

**บทความวิชาการประจำปี 2541**

**สถาบันบัณฑิตพัฒนบริหารศาสตร์**

**Liberalization and Privatization of the Thai Power Sector:  
Issues and Perspectives**

**Thiraphong Vikitset, PH.D.**

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**Liberalization and Privatization of the Thai Power Sector:  
Issues and Perspectives**

**by**

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### ประกาศสถาบันบัณฑิตพัฒนบริหารศาสตร์

เรื่อง ผลการคัดเลือกบทความวิชาการดีและบทความวิชาการดีเด่น ประจำปี 2541

ตามประกาศสถาบันบัณฑิตพัฒนบริหารศาสตร์ ลงวันที่ 30 กรกฎาคม 2541 ได้ประกาศเชิญชวนให้ข้าราชการของสถาบันส่งบทความวิชาการเข้ารับการพิจารณา คัดเลือกเป็นบทความวิชาการดีและบทความวิชาการดีเด่น ประจำปี 2541 ใน 11 สาขาวิชา คือ สาขาวิชารัฐประศาสนศาสตร์ บริหารธุรกิจ พัฒนาการเศรษฐกิจ สหกิจศึกษา คอมพิวเตอร์และสารสนเทศ พัฒนาสังคม พัฒนาศึกษาชุมชน เทคโนโลยีการบริหาร ภาษาและการสื่อสาร การจัดการสิ่งแวดล้อม และสาขาวิชา สังคมศาสตร์อื่น ๆ โดยบทความวิชาการที่ได้รับการคัดเลือกจะได้รับเงินรางวัล ดังนี้

1. บทความวิชาการดี ได้รับเงินรางวัล บทความละ 15,000.- บาท
2. บทความวิชาการดีเด่น ได้รับเงินรางวัล บทความละ 30,000.- บาท


สถาบันบัณฑิตพัฒนบริหารศาสตร์ได้รับบทความวิชาการที่ส่งเข้ารับการคัดเลือก เป็นบทความวิชาการดีและบทความวิชาการดีเด่น จำนวนทั้งสิ้น 8 บทความ เป็น บทความในสาขาวิชาคอมพิวเตอร์และสารสนเทศ จำนวน 2 บทความ สาขาวิชารัฐ-ประศาสนศาสตร์ บริหารธุรกิจ พัฒนาการเศรษฐกิจ พัฒนาสังคม สังคมศาสตร์อื่น ๆ และไม่ได้กำหนดสาขาวิชา มา สาขาวิชาละ 1 บทความ ซึ่งคณะกรรมการดำเนินงาน คัดเลือกบทความวิชาการดีและบทความวิชาการดีเด่น ได้พิจารณาบทความดังกล่าว เสร็จเรียบร้อยแล้ว ปรากฏว่าบทความวิชาการที่ได้รับการคัดเลือกเป็นบทความ วิชาการดี ประจำปี 2541 คือ

1. บทความวิชาการในสาขาวิชาพัฒนาการเศรษฐกิจ เรื่อง Liberaliza- tion and privatization of the Thai power sector : issues and perspectives ของรองศาสตราจารย์ ดร.ธีระพงษ์ วิจิตเศรษฐ
2. บทความวิชาการในสาขาวิชาคอมพิวเตอร์และสารสนเทศ เรื่อง การ เปลี่ยนแปลงโครงสร้างองค์การอันเนื่องมาจากเทคโนโลยีสารสนเทศ : กรณีของ องค์การไทย ของรองศาสตราจารย์ ดร.สมบูรณ์วัลย์ สัตยารักษ์วิทย์

นอกจากนี้ คณะกรรมการดำเนินงานคัดเลือกบทความวิชาการดีและบทความ  
วิชาการดีเด่น ยังได้พิจารณาเห็นว่า บทความวิชาการในสาขาวิชาคอมพิวเตอร์และ  
สารสนเทศ เรื่อง Executive Information Systems Development in  
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D.R. Arnett และ P.A.O' Donnell เป็นบทความวิชาการที่สมควรได้รับรางวัล  
ชมเชย

จึงประกาศให้ทราบทั่วกัน

ประกาศ ณ วันที่ 14 มกราคม พ.ศ. 2542

รองศาสตราจารย์   
(อนงกุล ศิริเวทิน)  
อธิการบดีสถาบันวิจัยและพัฒนาบริหารศาสตร์

## **ABSTRACT**

### **Liberalization and Privatization of the Thai Power Sector: Issues and Perspectives**

by

Thiraphong Vikitsat

Rationale for privatization of the power sector in Thailand are promotion of competition and efficiency, and alleviation of the large investment burden in the public sector. Privatization of the power sector in Thailand focuses on power generation. Success or failure of a privatization program may be evaluated in terms of induced changes in the sector efficiency and the distribution of benefits among affected parties, i.e. the three power authorities of Thailand (EGAT, MEA, and PEA), the independent private power producers (IPPs), and the power customers.

The effect of privatization on efficiency and distribution of benefits depends upon the power tariff structure, methods of power solicitation, organization of the power sector, and the government policy's on power sales between the three parties.

Retail tariff rates in Thailand are uniform for given customer groups. The rates are approximately 80 percent of the corresponding marginal costs. Marginal costs of service computed for the power tariff design may be interpreted as the 'average' marginal costs for the whole power system. The power sector earns an 8 percent rate of return on revalue assets at these tariff rates.

There are no restrictions on plant types for the IPP project. The average marginal costs of generation and transmission used in the tariff design are not appropriate references for the power purchase price agreement, since it provides misleading economic signals to a given IPP. The power purchase price agreement should be based on EGAT's avoided costs of generation and transmission by plant types and by sites.

EGAT's marginal costs of generation and transmission should be computed by plant types and by sites, and announced as EGAT's avoided costs to be used as basis for power purchase price agreement. The present tariff rates will be unaffected, if purchase prices from the IPPs are, on average, about 80 percent of the avoided costs. The avoided costs defined and announced in this manner will initially screen out less efficient IPP projects and promote efficiency in the power sector.

The IPPs may sell their power directly to EGAT and to the third parties in surrounding project areas but are not allowed to sell power directly to MEA and PEA. This policy, in effect, denies MEA and PEA access to potentially cheaper source of power and will, eventually, worsen their financial positions.

At present, it is premature to evaluate the result of privatization in the Thai power sector which began in the early 1990s. However, if the process of power solicitations, definition of EGAT's avoided costs, and determination of the power purchase prices between EGAT and the IPPs are not addressed in a transparent manner, privatization may not achieve its desired objective.

# Liberalization and Privatization of the Thai Power Sector: Issues and Perspectives

by  
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Before the beginning of this decade, power generation in Thailand was the sole responsibility of the Electricity Generating Authority of Thailand (EGAT) which is a state enterprise. EGAT's investment in its power system expansion increased steadily in order to satisfy power demand which has been increasing at approximately 14 percent per annum during the last decade.

During the sixth development plan (1987-1991), EGAT's investment totaled m4000\$U.S. of which m2120\$U.S. was financed by foreign borrowing.<sup>1</sup> The government policy was to limit the public sector foreign borrowing at m1000\$U.S. per annum. Since EGAT's external borrowing amount to an average of \$m424 per annum or 42 percent of the public sector debt ceiling, the amount of EGAT's investment becomes an agenda for the government.

