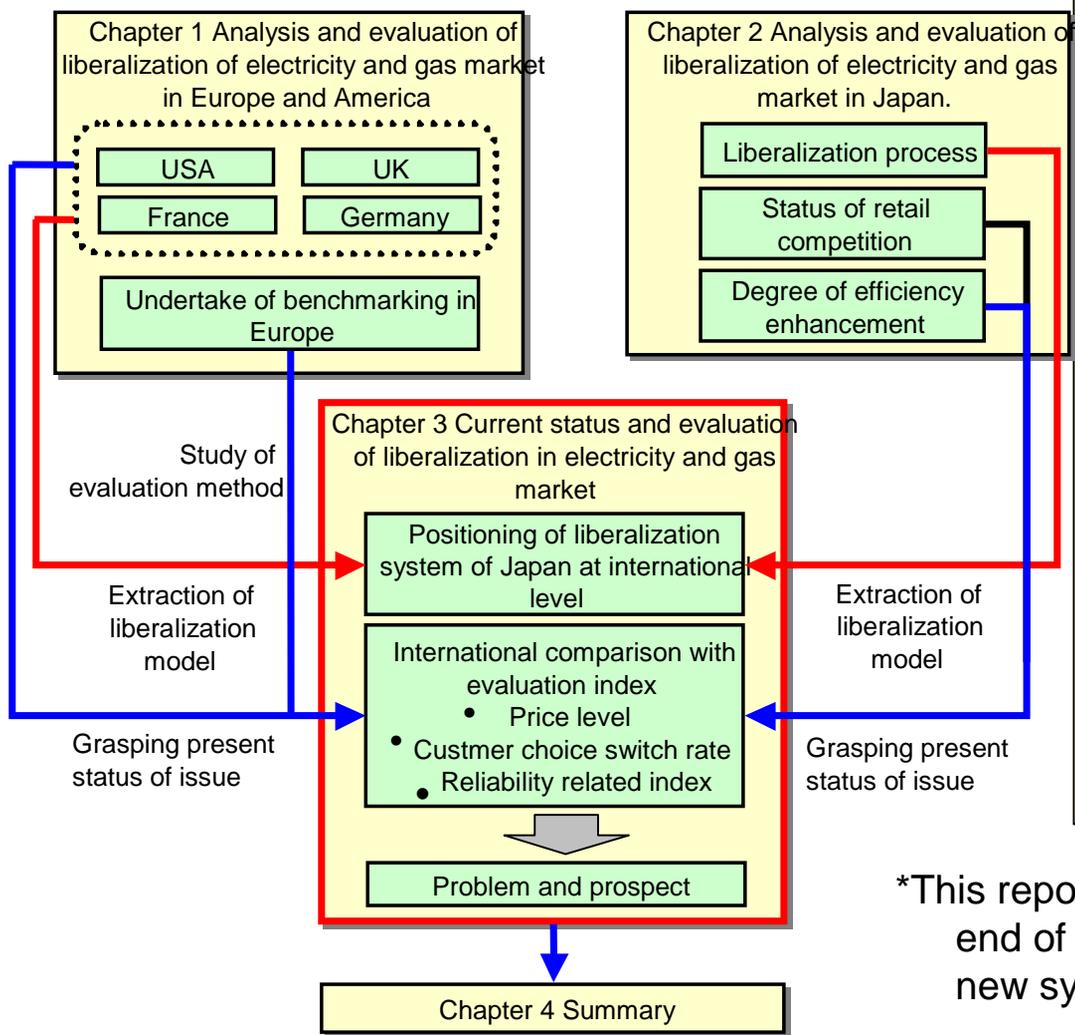
Industry Law	Electricity Industry	Gas Industry
1995's amendment	<ul style="list-style-type: none"> ● Introduction of IPP (Independent Generators). enhance flexibility of selective tariffs, introduction of yard stick evaluation and others. 	<ul style="list-style-type: none"> ● Liberalization of large scale supply (over 2 mega m³), delivery system, introduction of yard stick assessment
1999's amendment	<ul style="list-style-type: none"> ● Retail partial liberalization, introduction of PPS (Power Producers and Suppliers) , introduction of reporting system at tariff rate down case, abolition of regulation on side business and others. 	<ul style="list-style-type: none"> ● General gas business: Range of big supply was expanded to 1 million m³. Review of regulation on new entry into community gas business. Abolition of regulation on side business. ● Community gas business: Price liberalization for particular large supply (more than 1 thousand m³ of annual contract). Abolition of local gas adjustment association.
2003's amendment	<ul style="list-style-type: none"> ● Expansion of retail partial liberalization scope, establishment of neutral system organization and power exchange, abolition of transfer charge and others. 	<ul style="list-style-type: none"> ● Range of big supply was expanded to a half million m³. Utilization of the third party in negotiation for LNG stock yard. Foundation of gas pipeline company. Community gas company came to be able to use natural gas.

- After 10 years from the start of electricity and gas reform in Japan, how is the regulatory reform evaluated?



1. Background and whole picture

(2) Whole picture



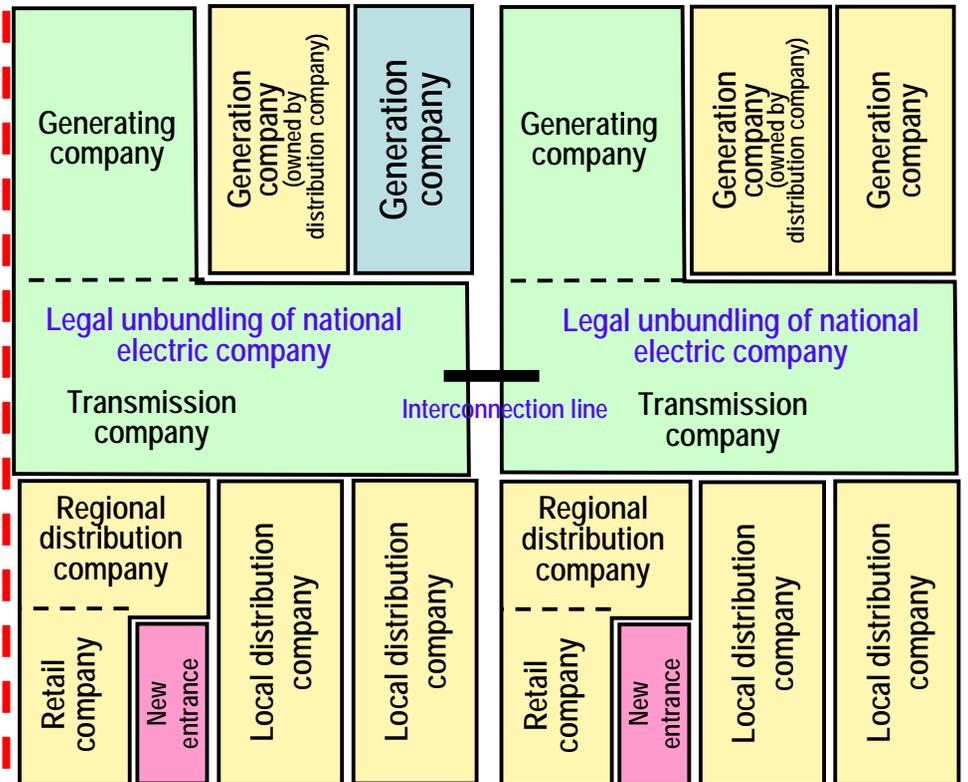
- The fiscal year 2004 contract research from **the Committee for Energy Policy Promotion**, “Current status and Evaluation of Electricity and Gas Market Liberalization (Comparisons between Japan, USA and Europe)” was carried out.
- Comparison of liberalization scheme, comparison of price level as a measure of efficiency, customer choice switch rates as a measure of competition development, and reliability index as reliable supply were reviewed for the status of Japan, USA and Europe.

*This report is an evaluation at the time of the end of March 2005, and is not for after the new system.

2. Comparison of liberalization model

(1) Comparison of liberalization model among Japan, USA and Europe

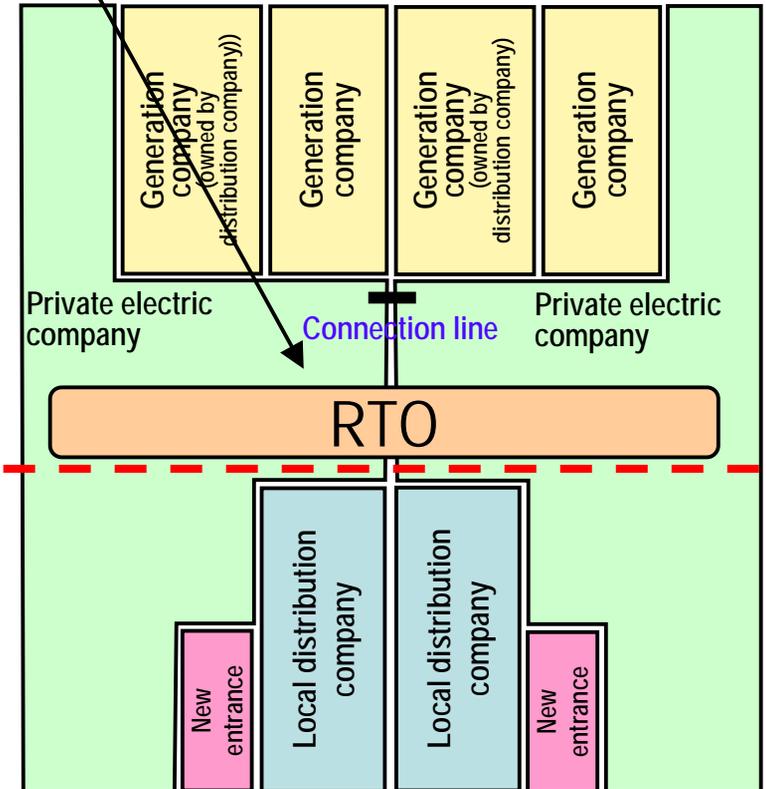
EU's single energy market concept



- Regulation reform started from the beginning of 1990s in UK, Norway and others.
- Through 1996 EU electricity directive and 2003 EU new electricity directive, unification of regulations for member countries is going on aiming for the single electricity market.

Federal reform for power generation and transmission sector

*Functional separation and wide area operation (+establishment of energy market)



Structural reform of the state

- The third party access to transmission facilities was begun by 1996 order 888/889. 1999 RTO order and others.
- State regulation reform was carried out in northeastern area from the 1997 Rhode Island.

2. Comparison of liberalization model

(1) Comparison of liberalization model among Japan, USA and Europe

	EU	USA	Japan
The year of liberalization start	Electricity regulation reform of EU-wide started in 1996, according to EU Electricity directive. The enforcement time of regulatory reform was various depending on the country. (liberalization of UK started in 1990)	Reform of generation and transmission sectors started following order 888 in 1996. The other sectors were carried out separately by the state. (partial liberalization was started at Rhode island in 1997.)	Overall reform of electricity industry was started according to revision of Electric Utility Industry Law in 1995. Retail liberalization was started March 2000, according to 1999's revision of Electric Utility Industry Law.
Main purpose of system reform	Realization of single market following EU economic integration	Correction of electricity price gap among the states	Correction of gap between domestic and foreign price
Framework of wholesale market	No regulation in all EU. But, most of countries have power exchange.	RTO founded mandatory energy market within its area. (so to speak "pool market")	Japan electric power exchange (JEPX), a non-mandatory type exchange, started operation from April 2005.
Unbundling of transmission sector	Functional and accounting unbundling were obliged by 1996 EU directive. The legal and functional unbundling were obliged by 2003 EU directive.	Functional and accounting unbundling were requested by 1996 order, however a wide area transmission organization RTO was proposed by 1999 order 2000. The northeastern PJM ISO, Midwest ISO are approved as RTO.	The accounting unbundling and information isolation were obliged by the 1999 amendment of the Electricity Utility Industry Law. The enforcement of regulation on action was carried out by the 2003 amendment.
Scope of retail liberalization	Full liberalization is obliged to start by 2007. Especially, UK and Germany has already started full liberalization.	There is no unified movement at Federal level. Full liberalization was carried out in the most states of the northeastern area. The southeastern area is not liberalized.	Liberalization was carried out for high or more voltage consumers April 2005. The discussion on the review of system including appropriateness of full liberalization is scheduled to start in 2007.

2. Comparison of liberalization model

(2) Evaluation of Japan's regulation reform from the view point of Europe and America

		Europe	USA	Japan
Power generation market	Establishing of Power Exchange (including mandatory energy market)	necessary	necessary	○
	Adoption of LMP method	unnecessary	necessary	×
	Obligation of ensuring resources to supply for retail company	unnecessary	necessary	×
	Establishing of balancing market	necessary	necessary	×
	Establishing of ancillary service market	necessary	necessary	×
Power transmission sector	Unbundling of accounting	necessary	necessary	○
	Unbundling of decision making	necessary	necessary	×
	Legal unbundling	necessary	unnecessary	×
	Ownership unbundling	unnecessary	unnecessary	×
	Establishing energy market	unnecessary	necessary	×
	Establishing of a wide area independent operator(RTO)	unnecessary	necessary	×
	Solution of pancake problem ^(*1)	necessary	necessary	○
	Reliability regulation	necessary	necessary	○
Retail sector	Full liberalization	necessary	-	×
	Establishing of last resort service supplier	necessary	-	-
regulation	Establishment of independent regulatory authority	necessary ^(*2)	necessary	×
Number of circles from each assessment axis		4/11	4/12	

*1 "Pancake problem" means a special charge which is assigned to wide area trade, for example in Japan, the transfer charge crossover multiple general utilities supply areas is that. (It was decided with 2003's amendment of Electricity Utility Industry Law to be abolished by April 2005.)

*2 The independent regulatory authority mentioned here is the one which is obliged to establish for each country government. It does not mean that the authority is independent from decision making of competitive policy in EU's overall energy policy.



2. Comparison of liberalization model

(3) Relation between Electricity regulation reform and political goals

	EU	USA	Japan
Promotion of efficiency raise	Under the concept of EU single energy market, through liberalization of retail market and regulation of transmission sector, the enhancement of efficiency is promoted. Reliability rule is being made by mainly UCTE, which constrains transmission company.	Efficiency enhancement is promoted through liberalization of wholesale market and regulation of transmission sector. Treatment of retail sector is different depending on the states.	Compatibility of efficiency enhancement through competition and other political problems is aimed in the base of competitive situations.
Maintaining of reliability of power grid system	Under the concept of EU single energy market, through liberalization of retail market and regulation of transmission sector, the enhancement of efficiency is promoted. Reliability rule is being made by mainly UCTE, which constrains transmission company.	NERC is carrying out review of reliability regulation, in accordance with variety of business form. Comprehensive Energy Law Draft will be able to give legal obligation.	Electricity system utilization association made the association rule, as a volunteer rule . Dispute resolution was carried out with it.
Energy security	Requesting a EU consistent electricity regulation reform to surrounding countries, energy transportation from a energy resource country. Additionally, dialogue to a energy resource country has been carried out.	No relation to Electricity Regulation Reform. No relation to Electricity Regulation Reform.	General electric companies are expected to promote the long term fixed power source development, as nuclear power generation and others, still under the generation and transmission combine system.
Global environment issue	There is no apparent relation to Electricity Regulation Reform, however a retail company has the obligation to publish CO2 unit production per electricity sales (labeling). Government assigns and ensures the final guarantee supplier.	No relation to Electricity Regulation Reform. No relation to Electricity Regulation Reform.	
Universal service	There is no apparent relation to Electricity Regulation Reform, however a retail company has the obligation to publish CO2 unit production per electricity sales (labeling). Government assigns and ensures the final guarantee supplier.	State government assigns the final guarantee supplier, and assure it. The situation depends on the state.	*

* General electric company has supply duty for small scale consumer.

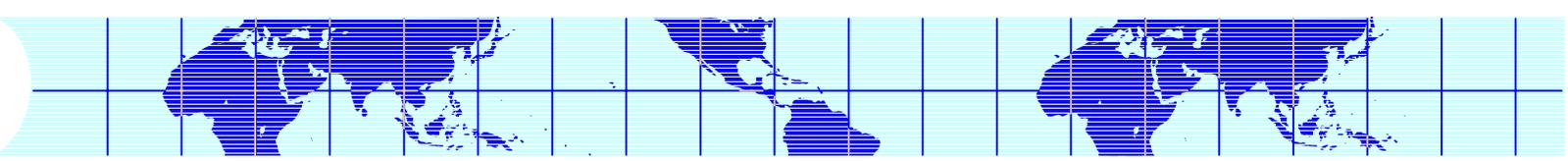
■ Japan has more restrictions based on energy security or global environmental problem than Europe and America.



