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THE DEREGULATION OF TAIWAN'S ELECTRIC POWER INDUSTRY

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Taiwan's thriving economy has been clamoring for internationalization and deregulation since the 1980s. One of the first areas to receive attention in this regard is the provision of electric power. After more than 50 years of monopoly operation by the Taiwan Power Company (*Taipower*), the electric power market in Taiwan is being subjected to deregulation and competition. The results are likely to be felt in at least three ways. *First*, opening the market for power generation could be a method to solve the power shortage problem effectively. Introducing private power producers and promoting distributed generation systems, such as cogeneration and renewable energy sources, could also help alleviate urban power shortages caused by metropolitan development, where large peak load demand derives from high-rise commercial buildings and where there are difficulties encountered in installing and expanding the distribution network and electric transformers. *Second*, the level of competition will be adjusted by a more liberalized market mechanism. Accordingly, the efficiency of operation as well as management will be enhanced and costs may then be reduced. This is expected to contribute to a reduction in the electricity rate charged to end users. *Third*, as the electricity market becomes more liberalized and diversified, it is expected that in the long term new schemes for electricity rates will be developed and introduced to customers, such as priority service rates (i.e. higher reliability sources can charge higher rates while lower reliability sources can charge less). Future and spot markets for electricity sales are also likely to be realized. Customers will then be able to hedge their risks in market transactions. In other words, the market will become more customer-oriented and profit-driven.

This paper is concerned to investigate some of the issues involved in the deregulation of the electricity power industry in Taiwan. The Taiwan experience represents one avenue towards electricity liberalization. It is a useful model which might be followed by other emerging market countries like Korea, Singapore, Malaysia and India. The Taiwan experience also can provide an effective means for diversifying sources of power (such as through cogeneration) and for mitigating the effects of power shortages. The outline of the paper is as follows. We first outline the current situation in Taiwan. The government's policy for promotion of cogeneration, the opening of the market for power generation to new power producers and the revision of the Electricity Act are then analyzed. Third, some implications of the government's deregulation policy and difficulties in relation to future regulatory reform of the electricity industry in Taiwan are also discussed. Some concluding remarks are offered in a final section.

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HISTORICAL REVIEW OF TAIWAN'S ELECTRICITY INDUSTRY

Taiwan, unlike many other countries, has an isolated power system with a lack of indigenous energy supply and a high population density. Electricity policy in Taiwan is then traditionally concerned with power supply stability. In 1948, the Taiwan Power Company (Taipower), was created as a State-owned corporation and equipped with monopoly rights in Taiwan's power market, according to the "Electricity Law". Since then, Taipower has been the sole company responsible for power generation, transmission, and distribution in Taiwan. This is because the main problem within the energy sector in Taiwan during that time was the lack of electric power for industrial development. With the power industry owned and run within the public sector, the government was able to intervene directly in the industry, allocating power for industry development, and accumulating assets and human capital within the public sector—in accordance with the injunction to "develop the country's capital" as proclaimed by Dr. Sun Yat-sen, the founder of the Republic of China.

The government's policy in the 1950s and 1960s was to give the power industry priority over other industries. For these two decades, capital for the development of Taipower infrastructure was drawn mostly from US aid and it was invested largely in generation facilities. Hydro-electric power plants were chosen for supplying electricity prior to 1961. After 1961, thermal power plants were chosen due to their shorter lead time and the less capital-intensive nature of plant construction. Until the 1970s, nuclear power was actively pushed as a major means for supplying electricity in order to avoid dependence on fossil fuels, and oil in particular. By the late 1970s and early 1980s, there was an over capacity in power generation facilities. However, over the past 10 years in Taiwan, the anti-nuclear movement and community organizations have kept many power development projects pending. During the early 1990s, there have again been power shortages threatening normal economic development and the public's living standards. This issue is currently among the most urgent for reviving the economy.[1] The main strategy is to encourage cogeneration and independent power producers. Demand-side management, including energy conservation, is also very important. In the 1990s, the Taiwan electricity industry has started to follow the policy of liberalization and privatization. The environmental protection movement, and the issues of global warming, have also become prevalent nationwide. Thus the issue of electric power—its sources, generation, distribution and conservation—have become central political issues in Taiwan.

