

## 4.2 Structural Framework for Power Supply

### 4.2.1 Electricity Generating Authority of Thailand (EGAT)

The Electricity Generating Authority of Thailand (EGAT) is the main organization supplying electricity in Thailand. It was formed in May 1, 1969, pursuant to the Electricity Generating Authority of Thailand Act, B.E. 2511 (EGAT Act 1968), to rationalize and consolidate the functions and responsibilities of three existing independent state enterprises, namely the Yanhee Electricity Authority (YEA), the Lignite Authority (LA) and the Northeast Electricity Authority (NEEA). Each of these enterprises was responsible for supplying electricity in the area specifically designated to it. The areas under the responsibility of YEA were in the North and Central Regions, while those of LA were in the far North and the South, and the area in the entire Northeast fell under the responsibility of NEEA. Such territorial division for the enterprises was primarily dictated by geographical consideration, in spite of their similar operational functions. Therefore, the Government finally decided to integrate the entities of the three organizations into one organization so that the effectiveness of better performance and higher efficiency could be achieved.

Since the establishment of EGAT in 1969, the EGAT Act has gone through a number of amendments (in 1978, 1987, and 1992). The last one in 1992 expanded the objectives of EGAT as follows:

- ◆ to generate, acquire, transmit and distribute electric energy to:
  - The Metropolitan Electricity Authority (MEA), the Provincial Electricity Authority (PEA) or other electricity distribution authority under the law there on;
  - Other electric energy consumers as prescribed by a Royal Decree;
  - Neighboring countries.
- ◆ to undertake various activities related to the production of electric energy such as developing energy sources from natural resources which could possibly be water, wind, natural heat, solar power, oil, coal, oil shale, natural gas etc., including nuclear power, and other activities.
- ◆ to undertake businesses concerning electric energy and other businesses concerning or continuity with the activities of EGAT, or collaborate with other persons for the said activities. <sup>a/</sup>

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Note : <sup>a/</sup> As amended by EGAT Act (No. 5), dated 1 March 1992.

- ◆ to carry out, individually or jointly with other bodies, the production and sale of both lignite and lignite by-product.

EGAT is a state enterprise and is overseen by Office of the Prime Minister, Government of Thailand. Within the scope of its objectives, EGAT has the following duties and responsibilities:

- ◆ to construct and operate dams, reservoirs and other equipment in connection with electric power generation, as well as the development of water resources for the purpose of power generation.
- ◆ to construct thermal, hydro, nuclear and other types of power plant.
- ◆ to improve and expand substations and transmission lines including associated equipment for electric power transmission and distribution.
- ◆ to specify the standard, type and size of power plants, switchyards and power plant accessories, lignite chemical plants, electric power system, as well as fuel for power production.
- ◆ to formulate policy and exercise control over the production, transmission and sales of electricity, and the production and sales of lignite and lignite by-product.
- ◆ to establish a limited company or a public company limited for undertaking businesses concerning electric energy and other businesses concerning or continuity with the activities of EGAT.<sup>b/</sup>
- ◆ to collaborate any activities with other entities whether internal or external entities of the private or of state or with international organizations, or to hold shares in any limited company or public company limited for the benefit of the activities under EGAT's objectives.<sup>b/</sup>
- ◆ to undertake other activities concerning or continuity with the achievement of EGAT's objectives.
- ◆ issue bonds or other documents for the purpose of investment.

EGAT is committed to providing an adequate, reliable and efficient power service to meet the national requirements at reasonable rates, while protecting the environment as well as encouraging public participation in EGAT's operations. For almost 30 years of operation, EGAT has lived up to this expectation and is ranked as one of the most successful and well-managed electric utilities in Asia.

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Note : <sup>b/</sup> As amended by EGAT Act (No. 5), dated 1 March 1992.

As of June 2001, EGAT had a total installed generating capacity of 22,117 MW (including private sector-IPP, SPP). Total annual electricity generation in 2000, including purchased energy, reached 96,780.72 GWh, increased by 7.04% from the year before. The electricity generated was transmitted through lines spanning 26,904 ckt-km and through 194 substations with a total capacity of 57,109 megavolt-amps (MVA), during the period. Electricity was sold primarily to the MEA and PEA, and that accounted for around 98% of EGAT's total electricity sales. The remaining 2% went mostly to direct customers.

EGAT's power system is divided into five areas of control. Each area is monitored and controlled by a regional control centre, but the whole network is supervised and co-ordinated by the National Control Centre located in EGAT's headquarters in Nonthaburi province to keep the balance between electricity supply and demand. The other four so called Region Control Centres located at Phitsanulok, Khon Kaen, Nonthaburi (adjacent to National Control Centre), and Trang provinces.

The 1992 amendments to the EGAT Act allowed EGAT to engage in businesses concerning electric energy or in continuity with EGAT's activities, but they may be outside the traditional generation and transmission functions. EGAT can do this by establishing private or public limited companies, in collaboration with other local or international business entities, or by holding shares in another company. This change was in the context of the ongoing privatisation and restructuring of the electricity sector in the country. (see also Chapter 7).

The 1992 amendments, therefore, provided EGAT with the legal framework for immediately establishing its first subsidiary, Electricity Generating Co., Ltd. (EGCO), in May 1992. EGCO was wholly-owned by EGAT at the beginning, but as it was listed on the Stock Exchange of Thailand, EGAT later sold a majority of its shares to the public. EGAT had sold 15% of its remaining 40% in EGCO in late 1997 and hold 25.05% in 2001.

EGCO became a public limited company in March 1994. It was established to buy and operate two EGAT's power plants, 1,232 MW Rayong combined cycle plant was transferred to EGCO in December 1994, while the sale of the 924 MW Khanom power complex was completed in mid-1996. For the purpose of running the two power plants, EGCO created two subsidiaries, the Rayong Electricity Generating Co., Ltd. (REGCO) and the Khanom Electricity Generating Co., Ltd. (KEGCO). (see also Chapter 6).

Still in line with the privatisation proposal, EGAT was granted the "good state enterprise" status in August 1994, the second to be given such a status, after Petroleum Authority of Thailand (PTT). This status gives EGAT greater autonomy in operation and management. At present, EGAT is undergoing organisational transformation to brace itself for the proposed privatisation. The organisational

structure as of August 2001 is shown in Figure 4-2 and the past operational and financial performances has presented in Table 4-1.

The overall performance of EGAT is healthy, however, in FY 1999 a lost of Baht 25,055 million was recorded. According to it's annual report in 1999, the net losses was mainly due to the big variation of currency exchange rates, on September 30, 1999 being Baht 41.1339 per 1USD and Baht 38.7233 per 100 Yen compare with the rates at September, 1998 which was 39.4737 per 1USD and Baht 29.2899 per 100 Yen, representing an increase in the rate of 4.21% and 32.21% respectively.

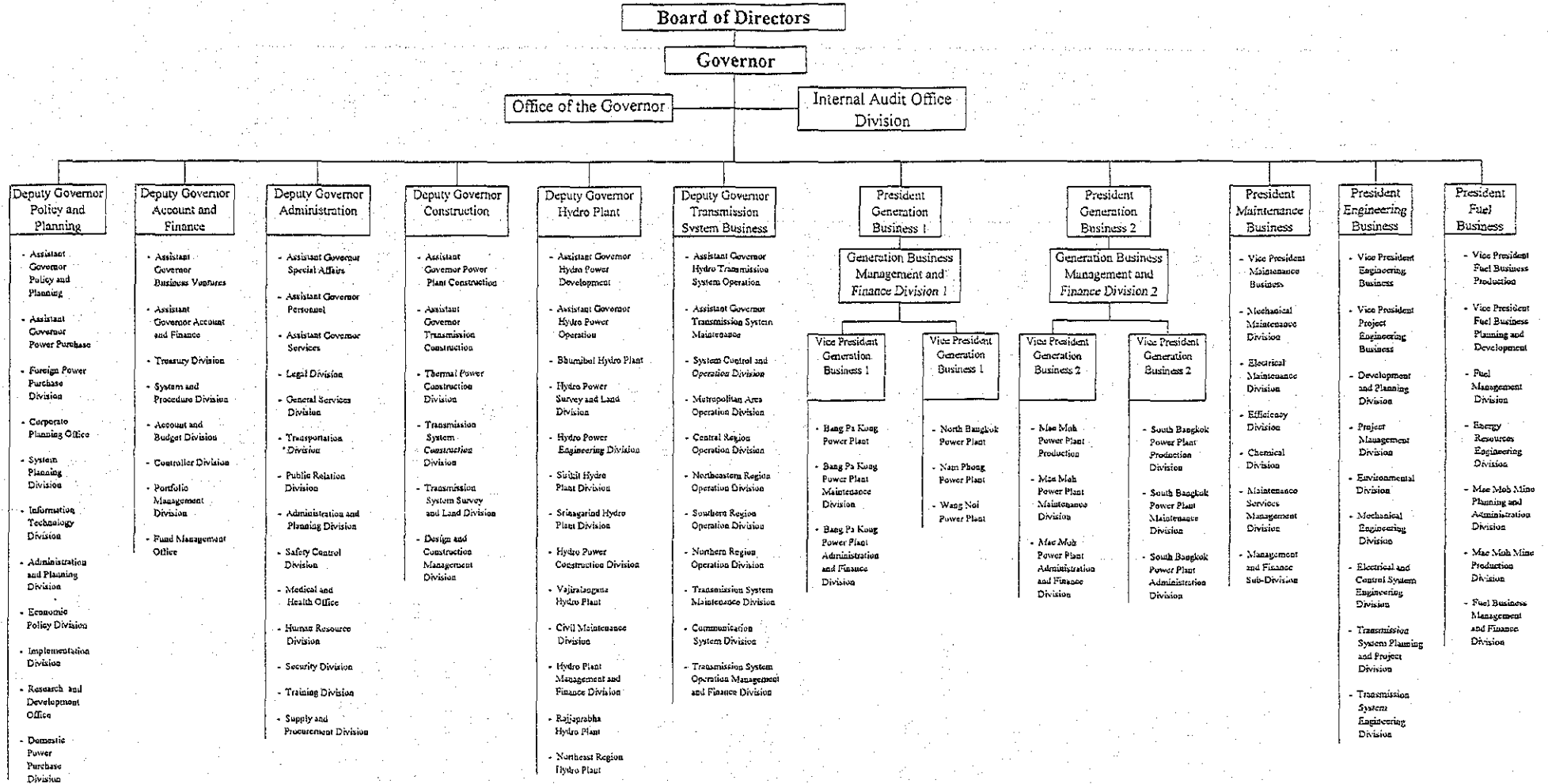


Figure 4-21 EGAT's Organization Chart

Source : EGAT

**Table 4-1 EGAT's Operational and Financial Performances**

	Fiscal Year 2000	Fiscal Year 1999	Fiscal Year 1998
<b>o Operation</b>			
Installed Capacity (kilowatts)	22,269	19,110	15,357,298
Peak Generation (kilowatts)	14,918	13,712	14,179,900
Energy Generated and Purchased (million kilowatt-hours)	96,781	90,414	92,134
<b>Transmission System</b>			
Line length (circuit-kilometers)	26,350	25,000	23,797
Substations	193	189	185
Transformer capacity (kilovolt-amperes)	55,903	49,356	43,673,980
Sales of Electricity (million kWh)	90,725	84,512	85,598
Number of Employees	29,175	30,202	31,276
<b>o Finance</b>			
Total Assets (million Baht)	434,411	396,114	358,445
Capital Expenditure (million Baht)	22,203	35,728	47,628
Total Liabilities (million Baht)	312,091	279,324	239,413
Long-term debts (million Baht)	216,410	210,560	164,217
Current liabilities and other liabilities (million Baht)	95,671	68,763	75,196
Total Revenues (million Baht)	164,041	136,487	155,507
Revenue from energy sales (million Baht)	160,992	134,335	146,572
Other revenues (million Baht)	3,049	2,152	8,935
Total Expenses (million Baht)	143,866	161,542	135,197
Operating expenses (million Baht)	132,132	109,414	115,012
Other expenses (million Baht)	11,734	52,128	20,185
Net Income (million Baht)	20,175	(25,055)	20,310
Remittance to the Ministry of Finance (million Baht)	7,975	5,837	2,000

Source : EGAT

## 4.2.2 The Metropolitan Electricity Authority (MEA)

### a. Background

The MEA is responsible for electricity distribution in the greater Bangkok area, Nonthaburi and Samut Prakarn provinces. The MEA was formed in 1958 under 1958 Act, by merging the Bangkok Electric Works and the Electrical Division of the Public Works Department, Ministry of Interior. The MEA was, at initial stage, responsible for the generation and distribution electricity for Bangkok Metropolis and three adjacent provinces, i.e. Nonthaburi, Thonburi (currently is merged with Bangkok), and Samut Prakarn Provinces until 1961, when its function of electricity generation was transferred to the Yanhee Electricity Authority (YEA). Since then, MEA has been assigned to be responsible only for electricity distribution for metropolitan areas. At present the MEA is responsible for electricity distribution covering the Bangkok, Nonthaburi and Samut Prakarn Provinces with a total area of approx. 3,115 km<sup>2</sup> and around 12,000 employees.

MEA is a state enterprise reporting to Ministry of Interior, with its headquarter located in Bangkok. Major MEA's tasks are:

- ◆ to acquire, transmit and distribute electricity
- ◆ to run the business concerning electricity or any profitable related business

MEA has vision, mission and principal policies as the followings:

#### ◆ Vision

To be a leading organization of electrical public utility, with strengthens of services and social responsibility.

#### ◆ Mission

To distribute adequate, reliable and safe power at fair rate tariffs, with efficiency to meet requirements of customers and the public, upon social and environment consciences, leading to favourable atmosphere of national economic development.

◆ Principal Policies

• Distribution System Development

- To expand, improve and maintenance of distribution system in accordance with international standard;
- More earthing system to be used;
- Opening for private sector to join a business.

• Services

- To improve and expand services with efficiency and quality in convenience and rapidity;
- To improve of rules, regulations, working processes, and staff mentality in services including public electricity services in order to enhance living standard and social welfare.

• Finance and Accounting

- To maintain finance status in a stability;
- To invest more in electricity business and related business;
- To open for private sector to join the investment in an proper proportion in accordance with government policy;
- To develop accounting operation and reporting of accounting system flexible enough to increase the efficiency and working management.

• Management

- To develop management system and structure in form of business;
- To raise staff potential by training to reach a best knowledge and proper vision;
- To improve wages or salary and welfare in response with the labour market;
- To apply a proper technologies and to increase more efficiency in public relations.

• Safety and Environment

- To diffuse knowledge in order to provide services in connection with preventive measures and to reduce the damage to the people caused by electricity;
- To support the staff in order to mind for safety working and to support electricity usage management for environment.



## **b. Power Supply and System Voltage**

Currently MEA receives electricity from EGAT at 3 levels of voltage, i.e. 230, 115, 69 kV. These 3 voltages have been used for bulk power transmission or as primary system. The secondary system of 24 and 12 kV has been stepped down from the primary system by the power transformers. The 24 and 12 kV have been further stepped down to 380/230 volt for customer services.

Distribution and transmission system operations are mostly radial type. The substations are mixed, i.e. both of conventional and Gas Insulated Substation (GIS) arrangements. The GIS will have been presently more used due to space limited in Bangkok.

Generally substations are installed with two transformers with a capacity 40 MVA each, a 12 and 24 kV metal-clad indoor switchgear accommodated in the control building of which substations are operated and monitored by computer-based substation control system (CSCS) in a substation control room. Modern technologies such as supervisory control and data acquisition (SCADA) system, and energy management system (EMS) have been installed for several years ago. The SCADA system is installed in order to control distribution system, record equipment information, report a working status of equipment and indicators while the EMS is introduced to forecast power demand, being data used to formulate future MEA power distribution system improvement and expansion plan.

