



## Energy Challenges for Thailand: An Overview

Srichattra Chaivongvilan, Deepak Sharma and Suwin Sandu

**Abstract**— Thailand is one of the most dynamic countries in South-east Asia. Energy has traditionally played a vital role in its economic growth. Currently, over 50% of the energy consumption in Thailand is imported. The energy demands are expected to increase by approximately 4.5% per year over the next decade. The future economic prosperity is, therefore, dependent on the provision of adequate energy. In order to ensure such provision, effective national energy policies would be needed. This is likely to be a challenging task. This paper examines if the current energy policies are adequate to meet this challenge. The examination reveals that the current policies are not adequate. This paper further recommends the need to develop a comprehensive framework that could be used to analyse the economy-wide impacts which could provide guidance for the development of appropriate energy policies.

**Keywords**— Energy Challenge, Institution, Policy, Thailand.

### 1. INTRODUCTION

Energy is essential for social and economic well-being of a nation. More so, energy in developing countries is needed to raise the level of vast majority of population from subsistence to self-sustaining levels. Consequently, the demand for energy has increased rapidly in the developing countries. According to [1], 'The process of economic development in the developing countries has involved a strong growth of energy demand over the last 50 years'. Thailand is one of the most dynamic energy-intensive economies in South-east Asia [2]. Over the last three decades, its total primary energy consumption has increased rapidly, from 8,642 thousand tonnes of oil equivalent (ktoe) in 1973, to 85,189 ktoe in 2005 – an average annual growth rate of 7.2%. In comparison, the average annual growth rate of GDP over this period was 4.2%. This increasing energy demand was mainly due to industrialisation, urbanisation, and economic growth [3]. It is also worth noting that the economic and energy growth took place in an environment of static, indeed declining population growth. For example, the population growth rate in Thailand decreased from 0.93% in the year 2000 to 0.66% in the year 2007 [4]. It is expected that the future energy demand would increase mainly due to the expansion of intensive energy manufacturing, road transport, and rural and urban development. According to [5], if Thailand's current energy trends do not change (that is, in the business-as-usual scenario) in the years to come, the primary energy demand in the year 2025 would be 186,659 ktoe, as compared to 85,189 ktoe in 2005. Clearly, the provision of adequate energy supply is essential for Thailand in order to promote economic growth. To ensure such provision requires effective energy policies. The design

of effective national energy policies is however likely to be a challenging task for Thailand due to a variety of internal and external factors. This paper identifies major energy challenges faced by Thailand and examines if the current policies are adequate to meet these challenges.

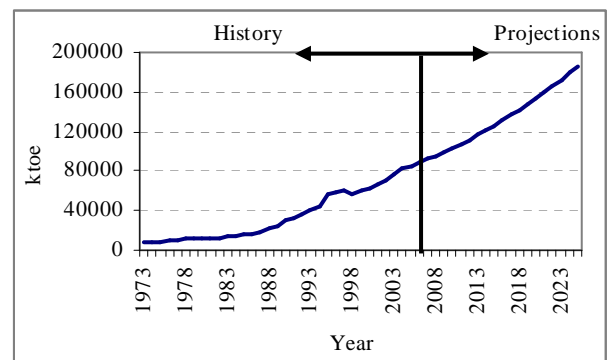


Fig.1. Primary energy demand and projections [4], [6]

### 2. ENERGY CHALLENGES

In view of the significant energy requirements to develop the country, along with the dependency of economy on foreign fuel, and global development, Thailand undoubtedly faces several challenges to ensure the provision of reliable and affordable energy supplies. The main issues that underpin these challenges include the following.