In order to alleviate EGAT's relatively large external borrowing, and hence the public sector investment, the policy of privatization and liberalization of the power sector was deliberated and implemented in the early 1990s. Liberalization allows private power producers to participate in power generation by producing power for sales to EGAT. Privatization allows EGAT to set up subsidiary companies and reorganize its structure to operate like private companies. These companies are allowed to offer their shares to the public.

In addition to the alleviation of public sector investment, liberalization and privatization of the power sector are expected to promote competition and efficiency in the sector. Since the process of liberalization and privatization only started in the early 1990s, it is premature to evaluate its success or failure. However, it is useful to discuss the frame work for evaluating the success of the liberalization and privatization policy. Success or failure of liberalization and privatization in the power sector may be evaluated in terms of induced changes in the sector efficiency and the distribution of benefits among affected parties, i.e. the power authorities, the private power producers, and the power customers.

Ideally, the gains in efficiency from liberalization and privatization in the power sector should lead to lower costs of service which implies lesser total investment burden in the power sector. The lower investment requirement releases resources for other useful activities. In addition, the lower costs of service increase consumer surplus of the residential power customers and producer surplus of the industrial and business power customers. Finally, liberalization provides efficient private power producers with 'acceptable' rate of return on their investment.

Factors that affect the success or failure of privatization are organization of the power sector, the power tariff structure, and the method of implementing liberalization and privatization.

The purpose of this paper is to examine the development of liberalization and privatization in the Thai power sector, and to discuss their possible effects on the costs

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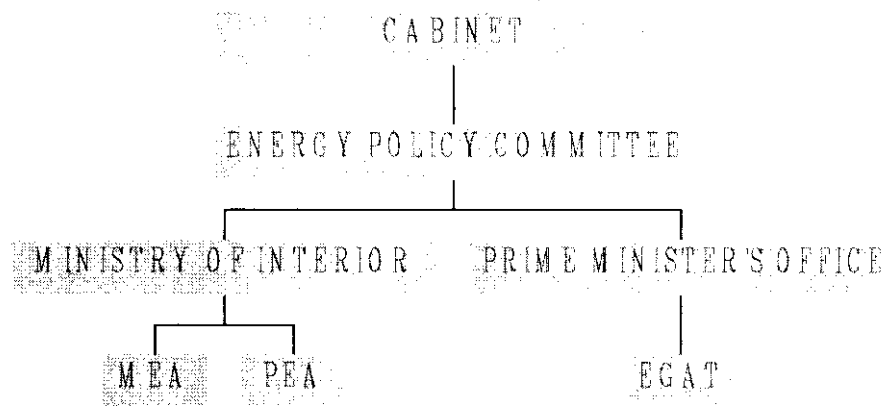
of service, and on the distribution of benefits between the power authorities, the private power producers, and the power customers.

The paper is organized into 5 parts. The first part presents a brief review of the power sector organization in Thailand. The second part reviews the present tariff structure which is in effect since 1991. The third part traces the process of liberalization and privatization in the Thai power sector which began in the early nineties. The fourth part analyses the possible effects of liberalization and privatization on the power sector efficiency and the distribution of benefits among affected parties. Finally, summary and conclusions are presented in part five of the paper.

## 1. Organization of the Power Sector

The power sector in Thailand is organized around three state enterprises. The Electricity Generating Authority of Thailand (EGAT) is responsible for power generation and transmission for the whole kingdom. The Metropolitan Electricity Authority (MEA) is responsible for the distribution of power to customers in the Bangkok metropolitan areas and the neighboring province of Samut Prakarn and Nonthaburi.

The Provincial Electricity Authority (PEA) is responsible for the distribution of power to customers in the provincial areas that are outside the jurisdiction of MEA. Both MEA and PEA purchase their power from EGAT for distribution to their customers. EGAT also sells a relatively small amount of power to its few direct customers and buys a small amount of power from Laos and Malaysia.



**Figure 1: Organization of the Power Sector**

Figure 1 presents the relevant organization of the power sector in Thailand. The cabinet is the highest policy body which sets up the Energy Policy Committee (EPC) chaired by the prime minister to oversee all energy policies since 1986<sup>2</sup>. Deputy prime ministers, ministers related to energy affairs, secretary generals and directors of energy related agencies comprise the 21 members of EPC. The official responsibilities of the EPC are<sup>3</sup>:

1. Formulate energy policies and action plans for the cabinet approval
2. Oversee and coordinate plans between energy sub-committees, government agencies, and state enterprises related to energy policies as formulated in 1)

3. Recommend relevant strategies and measures required to implement the formulated policies to the cabinet
4. Follow directives of the cabinet on energy policy formulation
5. Regulate and oversee the National Energy Policy Office
6. Formulate criteria and guidelines for pricing of energy resources which are consistent with their economic values

Even though the EPC must follow policy directives of the cabinet, the cabinet has delegated its authority in formulating and implementing energy policies to the EPC. Once the policy has been formulated and implemented, the EPC is only required to inform the cabinet for acknowledgment.

The Energy Policy Committee sets up two sub committees to assist in its policy formulation. The sub-committee on petroleum, chaired by a deputy prime minister, is set up to oversee all policy issues on petroleum which include petroleum product pricings. The sub-committee on energy policy formulation, also chaired by a deputy prime minister, is set up to oversee all policy issues related to electricity, coal and lignite, hydroelectric, unconventional energy, and also include pricings of electricity. The two sub-committees, later upgraded to a committee status, have authority to set up working groups to propose strategies, measures, and action plans to facilitate the implementations of formulated policies.

The National Energy Policy Office (NEPO) was also set up in 1986 initially with a status of a division, to serve as a secretariat to the Energy Policy Committee and to the two sub-committees. NEPO's status was upgraded to a department in 1989.

There is, as yet, no official regulatory body in the Thai power sector. However, NEPO acts as a link between the EPC and the three power authorities. The link is established through the secretary general of NEPO or nominated representatives serving as members in various sub-committee and working groups. For example, the working group on the role of private power producers has as their members the representatives from EGAT, MEA, PEA, NEPO, Ministry of Finance, and nominated experts. It is through this link that NEPO 'regulates' the power sector according to the policy formulated by the EPC. The EPC has considered the possibility of setting up an independent regulatory body to oversee the power sector. However, this is not expected in the near future due to the time consuming legal process of passing such an Act.

The operation of EGAT is under the jurisdiction of the Prime Minister's office whereas the operations of MEA and PEA are under the jurisdiction of the Interior Ministry. The ministers of the Prime Minister's Office and the Interior Ministry are both members of the EPC.

## 2. The Power Tariff

Before 1986, the objectives behind the power tariff were not formally documented. Changes in the tariff structure or the tariff rates must be considered and approved by the cabinet before they can be announced and implemented. After the EPC was set up in 1986, it has delegated its authority in electricity pricings to the sub-committee on energy policy formulation. The process of electricity pricings after 1986 has been somewhat depoliticized. As a result, there was a major revision of the power tariff structure to better reflect their economic costs in 1986 and again in 1989. Objectives behind the tariff revision were formally stated in 1986<sup>4</sup>. The objectives are

1. The tariff must reflect the economic costs of service



2. The tariff must generate sufficient revenue to yield at least an 8 percent return on revalued assets as stipulated in the World Bank covenant

3. The tariff must be acceptable and convenient to apply

The first objective may be realized by setting the tariff rates equal to their respective long run marginal costs of service. Computations of the long run marginal costs are based on EGAT's power development plan (PDP) which is derived from the power forecasts. The load forecast working group, set up by the sub-committee on energy policy formulation, comprises of members from the three power authorities and other related agencies. The working group is responsible for the long range power forecast which is updated annually. EGAT's PDP for power generation and transmission consistent with the power forecasts is design to provide power at minimum cost. Similarly, the distribution plans of MEA and PEA, are also based on the load forecast published by the load forecast working group.