DEREGULATION OF THE ELECTRICITY INDUSTRY

Power industry deregulation in Taiwan is mainly motivated by two factors: firstly, the aforementioned power shortages, and second, deregulation of overall economic policy. In the late 1980s, many citizens began strenuously protesting against the

1 By the end of 1996, the total number of power plants in Taiwan was 60, of which 39 were hydroelectric, 18 were thermal, and 3 were nuclear. The total installed capacity was 23,763 MW, of which 18 percent was hydroelectric, 32 percent coal-fired, 20 percent oil-fired, 9 percent gas-fired, and 22 percent nuclear. The peak load was 21,762 MW in 1996, a 9.2 percent increase over that in 1995, and the average load was 14,227 MW, a 5.7 percent increase over 1995 (Energy Commission, 1996).

establishment of new power plants such as the Suao thermal plant and the fourth nuclear power project. Even existing power plants, such as the Hsing-Ta and the Tung-Hsiao thermal power plants, suffer from the "not in my back" yard effect, with constant protests from local residents. There have been many "self-rescue" events in which protesters demonstrate against, or even interfere in the operation of existing plants and the establishment of new power facilities. As a result, power shortages in summer peak load periods have occurred for many years and will create an obstacle to further economic development in Taiwan. In addition, the descending trend of primary energy prices, and rapid economic and load growth in Taiwan have worsened the power shortage situation. In response, the government has emphasized mitigating power shortages by various means. One of the most important strategies is to encourage the setting up of cogeneration and independent power producers. Since opening the power industry can encourage various private investors (including investors from other countries) to develop new power plants, the power shortage problem could be resolved. Taiwan's power industry has thus started to move towards liberalization and deregulation.

A second factor has been economic deregulation more generally. Since the early 1980s, the Taiwan government has promulgated a series of deregulation policies, dealing, for example, with interest rates, foreign currency exchange rates, international trade, industries such as aviation, and so forth. Because Taiwan wants to participate in a number of international economic-trade organizations or agreements, it needs to have a market-driven economic system to satisfy the requirements of application. Accordingly, the government is promoting deregulation of the electricity industry through three means: promotion of cogeneration, introduction of private power producers, and vertical disintegration of Taipower. These changes have led to a revision of the Electricity Act. Hence, this section first describes the government's policy and measures regarding cogeneration development. Second, the introduction of private power producers is discussed. Third, the dismembering of Taipower, and the various options canvassed, is discussed. Finally, important points of the proposed Electricity Act revision are summarized.

Cogeneration

Cogeneration is a production method to generate electricity and industrial gases simultaneously which has a more efficient rate (85 percent heat efficiency) of energy utilization. The initial step in the reform of the electricity industry in Taiwan could be said to have been taken in 1988 when the Ministry of Economic Affairs first promulgated the Measures for Promoting Cogeneration Applications, based on the Energy Management Law and Electricity Act. The highlights are the following: (1) The measures apply to "qualified cogeneration systems" only. These are cogeneration systems complying with certain conditions, such as that the operating standard for thermal output has to be no less than 20 percent of the total energy output of the facility; and the efficiency standard has to be no less than 50 percent. (2) Natural gas is the fuel given highest priority for cogeneration systems. (3) Third-party investments are encouraged to install qualified cogeneration systems for selling produced heat and electricity to either users or electric utilities. (4) Consumers have been encouraged to

invest in cogenerators by installing qualified cogeneration systems to meet their own needs, including steam and electricity. Taipower is obligated to purchase any surplus electricity from the cogenerators. (5) Purchase prices of surplus electricity can be based on either Taipower's "avoided cost" or the time-of-use rate which Taipower uses for generation, transmission, and distribution. Qualified cogeneration system owners have the right to select the more favorable of the two above. (6) Taipower has to serve as the back-up and supplementary power supplier for the maintenance of qualified cogeneration systems.