#### 2.1 Energy-economic interactions

The Thai economy has grown rapidly and so has energy consumption over the last 30 years. Figure 2 shows Thailand's average annual growth rate of GDP and energy consumption over the period 1972-2006. The figure suggests that there is a correspondence between energy consumption and economic growth. Prior to the 1973 energy crisis, Thailand's rate of energy consumption, which grew by 15% in the year 1973,

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reduced to minus 4% in the year 1974. Again, Thailand's energy consumption and hence economy were impacted by the second oil shock of 1979. The average annual growth rate of GDP of 10.7% in 1978, declined to 1.8% in 1980. And, the growth rate of energy consumption fell from 3.2% in 1978, to minus 1% in 1980. The figure also shows that Thailand's energy consumption was strongly affected by the 1997 East Asian financial crisis. The Thai economy which expanded by 2.2% in the year 1996 shrank by 36% in the year 1998. And, energy consumption growth rates for the years 1996 and 1998 were 10.8% and minus 7%, respectively. These statistics reinforce the strength of the relationship between energy and economy, and also shows the influence of the world's energy and economic events on Thailand.

Due to the limited indigenous energy resources, Thailand is strongly dependent on imported fuels, which are important for country's economic development. Many of those fuels are obtained from politically volatile regions, for example, the middle-east. Any geo-strategic volatility in these regions is likely to have perceptible impacts on the world economy and, by implication, Thailand. The ongoing high oil price and its anticipated influence on the balance of payment account for the country and consequential slow-down of economic growths is just a case in point.

## 2.2 Security of energy supply

There has certainly been increasing recognition of the importance of energy security since the 1973 energy crisis. A significant portion of the oil and gas demands are imported to maintain the country's economic development. Since the 1990s, Thailand's total primary energy mix has been heavily dominated by oil (about 50%) [7]. In the year 2005, Thailand's oil consumption was 910 thousand barrels per day, whereas oil production was only 330 thousand barrels per day, which meant that Thailand imported nearly 570 thousand barrels of oil per day [8]. Even though Thailand has large proven natural gas reserves and natural gas production increased significantly over the last few years, the country still remains reliant on imports of oil to meet growing domestic fuel demand. In 2005, for example, over 95% of crude oil requirements were imported and it cost the economy around US\$13 billion – approximately 9.6% of 2005 GDP [2]. According to [9], 'Thailand is facing major challenges concerning its energy supply, as natural energy resources are fast depleting, leading to an insufficient supply of energy to the private manufacturing and service sectors, as well as the general public'. Thus, ensuring the security of energy supply is the major challenge for Thailand.

## 2.3 Energy investment requirements

Thailand energy consumption is forecasted to grow at an average rate 4.5% to sustain economic growth of 4% per annum to the year 2025 [4]. This increased energy demand would require significant investments in the energy infrastructure, for example, according to [10] Thailand would require a total investment of \$168-211 billion to the year 2030 for the expansion of electricity generation capacity, transmission, including oil and

natural gas infrastructure. To meet the rising demand for energy, Thailand has made rigorous efforts to expand domestic production. It has also tried to promote private participation in the energy industry. However, these efforts were stalled in the year 2006, due to political and societal constraints. The challenge to attract new investments therefore stays.

## 2.4 Environmental impacts

Figure 3 shows the relationship between carbon emissions and economic growth. As Thailand's economy recovered from the 1997 financial crisis, the government has pursued policies that promoted new investments to rebuild country's industrial base while increasing other measures, such as international cooperation and environmental protection. Thailand signed the Kyoto Protocol on 2 February 1999, and ratified it in August 2002. However, carbon emissions increased by almost 4,000 thousand metric tons of carbon between 2001 and 2002, despite Thailand's ongoing efforts to improve environmental quality [11]. Thailand is now faced with the consequences of environmental degradations resulting from carbon combustion. The future soaring energy demand is likely to worsen the country's environmental situation. And any environmental policy aimed at, say, reducing carbon-dioxide emissions from the energy sector, is likely to constrain economic growth. The pressure to reduce carbon-dioxide emissions is however real and therefore the question of reconciliation between environment and economy has emerged as a significant policy challenge. This challenge is compounded by the fact that Thailand currently does not have any coherent policy framework to address environmental issues.

