

## **Chapter 3.**

### **Demand, Transportation System and Oil Situation**

This chapter involves with the marketing analysis, which is the first element of feasibility study that should be considered in every project. Because the project will not process without markets and consumers support. The scope of market study includes demand and supply of petroleum products, oil market, the current oil transportation system in Thailand and economic projection on power and oil demand/supply in the next decade.

#### ***3.1 Overview Demand, Supply and Oil Market***

Because of the sustained pressure of economic and financial crises, 1998 was another grave year for the Thai economy, evident in a dearth of liquidity at financial institutions, the huge debts of the private sector, foreign exchange rate volatility, and so on. These numerous problems proved to be the undoing of various firms within the business, industrial, and financial sectors. The shrinking of these entities was accompanied by personnel layoffs and the accumulation of debt. Double-digit growth rates became a thing of the past as the economy went at minus 8%.

##### **3.1.1 Demand / Supply of Thailand**

Directly affected was the purchasing power of Thai consumers, reflected in a 6.4% drop in domestic demand for petroleum to about 867,000 barrel/day. The total domestic demand for refined products was effectively halved to roughly 630,000 barrel/day as car and motorcycle sales slackened along with the slowdown in the construction sector. At the same time, consumption of fuel oil in the industrial and power sectors fell due to natural gas substitution. It must be said that care for the environment and the well-being of society also increasingly made natural gas, a more environmentally friendly fuel, the fuel of choice. The government, moreover, made it a policy to encourage the use of natural gas for power generation. During 1998, consumption of gas by the power sector (exclusive of gas used as petrochemical feedstock) amounted to 237,000 barrel/day equivalent, a rise of 4.9% from the previous year. The power sector's share of this was 78.7%, with rising

demand for gas at the Wong Noi, South Bangkok, Bang Prakong, and the Nam Phong power plants. About 6.1% of the gas were used to fuel industrial plants.

As for petroleum procurement, Thailand acquired about 1,061,000 barrel/day from domestic and overseas sources, which was 5.6% lower than the previous year. The degree of petroleum self-reliance rose mildly as imports dropped from 70% to 66% and indigenous supplies rose from 30% to 34% of total procurement. Total liquid energy resources, i.e. crude oil and condensate from indigenous and overseas sources, amounted to 755,000 barrel/day, or 5.8% lower in 1998. Procurement of refined products totaled 724,000 barrel/day, most of which came from domestic refineries and gas separation plants. Imports of refined products from foreign sources accounted for only 3.4%. Procurement of gas supplies averaged 282,000 barrel/day equivalent, a rise of 5.1% from the previous year, with increasing production from fields in the Gulf of Thailand (Source: Petroleum Authority of Thailand).

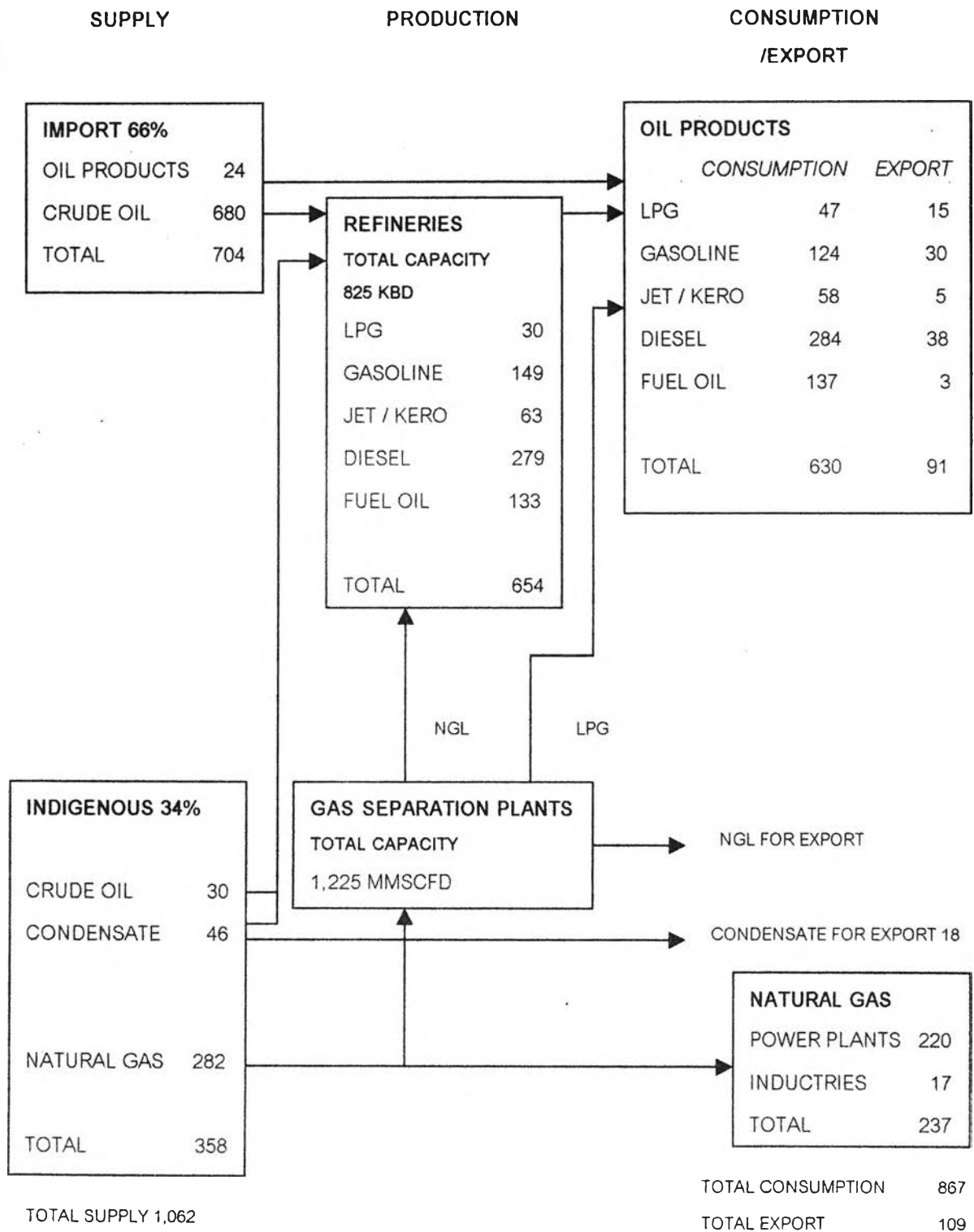
In summary, in 1998, Oil and Gas produced in Thailand would meet only 34% of the total demand of the country as shown in Figure 3.1. The remaining 66% are required to be imported, mostly in the form of Crude oil that is 97% of the total import. At the same time, export of refined oil and condensate 109 KBD has accounted for 17% of the total demand in the country while Diesel is the petroleum product mostly exported.