Other than the above-mentioned regulations, the government also provides financial and tax incentives for setting up cogeneration systems, such as through:

(i) *Loans with low interest rates.* Chiao-Tung Bank[2] will provide loans with regular interest minus 2.125 to 2.25 percent.
(ii) *Accelerated depreciation.* Cogeneration facilities may apply for two-year accelerated depreciation.
(iii) *Tax credits.* Profit-oriented enterprises may receive a credit of 5 to 15 percent of the income tax payable in the current year. Such credit may accumulate for the following four years once the deductible amount is more than the income tax payable in the current year.
(iv) *Pricing discounts.* Qualified cogeneration systems may set their prices to favor natural gas use, with 2.5 percent off for industrial use.

In 1990, these measures induced the installation of cogeneration facilities to supply 933 MW, representing 7.3 percent of the total installed capacity of Taipower. The total installed capacity of cogeneration systems was 1,980 MW, which represents 9.44 percent of Taipower's installed capacity (2,654 MW) in 1994. Table 1 shows the allocation of cogeneration facilities among various major industrial sectors. Note that petroleum was no longer a cheap commodity and its availability become quite unstable after the two worldwide oil crises. The government power policy then turned to emphasize electricity conservation, load management, and environment protection. Cogeneration has a more efficient rate of energy utilization and has successfully improved the energy productivity in some extent.

Industries are expected to implement about 2,035 MW more in cogeneration facilities over the next four years. The total installed capacity is expected to grow to 4,015 MW by the year 2000. Table 2 summarizes the outlook for such growth in the 4 years following 1996. This increase in cogeneration is likely to promote energy efficiency in terms of the total energy consumed. Additionally, cogeneration can ease the problems of power shortages for energy users. The most common size of cogeneration units is currently from 10 to 30 MW in Taiwan, accounting for roughly 47 percent of overall installed cogeneration unit capacity. Oil is the dominant fuel, which powers about 62 percent of all new facilities. Among all the facilities installed, steam turbines are the most common type.

2 A government-owned bank that mainly helps provide investment loans to the commercial and industrial sectors in Taiwan.

TABLE 1: EXISTING INSTALLED CAPACITY OF COGENERATION IN TAIWAN

Year	1986		1990		1992		1994		1996	
Industry	MW	%	MW	%	MW	%	MW	%	MW	%
Petrochemicals	116.1	24.0	278.3	30.0	505.0	29.2	630.2	31.8	751.0	28.3
Oil refineries	90.0	19.0	100.0	11.0	130.0	7.5	142.4	7.2	142.4	5.4
Metals	80.0	17.0	235.8	25.0	355.0	20.5	374.3	18.9	385.6	14.5
Paper	67.4	14.0	142.8	15.0	205.0	11.9	205.5	10.4	208.8	11.6
Textiles	59.5	13.0	110.2	12.0	413.0	23.9	424.6	21.4	778.3	29.3
Food	56.0	12.0	60.0	6.0		60.0	65.7	3.3	76.2	2.9
Cement	6.0	1.0	6.0	1.0		35.2	86.6	4.4	96.1	3.6
Others						60.0	50.8	2.6	116.7	4.4
						35.5				
Total	475.0	100.0	932.9	100.0	1728.0	100.0	1980.1	100.0	2654.1	100.0

Source: Energy Commission (1996)

TABLE 2: ESTIMATED INSTALLED CAPACITY OF COGENERATION IN TAIWAN

Item/Year	1996	1997	1998	2000
Additional capacity (MW)	392	940	254	113
Total (MW)	2,708	3,648	3,902	4,015
Cogen/Taipower system (%)	10.8	13.8	14.6	14.9

Source: Energy Commission (1996)

Private power producers

Private power producers in Taiwan are somewhat different from independent power producers as they are generally known. To be "independent", a power producer must compete on overtly equal terms through power pool and be given non-discriminatory access to the network. In other countries, such the United Kingdom, establishment of a power plant is just like establishment of a manufacturing facility and does not require some special permission or franchise. However, according to Taiwan government's regulations, these private power producers are defined as "public utilities" and require the Ministry of Economic Affairs' permission with a franchise. Therefore we call these power producers "private" instead of "independent", although in this paper we refer to them as independent power producers (IPPs), in conformity with international practice.

