Regulatory Reform in Japan

Regulatory Reform in the Electricity Industry

OECD

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FOREWORD

Regulatory reform has emerged as an important policy area in OECD and non-OECD countries. For regulatory reforms to be beneficial, the regulatory regimes need to be transparent, coherent, and comprehensive, spanning from establishing the appropriate institutional framework to liberalising network industries, advocating and enforcing competition policy and law and opening external and internal markets to trade and investment.

This report on *Regulatory Reform in the Electricity Industry* analyses the institutional set-up and use of policy instruments in Japan. It also includes the country-specific policy recommendations developed by the OECD during the review process.

The report was prepared for *The OECD Review of Regulatory Reform in Japan* published in 1999. The Review is one of a series of country reports carried out under the OECD's Regulatory Reform Programme, in response to the 1997 mandate by OECD Ministers.

Since then, the OECD has assessed regulatory policies in 16 member countries as part of its Regulatory Reform programme. The Programme aims at assisting governments to improve regulatory quality — that is, to reform regulations to foster competition, innovation, economic growth and important social objectives. It assesses country's progresses relative to the principles endorsed by member countries in the 1997 *OECD Report on Regulatory Reform*.

The country reviews follow a multi-disciplinary approach and focus on the government's capacity to manage regulatory reform, on competition policy and enforcement, on market openness, specific sectors such as electricity and telecommunications, and on the domestic macroeconomic context.

This report was principally prepared by Peter Fraser of the International Energy and Sally Van Siclen of the OECD's Directorate for Financial, Fiscal, and Enterprise Affairs, in consultation with John Cameron of the IEA and Bernard J. Phillips, Directorate for Financial, Fiscal, and Enterprise Affairs in the OECD Division for Competition Law and Policy, and Caroline Varley, Office of Long Term Co-operation and Policy Analysis of the IEA. It benefited from extensive comments provided by colleagues throughout the OECD Secretariat, as well as close consultations with a wide range of government officials, parliamentarians, business and trade union representatives, consumer groups, and academic experts in Japan. The report was peer-reviewed by the 30 member countries of the OECD. It is published under the authority of the OECD Secretary-General.

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Background Report on Regulatory Reform in the Electricity Sector of Japan

The Japanese electricity sector has been shaped by the Government's key policy goals and objectives of energy security, economic growth and environmental protection. The ten vertically integrated utilities that serve virtually all end-users of electricity in Japan have been responsible for enhancing energy security through diversification away from oil. Investment in nuclear power has been a major contributor to diversification and is expected to contribute to government efforts to limit carbon dioxide emissions from the energy sector.

Government concerns about high electricity prices (the highest in the OECD) have led to reforms of the sector of which the introduction of competition is seen as a key measure. Amendment of the Electric Utilities Industry law has required utilities to conduct tenders for independent power producers to supply short-term thermal power needs to the utilities. These tenders have been highly successful and demonstrate significant potential for other industrial companies to enter the power business. These tenders will be expanded beginning in 1999 (and overseen by a neutral agency) to compete to supply all future thermal power needs, unless a remarkable change in the situation occurs.

Proposals for reform of Japan's electricity sector have been introduced into the Diet. These proposals call for the liberalisation of the market for extra high voltage consumers (28 per cent of all supply) and introduce accounting measures to separate the activities of the incumbent utilities to ensure non-discrimination.

The decision to move forward with partial liberalisation of retail supply is an important, irreversible step for Japan to take towards its goal of internationally comparable electricity prices. In particular, the recognition of the need for equal conditions in competition between the utilities and new entrants, the need for fair and transparent rules on the use of power transmission lines, and the commitment to set a timetable for liberalisation are essential points in any liberalisation. Key recommendations for the first step of reform include:

- Adopt a comprehensive reform plan for the industry that lays out the time and criteria for evaluating progress with reform; monitor the progress of these reforms and, if there are problems with this progress, a timely adjustment towards other policies can be made.
- Strengthen competition principles in the overall policy framework and vigorously enforce the antimonopoly law;
- Amend the Anti-monopoly Act to clarify that it also applies to the electricity sector;
- Ensure that regulation of the electricity sector is independent from policy functions and industry promotion functions, with transparent procedures and due process for the review of decisions;
- Separate accounts for natural monopoly activities and supply of electricity to captive customers from the potentially competitive activities;
- Reform standard electricity tariffs, and tariffs for networks and system services, to reflect costs by time of use;
- Revise the yardstick mechanism for regulating utilities to provide a greater incentive.

If after a reasonable period, such as by 2003, there is evidence of discriminatory behaviour, and the market is not sufficiently competitive, further changes will be necessary, taking into account the Government's policy goals and objectives. Recommendations for this second step are:

- Expand the set of eligible customers. If possible make all customers eligible.
- If difficulties with accounting separation are found, and not eliminated by measures to strengthen this separation, then require utilities to functionally separate their regulated activities from unregulated activities. The regulatory regime may need to be strengthened. Consider the full range of feasible separation options to promote competition in the industry.

- Develop electricity markets to manage short-term imbalances in supply and demand.

After the second step, under a review of the operation of the competitive electricity market in each utility service area in Japan. Depending on the outcome of this evaluation, consider what further practical regulatory and/or structural reforms should be introduced, consistent with the Government of Japan's reform objectives and overall energy policy goals and objectives. Among the options to be considered are:

- Measures to encourage further entry
- Expansion of interconnections between regions
- Modification of economic regulation of the utilities to provide them with greater incentives to operate and invest efficiently, as well as to compete
- Measures to encourage the voluntary sale of utilities' generating capacity to multiple buyers
- The full range of feasible horizontal and vertical separation options to promote further competition in the industry.

1. Policy goals and objectives for the sector

The structure of the Japanese electricity sector has been shaped by the Government's key sectoral policy goals and objectives. Three of these are energy security, environmental protection, and economic growth. A recently emphasised policy objective contains an explicit target for economic performance in the sector.

Energy security has been the fundamental driver of the electricity policy for the past 25 years and is one of the "3Es" of Japanese energy policy. Japan has no economical natural energy resources of significance and the experience of dependence of imported oil during the oil crises of the 1970s has elevated security of supply to the main determinant of fuel supply mix. Policies toward this end have included strong government policy support for nuclear power, bans on new and replacement oil-fired power baseload capacity generation, low interest loans from the Japan Development Bank for utilities to invest in other power sources, and substantial research and development funding by government and by utilities. The policies have led to a much more diversified and less oil dependent power generation sector, as companies have moved to use more nuclear, coal and natural gas fired power generation and, to a much lesser extent, new renewable sources.

Environmental protection, focuses on the greenhouse gas emissions of the energy sector and particularly the government's commitments to stabilise carbon dioxide emissions at 1990 levels by the year 2000 and with the Kyoto agreement, to cut emissions of greenhouse gases by 6% below this level over the period 2008-2012.

Economic growth, or in other words, promoting economic efficiency of the energy industry is the second of the 3Es. The energy industry, and particularly the electricity sector, has been identified as inefficient and a potential damper on future economic growth due to relatively high prices.

Promotion of nuclear power: The three energy policy objectives—energy security, economic growth, and environmental protection—have led the government to conclude that additional use of nuclear energy is vital for Japan. The Japanese government will continue to promote nuclear power and more specifically the construction of 16-20 additional nuclear reactors by 2010.

The policy objective added most recently is for electricity prices to be at internationally comparable levels by 2001. Given current prices, this might only be achieved through reform that greatly increases economic efficiency in the sector. The government's Action Plan for Economic Structure Reform of May 1997 identified the pursuit of enhanced efficiency through competition as a basic principle for reform in the electric power sector. The government is committed to a fair allocation of the benefits of those efficiency gains.

1.1. Key features of the electricity sector

Ten heavily regulated investor-owned regional vertically integrated utilities (Hokkaido, Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku, Kyushu and Okinawa Electric Power Companies) dominate the sector. While not monopolies in law, no new general electric utilities have been created since 1951. The utilities are vertically integrated and responsible for generation, transmission, distribution and retail supply. Three of the utilities (Tokyo, Kansai and Chubu) are very large by world standards, with Tokyo second in size only to Electricité de France. The sector is regulated by the Ministry of International Trade and Industry: MITI grants licenses to the utilities, regulates standard electricity rates and approves plans for expansion. MITI is also responsible for a large number of technical and safety regulations affecting the sector.

High costs lead to the highest electricity prices in the OECD. Electricity costs are high because a number of Japan-specific factors such as a lack of domestic energy resources for power generation, very high reliability and environmental operating standards, and large day/night and seasonal variations in demand. Costs of constructing new facilities are the highest in the OECD. One consequence of high prices has been the development of significant in-house generation of electricity in the industrial sector amounting to 28% of all industrial demand.

Initial reform efforts to address the problems of high costs have liberalised generation entry by allowing independent power producers to supply thermal[1] power to the utilities through a bidding process without requiring a permit from MITI, enabled customers to generate power at one site and "wheel" it for use at another site, allowed new networks to be established to supply specific customers, somewhat revised the rate-of-return regulation, and eased technical regulatory requirements. However, liberalisation of retail supply is still very limited (i.e., only self-wheeling). The government recognises that there continues to be a problem with the level of electricity prices in Japan. The Programme for Economic Structure Reform (December 1996) and the Action Plan for Economic Structure Reform (May 1997) aim, by 2001, to bring electricity costs to levels in line with those seen internationally.

2. Industry structure

2.1 Participants

There are nine general electric utilities covering the four principal islands of Japan. A tenth company covers Okinawa. All of the utilities are privately owned and vertically integrated, from generation to retail supply, and they have mutually exclusive supply areas. There are no independent distributors of electricity. There is a small amount of inter-utility trade, amounting to about 55 TWh, or about 5% of total generation.

Table 1 shows sales of the general electric utilities. Tokyo has the largest sales, followed by Kansai, which covers Osaka, Kyoto and Kobe, and Chubu, which covers Nagoya.

Table 1. **General electric utility sales, 1997**

Company	**Customers ('000)**	**Installed Capacity (MW)**	**Electricity Sales (GWh)**		
			Residential	Commercial & Industrial	Total
Hokkaido	3 579	5 431	9 623	16 179	25 802
Tohoku	7 219	12 437	19 953	46 377	66 330
Tokyo	25 285	53 975	76 531	186 719	263 250
Chubu	9 525	29 274	28 360	87 211	115 580
Hokuriku	1 869	5 509	5 866	18 286	24 151
Kansai	12 157	37 051	40 574	97 273	137 847
Chugoku	4 869	10 936	14 623	42 230	56 853
Shikoku	2 690	6 314	7 809	17 152	24 961
Kyushu	7 700	16 983	22 534	51 003	73 537
Okinawa	688	1 434	2 358	3 648	6 006
TOTAL	75 610	179 515	228 231	566 087	794 318

Source: Electric Power Industry in Japan, 1997/98, Japan Electric Power Information Center, Inc. Tokyo, 1997.

Electric Power Development Corporation (EPDC) owns and operates large-scale hydroelectric (mainly peaking) plants, coal-fired generating stations, geothermal generating stations and associated transmission assets. Its generating capacity amounts to 13 915 MW or about 6% of total capacity. EPDC sells power at cost to the ten utilities through long-term contracts. The government owns two-thirds of EPDC (the nine utilities i.e., excluding Okinawa own the other third) and had provided most of the financing. The government has announced plans to privatise EPDC by 2003. A broad privatisation is planned, including a listing on the Tokyo Stock Exchange. The company is currently restructuring its finances to become independent of the government.

The Japan Atomic Power Corporation (JAPC) was established in 1957 by the nine general utilities, EPDC and other nuclear enterprises to commercialise nuclear power development in Japan. Its three plants have a total capacity of 2 617 MW. JAPC sells power at cost to the nine utilities.