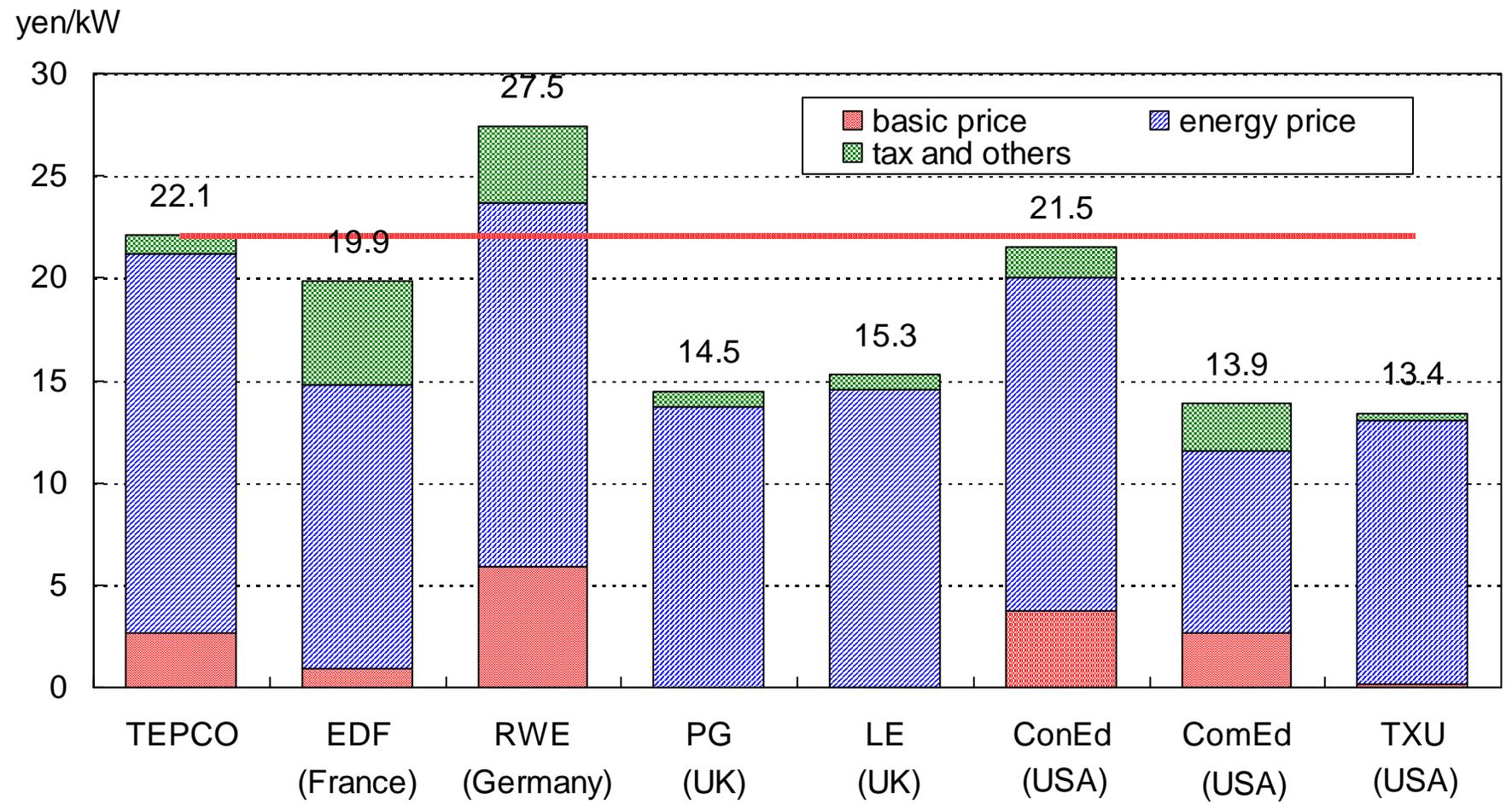
3. Status of price gap between Japan and foreign countries

(1) preconditions

Nation or region	Name of electric company	Abbreviation		Home use	Middle scale, business	Large scale, business	Ultra large scale, business
New York USA	Consolidated Edison	ConEd	Consumer image	Common home	Small works, supermarket, small building	Middle works, supermarket, small building	Large works, hotel or department store
Illinois USA	Commonwealth Edison (Exelon)	ComEd	Receiving voltage	100V or 200V	6,000V	6,000V	20,000V
Texas USA	TXU Energy (Texas Utilities)	TXU	Use magnitude (contract power etc)	30A	150kW	1,000kW	4,000kW
United Kingdom	London Electricity (LE Group)	LE	Consumed power	3,480kWh (annual)	396,000 kWh (annual)	4 million kWh (annual)	16 million kWh (annual)
United Kingdom	PowerGen (E.on)	PG	Calculation period	Jan.2004 to Dec.2004	Same as the left	Same as the left	Same as the left
Germany	RWE	RWE	Exchange rate	1=109yen, 1pound=198yen, 1euro=135yen	Same as the left	Same as the left	Same as the left
France	EDF	EDF					
Japan	Tokyo Electric Company	TEPCO					

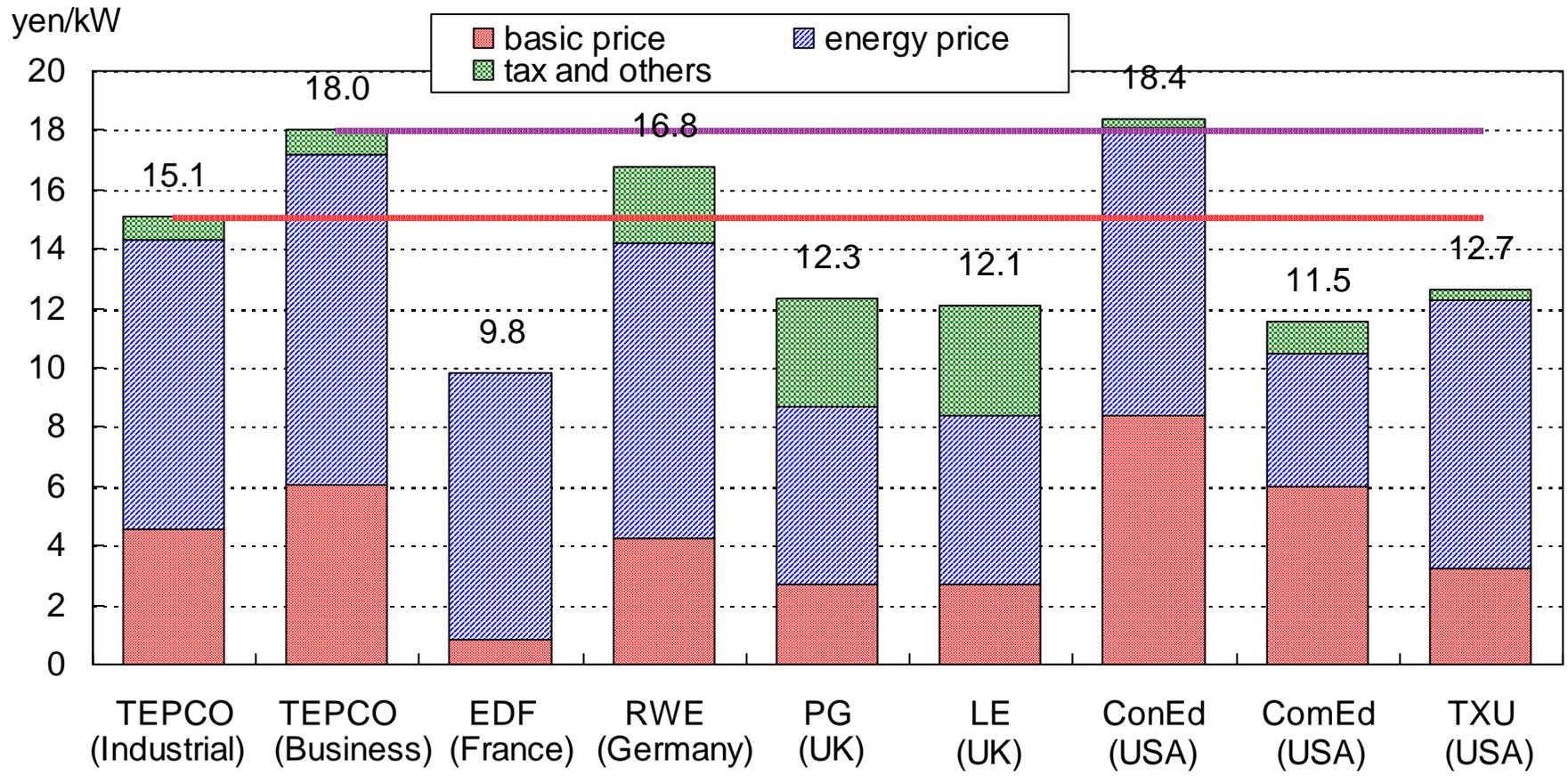


3. Status of price gap between Japan and foreign countries (2) home use (in 2004)





3. Status of price gap between Japan and foreign countries (3) middle scale use (in 2004)

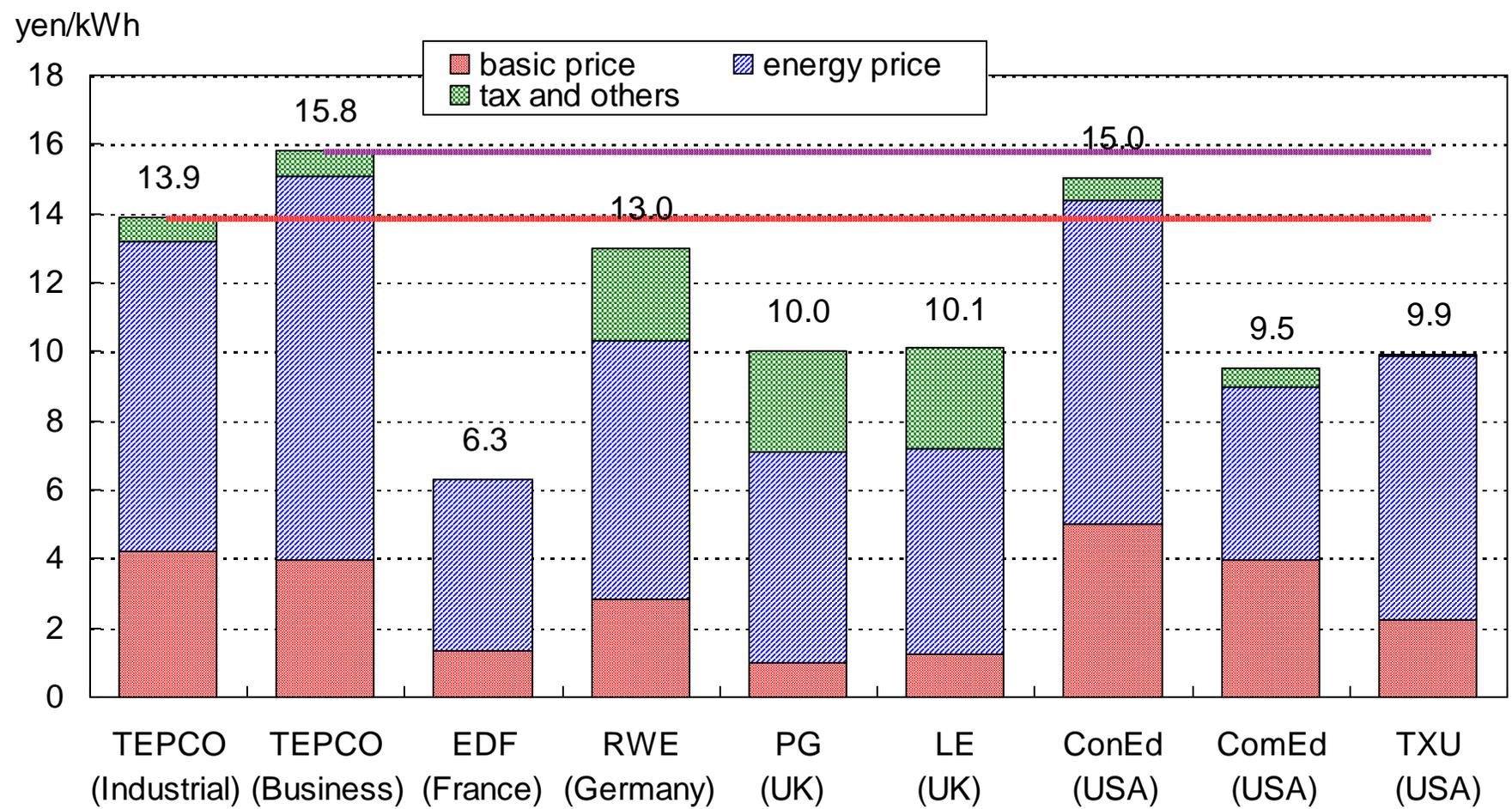


Note: electricity price of EDF does not include tax and others.

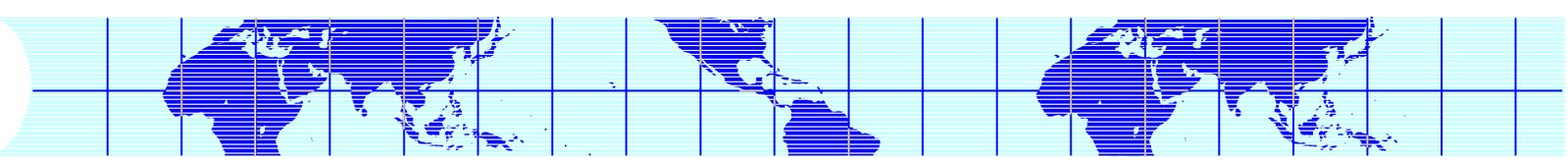


3. Status of price gap between Japan and foreign countries

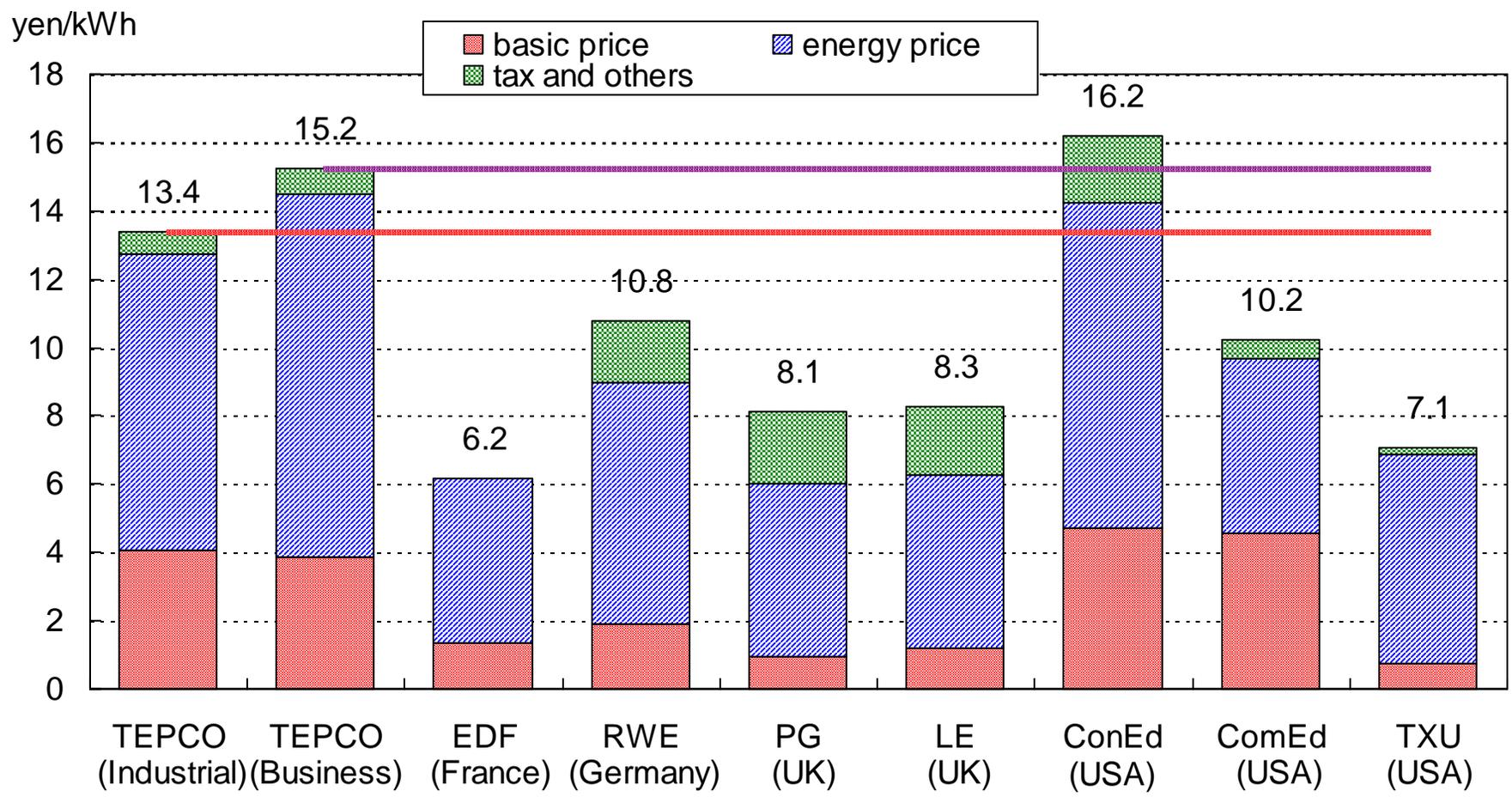
(4) large scale use (in 2004)



Note: electricity price of EDF does not include tax and others.