## 2.5 Social impacts

Energy is a key factor in our daily life. Directly and indirectly, energy policies affect society. According to [12], 'Because of the direct relationship between productivity and energy use, a main premise is that social and economic structures could be substantially and regressively altered by large energy use constraints'. Further, according to [13], 'To make efficient policies, the analysis of the distribution impact of policy on social acceptances is the requirement'. The social impacts of energy policies include employment, equity of prices and consumer interests [14]. Several works, for example [15] and [16], have expressed concerns about the lack of consideration of social impacts in the current Thai energy policies, especially related to electricity reform policies. According to [17], 'A recurring theme in Thai history is that the power sector does not receive a level of attention from civil society in proportion to its significance to Thailand's economy, environment and society...very few players submitting ideas for public discussion and even fewer analytically rigorous discussions of options, approached and strategies'. The overlooking of the social impacts could render the policies meaningless, and result in a waste of time and money. The cancellation of the Thai Electric Supply Industry (ESI) privatisation plan in the year 2006 is a case in point.

## 2.6 Political influences

Thailand's policy institutions are numerous, spread over different ministries sections and departments, often operating in an isolated manner. Under the Administrative Organisation of State Affairs Act (No.5) BE. 2545 (2002), these units are purportedly meant to function in a unified manner. The Office of the Prime Minister is the central body, which in itself ranks as a ministry. The responsibility of this office is largely concerned with formulating and detecting the conflicts in the national policy [18]. As the Office of the Prime Minister is under the direct command of the Prime Minister and the cabinet, the approvals of policies are influenced by the political preferences of the Prime Minister. Political constraints therefore could interfere with the need for effective policy development, especially if the political system is corrupt. Figure 5 and 6 show the structure of energy institutions before and after the 2002 institutional arrangements.

## 2.7 International conflicts

Thailand is an important member of several international organisations, such as WTO, APEC, ASEAN and GMS. A number of agreements have been signed in order to strengthen the relationship and political power in the region. Occasionally, some of agreements have conflicted with national policy agendas. For instance, Thailand wishes to import more energy from neighbouring countries; however, national policy emphasises decreased import dependency. Such conflicts could obviously affect other sectors of the economy.

The issues noted above suggest that the development of an appropriate energy policy is likely to be a challenging task. The following sections of this paper analyse if the current energy policy environment in Thailand is adequate to meet this challenge.

## 3. A REVIEW OF ENERGY INSTITUTIONS

The energy system in Thailand can be categorised into two major industries, namely, petroleum and electricity. Both these industries are currently under the command of the Ministry of Energy – the apex energy planning and policy institution in Thailand. This paper focuses on the evolution of national institutions for energy planning and policy.

The evolution of the energy policy institutions in Thailand, examined in this paper, can be classified into 5 periods: absolute monarchy (before 1932); World War II and international influences (1932-1970); the expansion of state-owned utilities (1971-1980); financial liberalisation (1981-1997); and the reform era (1998-present).

### *Absolute monarchy (before 1932)*

Before 1932, Thailand purchased oil and petroleum from two foreign companies, namely, Standard Welcome Oil Company and Royal Dutch Petroleum Company. As there was no competition, the prices of energy depended solely on the prices set by these companies. As a result, Thailand was forced to pay higher prices for energy,

compared to the world energy prices. Oil and petroleum were strictly consumed in the households, transportation and military sectors. Electricity was available only to the wealthy families.

### *World War II and international influences (1932-1970)*

Thailand became a constitution monarchy in the year 1932. The Energy Division was established in 1933, worked under command of the Ministry of Defence. This initial energy policy institution was responsible for national energy planning and policy development, and energy trading. In the year 1937, the Energy Division was upgraded to be the Department of Energy.

World War II began in the year 1939 and caused economic and identity crises for the country. Thai people suffered from essential commodity shortages, increased taxation and high inflation [17]. The main electricity station was destroyed during the war. However, the establishment of the oil refinery at Chong Non-See in the year 1940 assisted Thailand to deal with this critical situation.