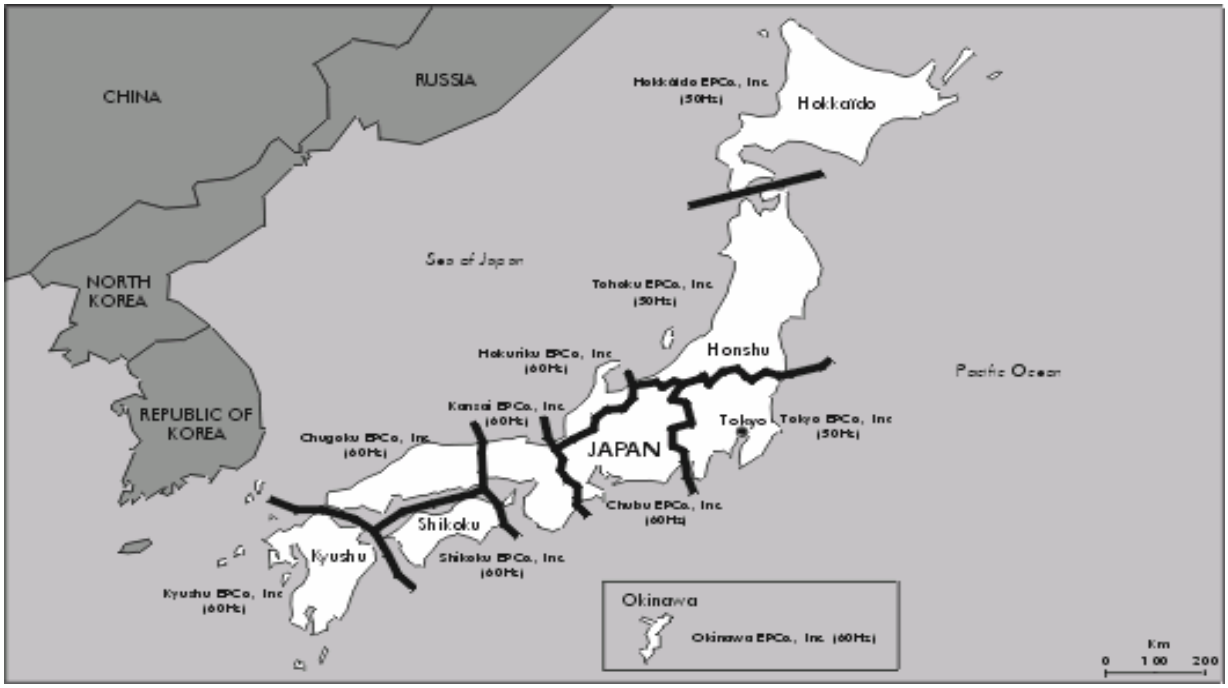
There are 34 public enterprises owned and operated by local governments which generate and sell power to the nine utilities. Their total capacity is about 2 492 MW (at the end of FY 1996) of mostly hydroelectric capacity.

Autoproduction by the industry sector accounts for 24 400 MW (at the end of FY 1996) of capacity, mostly from oil and coal cogeneration. Steel makers, chemical companies, oil refiners, cement producers and pulp and paper companies are all major producers of electricity for in-house consumption and/or sale to a utility through joint venture arrangements. Autoproduction supplies 28% of the total electricity used by industry.

2.2 Grid structure

The utilities serving the eastern part of Japan (Hokkaido, Tohuku and Tokyo) deliver electricity at a frequency of 50 Hz. Western Japan uses 60 Hz. All four main islands of Japan and the nine electricity generation regions have transmission links, making national inter-regional power exchange possible. Frequency converter stations are operated by EPDC at Sakuma and TEPCO at Shin Shinano, but total interconnection capacity between the two frequency areas is limited to 900 MW.[2] Transmission links have been upgraded to improve reliability, but are limited by the mountainous terrain and the elongated shape of Japan, which restricts opportunities for enhancing the networks through parallel transmission lines Seven large transmission projects are under construction or have been planned to increase inter-regional linkages. Okinawa is not connected to the main grid. There is no grid connection with other countries.

Figure 1. **Electric utilities**

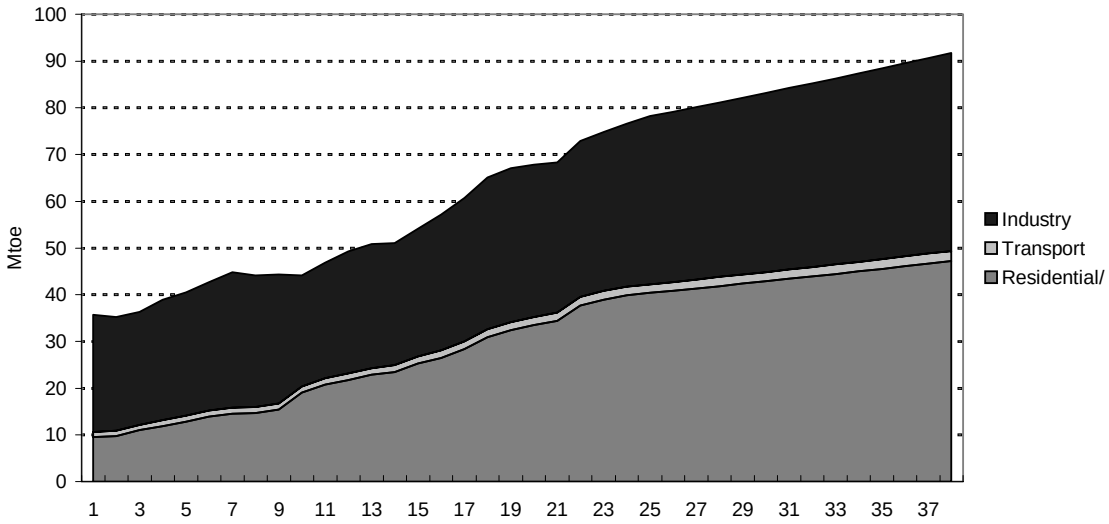


Source: MITI.

Supply and demand

Electricity consumption by sector is shown in Figure 2. Growth in demand has been rapid, especially in the residential/commercial sector. In recent years, air-conditioning demand has risen rapidly, sharpening the peak in demand on a hot mid-day in summer.

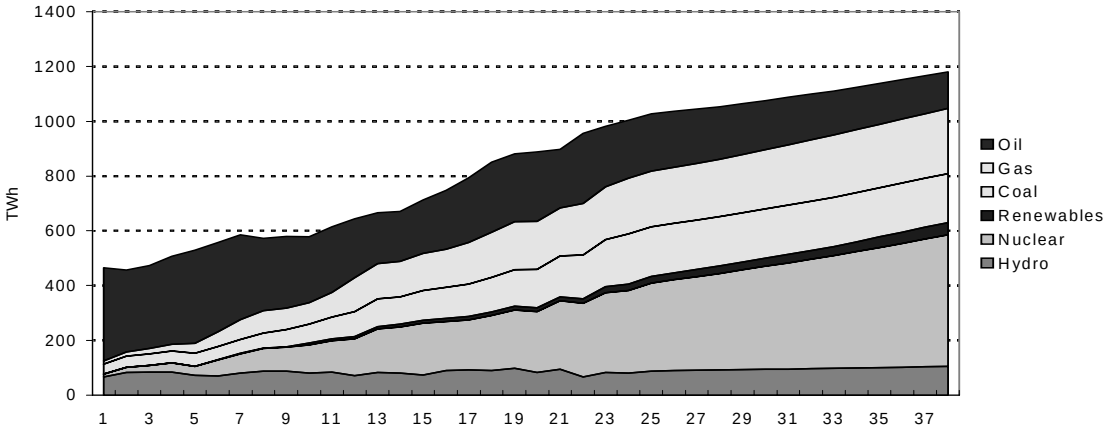
Figure 2. **Electricity consumption by sector**



Source: IEA/OECD (1998), *Energy Balances of OECD Countries*, Paris and country submission.

Figure 3 indicates a fall in the share of oil-fired power generation from the most important fuel for electricity generation to an increasingly marginal role of meeting peak demand. Policy initiatives to promote this shift have included strong government policy support for nuclear power, bans on building or replacing oil-fired baseload generation, low interest loans from the Japan Development Bank for utilities to invest in other power sources, and substantial research and development funding. These policies encouraged a more diversified fuel mix, although Japan's dependency on oil-fired power generation remains as one of the highest among OECD countries.

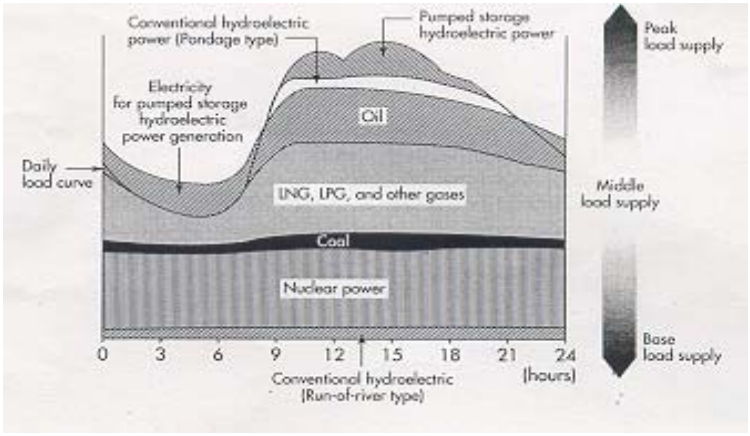
Figure 3. **Electricity generation by fuel**



Source: IEA/OECD Paris (1998), *Energy Balances of OECD Countries*, Paris, and country submission.

Baseload power generation is mainly provided by nuclear power and a modest amount of run-of-river hydroelectric power. Coal also provides base load energy and some mid-load generation. Natural gas is a mid-load fuel, operated during the day. Peaking loads are principally provided by oil-fired generation along with peaking hydroelectric capacity. Substantial pumped storage hydroelectric capacity is used to meet the very steep daytime peak loads, using electricity generated at night (often oil-fired).

Figure 4. **Daily load curve**

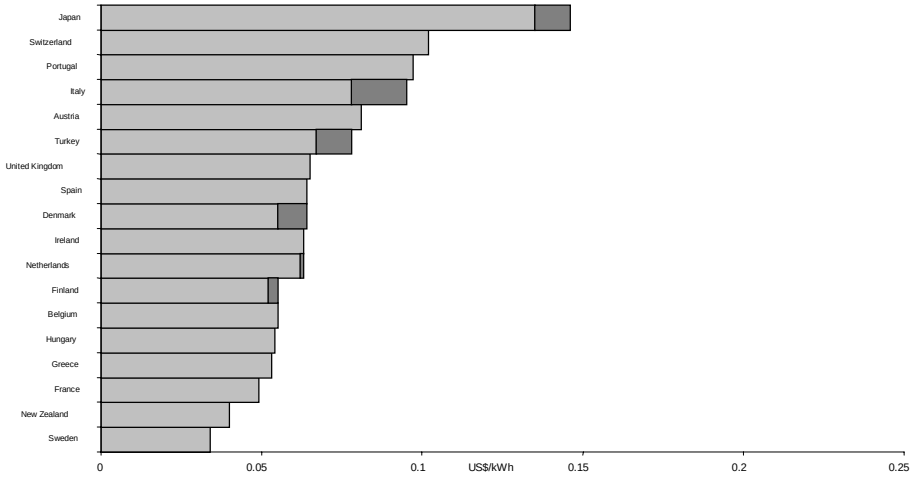


Source: Tokyo Electric Power Company (1998), *TEPCO Illustrated, 1997,* Tokyo.

3. Prices and costs

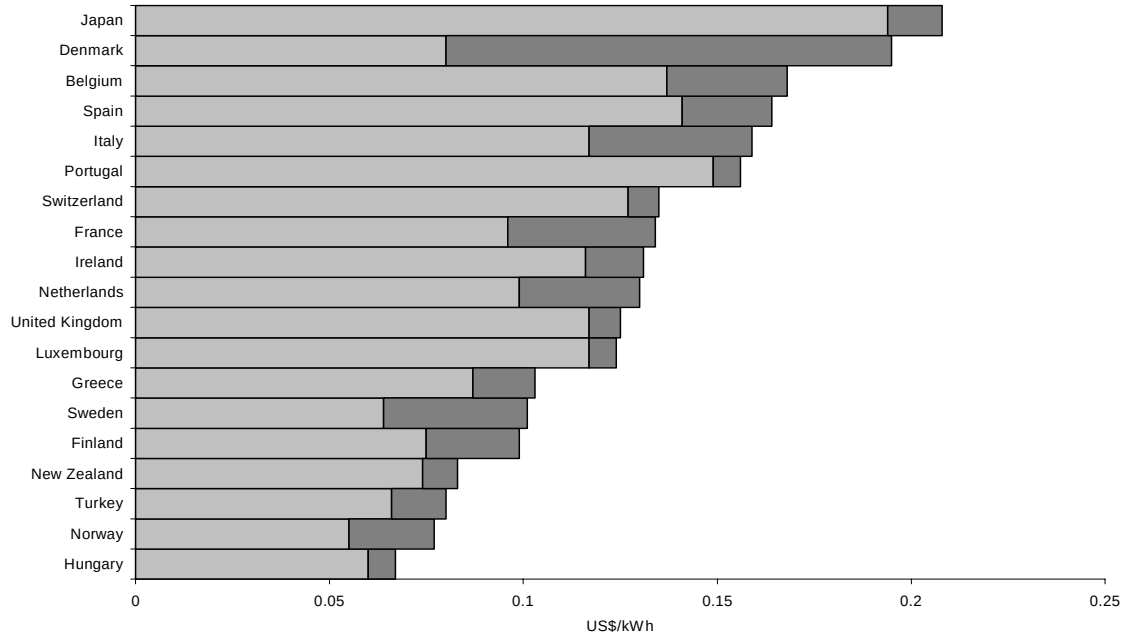
Electricity prices in Japan are the highest in the OECD (Figures 5, 6 and 7).