3. Status of price gap between Japan and foreign countries (5) ultra large scale use (in 2004)



Note: electricity price of EDF does not include tax and others.



3. Status of price gap between Japan and foreign countries

(6) summary of comparison (in 2004)

		EDF (France)	RWE (Germany)	PG (UK)	LE (UK)	ConEd (NY, USA)	ComEd (IL, USA)	TXU (TX, USA)
Home		1.11	0.81	1.53	1.45	1.03	1.59	1.66
Middle scale	business	1.83*	1.07	1.46	1.49	0.98	1.56	1.42
	Industry	1.53*	0.90	1.22	1.24	0.82	1.31	1.19
Large scale	business	2.52*	1.22	1.58	1.57	1.05	1.66	1.60
	Industry	2.21*	1.07	1.39	1.37	0.92	1.46	1.40
Ultra-large scale	business	2.47*	1.41	1.88	1.84	0.94	1.49	2.16
	Industry	2.17*	1.24	1.65	1.61	0.83	1.31	1.90

*1 EDF electricity price does not include tax and others, excluding home use.

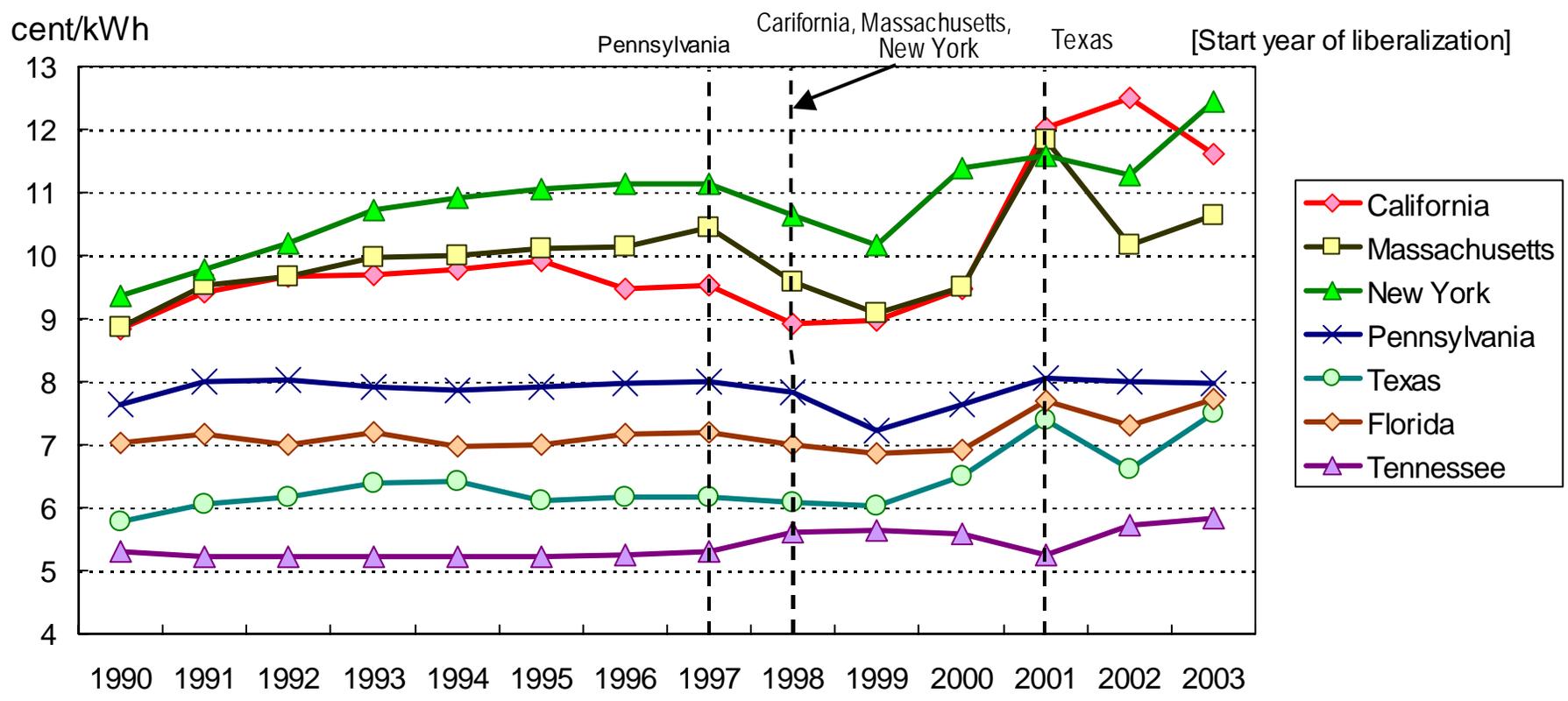
*2 Numeric numbers indicate the ratio of Japan's electricity price assumed the price of each company to be unity.

- In comparison with the representative electric company of France, Germany, UK and USA, electricity price of Japan is approaching to the level of these countries.
- In comparison with New York area, Japan's price is realized to be equal or low level of it.



3. Status of price gap between Japan and foreign countries

(7) Change of electricity price : USA



Data origin: EIA

Price down was done at the beginning of structural reform and liberalization, afterward electricity price tends to fluctuate largely.



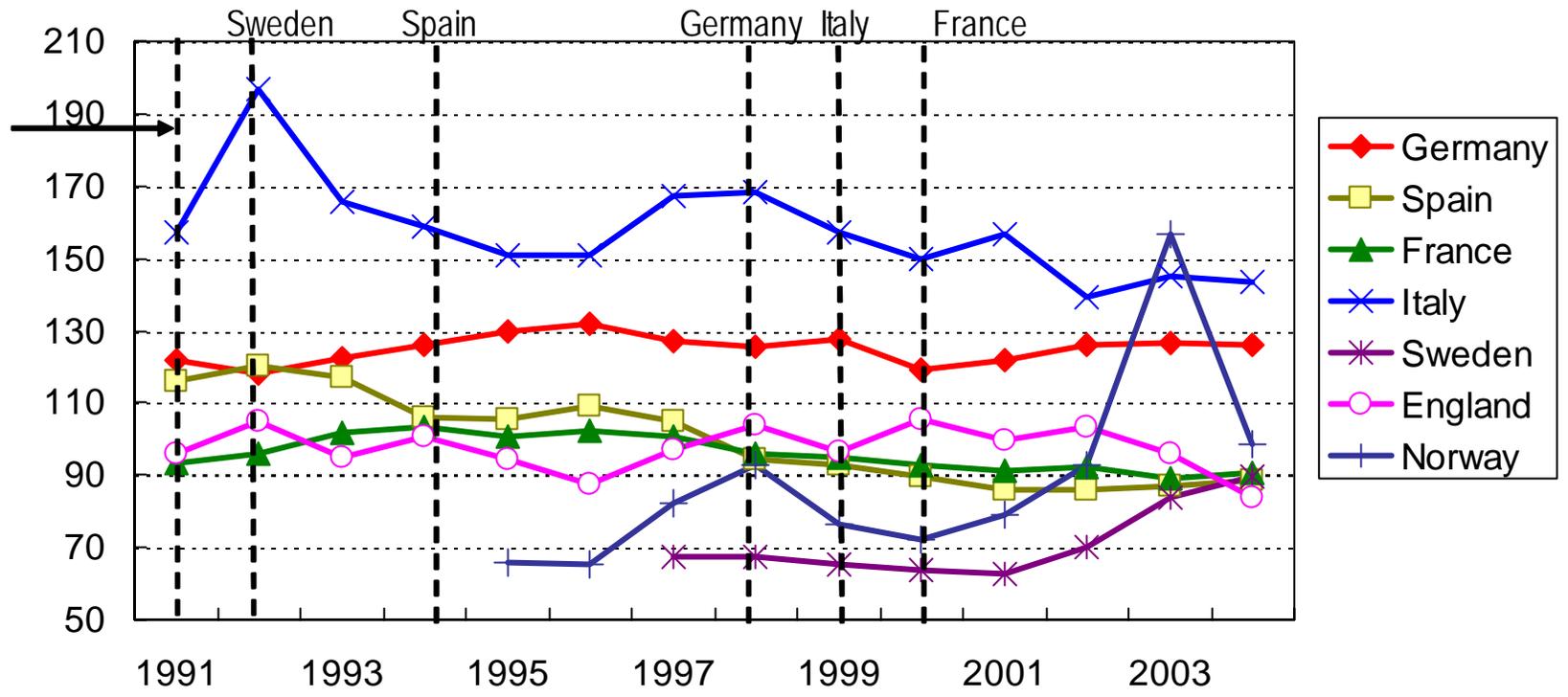
3. Status of price gap between Japan and foreign countries

(8) Change of electricity price: Europe

Change of home use electricity price in Europe

Euro/1,000kWh

England (1990)
Norway (1991)



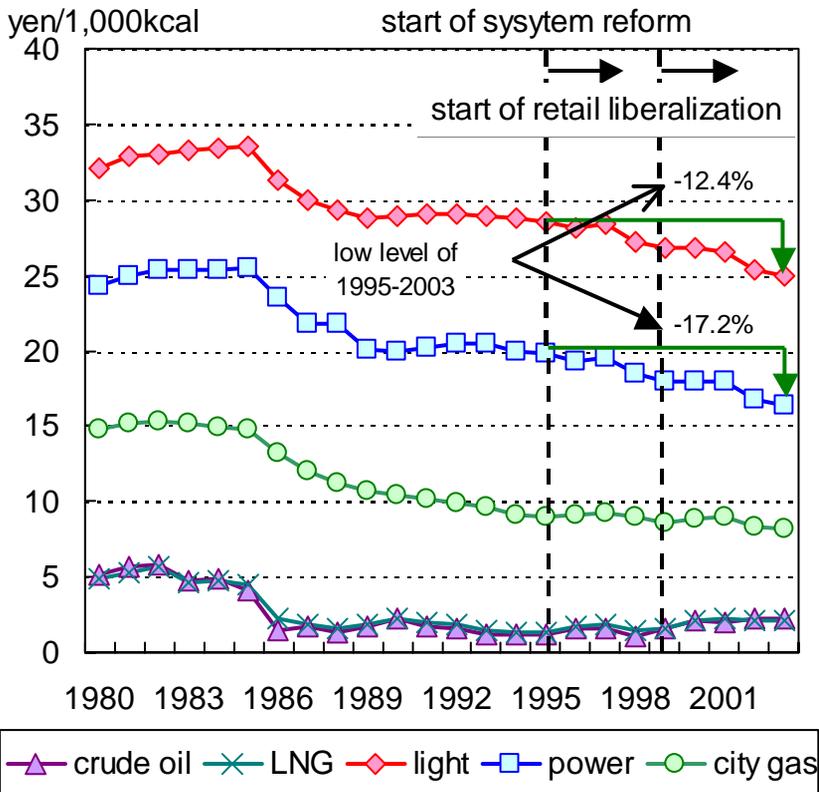
Data origin: Eurostat

■ Price in Spain is stably in falling down trend, in some countries, a large up and down fluctuation occurs.

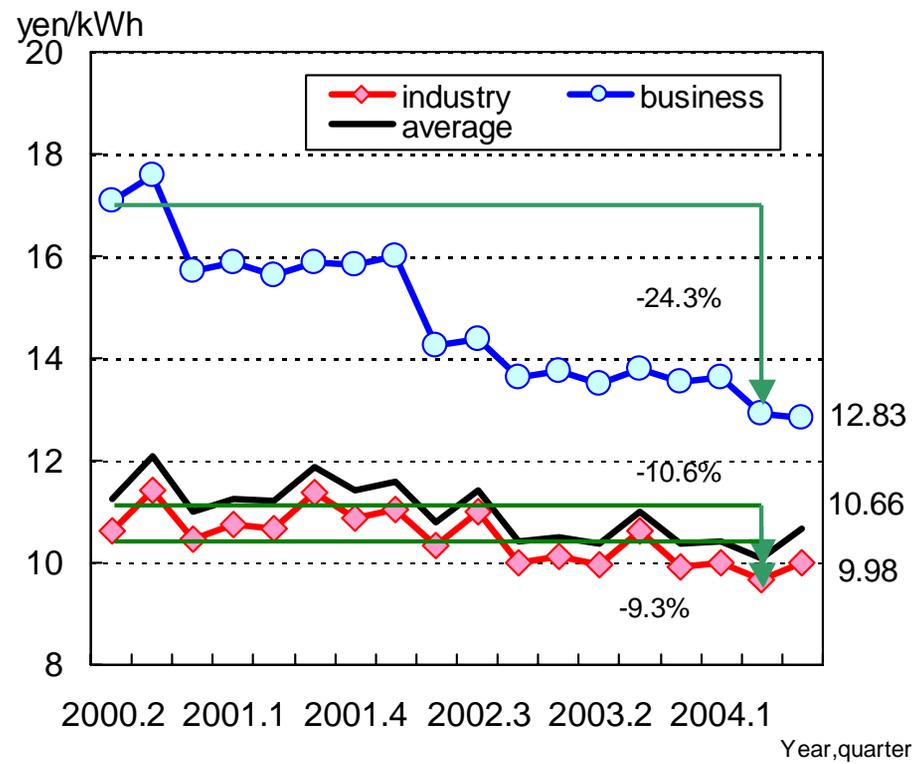


3. Status of price gap between Japan and foreign countries

(9) Change of electricity price: Japan



Data origin: Japan energy economics research institute, measure analysis unit, "handbook of energy and economics statistics"



Data origin: Ministry of Economics and Industry, "Survey of total electric power demand"

■ After the 1995's revision of Electric Utility Industries Law, general power electric companies continued to revise electricity price, and more than 20% of price down was realized, in comparison with 1995 price level. (from TEPCO light and power revision rate)

3. Status of price gap between Japan and foreign countries

(10) Change of electricity price : comparison

		Initial year of liberalization ^(*1)	Price in initial year	Price in 2003	Changing rate
USA	Pennsylvania	1997	7.99 cent/kWh	7.98cent/kWh	▲0.1%
	California	1998	8.93 cent/kWh	11.62 cent/kWh	+30.2%
	Massachusetts	1998	9.59 cent/kWh	10.63cent/kWh	+10.9%
	New York	1998	10.63cent/kWh	12.44cent/kWh	+17.0%
	Texas	2001	7.39cent/kWh	7.50cent/kWh	+1.5%
Europe	UK	1990	7.42 pence/kWh	7.76 pence/kWh	+4.5%
	Norway	1991	38.9 ole/kWh	54.8 ole/kWh	+40.9%
	Sweden ^(*2)	1992	67.5euro/MWh	83.8euro/MWh	+24.1%
	Spain	1994	105.9euro/MWh	87.2euro/MWh	▲17.7%
	Germany	1998	125.6euro/MWh	126.7euro/MWh	+0.9%
	Italy	1999	157.0euro/MWh	144.9euro/MWh	▲7.7%
	France	2000	92.8 euro/MWh	89.0euro/MWh	▲4.1%
Japan		1995	22.38 yen/kWh	19.05yen/kWh	▲14.9%

*1 The initial year means the year when structural reform regulations were put into effect, such as not only beginning of retail liberalization and implementation of pilot program.

