Chapter 1

Introduction

At Figure 1.1 shows, according to data supplied by the National Policy Office in Thailand in 1999, petroleum comprised 54 percent of the energy consumption in Thailand. (Converting the units to crude oil barrels/day equivalents enables this comparison between different energy sources.)

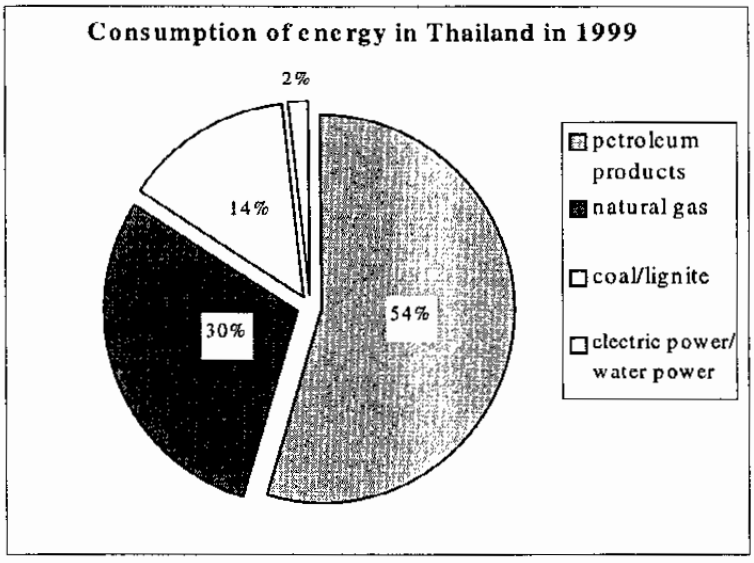

Figure 1.1 Components of energy consumption in Thailand in 1999

1.1 Background

Petroleum is a costly and non-renewable energy resource. Petroleum products that are refined from crude oil include gasoline, kerosene, diesel, jet petrol, fuel oil, liquid petroleum gas (LPG) and asphalt. Petroleum is needed to respond to basic human needs as well as to industrial needs, transportation, agriculture, accommodation, and trade. The production of petroleum is necessary for the expanding economy of Thailand. Sufficient petroleum in Thailand will help competition with other countries. Rattapan (1996) found that the most important factor affecting petroleum demand is the Gross Domestic Product (GDP).

Since the middle of 1996, Thailand has experienced an economic reversal. Any instability in the petroleum supply and demand will cause further economic problems. However, Thailand's economy improved in 1999. Industrial products expanded by 7.8%, while many sections of industry also expanded, particularly transportation and construction (Office of the National Economic Development Board, 1996). The economic expansion rate in 1999 increased to 1.1%, from -1.9% in 1998 (Bank of Thailand, 1999). That raised the demand for petroleum after the setbacks of 1997. Setthalak (1996) showed that the estimation of crude oil demand is important. Thus, knowledge of petroleum consumption can help to estimate petroleum demand and lead to the most profitable crude oil production plan. Moreover, knowing the amount of petroleum consumption can determine whether Thailand would be some stockpiling of resources or would be a stockpile to cater to the demand.

Research is needed to find the factors determining the stockpile of petroleum. Time series analysis can be used to model these factors. This model may be useful for any authority concerned with the petroleum industry for planning information on managing petroleum in every aspect, including consumption, import, production and reservation, as well as finding ways to save energy. Only limited energy resources are found in Thailand, so 60% of energy consumption in the nation is imported from other countries. The consumption of these limited resources should be efficiently used (National Energy Policy Office, 1999).

1.2 Petroleum Products, Demand, Supply and Strategies

1.2.1 Petroleum Products: Consumption, Import, Production and Stock

1.2.1.1 Consumption

Consumption of petroleum products refers to the petroleum consumption in response to requirements. Consumption should be similar to import + production. If we need more consumption, then Thailand must import petroleum products from abroad or increase the production of petroleum products in Thailand. If import and production of petroleum products exceed consumption then it must be stored.

1.2.1.2 Import

Import of petroleum products is the amount of petroleum products that are imported from other countries. Since Thailand is not well endowed with indigenous crude oil resources, many domestic refined petroleum products are not adequate to meet the demand in various economic activities, which results in the import of crude oil from other countries such as Singapore.