Major supply sources are from six oil refineries with total refinery capacity of 717 KBD, as follow (as shown in Figure 3.3):

<b>Refineries</b>	<b>Capacity (KBD)</b>
Thaioil Refinery	188
Bangchak Refinery	91
Esso Refinery	121
Rayong Refinery	130
Star Petroleum Refinery	131
TPI Refinery	56

## THAILAND'S PETROLEUM BALANCE 1998

Unit: KBD



**Figure 3.1** Oil & Gas Demand / Supply of Thailand in 1998

Source : Petroleum Authority of Thailand (PTT).

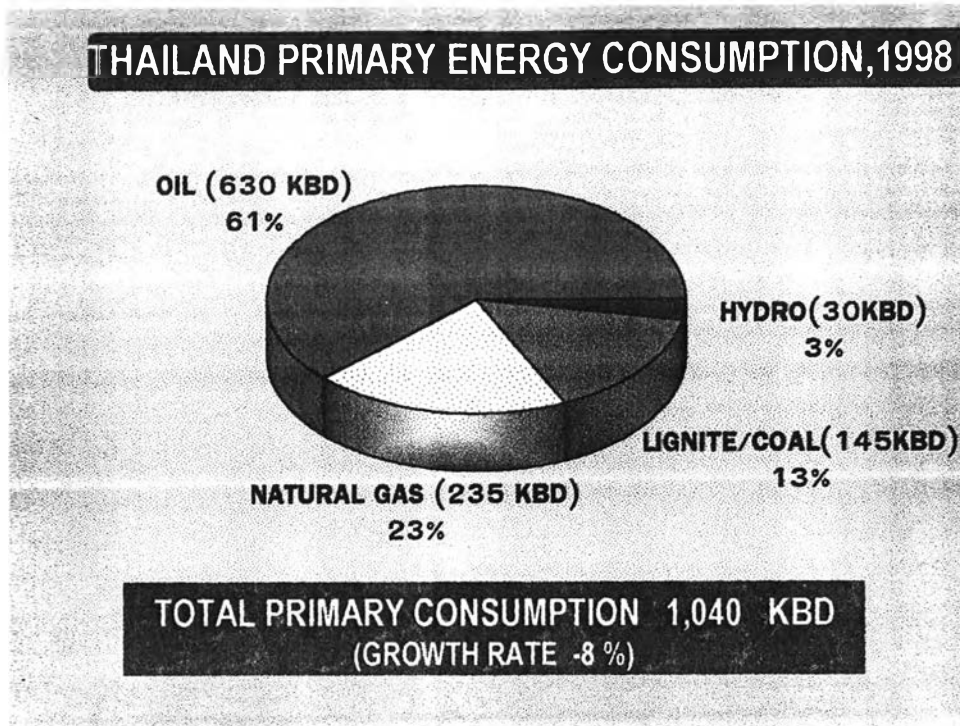


Figure 3.2 Thailand Primary Energy Consumption 1998.

Source : PTT.