*2 Only for Sweden, price in 1997 is used as price in initial year because of data limitations.

Data origin: USA; electric utilities average unit income price by EIA, UK; average credit buying price of standard family (annual consumption of 3,300kWh) by DTI (tax included), Norway; home and agricultural average unit price (added value tax excluded) by statistics authority, other European countries: Eurostat data, Japan; general power electric company light power comprehensive unit prices.

4. Customer choice switch rates

(1) USA: Status of the each state

State	Survey time	Objective consumer	Change rate	Start year of liberalization	Base of change rate	Outline
Illinois	End of 2003	All consumer (*1)	16.4%	Home:02/05,business&industry:99/10,all:02/05	MWh base	Transfer cost into home sector is not expensive. New entries concentrate on ComEd Co. area.
Main	November 2004	All consumer	38%	home:00/03, business & industry:00/03,all:00/03	Number of consumers	All consumers are provided with Standard Offer Service. High change rate in big user.
Maryland	September 2004	All consumer	22.9%	Home:00/07, business & industry: 00/07,all:02/07	MW base	SOS is provided to user who does not choose the new entry. High change rate in big user
		Home use	3.1%			
		Business & industry use	42.4%			
Massachusetts	September 2004	All consumer	26.5%	Home:98/03, business & industry: 98/03,all:98/03	MWh base	SOS is provided as a transition measure, and Default Service (DS) is provided as the final guarantee service. The change rate greatly varies depending on wholesale price trend.
		Home use	2.7%			
		Business & industry use	39.3%			
New Jersey	September 2004	All consumer	0.28%	Home:99/11, business & industry: 99/11,all:99/11	Number of consumers	The price of Basic Generation Services (BGS) provided by local distribution company was depressed. The change rate is low.
		Home use	0.05%			
		Business & industry use	1.87%			
New York	September 2004	All consumer	31.7%	Home:98/05-01/07, business & industry: 98/05-01/07,all:01/07	MWh base	Because of the incentive policy of retail competition like Backout Credit and bounty, the change rate is high.
		Home use	7.2%			
		Business & industry use	45.1%			
Ohio (*2)	June 2004	All consumer	19.2%	Home:01/01, business & industry: 01/01,all:01/01	MWh base	SOS is provided to user who does not choose the new entry. The obligation to depress the SOS price for home sector. The high change rate of home sector is because of an active aggregation service at local government level.
		Home use	18.7%			
		Business use	28.8%			
		Business & industry use	18.9%			
Pennsylvania (*3)	October 2004	Allegheny supply area	0.1%	Home:99/01, business & industry: 99/01,all:99/01	MWh base	Competition promotion policy is carried out. For example, Default Service is transferred to the new entry with the Market Share Threshold: MST.
		Duquesne supply area	33.7%			
		PECO supply area	15.7%			
		Penn Power supply area	0.3%			
		PPL supply area	1.6%			
Texas	March 2004	Home use	15%	Home:01/07, business & industry: 01/07,all:02/01	MWh base	Existing electric company provides at regulated standard price (price-to-beat) till the market share of new entry exceeds 40%.
		1 st voltage receive (*4)	63%			
		2 nd voltage receive (*4)	46%			

*1 In Illinois, there is no new entry in home use consumer.

*2 The Customer choice switch rates in Ohio is the total of 8 regional public companies within the state.

*3 In Pennsylvania, only the number of users and the share for the new entry is published for each supply area.

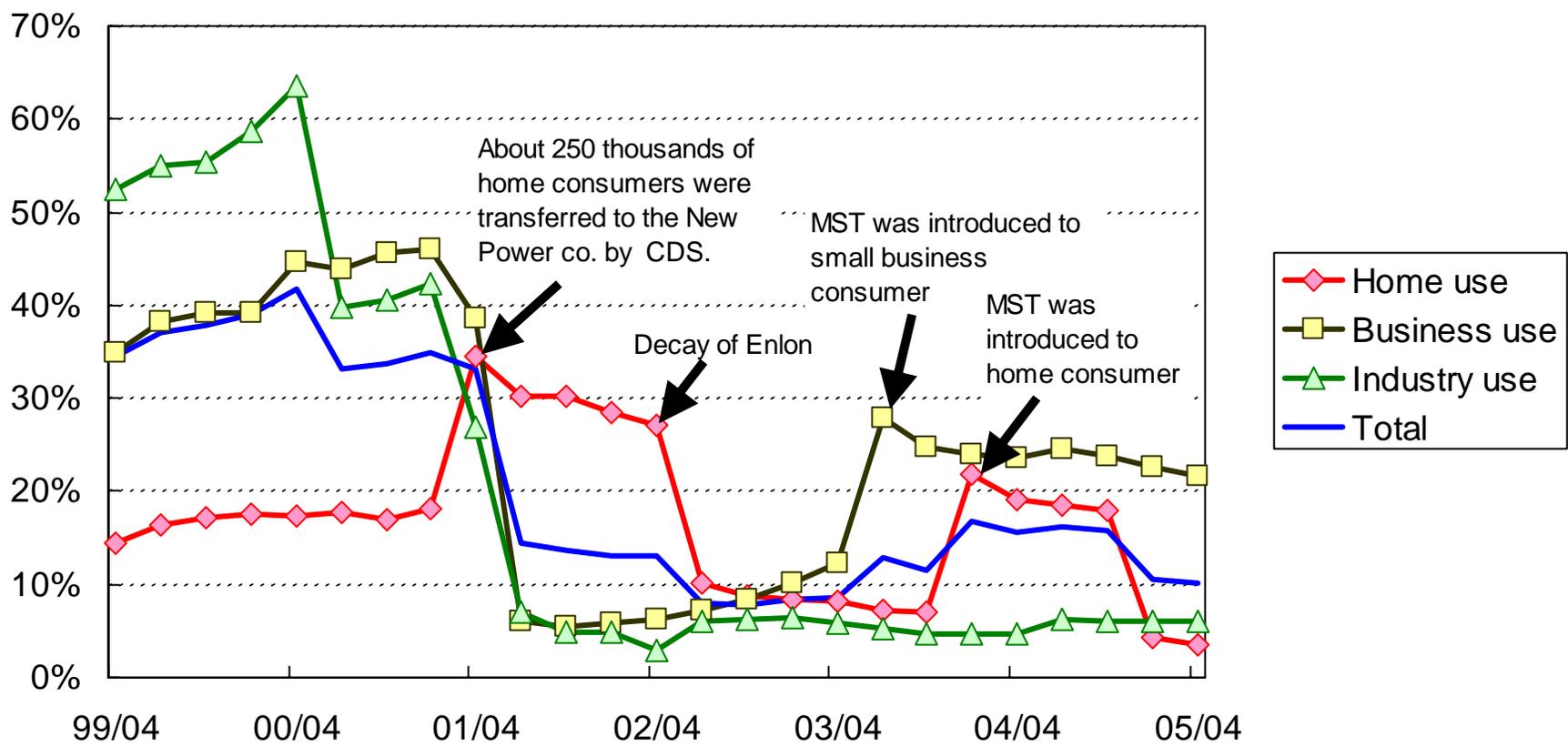
*4 In Texas, 1st voltage receive means a user who receive standard transmission voltage and corresponds to mainly big user, and 2nd voltage receive means a user who receive non-standard voltage and corresponds to mainly business or small industry user.

Data origin: Website of public business committee of each state



4. Customer choice switch rates

(1) USA: Example in PECO co. Ltd. Pennsylvania



Note: (Market Share Threshold Program): 20% of consumers who did not change supplier were randomly selected, then Default Service supplier was decided by bid. PECO Energy's business reform plan of 1998 said that if the supplier change rate of home and small business consumers did not reach 50% by January 1 2003, the supplier for the consumers should be changed by bid. This open bid was carried out based on the provision.

Data origin: Pennsylvania Office of Consumer Advocate, "Pennsylvania Electric Shopping Statistics"

4. Customer choice switch rates

(2) Europe

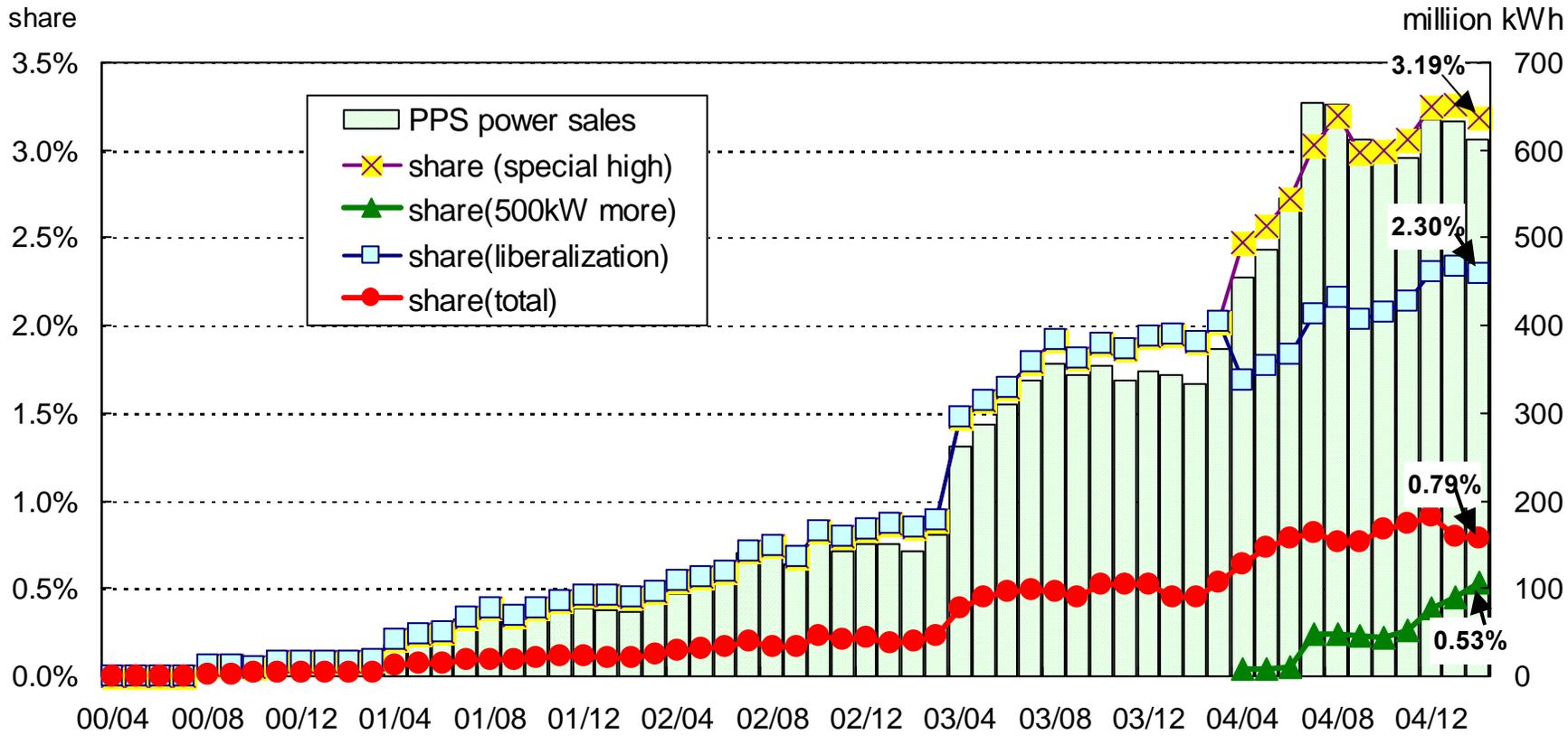
	Large scale adequate consumer		Small business/home consumer		Retail supply market share				
	Change rate	Change in 2003	Change rate	Change in 2003	Number of suppliers	Number of suppliers independent from DSO	Number of companies with share of 5% more	Top 3 market share	Foreign market share
Austria	22%	7%	3%	1%	144	19	4	67%	2%
Belgium	35%	8%	19%	19%	41	17	2	90%	<10%
Denmark	>50%	22%	5%	5%	69	23	5	67%	n.k.
Finland	>50%	16%	n.k.	4%	70	8	6	30%	25%
France	22%	n.k.			20-25	15	1	88%	9%
Germany	35%	n.k.	6%	n.k.	1050	100	3	50%	20%
Greece	0%	0%			10	9	1	100%	0%
Ireland	>50%	6%	1%	1%	9	7	4	88%	12%
Italy	30%	n.k.			305	270	6	35%	n.k.
Luxemburg	15%	n.k.			12	1	2	100%	0%
Netherlands	10%	n.k.	35%	n.k.	37	16	3	88%	18%
Portugal	30%	7%	1%	1%	4	3	3	99%	33%
Spain	9%	5%	0%	0%	70	62	5	85%	8%
Sweden	>50%	5%	n.k.	10%	127	127	4	70%	39%
UK	>50%	n.k.	>50%	22%	80	66	6	60%	50%
Norway	>50%	15%	>50%	19%	130	70	4	44%	2%
Estonia	0%	0%			17	1	1	?	3%
Latvia	0%	0%			14	4	1	99%	0%
Lithuania	17%	17%			21	14	1	100%(1)	0%
Poland	10%	7%	4%		357	328	3	32%	17%
Czech	n.k.	n.k.			370	0	8	46%	n.k.
Slovakia	10%	3%			25	21	4	84%	28%
Hungary	24%	19%			26	20	7	56%	97%
Slovenia	10%	10%			76	71	6	71%	20%
Cyprus	0%	0%			1	0	1	100%(1)	0%
Malta	0%	0%			1	0	1	100%(1)	0%

Data origin: European committee, "Annual Report on the Implementation of the Gas and Electricity Internal Market TECHNICAL ANNEXES", January 2005



4. Customer choice switch rates

(3) Japan: Trend in PPS share



Data origin: Agency for National Resource and Energy, "Electric power total demand statistics"

■ Electric power sales and share of PPS is in an increasing trend, however it occupies only 2.30% of liberalization sector at the time of February 2005.

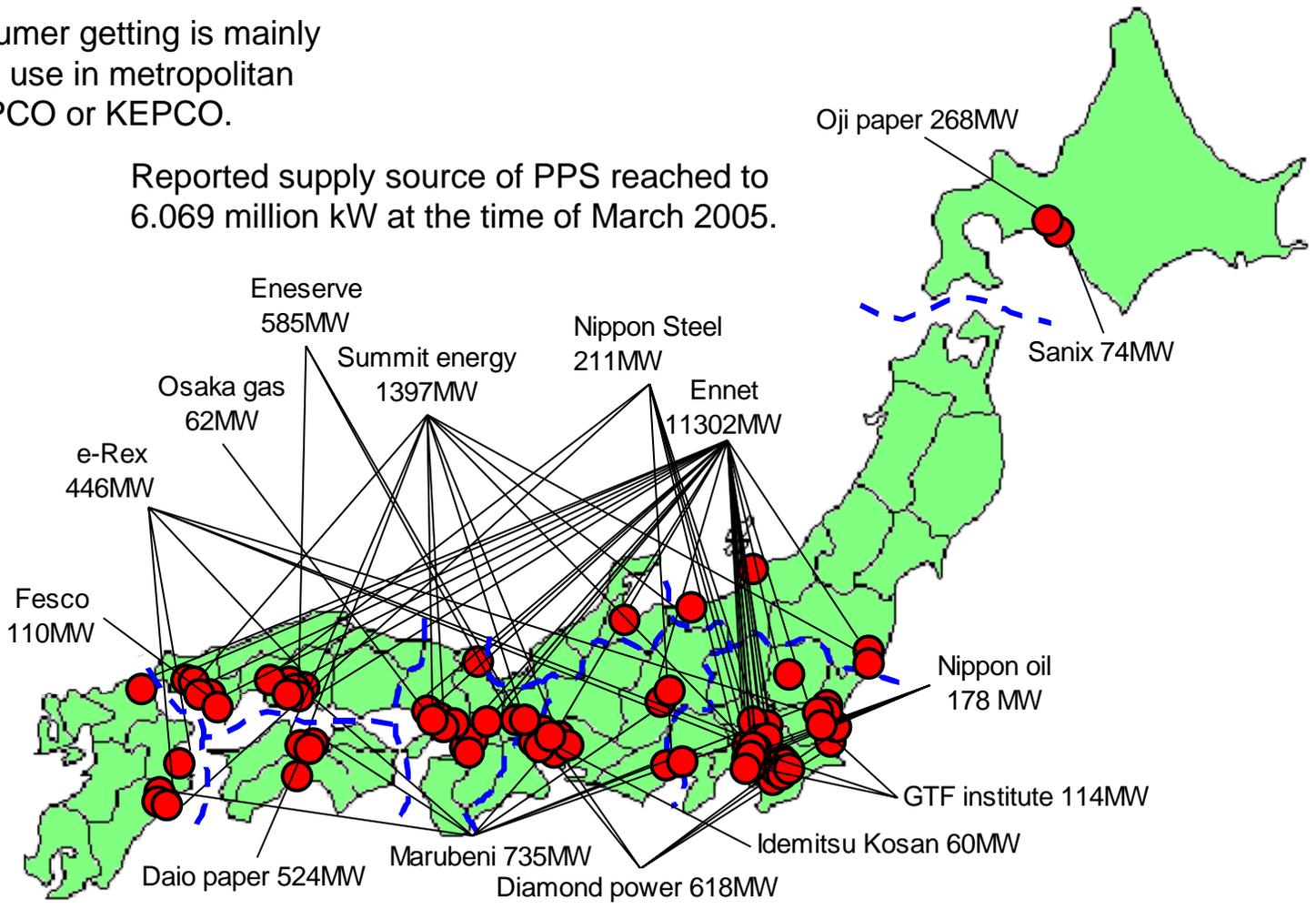


4. Customer choice switch rates

(3) Japan: Distribution of reported PPS

Actual consumer getting is mainly for business use in metropolitan area by TEPCO or KEPCO.