Long run marginal costs are estimated as the average incremental cost (AIC) which may be expressed algebraically as

$$\Delta \text{AIC} = \frac{\sum_{t=1}^T \frac{I_t}{(1+r)^t}}{\sum_{t=1}^T \frac{\Delta Q_t}{(1+r)^t}} \quad \text{--- (1)}$$

where  $I$  = investment in year  $t$      $\Delta Q_t$  = incremental demand in year  $t$   
 $r$  = discount rate

The AIC approach may be applied to estimate the marginal capacity costs, marginal energy costs, and marginal customer costs, the three components of costs in the power sector that are required for the tariff design. The types of power plants selected in the least cost plan of EGAT during the period 1990 through 2001 and are the basis for the power tariff design in 1989 may be summarized as follows

<b>Power Plant Type</b>	<b>Capacity(MW)</b>	<b>Percent</b>
Hydroelectric	1752	13.4
Combined Cycle	3448	26.3
Peaking Gas Turbine	500	3.8
Dual Fired Thermal Plant	1800	3.7
Lignite Thermal Plant	4200	32.1
Imported Coal Power Plant	1400	10.7
<b>Total</b>	<b>13100</b>	<b>100.00</b>

The marginal costs of generation estimated by the AIC approach may be interpreted as the average marginal cost of this total plant mix. Similarly, the marginal costs of MEA and PEA, which include EGAT's marginal generation and transmission costs, may be interpreted as 'average' marginal costs for the areas under each authority's jurisdiction.

Table 1 presents examples of typical data from the development plan required for the marginal capacity cost estimations. The discount rate of 8 percent which is the rate used to evaluate public projects in Thailand was applied in the marginal cost estimations. Marginal capacity costs and marginal customer costs are finally computed as baht/kw/month and baht/customer/month respectively to conform to the power billing period. The marginal energy costs are computed as baht/kwh. Table 2 presents

the long run marginal costs of service computed from the power development plans for the period 1990 through 2001.

Table 1 Example of Typical Power Plants in Power Development Plan, 1996-2001

Year	Month	Name of Unit	Capacity Addition	Life	Capital Cost	Fixed O&M
96	March	S.Bangkok	600	25	x	y
...	.....	.....	.....	.....	.....	.....
2001	Jan	Ao Phai	700	25	w	v

The government policy requires the retail tariff to be uniform throughout the country. In other words, a customer in a given customer group faces the same tariff regardless of his location in the country.

In order to satisfy the uniform tariff policy, the marginal costs of service are computed as if there is one single power system. The marginal costs computed under this frame work may be interpreted as the average marginal costs of service for the whole country. Since MEA's marginal costs are relatively greater than the corresponding PEA marginal costs, the average marginal costs of service for the whole system, as computed in this manner, are greater than MEA's corresponding marginal costs and lower than PEA's corresponding marginal costs.

Table 2: Marginal Costs of Service, 1991 (1989 prices)

Utilities	Capacity (bt/kw/month)	Energy (bt/kwh)	Customer (bt/customer)
EGAT	291	0.744	
MEA			
Subtransmission	325	0.7568	
Primary	382	0.7845	1727
Secondary	410	0.8147	103
PEA			
Subtransmission	372	0.7582	
Primary	428	0.7922	1711
Secondary	499	0.8512	89

Subtransmission are 69 KV and above Primary are 12-24 KV Secondary are below 12 KV 25 baht = 1 US\$

Source: Monenco in association with NIDA, Marginal Cost Based Electric Power Tariff, A Report submitted to the National Energy Office, April, 1991

The marginal cost based tariff more than satisfy the financial target for the case of Thailand, since it generates revenue that yields the rate of return in excess of the minimum target rate<sup>5</sup>. The third objective of the power tariff is rather abstract and is interpreted to mean that the tariff must not cause 'excessive' financial burden to the power customers, especially the low income customers.

In addition, the tariff structure must enable the large power customers to reduce their power bills through more efficient power usage which improve their load factors. Since the pure marginal cost based tariff results in increases in the power bills for all customers, the first two objectives must be compromised with the third objective. This is accomplished by adjusting the marginal cost tariff downward until

an eight percent rate of return for the power sector is realized. Nevertheless, the present power tariff, implemented in 1991, reflects marginal costs of service more closely than the previous tariff structure.<sup>6</sup>

Table 3: Comparison between Tariff Rates and Marginal Costs, 1991-1996

Customer Groups	Average Tariff Rate (baht/kwh)		
	Marginal cost	Present Tariff	Ratio
Small Residential	4.33	1.20	0.2771
Large Residential	2.42	1.93	0.7975
Small General Service	2.13	2.28	1.0704
Medium General Service	1.82	1.71	0.9396
Primary	1.82	1.66	0.9121
Secondary	1.85	1.94	1.0486
Large General Service	1.62	1.51	0.9321
Subtransmission	1.55	1.44	0.9290
Primary	1.71	1.59	0.9298
Specific Business	1.76	1.64	0.9318
Subtransmission	1.54	1.60	1.0390
Primary	1.79	1.64	0.9162
Secondary	1.76	1.72	0.9773
Government and Nonprofit	1.81	1.70	0.9392
Subtransmission	1.57	1.48	0.9427
Primary	1.76	1.65	0.9375
Secondary	2.00	1.87	0.9350
Agricultural Pumping	1.89	1.17	0.6190

Source: Same as Table 1

Table 3 compares the final 'compromised' tariff rates, which yield an 8 percent rate of return on revalued assets for the whole power sector, with the marginal costs by customer groups. With the exception of the residential group and the agricultural pumping group, the average tariff rates for other customer groups account for over 90 percent of the marginal costs. The average tariff rate for the country is approximately 80 percent of the marginal costs.

The 1991 tariff has an automatic adjustment in energy charges which are based on the 1989 fuel prices. The energy charges are adjusted whenever there are changes in the following items:

- a) fuel prices
- b) cost of purchased power
- c) value added tax
- d) property tax
- e) cost of demand side management programs

Changes in the above items are monitored continuously by a working group set up by the sub-committee on energy policy formulation. The members of this working group comprise of representatives from EGAT, MEA, PEA, NEPO, Ministry of Finance, and nominated experts. Whenever the cumulative changes in the costs of these items affect the energy charges by more than 2 satang/kwh, adjustments to the energy charges are made to reflect these changes. Power customers' bills are then

adjusted accordingly without further approval from the sub-committee on energy policy formulation.

The uniform retail tariff policy implies financial difficulties for PEA and financial windfalls for MEA. A transfer pricing mechanism between the three power authorities is used to redress the financial imbalance caused by the uniform retail tariff policy. EGAT requires a bulk tariff rate of 1.2067 baht/kwh to achieve an 8 percent rate of return.

In order to balance the rate of return between the three power utilities, EGAT's required bulk tariff of 1.2067 baht/kwh is achieved by selling its power to PEA at the rate of 0.9630 baht/kwh and to MEA at the rate of 1.4682 baht/kwh in 1991. In effect, MEA channels the subsidy to PEA through EGAT's bulk tariff.

Adjustments in the bulk tariff are allowed whenever there are adjustments in the retail tariff after allowing for losses in the PEA and MEA systems. The bulk rate was adjusted in March 1995 when EGAT's rate of return began to decline as its investment was greater than expected. The selling prices to MEA and PEA were increased to 1.4865 baht/kwh and 1.0910 baht/kwh respectively for an average bulk rate of 1.2640 baht/kwh.