In the year 1945 after World War II, Thailand was forced by foreign companies and the United Nations agencies to open its petroleum market. Under this pressure, the government, under Prime Minister Kuang Apaiyawong, decided to let foreign companies take control of the country's oil refinery and all of petroleum businesses in 1946. The Department of Energy was disbanded. However, the Energy Division and Energy Stock Organisation still remained, primarily for military reasons. In 1953, the Energy Division was upgraded to be the Department of Energy and Defence. The government decided to assume control of the country's energy business again. The Chong Non-See oil refinery station was taken back from foreign companies, and it started producing petroleum under the authority of the Thai government in 1957. In this period, the demand for electricity increased rapidly. As part of this development process, the National Energy Authority (NEA) was created in 1953, under the National Energy Authority Act, reporting directly to the Ministry of Prime Minister. [17], cited in United Nations (1963), explained the responsibilities of the NEA: 'NEA was responsible for the planning and coordination of schemes for development and utilisation of all energy resources in the country'. In the year 1959, Bangchak oil refinery station was established with the capacity to produce 5,000 barrels per day of petroleum. The Metropolitan Electricity Authority (MEA), the Provincial Electricity Authority (PEA) and the Electricity Generating Authority of Thailand (EGAT) were created in the years 1958, 1960 and 1968, respectively, responsible to act as state-owned enterprises in the electricity sector.

### *The expansion of state-owned utilities (1971-1980)*

The rise in world energy prices in the year 1973 strongly impacted the Thailand economy; Thailand's oil import dependency was 95% at that time [4]. The governments began to consider alternative energy sources instead of imported fuel. The Natural Gas Division was established in 1977, responsible for exploring domestic natural gas resources. The Petroleum Authority of Thailand (PTT)

was established in 1978, to work as a state-owned enterprise in the petroleum sector. During this period, the state-owned enterprises rose in power, and the role of NEA declined.

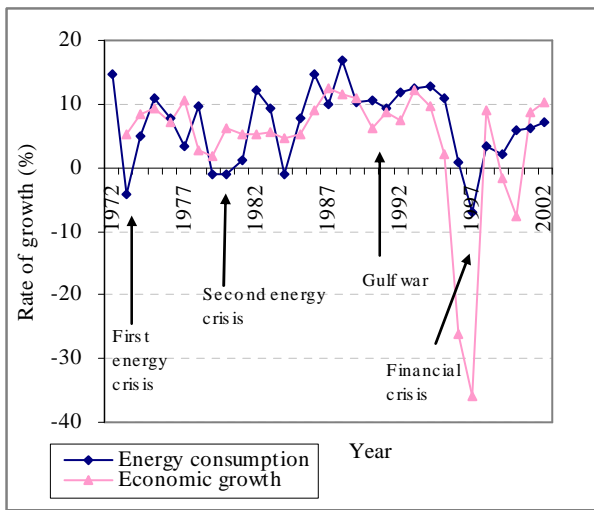


Fig.2. Energy consumption and economic rates of growth [6], [19]

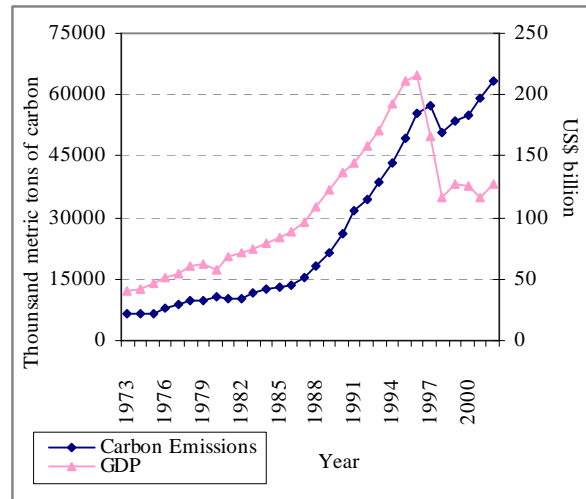


Fig.3. Carbon emissions and economic growth [5], [11]