Figure 5. **Electricity prices in IEA countries, 1997 industry sector***



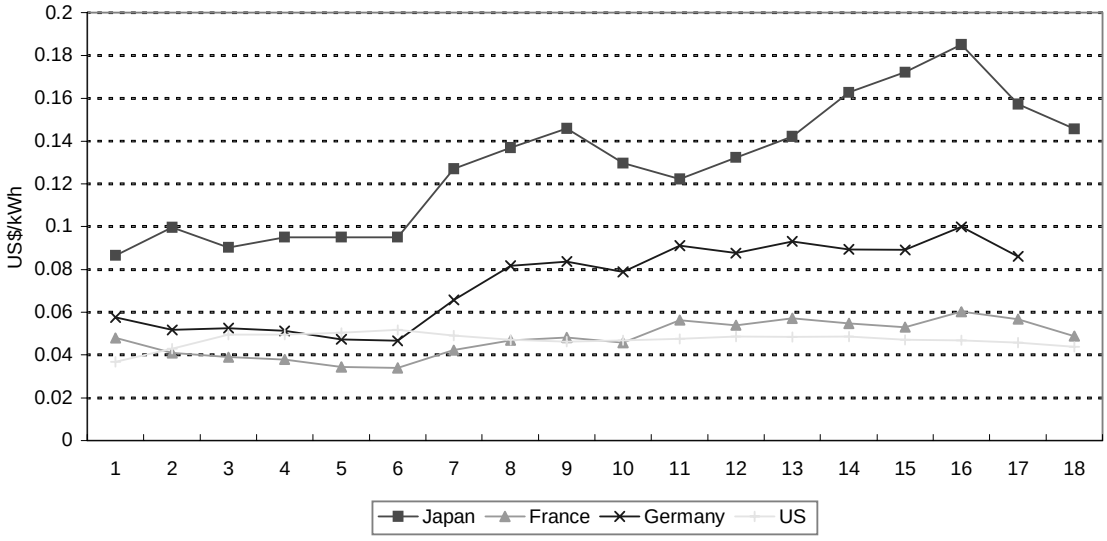
* Data not available for Australia, Canada, Germany, Luxembourg, Norway and the United States.

Figure 6. **Household sector**



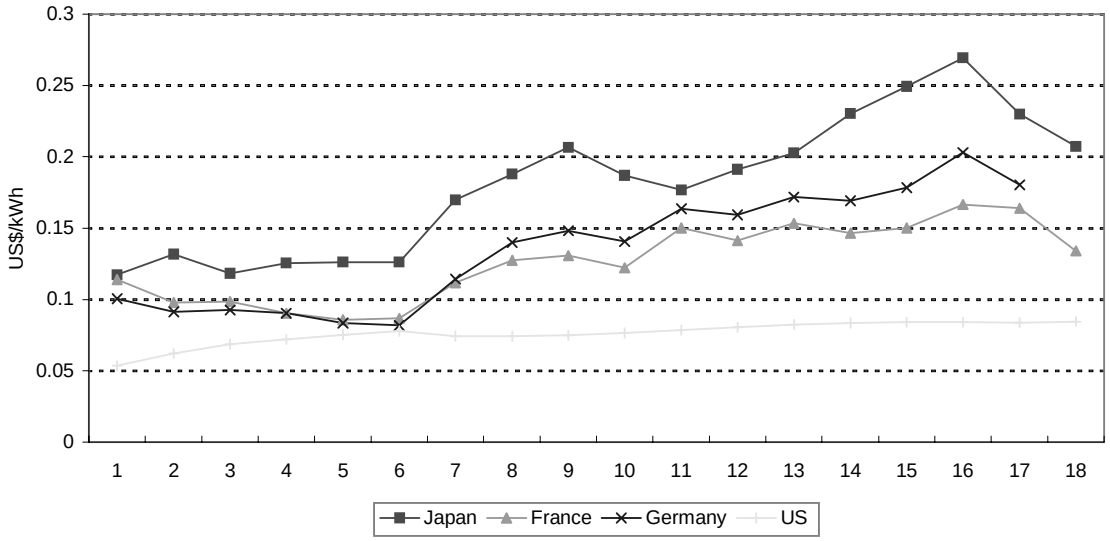
Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

Figure 7. **Electricity prices in the industry sector 1980-1997**



Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

Figure 8. **Electricity prices in the household sector: 1980-1997**



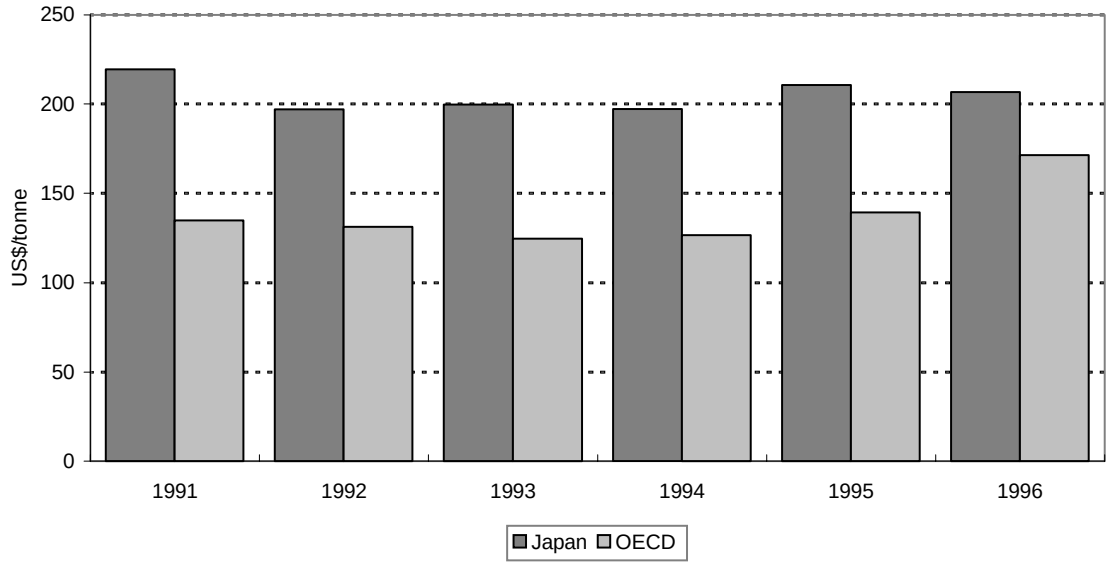
Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

There are a number of reasons for these relatively high prices.

- High generation capital costs: Japan has the highest investment costs for nuclear, gas and coal- fired power in the OECD. Expensive land, compensation payments made to local communities, and high safety standards (including earthquake resistance) contribute to increased costs. In addition, Japanese utilities historically relied on a limited number of suppliers and only recently have been actively encouraging foreign participation in their equipment procurement tenders. Very high technical standards for equipment compared with other countries force prices up and limit the number of competitors.

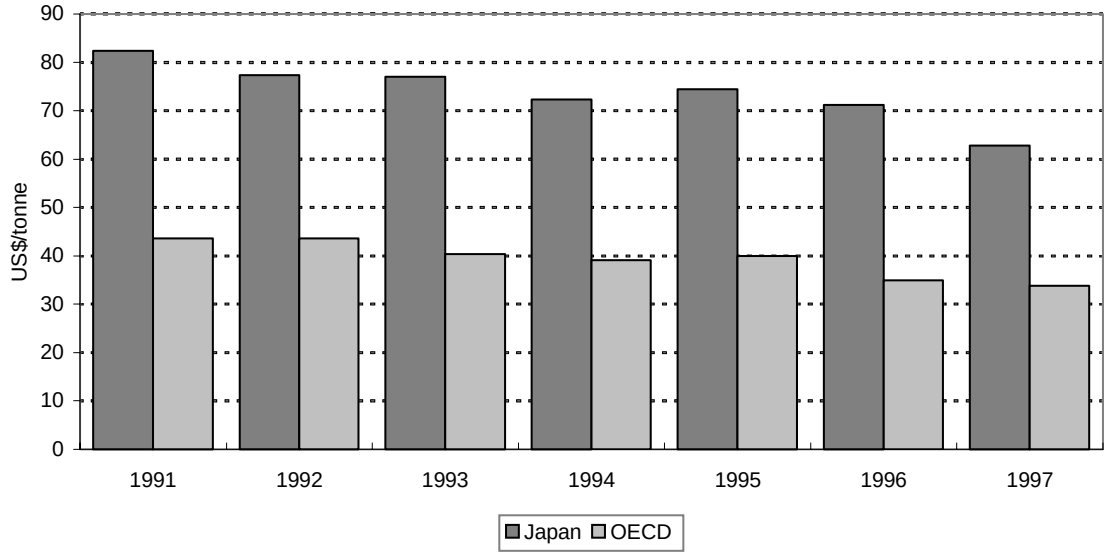
- High fuel costs: Japanese utilities pay 20% more for oil than the OECD average and 80% more for coal. Natural gas costs are also much higher than in many OECD countries. Customs duties on oil, revenues from which go towards restructuring of the coal industry contribute to high oil costs. Oil costs would be even higher except a number of Japanese oil-fired plants are capable of burning heavy sweet crude oil, at a saving of approximately 50% over heavy fuel oil. High coal costs are partly attributable to the use of the highest quality, lowest sulphur coal to meet environmental standards, to technical requirements for Japanese utility boilers and to the use of long-term contracts incorporating price premia for security of supply purposes. Natural gas costs are higher because of the necessity to import gas as liquefied natural gas (LNG) and because of taxes. The costs associated with LNG means that natural gas prices are much higher than natural gas prices in OECD countries that use pipeline gas.

Figure 9. **Heavy fuel oil costs for power generation (Japan versus OECD)**



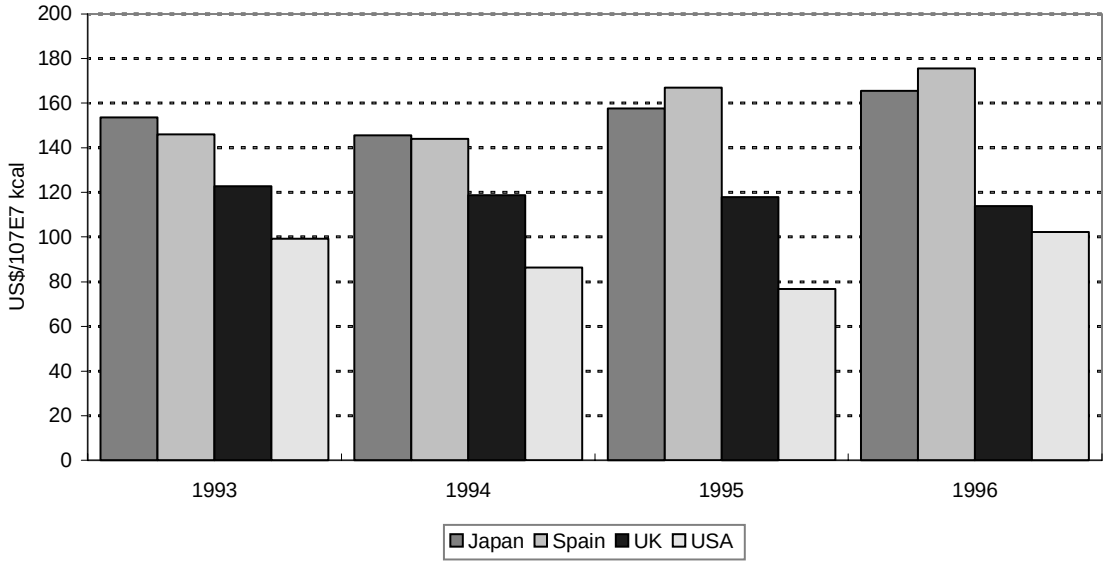
Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

Figure 10. **Coal costs for power generation (Japan versus OECD)**



Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

Figure 11. **Natural gas costs for power generation (Japan versus selected countries)**



Source: IEA/OECD (1998), *Energy Prices and Taxes*, Paris.

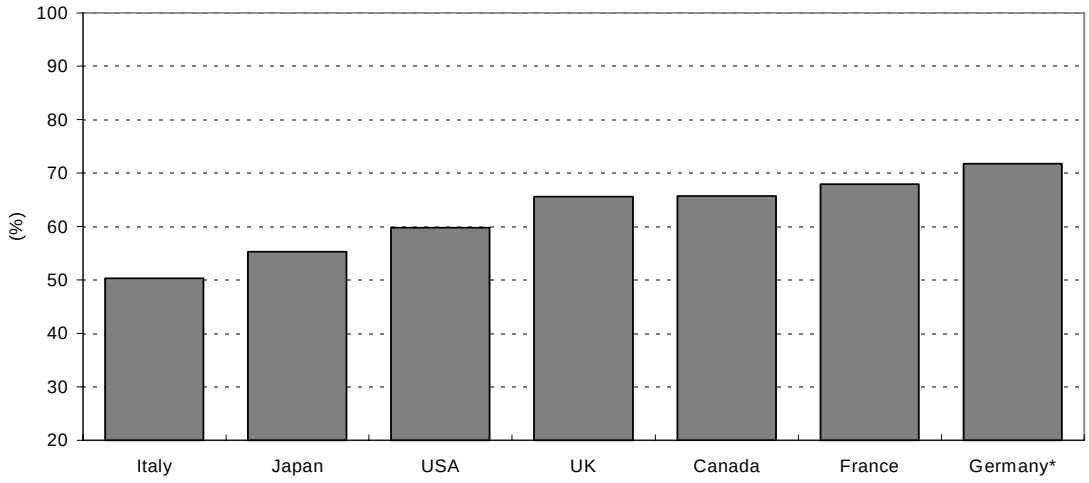
- High transmission and distribution costs: Costs for transmission and distribution infrastructure are high because of high land costs, mountainous terrain, the remote siting of new power stations, very high construction standards to withstand earthquakes and typhoons, and very high operating standards.