The organizational structure of MEA is presented in Figure 4-3, its operational and financial performances covering FY 1998 and 1999 (year 2000 will be issued in January 2002) are presented in Table 4-2.

According to Table 4-2, it can be observed that the energy sales amount in FY 1999 decreased from 1998 by about 5% at the same time the total customer amount increased by 2.3%. It is, however, financial performance for total revenues was also decreased by 7.1% representing the net income lost in 1999. The major cause of loss in operation of FY 1999 was due to fluctuation of currency exchange rate, as explained in Section 4.2.1 for EGAT.

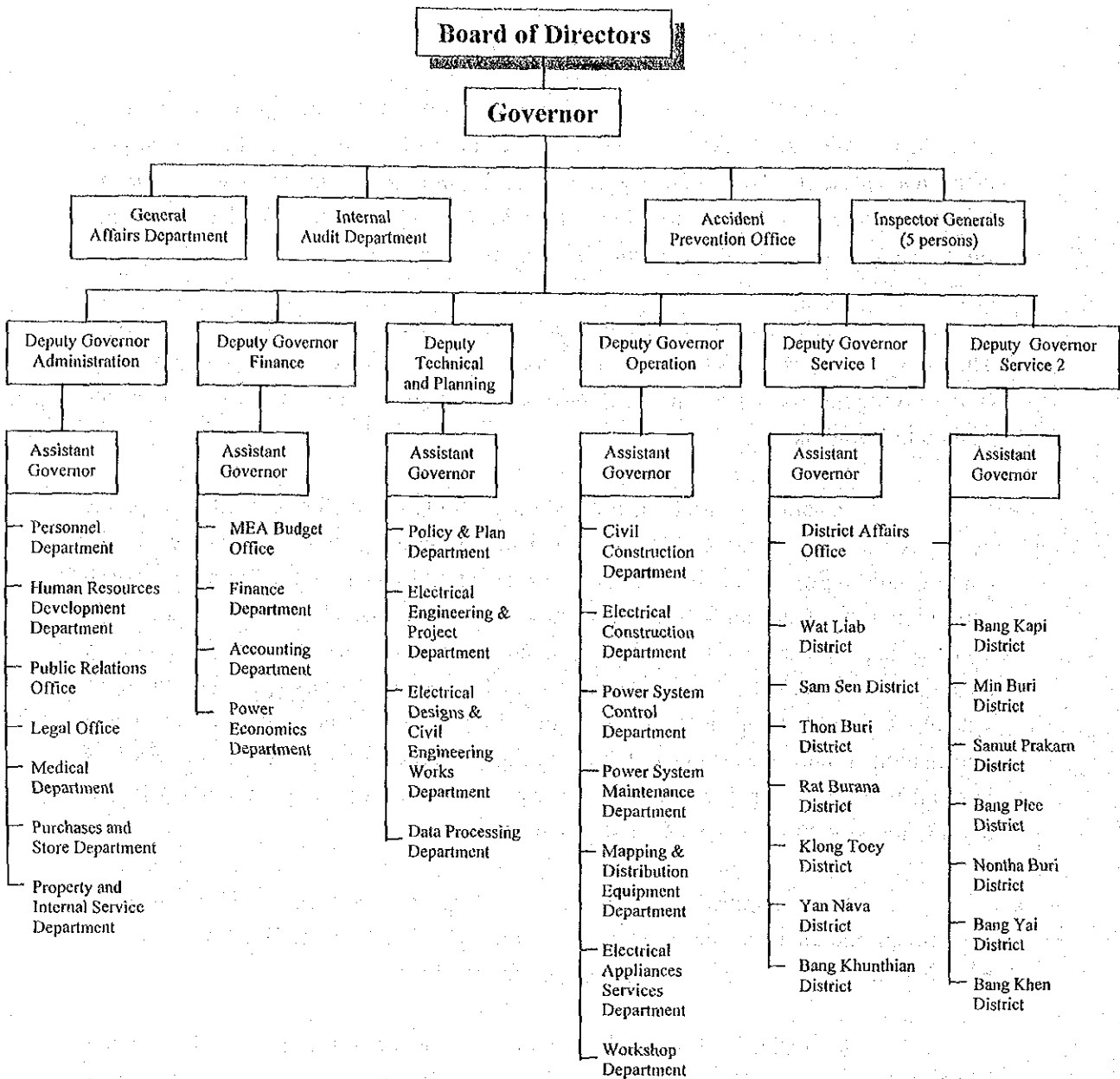


Figure 4-3 MEA's Organization Chart

Source : MEA

**Table 4-2 MEA's Operational and Financial Performances**

Description	Fiscal Year		
	2000*	1999	1998
<b>Operation</b>			
kWh sales (excluding public lightings) (Million kWh)	-	29,500.36	30,987.49
Energy loss (%)	-	3.99	3.77
Total customers at FY end (customer)	-	2,094,893	2,046,594
Total employees (person)	-	12,037	12,282
Customers/employee ratio	-	174	167
<b>Finance</b>			
Total Assets (Million Baht)	-	81,145.65	77,020.88
Equity (Million Baht)	-	25,090.89	23,721.29
Total revenues (Million Baht)	-	68,084.68	73,259.87
Total expenses (Million Baht)	-	69,020.55	70,532.62
Net profit (Loss) (Million Baht)	-	(935.87)	2,727.25
<b>Financial Ratios</b>			
Total expenses per total revenues (%)	-	94.79	95.37
Quick ratio	-	0.97	0.80
Debt equity ratio	-	1.02	0.80
Collection period (day)	-	41	42
Note : * Will be issued in January 2002			

Source : MEA

### 4.2.3 The Provincial Electricity Authority (PEA)

#### a. Background

Electricity distribution throughout the Kingdom of Thailand is provided by the Provincial Electricity Authority (PEA). The PEA was established in 1960 and is responsible for supply of electric power for all provinces, except the Metropolitan area of Bangkok and two adjoining provinces, Nonthaburi and Samut Prakarn.

The PEA is a state enterprise supervised by the Ministry of Interior. PEA areas of responsibility are extensive, covering approximately 510,000 square kilometers, or roughly 99% of the Kingdom's total area. PEA maintains headquarters in Bangkok, and serves approximately 54.18 million people throughout 73 provinces, which include approximately 68,461 rural villages. As of June 2001 PEA maintains 12 areas, 73 provinces, 864 districts and 979 customers service offices.

The main objectives of the PEA are:

- (1) to improve the provision and distribution of electric energy to a level of sufficiency, efficiency and reliability in accordance with safety practices;
- (2) to develop activities in all areas in order to maximize revenues and minimize expenditure in order to facilitate further development;
- (3) to develop its organizational structure, manpower and resource management in order to achieve the highest level of efficiency.

#### b. Power Supply and System Voltage

PEA receives electric power from EGAT at 22, 33, 69 and 115 kV voltage levels. The 22 kV has been adopted as the standard for medium voltage power distribution in most areas although 33 kV is used in certain places. 115 kV and 69 kV transmission voltage are used for large industrial customers. 115 kV is being progressively extended as a distribution voltage. Mostly, radial distribution and transmission systems are utilized in the PEA service area. Substations are mostly conventional type consisting of 115 kV outdoor switchyard with one main busbar and one transfer busbar, except GIS type which is double busbar. In general, a substation will be installed with one or two 115/22 kV transformers of 50 MVA and a 22 kV metal-clad indoor switchgear accommodated in the control building of the substations which are operated and monitored by Computer-based Substation Control System in substation control room. Switching stations are double busbar for GIS type, but conventional type is "breaker and a half".

For efficiency and reliability, a system of open loops with group operating switches has been adopted to tie with different feeders. Supplies to major loads, industrial estates and the like are given a more reliable configuration and ultimately the new 115 kV transmission circuits will be introduced.

Like EGAT, the PEA is undergoing restructuring in line with the overall electricity sector restructuring. Its organizational structure as of September 2001 is shown in Figure 4-4, and operational and financial performance is presented in Table 4-3, which covers for the year 1998 through 2000.

PEA's performance had a little different point when compared to MEA, i.e. sales of PEA's electricity amount increased by 1% while MEA was decreased by 5% of the same period from FY 1999 to 1998. However, PEA's financial performance was presented in the same situation-loss income in 1999. Mainly causing was informed- due to exchange rate.

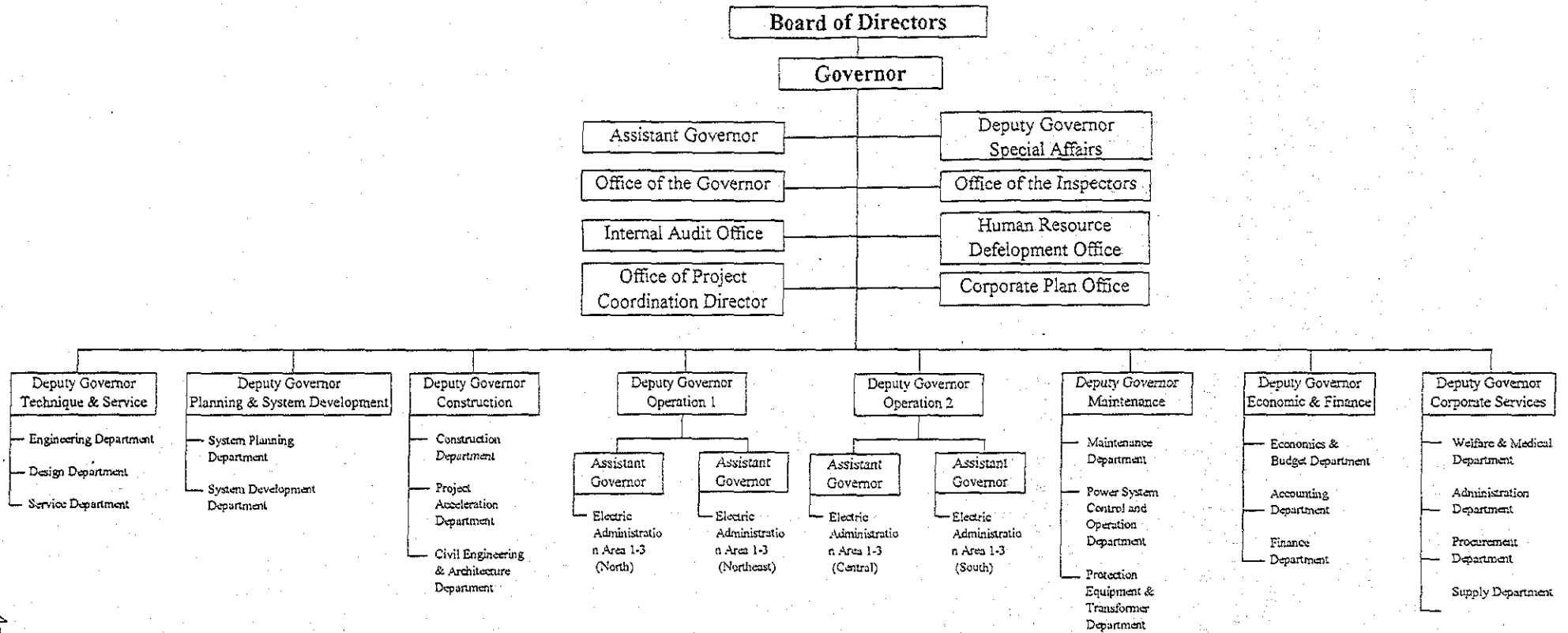


Figure 4-23 PEA's Organization Chart

**Table 4-3 PEA's Operational and Financial Performances**

Description	Fiscal Year		
	2000	1999	1998
<b>Operation</b>			
Number of Customers	11,228,792	10,900,938	10,583,054
Total Sales of Electricity (Million kWh)	52,370	48,532	48,003
Average Customer Consumption (kWh)	4,664	4,452	4,536
Average Price of Electricity (Baht/kWh)	2.15	2.03	2.09
Total Maximum Demand (MW)	10,509	9,901	9,419
Total Electric Energy (Million kWh)	56,292	51,914	51,484
Purchased Power (Million kWh)	56,245	51,882	51,449
PEA Generation (Million kWh)	47	32	35
Transmission Lines (Circuit-km)	3,809	2,892	1,996
H.V. Distribution Lines (Circuit-km)	243,824	238,985	224,243
L.V. Distribution Lines (Circuit-km)	338,493	327,509	310,595
Installed Transformers (MVA)	37,509	37,203	45,813
Number of PEA Offices	979	1,007	1,045
Number of Employees	28,933	29,838	30,052
Total Villages	69,174	68,162	67,167
Number of Electrified Villages	68,464	67,446	66,411
% of Electrified Villages	99.0	98.9	98.9
<b>Finance</b>			
Electric Revenue (Million Baht)	112,772	98,626	100,217
Other Revenues (Million Baht)	3,913	4,170	5,136
Operating Expenses (Million Baht)	108,408	93,596	92,575
Other Expenses (Million Baht)	1,577	16,702	2,313
Net (Loss) Income (Million Baht)	6,700	(7,502)	10,465
Investment (Million Baht)	18,592	19,071	21,824
Loans (Million Baht)	57,239	56,775	44,574
Net Assets (Million Baht)	157,314	151,546	147,322

Source : PEA

#### 4.2.4 Petroleum Authority of Thailand (PTT)

##### a. Background

The Petroleum Authority of Thailand (PTT) was formed in early 1979 after the PTT's Act was proclaimed on 29 December 1978, to consolidate related government agencies responsible for national petroleum energy security as well as to conduct and promote the petroleum and related business for maximum benefit to the country.

The role of PTT in the electricity sector cannot be underestimated. PTT is a major player in domestic oil and gas exploration and development and owns the country's gas transmission networks, although its monopoly over gas transmission and distribution has been lifted. PTT also holds shares in the country's petroleum refineries. Oil and gas comprise the bulk of EGAT's fuel mix. In the year ended September 2000, for example, oil and gas accounted for 27.7% and 39.7%, respectively, of EGAT's total generation. The share of natural gas in the generation mix is expected to increase in the medium term when natural gas-fired power plants, mostly owned by IPPs, are commissioned. Indeed, the structure of the generation sector is highly influenced by the availability of fuels.

PTT is under the Ministry of Industry (MOI). Since it is assigned to act as national petroleum business entity there are many events in PTT has been developed and improved in order to meet its missions and government policy. Presently PTT Head Office is under way to be privatized as a public company and management according to the Performance Agreement, concluded with the Ministry of Finance.

##### b. PTT Corporate Structure

The PTT's organizational structure as of September 2001 is presented in Figure 4-5. The Head Office has been arranged with the management divided into two sectors i.e., supporting sector and business sector. Main Supporting Sector comprises of Corporate Strategy & Development, Corporate Finance & Accounting, Corporate Support, while Business Sector consists of three principal groups, Gas Business Group, Oil Business Group, and Petrochemical & Refinery Business Group. PTT has assigned a deputy governor level to oversee the principal units and also some attached sub-units such as PTTEP, PTT Gas, NPC, etc.