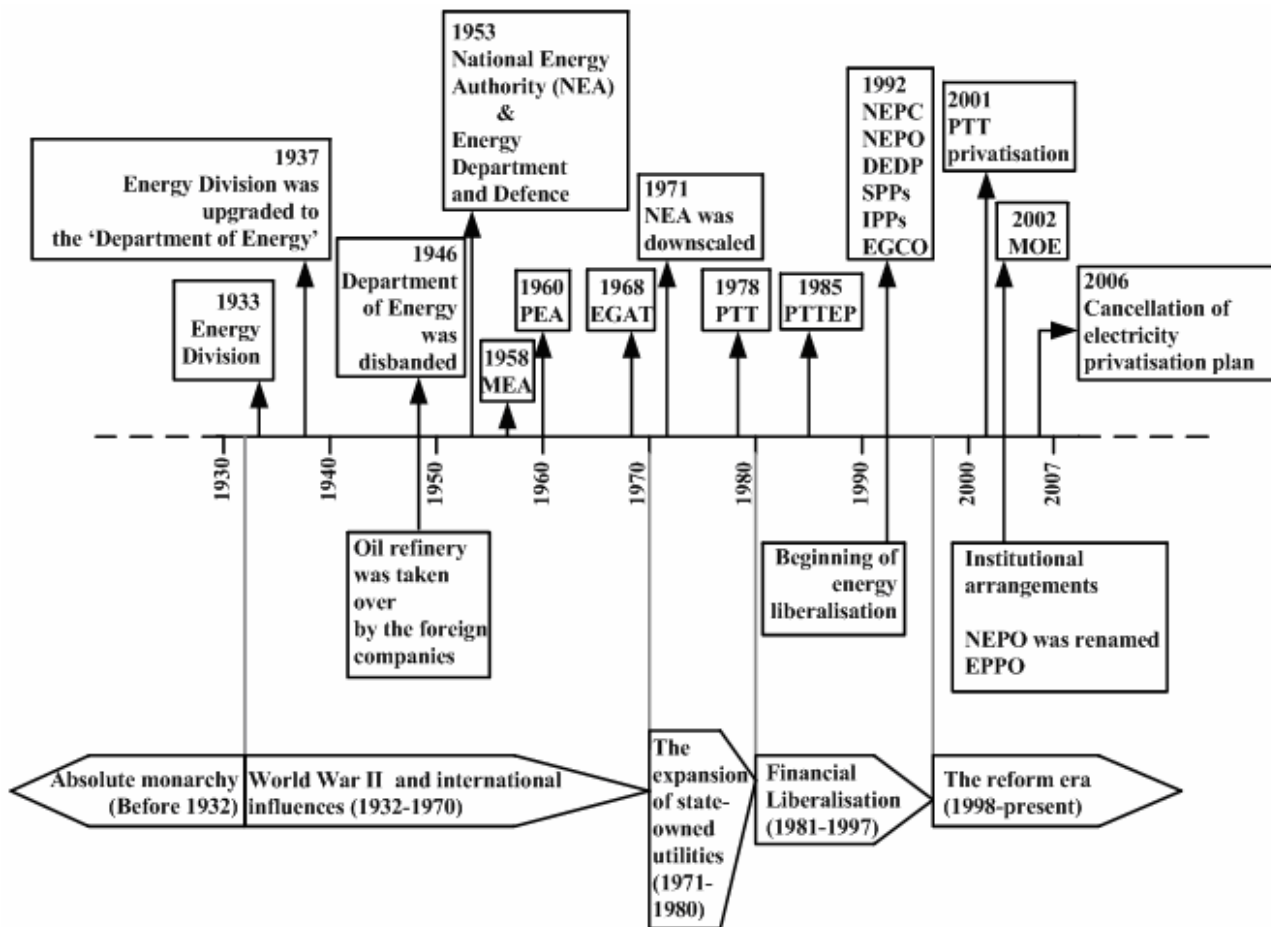


Fig.4. The evolution of Thai energy policy institutions

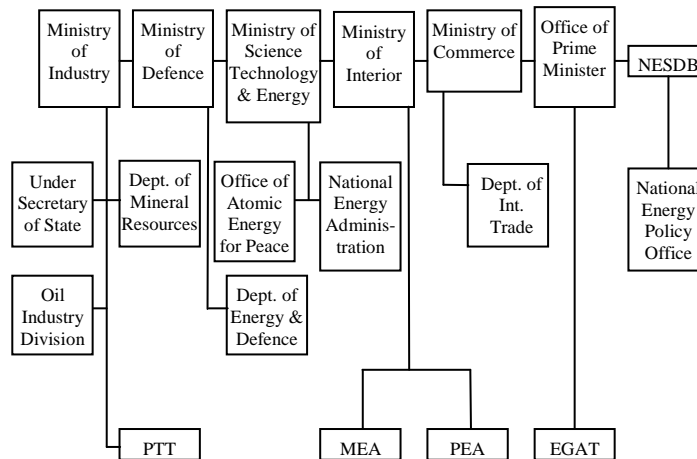


Fig. 5. The structure of energy institutions in the 1980s [21]