- Additional regulatory costs: Japanese environmental regulations are quite strict. As a result, nearly all coal-fired and most oil-fired power stations have equipment to greatly reduce SOx emissions (through flue gas desulphurisation). The majority of coal-fired plants also have advanced NOx removal technologies (principally selective catalytic reduction). The Air Pollution Control Law allows local government to set even stricter limits still, resulting in additional utility expenditures. For example, despite the use of advanced SOx emissions control equipment, utilities still use coal and oil with lower sulphur content.

- Regulations regarding maintenance of power plants are highly prescriptive. For example, nuclear plants are required to have a refuelling outage every 13 months, although longer fuel cycles have been proven to be both safe and feasible. Government regulations also require natural gas turbines to be completely disassembled for inspection every 30 months - a requirement not duplicated elsewhere and not recommended by the manufacturer.

- Low load factor: The load factor in Japan (the ratio of average electricity demand to the annual peak demand) is extremely low in comparison with other industrialised countries, principally because of air conditioning use. Additional generation, transmission and distribution capacity has been constructed to meet the increasing peak demand. Each 1% decrease in the load factor increases costs of service by approximately 1%.

Figure 12. **International comparison of annual load factor**



Source: Federation of Electric Power Companies.

- Tax and purchase of domestic coal: Subsidies for power development, primarily funds paid to communities near new power plants for regional development are recovered through a special electricity power development tax of ¥0.445 per kWh (1998 budget for subsidies was ¥224 billion). The remainder of tax revenue from this source (¥238 billion) goes towards measures for development and diffusion of alternative energy to oil. Electric utilities also committed to purchasing domestic coal (4.25 million tonnes in 1997, about 10% of total utility requirements) at a price approximately three times the imported coal price. Domestic coal prices were recently cut to ¥15 800 per tonne, with a commitment to cut prices a further ¥1800 per tonne by FY 2001. This compares to imported coal prices of approximately ¥5500 per tonne. The cost premium (¥69.8 billion in FY 1996) is shared among all the utilities, although the coal is actually used by only three general utilities and three wholesale utilities. The utilities also purchase power above cost from renewable sources, although the amounts involved here are quite small.

Costs per kWh have changed little since 1990 despite significant growth in electricity demand, and reductions in interest rates and fuel costs. These factors have been nearly entirely offset by increases in personnel and maintenance costs as well as higher depreciation costs from new plants coming into service (Table 2).

Table 2. **Average costs per kilowatt-hour generated at 10 Japanese utilities 1990 *vs* 1996**

Average Costs (¥ per kWh)	**1990**	**1996**
Personnel	2.06	2.21
Fuel	3.83	2.58
Repair and Maintenance	2.11	2.40
Interest Charges	2.29	1.80
Depreciation	3.11	3.77
Taxes	1.69	1.72
Other (mainly power purchases)	4.45	4.93
Total	**19.55**	**19.41**

Source: Derived from information in *Electric Power Industry in Japan 1997/98*, Japan Electric Power Information Center, Tokyo, 1997.

4. Regulation and regulatory change

The electricity sector is regulated by the Ministry for International Trade and Industry (MITI). Within MITI, the Agency of Natural Resources and Energy oversees the sector.

4.1 Electric Utilities Industry Law and 1995 amendments

The Electric Utilities Industry Law is the main legislation governing the electricity industry. There are also a variety of MITI ordinances. The law makes clear the central role played by MITI in developing the structure of the industry (as regards entry, exit and expansion), the coordination of utilities, and the regulation of tariffs.

Regulation under the Electric Utilities Industry Law follows a form relatively common in Japan,[3] in which entry into a sector is restricted so that supply and demand are balanced. The law defines three main types of businesses in the electricity industry: the general electric utility supply business (general EUSB), the wholesale EUSB, and the special EUSB. MITI issues permits for these businesses. For MITI to issue a permit, there must be demand for the service; in the case of a general or a wholesale EUSB, the new business "must be necessary and appropriate for the comprehensive and rational development of the EUSB or otherwise for the promotion of the public interests"; in the case of a special EUSB, the new business must not harm the interests of electricity consumers in the general EUSB's service area and it must be "appropriate in view of the public interests." Permission from MITI is also needed to exit; permission is granted if the exit does not impair public interests. Entry into non-utility business activities by the utilities requires the permission of the MITI Minister.

No new general EUSB have been created since 1951 (with the exception of Okinawa). One special EUSB (which serves a few large customers within a general utility's area) has been created.

If a general EUSB wishes to supply outside its service area, it needs the permission of MITI. MITI will not grant permission unless *inter alia*, such supply would "not be easy to accomplish and not apposite to undertake" for the general EUSB in whose area the supply is to be made. Conversely, a general EUSB cannot, without good reason, refuse to supply electricity in its own service area.

A key part of the 1995 amendments to the Electric Utilities Industry Law was to liberalise entry rules for independent power producers (IPPs), i.e., independent generators which sell power to the utilities. IPPs are no longer required to get a permit from MITI to enter the generating business (although they are expected to sign a contract of at least 10 years duration). Utilities have been required to conduct tenders to meet additional thermal power needs that would arise within a seven-year period. Two sets of tenders have been conducted to date (see section on the impact of the 1995 amendments).

MITI has decided to open the bidding system still wider in 1999, and plans to allow, barring a significant change, both utilities and IPPs to bid for thermal power plants coming on stream in 2008 and beyond. The amount of capacity to be tendered will be set by the utility as part of its normal planning process. The bidding process will be overseen by a neutral party. The utilities will be required to implement separate accounting for bidding on new plants.

In addition, the 1995 amendments simplified approvals for specified supply by the autoproducers.

Grid access regulation

The Electric Utility Industry Law requires designated utilities to notify tariffs to MITI. MITI can order transfer supply[4] if it is refused without good reason. MITI must approve tariffs and other conditions for back-up power supply to a special EUSB, and can impose tariffs and other conditions if a general EUSB and a special EUSB cannot negotiate an agreement.

Tariff and profit regulation

Standard tariffs and other conditions of supply must be approved by MITI. In order to be approved, the tariff "for supply of electricity shall be the sum of the fair and proper cost of electricity and the fair and proper profits under efficient management". Also, "there shall be no discrimination against specific persons." If, because of social or economic changes, the tariffs and conditions for the supply of electricity have become unfair and improper to the extent that advancement of public interests is thereby impeded, MITI may order the EUSB or wholesale supplier to submit an application for a change in the tariffs or conditions.

Utilities are permitted to offer optional tariffs to contribute to the efficient use of facilities. Interruptible supply contracts for large consumers and time of use rates have both been offered to contribute to load levelling.

The basic regulatory scheme for the Japanese electricity sector is rate of return. As of September 1998, the regulated rate of return on capital was set at 4.4%; by contrast, the rate of return on government debt at that time was under 1%. The asset price is based on a MITI assessment. MITI sets out the accounting system to be used by electric utilities.

The 1995 amendments adjusted the rate of return approach to allow slightly augmented incentives to reduce costs. These incentives are called "yardsticks" because they rely, in small part, on comparisons among the utilities. The current rate regulation process is summarised in the box below. The net impact of the latest yardstick assessment was to reduce utility revenues by 0.6% from what they would have been absent the yardstick aspect.

Box 1. **Process of price regulation in Japan**

Electric utilities file a rate application that sets out:

Costs (all operating and financial expenses) related to utility operations.

An estimate of a fair rate of return on capital.

Revenue requirement (the sum of the first two items less certain other revenues such as sales to other utilities).

An allocation of costs into rates which sets out rates according to voltage (and appears to show different costs attributed to different power facilities). Customer classes are:

- extra high voltage (> 20 kV)
- high voltage (6 to 20 kV)
- low voltage (under 6 kV i.e., business)
- lighting (i.e., residential demand for any use)

Standard consumer rates vary by voltage, but not by location. (Homogeneity across location is imposed to meet the policy objective of fairness.) Optional time-of- use rate packages are offered to customers but are not regulated *per se*.

MITI holds public hearings. The yardstick assessment involves comparing the utility to its own past performance and to the performance of the other utilities, on the basis of three categories (generation; transmission, transformation, and distribution; and general administration) where the costs compared are those over which the utility is considered to have control. For each category, the range of costs is calculated. For each category, the costs for each utility determine whether it is in the bottom third of the range, middle third, or upper third. Those utilities in the bottom third, i.e., among the most efficient or most improved, are allowed to receive revenues equal to the value of their costs in that category. Those utilities in the middle third, are allowed to receive revenues equal to 99% of the value of their costs in that category. Those utilities in the top third, i.e., among the least efficient or least improved, are allowed to receive revenues equal to 98% of the value of their costs in that category. Rankings are published.

A fuel cost adjustment mechanism passes on most, but not all, changes in fuel costs to customers. Changes in average fuel costs exceeding 5% are reflected in prices. The mechanism ensures that customers benefit from falling fuel prices but, because it shifts the majority of the risk of changing fuel prices on to customers, it reduces direct incentives for utilities to manage their fuel costs.

System security regulation

Supply reliability is also regulated by MITI. Ministry ordinances set power quality standards (voltage and frequency). MITI can order utilities to improve facilities if service quality to customers is impaired.

Each utility submits an annual ten-year plan to MITI regarding electricity supply, and the installation and operation of facilities. MITI may, if the plan is "not proper and apposite for promoting rational and integral development of the electric utility supply business through ... wide-area operations, recommend the designated electric utility supply business operator to change or alter the plan." In the case of non-compliance with its recommendations, MITI may order utilities to supply, transfer, or receive electricity or to loan, borrow or share electrical facilities.

Technical regulation

MITI is also responsible for the safety and technical regulations of electrical appliances and facilities, nuclear fuel, boilers and pressure vessels. Delays arising from inspection of new generating plants before commencing operation have been a major concern of the utilities. The 1995 amendments reduced requirements for these inspections, but remain more strict than most other OECD countries, resulting in longer outages at power plants.

Impact of the 1995 amendments

The 1995 amendments to the Electric Utilities Industry Law have brought the entry of IPPs to supply the utilities. Two sets of tenders have been conducted to date. The average quantity of capacity bid exceeded the average quantity tendered at least fourfold. The prices of successful bidders were between 10 and 40% less than the "upper limit prices" calculated by the utilities, averaging almost 30% lower. The successful IPP bids total about 3% of all installed capacity and about 19% of all capacity outside the major utilities (including EPDC as described above). The summary of the IPP projects accepted by fuel is given in Table 3.

Table 3. **IPPs by fuel (successful bids from 1996 and 1997 tenders)**

Fuel	Number of Projects	Capacity (MW)	Share (%)
Coal	13	2844	46
Oil	17	2425	39
Gas	5	842	14
Other	1	55	1
Total	36	6165	100

Source: MITI

Average prices in the second set of tenders were 25 to 40% lower than upper limit prices.[5] According to MITI, there is a total 40-50 GW potential available, with the lower estimate taking into account environmental constraints and other constraints (water for generation and fuel supply). The upper estimate, about 25% of the existing capacity of the utilities, is large enough to account for most of the forecast increase in power demand between 1998 and 2010. The actual need for capacity could be considerably reduced if Japan is successful at increasing its load factor to a level comparable with other IEA countries.

The majority of capacity bid and the potential for new IPP capacity is coming from the steel industry (mostly coal-fired generation) and the petroleum refining industry (oil-fired generation). A number of these industrial companies are already autoproducers of electricity. Both industries have idle industrial land available and relatively easy access to fuel sources, allowing them to overcome two major hurdles with building new generating plants and bringing them online quickly. The lengthy time needed to obtain approval and construct coal-fired green-field plants (10 years or more) give these companies an advantage over utilities using greenfield sites.

Unlike most countries with IPPs, new gas-fired development plays a relatively limited role. Of the 36 successful IPP projects to date, only five use natural gas. The high cost of liquefied natural gas in Japan is a major factor. Also, at present, there is no third party access to LNG terminals in Japan. Furthermore, there is no instance to date of an electric utility, each of whom owns at least part of an LNG terminal, selling natural gas to an IPP.