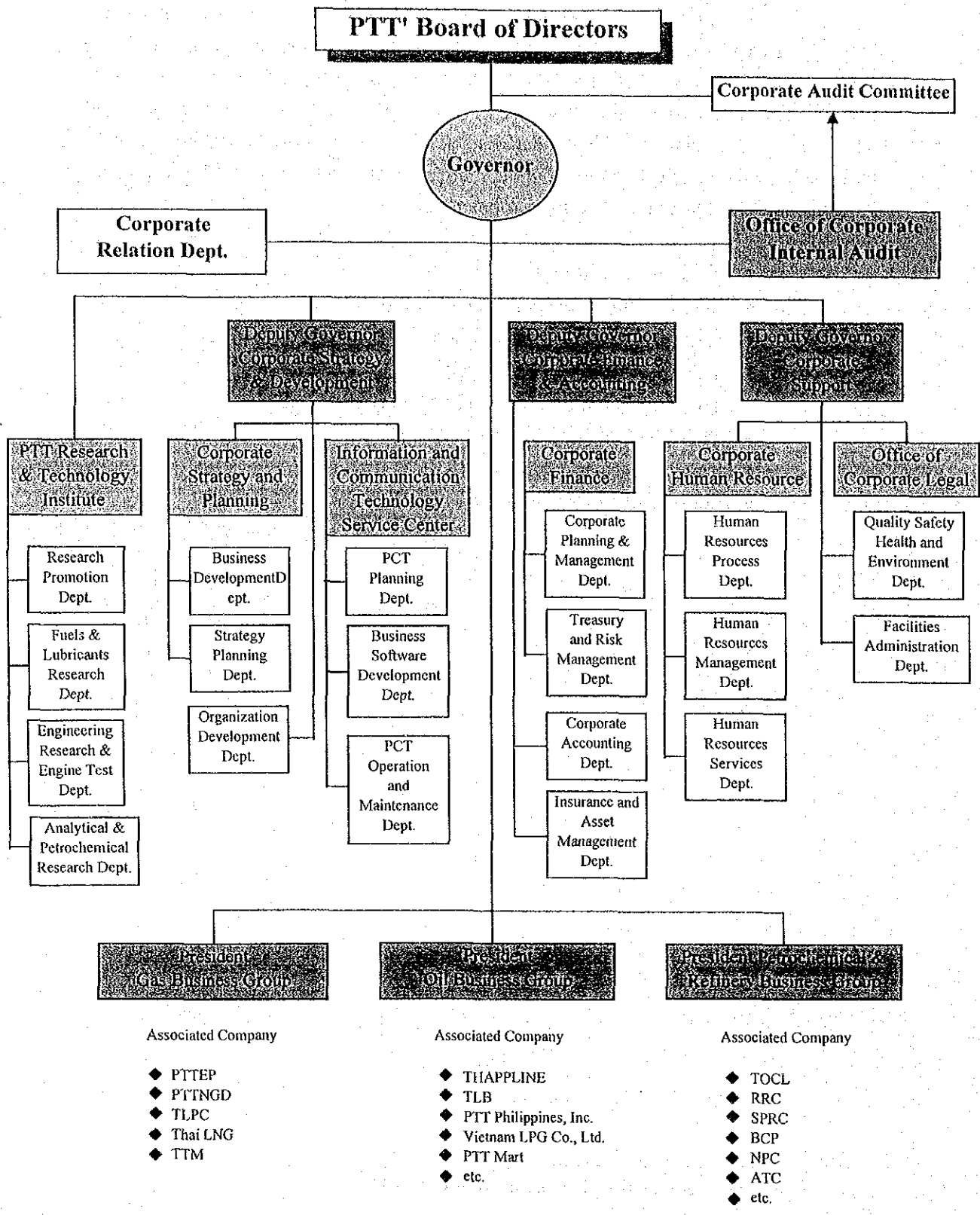


The strategy for restructuring the PTT was approved by cabinet since 1996, in order to promote a liberalised petroleum market. Consent was given to the corporatisation of Gas Business Group, Oil Business Group and Petrochemical & Refinery Business Group, all owned by PTT. Some of these businesses were on listed on the Stock Exchange of Thailand (SET) several years ago-PTTEP, NPC, TOC. PTT itself has been privatized to a public company since October 1, 2001. At present PTT has held the shares of the following businesses:

- ◆ Thai Oil Co., Ltd. (TOCL)
- ◆ Fuel Pipeline Transportation Co., Ltd. (FPT)
- ◆ National Petrochemical Public Co., Ltd. (NPC)
- ◆ Thai Olefins Co., Ltd. (TOC)
- ◆ Thai Petroleum Pipeline Co., Ltd. (THAPPLINE)
- ◆ Thai LNG Power Co., Ltd. (TLPC)
- ◆ Rayong Refinery Company (RRC)
- ◆ Star Petroleum Refining Co., Ltd. (SPRC)

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Note : <sup>1/</sup> Since October 1, 2001 PTT has been privatized to public company.



Source : PTT

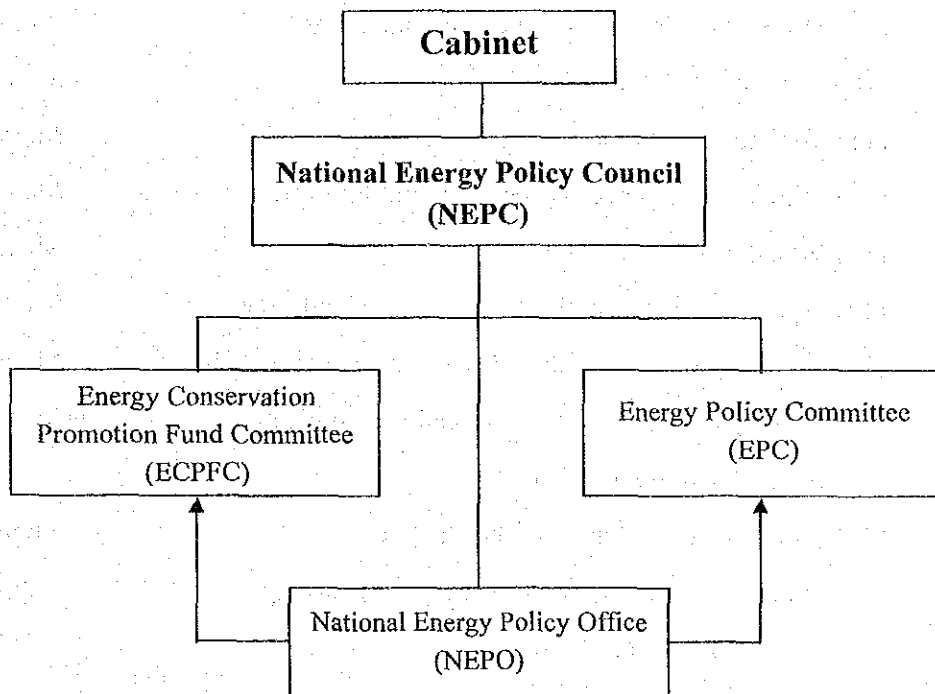
Figure 4-5 Current Structure of PTT

### 4.3 Regulatory Framework for the Power Sector

#### 4.3.1 National Energy Policy Council

The NEPC was established under the National Energy Policy Council Act, B.E. 2535 (1992), chaired by Prime Minister, and with the National Energy Policy Office (NEPO) acting as its Secretariat. The NEPC is the central authoritative body in the establishment of the national energy policies by virtue of its having Ministers from related Ministries as well as chiefs of concerned government agencies as its committee members. As a result, it is able to recommend national energy policies as well as energy management and development plans to the cabinet.

The organization Chart of NEPC is presented in Figure 4-6.



Source : NEPO

Figure 4-6 Organization Chart of NEPC

The membership of the NEPC is as follows:

(1) Prime Minister	Chairman
(2) Deputy Prime Minister, as assigned by the Prime Minister	Vice Chairman
(3) Deputy Prime Ministers	Member
(4) Minister to the Prime Minister's Office, as assigned by the Prime Minister	Member
(5) Minister of Defense	Member
(6) Minister of Finance	Member
(7) Minister of Foreign Affairs	Member
(8) Minister of Agriculture and Cooperatives	Member
(9) Minister of Transport and Communications	Member
(10) Minister of Commerce	Member
(11) Minister of Interior	Member
(12) Minister of Science, Technology and Environment	Member
(13) Minister of Industry	Member
(14) Permanent-Secretary of the Ministry of Industry	Member
(15) Secretary-General of the Office of the Council of State	Member
(16) Secretary-General of the National Economic and Social Development Board	Member
(17) Director of the Bureau of the Budget	Member
(18) Director-General of the Department of Energy Development and Promotion	Member
(19) Secretary-General of the NEPC	Member and Secretary

The scope of authority and responsibilities of the NEPC are as follows:

- ◆ Recommend national energy policies, energy management and development plans to the cabinet.
- ◆ Establish rules and terms in determining energy prices that will be consistent with the national energy policies and energy management and development plans.
- ◆ Monitor, supervise, coordinate and support the efforts of all energy-related committees, government authorities, state-enterprises and the private sector on energy matters to ensure consistency with the national energy policies and energy management and development plans.
- ◆ Evaluate the implementation of the national energy policies and energy management and development plans.
- ◆ Perform any other tasks that may be assigned by the Prime Minister or by the cabinet.

Apart from NEPO which acts as NEPC's secretary, there are two more committees involved in national energy management. They are ECPFC and EPC as follows:

**(a) The Energy Conservation Promotion Fund Committee (ECPFC)**

According to the Energy Conservation Promotion Act, B.E. 2535 (1992), the NEPC is in charge with promotion of energy conservation and management of the Energy Conservation Promotion Fund (ENCON Fund). In this connection, the Energy Conservation Promotion Fund Committee has been appointed to manage the ENCON Fund with a view to achieving the objectives of this Act.

The Energy Conservation Promotion Fund Committee comprises:

- |                                                                                            |                         |
|--------------------------------------------------------------------------------------------|-------------------------|
| (1) Deputy Prime Minister, as assigned<br>by the Prime Minister                            | Chairman                |
| (2) Permanent-Secretary of the Ministry of Science,<br>Technology and Environment          | Member                  |
| (3) Secretary-General of the National Economic and<br>Social Development Board             | Member                  |
| (4) Permanent-Secretary of the Ministry of Industry                                        | Member                  |
| (5) Secretary-General of the Thai Industrial Standards Institute                           | Member                  |
| (6) Director-General of the Comptroller-General's Department                               | Member                  |
| (7) Director-General of the Department of Energy<br>Development and Promotion              | Member                  |
| (8) Director-General of the Public Works Department                                        | Member                  |
| (9) Director-General of the Industrial Works Department                                    | Member                  |
| (10) President of the Federation of Thai Industries                                        | Member                  |
| (11) President of the Engineering Institute of Thailand<br>under H.M. the King's Patronage | Member                  |
| (12) Well-qualified persons as appointed by the cabinet<br>(no more than seven members)    | Member                  |
| (13) Secretary-General of the National Energy<br>Policy Council                            | Member and<br>Secretary |

The scope of authority and responsibilities of the Energy Conservation Promotion Fund Committee are as follows:

- ◆ Suggest to the NEPC guidelines, criteria, terms, and priorities in dispensing the Energy Conservation Promotion Fund (ENCON Fund) in accordance with the objectives stipulated under Section 25 of the Energy Conservation Promotion Act, B.E. 2535 (1992).
- ◆ Allocate appropriations from the ENCON Fund in accordance with the objectives prescribed under Section 25 of the Act, and ensure that they conform to the guidelines, criteria, conditions and priorities prescribed by the NEPC.
- ◆ Establish regulations on the criteria and procedures for submissions for grants, grant allocations or subsidies from the ENCON Fund.
- ◆ Propose to the NEPC the appropriate rates of contribution to be imposed on oil for the ENCON Fund.
- ◆ Recommend to the NEPC the types of oil to be exempted from the above contribution to the ENCON Fund.
- ◆ Prescribe surcharges to be levied, with the approval of the NEPC and determine exceptional cases where surcharges should be exempted.
- ◆ Consider approval requests for support and/or assistance in accordance with the guidelines, criteria and conditions laid down by the NEPC.
- ◆ Prescribe regulations on the criteria and procedures for making requests for support and/or assistance.
- ◆ Perform other duties as stipulated under the Energy Conservation Promotion Act, B.E. 2535 (1992).

**(b) The Energy Policy Committee (EPC)**

In order to enhance efficiency of the national energy management, the Energy Policy Committee (EPC) was established under the National Energy Policy Council Act, B.E. 2535 (1992). The EPC is responsible for screening work related to energy management and development prior to its submission to the NEPC for further consideration.

The EPC consists of the following members:

- |                                                                                   |                                   |
|-----------------------------------------------------------------------------------|-----------------------------------|
| (1) Minister of the Prime Minister's Office, as assigned<br>by the Prime Minister | Chairman                          |
| (2) Permanent-Secretary of the Ministry of Industry                               | Member                            |
| (3) Secretary-General of the National Economic and<br>Social Development Board    | Member                            |
| (4) Permanent-Secretary of the Ministry of Science, Technology<br>and Environment | Member                            |
| (5) Secretary-General of the Office of the Council of State<br>or Representative  | Member                            |
| (6) Director-General of the Department of Energy Development<br>and Promotion     | Member                            |
| (7) Director-General of the Fiscal Policy Office                                  | Member                            |
| (8) Director-General of the Department of Commercial<br>Registration              | Member                            |
| (9) Director-General of the Department of Mineral Resources                       | Member                            |
| (10) Governor of the Electricity Generating Authority of<br>Thailand              | Member                            |
| (11) Governor of the Petroleum Authority of Thailand                              | Member                            |
| (12) Secretary-General of the National Energy Policy Council                      | Member and<br>Secretary           |
| (13) Representative of the National Energy Policy Office                          | Member and<br>Assistant Secretary |



The scope of authority and responsibilities of the EPC are as follows:

- ◆ Recommend to the NEPC energy policies, energy management and development plans and energy measures.
- ◆ Provide comments on energy-related plans and projects of various agencies, including their priority.
- ◆ Determine oil prices and levies to be collected for the Oil Fund, and perform other functions with respect to the Oil Fund management as may be assigned by the Prime Minister and as prescribed under the Royal Decree on the Solution and Prevention of Fuel Oil Shortage.
- ◆ Recommend policies and measures on energy pricing and regulate changes in electricity tariffs in accordance with the automatic (price) adjustment mechanism.
- ◆ Consider and provide recommendations to the NEPC concerning royal decrees, ministerial regulations and measures to be issued under the Energy Conservation Promotion Act.
- ◆ Liaise with government agencies, private and public bodies and individuals to submit technical, financial, statistics information and/or other necessary details related to national energy policies, energy management, and development plans.
- ◆ Perform other duties as may be assigned by either the NEPC or its Chairman.
- ◆ Appoint sub-committees to assist with particular tasks as deemed necessary.

#### **4.3.2 National Energy Policy Office (NEPO)**

##### **(a) Background**

In the past, particularly in the period prior to the implementation of the Sixth NESDP (1987-1991), Thailand encountered severe energy crisis on several occasions. Two eminent features stood out clearly from these energy crises. Firstly, the government lacked unity in administering the country's energy affairs due to the existence of various agencies and units involved in the country's energy matter. These agencies and units were not brought under the command of a single organizational chain, thus resulting in difficulties with management and coordination. Secondly, the government lacked a permanent and well-organized system that would not only oversee the planning and development of national energy programs, but also regulate and coordinate roles of the public and private sectors of the economy. Such a system would facilitate the continuity and effectiveness of energy planning and administration.