The history of private power producers is very short in Taiwan. If we date their existence from the time they were approved by the government, their existence spans just over two years.[3] The first group contains seven companies that were selected through a bidding process out of twenty-two applicants at the end of June

3 The first batch of seven private power producers was announced by the Ministry of Economic Affairs on Aug. 17, 1995.

1995, representing generation capacity of 7,050 MW. The second group contains four companies out of twenty competitive bidders at the end of 1995, representing 3,250 MW generating capacity. Further steps under consideration by the government include the establishment of new private power producers defined as independent power producers and not public utilities, with Taipower on the other hand remaining a public utility, responsible for the reliability of the power supply, i.e. obligated to serve. Other options include dividing up the generating sector of Taipower to form several power-generating companies in order to further enhance competition for power generation—more or less as was done in the UK under the Thatcher government. Note that the investor-owned utilities or independent power products tend to develop combined-cycle gas-turbine unit or a gas-fired power plant which has a shorter lead time, less-capital intensive, and less environmental impacts to the local residents.

Taiwan power company

The power industry in Taiwan has been vertically integrated and monopolized by a single company (Taipower) for over fifty years. Generally speaking, Taipower has made a significant contribution to current economic development in Taiwan. It increases the international competitiveness of Taiwan's industries in three aspects. First, through the import of primary energy such as coal and oil, and its transformation into the secondary energy of electric power steadily, the industrial process can be fully mobilized and productivity enhanced. A steady power supply has made Taiwan, a resource-poor island, thrive economically. Second, through the use of a cheaper electricity, manufactured products can then be shipped to international markets with a lower cost and earn the foreign exchange needed for economic development. Third, Taipower has been a source of technologies and new business sectors, especially in the electricity engineering and nuclear engineering field. Meanwhile, it has also assisted to the development of diversity in the electricity technology improvement in Taiwan. Thus, Taipower in the past has served Taiwan well. However, under the regulation and full control of the government, Taipower has to follow its policy instructions, such as the electricity discount policy for military and other specific groups, the fuel purchase policy, whereby primary energy must be imported only from specific countries or areas, the overall low energy-price policy, and so on. On the other hand, the government also helps Taipower in many matters, such as guarantees for loans, the procurement of land for plant construction, rights-of-way for transmission and distribution for Taipower. Because of the monopoly, economies of scale are enjoyed by Taipower. And since these facilities are owned and run by the government, the profit of this company does not accrue to a few people, but to the nation as a whole. The governmental intervention and an inflexible personnel system have also restricted the entrepreneurship of the power industry. Therefore, the current policy of the government is to privatize Taipower, and to liberalize Taiwan's power market in the future. Now is a critical time because the current monopoly right of Taipower expires in February 1998.

In this moment of deregulation, the key issue is whether the vertical integration of the existing power company should be dismantled. The argument in support of

disintegration of the power industry in Taiwan can be summarized as follows: Monopoly is subject to regulation, which is difficult to conduct perfectly. According to regulations set by the Taiwan government in 1969, the allowed rate of return for Taipower ranges from 9.5 percent to 12 percent. Costs and proposed rates for Taipower are first reviewed and approved by the Ministry of Economic Affairs (MOEA) and then by the Council for Economic Planning and Development (CEPD), the Public Utility Regulatory Committee, and the Directorate-General of Budget, Accounting and Statistics (DGBAS) of the Executive Yuan. After Taipower's costs and rates are approved, they must be confirmed by the Legislative Yuan before the new rates can be implemented. Compared with the procedure of regulation in the US, where the public utility commissions use "prudence reviews" and "used and useful" tests (i.e. are capital assets actually "used and useful" in the company's production effort?) before allowing a capital investment to enter the rate base, the Taiwan case is different in at least two aspects. One is that the members of Taiwan's Public Utility Regulatory Committee are primarily government officials: there are no consumer representatives and no public hearings. The other is that "used and useful tests" are not applied with regard to the determination of the base rate.