### 3. Privatization and Liberalization of the Power Sector

The general policy guideline for privatization and liberalization is that the implementation of this policy must not cause 'burden' to the general public. In following this guideline, the EPC, assisted by NEPO, will 'regulate' the power sector, especially in the areas of power purchase price agreement between EGAT and the independent power producers, procurement of fuels for power generation, transfer pricings between the three power authorities, and reliability and quality of the power system.<sup>7</sup> In practice, all the working groups deliberating on these issues directed by the EPC have NEPO representatives as their members.

#### *Privatization of Power Generation*

Under the policy guidelines of the EPC, the 1968 EGAT Act which governs the operation of EGAT was amended in 1992 to pave ways for the privatization of EGAT. In line with the government policy, EGAT has three directives in its privatization plan.

a) Divest some of its power plants to its own subsidiary company which may issue shares in the stock exchange.

b) Purchase electricity from small power producers (SPP)

c) Purchase electricity from independent power producers (IPP)

The amended EGAT act allows EGAT to set up a subsidiary company through which a joint venture with the private sector may be formed. Currently, EGAT has set up the Electricity Generation Company (EGCO), a subsidiary company through which it holds all of the shares in the initial stage. By the end of 1994, EGAT sold its 4 x 308 MW Rayong combined cycle power plant to EGCO. In January, 1995, the EGCO shares were divested in the stock exchange of Thailand which reduced the EGAT holding to 48 percent.

Divestiture of the EGCO shares in the SET will help alleviate the public sector investment in the power sector and reduce pressure on the foreign borrowing ceiling.<sup>8</sup> The share divestiture also transforms EGCO into a private company.

Currently, EGAT is contracted to purchase electricity from EGCO at a price of 1.07 baht/kwh for a period of twenty years. The contract allows an inflation adjustment to the purchasing price. EGCO also has an option to purchase the Khanom

power plant. It is expected that negotiations on the Khanom purchase will be concluded in the near future.

In addition to setting up a subsidiary company, EGAT is planning to reorganize its operation into 6 business units (BU) and 5 operative units (OU). The 6 BUs are classified as:

- a) Transmission System
- b) Power Plant
- c) Maintenance
- d) Lignite Mining
- e) Engineering
- f) Construction

The 5 OUs are:

- a) Policy and Planning
- b) Accounting and Finance
- c) Administration
- d) Business Development
- e) Hydroelectric Power Plant

The 6 BUs will operate like private companies and EGAT will initially be the sole share holders of these companies. Eventually, the BU shares, with the exception of the transmission BU, will be offered to the public in the SET. The transmission BUs and the 5 OUs will remain under EGAT and retain their state enterprise status.

#### ***Privatization of Power Distribution***

The MEA and PEA are currently under going reorganization in their structure. The cabinet has approved in 1995, in principle, the restructuring of PEA as proposed by the Southern Electric International (SEI) study<sup>9</sup>.

The SEI study recommends that PEA is reorganized into four regional distribution companies in the form of PEA subsidiaries. PEA will be the sole share holder of these companies. The restructuring of PEA requires amendments of the 1960 PEA Act which governs the operation of PEA. Since amendments of the PEA Act is likely to be a time consuming process, the restructuring of PEA is not expected in the near future. MEA is also planning to reorganize its structure and is expected to submit its reorganization plan for the cabinet approval by the end of 1996.

#### ***Liberalization***

Under the amended EGAT Act, private power producers are allowed to generate power and sell their output to EGAT. The private power producers are classified as small power producers (SPP) and independent power producers (IPP). The SPP are producers of electricity from renewable energy such as wind energy, solar energy, minihydro; from agricultural waste or production waste, transformed products such as rice-husks, bagasse, biogas, municipal waste or dendothermal fuels (supplemented to the extent of less than 25% of the total thermal energy by commercial fuels; and from cogeneration process.

The EPC has provided general guidelines for the power purchase agreement. The power purchase price agreement must be designed on the basis of EGAT's 'avoided costs' and the purchasing price structure must be clear to avoid case by case negotiation.<sup>10</sup> In order to promote fair competition, the EPC also give the directives that the tax structure and incentives given to the SPP and the IPP must be compatible to those of EGAT in the calculations of financial costs.

The sub committee on energy policy formulation has set up a IPP selection sub committee to screen and select projects submitted by the IPP. The sub-committee is

chaired by the governor of EGAT and its members are representatives from NEPO, NESDB, fiscal policy department with the deputy governor of EGAT acting as the sub-committee secretary. The selection of SPP is the responsibility of EGAT.

**SPP.** EGAT began to solicit power from the SPP in 1992. Initially, the maximum purchase from a given SPP is set at 50 MW but later the purchase ceiling was increased to 60 MW.<sup>11</sup> Any SPP wishing to sell its power in excess of 60 MW may be considered on a case by case basis. In any event, the purchase limit may not exceed 90 MW. The qualified SPP must adhere to the technical and other conditions as stipulated by EGAT.<sup>12</sup> The total power purchase from the SPP was limited at 300 MW in 1992 but the limit was raised to 1444 MW and later to 3200 MW in 1996.

Along with the solicitation of power from the SPP, EGAT has announced the purchase prices that it will purchase power from the SPP.<sup>13</sup> The purchase prices depend upon the duration of the contract which varies from less than 5 years to 25 years and were announced in 1992 as follow:

<u>Contract Duration</u>	<u>Capacity Payments</u>
5 to 10 years	164 baht/kw/month
more than 10 years but less than 15 years	204 baht/kw/month
more than 15 years but less than 20 years	227 baht/kw/month
more than 20 years but less than 25 years	302 baht/kw/month

The energy payment is set at 0.85 baht/kwh. Producers with contracts of less than 5 year, the non firm contract, receive no capacity payments but receive energy payments of 0.87 baht/kwh. Initially, the price adjustments are made on the same basis as the adjustments in energy charges for the medium and large general service retail customers regardless of the SPP's fuel types.

The adjustments were modified later to better reflect the changes in the SPP's fuel costs. The modified price adjustments depend upon the fuel type used by the SPP. Formula for adjustments are developed for natural gas, fuel oil, coal and lignite. The energy payments will be adjusted if the actual fuel prices deviated from the benchmark price on August 1, 1995. In the event that a SPP uses other types of fuel, he may select either the adjustment which follow the adjustment of the energy charge in the retail tariff or the fuel oil adjustment formula. The selected formula in this case will be used throughout the contract period.

Currently, EGAT purchases 418.6 MW of power from 24 small power producers. Nineteen of the small power producers are non-firm producers with a combined capacity of 174.6 MW. The remaining 244 MW comes from firm producers.<sup>14</sup>

**IPP.** During the period 1997 through 2002, the IPPs are expected initially to contribute 4,200 MW of power capacity. However, it is expected that power consumption will increase at a faster rate than predicted in the PDP 95-01.<sup>15</sup>

In anticipation of the increases in power demand, the EPC assigned EGAT and NEPO to consider the possibility of expanding the power purchase from the IPP given that the SPP purchase limit was already increased to 3200 MW. In response to the EPC directives, EGAT and NEPO has revised the power purchase plan from the IPP. Table 4 presents the revision of the IPP power purchase.

Revision of the IPP power purchase will increase the total system capacity to 34109 MW in 2003 to satisfy 25506 MW of demand which implies a reserve margin of about 25 percent.