The success of coal and oil-fired capacity in the bidding has raised concerns at the Environment Agency, who suggest that the IPP policy could raise Japan's CO_2 emissions by 1%. Emissions from IPPs are as high as 0.225 tonnes of carbon per MWh versus an average of 0.098 tonnes of carbon per MWh for utility plants (with the current fuel mix).[6] MITI plans to ask the utilities to treat lower CO_2 emitting plant more favourably than coal - perhaps by limiting the tender to certain kinds of fuels or requiring them to consider fuels in evaluating future bids.

Barring any remarkable changes, MITI is planning to allow both utilities and IPPs to bid, commencing in 1999, for all thermal power plants coming on stream in FY 2008 and beyond. The utilities believe that they can compete with IPPs partly through repowering existing plants e.g., with combined cycle, to avoid the high costs of greenfield projects.

Another source of entry into generation is by industrial users, who build power plants either separately or as a joint venture with an electric utility.

Special electricity supply businesses are power utilities created to supply specified customers rather than offer general public service. In June 1997, Suwa Energy Service Company became the first firm to obtain a licence from MITI as a special electricity supplier. The company, was formed by Suwa Gas Company, a regional city gas company, to supply a hospital and retirement homes in a limited area with

both electricity and heat produced by a cogeneration facility. The facility will open in February 1999 with a capacity of 3 MW. Other companies that plan to become special suppliers include East Japan Railway Co., Toyota Motor Corporation, and Tokyo Gas Co., Ltd.

4.2 Competition law

Competition law enforcement can protect competition in the new markets created by electricity sector liberalisation. The Japan Fair Trade Commission's (FTC) principal statute, the Anti-monopoly Act, prohibits unreasonable restraints of trade, "private monopolisation" and monopoly, as well as unfair practises and anti-competitive mergers. The FTC has substantial associated powers to enforce these prohibitions, including powers to investigate and prosecute violations, which can lead to fines or even imprisonment.

While the FTC might appear to have both the scope and the powers to police anti-competitive behaviour in the electricity sector, Section 21 of the Act appears to exempt electric utility services as an example of a natural monopoly. The FTC's involvement to date has been limited to the role of competition advocate, reviewing and commenting on electricity competition issues with the assistance of study groups, and generally favouring market reforms and particularly the amendment of Section 21.

Subsidies

The government is financially involved in the electricity sector in a number of ways. It is a direct owner of two-thirds of EPDC and of part of Japan Atomic Power Corporation (JAPC). The government is financially indirectly involved in the electricity sector through its involvement in fuels, notably in support of nuclear generation and coal-fired generation (through support of the domestic coal industry). The Japan Development Bank has historically provided utilities with low-interest loans for power generation, particularly from non-oil fuels; its loans total about 6% of power sector investment. The bank's policy to offer low-interest loans has now been extended to independent power producers, who can receive low-interest loans to cover up to 50% of their investment.

The Electric Power Development Company (EPDC), was created to assist in power development, and has since played a leading role in investment in leading edge power generation technologies such as "clean coal" generation facilities. Sixty per cent of EPDC's capacity is hydroelectric, of which 60% is pumped storage, but more than two-thirds of its energy sales come from coal-fired generation. The average capacity factor for hydroelectric (excluding pumped storage) was 30% in FY1997.[7] Since the price of electricity during peak times would be much higher than the average price, if peakload pricing were instituted, EPDC's hydroelectric facilities may be quite valuable. However, EPDC currently sells its hydroelectric energy at cost, which is less than ¥9 per kWh (excluding pumped storage), through long-term agreements with the nine utilities. This is far less than the estimated cost of new peaking facilities of ¥32 per kWh. Currently the excess rents of this low-cost high-value energy accrues to customers in the form of lower rates. However, if generation is liberalised, the utilities, rather than the customers, will enjoy these benefits.

5. Advisory bodies

There are several advisory or policy institutions of interest. The Electric Utility Industry Council is a consultative body created by statute in MITI to "investigate and deliberate on important matters" relevant to the sector. The Council investigates and deliberates at the request of the MITI Minister, and sends recommendations to which he/she must to give due consideration. The recommendations of the Council usually become government policy. The Council is composed of presidents of the electric utilities, power equipment suppliers, large users of electric power, academics, journalists, small business owners and household consumers.

The Committee on Basic Policy, a body within the Electric Utility Industry Council, was established in response to the Government's Action Plan for Economic Structure Reform to deal specifically with current reforms. The Committee was established to advise on the following question: "How best should the electricity supply industry be organised in the future to realise internationally comparable levels in electricity prices by the year 2001, and to establish the foundation for reducing our country's electricity costs on a medium - to long term basis?". The Committee returned an interim report in May 1998 and made further recommendations in December 1998.

The Electric Power Development Coordination Council (EPDCC), chaired by the Prime Minister, settles annual electric power development plans, which identify planned facilities developments over the following 10 years. Utilities must also obtain agreement from the prefectoral governor before commencing construction. The Electric Power Source Siting Committee (composed of several ministers, academics, and representatives from industry) was formed in 1993 to advise the Prime Minister on the suitability of proposed sites.

The Administrative Reform Committee, reporting to Office of the Prime Minister, is responsible for developing policy recommendations and monitoring progress on broader structural reforms to the Japanese economy. The Committee is a driving force behind the government's program for structural reform: its recommendations have shaped the *Program on Economic Structure Reform* adopted by the Government in December 1996 and the *Action Plan for Economic Structure Reform* of May 1997. The Action Plan identified the pursuit of enhanced efficiency through competition as a basic principle for reform in the electric power sector. The Committee recently indicated that it will review reforms in the electric power sector with the intention of proposing more long-term reforms in March 1999.

6. The current status of regulatory reform

The interim report of May 1998 produced by the Committee on Basic Policy of the Electric Utility Industry Council recommended partial liberalisation of retail supply, which means allowing only some customers to choose suppliers while the rest would remain customers of their utilities exclusively (i.e., captive customers). The report ruled out full liberalisation and the introduction of a pool market as inappropriate and premature for the time being. The Committee decided that it would further study a system of partial liberalisation with the objective of presenting recommendations to the full Council in December 1998. The study made recommendations on partial liberalisation, within the three constraints of:

- Ensuring maximum management autonomy and minimising administrative intervention.
- Guaranteeing equal and effective competition.
- Spreading the results of efficiency to all users and that partial liberalisation not adversely affect users to which such liberalisation does not apply.

The report of the Committee and of the Council in December 1998 is expected to form the basis of future amendments to the Electric Utilities Industry Law in 1999.

7. Critique

The variety of policy goals and objectives in Japan with respect to the electricity sector present a challenge both for the traditional form of regulation in the sector and for reforming that regulation. One of these challenges is the harmonisation of the three goals of energy security, environmental protection and economic growth. An emphasised element in economic growth is the target of internationally comparable prices by 2001, which is very ambitious in light of the exogenous factors which contribute to high costs in Japan including high fuel and sitting costs.

7.1 Tendering for IPPs

The 1995 amendments to the Electricity Utilities Law have begun a process of change in the Japanese electricity sector. The tendering for new "thermal" capacity, which the amendments enabled, was very important in revealing the extent of potential lower costs in generation.

The decision that tendering for new thermal capacity will be opened up to all bidders, including utilities, is a logical step forward. Care will need to be taken, however, to ensure that utilities do not subsidise this activity from their regulated activities. Where an IPP is selling only peaking energy to the utility, the IPP should be able to sell power at other times to other customers. Access to fuels, particularly to natural gas, is a vital factor in establishing IPPs. Third party access to the LNG terminals may be one way of introducing competition and may lower the cost of natural gas, thereby increasing the number of IPPs using natural gas.

Contracted IPP capacity represents only 10% of all new capacity scheduled to come into service over the next several years, and the tendering process, in and of itself, will not be enough to meet the Government's objective of reducing power costs to internationally competitive levels by 2001. Therefore moving beyond this tendering process to a partial retail liberalisation is a necessary step.

7.2 Price regulation

The present mechanism based on rate-of-return, even with a yardstick approach for setting the rate, gives utilities very limited incentives to reduce their costs, as nearly all cost savings are passed on to customers. While partial liberalisation of retail supply can be expected to provide some competitive pressure to reduce generation costs, there will be no corresponding pressure to reduce network costs. Furthermore, there are no competitive pressures on utilities to reduce supply costs for captive customers by purchasing power from other utilities or from IPPs.

Other forms of yardstick regulation do provide a stronger incentive for a utility to reduce costs, particularly regulation that makes a more direct link between one utility's regulated maximum price and other utilities' costs. This form of regulation allows more of a utility's cost savings to be retained in the form of greater profits and thus provides greater incentives for a utility to be cost efficient.

Similarly, the fuel-cost adjustment mechanism, while it ensures that customers obtain the benefits of a fall in fuel prices, reduces the incentive for the utility to reduce fuel costs, by changing fuel purchase strategies. The Government should consider whether to modify the mechanism to provide the utility with stronger incentives to reduce fuel costs.

7.3 Tariff reform reflecting time of use

Although the load factor continues to deteriorate, the high cost of producing electricity at peak periods has not been reflected in prices, except through a variety of optional programs. Over 170 optional programs have been developed, but they have affected less than 10% of contracted capacity. At the same time, substantial pumped-storage hydroelectric capability continues to be developed to increase capacity at peak periods. Peaking capacity for power generation is very costly. TEPCO estimates the avoided costs of peaking capacity at ¥32 per kWh or triple the cost of baseload power. Changing standard tariffs to reflect costs by time of use could reduce peak load significantly over time, saving Japanese electricity consumers billions of yen, and reducing the need for additional peak capacity. Implementation of this reform can be phased in, beginning with larger customers. As the cost of time-of-use metering is falling, it will become more economic for it to be used by smaller and less price sensitive customers.

A reform based on pricing by time- of-use is also needed for the utility services required by IPPs and liberalised customers. At present, back-up power is charged as a premium to ordinary rates, and wheeling (transfer supply) charges are a flat rate per kWh transmitted. These approaches are too simple to capture the costs which vary by time of use. Under partial liberalisation, large industrial customers purchasing power from IPPs, who have a flatter demand than commercial or residential customers, may actually be paying more for network services than the costs they are incurring. Tariffs for these services should also reflect time of use to ensure that the costs for transmission, distribution and ancillary services such as backup supply are fully recovered from each customer segment.

7.4 Partial liberalisation

It is expected that Japan will partially liberalise retail supply, while at the same time broadening tendering so that it includes not only IPPs but also utilities. Clearly, these changes will need to be accompanied by a variety of changes in regulation of the utilities in order to prevent cross-subsidies from regulated activities to competitive activities, and to ensure cost-reflective, non-discriminatory access by third parties to transmission and ancillary services.

The decision to move forward with partial liberalisation of retail supply shows that the Government recognises the need for reform. The move will provide valuable information about the ability to operate the Japanese network with an increased number of participants. It may bring the benefits of lower generating costs to major industrial consumers and may provide some information for further steps in liberalisation. This is an important step for Japan to take towards international comparability in electricity prices, consistent with its other major goals of energy security and environmental protection.

Partial liberalisation of retail supply means that certain customers may purchase power at a negotiated price from their local utility, from another utility or from an IPP. This means:

- such prices will no longer be set by regulated tariffs (except for network services) but through negotiation with the customer;
- these customers will have a choice of suppliers: their local utility, other neighbouring utilities and IPPs;
- these customers would, in principle, be able to contract for a variety of terms, not just 10-15 years as required by the current agreements between IPPs and utilities;
- the customers contracting with other suppliers could manage their risks with respect to their supplier (in effect managing their own security of supply) provided that they still have access to back-up power at a cost-reflective price.

Partial liberalisation of retail supply requires a series of interlocking changes to ensure that the liberalisation has the intended effects:

- access to transmission and ancillary services (including backup) needs to be cost-reflective, economically efficient, and non-discriminatory in tariffs, terms and conditions;
- regulation is needed to avoid the cross-subsidisation of competitive activities of utilities by their regulated activities, and to encourage efficient use of system services;
- competition enforcement: is needed to curb anti-competitive behaviour;

- liberalisation of generation would mean that generators, including the utilities, IPPs and new entrants, are free to compete for liberalised customers.

Under partial retail liberalisation, utilities will continue to be responsible for the long-term security of supply of their captive customers. Customers in the liberalised market could become responsible for their own long-term supply security through contracts. Short-term supply security will be provided by the utilities through their network services.

Transmission and ancillary services

Transmission and ancillary services must be accessible at tariffs that reflect costs and that are non-discriminatory, in order to ensure that independent generators can compete with the utilities to supply to liberalised end-users. For liberalised customers and IPPs, efficient pricing of the use of network services is the key to ensuring efficient use and augmentation of the transmission network. The Japanese electricity system, despite its high reliability, is heavily constrained with respect to its transmission network. While a vertically integrated utility has no need to price transmission separately for its own use, IPPs and liberalised customers use only a part of the services provided by a vertically integrated utility, e.g., the transmission network, making such pricing necessary.[8]

Investments in nuclear plants

The Government of Japan has identified increased investment in nuclear power as important to meeting its energy security goals and greenhouse gas emission objectives. Utilities will continue to require assurances that they will be able to recover costs from investments in new nuclear plants. A cost recovery mechanism will continue to be required for any excess costs associated with renewable energy and, possibly, with nuclear power.