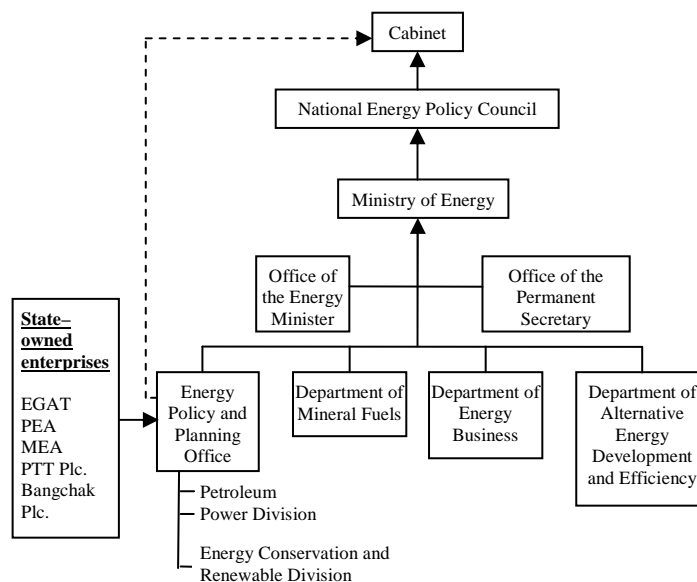


Fig. 6. The current energy institutions [6], [17]

The conflicts between institutions became an issue. According to [17], ‘In theory it was the responsibility of the NEA to regulate the utilities. ... The utilities refused to share key information with the NEA which would have allowed the NEA to effectively serve as a regulatory body. As it became clear that the NEA lacked data, analytical capability, and enforcement authority, the NEA became simply an energy data collection agency and also the agency entrusted with energy efficiency and renewable energy’. Therefore, NEA lost political power as well because it lacked a clear area of responsibility. The conflicts between institutions became an issue. According to [17], ‘In theory it was the responsibility of the NEA to regulate the utilities. ... The utilities refused to share key information with the NEA which would have allowed the NEA to effectively serve as a regulatory body. As it became clear that the NEA lacked data, analytical capability, and enforcement authority, the NEA became simply an energy data collection agency and also the agency entrusted with energy efficiency and

renewable energy’. Therefore, NEA lost political power as well because it lacked a clear area of responsibility. In the year 1971, NEA was renamed from National Energy Authority to National Energy Administration. It was transferred to be under the Ministry of Science, Technology and Energy in 1979.

**Financial liberalisation (1981-1997)**

The importance of energy in achieving economic growth emerged as an issue in the 1980s, when energy demand increased rapidly due to industrialisation and urbanisation of the country. According to [20], ‘The 1980s were a period of structural adjustment and industrial take-off... the economic boom was largely export driven, especially the latter half of the 1980s. Consequently, the country’s economic structure changed,... the industrial sector accounted for about 30% of GDP in the 1980s’. During these years, Thailand began to notice the impact of inefficient energy policies and institutions, for example, the impacts caused by the

1979 energy crisis and the 1990 gulf war. To improve the efficiency of country's energy system required significant energy investments. In order to attract these investments, Thailand decided to liberalise its energy industry. In 1985, the PTT Exploration Production (PTTEP) was established, responsible to explore petroleum resources within and across the country. PTT was restructured in the year 1992, on the basis of recommendations made by McKinsey & Company Inc. As a result, PTT improved its performance as a commercial entity. As part of institution evolution, the National Energy Policy Council (NEPC) and the National Energy Policy Office (NEPO) were established in the year 1992, to be the national energy policy institutions instead of NEA. NEA was renamed Department of Energy Development and Promotion (DEDP). In the same year, the government began the electricity reform. The Small Power Producer (SPP) and the Independent Power Producer (IPP) programs appeared as the first step in this reform. The Electricity Generating Company (EGCO) was created as a subsidiary company of EGAT, purchasing electricity from SPPs and IPPs. The privatisation plans for MEA, PEA and EGAT were announced. They were however fiercely opposed by the labour unions of the state electric utilities. As a result, the electricity privatisation was postponed and no significant changes in the electricity industry occurred during the second half of the 1990s.