Table 4: Revision of the IPP Power Purchase (MW)

Period	Initial Purchase Plan	Revised Purchase Plan	Total
1999-2000	1400	300	1700
2001	2800	0	2800
2002	0	700	700
2003	0	600	600
Total	4200	1600	5800

Source: National Energy Policy Office, "Revision of IPP Power Purchase", Energy Policy Journal, July-September, 1996, p.8

The IPP must meet the technical conditions specified by EGAT. The duration of the contract must be between 20-25 years and the power plant must be a base load or a intermediate load plant with capacity not greater than 1400 MW. There are flexibility allowed for the selection of fuel used by the IPP. Unconventional fuel (except nuclear), local natural gas with firm contract with the Petroleum Authority of Thailand (PTT) or producers, imported natural gas (LNG), local lignite, imported coal and lignite, fuel oil, and orimulsion are allowed to be used for power generation.<sup>16</sup>

The IPP is also required to meet the official environmental standard set by the government. EGAT has specified additional environmental standard in the case where there are no official standard, for example sulfur dioxide content in the atmosphere.

The IPP may select its project site but EGAT has announced its preference for sites<sup>17</sup> in descending order as central region (upper Bangkok: Saraburi, Lopburi, Ang Thong, Singburi, Ayudhdhaya, Nakhon Nayok etc.), west coast of Thailand (Prachuap Kirikarn, Petchaburi, Samut Sakhon, Samut Songkram), and the east coast of Thailand (Cholburi, Rayong, Chanthaburi, Prachin Buri, Srakaew), and other regions.

Contrary to the SPP power purchase price where EGAT announced the power purchase prices, the IPP is required to propose the power purchase prices for its power. The power purchase price will be on the basis of a 2 part tariff with a availability component in baht/kw/year and energy component in baht/kwh.

The availability component will cover the capital investment of the IPP project, fixed operating and maintenance(O&M) expense including spare parts, and return on shareholder's equity. The availability component is compatible to a demand charge in the retail tariff. The energy component will cover the energy expense in generation including the variable O&M. The energy component is compatible to an energy charge in the retail tariff. The IPP is also required to submit the method or formula for adjustment in the energy charge when there are changes in the relevant energy prices.

The IPP selection sub committee will consider the proposed power purchase price and non-price factors of the IPP in their selection by attaching a 60 percent weight to the proposed power purchase price and 40 percent weight to the non-price factors. The weight attached to the non-price factor is disaggregated into 25 percent for project viability, 4 percent for choice of fuel and fuel diversity, and 11 percent for other factors.

The 25 percent weight for project viability may be disaggregated further into 11 percent for level of development, 7 percent for financial status and ability to arrange the financing of the bidder, and 7 percent for the experience of the bidder. The 11 percent weight attached to other factors is diagggregated into 6 percent for site location, and 5 percent for proposed exception to the specified conditions of the

announcement. The selection committee reserves the right to reject all the proposed projects. After the selection is completed, the committee will presents the results to the EGAT board of directors for approval.

The process of electricity solicitation from the IPPs started in December of 1994 and calls initially for a total capacity of 3800 MW which is increased later to 4200 MW. All the IPP projects were to be submitted to EGAT by June 1995. At the end of June, 1995, EGAT received bids totaling 50 projects from 32 international consortia with a total capacity of 37500 MW.<sup>18</sup> EGAT has initially screen 21 projects for further consideration.

The first round screening results in 13 projects bidding for the first phase sales(1999-2000) with total capacity of 6184 MW and 8 projects bidding for the second phase sales (2002) with total capacity of 8250 MW. Natural gas is the fuel used to generate electricity in sixteen of the proposed projects. Lignite is used in 4 of the projects and the other remain project proposes to use orimulsion. Currently, EGAT has short listed the bids to 8 consortia and results of the bids are expected by the end of 1996 or early 1997. EGAT is currently planning a second round power solicitation from the IPP in accordance with the revised purchase plan. It is expected that the second round solicitation can be implemented in mid 1997.

#### ***Power Purchase between Power Authorities and Other Producers***

Before the amendment of the EGAT Act, power must be purchased only from EGAT. The amendment of the EGAT Act allows EGAT to purchase power from the SPP, the IPP, and from its own subsidiary. The power purchase agreement (PPA) between EGAT and EGCO also allows EGCO to sell its electricity directly to the third parties subject to EGAT's approval.

Similarly, the SPPs and the IPPs are allowed to sell their electricity directly to the third parties *in the surrounding areas* at unregulated prices. However, the SPP and the IPP are not allow to sell power directly to the MEA and the PEA. The two distribution authorities are still required to buy power directly from EGAT.

Liberalization of the power sector focuses on the generation side. The EPC has considered the possibility of allowing the private power producers to sell power directly to the third parties through the common carrier or the power authorities' lines and pay a wheeling charge to the relevant power authorities. However, the liberalization in the distribution activities is not expected in the immediate future.

Figure 2 compares the generation and distribution system before and after privatization and liberalization of the power sector. In addition to its own generation, and purchases from Laos and Malaysia, privatization and liberalization enables EGAT to purchase power from EGCO, SPP, IPP, and other subsidiaries that may be set up in the future.

## **4. Possible Effects of Privatization and Liberalization**

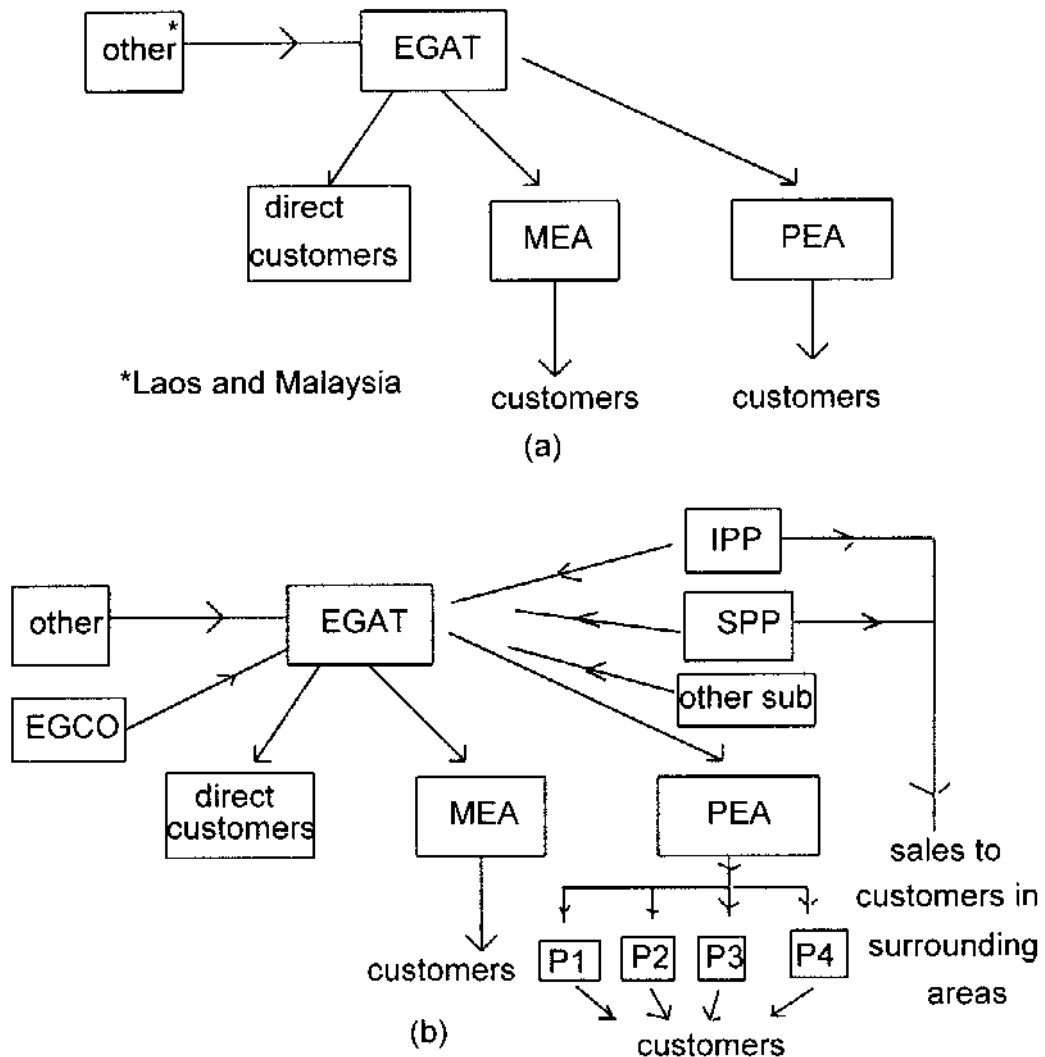
### ***Effect on the Costs of Service***