If economic incentives are insufficient in promoting investment, one option would be to guarantee that a share of the demand is met by nuclear-generated electricity. This could be accomplished by requiring all customers to purchase a portion of their supplies from nuclear-generated power. The nuclear share would be set by the government. It could be made consistent with the expected contribution by nuclear power to meeting the Kyoto target. In effect, this would create two markets, a market for non-nuclear power generation and a separate market for nuclear-generated power.

A market for nuclear-generated power, would assure utilities that there would be a market for the power generated from their nuclear power plant investments. In conjunction with the liberalisation of retail supply, this market would encourage utilities to compete with one another to supply this nuclear power in the most cost efficient way. For example, they could either increase output from existing plants, or build more efficient new plants. The Netherlands has recently passed legislation that introduces a system to guarantee that a specific share of total electricity is generated by renewable fuels. Such a system may be useful for Japan to study.[9]

Eligibility of consumers

The issue of customer eligibility is crucial to partial retail liberalisation. In Japan's case it would be administratively convenient if, at the first stage, liberalised customers were limited to "extra high voltage" customers, i.e., industrial and commercial customers taking power at 20 kV or above. Delivery costs for these customers are already desegregated as part of the regulatory process. They would constitute a 28% share of energy sales of the utilities, already a significant step.

Alternatively, eligibility could be based on the equivalent annual consumption level. This consumption level could be set so that eligible customers included all customers in the extra high voltage category as well as customers with multiple sites whose aggregated annual consumption exceeds a certain level. It could also include groups of small and medium companies, if they decide to purchase electricity jointly. Allowing groups of customers to participate could provide valuable experience to both customers and utilities, despite being more demanding from an administrative point of view. Hence, the Government should encourage the utilities to implement, on a voluntary basis, a programme that would allow such aggregation.

Regulatory institutions

Changing the structure of a network-based industry such as electricity from a monopoly to a competitive market requires a sophisticated regulatory structure. A market environment requires regulatory institutions that make decisions that are neutral, transparent, and not subject to day-to-day political pressures. The new environment will increase the responsibilities of the regulator. In addition to regulation of tariffs to captive customers, the regulator will need to ensure non-discriminatory access conditions and economically rational pricing for those services (such as transmission and ancillary services) that are used by IPPs and large users. The regulator will need to ensure that there is not cross-subsidy from regulated to competitive businesses. Either the competition authority or the regulator will need to prevent anti-competitive behaviour.

In order to make fair and reasonably predictable decisions, the regulator must have analytical expertise and not rely on the expertise of the regulated utilities. The regulator must also be functionally separate from policy-making and from electricity industry promotion functions in order to maintain a neutral regulatory regime. To be seen to be fair, the regulator should have well-defined obligations for transparency, notably with respect to its decision-making processes and information on which the decisions are made. Further, the objectives of the regulator must be clearly stated, more specifically than, for example, "the public interest" and progress towards these objectives should be monitored. Finally, the powers of the regulator should be clearly stated. The combination of transparencies of objectives, powers, processes, decisions, and information, gives the public clear performance criteria to evaluate the extent to which the regulator is fulfilling its role.

The utilities' behaviour in a partially liberalised market should be made subject to the Anti-monopoly Act. This act should be amended to make it clear that it also applies to the electricity sector. The precise areas of joint or primary responsibility of the regulator and of the FTC should be specified, after due consideration of the institutions' legal bases, objectives, powers, degrees of transparency, and expertise. A possible division of responsibility is for areas where the FTC has expertise (such as with mergers and unfair practices, including market power abuse) to remain within its jurisdiction, while network regulation, including prices and terms and conditions of access, would be the responsibility of the sector regulator. Each institution should exercise its powers in consultation with the other institution. The FTC thus would continue and increase its role as an independent institution.

To provide a solid basis for market regulation, many countries have established or are examining the establishment of "independent" regulatory bodies to regulate electricity after reform. For example, Australia, Finland, Italy, Norway, Netherlands, Spain, Sweden, United Kingdom and the United States use an independent electricity regulator. Germany and New Zealand use the competition authority to regulate electricity.[10] While specific arrangements differ in each country, to meet their specific situations, the essential features of independent regulation are: complete independence from the regulated companies; a legal mandate that provides for separating the regulators and the regulatory body from political control; a degree of organisational autonomy; well-defined obligations for transparency (e.g., publishing decisions) and for accountability (e.g., appealable decisions, public scrutiny of expenditures).

The current policy of the Japanese government is to have MITI remain the electricity sector regulator, with regulatory activities kept separate from the policy-making activities. However, at present, safeguards from political pressures that would instil market confidence are limited. Transparency needs to be ensured to regulate a competitive market in an open and fair manner. Significant reform of the institutional arrangements is needed to support partial liberalisation of retail supply.

The role of the Electric Power Development Coordination Council in deliberating fossil fuel utility generation projects should be reconsidered after the schemes of partial liberalisation and expansion of IPP bidding are established so that IPP and competitive utility projects are on equal footing.

Competition in generation

Reform in the electricity sector should enhance efficiency through competition in generation and retail supply. Developing competition in generation is the main purpose of reform of the sector.

Effective competition in generation requires several elements:

- non-discriminatory access, including economically rational pricing, to the transmission grid and provision of ancillary services;
- sufficient grid capacity to support trade;
- electricity industry law and competition law and policy that effectively prevent anti-competitive conduct;
- a sufficient number of generation market players to give rise to competitive rivalry.

Competition in generation is enhanced by:

- low barriers of entry into generation;
- a non-discriminatory efficient market mechanism for electricity trade;
- a stranded cost recovery mechanism, if necessary, that is non-distortionary and fair;
- greater elasticity of demand with respect to price changes; and
- end-user choice, with competition to supply end-users.

Discriminatory access to the transmission grid creates two types of inefficiencies: (1) higher-cost generators may be used instead of lower-cost generators, and (2) efficient entry by generators may be discouraged. Both of these effects increase costs which could be avoided with non-discriminatory access. However, a vertically integrated utility has strong incentives to discriminate in favour of its own generating assets, providing them with preferential access to its transmission grid.

Vertical separation

A combination of regulation and vertical separation of utilities can be used to counter discrimination in transmission access. There are tradeoffs between regulation and degree of vertical separation: Where there is less vertical separation, there is a need for greater regulation, and vice versa. These two policy tools can be used to reduce the incentives and the ability to discriminate. Divestiture, that is, separation of ownership of generation from transmission, eliminates incentives to discriminate. Also, the ability to discriminate can be reduced in various ways and to varying degrees by the other types of separation (see box below).

Box 2. **Approaches to vertical separation between transmission and generation**

OECD countries are trying various approaches to vertical separation between generation and transmission include: These approaches include (ordered by degree of separation):

Accounting separation: keeping separate accounts of the generation and transmission activities within the same vertically integrated entity. In this case, a vertically integrated entity charges itself the same prices for transmission services, including ancillary services, as it does others and states separate prices for generation, transmission, and ancillary services.

Functional separation: accounting separation, plus (1) relying on the same information about its transmission system as its customers when buying and selling power and (2) separating employees involved in transmission from those involved in power sales.

Operational separation: operation of and decisions about investment in the transmission grid are the responsibility of an entity that is fully independent of the owner(s) of generation; ownership of the transmission grid remains with the owner(s) of generation.

Divestiture or ownership separation: generation and transmission are separated into distinct legal entities without significant common ownership, management, control or operations.

Different strategies for vertical separation of generation and transmission are being employed in different countries. Japan has decided to implement accounting separation, and should carry this out as quickly as possible, making sure it is effectively implemented. In many OECD countries who have restructured their publicly-owned electricity systems, the transmission business has been made a separate company (United Kingdom (England and Wales), Norway, Sweden, Spain, Hungary, Finland, most states of Australia, New Zealand). However, other countries within publicly-owned utilities, such as France, Italy, and Austria, have opted for accounting separation, albeit with an independent network manager as required by the European Union Electricity Directive.

There are fewer examples of electricity reform in countries where utilities are predominantly privately owned, as in Japan. Accounting separation is used in both Germany and Scotland (United Kingdom). In the United States, federal regulators require functional separation of transmission and encourage operational separation. In certain US states that have implemented full liberalisation of retail supply, utilities have been encouraged (and in the case of Connecticut and Maine are legally required) to divest much or all of their generating capacity. As the utilities in Japan are privately owned, the Government of Japan considers that it has no legal authority to require private electric utilities operating in the ordinary circumstances to divest their property and assets. The box below discusses how accounting separation can be made to work.

Box 3. **Making accounting separation work**

Current proposals would make discrimination illegal in Japan under the Electric Utilities Industry Law. But beyond keeping separate accounts, no changes in the structure or operation of the electric utilities would be mandated in the current proposals.

Accounting separation does not require large changes in the structure of companies. Thus it can be implemented relatively quickly and, for privately owned firms, without intruding into private property issues. In order to be successful, accounting separation needs to be accompanied by appropriate regulation to ensure non-discrimination and cost-reflective pricing. The accounting information made available to the regulator must reliably detect anticompetitive or discriminatory behaviour that might occur.

Functional separation, i.e., separate business units within the same corporate structure, reduces the ability to discriminate through the separation of personnel and of information systems. This should reduce the burden of regulation designed to control discrimination. For example, functional separation reduces the ability to misuse information in an anticompetitive way, because the information systems of the two parts of the companies are distinct.

Operational separation further reduces the ability to discriminate in grid operations and grid investments by creating an organisation responsible for independent management of the system known as an independent system operator (ISO). ISOs are new institutions, with a limited operational history in institutional and legal environments very different from those of Japan. There is not yet widespread agreement on key aspects of ISOs, notably with respect to forming a governance structure that ensures non-discrimination, and a management incentive system that leads the ISO to adopt correct transmission and ancillary services pricing policies. In Japan, there would also be the problem of ensuring sufficiently deconcentrated control of an ISO, and the limited interconnection between the 50 Hz and 60 Hz areas suggests that, if operational separation were implemented, at least two ISOs would be needed for the main islands. There can be no certainty that an ISO could be put into practice in Japan and the Government of Japan considers the concept inappropriate to Japanese circumstances.

Ownership separation, or divestiture, is intended to eliminate the incentive to discriminate, to reduce the need for regulatory oversight, and to deconcentrate markets when there are sales to multiple owners. Yet divestiture may raise issues of supply reliability because coordinated planning of generation and transmission investment is made more difficult. Divestiture can be either mandatory or voluntary.[11]

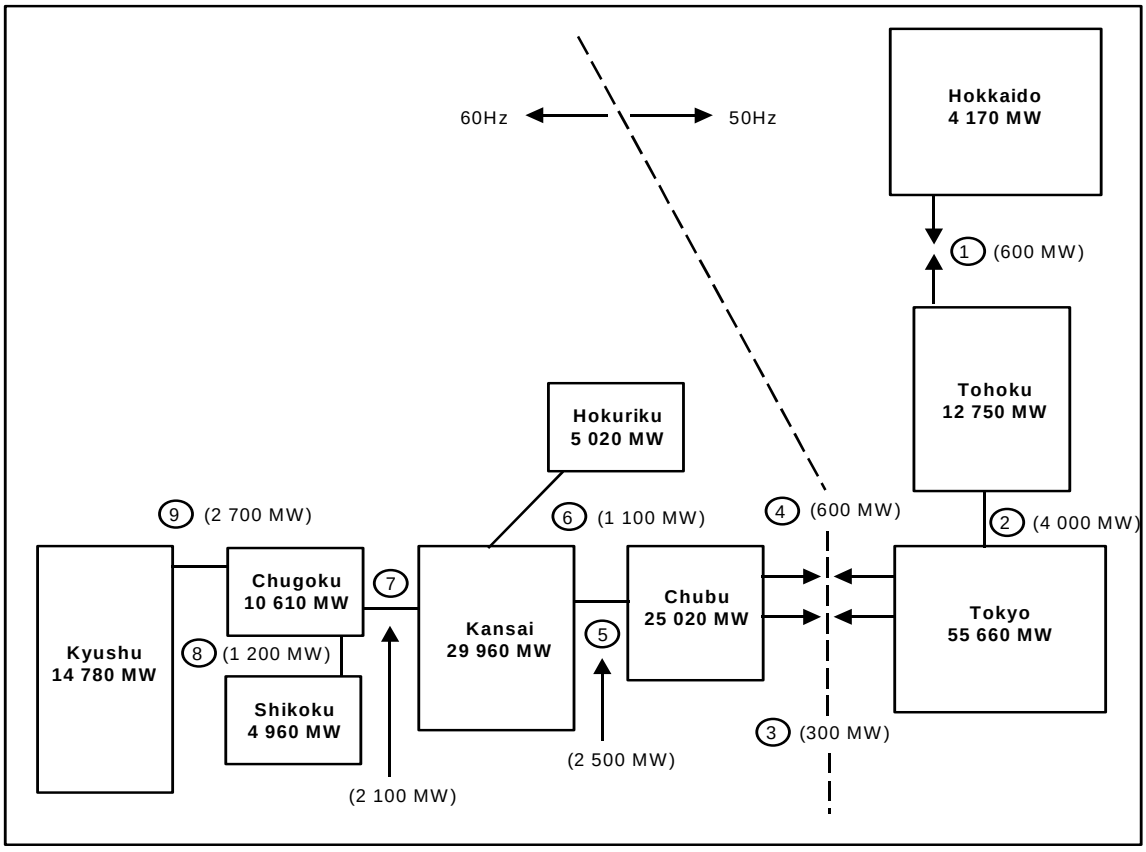
Competitive rivalry in generation

In addition to some degree of vertical separation, competitive rivalry among generators is a necessary condition for effective competition. Competitive rivalry is enhanced by the entry of IPPs selling to liberalised customers. It is also enhanced if many customers respond to liberalisation by installing their own generating capacity, using e.g. cogeneration or trigeneration,[12] to displace their use of utility electricity and generate surpluses that could be sold to other customers. This can also be done as part of a district heating and cooling business. Such action, or even the credible possibility of such action, would put competitive pressure on the utility to change its prices and reduce its costs to those customers who can credibly self generate.