Reported supply source of PPS reached to 6.069 million kW at the time of March 2005.



Note: Reported power capacity of less than 10 thousands kW is omitted.



4. Customer choice switch rates

(4) Summary of comparative results

■ USA

- ✦ In a competitive state, because the asymmetry regulation is introduced between existing and new comer electric company, change rate is high.
- ✦ On the contrary, in the state which make importance on returning profit of liberalization to a small consumer including home, preceding price down has been carried out and change rate is low.

■ Europe

- ✦ In UK or northern European countries, the situation is that the change rate of big consumers is more than 50%. The change rate differs largely depending on countries.
- ✦ In the benchmarking report of European committee, as an index related to the degree of competition development, market concentration index (number of companies which have more than 5% share, share of top 3 companies), and share in a foreign market are considered in comparison.

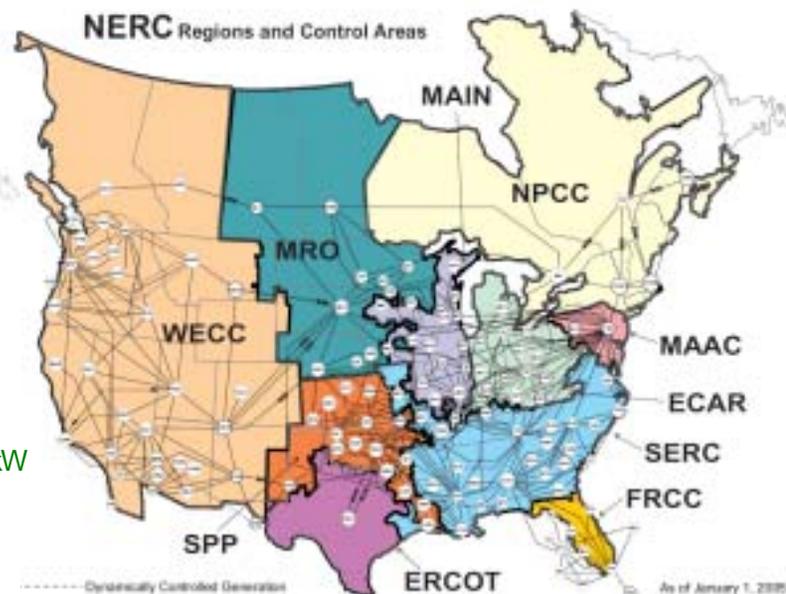
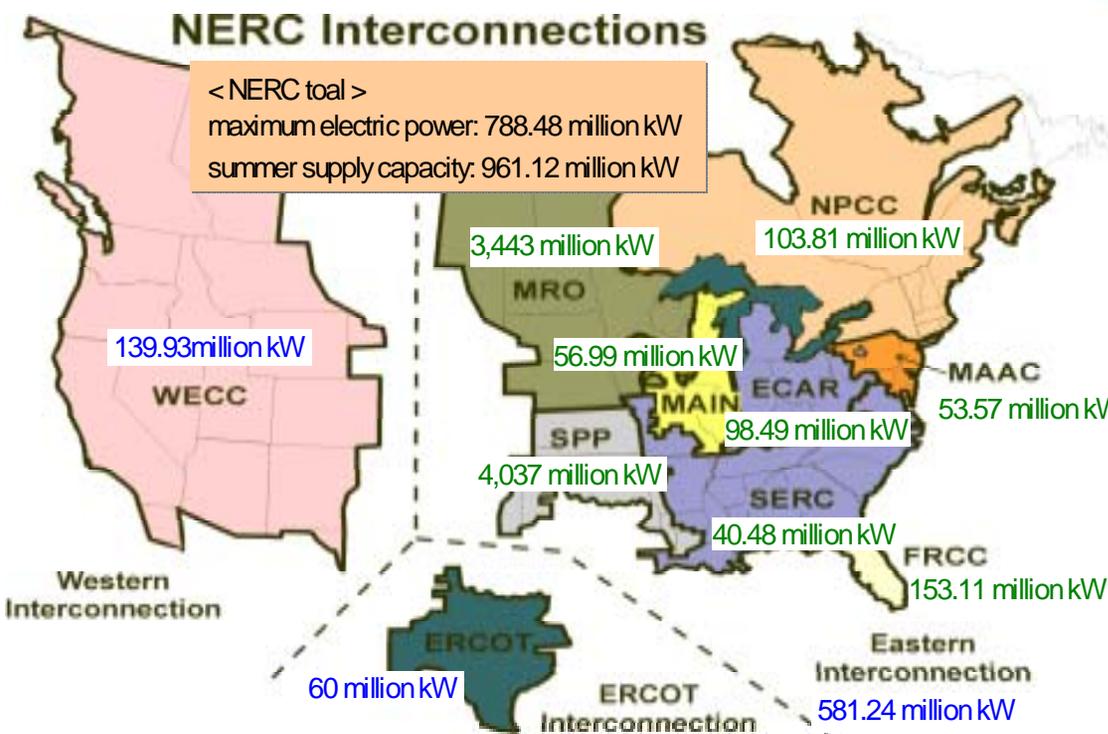
■ Japan

- ✦ In Japan, an asymmetry regulation as in USA is not introduced.
- ✦ The percentage of PPS getter is 2.30% and low among liberalization objective consumers. If confined to Very-High, it remains 3.19%. (at the time of February 2005)



5. Reliability of power grid system

(1) Reliability Organization: USA



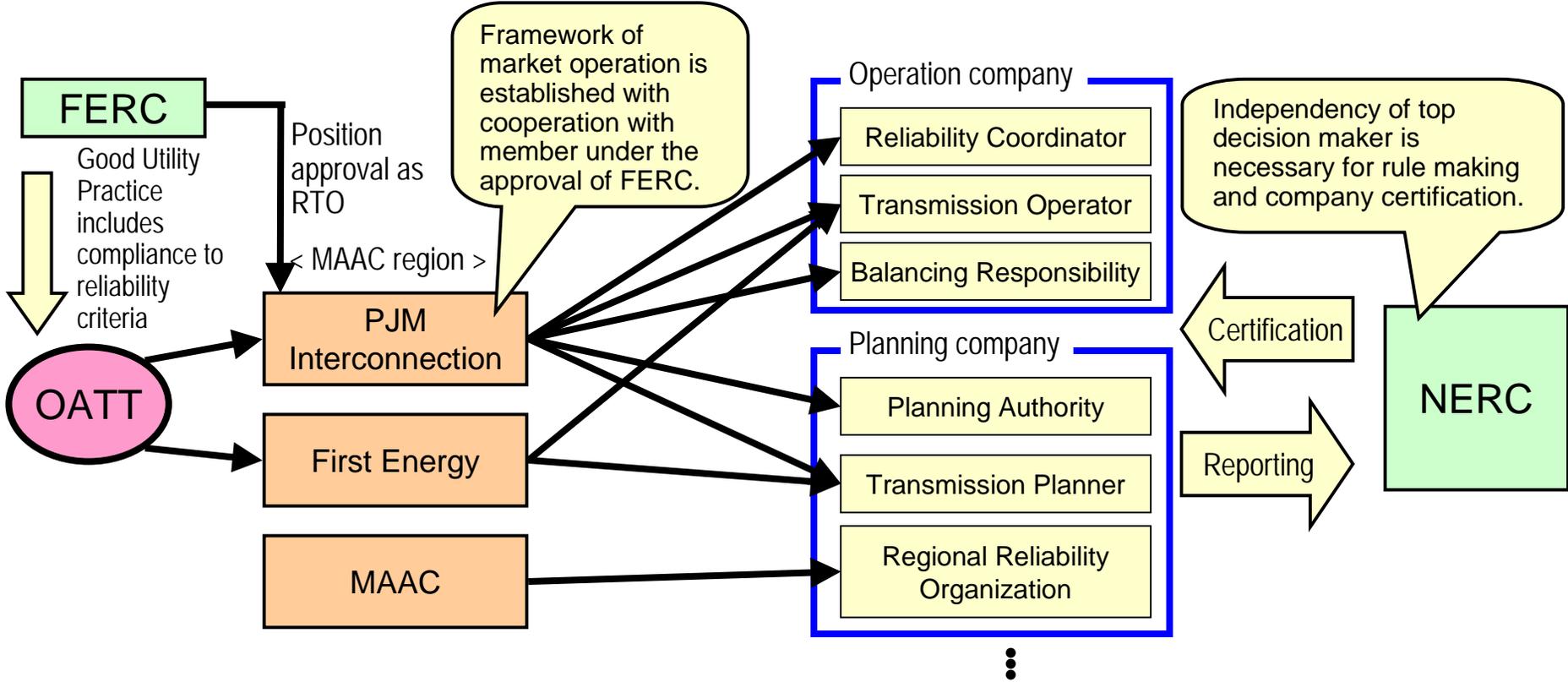
- 3,084 of electric companies are joining, and small and large system operators are operating in 133 of system control area.

- The USA's security of Reliability of power grid system is in the multiple structure like that the NERC administrates all of the northern American system, under it a regional reliability organization exists, and further, electric companies join in regional reliability association.



5. Reliability of power grid system

(1) Reliability Organization: Framework of NERC



- The new Reliability Standard has been in valid since April 2005, but it is a re-construction of existing rules based on the Functional Model. Effectiveness of it will be secured by certifying the organization which has the corresponding function, and providing compliance method.

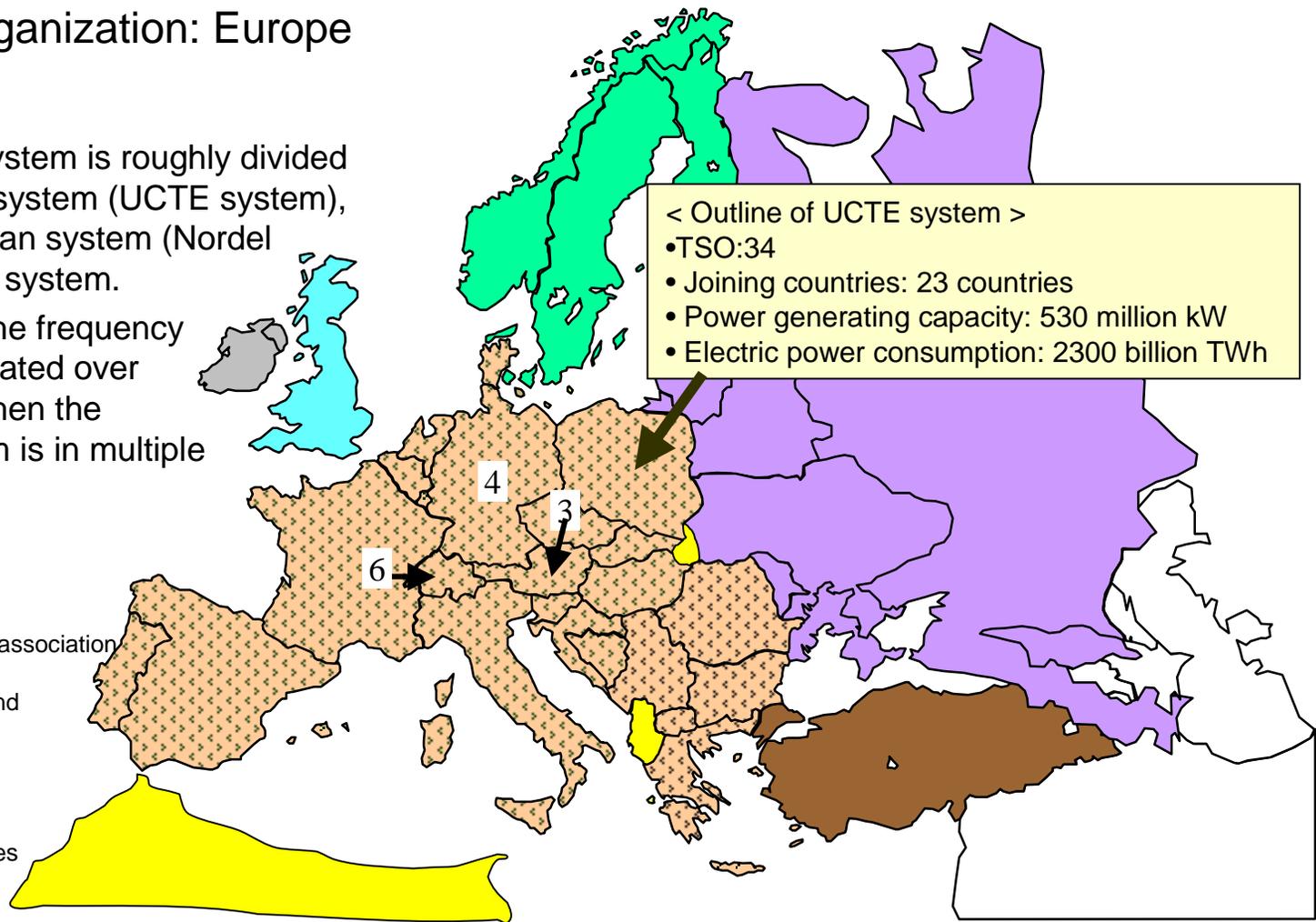


5. Reliability of power grid system

(1) Reliability Organization: Europe

- European electric system is roughly divided into the continental system (UCTE system), the northern European system (Nordel system) and the UK system.
- In the UCTE area, the frequency control block is operated over multiple countries, then the responsibility system is in multiple structure.