According to Averch and Johnson (1962), under a constrained rate of return on capital, such as the above-mentioned case in Taiwan, a utility tends to over-utilize capital in maximizing its profit given the case of asymmetric information. However, since the regulatory agency obtains a good deal of the information it gets on the regulated entity from the entity itself, and given the possibility of conflicts of interest, the obtained information could lead to the manipulation or misrepresentation of the facts. Therefore, the more realistic assumption of symmetric information between the regulator and the regulated entity should be made.[4] If the vertical integration of Taiwan's power industry remains in place, the government will have to make strenuous efforts to regulate and monitor such a monopoly. If dismemberment is pursued, much of the administration cost will be saved in the power generation market. In addition, cross-subsidies among various sectors can be prevented and operation efficiency can be improved by competition. Without disintegration, the operation and management performance in each sector will be difficult to assess realistically. Moreover, a vertically integrated power company may act against other power generation suppliers when the former is the sole buyer of power generated by the latter. This kind of potential unfair competition is another reason for dismantling the vertical power company.

Some argue that disintegration will hamper synergistic management efforts, linking the various operations of power generation and distribution more efficiently than in an open market. Some works by Hotelling (1938), Dupuit (1952) and others are marshaled to support the virtues of the market. This may be true to some extent for former times when smart-meter and electronic trading systems were not available and the transaction costs among electricity companies of generation, transmission and distribution were relatively high. However, with the breakthrough of modern technologies today applied in the electricity power industry, the cost of uncertainty and risk involved in the transactions between power generation and transmission/

4 See Hsu and Chen (1991a; 1991b).

distribution can be reduced significantly and thus allow the most capable party to manage the risk better with a lower cost. Thus, the overall cost of power supply could be brought down through external competitive pressure. Furthermore, according to Gilsdorf (1994), continued integration does not reduce the aggregate cost of operation. That is, from the viewpoint of efficiency and power supply cost, it is not necessary to maintain vertical integration of the power industry.

Electricity Act

It is clear that the Electricity Act, first passed in 1947, with minor modification in 1965, can no longer meet the current needs of Taiwan's power market. For example, the roles of cogenerators and independent power producers have not been fully clarified, the rules for monitoring the electricity industry and related regulations are not well-considered, and the franchises for power generation, transmission, and distribution are also not clearly defined. All of the above-mentioned issues are to be addressed in a revision of the Electricity Act in the near future. It is of interest that parallel versions are proposed for discussion in the Legislative Yuan. Two of these, the version advanced by the government (the Executive Yuan draft) and a draft from Committeeman Koa, appear to be based on the free competition principle and support the disintegration of the existing power industry. These drafts envisage the division of power producers into public utilities and non-public utilities. The other two drafts (tabled by Committeeman Li and by the Union of power company workers) envisage, on the contrary, a vertical integration of the existing power company (Taipower) and demand the right to strike of the power company workers.

For example, the new draft of the Electricity Act revision, which was approved in the Executive Yuan in August 1995 and has been submitted to the Legislative Yuan for passage, contains most of the points described above. Important aspects of this revision are listed below: (1) The power industry is classified into three categories: generation companies (*gencos*), transmission companies (*transcos*), and distribution companies (*discos*). (2) One company can operate in no more than two of these three categories of the power industry. (3) Licensing permission from the government is required for company establishment in any category. (4) Transmission and distribution business is territory-specified. Only one firm is allowed in a given region. (5) Licensing permission will expire after twenty years. A 10-year extension is allowable, subject to the government's review. (6) Non-utility generators (NUGs) are defined to include independent power plants, cogenerators, renewable energy suppliers, and others, such as back-up generators owned by electricity consumers. (7) Power generated from a company's cogeneration system can be sold to electricity users in the same industrial park or building; power generators using renewable energy sources can supply electricity to electricity users directly. The above conditions are all subject to the permission of the government. (8) Power generated by independent power plants, cogeneration, renewable energy, and other self-generators can be transmitted and distributed by transcos and discos. In summary, this revision proposes to make a system of deregulated power generation workable—particularly through the introduction of a legal category of non-utility generators. How it works in practice remains to be seen.