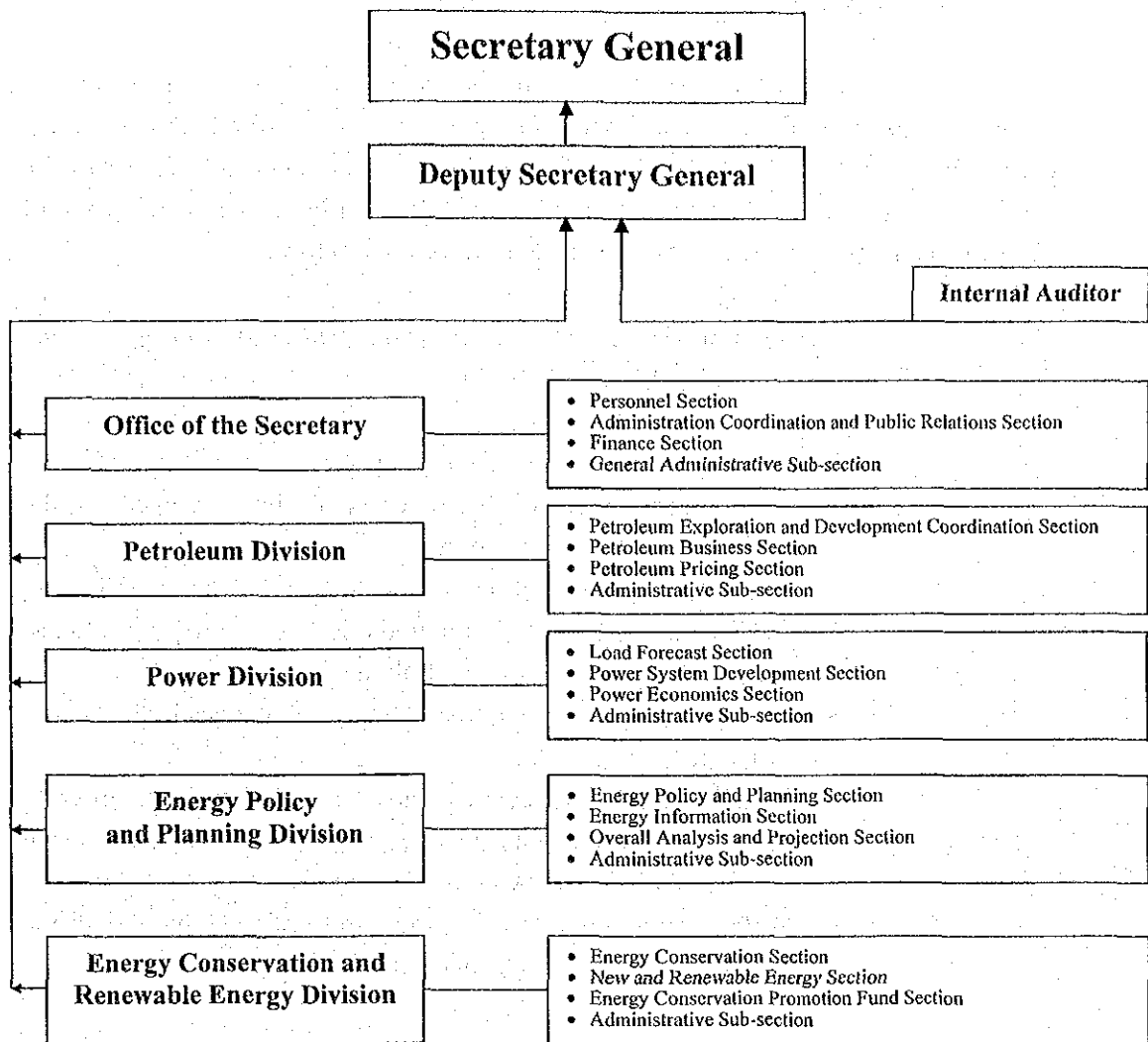
The initial concept of modernizing the energy administration began with the conceptualization of an energy bureau, which emerged from a cabinet decision made on November 20, 1984. This cabinet decision authorized the Public Service Reform Committee to assume a detailed study. Unfortunately, the study was not brought to the attention of the cabinet for further consideration and approval.

During the era of Prime Minister General Prem Tinasulanonda, this same matter was urgently brought into consideration by the Council of Economic Ministers on September 8, 1986. A decision was made on the formation of the National Energy Policy Council (NEPC), which would function under the chairmanship of the Prime Minister himself. The council further decided to establish the National Energy Policy Office (NEPO), which would be referred to as the Secretariat to the NEPC and would function under the supervision of the Secretariat of the Prime Minister. This office would develop systematic energy policies or measures. Subsequently, Prime Minister General Prem Tinasulanonda signed the Office of the Prime Minister's Regulation on the National Energy Administration of 1986, leading to the appointment of the National Energy Policy Council on October 16, 1986.

The cabinet under Prime Minister General Chatichai Choonhavan enacted a cabinet resolution on June 6, 1989, that favored the NEPC resolution to upgrade the status of NEPO to a departmental level under the supervision of the Office of the Prime Minister and to function as Secretariat to the NEPC. The Minister to the Prime Minister's Office, in coordination with some concerned government units, was assigned the responsibility of drafting the organizational structure of NEPO. It was also assigned the task of legislating and legalizing NEPO's organizational structure and presenting the final draft of the proposed structure to the NEPC for approval.

In January 1991, during the Chatichai Administration, a policy to establish an energy ministry was being laid down in accordance with the Prime Minister's policy statement delivered to Parliament. The then Minister to the Prime Minister's Office (Mr. Korn Dabbaransi), who was responsible for the country's energy affairs, prepared a draft proposal on the formation of this government agency. In this draft proposal, all government and state enterprise units concerned with the energy affairs were to be brought under the administration of this to be established ministry, but the matter had never been enacted by this administration.

After the appointment of a new administration under the leadership of Prime Minister Anand Panyarachun, the status of NEPO is a permanent department under the supervision of the Office of the Prime Minister. NEPO would be responsible for energy policy work while the National Energy Office under the Ministry of Science, Technology and Environment would be reassigned to oversee the actual policy operations. Currently NEPO has been divided into four divisions with several sections as presented in Figure 4-7.



Source : NEPO

**Figure 4-7 NEPO's Organization Chart**

**(b) Principal Roles and Responsibilities**

The main responsibilities of the NEPO are stipulated under the following legislation: the National Energy Policy Council Act, B.E. 2535 (1992), the Royal Decree on the Solution and Prevention of Fuel Oil Shortage, B.E. 2516 (1973), and the Energy Conservation Promotion Act, B.E. 2535 (1992). The legal scope of authority and responsibilities of NEPO are summarized as follows:

◆ **Responsibilities Stated Under the National Energy Policy Council Act, B.E. 2535 (1992)**

- Study and analyze energy policies, management and development plans of the country to be presented to the National Energy Policy Council.
- Monitor, evaluate, and act as the focal point for coordinating and supporting the implementation of energy policies, management and development plans of the country.
- Compile information and keep abreast of changes in the energy situation.
- Analyze trends and evaluate any possible effect in order to make recommendations on energy policies, management and development plans, as well as disseminate energy statistics.
- Perform any other tasks as may be assigned by the Prime Minister or the National Energy Policy Council.

Other than performing duties as outlined by the National Energy Policy Council Act as Secretariat to the NEPC, NEPO also serves as Secretary to EPC, which was established under the above Act. The Minister to the Prime Minister's Office, as assigned by the Prime Minister, acts as chairman, and chiefs of concerned government agencies as committee members. The EPC will be in charge of screening work related to energy management and development prior to submission to the NEPC for consideration.

◆ **Responsibilities under the Royal Decree on the Solution and Prevention of Fuel Oil Shortage, B.E. 2516 (1973)**

This legislation provides the Prime Minister with extensive authority in designating measures to solve and prevent shortage of oil. As the central agency responsible for energy management and development and reporting directly to the Prime Minister, NEPO would have, therefore, the direct responsibility to monitor and

co-ordinate implementations according to the legislation. Thus far, the legislation has served as the enabling law for the setting of oil prices and for the establishment of the Oil Fund. Hereafter, NEPO would have direct responsibility in managing the Oil Fund and in formulating policies and measures related to oil prices and the Oil Fund.

◆ **Responsibilities under the Energy Conservation Promotion Act, B.E. 2535 (1992)**

Authorities and responsibilities of the National Energy Policy Council relating to energy conservation are prescribed in this Act. NEPO, as Secretariat to the NEPC, is to recommend and coordinate tasks conforming to this Act, in particular, recommendations of policies, projects and measures on energy conservation as well as the management of the Energy Conservation Promotion Fund (ENCON Fund). The ENCON Fund was established to provide incentives to promote more efficient and economical utilization of energy; to enhance the production of high energy-efficiency appliances, machines and equipment; to promote studies, research and development related to energy conservation and mitigation of impacts on the environment resulting from the development and utilization of energy; and to promote production and utilization of renewable and new energy. In order that the main tasks of NEPO under the above legislations could be efficiently carried out, a royal decree was enacted to divide the NEPO organizational structure into one office and four divisions as shown in Figure 4-7.

(c) **Association with Other Government Agencies**

Since energy policy implementation calls for concerted efforts nationwide, to implement energy policies thus intensively involves both directly and indirectly various government agencies, state enterprises and the private sector. NEPO, as the central agency, will coordinate the implementation of main tasks to ensure their compliance with the policy framework set forth by the NEPC. Such agencies include:

- ◆ Ministry of Industry : Department of Mineral Resources and Thai Industrial Standards Institute.
- ◆ Ministry of Science, Technology and Environment : Department of Energy Development and Promotion, Office of Environmental Policy and Planning, and Office of Atomic Energy for Peace.

- ◆ Ministry of Interior : Public Works Department.
- ◆ Ministry of Commerce : Department of Commercial Registration, Department of Internal Trade, Department of Foreign Trade, Department of Business Economics.
- ◆ Ministry of Defense : Defense Energy Department, Royal Thai Navy.
- ◆ Ministry of Finance : the Customs Department, the Excise Department, the Revenue Department, the Comptroller – General’s Department, and the Fiscal Policy Office.
- ◆ Office of the Prime Minister : Office of the National Economic and Social Development Board (NESDB), Office of the Board of Investment, Office of the Consumer Protection Board, Office of the Council of State, and the National Police Bureau.
- ◆ Ministry of Transport and Communications : the Harbour Department, the Department of Land Transport, the Department of Highways.
- ◆ Ministry of Foreign Affairs : Department of Treaties and Legal Affairs.
- ◆ State Enterprises : the Petroleum Authority of Thailand, the Electricity Generating Authority of Thailand, the Metropolitan Electricity Authority, the Provincial Electricity Authority, and Bang Chak Petroleum Public Co. Ltd.
- ◆ Private Sector Organizations and Institutions : These will include academic and research institutions, oil corporations, electricity and energy producers, importers and exporters of energy and private enterprises related to energy and energy consumption.

### 4.3.3 Administrative Regulation of EGAT

The section 4.2.1 of this chapter discusses EGAT on the structural framework for power supply which emphasized the EGAT's role in the field of power supply for the country. In this section, will focus its roles on administrative regulation of regulatory framework for the power sector.

The three state electric utilities-EGAT, MEA, PEA are regulated through the respective institutional acts; the EGAT Act, MEA Act and PEA Act. These charters define their activities and functions and also their relationship with their respective ministries through a set of administrative regulations.

According to the Amended EGAT Act of 1992, the assigned minister under the Office of the Prime Minister, which provides general supervision of EGAT's activities, is responsible for the administrative regulation of EGAT. The minister will instruct EGAT to give factual statements and comments, submit reports, or stop any action not in accordance with government policies or the Council of Ministers' resolutions. He will also ensure that EGAT acts in conformity to such policies or resolutions, and has the power to order an investigation of the management. The EGAT Act states that EGAT has to abide by the following:

- ◆ In case EGAT has to submit any matter to the Council of Ministers, the matter is to be submitted by the EGAT board to the minister for presentation to the Council of Ministers.
- ◆ EGAT has to establish bank accounts according to the rules laid down by the EGAT board with the approval of the Council of Ministers.
- ◆ EGAT has to obtain approval from the Council of Ministers before undertaking:
  - to invest in the expansion of existing projects or for initiation of new projects;
  - increase its capital by revaluation;
  - decrease capital;
  - borrow funds exceeding THB 40 m;
  - issue bonds or other notes for the purpose of investment;
  - dispose of immovable properties with a value over THB 10 m.
- ◆ EGAT has to prepare an annual budget classified into capital account and operating account. The capital account is to be presented to the Council of Ministers for consideration and approval, while the operating account is to be presented to the Council of Ministers for information.

- ◆ The revenue derived from EGAT's operations will accrue to it to cover expenses and the annual revenue remaining after deducting expenses is to be turned over to the state as its revenue. In case the revenue is insufficient to cover expenses excluding of the reserve funds, and EGAT is unable to obtain funds from other sources, the deficiency will be covered by the state.
- ◆ EGAT has to prepare an annual report for submission to the minister. Such a report will include the results of EGAT's operations in the previous year, together with a statement of policy from its board, of its projects as well as future work plans.
- ◆ EGAT will set up and maintain an accounting system proper to the business of a public utility, with classification of major works. It is to keep an account of its receipts and payments, assets and liabilities, which represent actual transactions, according to the appropriate categories of work, together with supporting information. All this is subject to an internal audit at regular intervals.
- ◆ EGAT will undertake to prepare its balance sheet, operating account, and profit and loss account within 90 days from the end of the accounting year. Every year the board is to appoint one or more auditors to audit and certify the accounts of each year of EGAT.
- ◆ The appointment of the chairman, directors, officers, employees or other persons representing EGAT or persons having any direct or indirect interest in the business of EGAT as auditors is forbidden.
- ◆ The auditor has a power to examine all the books of account and documents of EGAT, and for this purpose he/she will also have power to question the chairman, director, officers, employees and other persons who represent EGAT.

The other two state electric utilities, the MEA and PEA, are also regulated in a similar manner. However, they are under the Ministry of Interior.



#### 4.4 Electricity Pricing and Regulation

The NEPC is also responsible for electricity pricing regulation in Thailand through the Subcommittee for the Consideration of Electricity Tariff which is under the Committee for Consideration of Energy Policy.

Electricity pricing in Thailand, like in most countries, tries to fulfil the three basic objectives of any pricing policy: the economic, financial and equity (or social) objectives. Because there are inherent conflicts in these three objectives, the challenge of an electricity pricing policy is to strike a balance between them. The economic objective is reflected in the pricing of electricity based on marginal costs at different voltage levels and by Time of Day (TOD) and Time of Use (TOU). Although the concept of marginal cost pricing has been recognized, it has not been fully implemented for political reasons. For example, before 1997, the bulk supply tariff (the rate EGAT charges to MEA, PEA and direct customers) had only a simple flat rate energy charge (Baht/kWh). However, the rapid growth of electricity demand and the consequent need of large scale investment prompted a reconsideration of this concept. Now, the structure of both the bulk supply tariff and retail tariff (the rate MEA and PEA charge to residential, commercial, industrial and other customers) reflects marginal cost.

The financial objective is met by setting electricity tariffs at levels which allow electric utilities to earn sufficient returns on their investment and have a healthy financial position. The current financial criteria for Thailand's electric utilities are an 8% rate of return on re-valued assets and a 25% self-financing ratio. The financial objective is also maintained through the automatic adjustment mechanism (AAM or the Ft formula, see Appendix 3). The AAM allows electric utilities to recover the increases in certain cost items without obtaining prior approval.

The equity or social objective is essential though from an economic point of view, it introduces some distortions into the structure and level of pricing. This is reflected, first of all, in the "unified" tariff applied across the country, i.e. electricity consumers in and outside of Bangkok (or those served by the MEA and PEA together) have the same tariff schedule. To maintain this tariff structure, EGAT charges the PEA a much lower rate than the MEA, even though it is more expensive to supply electricity to PEA's franchise areas. Thus, there is a "cross-subsidy" between the MEA and PEA. In addition, cross-subsidy is present in the rates charged between retail customers. Thus, residential customers consuming less than 150 kWh per month are charged lower rates than the other types of customers (this is the so-called "lifeline" rate).

#### 4.4.1 Bulk Supply Tariff

Prior to January 1997 the electricity tariff was determined on a flat rate basis. EGAT had to sell electricity to the PEA at a wholesale rate, which was lower than the rate of EGAT sale to the MEA. This was due to the fact that the uniform retail tariff is applied nationwide, in both MEA and PEA distribution territories, whereas the distribution cost for consumers in the PEA areas is higher; therefore, a cross-subsidy from the MEA to the PEA is required via such bulk supply tariffs.