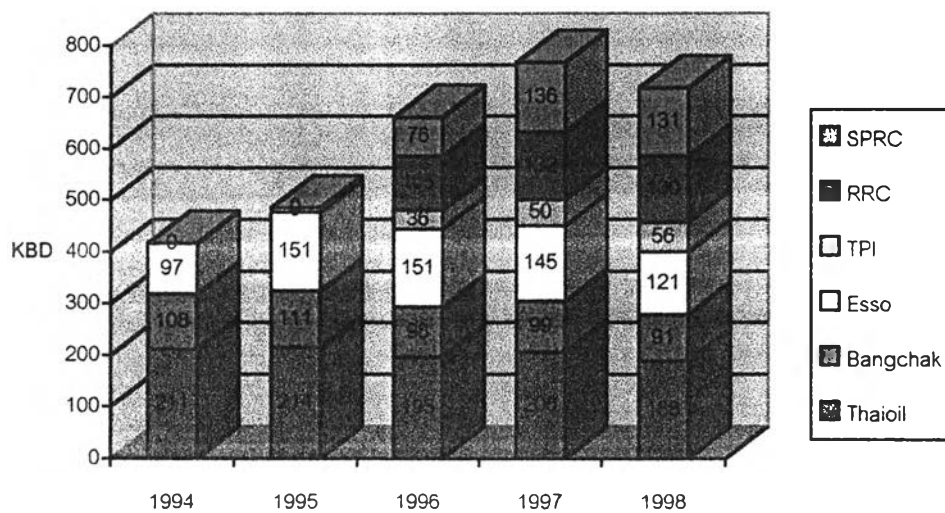


Figure 3.3 Utilized Refinery Capacity 1994-1998

Source : PTT.

### 3.1.2 Demand in Northern Region

The Northern region of Thailand consists of 17 provinces, which is divided into two sections: the Upper and the Lower North. The Upper North has 9 provinces: Chaing Rai, Chaing Mai, Tak, Nan, Phayao, Phrae, Mae Hongson, Lampang, and Lamphun, while the Lower North comprises of 8 provinces that are Nakhon Sawan, Phitchit, Uthai Thani, Phetchabun, Pittsanulok, Sukhothai, Utradit, and Kampheng Phet. The Northern region has the largest area (169,645 sq.km.) or 33.1% of the country area and its population in 1997 ranks only second to that of the Northeastern region (or 19.9% of the country). In addition, Gross Domestic Products (GDP) in 1997 is approximately 254,762 million-baht or 10.2% of Thailand's GDP. (Source: National Economic and Social Development Office, 1997)

In the future, the oil demand in the North will likely be increasing. The government has the policy to support the development in the region. The major development project is the Mekong Sub-regional Economic Cooperation Development Project among 6 Countries (China, Thailand, Burmar, Laos, Kamphucha and Vietnam). Consequently, the economy in the North will be boosted after the borders are opened wider. Whenever the borders are opened, the border trade will be boom and the investment will be extended. The demand for energy, especially the oil, will rise. This will cause the positive effect to the investment of the pipeline transportation project.

The Northern region plays a role in economic development that links neighboring countries, such as Laos and Burma. An important project of the National Economic and Social Development Board is one for a link to the Burmese and Laos seashore or East-West Corridor. There will then be transportation of goods via this region to a port in Burma and Laos. This will bring progress to the region in future.

In 1998, Northern region has oil demand that can be transported by pipeline, as follow:

Type of oil	Million-litre/Year
Unleaded Gasoline (ULG)	482
Unleaded Regular (ULR)	222
High Speed Diesel (HSD)	1,560

Source: Ministry of Commerce.

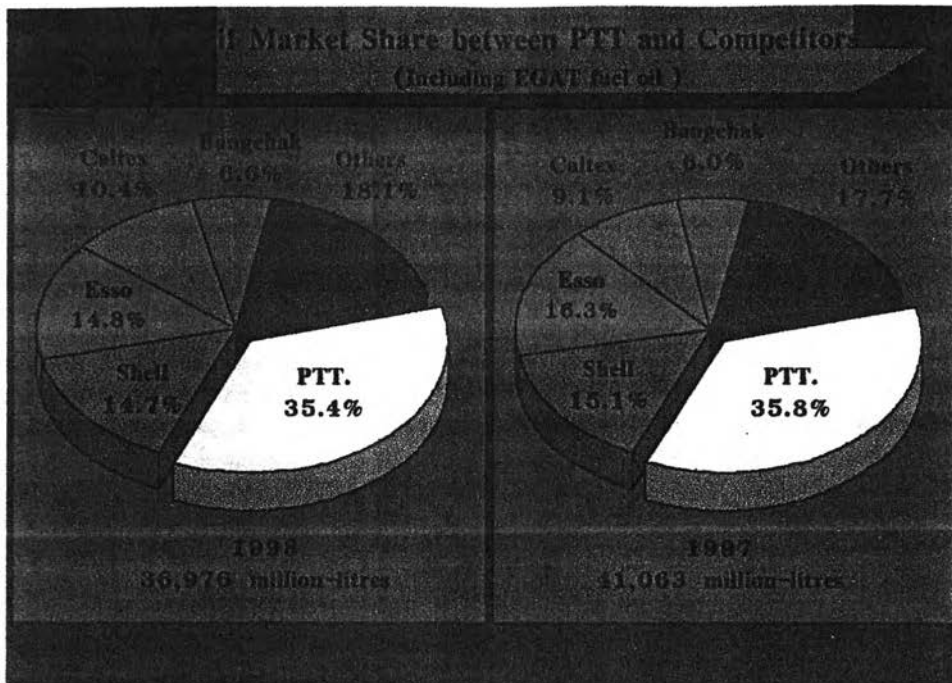
### 3.1.3 Oil Market

Currently, petroleum distribution and marketing in Thailand is consisted of 29 companies as follows:

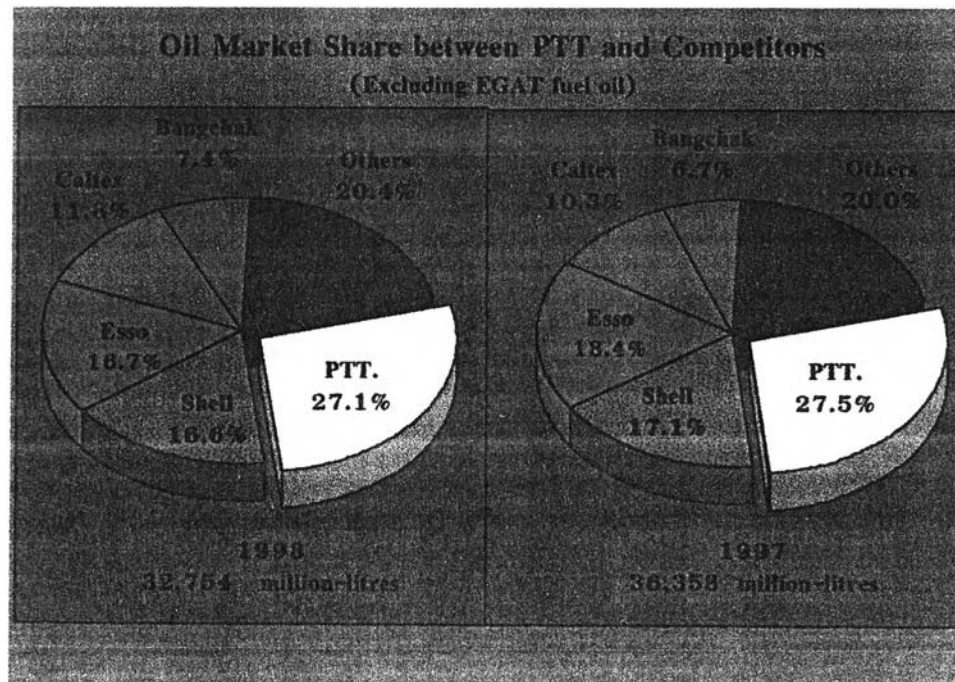
- |  |                         |
|--|-------------------------|
| 1) Petroleum Authority of Thailand (PTT) | 2) Shell                |
| 3) Esso                                  | 4) Caltex               |
| 5) Bangchak Petroleum (BCK)              | 6) Thairoil             |
| 7) Thailand Petroleum Industry (TPI)     | 8) Unix-gas             |
| 9) Siam Gas                              | 10) Cosmo Oil           |
| 11) Siamsaha                             | 12) Chareon Munkong     |
| 13) Paktai Petroleum (PT)                | 14) Sukhothai Petroleum |
| 15) Mobil Oil                            | 16) PC. Siam Petroleum  |
| 17) Star Petroleum Refinery (SPRC)       | 18) Tipco Asphalt       |
| 19) Petrochemical Thailand Industry      | 20) MP. Petroleum       |
| 21) Q8                                   | 22) World Gas           |
| 23) Rayong Refinery (RRC)                | 24) BP. Oil             |
| 25) Siam Chemical                        | 26) Hart Oil            |
| 27) Aromatic (Thailand)                  | 28) Conoco              |
| 29) Thai Public Port                     |                         |

#### Market Share

In 1998, PTT, Esso, Shell and Caltex are the four major oil companies that dominate Thailand's oil market. These four firms account for approximately 76% of the total market consumption in the Northern region.



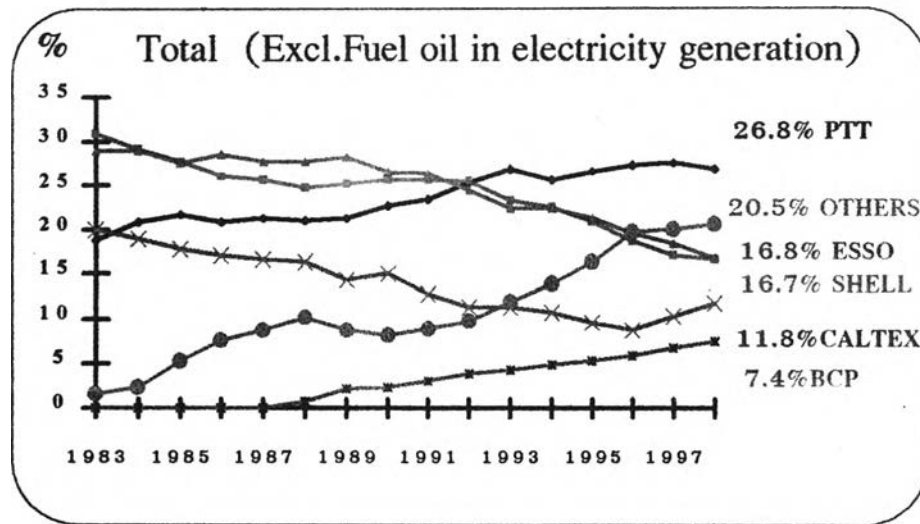
**Figure 3.4** Oil Market Share ( Including EGAT Fuel Oil )



**Figure 3.5** Oil Market Share ( Excluding EGAT Fuel Oil )

Source : PTT.

## OIL MARKET SHARE (1963-1998)



**Figure 3.6 Oil Market Share (1983 - 1998)**

Figures 3.4-3.6 show the market of the total market consumption in 1998. PTT has a leading market share of 35.4% and 27.1% in term of include and exclude EGAT fuel oil, respectively.