IMPACT OF DEREGULATION AND CURRENT ISSUES

Deregulation mainly focuses on relaxing or removing regulations to stimulate competition, while privatization seeks to transfer ownership and rights of management and operation from the government to the private sector in order to promote entrepreneurship and operational efficiency. In other words, deregulation concentrates on market competition, while privatization is focused on the control of the management mechanisms. Usually deregulation is a necessary condition for privatization if the power industry is publicly owned originally. Hence, not every country begins from similar conditions and, for Taiwan, it is recommended that deregulation of the power market precede the privatization of Taipower.

As to how the deregulation is likely to impact on the power industry in Taiwan, there are several points worth noting. First, Taipower has taken sole responsibility for Taiwan's power development tasks in the last decades. The quality of power supply can be assured if the installed capacity is sufficient. However, if the new, private power producers joined into the power market, they will gradually replace a portion of the power system capacity and the corresponding responsibility for formulating new power development programs. It may serve to mitigate the pressures being experienced by Taipower in seeking to construct adequate power plant capacity. Meanwhile, the supply stability in the whole power system will become more complicated and uncertain.

Power purchase and/or sales arrangements between Taipower, cogenerators and private power producers are likely to gradually increase. Building a "power pool" market and establishing a real-time and global information system, will be needed in the near future. In terms of the deregulation or reform policy planned for Taiwan's electricity industry, the generation sector could be the first part to be deregulated if the revision of Electricity Act is passed, the generation sector, in contrast to the transmission and distribution sectors, represents the largest fraction of total power supply cost. If the generation cost can be effectively reduced through the mechanism of competition, the overall electric tariff rate might be expected to be reduced significantly, with benefits for industry generally and ultimately consumers.

However, it should be noted that private power producers in Taiwan currently have been given approval by the government to install generation facilities of 7,050 MW. An additional 3,000 MW was to be allowed for bidding by the end of 1996, installation of which is expected to be completed by the year 2000. All together, this will represent roughly a quarter of the power generation market. This will make the Taiwan power market one of the most liberalized in the world. Given these circumstances, it is important to ensure the reliability of private power producer operations. The current Electricity Act revision proposed by the government (the Executive Yuan) allows private power producers to be taken over by others in case of bankruptcy or poor performance. In addition, the vulnerability of the Taipower transmission system need to be recognized. In particular, the heavily industrialized northern region has a serious shortage of power supply in peak periods and needs to have long-range power transmitted from the southern power plants' generators. This is because land for power plants is scarce, and northern Taiwan consumes more than 50 percent of the load demand of Taiwan due to intensive economic activities in the

northern area. This situation will be exacerbated by having private power producers sited in southern Taiwan. Therefore, for the security of the power system, regional balancing is a critical issue in Taiwan. These problems could be mitigated by strengthening and expanding the power transmission system in Taiwan. However, the problem of obtaining the rights-of-way for establishing or expanding transmission lines has become more and more difficult to deal with. Citizens who live along the proposed transmission routes tend to obstruct such engineering work. As a result, the cost of rebalance among different regions and achieving a reserve margin for the whole electricity supply system need to allocated between private power producers and Taipower in an equitable manner. In terms of cogeneration and renewable energy, the deregulation policy could continue to promote both types of power generation because they are comparatively more beneficial to the society than conventional steam-turbine power generation. Two important issues are raised by this deregulation of the power industry.