According to the meeting on 5 November 1996, the Energy Policy Committee (EPC) approved the modification of the bulk supply tariff from the initial flat rate to the Time of Use (TOU) rate. Also, a more explicit approach regarding subsidization for the PEA was established, i.e. the subsidization would be in the form of a "surcharge" onto the tariff that EGAT imposed on the MEA and a "deduction" from the tariff that EGAT imposed on the PEA. In the case where the value added tax (VAT) is excluded, the surcharge and the deduction (Table 4-4a) would be 0.2273 and 0.1890 Baht/kWh respectively. In this connection, the National Energy Policy Office (NEPO) and the three power utilities have been assigned to further review the surcharge (deduction) rates to ensure that they would correspond with the current average bulk supply tariff.

**Table 4-4a Bulk Supply Tariff Structure before October 1, 2000  
(without VAT and F<sub>t</sub>)**

Voltage Level (kV)	Energy Charge (Baht/kWh)		
	Monday – Saturday		Sunday
	Peak (09.00-22.00 hrs.)	Off-Peak (22.00-09.00 hrs.)	Off-Peak (0.00-24.00 hrs.)
230	1.5349	0.6671	0.6062
115	1.5697	0.6697	0.6088
69	1.6292	0.6769	0.6153
33	1.7720	0.6857	0.6232
22	1.7751	0.6864	0.6238

The Energy Policy Committee (EPC) has approved the surcharge & deduction adjustment for three times as follows:

- (1) In the meeting on 22 May 1997, a resolution was passed on the adjustment of the surcharge & deduction of the bulk supply tariff (BST) as from January 1997 so that the surcharge & deduction of the BST would correspond with the former average BST. Hence, the surcharge that EGAT imposed on the MEA and the deduction that EGAT offered to the PEA, exclusive of VAT, were 0.2507 and 0.1461 Baht/kWh respectively.
- (2) In the meeting on 8 October 1997, a resolution was passed on the adjustment of the surcharge & deduction of the BST as from July 1997, resulting in the surcharge that EGAT imposed on the MEA and the deduction that EGAT offered to the PEA, exclusive of VAT, at the rates of 0.2577 and 0.1205 Baht/kWh respectively. This was due to the economic depression that had caused a decrease in the domestic power demand and hence the revenues of the power utilities were much lower than what was initially forecasted. EGAT, therefore, requested a review of the BST, using the actual Rate of Return on Revalued Asset (ROR) as a base in considering the financial status of the three utilities in order to adjust the new average BST. However, no adjustment was made for the BST using the TOU rate.
- (3) In the meeting on 30 March 2000, a resolution was passed on the adjustment of the surcharge & deduction of the BST with retroactive effect as from October 1998 until the new structure of electricity tariffs is enforced. According to this adjustment, the surcharge that EGAT imposed on the MEA and the deduction that EGAT offered to the PEA, exclusive of VAT (Table 4-4b), are at the rates of 0.2277 and 0.1005 Baht/kWh respectively. This is to maintain the financial status of the power utilities to be in line with the established criteria after the revision of the automatic tariff adjustment mechanism ( $F_t$ ), by removing the impact of the change of the BST to the TOU rate from the  $F_t$  calculation, which has affected the financial status of the power utilities.

**Table 4-4b Surcharge & Deduction in the Bulk Supply Tariff up to September 2000 (without VAT)**

Description	Period of Development		
	Jan 97-Jun 97	Jul 97-Sep 98	Oct 98-Sept 2000
EGAT sale to MEA (surcharge)	0.2507	0.2577	0.2277
EGAT sale to PEA (deduction)	0.1461	0.1205	0.1005

However, the cabinet has approved the new structure of electricity tariffs on BST for EGAT sale to MEA, PEA and to be enforced since October 1, 2000 as followings:

- (1) Energy Charge comprises generation charge and transmission system charge are divided into peak and off-peak period as presented in Table 4-4c.

**Table 4-4c Bulk Supply Tariff beginning October 1, 2001**

(Unit B/kWh excluding VAT)

Voltage (kV)	Generation Charge		Transmission System Charge		Total Charge	
	Peak	Off-peak	Peak	Off-peak	Peak	Off-peak
230	1.8758	1.1514	0.2810	-	2.1568	1.1514
69, 115	1.8803	1.1539	0.5042	-	2.3845	1.1539
at end of 69, 115 transmission line*	1.9405	1.1753	0.8717	-	2.8122	1.1753
11, 22, 33	1.9450	1.1765	1.0439	-	2.9889	1.1765

Source : EGAT

Note : 1. \* Including terminal substation 115 : 115 kV and 69 : 69 kV  
 2. Peak period : 09.00 - 22.00 h, Monday - Friday  
 3. Off-peak period : 22.00 - 09.00 h, Monday - Friday  
 00.00 - 24.00 h, Saturday - Sunday and normal holidays  
 (excluding substituting holidays)

**(2) Connection Charge**

- ◆ ≥ 69 kV                      50,000              B/MVA/year
- ◆ 11-33 kV                    100,000            B/MVA/year

Charges for new purchase-sale point will be in accordance with installed transformer capacity.

**(3) Power Factor Charge**

Power factor charge rate will be 5 B/kVAr/month, excessive kVAr when power factor lagging lower than 0.875 will be charged from January 2002 onwards.

**(4) Conditions Relating to Electricity Tariffs**

- (a) electric energy cost per unit (kWh) can be adjusted when costs is not in the control of utility, Ft (see Appendix 3) adjustment charge will be stated on electricity charges billed;
- (b) the above electricity charge billed do not include Value Added Tax (VAT).

**4.4.2 Retail Tariff**

The new electricity tariff structure of MEA and PEA, which has been approved to effect since October 2000, are divided into seven categories (or schedules) for the purpose of charging as follows.

**(1) Residential**

- ◆ Applicable to household and other dwelling places, temples and other religion places of worship, including its compound, through a single Watt-hour meter.

**(2) Small General Services**

- ◆ Applicable to a business enterprise, business enterprise cum residence industrial and state enterprise or the alike, including its compound, with a maximum 15-minute integrated demand of less than 30 kW through a single Watt-hour meter.

**(3) Medium and Large General Services, and Specific Business Services**

- ◆ Applicable to businesses, industrials, and state enterprises, as well as the foreign entities and international organizations including its compound, with a maximum 15-minute integrated demand from 30 to 999 kilowatts. Of which the average energy consumption for three (3) consecutive months through a single Watt-hour meter does not exceed 250,000 kWh per month.

**(4) Large General Service**

- ◆ Applicable to businesses, industrials, government institutions, state enterprises foreign entities and international organizations including its compound, with a maximum 15-minute integrated demand over 1,000 kilowatt, or the energy consumption for three (3) average consecutive months through a single Watt-hour meter exceeds 250,000 kWh per month.

**(5) Specific Business Service**

- ◆ Applicable to any hotel and other businesses providing lodging accommodation to their customers including its compound with a maximum 15-minute integrated demand of 30 kilowatt and over, through a single Watt-hour demand meter.

**(6) Government Institutions and Non-Profit Organizations**

- ◆ Applicable to any government institutions and agencies under the large governing the Local Administration Regulation, including its compound with a maximum 15-minute integrated demand of less than 1,000 kilowatt, and with the average consumption for 3 months not exceeding 250,000 kWh per month. In addition to the non-governmental organizations that provide non-charge services including places conducting religious rites and their compounds through a single Watt-hour meter, not applicable to the state enterprises, embassies, foreign entities and office buildings of international organizations.

**(7) Water Pumping for Agricultural Pumping Purposes**

- ◆ Applicable to electricity consumption for the use of water pumps for agricultural purposes of a government agricultural agency, officially-recognized farmer groups agricultural co-operatives through a single Watt-hour meter.

**Followings are detail of tariff structure of each category:**

**Customers Under Schedule (1) : Residential**

- Normal tariff with a consumption energy not exceeding 150 kWh per month is billed only the energy charge (average ₱1.8305 per kWh).
- Normal tariff with a consumption energy exceeding 150 kWh per month is billed energy charge and service charge (₱ 40.90 per month).
- Time of Use (TOU), the customer who intends apply TOU tariff is required to notify the MEA in advance and then MEA will arrange installation of a TOU meter as from January 2002 onwards. The energy charge rate:

Voltage System	Energy Charge		Service Charge (₱/month)
	1*	2*	
12 – 24 kV	3.6246	1.1914	228.17
below 12 kV	4.3093	1.2246	57.95
1* On-peak : 09.00 – 22.00 h, Monday - Friday 2* Off-peak : 10.00 – 09.00 h, Monday – Friday, Saturday – Sunday and normal public holiday (excluding substitution holiday) from 0.00 – 24.00 h			

Source : MEA

### Customer Under Schedule (2) : Small General Services

- Normal tariff
  - 12-24 kV energy charge ₱2.4649/kWh, service charge ₱228.17/month
  - below 12 kV :
    - 1 – 150 kWh            ₱1.8047/kWh
    - 151 – 400 kWh        ₱2.7781/kWh
    - 401 up kWh            ₱2.9780/kWh
  - Service Charge ₱40.90/month
- TOU tariff, the customer who intends to apply this tariff is required to notify the MEA in advance and then MEA will arrange installation of a TOU meter as from January 2002 onwards. The energy charge rate is the same as residential's category.

### Customer Under Schedule (3) : Medium General Service

- Normal tariff :

Voltage System	Demand Charge (₱/kWh)	Energy Charge (₱/kWh)
69 kV and over	175.70	1.6660
12 – 24 kV	196.26	1.7034
below 12 kV	221.50	1.7314

Source : MEA

- TOU tariff :

Voltage System	Demand Charge (฿/kWh)		Energy Charge (฿/kWh)		Service Charge (฿/month)
	1*		1*	2*	
69 kV and over	74.14		2.6136	1.1726	228.17
12 – 24 kV	132.93		2.6950	1.1914	228.17
below 12 kV	210.00		2.8408	1.2246	228.17
1* On-peak : 09.00 – 22.00 h, Monday – Friday 2* Off-peak : 22.00 – 09.00 h, Monday – Friday, Saturday – Sunday and normal public holiday (excluding substitution holiday) from 0.00 – 24.00 h					

Source : MEA

#### Customer Under Schedule (4) : Large General Service

- Time of Day Tariff (TOD)

Voltage System	Demand Charge (฿/kWh)			Energy Charge (฿/kWh)
	1*	2*	3*	
69 kV and over	224.30	29.91	0	1.6660
12 – 24 kV	285.05	58.88	0	1.7034
below 12 kV	332.71	68.22	0	1.7314
1* On-peak : everyday 18.30 – 21.30 h 2* Partial-peak : everyday 08.00 – 18.30 h (only the amount of maximum demand that is out of on-peak period will be charged at this rate) 3* Off-peak : everyday 21.30 – 08.00 h (no demand charge)				

Source : MEA

- TOU tariff :

Same as TOU's customer under schedule (3).



**Customer Under Schedule (5) : Specific Business**

- Normal tariff

Voltage System	Demand Charge (₱/kWh)	Energy Charge (₱/kWh)
69 kV and over	220.56	1.6660
12 – 24 kV	256.07	1.7034
below 12 kV	276.64	1.7314

Source : MEA

- TOU tariff

Same as TOU's customer under schedule (3).

**Customer Under Schedule (6) : Government Institutions and Non-Profit Organization**

- Normal tariff

Voltage System	Energy Charge (₱/kWh)	Service Charge (₱/month)
69 kV and over	1.9712	228.17
12 – 24 kV	2.1412	228.17
below 12 kV:		
1 – 10 kWh	1.3576	-
over 10 kWh	2.4482	-

Source : MEA

- TOU tariff :

Same as TOU's customer under schedule (3).

**Customer Under Schedule (7) : Pumping of Water for Agricultural Purposes**

- Normal tariff

Interval	Energy Charge (₱/kWh)
1 – 100 kWh	0.6452
101 – up kWh	1.7968

Source : MEA

- TOU tariff :

Voltage System	Demand Charge	Energy Charge		Service Charge
	(฿/kWh)	(฿/kWh)		
	1*	1*	2*	
12 – 24 kV	132.93	2.6950	1.1914	228.17
below 12 kV	210.00	2.8408	1.2246	228.17
1* On-peak : 09.00 – 22.00 h, Monday – Friday 2* Off-peak : 22.00 – 09.00 h, Monday – Friday, Saturday – Sunday and normal public holiday (excluding substitution holiday) from 0.00 – 24.00 h				

Source : MEA

The new electricity tariff structure of MEA and PEA is some different of the years from 1998-2000 as follows:

### Electricity Tariffs (1998-2000)

#### Schedule 1 : Residential

##### 1.1 Consumption not exceeding 150 kWh per month

###### Energy Charge :

5 kWh (1 <sup>st</sup> – 5 <sup>th</sup> )	Baht	4.9600	
10 kWh (6 <sup>th</sup> – 15 <sup>th</sup> )	Baht	0.7124	per kWh
10 kWh (16 <sup>th</sup> – 25 <sup>th</sup> )	Baht	0.8993	per kWh
10 kWh (26 <sup>th</sup> – 35 <sup>th</sup> )	Baht	1.1516	per kWh
65 kWh (36 <sup>th</sup> – 100 <sup>th</sup> )	Baht	1.5348	per kWh
50 kWh (101 <sup>st</sup> – 150 <sup>th</sup> )	Baht	1.6282	per kWh
250 kWh (151 <sup>st</sup> – 400 <sup>th</sup> )	Baht	2.1329	per kWh
400 kWh (401 <sup>st</sup> and above)	Baht	2.4226	per kWh

**Minimum Charge : Baht 4.67 per month**

##### 1.2 Consumption exceeding 150 kWh per month

###### Energy Charge :

35 kWh (1 <sup>st</sup> – 35 <sup>th</sup> )	Baht	85.2100	
115 kWh (36 <sup>th</sup> – 150 <sup>th</sup> )	Baht	1.1236	per kWh
250 kWh (151 <sup>st</sup> – 400 <sup>th</sup> )	Baht	2.1329	per kWh
400 kWh (401 <sup>st</sup> and above)	Baht	2.4226	per kWh

**Minimum Charge : Baht 83.18 per month**

## Schedule 2 : Small General Service

### Energy Charge :

35 kWh (1 <sup>st</sup> – 35 <sup>th</sup> )	Baht	89.8900		
115 kWh (36 <sup>th</sup> – 150 <sup>th</sup> )	Baht	1.1236	per kWh	
250 kWh (151 <sup>st</sup> – 400 <sup>th</sup> )	Baht	2.1329	per kWh	
400 kWh (401 <sup>st</sup> and above)	Baht	2.4226	per kWh	

**Minimum Charge : Baht 87.85 per month**

## Schedule 3 : Medium General Service

### 3.1 Normal Tariff

	Demand Charge (Baht/kW)	Energy Charge (Baht/kWh)
3.1.1 69 kV and Over	175.70	1.0208
3.1.2 12-24 kV	196.26	1.0582
3.1.3 Below 12 kV	221.50	1.0862

### Billing Demand :

The billing demand is defined as the 15-minute maximum integrated demand over the monthly billing period measured to the nearest whole kilowatt discarding the fraction of 0.5 kW.

### 3.2 Time of Use Tariff (TOU Tariff)

	Demand Charge (Baht/kW)	Energy Charge (Baht/kWh)	Service Charge (Baht/Month)
	1*	1* 2* 3*	
3.2.1 115 kV and Over	102.80	1.5349 0.6671 0.6062	400.00
3.2.2 69 kV	158.88	1.6292 0.6769 0.6153	400.00
3.2.2 12-24 kV	200.93	1.7736 0.6861 0.6236	850.00
3.2.3 Below 12 kV	214.95	1.8891 0.7283 0.6616	850.00
1*	Monday – Saturday	09:00 AM – 10:00 PM (On Peak)	
2*	Monday – Saturday	10:00 PM – 09:00 PM (Off Peak)	
3*	Sunday	00:00 AM – 12:00 PM (Off Peak)	

**Billing Demand :**

Same as 3.1

**Minimum Charge :**

The minimum charge in any monthly billing period shall not be lower than 70% of the maximum billing demand charge of the preceding 12 months (ending in the current month).