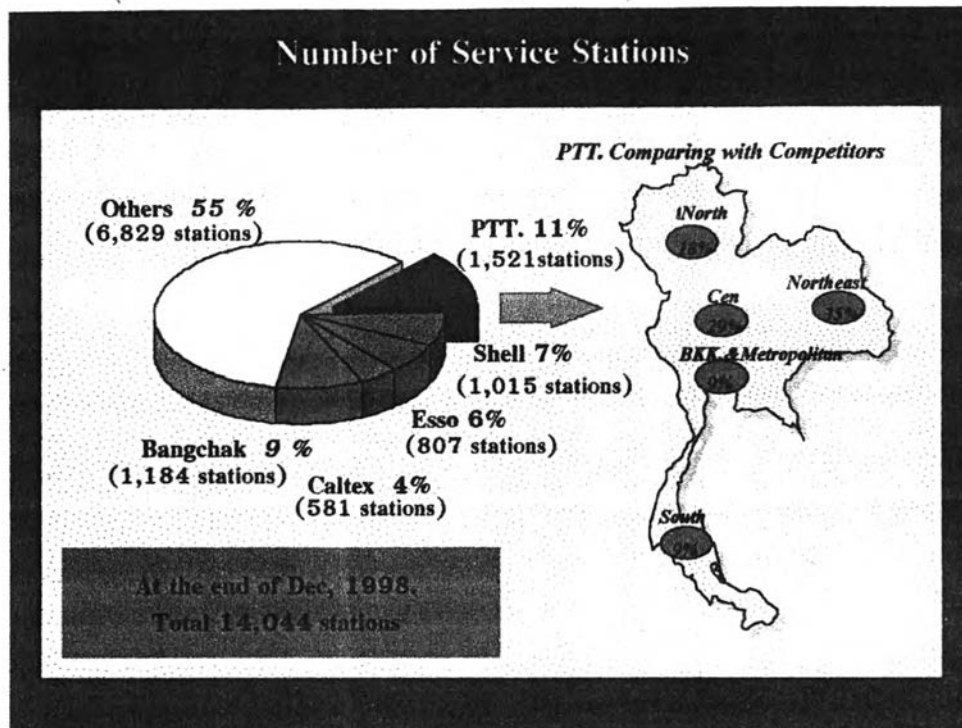
Over the past few years, the market share of major oil companies that are Shell, Esso and Caltex has a tendency to decline while those of PTT, Bangchak and minor oil companies are growing rapidly.

### Service Stations

In 1998, Thailand has 14,044 oil service stations while 55% of service stations belong to minor oil companies that are 6,829 stations. For major firms as PTT has 1,521 stations, which is 11% of total service stations, and the next are Bangchak and Shell that are 9% and 7% respectively.

For Northern region has 2,528 stations that is equal to 18% of total service stations of the country as shown below:





**Figure 3.7** Number of Service Stations in 1998.

Source : PTT.

### **3.2 The Current Oil Transportation System in Thailand**

#### **3.2.1 Oil Transportation of the Country**

At present, the transportation of petroleum product from Rayong and Sriracha oil refineries, and import from abroad to the oil depot Bangkok and to other regions of the country can be transported by four transportation modes as following (Figure 3.8). The four transportation modes of the Thailand's oil transport system are Ship, Pipeline, Truck and Train.

**Bangkok** : Petroleum product is transported by *ship* from Sriracha and Rayong oil refineries through the Prakanong, Bangchak, and Chong Nonthree oil depots in Bangkok.

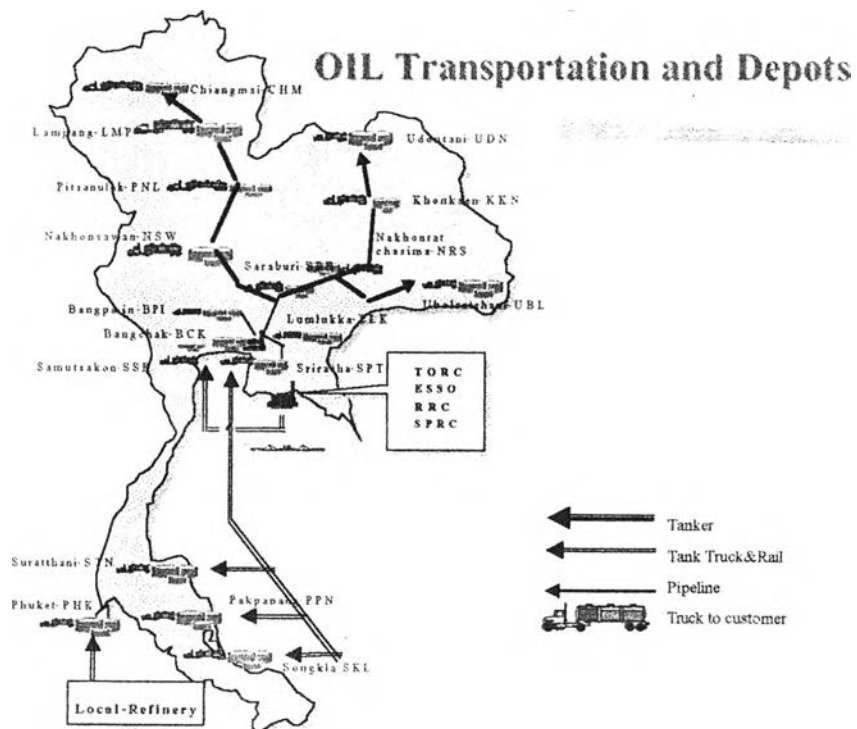
**Central Region** : The oil transportation by pipeline transport petroleum through the pipeline at Sriracha-Saburi of the Thai Petroleum Pipeline Co., Ltd. (Thappline) and from Bangchak-Donmuang-Bangpa-in of the Fuel Pipeline Transportation Co., Ltd. (FPT). Another transportation mode is truck.