The economy would gain if liberalization and privatization in the power sector induces lower costs of service which results in lower long run marginal costs. The efficiency gain from leberalization and privatization may be evaluated by comparing the power purchase price between EGAT and other power producers to EGAT's avoided costs of service.

The avoided cost of EGAT, to be used as a basis for power purchase price, should be *the cost of service that can be avoided by EGAT, if a given power plant in its least cost power system is substituted by other producers' power plant.* For



example, if EGAT identifies that a power plant of a successful IPP is a substitute for the S. Bangkok power plant in Table 1, the avoided capacity costs are the S. Bangkok capital cost of  $x$  baht and the fixed O&M cost of  $y$  baht/kw. These costs may be allowed for power losses compatible with EGAT's corresponding losses and levelized at 8 percent discount rate, which is the discount rate used in the marginal cost estimations.



**Figure 2 Power System before and After Privatization**

**Effect of Power purchase from SPP.** In the solicitation of power from the SPP, EGAT has announced the power purchase prices for the SPP power. It is seen that the announced capacity component of the power purchase prices increases with the length of the contract and no capacity payments are offered for contract under 5 years. The structure of the announced SPP power purchase price is compatible with the structure of EGAT's avoided costs. If it may be assumed that a typical power plant takes approximately 5 years to commission and have a useful life of 25 years, then a SPP contract of less than 5 years implies that no EGAT's plant in the PDP can be substituted during this contracted period.

Contract of less than 5 years only enables EGAT to prolong the commissioning of its power plant for 5 years. This implies that EGAT avoids only the energy expenses when it buys power from the SPP under this contract. After the end of the 5 year contract, EGAT has to commission its own power plant. Thus, there is only avoided energy cost for the less than 5 year contract which is interpreted to be the short run marginal energy cost.

For the contract of more than 5 years, for example a 15 year contract, EGAT's power plant would have been commissioned and in operation for about 10 years in absence of this particular SPP contract. In this case, there are avoided capacity cost as well as the avoided energy cost. However, the capacity payment would be equivalent to the avoided power plant for only 10 years. Full capacity payment will be offered for the contract of more than 20 years, since, in this case, the SPP power will be equivalent to EGAT's avoided plant for its entire life.

For the contract of over 20 years, the avoided cost is based on EGAT's AIC used in the national tariff design adjusted to 1992 prices which is the average for the whole power system. It is assumed that the avoided transmission costs for EGAT is insignificant so that EGAT's avoided cost is considered as its generation cost.

The AIC for EGAT's capacity of 291 baht/kw/month in 1989 prices includes transmission cost. Removal of the transmission component results in the generation component of 210 baht/kw/month. Since the AIC for the national tariff design allows for a 15% reserve margin for capacity, the reserve margin component is removed because the SPP is not required to provide reserve margin in their proposal.

The AIC for the national design is computed on economic basis, i.e. no transfer payment items are considered as costs, so it is adjusted for transfer payments that are compatible with the corresponding EGAT's items. EGAT's transfer payments include import duties, 'bonus', and remittance to the Ministry of Finance. Table 5 summarizes the financial avoided costs of EGAT to be used as basis for the SPP power purchase prices.

As the SPP power purchase prices were announced in 1992, the values in Table 5 were adjusted to 1992 prices. It may be noted that the announced capacity payment for the 20-25 year contract is the same as the full avoided costs of EGAT. Capacity payments for contract of less than 20 years but greater than 5 years are adjusted according to the duration of the contract. It is also noted that the energy payment is lower than EGAT's avoided energy cost.

Table 5: Avoided Costs for the SPP Power Purchase Prices, 1989 prices

Items	Short run MCE	Long run MCE	Long Run MCp
Generation	0.742	0.680	210
delivered to transmission*	0.773	0.708	218.7
removal of reserve margin**	0.773	0.708	190.2
inclusion of taxes	0.889	0.770	206.9
remittance and bonus	0.889(1.175)	0.770(0.899)	258.6(302.2)

Figures in parenthesis are values in 1992 prices

\* losses allowed are slightly lower than used in the national AIC computations

\*\* Adjusted for reserve margin of 15 percent or 218.7/1.15

MCE = marginal energy cost in baht/kwh      MCp = marginal capacity cost in baht/kw/month

Source: same as Table 1

The announcement of SPP power purchase prices implies that a given SPP is competing with the EGAT system and not directly with other SPP. If the purchase prices are announced as maximum limits and the SPP is required to submit the price bid for their project, EGAT could select a group of project with lowest price bids which would promote competition within the SPP group and increase the generation efficiency.

It should also be noted that the announced power purchase prices are based on EGAT's AIC for generation which is the average AIC for the whole power system. The power purchase prices based on this AIC are simple to administer since these prices apply to all SPP projects. However, the use of the national AIC as a basis for the power purchase price may lead to increases in the cost of services to the power customers for the following reasons.

EGAT must still commission its own power plants to complete the generation system. In the event that the SPP power substitutes for EGAT power plant with marginal cost lower than the national AIC but purchased at the national AIC, EGAT must commission the remaining power plants in the system with higher marginal costs than the national AIC. In this case, when EGAT's power is combined with the SPP power purchased at the national AIC, the cost of services to power customers be higher than the cost of services prior to liberalization.

In order avoid this scenario, EGAT should identify and announce its power plants to be substituted by the SPP power plants along with their costs. This will correspond to the avoided costs as defined above and may be used as power purchase prices for the SPP. However, this pricing method will be more complex to administer than the method that uses a uniform AIC as the power purchase prices.

***Effect of Power Purchase from EGCO.*** At the time of this writing, privatization implemented involves the setting up of EGCO, an EGAT subsidiary on the generation side. EGCO has purchased the Rayong combined cycle power plant from EGAT and is now a public company with its shares traded in the SET.

EGAT is purchasing power from EGCO at the price of 1.07 baht/kwh. The Rayong power plant is not constructed by EGCO but is originally in the EGAT PDP which has already been commissioned. Thus, the privatization in this case means simply a transfer of ownership from EGAT to EGCO which is managed and run largely by former EGAT personnel.