**Power Factor Charge :**

For a customer with a lagging power factor, if, in any monthly billing period during which the customer's 15-minute maximum kilovar demand exceeds 63% of his 15-minute maximum kilowatt demand, a power factor charge of Baht 14.02 will be made on each kilovar in excess, determined to the nearest whole kilovar, discarding the fraction of 0.5 kVAR.

**Schedule 4 : Large General Service****4.1 Time of Day Tariff (TOD Tariff)**

	Demand Charge (Baht/kW)			Energy Charge (Baht/kWh)
	1*	2*	3*	
4.1.1 69 kV and Over	224.30	29.91	0	1.0208
4.1.2 12-24 kV	285.05	58.88	0	1.0582
4.1.3 Below 12 kV	332.71	68.22	0	1.0862
1*	Everyday 06:30 PM – 09:30 PM (On Peak)			
2*	Everyday 08:00 AM – 06:30 PM (Partial Peak) (Only the amount of maximum demand that is out of On Peak period will be charged at this tariff)			
3*	Everyday 09:30 PM – 08:00 AM (Off Peak) (No demand charge)			

**Billing Demand :**

Same as 3.1

## 4.2 Time of Use Tariff (TOU Tariff)

		Demand Charge		Energy Charge		Service Charge
		(Baht/kW)		(Baht/kWh)		(Baht/Month)
		1*	1*	2*	3*	
4.2.1	115 kV and Over	102.80	1.5349	0.6671	0.6062	400.00
4.2.2	69 kV	158.88	1.6292	0.6769	0.6153	400.00
4.2.2	12-24 kV	200.93	1.7736	0.6861	0.6236	850.00
4.2.3	Below 12 kV	214.95	1.8891	0.7283	0.6616	850.00

1\*, 2\*, 3\* same as 3.2

### Billing Demand :

Same as 3.1

### Minimum Charge :

Same as 3.2

### Power Factor Charge :

Same as 3.2

## Schedule 5 : Specific Business

### 5.1 Normal Tariff

		Demand Charge	Energy Charge
		(Baht/kW)	(Baht/kWh)
5.1.1	69 kV and Over	220.56	1.0208
5.1.2	12-24 kV	256.07	1.0582
5.1.3	Below 12 kV	276.64	1.0862

### Billing Demand :

Same as 3.1

## 5.2 Time of Use Tariff (TOU Tariff)

		Demand Charge		Energy Charge		Service Charge
		(Baht/kW)		(Baht/kWh)		(Baht/Month)
		1*	1*	2*	3*	
5.2.1	115 kV and Over	102.80	1.5349	0.6671	0.6062	400.00
5.2.2	69 kV	158.88	1.6292	0.6769	0.6153	400.00
5.2.2	12-24 kV	200.93	1.7736	0.6861	0.6236	850.00
5.2.3	Below 12 kV	214.95	1.8891	0.7283	0.6616	850.00

1\*, 2\*, 3\* same as 3.2

### Billing Demand :

Same as 3.1

### Minimum Charge :

Same as 3.2

### Power Factor Charge :

Same as 3.2

## Schedule 6 : Government Institutions and Non-Profit Organizations

### 6.1 69 kV and Over

#### Energy Charge :

First	10,000 kWh	(1 <sup>st</sup> – 10,000 <sup>th</sup> ):	Baht	14,413.31
Over	10,000 kWh	(1001 <sup>st</sup> and above):	Baht	1.4413 per kWh

### 6.2 12-24 kV

#### Energy Charge :

First	300 kWh	(1 <sup>st</sup> – 300 <sup>th</sup> ):	Baht	480.06
Over	300 kWh	(301 <sup>st</sup> and above):	Baht	1.6002 per kWh

### 6.3 Below 12 kV

#### Energy Charge :

First	10 kWh	(1 <sup>st</sup> – 10 <sup>th</sup> ):	Baht	18.06
Over	10 kWh	(11 <sup>th</sup> and above):	Baht	1.80582 per kWh

**Minimum Charge :**

69 kV and Over	:	Baht	13,831.78	per month
12-24 kV	:	Baht	462.62	per month
Below 12 kV	:	Baht	17.48	per month

**Schedule 7 : Pumping of Water for Agricultural Purposes**

**Energy Charge :**

First	100 kWh (1 <sup>st</sup> – 100 <sup>th</sup> )	:	Baht	115.16
Over	100 kWh (101 <sup>st</sup> and above)	:	Baht	1.1516 per kWh

**Minimum Charge : Baht 109.35 per month**

#### 4.4.3 Automatic Adjustment Mechanism

The development of the power tariff structures as mentioned in Section 4.4.2 is based on the assumptions of fuel prices, inflation rates or consumer price index (CPI), currency exchange rates, and efficiency improvement of transmission, distribution and retail businesses. Therefore, in order to have the actual costs reflected to power tariffs and to reduce impact of the fuel price volatility on the power utilities' financial status, the Automatic Adjustment Mechanism (or  $F_1$ ) has been introduced. In this system, the monthly tariff collected from consumers will comprise two parts, i.e. the base tariff as detailed in Section 4.4.2 and the tariff derived from the  $F_1$  formula (see Appendix 3).

On 29 January 1991 the cabinet passed a resolution approving the Automatic Adjustment Mechanism (AAM) in order to have the actual costs reflected to the tariffs and to reduce impact of the fuel price volatility on the power utilities' financial status. Thus, the power utilities can adjust electricity tariffs to correspond with the changing actual costs which are beyond control of the utilities. In this connection, there have been several revisions of the AAM to be more appropriate. The key elements for the current determination of  $F_1$  are the following:

- (1) The charge of fuel prices which is beyond control of EGAT (i.e. natural gas, fuel oil, diesel, and imported coal) and power purchasing prices that EGAT has contracted with private power producers;
- (2) The change in revenue from the actual total sale of electricity and the actual retail prices which differ from those forecasted and used as the base for determining the electric power tariff structure;
- (3) The change in the investment capital for the operation of the transmission and distribution systems and the customer service business due to inflation rates and the total sale which differ from the assumptions used in estimating the power utilities' financial status;
- (4) The change in foreign exchange rates, which affects the power utilities' liability burden;
- (5) Expenditures on the Demand Side Management (DSM).



The three power utilities has applied the calculation of electricity charges according to the Automatic Adjustment Mechanism (Ft) since September 1992, including the derived Ft into the tariff calculated under the normal tariff structure; the Ft would be adjusted on a monthly basis. Subsequently, a request was received from the Federation of Thai Industries to reduce the frequency of the Ft adjustment. The matter was, therefore, resolved by using a four-month averaged value of Ft. The Ft value used for the billing up to November 2000 was 64.52 Satang/kWh. Statistic of Ft during September 1992 – December 2001 are presented in Table 4-5, and detail of Ft calculation formula is attached in Appendix 3.

**Table 4-5 Fuel Adjustment Clause (Ft)**

Unit : Stang/kWh

Month	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
January	-	8.39	6.91	7.50	18.10	18.28	42.40	50.71	56.32	0.00 *
February	-	8.39	6.91	7.50	18.10	18.28	42.40	50.71	56.32	24.44
March	-	8.39	3.56	14.85	18.10	26.73	42.40	50.71	56.32	24.44
April	-	5.32	0.36	14.85	22.87	26.73	50.45	32.61	61.52	24.44
May	-	5.32	9.53	14.85	27.84	26.73	50.45	32.61	61.52	24.44
June	-	5.32	2.80	17.35	22.50	26.73	50.45	32.61	61.52	27.13
July	-	3.24	2.80	24.70	25.82	26.73	50.45	32.61	61.52	27.13
August	-	-1.86	-0.53	19.95	25.82	26.73	55.77	37.92	61.52	27.13
September	6.17	-1.86	7.50	23.82	25.82	26.73	55.77	37.92	61.52	27.13
October	6.17	-1.86	7.50	18.10	20.42	26.73	55.77	37.92	61.52	22.77
November	6.17	-1.86	7.50	18.10	25.60	42.40	55.77	37.92	61.52	22.77
December	6.17	-1.86	7.50	18.10	25.60	42.40	50.71	56.32	0.00 *	22.77
<b>Average</b>	<b>6.17</b>	<b>2.92</b>	<b>5.20</b>	<b>16.64</b>	<b>23.05</b>	<b>27.93</b>	<b>50.23</b>	<b>40.88</b>	<b>59.29</b>	<b>22.88</b>

Source : NEPO

\* New tariff structure introduced (Ft cost for each period takes 4 month)

## Chapter 5

### EGAT Power Development Plan

#### 5.1 Introduction

The EGAT Power Development Plan (PDP) is the "least-cost" power development program based on the latest load projection and a set of reliability criteria. The PDP usually covers a study period of 10–15 years. The PDP contains information on the generation projects as well as some major transmission projects and their commissioning schedules. The PDP has to be approved by the Cabinet to become official.

At present, the new PDP (PDP2002) was already approved by the EGAT's Board of Directors. The PDP 2002 is now being submitted to the National Energy Policy Office for review and consideration. Therefore, the PDP2002 remains unofficial at the time of the writing of this report (October 2001), pending an approval by the Cabinet. The latest official PDP is the PDP99-02 which was issued after the PDP99-01. The PDP99-02 was made official just to accommodate the updates of information on the delay of the IPPs which are under construction and the EGAT's Ratchaburi Project. Other parts of the PDP99-02 are essentially the same as the PDP99-01.

The PDP2002 is based on the new Load Forecast which was released by the Load Forecast Sub-committee in February 2001. Not only was the new Load Forecast incorporated in the PDP2001 but a number of new projects were introduced.

#### 5.2 Electricity Load Forecast

Under the current economic conditions, the electricity consumption in the MEA's service area has not increased as rapidly as expected while the demand in the provincial areas under PEA's network has shown a much higher rate of growth than the projections. The combined effect results in a slight increase of the overall demand compared to the previous demand forecast. As a consequence, an upward trend of power demand has been expected.

The Thailand Load Forecast Sub-committee (TLFS) of Thailand has reviewed the economic situation and decided to revise the forecast to reflect the new trend. Basically, the TLFS revised the load forecast with reference to the moderate economic scenario of the GDP forecast (as presented in Section 1.1 of Chapter 1). The GDP elasticity of electricity demand for the 9<sup>th</sup> NESDP is assumed to be 1.45. For the 10<sup>th</sup> NESDP, the elasticity is expected to be 1.33 which is a little lower than the level predicted for the previous 5-year period as it was assumed that the economy of the country will be back to normal.

As a result, the demand during the 9<sup>th</sup> NESDP has been adjusted upward. The demand for the remaining future years until the end of the 11<sup>th</sup> NESDP was kept relatively the same as in the previous forecast. The Thailand Load Forecast Subcommittee issued the new forecast in February 2001. Details of the peak demand and the energy generation for the period of 2001-2016 are shown in Table 5-1. Also included in Table 5-1 are the forecast of EGAT's sales of power to MEA, PEA and the EGAT's direct customers.

During the period of the 8<sup>th</sup> NESDP, the demand for electricity is expected to increase by 2,873 MW, or 3.99 % yearly. In the 9<sup>th</sup> NESDP, the peak demand is forecast to increase by 6,368 MW, with an annual average growth rate of 6.86 %. In the 10<sup>th</sup> NESDP, the demand projection is based on the estimated annual growth rate of 6.28 % which will make the capacity requirement to rise from 22,552 MW to 30,587 MW. For the next five year period of the 11<sup>th</sup> NESDP, the average increase of capacity is projected to be 5.88 % yearly and the capacity will increase from 30,587 MW in FY 2011 to 40,699 MW in FY 2016.

The annual growth rates of the peak demand and the energy generation for the period of 2001-2016 are illustrated in Figure 5-1. It shows a clear trend of decline in the growth rate from around 7 % in FY 2002 to almost stable growth rate of about 6 % in the 11<sup>th</sup> NESDP period (2011-2016). A surge in the growth rate of FY 2009 (mid of 10<sup>th</sup> NESDP) was due to the expected demand by the Sahaviriya Steel Industry Public Company located in Bang Saphan District, Prachuab Kirikhan province.

**Table 5-1 Forecast of EGAT's Generation and Sales**

N E S D P	Fiscal Year	EGAT's Generation		EGAT's Sales							
		MW	GWh	MEA		PEA		Direct Customers		Total	
				MW	GWh	MW	GWh	MW	GWh	MW	GWh
8	2001	16,184	103,496	6,140	34,817	9,263	60,580	337	1,777	15,740	97,174
9	2002	17,388	110,945	6,555	37,037	9,945	65,434	356	1,915	16,856	104,386
	2003	18,587	118,540	6,879	39,078	10,679	70,584	366	1,971	17,924	111,633
	2004	19,913	126,449	7,167	41,129	11,478	76,093	373	2,017	19,018	119,239
	2005	21,222	134,794	7,498	43,097	12,355	82,058	390	2,118	20,243	127,273
	2006	22,552	143,748	7,841	45,132	13,316	88,500	394	2,146	21,551	135,778
10	2007	23,951	152,743	8,230	47,273	14,319	95,215	398	2,171	22,947	144,659
	2008	25,450	162,438	8,629	49,354	15,392	102,453	402	2,197	24,423	154,004
	2009	27,232	173,532	8,936	51,561	16,647	111,292	376	2,032	25,959	164,885
	2010	28,912	184,213	9,314	53,770	17,847	119,407	380	2,058	27,541	175,235
	2011	30,587	194,930	9,695	55,998	19,087	127,711	384	2,083	29,166	185,792
11	2012	32,405	206,660	10,084	58,116	20,433	136,834	388	2,109	30,905	197,059
	2013	34,352	219,134	10,535	60,271	21,884	146,765	392	2,134	32,811	209,170
	2014	36,366	232,106	10,875	62,470	23,404	157,134	396	2,160	34,675	221,764
	2015	38,519	245,948	11,163	64,702	25,031	168,316	400	2,185	36,594	235,203
	2016	40,699	260,262	11,547	66,972	26,725	179,917	405	2,211	38,677	249,100
	Growth Rate (%)										
8	1997-2001	3.99	3.79	1.73	1.47	5.37	6.14	3.06	-3.31	3.81	4.11
9	2002-2006	6.86	6.79	5.01	5.33	7.53	7.88	3.17	3.85	6.49	6.92
10	2007-2011	6.28	6.28	4.34	4.41	7.47	7.61	-0.51	-0.59	6.24	6.47
11	2011-2016	5.88	5.95	3.56	3.64	6.96	7.09	1.07	1.20	5.81	6.04

Source : EGAT

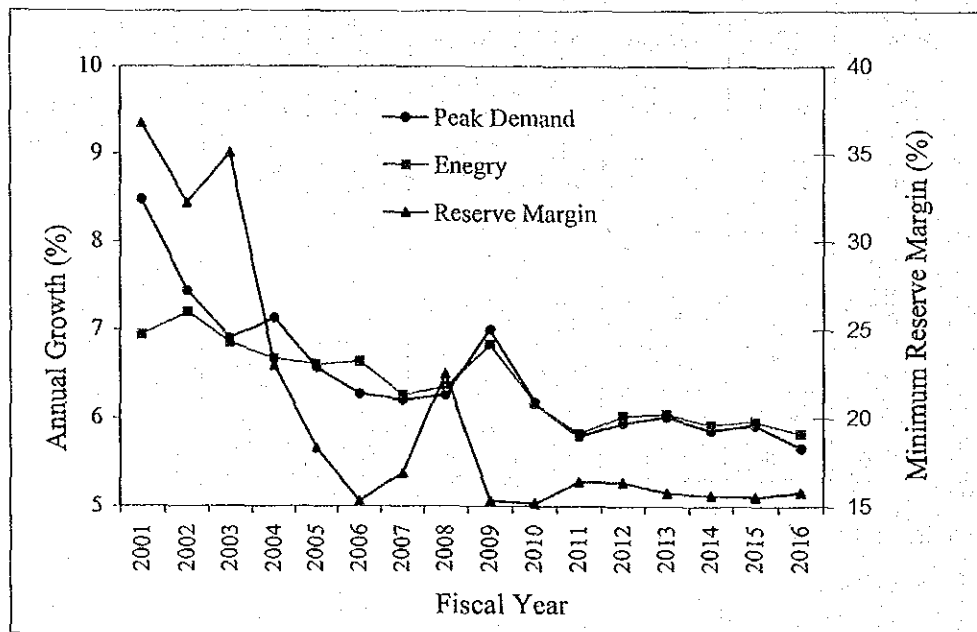
### 5.3 The Generation Expansion Plan

#### 5.3.1 Capacity Additions

The new capacity in the PDP2002 will come from the projects which are currently under construction and the future projects. These capacity additions will be implemented either by EGAT or the private sector including the power purchase from Thailand's neighboring countries such as Lao PDR, Myanmar and China's Yunnan Province. The existing capacity as of August 2001 is 21,939.8 MW. There will be a net capacity increase of 26,331.7 MW between 2001 and the end of FY 2016. Details of capacity additions presented in the unofficial PDP2002 are shown in Table 5-2a and the corresponding yearly minimum reserve margins are given in Table 5-2b.