**Southern Region :** The oil transportation by ship transport petroleum product from Rayong and Siracha oil refineries to oil depots in Chunphon, Surat Thani, Nakhon Si Thamrat, Songkhla, and Phuket.

**Western Region :** Transport by ship through oil depots in Samut Prakhan, Samut Songkram, and Phetchaburi.

**North Eastern Region :** Transport by pipeline system of Thapline and FPT. And then transport by trucks and trains at terminal oil pipeline to terminal oil depot in Nakhon Ratchasima, Ubon Ratchathani, Khon Kaen and Udon Thani.

**Northern Region :** Oil is transported by Thapline (Siracha-Saraburi) and FPT (Bangchak-Donmuang-Bandpa-In) pipeline systems. From the terminal oil pipeline is further transported by trains and trucks to terminal oil depots in Pittsanulok, Den Chai, Lampang and Chaing Mai and then to users.



**Figure 3.8** Oil Transportation Systems and Oil Depots.

Source : PTT.

### 3.2.2 The Existing Petroleum Pipeline System

Currently, the oil transportation by pipeline has two existing routes that are the pipeline at Sriracha-Saraburi of the Thai Petroleum Pipeline Co., Ltd. (Thapline) and from Bangchak-Donmuang-Bangpa-in of the Fuel Pipeline Transportation Co., Ltd. (FPT) as the following detailed (Figure 3.9):

#### 1) *The Sriracha-Saraburi Pipeline System of the Thai Petroleum Pipeline Co., Ltd. (Thapline)*

Summary of Background : The Cabinet on June 5, 1990 granted approval of the project and specified it as an urgent project. PTT was required to serve as coordinator in setting up a joint venture company, which the Thai Petroleum Pipeline Co., Ltd. (Thapline) was established on January 9, 1991. Structure of shareholders is as follows:

#### MultiProducts Pipeline system

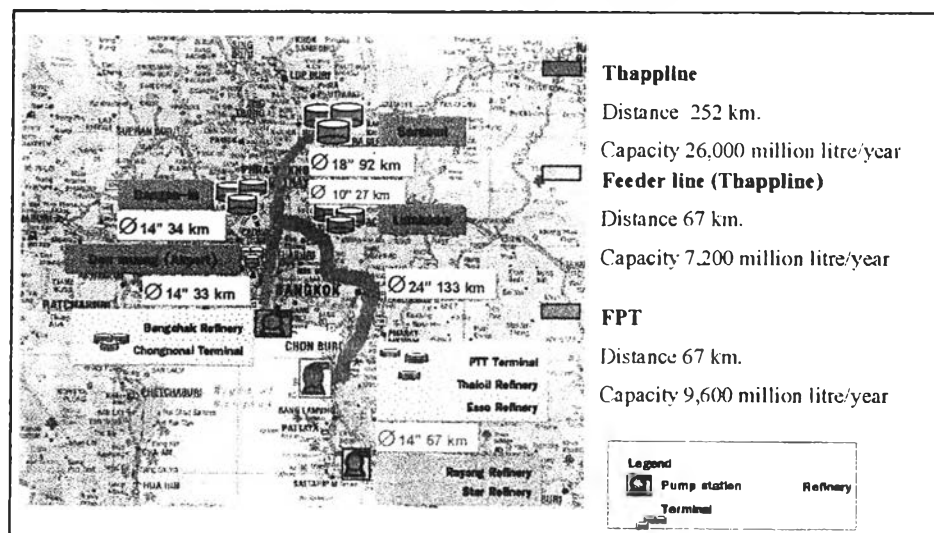


Figure 3.9 The Existing Petroleum Pipeline System

Source : PTT.

Characteristics of the project : The pipeline is of a single pipe type for supply of Benzene, Diesel and Jet fuel. Its terminal is in Saraburi, and a depot on the route is at Lam Look Ka. The pipeline can supply oil at 26,000 million-litres/year to serve customers in the northern and eastern outlying areas of Bangkok, and the Central region, the Northern region and the Northern-Eastern region. The oil to be fed to the pipeline from Esso and Thaioil oil refineries, and PTT, Q8 and BP oil depots in Sriracha District, Chanburi Province. The pipeline is composed of Sriracha - Chachoengsao - Latkrabang - Lam Look Ka - Rangsit - Saraburi main pipeline and branch pipelines to Nong Chok Electric Power Plant and Don Muang Airport. The length of the pipeline is 322 km. that has detail as follows:

Sriracha - Lam Look Ka	Distance	134 km.	Size	24 inches.
Lam Look Ka - Saraburi	Distance	92 km.	Size	18 inches.
Lam Look Ka - Don Muang	Distance	29 km.	Size	10 inches.

Lam Look Ka oil depot is in an area of 188 rai with oil tank capacity of 120 million-litres. And Saraburi oil depot is 170 rai with oil tank capacity of 160 million-litres.