#### *The reform era (1998-present)*

The impacts of the East Asian financial crisis (1997/98) brought the institutional issues to the fore. As Thailand is an energy-importing country, evidently the energy sectors were strongly impacted by the financial crisis (see, Figure 2). This economic crisis was one of the factors to stimulate the energy industry for further reform. The significant debt due to past infrastructure borrowings and their poor performance also induced Thailand to privatise its energy sector. As a result, in the administration of Prime Minister Thaksin Shinawatra (in office 2001-2006), the government policies focused on economic and energy industry reforms. The government made several institutional arrangements with the principle objective of improving the efficiency of institutions. Several organisations were established in order to centralise the formulation and implementation of the country's policy. The Ministry of Energy (MOE) was established in 2002, under the Administrative Organisation of State Affairs Act (No.5) BE. 2545 (2002). More than 20 government agencies, in 9 ministries and state-owned enterprises, responsible for energy planning policy, regulation and implementation were unified. The supervision role of NEPO was transferred from the secretariat of the Prime Minister to the Ministry of Energy. NEPO was renamed the Energy Planning and Policy Office (EPPO). In the year 2001, NEPO approved the partial listing of PTT. PTT was privatised and became PTT Plc., listed on the Stock Exchange of Thailand. For the electricity industry, in the year 2003, EGAT was approved by the cabinet to be corporatised as a public company under the Corporation Law. However the plan to list EGAT on the Stock

Exchange was cancelled in 2006 by Thailand's Supreme Administrative Court.

#### **4. A REVIEW OF ENERGY POLICIES**

Since 1932, the main focus of Thai energy policies has been to reduce the country's dependence on imports, especially oil imports. Indigenous oil production and diversification of fuel resources therefore received considerable policy attention. However, there were no consistent and coherent energy policies to achieve these objectives until 1992. After the establishment of NEPC and NEPO, the central energy agencies, several energy policies were formulated. This section reviews major energy policies that were approved by the NEPO (EPPO), under the National Energy Policy Council Act BE 2535 (1992).

##### *Policies on privatisation and liberalisation*

The policies on energy industry privatisation in Thailand began to be formulated in 1992, with the aim to develop the energy sector, primarily to satisfy the growing energy demand and economic expansion. SPP and IPP projects were created to increase private participation in the electricity markets. The 1997 financial crisis and the ensuing rapid economic slow-down forced Thailand to accept the conditions associated with the economic adjustment package offered by the IMF. This prompted the Thai government to accelerate the energy reform program. In September 2001, NEPO approved the privatisation plan of PTT, the state-owned oil and gas enterprise. Thus, PTT became PTT Plc. For the electricity industry, EGAT was slated to be corporatised in the year 2003 as a public company under the Corporation Law. However, the privatisation plans were cancelled by the Supreme Administrative Court in the year 2006 due to the political and societal opposition. According to [22], reasons of this cancellation were, '...the conflicts of interest plaguing the information of the committee that worked on the state agency corporatisation process; the conflict of interest in the appointment of a chairman for the public hearing committee and the improper process of the hearings; and the fact that EGAT would still have held state power of land expropriation after being privatised'.

##### *Policies on energy conservation*

The main objectives of the Energy Conservation Promotion Act BE 2535 (1992) are to promote energy conservation and encourage investment in energy savings in the factories and buildings as specified by the law. Under this Act, financial support is available for the projects that improve efficiency of energy consumption. Thailand has already implemented two phases of energy conservation programs. The first phase was in the period 1995-1999 and the second phase 2000-2004. Thailand is now implementing the third phase of energy conservation program (2005-2011). The past and existing conservation policies are summarised as follow:

##### *- The first phase (1995-1999)*

The policies during this period can be divided into

three categories, namely, compulsory, voluntary, and complementary. The compulsory program includes the financial support for the development of energy efficiency improvement in the existing factories and commercial buildings. The voluntary program focuses on research and development projects in the area of energy saving potential, technologies, and policy. The increased competency of human resources and public campaigns are emphasised in the complementary program. The total expenditure in the first phase on these programs was \$195 million. The total value of energy saving over the period 1995-1999 was \$203 million.