First, according to the current regulations, foreign capital investment is not allowed to exceed 30 percent of the total amount in any private power producer project. This restriction could be lifted for three reasons. First, Taiwan, being a small island, should encourage more foreign capital to flow in and more domestic capital to flow out for investment so as to increase the total amount of international trade of capital. This can enhance the influence of Taiwan in the world economy. Second, owing to Taiwan's ongoing diplomatic difficulties, having more foreign investors will improve the ties between Taiwan and other countries. Also, in case of any political entanglement or confrontation with other countries, more support from abroad could be expected because those investors will try to protect their local investment with the help of their home countries. Third, by owning and operating the private power producers, foreign investors can be expected to transplant relevant technology and management skills to improve the performance of local private power producers.

Second, it should be noted that the current process for installing private power producer capacity is controlled by the government and non-periodically open to potential entrants. So far, generation of 7,050 MW has been opened in the first round of bidding (in June 1995) to seven private power producers, and permission to generate another 3,250 MW was bid on by four private power producers at the end of December 1995. However, it is believed that a more liberal policy could be implemented because having more suppliers will stimulate competition through entrepreneurship which will in turn lower the power supply cost and thus benefit the end consumers. Furthermore, many other advanced countries do not have this kind of limitation.

Compared with the problems encountered by private power producers in other countries, the acquisition of land is much more difficult in Taiwan mainly because Taiwan is densely populated and land resources are scarce. Although creating reclaimed land along the west coast is an alternative for sites for private power producers, it normally takes more time to complete the necessary tasks than to simply buy land. Moreover, it is extremely difficult to establish the connections between private power producers and the Taipower transmission grid. The rights-of-way for

these connections are difficult to obtain because local citizens frequently obstruct the necessary engineering work and block the work through taking out court injunctions. These are the activities of a nascent democracy, and the electricity industry is having to learn to live with them.

Another controversial issue is that "wheeling" (i.e. direct sale to third parties) is not allowed and Taipower is the sole buyer of the power generated by private power producers. The contract price between the two parties is to be based on bidding with a ceiling being placed on Taipower's "avoided cost". However, Taipower's "avoided cost" is confidential according to the current regulations. In contrast, the "avoided cost" for the contract price in many other countries is deemed to be public information, and available to all private power producers in advance of bidding. Currently, many private power producers have complained that the price for bidding the contract is too low or uncertain. This problem deserves the attention of the government, because pricing signals are indicators for optimal resource allocation.

CONCLUDING REMARKS

After years of ideological contest and new breakthroughs in technology, the world has now embarked on the path of market-driven economic development. Many industries in industrialized countries have shifted from a conventional regulated system to a more liberalized one. The electricity industry is one which is rapidly evolving toward a more competitive market. For example, the electricity industries in the United Kingdom, New Zealand, and Norway have faced drastic changes over the past few years. This international trend in the electricity industry has inevitably influenced Taiwan's electricity industry, currently monopolized by the vertically integrated Taiwan Power Company (Taipower), which is run by the government, to move gradually toward a more open and liberalized market system.

Private power producers and cogenerators have been encouraged by the Taiwan government so as to create more competition in the power generating sector. Since the late 1980s, the Taiwan government has promoted the installation of cogeneration facilities. This strategy seems likely to be the most successful among all the strategies for solving the power shortage problem because of the attractive nature of the cogeneration system: short lead time, better energy efficiency and the possibility for on-site construction. At this stage, however, relevant regulations and laws are quite inadequate, and the existing legal system which regulates the power market has many deficiencies. The Electricity Act has not been revised for more than thirty years, so revision is essential. The new draft of the Electricity Act was approved by the Executive Yuan in August 1995 and submitted to the Legislative Yuan for final approval.

Finally, it should be emphasized that the deregulation of power generation is just the first step in liberalizing the power market in Taiwan. The deregulation of power transmission and distribution are equally important. In many advanced countries, power wheeling is implemented and transmission and distribution companies are required by law to comply. Therefore, the government needs to officially announce a plan for the reform of the electricity industry and set up a timetable for the

subsequent measures for future deregulation. Of course, in order to carry out all those measures effectively, the education of the public is necessary and communication between related parties, such as government officials, private power producers, utility managers, cogenerators, and electricity users, could be strengthened so as to construct the consensus to successfully complete the overall reform of the electricity industry in Taiwan.

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