### Thappline Shareholder

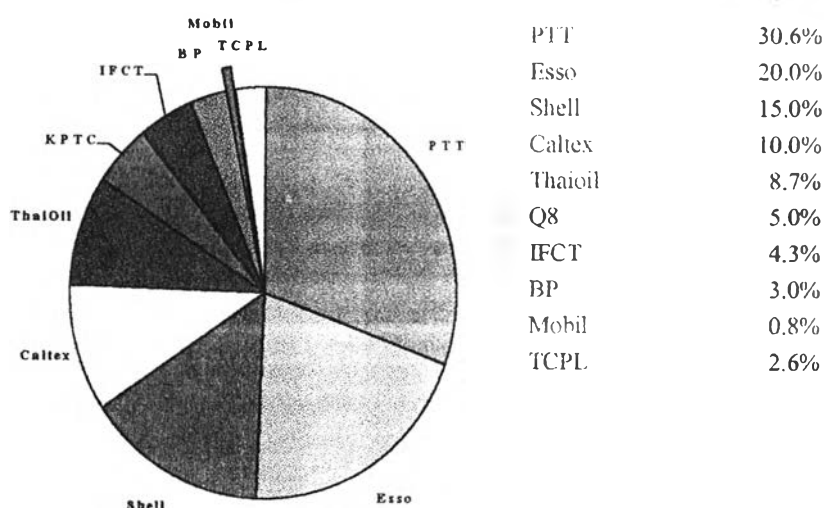
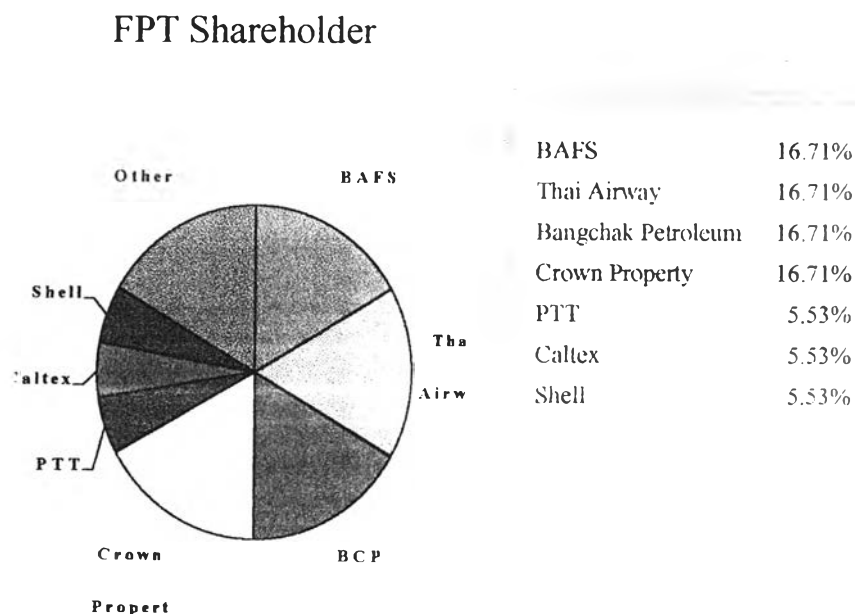


Figure 3.10 Thappline Shareholder in 1998.

The pipeline system control center is located in Lam Look Ka oil depot area. It controls of oil flow throughout the length of the pipeline that is maintained by SCADA (Supervisory Control and Data Acquisition System). And fiber optic cables are used monitor change of pressure, movements, leakage and various situations throughout the pipeline, in addition to giving alarms of emergency and automatic closing/opening. Construction of this pipeline was completed in 1994. In 1997, the quantity of oil passing through the pipeline was 9,026 million-litres or 35% of its capacity.

2) *The Bangchak-Donmuang-Bangpa-in Pipeline System of the Fuel Pipeline Transportation Co., Ltd. (FPT)*

Summary of background : The Cabinet granted approval of the project on May 31, 1991 and required Thai Airway to serve as coordinator in setting a joint venture company. This was followed by the establishment of the Fuel Pipeline Transportation Co., Ltd. (FPT) on July 8, 1997. The structure of shareholders is as follows:



**Figure 3.11** FPT Shareholder in 1998.

Source : PTT

Characteristics of the project : The pipeline is of a single pipe system with pipes of the diameter of 14 inches and total length of 66 km. the pipeline can supply Benzene, Diesel and Jet fuel from Bang Chak to Don Muang and Bangpa-in with maximum capacity of 9,600 million-litres/year. Pumping station for the pipeline is at Bang Chak oil refinery, Chang Nonsee oil depot and Esso oil depot. The terminal at Bangpa-in is in an area of 55 rai with storage tank capacity of 80 million-litres. In 1997, the quantity of oil passing through the pipeline was 4,196 million-litres or 44% of its capacity.

### 3.3 Economic Project on Power Demand and Oil Market in the Next Decade

#### 3.3.1 Economic Project and Power Demand in the next decade

In the next decade between 1998 - 2009, Thailand's GDP (Gross Domestic Production) is expected to grow at 5.7% per year and will reach 6.6% per year in the final year.