- *The second phase (2000-2004)*

This phase continued the conservation programs from the first phase. The compulsory, voluntary and complementary programs remained. Renewed effort was devoted in this phase to promote the energy conservation plans among various groups in society. The total expenditure used in this period was \$396 million, nearly double the expenditure in the first phase. The total value of energy saving were estimated to be \$334 million over the 4-year period.

- *The third phase (2005-2011)*

The energy conservation policies in the current phase can be divided into three main parts, namely, the renewable energy development program, energy efficiency program, and the analysis of energy strategies program. This phase expects to result in a decrease in energy consumption for producing one unit of GDP from 1.4 to 1 and increase in the share of renewable energy to 8% of total primary energy by the year 2011.

***Policies on international energy cooperation***

Thailand is a participant in several regional energy programs, for example, the ASEAN and GMS energy cooperation programs. The electricity demand in Thailand is forecasted to reach 49,975 MW in the year 2020, which is almost double when compared to the electricity demand in the year 2006 (25,371 MW) [23]. In order to meet the future demand, the expansion of the electricity industry is necessary. This might create several issues relating, for example, to investment, environment, public health, and livelihood of people. However, the increase in imported energy supply from neighbouring countries could meet increased electricity demand in Thailand [24]. The ASEAN 2020 Vision adopted in 1997 by the heads of state at the 2<sup>nd</sup> ASEAN Informal Summit envisioned an energy-interconnected South-east Asia through the ASEAN Power Grid and the Trans-ASEAN Gas Pipeline Projects. These ventures call for regional cooperation in power pooling and maximising efficient use of energy resources [25]. Thailand is a strong supporter of the Power Grid project in ASEAN, especially the construction of hydro-electric dams in Myanmar and Laos. This is disturbing because this could place environmental and humanitarian strains on Myanmar and Laos where environmental laws are

less stringent as compared to Thailand [25]. According to [26], ‘...in the future, Thailand will be the main buyer of hydro-electricity from the neighbouring countries and will act as a middleman, selling power to the other nations’.

The foregoing review of the existing energy policies suggests that while these policies are well intentioned, they are insular, narrowly focused and lacking in concerns about their economy-wide impacts. Moreover, there may be some inherent conflicts among various policies. For example, while the privatisation and liberalisation policies could attract energy investments, they might raise issues of sovereignty. The energy conservation policies, while useful, may not be able to meet the rapidly rising energy demand. Moreover, the rising economic prosperity might militate against the adoption of meaningful energy conservation programs. Further, increased energy cooperation policies could ensure energy security but might affect sovereignty. Some of the above noted anomalies could be traced to the fragmented nature of decision-making and planning and policy development processes. For example, there is no apex body that has the overall responsibility for providing strategic direction for policy development, its implementation, feedback, and refinement. Even the modelling approaches followed by the energy planning agency (namely, EPPO) appear to be essentially technocratic, bottom-up, and devoid of economic linkages. Against this backdrop, this paper argues that the current energy policies are unlikely to be able to provide a satisfactory redress to the energy challenges facing Thailand.

**5. A WAY FORWARD**

A possible way forward is to develop a “policy coherence”. This would entail changes in the current policy settings, involving changes to the planning philosophies, institutions and implementation practices. The energy planning philosophy would need to clearly articulate its link with the broader economic, environmental and social policy regimes – with full recognition of the socio-political realities of Thailand. Such articulation could be assisted, for example, through the development of a comprehensive modelling and policy analysis framework that allows integration between technical, economic, environmental and social realms of energy development – and more importantly - provides a justifiable mechanism for the reconciliation of conflicts that are inevitable in such policy setting. The development of such a framework constitutes the current focus of these authors’ research.

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