Based on EGAT's PDP2002, the forecast of the annual minimum reserve margins will be in line with the forecasted annual growth of peak demand and energy generation, as shown in Figure 5-1.

**Figure 5-1 Annual Growth of Peak Demand & Energy Generation and Minimum Reserve Margin**



Source : EGAT

**Table 5-2a Power Development Program of Thailand (2001-2016)**

	Projects	Capacity (MW)	Commissioning Schedule
Committed Projects	Lam Takong Pumped Storage	2x250	Oct 01 – Nov 01
	Ratchaburi Combined Cycle Block # 1	725	Nov 01
	Ratchaburi Combined Cycle Block # 2	725	Dec 01
	HVDC Link with Malaysia	300	Dec 01
	Ratchaburi Combined Cycle Block # 3	725	Apr 02
	IPP (Bowin Power)	2x356.5	Apr 02
	Lan Krabu Gas Turbine	122	Jun 02
	IPP (Eastern Power)	350	Jul 02
	Krabi Thermal	300	Dec 03
	IPP (Gulf Power Generation)	2x367	Oct 04 – Apr 05
	IPP (Union Power Development)	2x700	Oct 05 – Jan 06
	IPP (BLCP Power)	2x673.25	Oct 06 – Feb 07
	<b>Total Committed Capacity</b>	<b>7,940.5 MW</b>	
	Future Candidate Projects	South Bangkok Renovation	2x693
North Bangkok Renovation		625	Jan 07
Power Purchase from Laos		1,903	Sep 07
Power Purchase from Laos		1,380	Mar 08
Bang Pakong Renovation		2x441	Oct 09 – Apr 2010
New Capacity (domestic/foreign)		700	Oct 2009
New Capacity (domestic/foreign)		2,300	Oct 2010
New Capacity (domestic/foreign)		2,800	Oct 2011
New Capacity (domestic/foreign)		2,800	Oct 2013
New Capacity (domestic/foreign)		3,200	Oct 2014
New Capacity (domestic/foreign)		3,500	Oct 2014
Kirithan Pumped Storage		3x220	Oct 2014 – Oct 2015
New Capacity (domestic/foreign)		3,000	Jan 2016
Installed Capacity (As of August 2001)		21,939.8	MW
Capacity Additions		33,076.5	MW
Purchase from SPPs	383.8	MW	
Capacity Retirements	7,128.6	MW	
Net Capacity Increase	26,331.7	MW	
<b>Total Installed Capacity (at the end of 2016)</b>	<b>48,271.5</b>	<b>MW</b>	

Source : EGAT PDP 2002 September 2001 (*Unofficial*)

**Table 5-2b Capacity Additions and Minimum Reserve Margin (2001-2006)**

Fiscal Year	Projects	Capacity (MW)	Installed Capacity at Year End (MW)	Minimum Reserve Margin (%)
2001	Existing Capacity		21,074.00	36.73
2002	Lam Takong Pumped Storage	2x250	25,715.6	32.23
	Ratchaburi Combined Cycle Block # 1	725		
	Ratchaburi Combined Cycle Block # 2	725		
	HVDC Link with Malaysia	300		
	Ratchaburi Combined Cycle Block # 3	725		
	IPP (Bowin Power)	2x356.5		
	Lan Krabu Gas Turbine	122		
	IPP (Eastern Power)	350		
2003	Krabi Thermal	300	26,205.6	35.05
2004			25,529.6	22.97
2005	IPP (Gulf Power Generation)	2x367	26,263.6	18.28
2006	IPP (Union Power Development)	2x700	27,043.6	15.29
2007	IPP (BLCP Power)	2x673.25	30,940.5	16.88
	South Bangkok Renovation # 1	693		
	North Bangkok Renovation	625		
	Power Purchase from Laos	1,903		
2008	Power Purchase from Laos	1,380	32,320.5	22.48
2009	South Bangkok Renovation # 2	693	32,863.5	15.31
2010	Bang Pakong Renovation	2x441	34,445.5	15.16
	New Capacity (domestic/foreign)	700		
2011	New Capacity (domestic/foreign)	2,300	36,745.5	16.38
2012	New Capacity (domestic/foreign)	2,800	38,854.5	16.36
2013	New Capacity (domestic/foreign)	2,800	40,916.5	15.76
2014	New Capacity (domestic/foreign)	3,200	43,258.5	15.61
2015	New Capacity (domestic/foreign)	3,500	45,658.5	15.55
	Kirithan Pumped Storage	3x220		
2016	New Capacity (domestic/foreign)	3,000	48,271.5	15.78

### 5.3.2 Total Installed Capacity

The net installed capacity at the end of fiscal year 2016, according to the unofficial PDP2002, will be 48,271.5 MW. Meanwhile, some 7,128.6 MW of old power plants will be retired from the system. New capacity development will add 33,076.5 MW to the 21,939.8 MW of the existing facilities (as of August 2001). There will also be a purchase of 383.8 MW from the small power producers under the government policy to promote the use of renewable energy for power generation and to enhance the overall efficiency in the manufacturing process.

Of the 33,076.5 MW capacity additions, 7,940.5 MW are already committed, leaving only 25,136 MW for new capacity expansion. EGAT will be carrying out the construction of the Khirithan Pumped Storage project planned to come on line by October 2014 – October 2015. EGAT will also propose the repowering of the North Bangkok, South Bangkok and the Bang Pakong Combined Cycle Power Plant, all of which have been in services beyond their economic lives and would be retired otherwise. The remaining capacity need will be provided by either the IPPs inside Thailand or from the external power purchases. However, only the power purchases from Lao PDR (MOU of 3,000 MW) are explicitly listed in the PDP2002. The power purchases from Myanmar (MOU of 1,500 MW) and China (MOU of 3,000 MW) are left open. Further negotiations will be needed for the projects from Myanmar and China as to the details of the projects and the schedules of power purchases. Therefore, the commissioning dates of the projects from these two countries have not been included in the PDP2002.

According to the PDP2002, the average yearly capacity increase over the next 15 years period would be approximately 1,600 MW. In the year 2011, in particular, the capacity increase would be 2,300 MW. The installed capacity in each year for the next 15 years is shown in Table 5-3.

In conclusion, Thailand load forecast and generation development plan (power) is summarized in Table 5-4.



Table 5-3 Forecast of Installed Capacity for Thailand System

Fiscal Year	Hydro		Thermal		Combined Cycle		New Capacity		Laos (committed)		SPPs&Peaking		Total	
	MW	%	MW	%	MW	%	MW	%	MW	%	MW	%	MW	% Increase
2001	2886	13.15	7875	35.89	8381	38.19			340	1.55	2463	11.22	21945	4.13
2002	3386	13.17	7475	29.07	11619	45.18			640	2.49	2596	10.09	25716	17.18
2003	3386	12.92	7775	29.67	11619	44.34			640	2.44	2786	10.63	26206	1.91
2004	3386	13.26	7465	29.24	11619	45.51			640	2.51	2420	9.48	25530	-2.58
2005	3386	12.89	8199	31.22	11619	44.24			640	2.44	2420	9.21	26264	2.88
2006	3386	12.52	8979	33.20	11619	42.96			640	2.37	2420	8.95	27044	2.97
2007	3386	10.94	10326	33.37	12176	39.35			2543	8.22	2510	8.11	30941	14.41
2008	3386	10.48	10326	31.95	12176	37.67			3923	12.14	2510	7.77	32321	4.46
2009	3386	10.30	10176	30.96	12869	39.16			3923	11.94	2510	7.64	32864	1.68
2010	3386	9.83	10176	29.54	13751	39.92	700	2.03	3923	11.39	2510	7.29	34446	4.81
2011	3386	9.21	10176	27.69	13751	37.42	3000	8.16	3923	10.68	2510	6.83	36746	6.68
2012	3386	8.71	10101	26.00	13135	33.81	5800	14.93	3923	10.10	2510	6.46	38855	5.74
2013	3386	8.28	10026	24.50	12472	30.48	8600	21.02	3923	9.59	2510	6.13	40917	5.31
2014	3386	7.83	9476	21.91	12164	28.12	11800	27.28	3923	9.07	2510	5.80	43259	5.72
2015	3826	8.38	8626	18.89	11474	25.13	15300	33.51	3923	8.59	2510	5.50	45659	5.55
2016	4046	8.38	8326	17.25	11167	23.13	18300	37.91	3923	8.13	2510	5.20	48272	5.72

Source : EGAT PDP 2002 (Unofficial)

### 5.3.3 Electricity Generation Mix

In fiscal year 2001, the electric energy will be generated from a number of energy resources according to the resources diversification policy. In terms of fuel utilization, the generation from natural gas accounts for 62.8 % of the total generation, taking the highest market share among all the fuels. The remaining generation will be from lignite (15.2 %), hydropower (5.0 %), heavy oil (4.2 %) and purchases from SPPs and Laos (12.8 %), respectively. In 2006, the utilization of natural gas is predicted to remain over half of the total generation. The composition of energy generation from various types of fuels is - natural gas at 61.9 %, heavy oil at 0.8 %, hydropower at 3.2 %, lignite at 12.3 %, imported coal at 9.9 % and purchases at 11.9 %, respectively.

In 2011, the utilization of natural gas is planned to drop to 47.6 % due to the increase in the use of imported coal by the IPPs which accounts for 13.1 % of the total energy requirement. The generation from lignite also decreases to 8.5 %. As a consequence, the energy purchases will become essential to serve the need for electricity. Therefore, as much as 28.0 % of the total energy generation will be purchased from new IPPs and Laos in FY 2011. The fuel type used by the future IPPs will be determined by the IPPs themselves.

By the end of fiscal year 2016, the energy purchase will play a major role in the electricity market since the purchased energy will be expected to increase to 61.4 %. The remaining generation will be met by the EGAT's power plants and the existing and committed IPPs which will be fuelled by imported coal, lignite, natural gas and hydropower by the percentage of 9.7 %, 4.4 %, 22.0 % and 2.1%, respectively. Details of the generation mix are given in Table 5-5.

In conclusion Thailand load forecast and generation development plan (energy) is summarized in Table 5-6.

Table 5-4 Thailand (EGAT) Load Forecast and Generation Development Plan (Power)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Electricity Demand</b>																	
Maximum Demand; MW	14,918	16,184	17,388	18,587	19,913	21,222	22,552	23,951	25,450	27,232	28,912	30,587	32,405	34,352	36,366	38,519	40,699
Annual Increase	14,918	1,266	1,204	1,199	1,326	1,309	1,330	1,399	1,499	1,782	1,680	1,675	1,818	1,947	2,014	2,153	2,180
Annual Load Factor	74.1	73.0	72.8	72.8	72.5	72.5	72.8	72.8	72.9	72.7	72.7	72.8	72.8	72.8	72.9	72.9	73.0
Energy Sent; GWh	96,781	103,496	110,945	118,540	126,449	134,794	143,748	152,743	162,438	173,532	184,213	194,930	206,660	219,134	232,106	245,948	260,262
Annual Increase	6,367	6,715	7,449	7,595	7,909	8,345	8,954	8,995	9,695	11,094	10,681	10,717	11,730	12,474	12,972	13,842	14,314
GDP Growth Rate	3.67	4.42	4.80	4.90	4.68	4.56	4.62	4.86	4.74	4.73	4.63	4.55					
GDP elasticity of electricity demand	2.40	1.92	1.55	1.41	1.52	1.44	1.36	1.28	1.32	1.48	1.33	1.27					
<b>Installed Generating Capacity (end of year); MW</b>																	
<b>EGAT</b>																	
Hydro Power Plant	2,880	2,886	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,386	3,826	4,046
Plant added (net)	0	0	500	0	0	0	0	0	0	0	0	0	0	0	0	440	220
Thermal Power Plant	7,238	6,255	5,855	6,155	5,845	5,845	5,225	5,225	5,225	5,075	5,075	5,075	5,000	5,000	4,450	3,600	3,300
Plant added (net)	0	-973	-400	300	-310	0	-620	0	0	-150	0	0	-75	0	-550	-850	-300
Combined Cycle Plant	5,075	5,075	5,075	5,075	5,075	5,075	5,075	5,632	5,632	6,325	7,207	7,207	7,207	6,852	6,852	6,162	5,855
Plant added (net)	0	0	0	0	0	0	0	557	0	693	882	0	0	-355	0	-690	-307
Gas Turbines	682	785	819	819	453	453	453	453	453	453	453	453	453	453	453	453	453
Plant added (net)	0	123	34	0	-366	0	0	0	0	0	0	0	0	0	0	0	0
Total Generation EGAT	15,845	15,001	15,135	15,435	14,759	14,759	14,139	14,696	14,695	15,239	16,121	16,121	16,046	15,691	15,141	14,041	13,654
Total Plant added (net)	0	-844	134	300	-676	0	-620	557	0	543	882	0	-75	-355	-550	-1,100	-387
<b>Purchased Power</b>																	
EGCO, IPP, RGCO																	
Thermal (Oil, Coal)	150	1,620	1,620	1,620	1,620	2,354	3,754	5,101	5,101	5,101	5,101	5,101	5,101	5,027	5,026	5,026	5,026
Plant added (net)																	
Combined Cycle	3,306	3,306	6,544	6,544	6,544	6,544	6,544	6,544	6,544	6,544	6,544	6,544	5,928	5,620	5,312	5,312	5,312
Plant added (net)																	
New Capacity	0	0	0	0	0	0	0	0	0	0	700	3,000	5,800	8,600	11,800	15,300	18,300
Plant added (net)											700	2,300	2,800	2,800	3,200	3,500	3,000
Total EGCO, IPP, RGCO	3,456	4,926	8,164	8,164	8,164	8,898	10,298	11,645	11,645	11,645	12,345	14,645	16,829	19,247	22,138	25,638	28,618
Plant added (net)	3,456	1,470	3,238	0	734	1,400	1,347	0	0	700	2,300	2,184	2,418	2,891	3,500	3,000	3,000
SPP	1,433	1,678	1,777	1,967	1,967	1,967	1,967	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057	2,057
Plant added (net)	90	245	99	190	0	0	0	0	0	0	0	0	0	0	0	0	0
Import from Laos																	
Theun-Hinboun	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214	214
Houay Ho	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126	126
Import 2007	0	0	0	0	0	0	0	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903	1,903
Import 2008	0	0	0	0	0	0	0	0	1,380	1,380	1,380	1,380	1,380	1,380	1,380	1,380	1,380
Total import from Laos added in year	340	340	340	340	340	340	340	2,243	3,623	3,623	3,623	3,623	3,623	3,623	3,623	3,623	3,623
Other (TNB, Malaysia)																	
TNB	0	0	300	300	300	300	300	300	300	300	300	300	300	300	300	300	300
Added in year (net)	0	0	300	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Power Purchased	5,229	6,944	10,581	10,771	10,771	11,505	12,905	16,245	17,625	17,625	18,325	20,625	22,809	25,227	28,118	31,618	34,618
Added in year (net)																	
<b>Total Generating Capacity (end of year)</b>	21,074	21,945	25,716	26,206	25,510	26,264	27,044	30,941	32,321	32,864	34,446	36,746	38,855	40,918	43,259	45,659	48,272
Total Capacity added in year (net)	1,974	872	3,771	450	-676	734	780	3,897	1,380	543	1,582	2,300	2,109	2,063	2,341	2,400	2,613
Dependable Generating Capacity at System Peak in Year	20,398	21,117	21,354	25,102	24,436	24,780	26,000	27,994	31,171	30,975	33,296	35,596	37,705	39,767	39,647	44,509	47,122
Reserve Margin (% of Peak Demand); target minimum is	36.73	30.48	32.23	35.05	22.97	18.28	15.29	16.88	22.48	15.31	15.16	16.38	16.36	15.76	13.61	15.55	15.78