In terms of avoided cost, the Rayong power plant, now under EGCO, simply substitutes itself in the EGAT PDP. The purchase price of 1.07 baht/kwh is slightly higher than its marginal cost under EGAT as a result of the 'transaction' costs. The benefit of privatization at this point of time is in the alleviation of foreign public borrowing in the power sector from the trading of EGCO shares in the SET.

***Effect of Power Purchase from IPP.*** Since the IPP is required to submit a price bid for its power, EGAT should compare the price bid to its avoided cost as defined above. If the purchase price agreement between EGAT and the IPP is equal to the levelized avoided costs, the long run marginal costs would remained unchanged. In this case, the costs of services to consumers would also remained unchanged. Gains in efficiency may be realized, if the power purchase prices are lower than EGAT's levelized avoided costs of service.

If avoided costs as defined above are not used as benchmarks for the IPP power purchase prices, the resulted power price purchase agreement may affect the costs of services to the final customers. One may be inclined to use the long run marginal costs of the system computed by the AIC approach as in the SPP case

because of its simplicity. In this case the cost of services to power customers may increase for the same reason explained above in the SPP case.

For the IPP power solicitation, its project is over 20 year and its power plant is more compatible with EGAT's power plant. It should be relatively simpler to identify EGAT's power plants that will be substituted by the compatible IPP power plants. EGAT may formally publish its power development plan with information on power plant costs by plant types and sites. Information on EGAT power plant by plant types will assist the IPP in their plant selection and in the preparation of their price bid.

EGAT may now solicit power from the IPP by plant types and by sites. The focus of competition between IPP will now be by plant types where the selection committee may select the IPP, *ceteris paribus*, with potential to substitute a given plant in the power development plan and offer the lowest price. For example, if there are 2 IPP lignite fired projects that have potential to substitute for EGAT's lignite fired power plant A with capital investment of B baht in the power development plan, the power purchase price should not be higher than the avoided cost of B baht. The IPP with the lower price bid, *ceteris paribus*, will then be awarded the contract to supply power. These prices may be adjusted for transfer payment items as in the SPP case.

If this solicitation of approach is selected, the purchase price will be based on avoided costs as defined above. When the IPP power is combined with EGAT's own power, the long run marginal costs, as computed by the AIC, will at least remain unchanged

#### ***Viability of the SPP/IPP Project***

Even though the SPP does not compete with the IPP, the former has an advantage in evaluating the project from the outset since he knows exactly the price offered for its power, whereas the IPP under the current bidding process is required to propose the purchase price which adds more uncertainty to the project. Since the SPP project is on a much smaller scale, and the basis of the SPP's fuel is based on residue fuels such as bagasse, its commercial fuel requirement is less vital than the IPP's requirements.

Viability of the IPP project depends upon the cost of fund, ability to manage risks associated with the power plant operations, control of losses in the power system, procurement of the fuel supplies, and the power purchase price agreement with EGAT and the third parties.

The cost of fund of the IPP with no link to a capital market is likely to exceed the corresponding cost of fund of EGAT. The IPP's higher cost of fund may be offset to a certain extent, if it is correct to assume that the IPPs's more flexible organization implies a relatively more efficient project management. A more efficient project management may lead to lower power losses, lower investment cost and better risk management such as fluctuations in the foreign exchange market.

One of the possible bottleneck for the IPPs is the lack of trained power plant operators and technicians, since the IPP project is relatively new to Thailand. Initially, the personnel are likely to be expatriates or 'imported' from EGAT which will exacerbate the public/private sector brain drain problem. The lack of trained personnel may increase the power plant operating costs which is detrimental to the IPP's efficiency.

Procurement of the energy supply is another issue that need to be addressed. Natural gas and lignite are the major two fuels in the power sector. Before the IPP project, EGAT mines its own lignite which is priced at its marginal cost. The marginal cost of lignite is used as a basis to compute the marginal energy cost. The IPP with a

lignite fired power plant will be hard pressed to secure the lignite supply which is competitive with EGAT's mine, unless it mines its own lignite. In addition, installation of a scrubber system is required to protect the environment which will raise the capacity cost of the plant.

Procurement of natural gas prior to privatization approximates a bilateral monopoly where EGAT purchase natural gas only from the Petroleum Authority of Thailand (PTT). If the IPPs with the gas fired power plants are to purchase natural gas solely from the PTT, the situation will approximate a monopoly market where the relatively larger number of IPPs tends to weaken their bargaining power. Attempts to secure natural gas from external sources such as LNG are likely to raise the marginal energy costs.

***Effects on Power Authority***

Power sales between the IPP, the SPP, and the third parties will affect the financial positions of the power authorities. Third party power sales of the IPP and SPP will lower the amount of power that EGAT sells to MEA, PEA, and to its direct customers which implies similar decreases in the amount of power sales at the retail level.

Reduction in the amount of wholesale power will affect the financial position of EGAT. The bulk tariff under privatization is based on the 'average' marginal costs of generation and transmission of EGAT's system and the purchased power from the IPPs and the SPPs. Assuming that power from the IPPs are purchased at EGAT's avoided costs, the marginal cost based bulk tariff would be unchanged. In this scenario, reductions in EGAT's own generation due to the IPPs' third parties sales will depress its net profit due to lower power sales.

Assuming that the rate of EGAT's investment declines in proportion to the rate of increases of its own power generation, the rate of return of EGAT may not be significantly affected, and hence the bulk tariff may be compatible to the level prior to privatization.

Initially, the rate of EGAT's investment may fail to match the reduction in its share of power generation. In this event, EGAT will experience a decline in its rate of return, which necessitates adjustments in the bulk tariff to a level that generates the required rate of return. The higher bulk tariff is then passed on to the final customers through a higher retail tariff. Even if the purchased power from the IPPs increases the average marginal costs of service, the higher costs may still be passed on to the final power customers.

The sales of power between the IPP and the third party may affect the financial positions of the distribution authorities, even if the higher bulk tariff may be passed on to the final customers. It is expected that the third party that purchase power directly from the IPPs are the large industrial and business customers with relatively high load factors.

Currently, these customers' tariff rates are over 90 percent of the marginal costs. Logically, these customers will purchase power from the IPPs if the agreed prices are, at least, equal to the current tariff rates. The reduction of power purchase of these customers from the distribution authorities will lower the system load factor.

The large industrial and business customers are under the 2 part (TOD) tariff where there are demand charges and energy charges. The monthly revenue from power sales is the sum of revenue generated from the demand charges and the energy charges. In order to illustrate the effect of the change in the load factor on the

distribution authorities, the energy charge in baht/kwh is converted to baht/kw by the relationship

$$\text{baht/kw} = (\text{baht/kwh})(\text{kwh/kw}) = (\text{baht/kwh})(L)(730 \text{ hours})$$

where L is the load factor and 730 is the number of hours in one month

The monthly revenue per kilowatt is thus

$$R = DC + EC(730L)$$

where R is the total revenue from power sales per kilowatt, DC the demand charge revenue, and EC the energy charge revenue

A one percentage change in load factor would lower the total revenue per kilowatt by the percentage change equal to  $\frac{dR}{dL} \frac{L}{R} = 730EC \frac{L}{R}$ , where L and  $\bar{R}$  are

the mean load factor and total revenue respectively. As an example, consider the PEA marginal capacity cost based demand charge of 428 baht/kw/month and marginal energy cost based energy charge of 0.7922 baht/kwh at the primary level. Since the PEA load factor is about 63 percent, a one percent drop in the load factor will lower the revenue by  $730(0.7922)(0.63)/792.33$  or 0.46 percent.