An alternative means of increasing competitive rivalry is to enlarge the geographic scope of the electricity market to include several utilities. For example, if all six utilities in the 60 Hz frequency zone of Japan were in a single electricity trading region, no utility would have more than 35% of the generating capacity, much less concentrated than at present. The eastern 50 Hz zone has only three utilities, with the largest, Tokyo, possessing nearly 80% of the capacity. A nation-wide power market would, in principle,

reduce the dominance of the large utilities further. However, interconnections between utilities are not strong (for seven out of nine utilities, interconnection capacity is less than 25 % of peak load)[13] reducing the scope for power trading between service areas. Strengthening interconnections between utilities should be encouraged.

Figure 13. **Transmission interconnection capacities and peak loads for the nine utilities**



Source: Tokyo Electric Power Company.

Finally, a more severe approach is to create several competing generating companies by dividing the assets of an existing large utility. In some countries where the publicly-owned electricity systems (such as United Kingdom (England and Wales), Australia (most states), New Zealand) have been reformed, the decision has been made to divide the generating capacity of large publicly-owned utilities into several companies in order to create more effective competition. There are also instances (the United Kingdom and the United States) where privately-owned utilities have, in response to incentives, agreed to sell generating assets to address regulatory concerns about the effectiveness of competition in the electricity market. As noted above, the Government of Japan does not consider requiring such separation through divestiture to be an option for Japan.

Electricity markets

Open transparent markets for trading electricity, combined with a legal framework which facilitates direct bilateral contracting between customers and suppliers, forges a critical link between

generation competition, competition in supply and end-user choice. Even under partial retail liberalisation, power generators and liberalised customers could encounter difficulties in ensuring that supply and demand are perfectly matched. This problem could be severe in a system such as Japan's, where transmission constraints can severely limit the physically possible trades of electricity during certain peak demand times. A limited spot "balancing" market could provide a practical means of managing such imbalances. Similarly, such balancing markets could be used to sell surplus IPP energy to utilities and liberalised customers and could be used to displace higher marginal cost resources. Appropriate governance (and, potentially, regulation) of the market would be important to ensure non-discrimination among participants, and efficiency, if balancing markets were developed.

Stranded costs

"Stranded costs" are unamortised costs of prior investments or ongoing costs from contractual obligations, prudently incurred under a prior regulatory regime that will not be recovered under a new, more market-based regulatory regime. If stranded costs are to be recovered from customers, the recovery mechanism and the amount to be recovered must be determined. Japan is in a position to avoid one source of stranded costs that other countries face, because IPP contracts have only been allowed since 1996.[14]

Consumer protection

Because consumers will have more choices under a liberalised electricity sector, effective consumer protection may require that consumers be provided with more information and confidence-building measures.[15] Cooperation with consumer protection authorities in the course of the reform planning is essential.

7.5 Evaluating the first step

Partial liberalisation of retail supply places an enormous responsibility both on the regulator and on the utilities if it is to function effectively. The Government should develop a comprehensive reform plan for the industry that lays out the options for reform steps which might be taken, and the timing and criteria for evaluating progress towards its major policy goals and objectives for the electricity sector.

As part of this reform plan, the Government should monitor the progress of the first step against measurable indicators and, if there are problems with this progress, the Government should take further steps.

If the following indicators are found, they probably show that sufficient competition has not been introduced:

- Limited switching by liberalised customers: The extent of customer activity, particularly by large industrial customers, is an indicator of the health of the market.

- Limited entry by IPPs: The extent of IPP activity is also an indicator of market health.

- Complaints by IPPs about discriminatory activity by utilities with respect to network services: Accounting separation does not affect the incentive for a utility to discriminate in favour of its own generating capacity and only slightly limits its ability to do so. Problems with discrimination would suggest that accounting separation is ineffective.

- Complaints by IPPs about abuse of market dominance: As utilities control most of the generating capacity, IPPs will be concerned about pricing practices by utilities that limit their ability to access liberalised customers, or the availability of backup power or ancillary services.

- Limited activities by utilities to compete with one another for customers: The utilities themselves are potential source of competition for liberalised customers. Limited utility activity may be an indication of either anti-competitive behaviour or limited transmission capacity.

- Regulatory difficulties with accounting separation: The regulator may well find it difficult to separate the various regulated activities of the utilities (e.g., supply to captive customers, competitive procurement, sales to liberalised customers) when the utility has not separated underlying functions. Inevitably, there is a degree of arbitrariness about how exactly costs are attributed to the liberalised customers and what is for captive customers. Therefore, the regulator cannot be expected to uncover all of the cross-subsidies with an aim of reducing discriminatory behaviour by the utility as much as possible. Utilities may also find such accounting cumbersome.

7.6 The second step

If the first step is experiencing several of the difficulties listed above, the government should be prepared to move quickly with other measures taking into consideration the policy goals and objectives such as economic growth, energy security, environmental protection, universal service and supply reliability:

The key elements of this second step are listed below:

- Additional liberalisation of supply by enlarging the number of eligible customers and, if possible, making all customers eligible.
- Strengthening protection against the cross-subsidisation of liberalised activity by regulated activity and of anticompetitive behaviour by strengthening of regulatory enforcement, by using a more strict application of accounting separation or by adopting other combinations of vertical separation and regulation. Functional separation or, if possible, operational separation of network services (transmission, distribution, and system operations) with appropriate regulation may bring more benefits of competition. All feasible forms of separation should be considered. Circumstances may arise where divestiture becomes feasible, for example, and this too should remain open for consideration.
- Regulation, independent of policy-making functions, designed to enhance the transparency and credibility of the regulator to all market participants.
- Promoting electric power trading by introducing, at least on a limited basis, a wholesale market, expanding interconnections and by requiring utilities to purchase power for captive consumers from the most economic source.
- Ancillary services which require the utility to offer, and the customer to purchase backup power and other system services.
- Nuclear power and renewables should continue to be supported by all customers.

The evolution from the current system to the second step is described in Table 4.

Table 4. **Evolution of the Japanese electricity sector**

Area	Current	Step 1	Step 2
Liberalisation of Retail Supply	No customer choice except for self wheeling and special retail supply.	Extra high voltage customers (average 28% of market) liberalised. Captive customers supplied by utility.	Expansion of eligible customers. If possible, extend to all customers.
Tariffs	Regulated standard tariffs. Optional time of use rates for all customers. Fixed tariff for self wheeling.	Regulated time-of-use tariffs for captive customers to manage peak loads. Time-of-use system tariffs for liberalised customers.	As in Step 1.
Network Access/ Separation	Vertically integrated with generation and retail supply.	Accounting separation of transmission, distribution and system operations. Regulated non-discriminatory terms of access to the grid (location-sensitive transmission and distribution and ancillary services tariffs).	Functional separation of transmission, distribution and system operations (or if possible, operational separation with oversight by a neutral national governing board).
Trading Electricity	Generation dispatched by each utility based on fuelling cost. Interutility trade to reduce costs. Optional time-of-use contracts to reduce peak load.	Time-of-use pricing for system services (liberalised customers) and retail electricity (captive customers). Liberalised customers negotiate contracts and purchase ancillary services as required. Inter-utility trade encouraged through expansion of interconnections.	Markets introduced by system operators to manage imbalances and cut utility generating costs. Time-of-use pricing for all customers. Inter-utility trade expanded through increased links and regulatory incentives to reduce costs.
Competition in Generation	IPP entry liberalised. Annual utility tender for 10% of system expansion needs through 2004. Beginning in 1999, barring a significant change in the situation, current plan is for utilities to compete with IPP for all thermal power needs through tender.	IPPs able to contract directly with liberalised customers. IPPs also compete with utilities to supply captive customers through competitive tender. Utilities sell to captive customers, compete for liberalised customers.	IPPs compete with utilities through sales in spot market as well as through contracts.
Economic Regulation	MITI regulation of retail prices through rate-of-return regulation with a yardstick mechanism. Notification of MITI for optional rates and wheeling charges. Competition authority (FTC) limited to comment role.	MITI regulates network prices, terms of access, transmission plans, and retail prices for captive customers. Improved yardstick regulation. FTC's authority clarified by amendment of Anti-monopoly Act.	Increased use of regulatory incentives to reduce network costs. Regulation of generation based on comparison with market prices. FTC regulates anti-competitive practises for liberalised customers. FTC consulted on amendments to access terms.
Security of Supply/ Nuclear Power	Utilities have obligation to serve and plan for adequate supplies. Government policies support nuclear expansion and continued fuel diversification.	Utilities have obligation to serve and plan for adequate supplies for captive customers. Nuclear power development continues.	As in Step 1.

Table 4. (cont.) **Evolution of the Japanese electricity sector**

Area	Current	Step 1	Step 2
Renewable Energy	Utilities purchase renewable energy at special buyback rates. Government support for new energy through subsidies, low interest loans and tax privileges.	Utilities continue to purchase renewable energy. Existing commitments continued through subsidies, low interest loans and tax privileges.	As in Step 1.
Public Service Obligations	Obligation to serve all customers of utility (including, e.g., remote islands). "Postage stamp" pricing of electricity.	Captive customers served by utility at postage stamp prices. Utility sells ancillary services to liberalised customers.	As in Step 1.
Stranded Cost Recovery	Not applicable	Tax on electricity use or other mechanisms.	As in Step 1.

7.7 Further steps

Implementation of the measures proposed in the second step of reform should complete the process of liberalising retail supply and achieve functional separation of the competitive and monopoly activities. Subsequent evaluation of the performance of the electricity market would be needed to determine whether these measures have been effective in establishing competition in the electricity market in every utility service area throughout Japan. Among the performance indicators to evaluate are whether prices are approaching internationally comparable levels, whether independent generators experience discrimination, and whether there are difficulties in reaching environmental and energy security goals for the electricity sector. Depending on the outcome of such an evaluation, the Government should then determine whether further regulatory and structural measures might be necessary and practical in particular utility service areas including, for example:

- Encouraging entry of new generating companies;
- Expanding interconnections between regions to support greater trade;
- Changing terms and conditions of access to networks;
- Modifying economic regulation of the utilities to provide greater incentives to compete for customers;
- Encouraging or requiring further vertical separation of network activities from competitive activities through strategies such as operational or ownership separation; and
- Encouraging or requiring horizontal separation of the generating assets of utilities into a number of competing entities.

8. Performance

As Japan is just beginning its market liberalisation, the performance measures below must be seen as benchmarks against which future performance can be measured. At this stage in international market reform of electricity, there is also little data for international comparison. It is not therefore clear how Japan compares with others.

8.1 Costs and productivity

Labour productivity: Market liberalisation should encourage electric utilities to make labour productivity gains. Japanese electric utility labour productivity, of 5.1 GWh generated per full-time employee, ranks among the better among OECD countries (OECD, 1997). These figures do not include the extent to which electric utilities outsource various tasks, which may in fact be more considerable in Japan than in other countries.

Fuel conversion efficiency: Efficiency of fossil fuel conversion to electricity at the utilities is average at 37% (net efficiency). This does not include power generation by large industry, which is more efficient through the use of cogeneration. The high cost and hence limited use of natural gas fuel, the fossil fuel that can be most readily used at very high efficiencies affect performance in this category. Market liberalisation may increase fuel conversion efficiency by encouraging use of cogeneration by liberalised customers.

Investment efficiency: Market liberalisation is expected to improve the productivity of utility assets. While there is very little surplus capacity in Japan compared to most other countries (about 9%), the load factor is very low. Pricing reforms that expose consumers to time of use prices are expected to provide the biggest gains in the productive use of assets.