Source : EGAT

Table 5-5 Forecast of EGAT's Energy Generation and Fuel Requirement

Types of Fuels	Units	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
		Hydro	GWh	5,052	3,552	3,552	4,351	4,493	4,503	4,479	4,241	4,413	4,461	4,457	4,476	4,536	4,489
	(%)	5.0	3.3	3.1	3.5	3.4	3.2	3.0	2.7	2.6	2.5	2.3	2.2	2.1	2.0	2.1	2.2
<b>Natural Gas</b>																	
- EGAT	GWh	36,044	33,703	29,525	30,408	33,370	32,898	36,929	34,498	41,065	47,303	45,418	43,232	40,302	37,893	34,188	32,401
	(%)	35.9	31.3	25.6	24.7	25.3	23.4	24.7	21.7	24.1	26.1	23.6	21.2	18.6	16.5	14.0	12.5
	MMCFD	857	753	678	660	736	725	777	714	844	970	925	876	810	757	674	631
- EGCO	GWh	11,395	8,904	9,931	12,847	13,297	12,964	11,123	10,691	11,623	11,208	9,874	5,363	3,226	1,762	981	763
	(%)	11.4	8.3	8.6	10.4	10.1	9.2	7.4	6.7	6.8	6.2	5.1	2.6	1.5	0.8	0.4	0.3
	MMCFD	270	221	243	291	302	294	252	242	263	254	224	121	72	39	22	17
- Ratchaburi	GWh	7,343	18,119	21,184	22,021	23,133	22,681	19,954	18,165	19,496	19,389	18,419	18,012	17,386	17,073	16,587	16,632
	(%)	7.3	16.8	18.4	17.9	17.6	16.1	13.3	11.4	11.4	10.7	9.6	8.8	8.0	7.4	6.8	6.4
	MMCFD	176	367	423	445	473	462	393	347	381	378	354	343	327	319	307	308
- IPPs	GWh	8,217	12,163	16,446	18,589	18,558	18,464	17,830	18,164	18,259	18,100	17,697	16,096	14,343	11,612	8,586	7,106
	(%)	8.2	11.3	14.3	15.1	14.1	13.1	11.9	11.4	10.7	10.0	9.2	7.9	6.6	5.1	3.5	2.7
	MMCFD	172	261	353	374	373	371	358	365	367	364	355	323	288	233	172	142
<b>Sub-total</b>	<b>GWh</b>	<b>62,999</b>	<b>72,889</b>	<b>77,086</b>	<b>83,865</b>	<b>88,358</b>	<b>87,007</b>	<b>85,836</b>	<b>81,518</b>	<b>90,443</b>	<b>96,000</b>	<b>91,408</b>	<b>82,783</b>	<b>75,257</b>	<b>68,340</b>	<b>60,342</b>	<b>56,902</b>
	<b>(%)</b>	<b>62.8</b>	<b>67.6</b>	<b>66.9</b>	<b>68.0</b>	<b>67.0</b>	<b>61.9</b>	<b>57.3</b>	<b>51.3</b>	<b>53.0</b>	<b>53.0</b>	<b>47.6</b>	<b>40.6</b>	<b>34.8</b>	<b>29.8</b>	<b>24.7</b>	<b>22.0</b>
	<b>MMCFD</b>	<b>1,475</b>	<b>1,602</b>	<b>1,697</b>	<b>1,770</b>	<b>1,884</b>	<b>1,852</b>	<b>1,780</b>	<b>1,668</b>	<b>1,855</b>	<b>1,966</b>	<b>1,858</b>	<b>1,663</b>	<b>1,497</b>	<b>1,348</b>	<b>1,175</b>	<b>1,098</b>
<b>Heavy Oil</b>																	
- EGAT	GWh	3,759	2,787	4,794	1,070	1,108	1,112	1,080	1,051	1,050	1,052	1,050	1,054	1,050	1,052	1,051	1,054
	(%)	3.7	2.6	4.2	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4
	10 <sup>6</sup> Liters	964	684	1,137	259	269	270	262	255	255	255	255	254	254	255	255	256
- EGCO	GWh	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10 <sup>6</sup> Liters	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Ratchaburi	GWh	411	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	(%)	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10 <sup>6</sup> Liters	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Sub-total</b>	<b>GWh</b>	<b>4,178</b>	<b>2,787</b>	<b>4,794</b>	<b>1,070</b>	<b>1,108</b>	<b>1,112</b>	<b>1,080</b>	<b>1,051</b>	<b>1,050</b>	<b>1,052</b>	<b>1,050</b>	<b>1,054</b>	<b>1,050</b>	<b>1,052</b>	<b>1,051</b>	<b>1,054</b>
	<b>(%)</b>	<b>4.2</b>	<b>2.6</b>	<b>4.2</b>	<b>0.9</b>	<b>0.8</b>	<b>0.8</b>	<b>0.7</b>	<b>0.7</b>	<b>0.6</b>	<b>0.6</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>	<b>0.4</b>	<b>0.4</b>
	<b>10<sup>6</sup> Liters</b>	<b>970</b>	<b>684</b>	<b>1,137</b>	<b>259</b>	<b>269</b>	<b>270</b>	<b>262</b>	<b>255</b>	<b>255</b>	<b>255</b>	<b>255</b>	<b>254</b>	<b>254</b>	<b>255</b>	<b>255</b>	<b>256</b>
Diesel	GWh	34	12	12	10	75	80	41	0	2	5	2	2	1	2	1	1
	(%)	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	10 <sup>6</sup> Liters	36	39	37	75	95	97	84	71	72	72	71	72	71	71	57	43
Lignite	GWh	15,213	14,603	15,106	17,311	17,258	17,237	17,235	17,309	16,254	16,252	16,255	15,797	15,749	15,751	13,786	11,237
	(%)	15.2	13.6	13.1	14.0	13.1	12.3	11.5	10.9	9.5	9.0	8.5	7.8	7.3	6.9	5.7	4.3
	10 <sup>8</sup> Tons	14,510	14,771	15,179	18,386	18,330	18,330	18,386	17,221	17,221	17,221	16,718	16,666	16,666	14,562	11,856	11,237
Imported Coal	GWh	0	0	0	0	3,809	13,979	23,291	25,170	25,094	25,094	25,094	25,170	25,094	25,094	25,094	25,170
	(%)	0.0	0.0	0.0	0.0	2.9	9.9	15.6	15.8	14.7	13.8	13.1	12.4	11.6	10.9	10.3	9.7
	10 <sup>6</sup> Tons	0.000	0.000	0.000	0.000	1,523	5,342	8,803	9,503	9,473	9,473	9,473	9,503	9,473	9,473	9,473	9,503
<b>Power Purchase</b>																	
- SPPs	GWh	10,215	11,232	12,057	13,786	13,786	13,786	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417
	(%)	10.2	10.4	10.5	11.2	10.5	9.8	9.6	9.1	8.5	8.0	7.5	7.1	6.7	6.3	5.9	5.6
- Lao PDR	GWh	2,631	2,690	2,640	2,921	2,918	2,875	3,330	15,332	18,835	18,787	18,722	18,699	18,635	18,585	18,535	18,499
	(%)	2.6	2.5	2.3	2.4	2.2	2.0	2.2	9.6	11.0	10.4	9.7	9.2	8.6	8.1	7.6	7.1
- New IPPs	GWh	0	0	0	0	0	0	0	0	0	5,190	20,742	41,460	61,599	81,513	105,555	125,933
	(%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	10.8	20.3	28.5	35.6	43.3	48.7
<b>Sub-total</b>	<b>GWh</b>	<b>12,846</b>	<b>13,922</b>	<b>14,697</b>	<b>16,707</b>	<b>16,704</b>	<b>16,661</b>	<b>17,747</b>	<b>29,749</b>	<b>33,252</b>	<b>38,394</b>	<b>53,881</b>	<b>74,576</b>	<b>94,651</b>	<b>114,515</b>	<b>138,507</b>	<b>158,849</b>
	<b>(%)</b>	<b>12.8</b>	<b>12.9</b>	<b>12.8</b>	<b>13.5</b>	<b>12.7</b>	<b>11.9</b>	<b>11.9</b>	<b>18.7</b>	<b>19.5</b>	<b>21.2</b>	<b>28.0</b>	<b>36.6</b>	<b>43.8</b>	<b>50.0</b>	<b>56.8</b>	<b>61.4</b>
<b>Total</b>	<b>GWh</b>	<b>100,322</b>	<b>107,765</b>	<b>115,247</b>	<b>123,314</b>	<b>131,805</b>	<b>140,599</b>	<b>149,729</b>	<b>159,038</b>	<b>170,508</b>	<b>181,258</b>	<b>192,147</b>	<b>203,778</b>	<b>216,338</b>	<b>229,243</b>	<b>243,930</b>	<b>258,786</b>

Source : EGAT

Table 5-6 Thailand Load Forecast and Generation Development Plan (Energy) (Moderate Economic Recovery Case)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
<b>Electricity Demand</b>																	
Maximum Demand (sent-out); MW	14,918	16,184	17,388	18,587	19,913	21,222	22,552	23,951	25,450	27,232	28,912	30,587	32,405	34,352	36,366	38,519	40,699
Annual Increase	14,918	1,266	1,204	1,199	1,326	1,309	1,330	1,399	1,499	1,782	1,680	1,675	1,818	1,947	2,014	2,153	2,180
Annual Load Factor	74.1	73.0	72.8	72.8	72.5	72.5	72.8	72.8	72.9	72.7	72.7	72.8	72.8	72.8	72.9	72.9	73.0
Energy Sent (sent-out); GWh	96,781	103,496	110,945	118,540	126,449	134,794	143,748	152,743	162,438	173,532	184,213	194,930	206,660	219,134	232,106	245,948	260,262
Annual Increase	6,367	6,715	7,449	7,595	7,909	8,345	8,954	8,995	9,695	11,094	10,681	10,717	11,730	12,474	12,972	13,842	14,314
GDP Growth Rate	3.67	4.42	4.80	4.90	4.68	4.56	4.62	4.86	4.74	4.73	4.63	4.55					
GDP elasticity of electricity demand	2.40	1.92	1.55	1.41	1.52	1.44	1.36	1.28	1.32	1.48	1.33	1.27					
<b>Energy Generation (sent-out); GWh</b>																	
<b>EGAT</b>																	
Hydro Power Plant	5,296	5,025	3,552	3,552	4,351	4,493	4,503	4,479	4,241	4,413	4,461	4,457	4,476	4,536	4,489	5,149	5,573
Average Plant Factor	20.99	19.98	11.98	11.98	14.67	15.15	15.18	15.10	14.30	14.88	15.04	15.03	15.09	15.29	15.13	15.36	15.72
Thermal Power Plant (Lignite; Oil, Gas)		37,090	31,853	33,764	16,640	19,181	19,082	16,883	15,389	14,583	14,575	14,109	13,431	13,014	12,932	9,755	6,784
Average Plant Factor		67.69	62.10	62.62	32.50	37.46	41.69	36.89	33.62	32.80	32.78	31.74	30.66	29.71	33.17	30.93	23.47
Combined Cycle Plant (Gas)		11,698	14,341	10,739	26,498	26,737	26,358	32,548	31,899	37,990	44,159	42,775	40,790	38,226	36,037	33,029	31,793
Average Plant Factor		26.31	32.26	24.16	59.60	60.14	59.29	65.97	64.66	68.57	69.95	67.75	64.61	63.69	60.04	61.19	61.99
Gas Turbines		1,210	1,359	1,382	1,310	1,400	1,404	1,395	1,329	1,385	1,417	1,384	1,388	1,326	1,240	1,093	543
Average Plant Factor		17.60	18.94	19.26	33.01	35.28	35.38	35.15	33.49	34.90	35.71	34.88	34.98	33.41	31.25	27.54	13.68
Total Generation EGAT	62,864	55,050	51,105	49,437	48,799	51,811	51,347	55,305	52,858	58,371	64,612	62,725	60,085	57,102	54,698	49,026	44,693
Average Plant Factor	45.29	14.89	38.55	36.56	37.74	40.07	41.46	42.96	41.06	43.73	45.75	44.42	42.75	41.54	41.24	39.86	37.37
<b>Purchased Energy</b>																	
<b>EGCO, IPP, RGCO</b>																	
Thermal (Oil, Coal, Gas)		10,846	10,880	11,084	10,136	15,286	25,023	31,585	31,338	32,822	32,761	31,776	31,406	30,811	30,452	30,625	31,123
Average Plant Factor		37.45	18.98	19.34	17.68	26.67	43.65	55.10	54.67	57.26	57.15	55.43	60.48	62.58	65.44	65.81	66.88
Combined Cycle		21,580	31,858	40,029	47,672	48,004	47,568	45,092	45,093	46,063	45,491	43,765	37,711	33,774	29,578	25,772	24,121
Average Plant Factor		74.52	55.57	69.83	83.16	83.74	82.98	78.66	78.66	80.35	79.36	76.34	72.62	68.60	63.56	55.38	51.84
New Capacity	0	0	0	0	0	0	0	0	0	0	5,190.0	20,742	41,460	61,599	81,513	105,555	125,933
Average Plant Factor											84.6	79	82	82	79	79	79
Total EGCO, IPP, RGCO	21,517	32,426	42,738	51,113	57,808	63,290	72,591	76,677	76,431	78,885	83,442	96,283	110,577	126,184	141,543	161,952	181,177
Average Plant Factor	71.07	75.14	59.76	71.47	80.83	81.20	80.47	75.17	74.92	77.33	77.16	75.05	75.01	74.84	72.99	72.11	72.22
<b>SPP</b>																	
Average Plant Factor	9.409	10.215	11,232	12,057	13,786	13,786	13,786	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417	14,417
Import from Laos	2,991	2,631	2,690	2,640	2,921	2,918	2,875	3,330	15,332	18,835	18,787	18,722	18,699	18,635	18,585	18,535	18,499
Other (TNB, Malaysia)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Energy Purchased	33,917	45,272	56,660	65,810	74,515	79,994	89,252	94,424	106,180	112,137	116,646	129,422	143,693	159,236	174,545	194,904	214,093
Average Plant Factor	74.04	74.42	61.13	69.75	78.97	79.37	78.95	66.35	68.77	72.63	72.66	71.63	71.92	72.06	70.86	70.37	70.60
<b>Total Electricity Supplied (sent-out)</b>	<b>96,781</b>	<b>100,322</b>	<b>107,765</b>	<b>115,247</b>	<b>123,314</b>	<b>131,805</b>	<b>140,599</b>	<b>149,729</b>	<b>159,038</b>	<b>170,508</b>	<b>181,258</b>	<b>192,147</b>	<b>203,778</b>	<b>216,338</b>	<b>229,243</b>	<b>243,930</b>	<b>258,786</b>

Source : EGAT 2002

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