- UCTE member
- UCTE non-joining and association
- Ireland and North-Ireland
- Nordel (North Europe)
- UK
- IPS/UPS Baltic countries
- Turkey

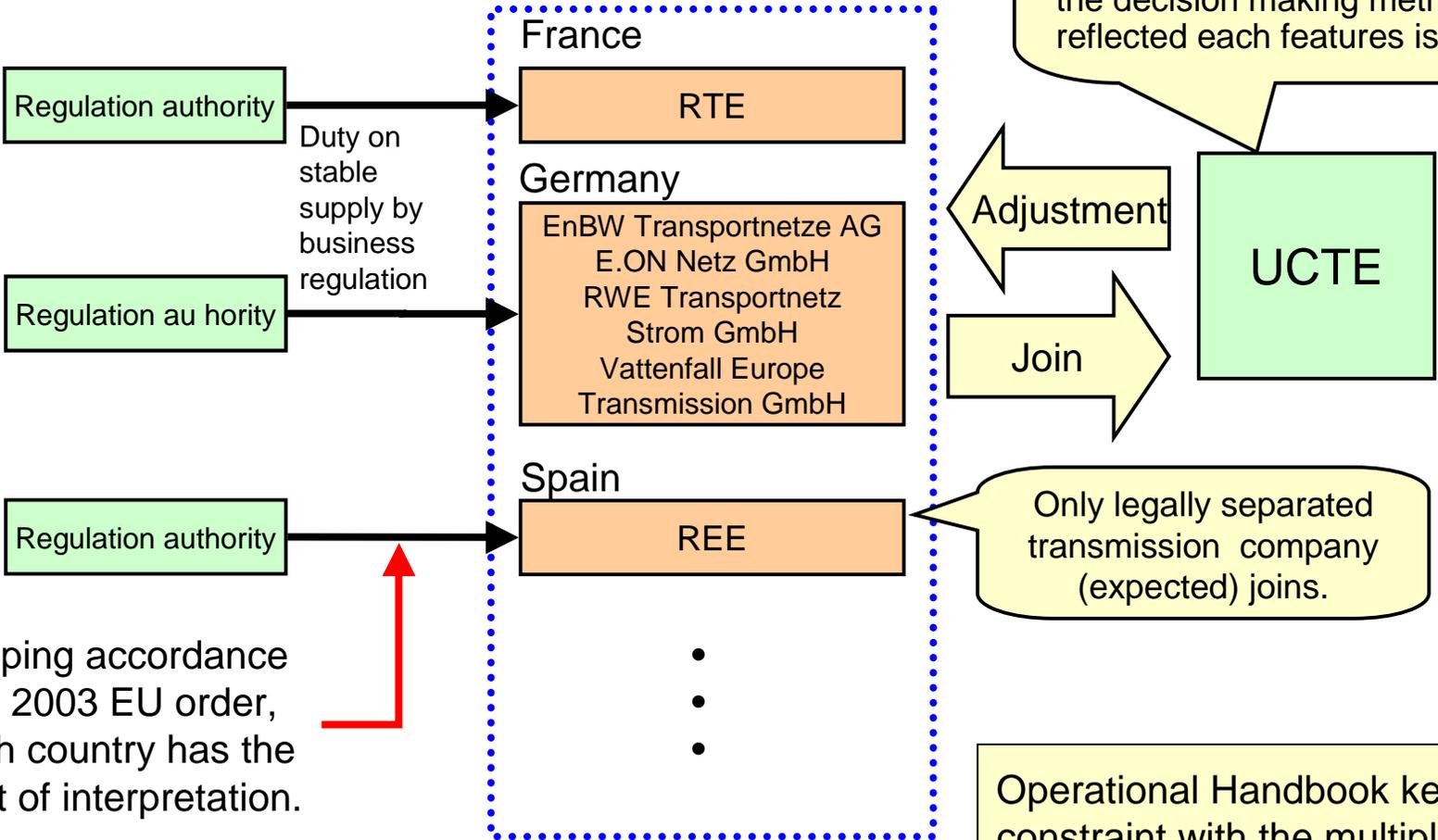


Note: numeric number in the figure means the number of transmission company joining in UCTE within the country
 Data origin: UCTE



5. Reliability of power grid system

(1) Reliability Organization: Framework of UCTE



As the adjustment of member transmission company's profit or each country's profit is necessary, the decision making method reflected each features is adopted.

Adjustment

Join

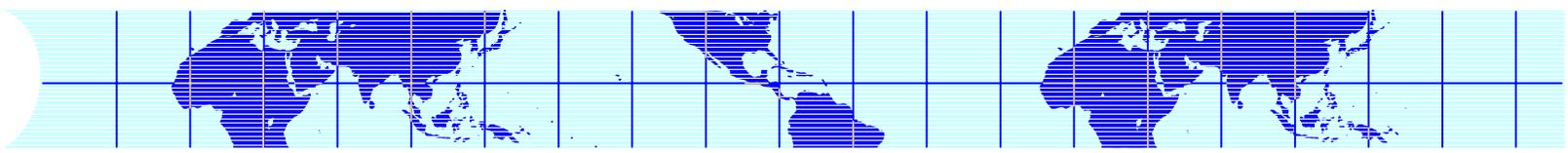
UCTE

Only legally separated transmission company (expected) joins.

Operational Handbook keeps a constraint with the multiple agreement in principle.

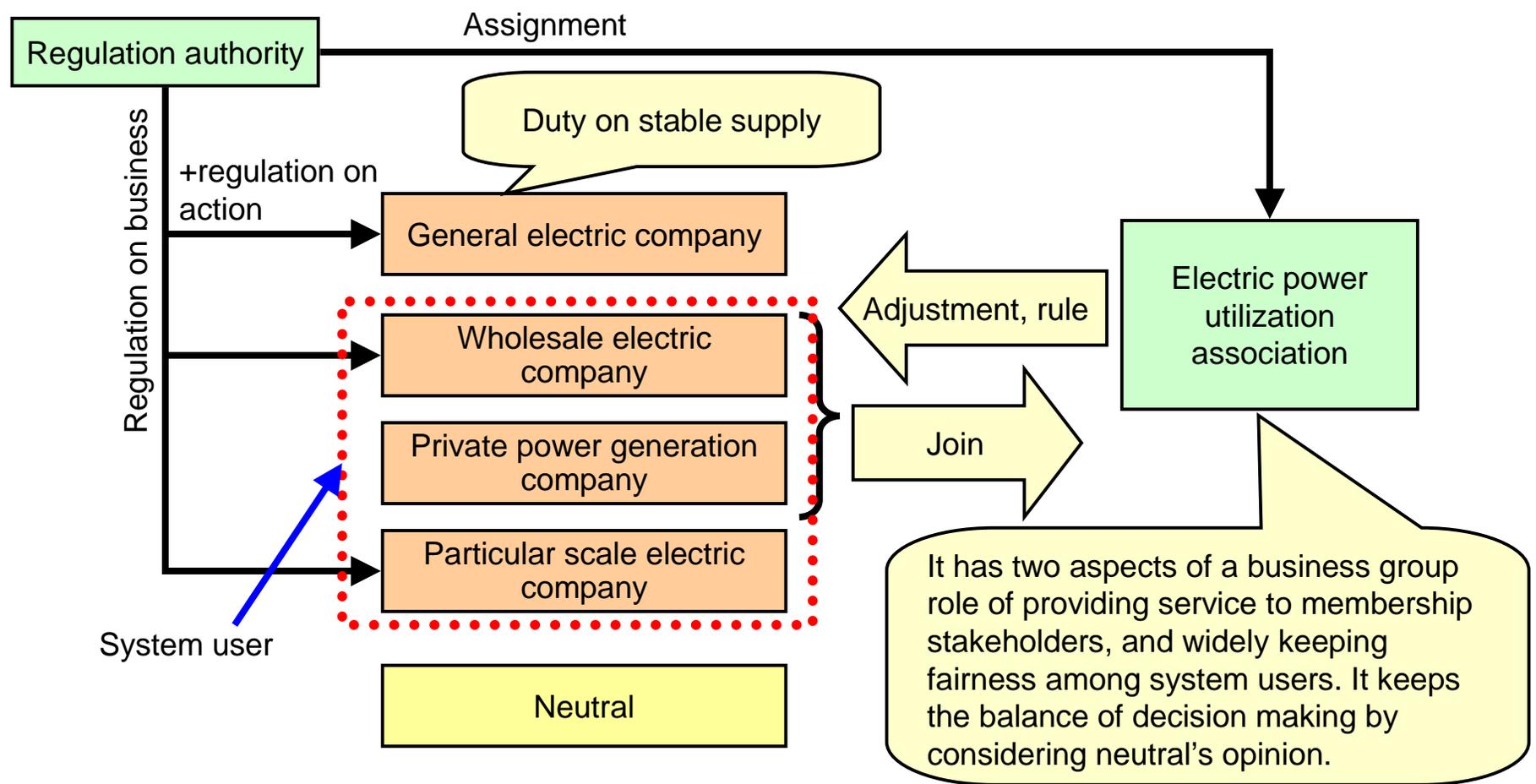
Keeping accordance with 2003 EU order, each country has the right of interpretation.

23 countries, 34 TSOs join.



5. Reliability of power grid system

(1) Reliability Organization: Framework of Electric Power Utilization Association





5. Reliability of power grid system

(1) Reliability organization: comparison of rules

	USA	Europe	Japan
Establishing Organization	NERC	UCTE	Electric Power System Council of Japan (ESCJ)
Name of Regulation	Reliability Standards	Operation Handbook	Association rule
Member	Regional Reliability Association	Transmission Company	General Power Electric Utility, Wholesale Generator, PPS, Neutral parties
System Operation Rule	O	O	O
Normal system operation rule	O	O	O
Emergency system operation rule	O	O	O
Transmission System Equipment Plan	O		
Demand prospecting method	O		
Criteria for equipment ensuring	O		
Wide-area adjustment of equipments formation	O		O
Wide-area Trading Method	O	O	O
Calculation Method for Available Transfer	O	O	O
Information Communication	O	O	
Training of System Operator	O	O	
Tree Management	O		
Publication of Information	O	O	O
<reference> Legal Framework of Stable Power Supply	Not clear, the function of transfer sector became various and complicated	Responsibility of electricity transfer company by Industry Law	Responsibility of general power electricity company by Industry Law

- In USA, the responsibility for stable supply is assured in the distributed framework concentrating to the private volunteer group NERC. In Japan and Europe, the responsibility for stable supply is assigned to particular companies by the industry law, but in Europe, a transmission company covers the role.
- Considering the difference of the framework of stable supply, such as the industry law, the applicable function for Japan should be distinguished clearly.

5. Reliability of power grid system

(2) Reliability assessment in USA: outline of assessment

< outline of the supply capacity adequacy evaluation in each regional reliability association >

	ECAR	ERCOT	FRCC	MAAC	MAIN	MAPP	NPCC	SERC	SPP	WECC
LOLE/LOLP	1day/10y LOLE	1day/10y LOLE	1day/10y LOLP	1day/10y LOLE	1day/10y LOLE	1day/10y LOLE	1day/10y LOLE	Decided for each system	1day/10y LOLP	-
Preparatory necessity (near most)	Fulfill LOLE	12.5%	15%	Calculate on LOLE criteria (PJM)	Next summer14. 12% long term16%	15%	Fulfill LOLE	Different for each system	12%(9% for system hydro more than 75%)	-
Criteria setting/approval body										
region	O	O ¹	O	O	O	O	O	-	O	-
Lower region	-	-	-	-	-	-	-	-	-	- ²
Control region/separate system		-	-	-	-	-	-	O	-	-
ISO/RTO	-	O ¹	-	O	-	-	-	-	-	-
state/local regulation authority	-		O	-	O ³	-	-	O	-	-
Evaluation term										
corresponding year	O	O	O	O	O	O	O	O	-	O
1year	O	O	O	O	O	O	-	O	-	O
5years	O	O	O	O	O	O	O	O	O	-
More than10years	O	-	O	-	-	O	-	O	-	O
Evaluation implementation subject										
region		O	O	O	O	O	-	O	O	O
Lower region		-	-	-	-	-	-	O		O
separate system	-	-	-	-	O	-	-	O	O	-
ISO/RTO	N/A	O	N/A	O	N/A	N/A	O	N/A	N/A	N/A

Note: 1. ERCOT is both for region and ISO.

2. A criteria does not exist in WECC, however criteria for supply adequacy is initiated in multiple lower area including California and Northwest.

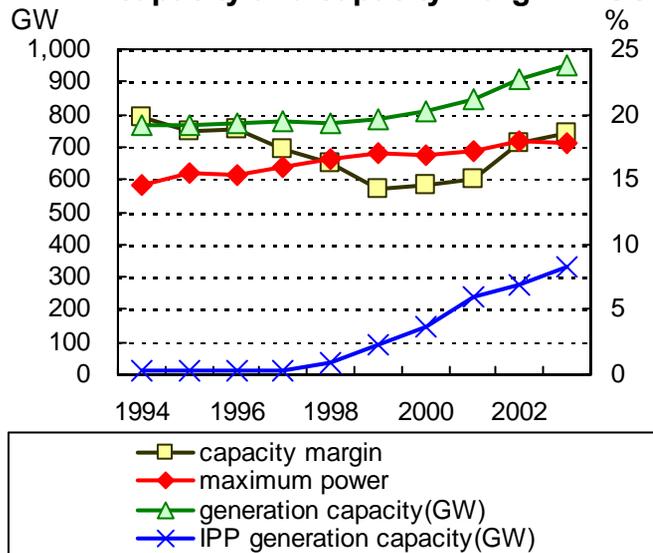
3. Only a part of region corresponds.

Data origin: Reproduced from NERC, "Resource and Transmission Adequacy Recommendation", June 15, 2004

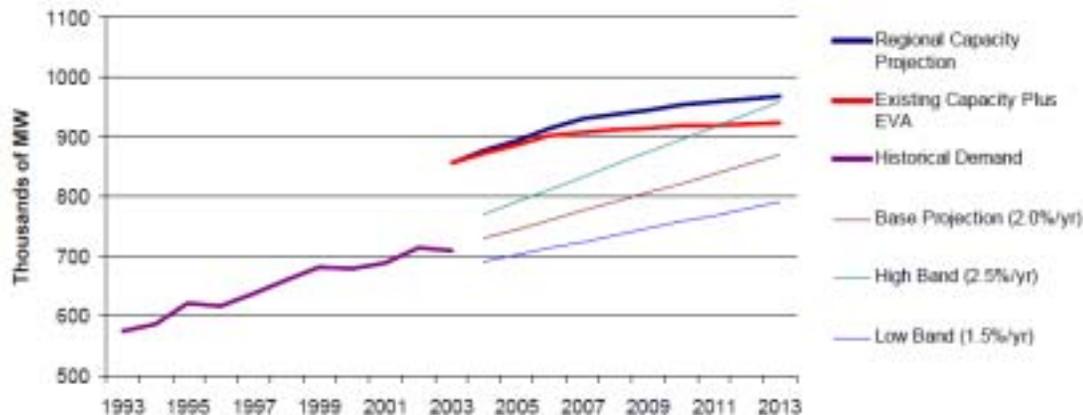
5. Reliability of power grid system

(2) Reliability assessment in USA: Prospect of supply capacity

Trend of the maximum electric power, generation capacity and capacity margin in USA



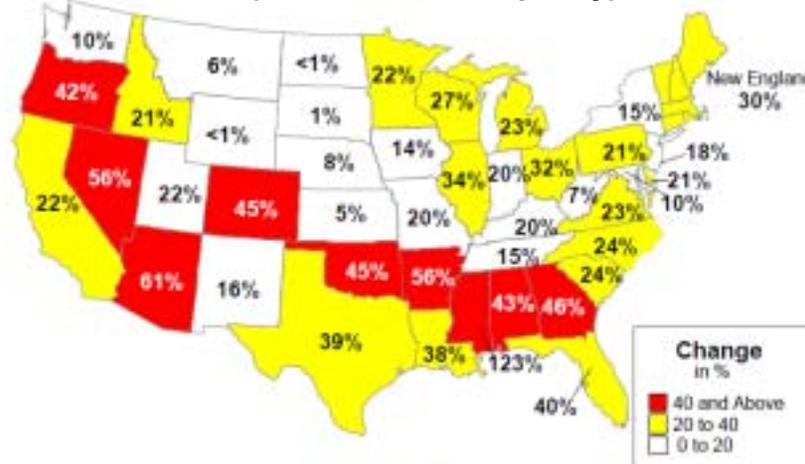
Prospect of the maximum electric power and power generating capacity in USA



Note: capacity margin; the ratio of an excess supply over a demand to supply capacity

Data origin: NERC, EIA

New construction plan of power generating facility 1998-2007 (ratio to 1998's capacity)



Source: EVA

Data origin: NERC, "2004 Long-Term Reliability Assessment", September, 2004

- As the main increase of supply capacity rely on merchant power generating company, the expectation of power supply capacity is difficult.
- The short term (2004 to 2008) adequacy of supply capacity is at enough level in the North American scale, conditioned that the new power generation facilities will be constructed as scheduled, however there still remains possibility that some local problems be caused by a high demand in unexpected bad weather or related various facility problems.
- It is prospected that a new location of power generating may cause local bias.