1.2.1.3 Production

Thailand has encouraged the exploration of crude oil for the increased use of petroleum base fuel and other petroleum products. Petroleum products are refined from crude oil consisting of the following components

(1) Liquefied Petroleum Gas (LPG) is not only used as a fuel for cooking but also in transportation and industry. Data that be used in this study came in three way first from crude oil refinery plants, second from natural gas plants and third from petrochemical industry.

(2) Gasoline is a volatile mixture of flammable liquid hydrocarbons derived chiefly from crude petroleum and used principally as a fuel for internal-combustion engines and as a solvent, an illuminant, and thinner. Gasoline is categorized into regular gasoline with its octane below 95 and premium gasoline with octane above 95.

(3) Kerosene is thin oil distilled from petroleum or shale oil, used as a fuel for heating and cooking, in lamps, and as a denaturant for alcohol. It is also called coal oil or lamp oil.

(4) Jet Petrol is used in jet engines usually found in aircraft.

(5) Diesel is divided into the high speed diesel that is generally used with vehicles powered by diesel engines, and low speed diesel that is used in the industrial section.

(6) Fuel Oil is used to generate electricity in industries, often in boilers and generators.

(7) The remainder of the process is Asphalt, which is generally used in constructing highways and coating the conduit. It is not used in this analysis.

One barrel of crude oil can be refined to various petroleum products as follows. (Boonyaratthanawat (lecture), 1973)

Type of petroleum products	Percentage
LPG	4
Gasoline	18
JP	5
Kerosene	5
Diesel	26
Fuel oil	42

Table 1.1: Percentage of petroleum products obtained from crude oil

In 1999, Thailand produced crude oil from many producing wells as shown below in Table 1.2, but the amount of crude oil is still insufficient for the internal consumption, which necessitates the import of crude oil to satisfy the demand. (National Energy Policy Office, 1999).

location	total(ML)
Sirikit	23384
Fang	996
Prukrathiam	33
Neung	546
Bung ya & Bung maung	570
Wichianburi	140
Tantawan	5056
Srithep	21
Benjamas	3223
Nhongjig	2
Wattan	36
total	34006

Table 1.2 Production of crude oil by location in 1999

1.2.1.4 Stock of Petroleum Products

Stock of petroleum products is the amount of petroleum products that are kept in Thailand. Thailand has to reserve an amount of crude oil equal to 8% of crude oil in Thailand in a whole year. This reserve can be refined to stratify the domestic petroleum requirement for 25 days. For petroleum, the reserve is equal to 5% of petroleum used in Thailand in a whole year, which can support the domestic demand for 18 days. From both reserve sources, Thailand can utilize the reserved oil for 47 days in the event that there is no imported crude oil to Thailand. However, in practice

there is more reserved oil than that because oil refinery companies require flexibility in petroleum transformation. (Boonyaratthanawat (lecture), 1973)

1.2.2 Demand

Demand refers to the requirement of petroleum in various quantities depending on the cost of it.

1.2.3 Supply

Supply refers to amount of petroleum offered at a specified cost at a period of time depending on the demand of petroleum.

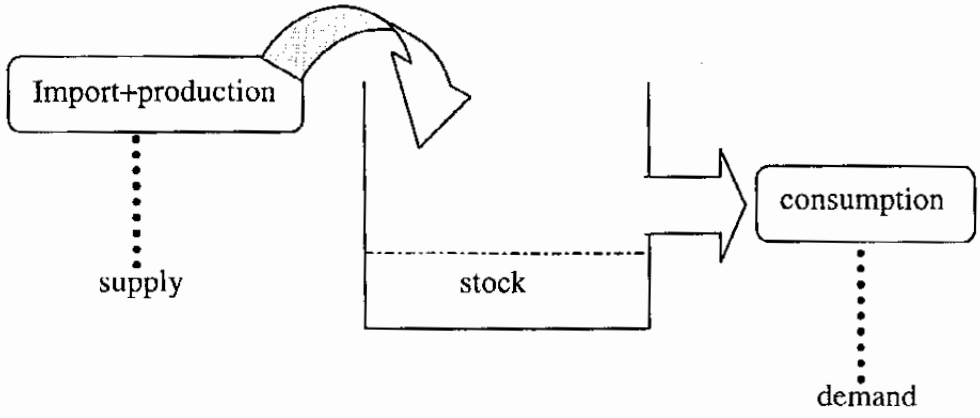

Figure 1.2: Demand and supply of petroleum products

1.2.4 Strategies

The following strategies have been adopted for energy development during the Eighth National Economic and Social Development Plan (1997-2001)