Losses in the distribution authorities' revenue due to a deterioration in the system load factor may not be passed on to the remaining customers under the automatic adjustment clause. Losses in the distribution authorities' revenue will eventually become another transfer pricing issue.

Under the present legal framework, MEA and PEA are not allowed to purchase power directly from the IPPs which affects the distribution of benefits between the three power authorities. If the distribution authorities are allowed to purchase power directly from the IPPs with lower marginal costs than EGAT, the direct IPP purchase will transfer some of the benefits from EGAT to the distribution authorities.

## 5. Summary and Conclusion

**Summary.** Privatization and liberalization of the power sector in Thailand only started in the early 1990s and focused on the generation side of the sector. This policy is not unexpected given the fast growth of EGAT's investment which exert pressure on the external borrowing limit of the public sector. In addition to the alleviation of the public sector investment and hence the pressure on the public foreign borrowing ceiling, it is also expected that privatization and liberalization will promote competition and efficiency which, hopefully, will lead to lower cost of services for the power customers.

Privatization of the power sector focuses on the EGAT organization. EGAT has set up EGCO as its subsidiary company which operates like a private company and is a member of the SET where its shares are traded. EGCO has since purchased Rayong combined cycle power plant from EGAT which is in EGAT's development plan and already commissioned.

In addition to the setting up of subsidiary company, EGAT is undergoing a reorganization where parts of its activities are transformed into 5 business units which operate as private companies while the remaining operating units still retain their state enterprise status. Since reorganization is in its very early stages, it is premature to evaluate the effect of this reorganization on the cost of services. PEA and MEA are also undergoing reorganization. However, the two distribution authorities will both retain their state enterprise status.

Liberalization also focuses on the generation side of the power sector. EGAT can now purchase power from its own subsidiary company, the SPP, and the IPP. The power purchase prices for the SPP are published along with the power solicitation announcement and the published prices are based on EGAT's avoided costs which is the AIC used in the national tariff design. The IPP is required to propose its power purchase price it wishes to sell power to EGAT. It is not clear as to the definition of avoided cost to be used as basis for the IPP power purchase agreement.

There is, as yet, no liberalization in the distribution activities as on the generation side. The IPP and the SPP are required to sell power to EGAT and to customers in their surrounding areas. They are not allowed to sell power directly to MEA and PEA. The EPC is considering the issue of allowing private power producers selling power to customers via the common carrier of the MEA and PEA lines, but this is not likely to materialize in the near future.

**Conclusion.** It is premature to evaluate the effects of liberalization and privatization of the power sector on the costs of services to power customers and distribution of benefits between the power authorities, the private power producers and power customers. However, some observations may be made regarding the process of privatization and liberalization.

The sale of Rayong power plant to EGCO does not promote competition since it involves the transfer of ownership of the already commissioned power plant from EGAT to EGCO. In addition, the transaction cost of power plant sales is likely to increase the cost of services slightly. The major benefit at this point appears to be in the public sector in the form of reduced foreign borrowing.

The power purchase price for the SPP project is transparent since EGAT clearly announces these prices. However, the AIC computed for the national tariff, which is the basis for the SPP purchase prices, may not be an appropriate basis for the power purchase price since this may lead to higher cost of services.

EGAT should publish its PDP with relevant costs. Such an announcement would be the bench mark of costs that will facilitate the private power producers in evaluating their project. In addition, if EGAT is able to identify its plants to be substituted by SPP power, its actual avoided cost, and not the average avoided cost, may be determined and used as basis for power purchase prices. There is no competition among the SPP since all projects receive the same prices regardless of their costs. In order to promote competition, the SPP should be required to submit price bid.

The announcement of EGAT's costs by plant types and by sites will also facilitate the IPP in the evaluation of his project. In this manner, the avoided cost by contracting a particular IPP plant may be determined and the power purchase price based on this avoided cost will ascertain that the cost of services will be, at least, remain at a level prior to liberalization.

The power sales between IPP, SPP and their customers in surrounding areas at unregulated prices will contradict the uniform tariff policy. This policy will tend to worsen the financial position of MEA and PEA which will raise the issue of transfer pricing between the 3 power authorities. The financial positions of MEA and PEA may improve if they are allowed to purchase power directly from the SPP/IPP.

The EPC should address the consistency of the uniform national tariff and the anticipated financial difficulties of MEA and PEA in the future from the expanding IPP/SPP/third party sales in the future.

In the near future, more subsidiaries, IPP, and SPP will participate in the power sector activities. The sales of EGAT's power plant, already commissioned in the PDP, to its subsidiary as in the Rayong case should not be allowed. These subsidiaries should be allowed to compete with the other IPPs on the same basis.

In order to follow the EPC's directive that privatization and liberalization should not impose more financial burden to the power customers, the effect of the current power purchase prices for the SPP/IPP on the cost of services should be evaluated and reviewed in the near future.

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<sup>1</sup>National Energy Policy Office, "Policy Guidelines for Private Power Producers' participation in the Power Sector" Energy Policy Journal, November, 1988, p.32 (in Thai), June-July, 1989, p.2 (in Thai).

<sup>2</sup>National Energy Policy Office, "Changing the Status of NEPO into a Department", Energy Policy Journal, June-July, 1989, p. 1 (in Thai).

<sup>3</sup>Ibid., p.1 (in Thai).

<sup>4</sup>Vichit Lorchirachoonkul and Thiraphong Vikitset, Thailand Power Tariff Structure, a Report Submitted to the National Energy Administration, Bangkok, Thailand, 1986

<sup>5</sup>This is because marginal cost is greater than average cost.

<sup>6</sup>Monenco in association with NIDA, Marginal Cost Based Electric Power Tariff, A Report submitted to the National Energy Office, April, 1991

<sup>7</sup>National Energy Policy Office, "Policy Guidelines for Restructuring the Power Sector" Energy Journal, January-March, 1996, p.28 (in Thai).

<sup>8</sup>However, it is not clear whether privatization will reduce the total foreign borrowing which is the sum of private and public borrowings.

<sup>9</sup>Southern Electric International, Feasibility Study for Privatization of Provincial Electricity Authority, A Report Submitted to the Provincial Electricity Authority, February, 1995.

<sup>10</sup>National Energy Policy Office, "Guidelines for Private Participation in Power Generation", Energy Policy Journal, November, 1988, p.36 (in Thai).

<sup>11</sup>National Energy Policy Office, "Revisions of Purchase Conditions from SPP", Energy Policy Journal, October-December, 1994, p.16 (in Thai).

<sup>12</sup>See National Energy Policy Office, "Power Solicitation from SPP", Energy Policy Journal, July-September, 1996, pp.12-27 (in Thai).

<sup>13</sup>National Energy Policy Office, "Power Solicitation from SPP", opus cited.

<sup>14</sup>Power purchase contract of over 5 years are considered firm, whereas power purchase contract under 5 years are considered non firm

<sup>15</sup>National Energy Policy Office, "Revision of Power Solicitation from IPP", Energy Policy Journal, July-September, 1996, pp.7-9 (in Thai).

<sup>16</sup>National Energy Policy Office, "Policy of Power Solicitation from IPP", Energy Policy Journal, April-June, 1994, pp.5-11 (in Thai).

<sup>17</sup>Proposals of Power Purchases from Independent Power Producers (Solicitation 1994).

<sup>18</sup>National Energy Policy Office, "Revision of Power Solicitation from IPP" opus cited, p.7