The success of current IPP suggests that investment productivity will also improve under partial liberalisation of retail supply.

8.2 Prices and costs

IEA data rank Japanese electricity prices for both industrial and household consumers as the highest among OECD countries. Reasons for high prices have been documented in Section 1. It should be noted, however, that international price comparisons may be misleading, as we may not be comparing "like with like". For example, some countries' electricity prices may be distorted by subsidies and cross subsidies between consumer groups. Also, the financial position of companies across countries is not easily comparable and may lead to price differences that are unrelated to real efficiency and costs.

8.3 Reliability

Electricity supply reliability is very high, higher than most other OECD countries.

8.4 Environmental performance

Emissions of sulphur and nitrogen oxides from Japanese electric utilities are extremely low owing to very strict environmental standards at both the national and prefectural/municipal levels. Extensive emissions control investments (flue gas desulphurisation, selective catalytic reduction) have been added to coal-fired and most oil-fired generation. Emissions intensity from all plant of 0.17 g/kWh for sulphur oxides and 0.21g/kWh for nitrogen oxides in 1996 is bettered only by countries relying almost entirely on non-fossil generation. Carbon dioxide emissions from electricity production have increased 5% since 1990 - owing in large part to a rise in production of 7%. Carbon dioxide emissions intensity has fallen to 0.1 kg-C/kWh as there has been a substantial rise in nuclear generation and in new efficient combined cycle gas power generation.

9. Conclusions and recommendations

9.1 Conclusions

The 1995 amendments to the Electric Utility Industry Law have begun a process of change in the Japanese electricity sector. The tendering for new capacity by independent power producers, which the amendments enabled, revealed significant scope for cost savings in generation. A revised regulatory process has put greater emphasis on improving efficiency at the utilities.

The decision to move forward with partial liberalisation of retail supply is an important and irreversible step for Japan to take towards its goal of international comparability in electricity prices. The first step of partial liberalisation may bring benefits to both liberalised and non-liberalised customers; it may bring the significant benefit of information about potential efficiency gains, and make clearer the way forward. The principles guiding the discussion of the first step appear to be soundly based. In particular, the recognition of the need for equal conditions for competition between the utilities and new entrants, the need for fair and transparent rules on the use of power transmission lines, and the commitment to set a timetable for liberalisation highlight essential points of any successful market liberalisation in electricity. Furthermore, the Committee's recent decision to recommend that all extra high voltage industrial and commercial customers, representing 28% of total utilities' sales, is an important milestone.

However, this first step under consideration will need to be carefully monitored to assess whether partial liberalisation of retail supply meets all the energy policy goals of the Japanese government. To establish the foundation for reducing Japan's electricity costs on a medium- to long-term basis, and to meet all of Japan's policy goals, further liberalisation will be needed. Further liberalisation will enable markets to become established and to expand, which will induce more efficient ways of organising the sector, and ways of using existing assets in the sector. It is important that access to the transmission grid and ancillary services be non-discriminatory and cost-reflective. Both the demand and the supply sides of the markets for electricity should be sufficiently unconcentrated, and those parts of the sector remaining under economic regulation should be subject to credible, transparent regulation. Each of these conditions are part of the foundation upon which an efficient electricity sector is built. A more robust foundation would require additional conditions.

9.2 Recommendations

The government should adopt a comprehensive reform plan for the industry that lays out the timing and criteria for evaluating progress with reform of introducing effective competition for the electricity sector, taking into account its major policy goals (environmental protection, energy security and economic growth). It can be noted that development of such a comprehensive plan is consistent with the OECD report of Ministers on Regulatory Reform, which recommends a complete and transparent package of reforms designed to achieve specific goals on a well-defined timetable.

As part of this reform plan, *the government should define measurable indicators of these reforms so that progress toward their achievement can be monitored*. The Government should monitor the progress of these reforms and, and, if there are problems with this progress, the government can make a timely adjustment toward other policies.

Competition principles should be strengthened in the overall policy framework.

The following recommendations would apply particularly to the first step of reform:

Regulatory independence from day to day political pressures is essential to build confidence of all electricity market participants that government intervention in the electricity market will be neutral and transparent. Further, independence from the regulated companies, including but not limited to utilities, is needed to ensure transparent, fair, and reasonably predictable decisions. Therefore, *the regulation of the electricity sector should be independent from policy-making functions and electricity industry promotion functions, with transparent procedures and due process for the review of decisions. Transparency, expertise, independence and adequate legal powers are particularly important. Co-ordination with the Fair Trade Commission should be clearly defined.*

Non-discriminatory tariffs and terms of access to the networks and system services are cornerstones of electricity reform. Therefore, *the first step of reform should include the requirement for regulated terms and conditions of access to the network and provision of ancillary services. Separate accounts for natural monopoly activities and supply of electricity to captive customers are needed from the potentially competitive activities. Prices should reflect, to the extent possible, underlying costs to encourage efficient development and use of the networks.*

Standard customer tariffs do not reflect the high cost of peak power. Cost reflective pricing of energy would encourage those customers able to manage their load to use less energy on peak, thus reducing total electricity costs. *Therefore, standard electricity tariffs for captive customers, and network/ancillary service tariffs for liberalised customers, should reflect costs by time of use. Implementation of the time of use tariffs should be phased in, beginning with liberalised customers and the larger (power) captive customers.*

The current application of yardstick assessment to economic regulation provides only diffuse incentives for utilities to improve their efficiency. *Therefore, the yardstick assessment scheme should be revised to provide a greater incentive for utilities to improve their efficiency by providing a less direct link between prices a utility can charge and the corresponding cost, and providing a more direct link with the cost efficiency of other electric utilities, making suitable adjustments for utilities' unique physical situations.*

Competition law needs to be enforced vigorously where collusive behaviour, abuse of dominant position, or anti-competitive mergers risks frustrating reform. *The Anti-monopoly Act should be amended to clarify that it also applies to the electricity sector.*

If after a reasonable period, such as by 2003, there continues to be evidence of discriminatory behaviour, and the market is not sufficiently competitive, despite accounting separation, further changes will be necessary:

The Government should expand the set of eligible customers. *If possible, make all customers eligible.*

If difficulties with accounting separation are found, and if measures to strengthen accounting separation have not eliminated these difficulties, then *utilities should be required to functionally separate their regulated activities from unregulated activities and the regulatory regime may need to be strengthened. The government should consider the full range of feasible separation options to promote competition in the industry.*

Increased activity in the trading of electricity will increase the need and the opportunity for a short-term electricity market to deal with imbalances between generation and loads. Therefore, *a short-term market for electricity sales should be created to optimise use of generating resources.*

Following the second step in the regulatory reform in the electricity sector**,** consistent with its reform objectives, the Government of Japan should undertake a review of the operation of the competitive electricity market in each utility service area in Japan. Depending on the outcome of such an evaluation, the Government should consider what further practical regulatory and/or structural reforms should be introduced, consistent with Japan's overall energy policy goals and objectives. Among the options to be considered are:

- *Measures to encourage entry of new generating companies;*

- *The expansion of interconnections between regions in a way that supports greater competition as well as reliability of supply;*

- *Modification of economic regulation applied to the utilities to provide them with greater incentives to operate and invest efficiently in monopoly activities of the sector, as well as to compete for customers in the competitive activities of the sector;*

- *Measures to encourage the voluntary sale of utilities' generating capacity to multiple buyers; and*

- *The full range of feasible horizontal and vertical separation options to promote further competition in the industry.*

NOTES

1. That is, fossil-fired generation.

2. Electric Power in Japan 1997/98, Japan Electric Power Information Center, Inc., Tokyo, 1997.

3. See Chapter 3.

4. Transfer supply allows a customer who generates power at one site to use a utility's transmission lines to transfer the supply for use by the same customer at another site. Also known as self-wheeling.

5. Based on information provided by Nippon Steel.

6. Based on Environmental Agency information reported in International Environment Reporter, 154, v. 21, no.4, 1998.

7. Implying that hydro facilities are used mainly for peaking or midload operation.

8. There are several transmission pricing schemes in use in various places outside Japan. Major schemes are as follows:

   – postage-stamp pricing: one price regardless of the locations of the buyer and seller.

   – contract-path pricing: summing prices of segments of transmission line between buyer and seller. For example, higher price if electricity is sent from Kyushu to Osaka, and lower price if electricity is sent from Kobe to Osaka.

   – location-sensitive pricing: pricing that reflects the cost of location of generation relative to loads. IPPs willing to locate close to loads (e.g., in Tokyo) could have the effect of reducing transmission congestion, and hence would pay lower transmission costs than a new plant located remotely from users. Locational marginal pricing, a particular manifestation of location-sensitive pricing, prices transmission congestion dynamically to pass on the costs, and signal, of congestion when it occurs.

   Neither postage-stamp nor contract-path pricing is related to the actual flow of electricity, and hence the cost of the transaction, nor do they reflect the economic value of a part of the grid under a particular pattern of use. Thus, these pricing schemes do not provide incentives for efficient grid use or augmentation. Locational marginal pricing induces efficient grid operation and dispatch by reflecting congestion of each period of time.

   The adoption of an efficient transmission pricing scheme will likely have several positive effects. First, the changed economic incentives may cause utilities and customers to change how they use the transmission system; if they pay higher prices to use the system in a congestion-causing way, then they may change toward a pattern of use that causes less congestion. Second, the changed economic incentives may change the siting of new generation, so that it is closer to the load; where provision of "counter-flow" is rewarded, it is more likely to be provided. Combined with the liberalisation of generation entry, new generation can be sited where utilities would not otherwise be able. Third, the transmission prices will provide signals as to where reinforcement of the transmission network would have the greatest economic value.

9. Under the system of green certificates adopted in the Netherlands, renewable fuels generators are awarded tradable renewable fuels certificate by the government. Customers are required by the government to have a specific quantity of tradable renewable fuels certificates, depending on their total electricity usage. Customers can get these certificates only by buying electricity generated by renewable fuels, or buying a certificate stripped of its electricity. Hence, the certificates are a means of metering the generation of

electricity by renewable fuels without forcing each customer, itself, to buy exactly the target average share of renewable fuels generated electricity. Thus, each renewable fuels electricity generator has incentives to generate electricity at lowest costs, since it competes with all other renewable fuels electricity generators in the Netherlands.

10. The purpose of independent regulation is to provide participants in the relevant sector, as well as potential investors, with confidence that regulatory decisions on, for example, the network tariffs, are fair, non-discriminatory, reasonably predictable, and not subject to political pressures. These require regulation to be regarded as independent of both the regulated utilities and day-to-day political pressures. Over time, the regulatory decisions made in this way can help build the credibility and legitimacy of the regulatory regime, encourage investment, and help reforms to progress.

11. Divestiture raises important issues of property rights in Japan, where electricity companies are private entities. Under the current legal system, the Government states it has no legal authority to force the private utilities to divest their assets. Thus, if someday Japan were to turn to divestiture, changes in law would be required. Further, supply reliability is important in Japan, where customers place a high value on reliability. Given the large planned increase in the number of nuclear power reactors in Japan, it is possible that divestiture would affect the ability to make these long term investments. If divestiture causes coal and oil fired plants to shift to base load use, the Government of Japan is concerned that there would be environmental effects. Finally, the Government of Japan is concerned that voluntary divestiture based on economic incentives may increase the price of electricity. The Government of Japan states that it does not consider requiring separation through divestiture to be a feasible option.

12. Cogeneration refers to the simultaneous production of both electricity and useful heat. Trigeneration refers to the simultaneous production of electricity, useful heat, and cooling.

13. Based on interconnection capacity and peak load information provided by Tokyo Electric Power Company.

14. A major error in the IPP procurement process in other countries (*e.g.*, in the US in the 1980s or in the UK in the early 1990s) was for utilities to sign long-term contracts for IPPs at prices well above what could ultimately be sustained in the market. These IPP contracts became a source of "stranded costs" that needed to be dealt with in the transition to a fully liberalised market. Fortunately, the relatively low bids in the IPP offers to date make this risk in Japan smaller than was the case in other countries. However, contracts for future independent tenders could contain provisions that make allowance for further developments in fuel and electricity markets and allow contract prices and other contract conditions to evolve accordingly.

    Principles with respect to transparent, fair, and efficient stranded cost recovery include:

    – Transparency: The amount is determined in a transparent manner by the regulator for each utility.

    – Shared recovery: Cost recovery is to be shared equitably among different customer classes and with the utilities.

    – Non-distortionary recovery: Cost recovery does not induce excessive or insufficient entry, nor distort the marginal price of electricity.

    – Utilities have a responsibility to mitigate stranded costs: Full recovery of stranded costs is not normally guaranteed to the utilities, but utilities are given incentives to reduce the amount of their reported stranded costs.

15. In some countries, abuses against consumers have caused backlashes against reform itself. This is because many countries neglected to install consumer protection regimes that work well in new market conditions. This failure stems from the mistaken notion that market liberalisation means that all kinds of regulation will be reduced. On the contrary, in some areas it may mean more.