1. Provide an adequate amount of energy to satisfy demand at reasonable prices while ensuring quality and security of supply.
2. Promote efficient and economical use of energy.
3. Promote competition in energy supply industry and increase the private sector role.
4. Prevent and solve environmental problems resulting from energy development and utilization, as well as improve safety of energy-related activities.
5. Develop legislation related to energy and energy administration mechanisms.

1.3 Objectives and Benefits

The objectives of our study are as follows.

1. To investigate the patterns of supply and demand of petroleum products in Thailand.
2. To study the trends of supply and demand of petroleum products in Thailand.

Our research questions may be stated as follows.

1. How does supply and demand differ between type of petroleum products in Thailand?
2. How does supply and demand differ from month to month for petroleum products in Thailand?

The expected benefits are as follows.

1. To understand the pattern in the supply and demand of each petroleum product.
2. To estimate the supply and demand of each petroleum product.
3. To forecast the petroleum supply and demand situation in the future and to be able to recommend policy based on measurements of petroleum products.
4. To provide some useful findings to assist efficient planning of energy use for Thailand in the future.

1.4 Review of Literature

The National Energy Policy Office (1999) studied the energy requirements for 1999-2011 to find out the energy demand estimation of Thailand in the future. It also considered many factors that might influence the national demand of energy such as economic growth in different production areas and the cost of fuels from the six petroleum-refinery-plants of Thailand.

In 1998 production was 692 thousand barrels per day, 7% less than in 1997. It is believed that it would be at 730 thousand barrels per day in 1999-2000 and it may reach 810-840 thousand barrels per day in 2005-2011. However, if the Sukhothai

refinery plant is established, it might reach 930-958 thousand barrels per day in 2005-2011.

In general the image of commercial energy demand comes from the economic situation in the 8th National Economic and Social Plan, which planned to delay energy demand in the first three years. Later the demand may rise up to 5.1% and 4.9% yearly in the 9th and 10th National Economic and Social Plan respectively. While petroleum would still be the national important energy resource, the commercial energy consumption proportion will be continuously reduced from 56.3% in 1998 to 49.8% and 49.4% in 2006 and 2011 respectively.

The transportation section consumes most energy, that is 63.8% of the whole energy transportation section. The industrial section consumes 12.4% of energy and the electricity generation consumes 12.3%. In the 8th National Economic and Social Plan, the demand of petroleum in industrial section went down by 0.8% and it was 3.4% in the 9th National Economic and Social Plan. It is expected that in the 10th National Economic and Social Plan, it will reach 5.1% for import. In 1998-2000, the petroleum production of the refinery plants may be at 730 thousand barrels per day, which is still lower than the production capacity. However, it may rise up from 2001 until 2007. Then, there import of petroleum will again be needed in 2008-2011.

Rattapan (1996) studied factors affecting Thailand's demand for and supply of oil and import substitution in 1995–2000, and found that the main factor affecting oil demand is the gross domestic product, while the factor affecting the volume of oil supply is restricted production. Despite the domestic oil output rising at an average of 10.79% per year and the oil demand rising at an average of 8.10% per annum, resulting from the two refineries expansion, the current oil output was still inadequate to meet the demand. It could not to be substituted for the whole volume of imported oil, except during the period of 1996–1997, when the domestic supply of gasoline and aviation oil was sufficient.

Sedtalug (1996) studied linear programming in crude oil production for scheduling crude oil production of wells from a reservoir for maximizing profit needs to estimate relevant factors such as crude oil price, operating expenditure, crude oil demand, characteristics of the reservoir and properties of fluids in the reservoir.

From an analysis of imported crude oil and oil products in Thailand, Thanin Patthanakul (1994), found that the gross domestic product most intensively influences the demand of imported crude oil, whereas the main utilization of each oil product dictates the demand of that particular imported oil product.