5. Reliability of power grid system

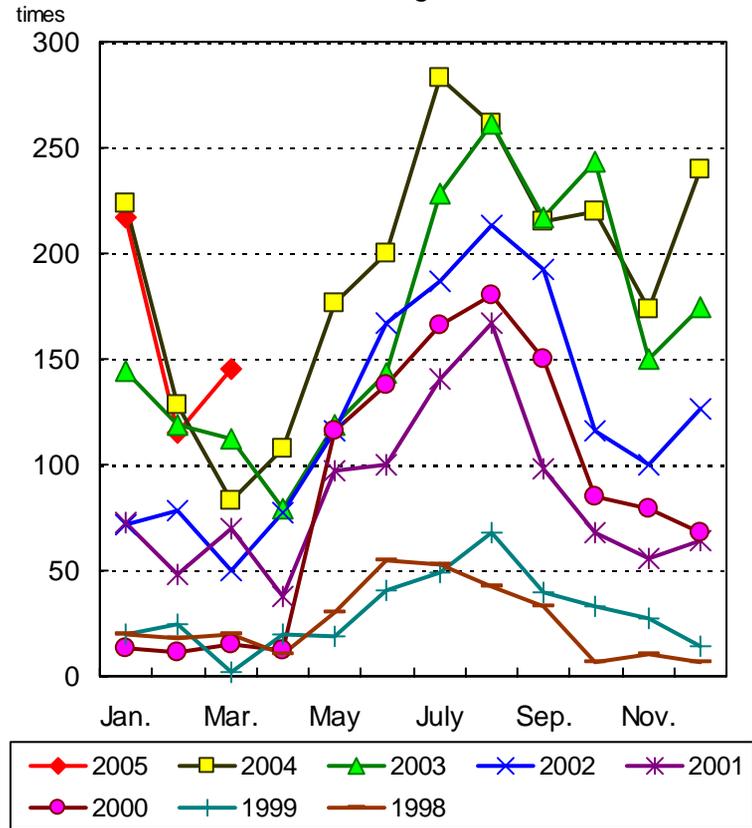
(2) Reliability assessment in USA: Prospect of transmission facility

Prospect of 230kVup transmission line construction (miles)

FRCC	6,894	360	81	7,335	0.62%	6.4%
MAAC	7,057	134	0	7,191	0.19%	1.9%
MAIN	6,195	374	260	6,829	0.98%	10.2%
MAAP-US	14,705	228	246	15,179	0.32%	3.2%
MAPP-Canada	6,660	94	963	7,717	1.48%	15.9%
NPCC-US	6,406	376	0	6,782	0.57%	5.9%
NPCC-Canada	28,961	258	38	29,257	0.10%	1.0%
SERC	28,868	1,349	1,085	31,302	0.81%	8.4%
SPP	7,659	191	17	7,867	0.27%	2.7%
Eastern system	129,844	3,520	2,707	136,071	0.47%	4.8%
WECC-UC	58,400	1,573	1,582	61,555	0.53%	5.4%
WECC-Canada	10,969	270	252	11,491	0.47%	4.8%
WECC-Mexico	563	24	0	587	0.42%	4.3%
Western system	69,932	1,867	1,834	73,633	0.52%	5.3%
ERCOTsystem	8,081	290	110	8,481	0.48%	4.9%
USA	160,704	5,031	3,398	169,133	0.51%	5.2%
Canada	46,590	622	1,253	48,465	0.40%	4.0%
Mexico	563	24	0	587	0.42%	4.3%
NERCtotal	207,857	5,677	4,651	218,185	0.49%	5.0%

Data origin: NERC, "2004 Long-Term Reliability Assessment", September, 2004

Number of invoking level above 2

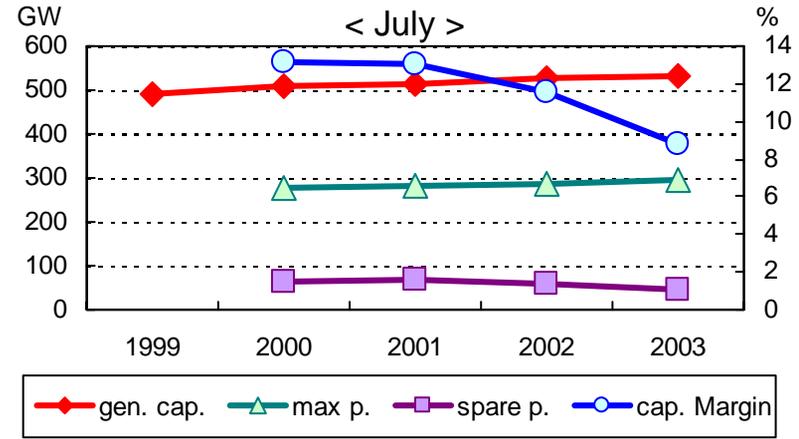
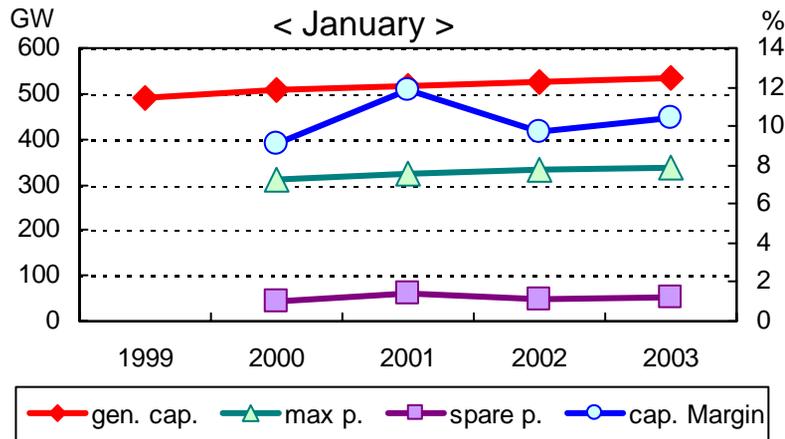


Data origin: NERC, Transmission Loading Relief (TLR) Procedure, <http://www.nerc.com/~filez/Logs/index.html>

5. Reliability of power grid/system

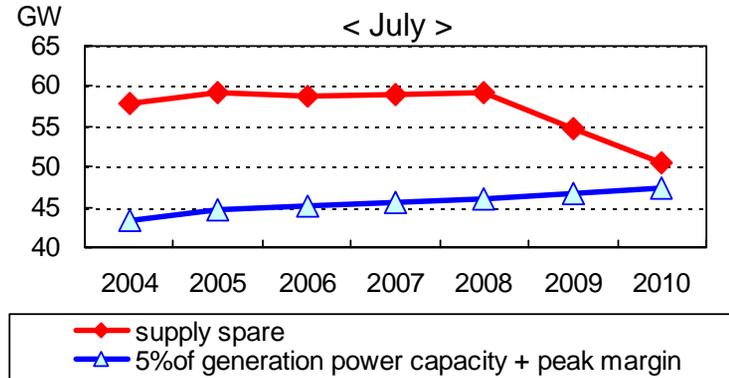
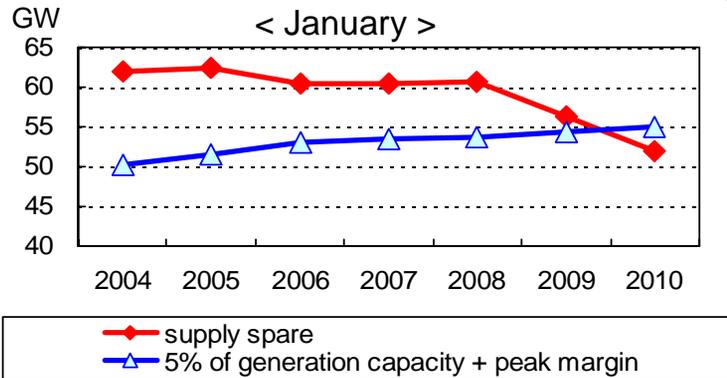
(3) Reliability assessment in Europe: Prospect of supply capacity

Trend of maximum power, generation capacity and capacity margin in UCTE system



- The increase of maximum electric power is showing the later of 2% range in all of UCTE. The generation capacity is also in a similar level of increase, and the preparatory supply margin remains flat. In Europe, the regenerative energy occupies the large part of the generation capacity increase, and it is a feature.

Prospect of maximum power and generation capacity in UCTE system



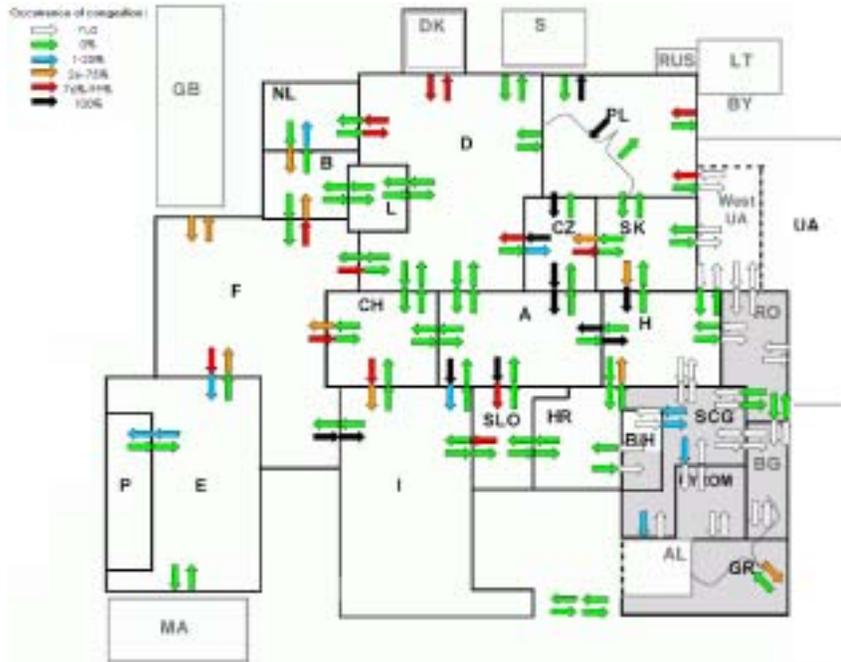
Data origin: UCTE, "UCTE System Adequacy Forecast 2005-2015", January, 2005

No danger exist in the reliability of UCTE system in the period of 2005 to 2007. Sufficient increase of power generation capacity is expected, and the ratio of regenerative energy to newly constructed power generation facility is being enhanced. Considered those low availability, preparatory power decreases from 2005 to 2007, but it is enough level in comparison with UCTE adequacy criteria margin. At the time of 2010, scheduled commissioning of power plant compensates a part of demand increase, preparatory power continues to decrease. However, adequate security margin can be maintained.

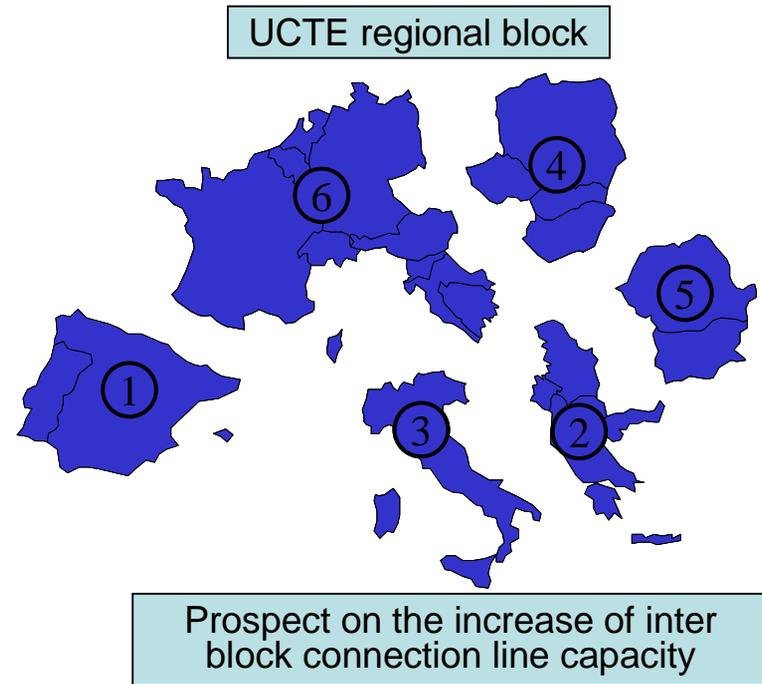
5. Reliability of power grid system

(3) Reliability assessment in Europe: Prospect of transmission facility

Busy occurrence in UCTE system international connection line



Data origin: UCTE, "UCTE System Adequacy Forecast 2005-2015, January, 2005



In general, delivery capacity is not considered to become a obstacle to system security. On the other hand, based on the market phenomena that a power station competes the most economic use, multiple crowded points emerge in connection system, and because of this narrow path, the utilization of more economic foreign power supply can become impossible.

	Cap. Inc.	period
UCTEmain region=Spain&Portugal	+1200MW	2007
UCT Emain region=Italy	+800MW	2008
UCTEmain region = Italy	+1600MW	2010
Spain&Portugal=Morocco	+400MW	2007
JIEL&Greece=Turkey	+500MW	2010
Central= UCTE main region	-	2007 - 2008
Central= Romania&Bulgaria	-	2000
Romania&Bulgaria =IPS/UPS	+1100MW	2009

Data origin: UCTE,"UCTE System Adequacy Forecast 2005-2015, January, 2005



5. Reliability of power grid system

(4) Reliability assessment in Japan

< long term demand and supply balance evaluation >

Unit: 10MW

Item	Demand and supply balance	
	5 th year (2009)	10 th year (2014)
	August	August
Maximum power demand (A)	18,200	19,246
Planned supply (B)	19,838	21,268
(B)/(A)	1.09	1.11

< short term demand and supply balance evaluation >

Unit:10MW

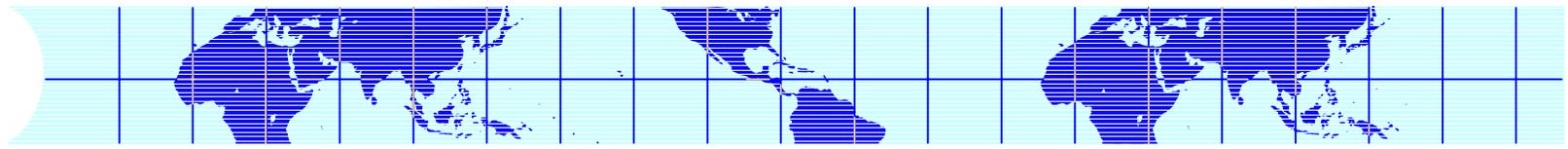
Item	Demand and supply balance	
	1 st year (2005)	2 nd year (2006)
	August	August
Maximum power demand (A)	17,349	17,564
Planned supply (B)	19,415	19,555
(B)/(A)	1.12	1.11

< reliability evaluation of connected system >

(1)criteria of reliability: The reliability criteria of each connection system permits a partial power drop and a supply difficulty, because no supply difficulty or generation difficulty can occur in principle for N-1 failure, and the frequency is rare for N-2 failure.

(2)calculation cross section: As for calculation cross section, once a year by rule in principle, calculation is carried out on multiple sections depending on facility utilization for each connection system.

(3)calculation result of operation capacity: Each connection system adopts the minimum of the limiting values decided from thermal capacity, system stability, voltage stability, frequency maintenance.



5. Reliability of power grid system

(5) Summary of comparison results

■ USA

- ✦ In the USA, NERC, the Reliability organization governing over all the North America, systematically and regularly accomplish reliability evaluation. (the next year (summer, winter), 10 years future)
- ✦ Power source development relies on market, and construction of independent power station increase, then the evaluation method has some change. Construction of transmission facility is slow down in comparison with the power source development prospect.
- ✦ Because of local unevenness of power development, there can be power supply shortage locally around in 2010.

■ Europe

- ✦ Reliability evaluation was carried out for the continental system by UCTE, and for the northern Europe system by Nordel in Europe. Similar to the USA, power source development is merchandised, and the construction of international connection line inclines to get importance.

■ Japan

- ✦ Reliability evaluation report was published by Power System Operation Association in. It is evaluated that 2005 a sufficient supply capacity exists till 10 years future.



6. Summary of evaluations from each index (1)

■ View point of liberalization system design (international comparison of systems)

- ⊕ In Europe and America, in spite of the difference in direction of convergence , each concept of “standard market design” is coming out. (However in the USA, it is a concept of the reform for generation and transmission sector.)
- ⊕ From that point of view, the degree of achievement in Japan is concluded as low.

■ View point of efficiency (comparison of electricity prices)

- ⊕ In comparison with the representative electric utilities in France, Germany, Italy and USA, Japan’s electricity price tends to approach them within a two times gap. In comparison with New York area, it is almost in a equal or slightly low level.
- ⊕ In Europe and America, electricity price is varying after regulation reform, however Japan’s electricity price is stably in falling trend.



6. Summary of evaluations from each index (2)

■ View point of competition development (customer choice switch rates)

- ✦ The Customer choice switch rates to PPS remains at 2.34%, and very low in liberalization field.
- ✦ In Europe, in the case that asymmetric regulation is introduced from the view point of competition promotion, the supplier change rate is high, and in the other case, the rate is low.

■ View point of stable supply (reliability of power grid system index)

- ✦ We should pay attention on that the framework of stable supply is largely unique in each country, as in Japan, Europe and America. Depending on that, the positioning of reliability organization is different between countries, and Japan (ESCJ) can be considered as the intermediate between USA (NERC) and Europe (UCTE).
- ✦ In Europe and America, power source development is relied on the market, and a change is occurring in framework of reliability evaluation. It is considered that the supply capacity is enough for the present, however there is a possibility that a local shortage of supply could occur because of uncertainty of new development.
- ✦ Also in Japan, reliability evaluation report comes to be published by the power system utilization association, and it is evaluated that a enough supply capacity exists in the next about 10 years.



7. Problem and Prospect

(1) Outline

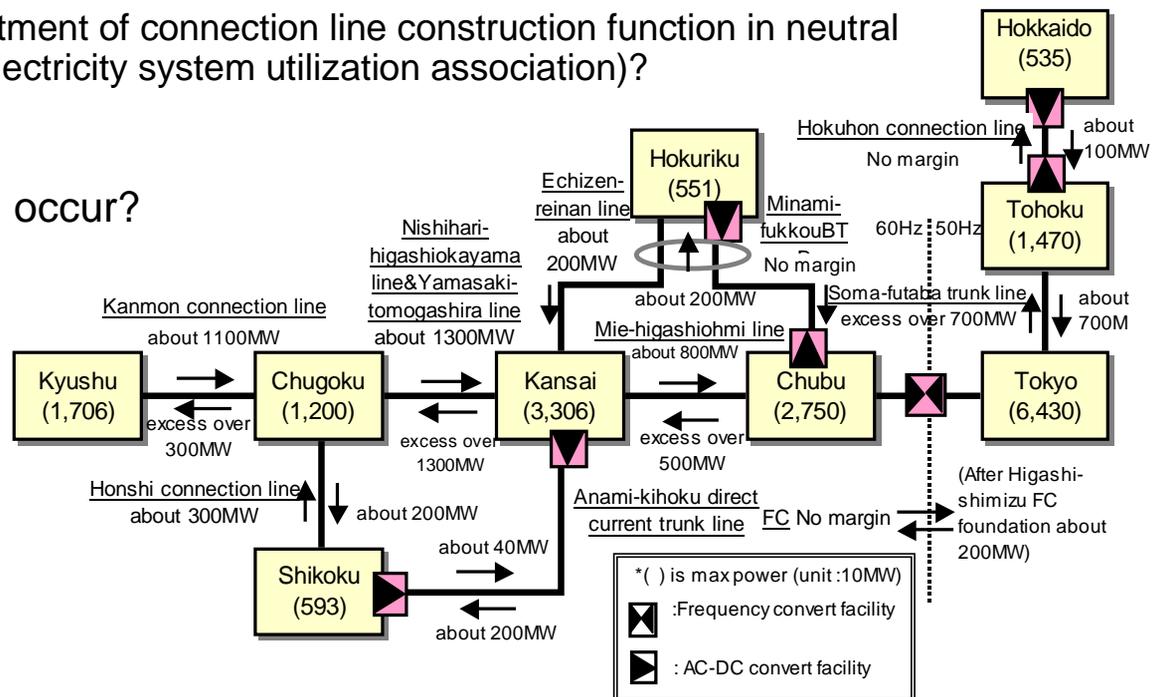
- Success of the new framework by revised Electric Utilities Industry Law
 - ⊕ Neutral Organization, Wholesale electric exchange
- Security of Stable Supply
 - ⊕ Maintaining long term balance of demand and supply
 - ⊕ Positioning of adjustment power source
- Expansion of retail liberalization

7. Problem and Prospect

(2) Neutral Organization, Wholesale electric exchange(i)

- ⊕ The role of wholesale electricity exchange and neutral organization is important for the smooth functioning of all Japan market founding.
 - Before now, relation of generated power and demand was put importance, and the needs of utilizing connection line for PPS was increased.
 - By functioning of wholesale electricity exchange, dose any change occur in connection line needs?
 - Does the adjustment of connection line construction function in neutral organization (electricity system utilization association)?

*What kind of dispute can occur?



Data origin: reproduced from 2004 supply plan

7. Problem and Prospect

(2) Neutral Organization, Exchange (ii): role of connection line

- In Europe and America, reliability organization(NERC&UCTE) has no adjustment function, and a project is promoted through adjustment among individual companies.

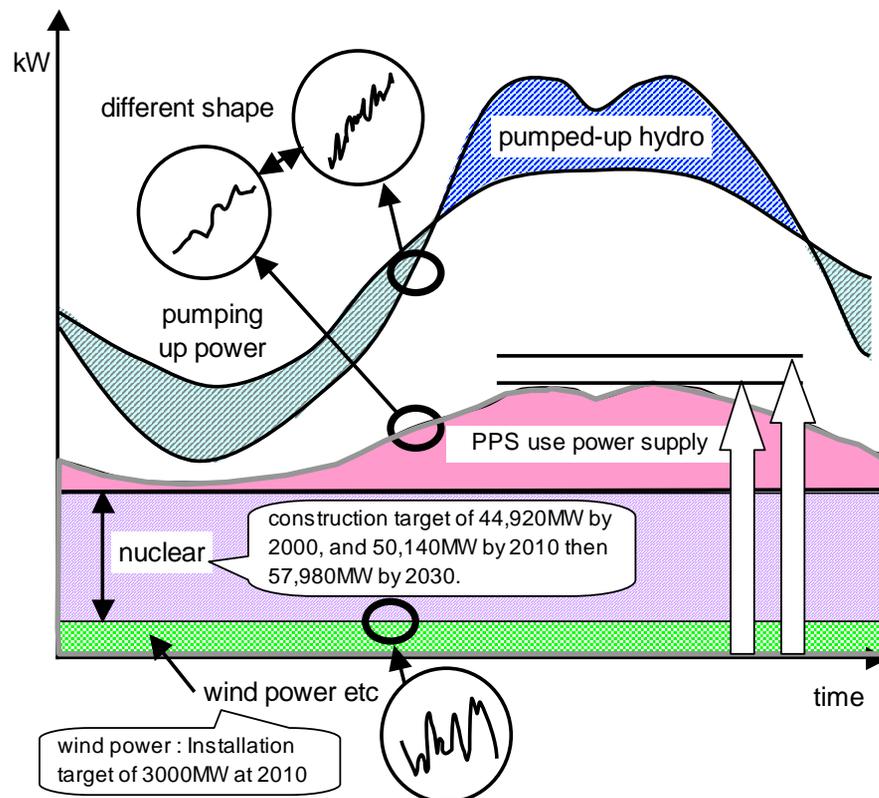
	USA	Europe	Japan
transmission line owner	<ul style="list-style-type: none"> Separate electric company (RTO&ISO does not possess transmission line) 	<ul style="list-style-type: none"> Possessed by transmission company 	<ul style="list-style-type: none"> General and wholesale electric company (Japan Power)
Construction of connection line	<ul style="list-style-type: none"> Separate consultation(RTO&ISO study, electric company constructs) 	<ul style="list-style-type: none"> Separate consultation 	<ul style="list-style-type: none"> Adjustment between related companies
Utilization of connection line	<ul style="list-style-type: none"> Direction for connection line be internal transmission line, by RTO expansion and unified market Use of connection line is in advanced reserve system 	<ul style="list-style-type: none"> Liberalization by divided market system (use through spot market) or transmission right market 	<ul style="list-style-type: none"> Advanced reserve system
Treatment of special facility	<ul style="list-style-type: none"> Priority use for owner, but the not used for the third party 	<ul style="list-style-type: none"> Priority use for owner, but the not used for the third party 	<ul style="list-style-type: none"> Same as the other connection line
Issues on connection line	<ul style="list-style-type: none"> More difficulty of getting land Complexity of licensing procedure System difference between regions (unclearness of income) Complicated interest relations (owner, operator, user each) 	<ul style="list-style-type: none"> More difficulty of getting land Complexity of licensing procedure System difference between regions (unclearness of income) 	<ul style="list-style-type: none"> More difficulty of getting land

- In USA, the income from connection line tends to unstable, because that multiple connection is adopted, and the market different in each region. Therefore, the construction of direct current connection line increased, because of stable expected income.
- In Europe, monopoly transmission company builds connection line in each country, then the construction of connection line is comparatively smooth. For the establishment of unified European market, policy of increasing connection line is kept. (a leading company exists in each country) Partially, a country expects for connection line as a measure of supply assurance, in which new power station construction is difficult.



7. Problem and Prospect

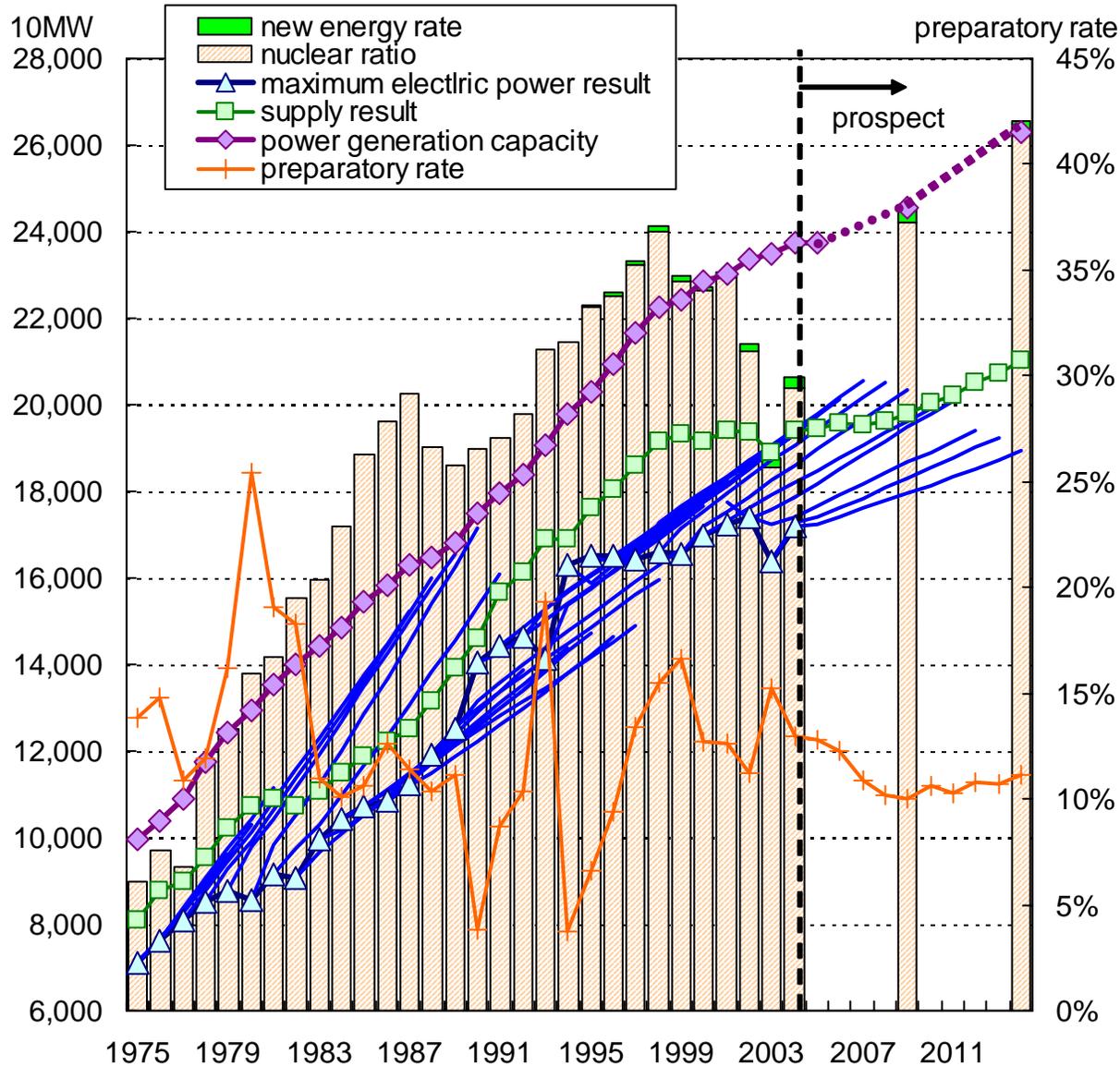
(3) Security of Stable Supply(i)



- Concerning to the countermeasures for energy security and global environmental problem, the promotion of nuclear power and the spread of new power source are considered as the electric industries' issue to be resolved.
- However, as the ratio of such a power source goes high, the ratio of adjustable power source, which is requested to contribute to frequency maintenance depending on load change, is expected to decrease.

7. Problem and Prospect

(3) Security of Stable Supply (ii)



Data origin: reproduced from yearly supply plan

- After 1990, the growth of demand tends to slow down.
- In this situation, the expectation of demand in supply plan is getting to depressive yearly, then the postpone of power source development increases.
- According to 2005's future supply plan, the total share of nuclear and new energy will occupy 42% of all the generated power.



7. Problem and Prospect

(4) Expansion of retail liberalization

Based on the electric power system of this time , and considering assurance status for consumers' choice of option, after considering the following issues like (i) assurance of Reliability of power grid system, (ii) energy security and compatibility with the issue of environmental preservation, (iii) assurance of the final guarantee and the universal service and (iv) practical issues, it is appropriate to carry out full scope liberalization. As the time to begin a concrete discussion, because of the necessity of judging the spread status for supplier choice associated with liberalization scope expansion by (i) it is reasonable that the target time is put on April 2007, 2years after of April 2005.

Data origin: Electric industries working group report, “desirable framework of electric industries system”, February 2003

- The Customer choice switch rates in home sector is not always high in Europe and America. However, the concept of “energy democracy” (power source constitution (equal to the first energy source) the right to choose a supplier including CO2 production per unit)
- Removing business regulation, is it reasonable to leave a partial monopoly permanently in retail market?
- In any case, if full scope of liberalization is carried out, the change of framework as “general electric company”, can lead to a large scale regulation reform compared to the before.



< Reference > Expected framework if full scope of liberalization is realized

	Duty of stable supply	Final guarantee	Remarks
Legal separation	Power transmission company	Assigned retail supply company or power transmission company	Framework is established separating stable supply and final guarantee. It is difficult to put duty on stable supply to other sector. (ex. Most of European countries)
License regulation	Transmission function holder and other license holder	Assigned retail function holder	Legal separation is unnecessary because license is provided on the outer-shape criteria. It is possible to put duty on stable supply to the other sector than transfer department. (ex. UK)
General supply duty regulation	Existing utility	Existing utility	Similar to the present system, general electric utility widely has the duty and final guarantee on stable supply. (form of maintaining present legal framework, overall liberalization is carried out.)
Energy business regulation (also transmission sector is liberalized)	(assured by industry's volunteer rule)	Assigned existing utility	With no regulation on delivery price, management is done by industry volunteer rule. Only the framework of energy company remains. (ex. Germany)



Final comment

- In the discussion of full scope liberalization scheduled in 2007, the followings are the points.
 - ⊕ (i) the new framework after 2003's revised Electric Utilities Law, especially, could the neutral organization and wholesale power market accomplish an expected function?
 - ⊕ (ii) What kind of disputes can occur under the new framework?
 - ⊕ (iii) taking account of the difference of framework between Japan and USA or Europe, and being compatible with the other political problems like promotion of efficiency and nuclear or regenerative energy power source which are the objectives of electricity system reform, how can we establish the framework of long term stable power supply, under the completely new framework of the reform associated with maintaining present scope of liberalization, or full range of liberalization?