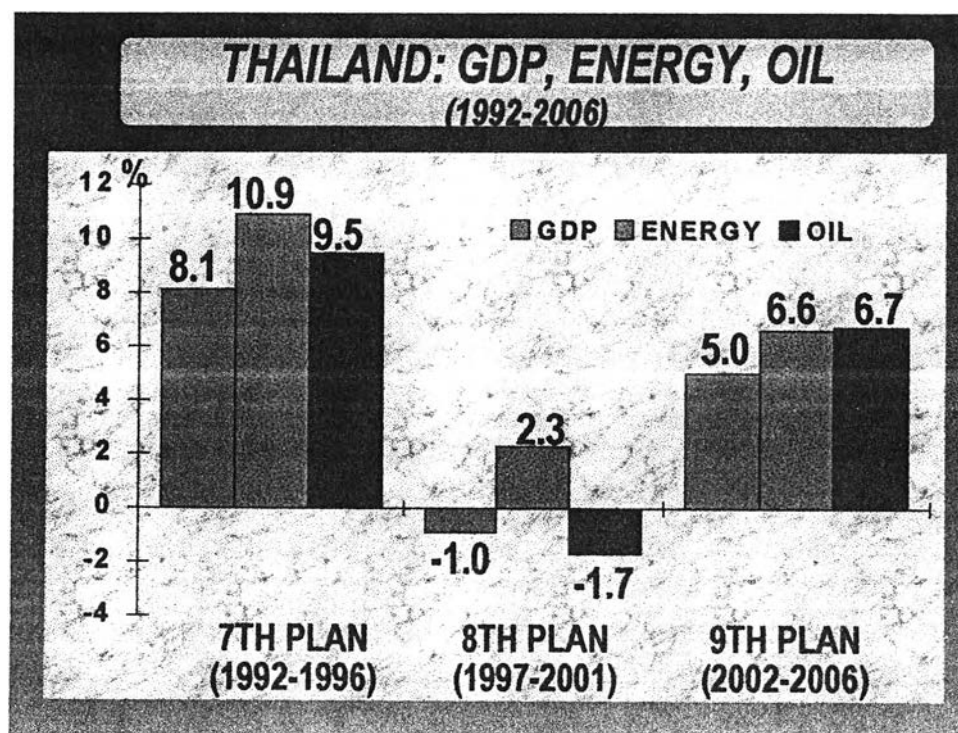
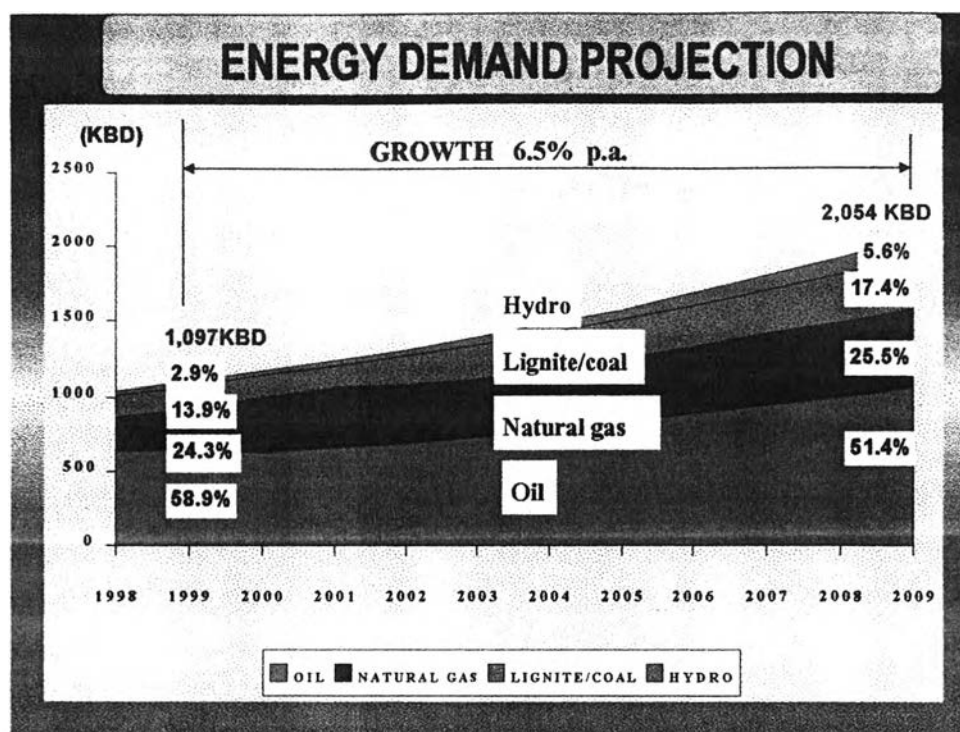


Figure 3.12 Thailand : GDP, Energy and Oil (1992 – 2006 )

Source : National Economic and Social Development Office



**Figure 3.13** Energy Demand Projection

Source : National Energy Policy Office.

The need of energy demand from oil will be reduced 58.9% in 1998 to 51.4% in 2009 while those produced from Natural gas, Lignite/Coal, and Hydro power will grow up from 24.3% to 25.5%, 13.9% to 17.4%, and 2.9% to 5.6%, respectively.

### 3.3.2 Trend of Oil Demand

In the next decade between 1998-2009, Thailand's oil demand is expected to increase at 5% per year.

Between 2003-2009, Diesel remains the mostly used oil that is about 41.8% in 1998 and 45.7% in 2009, because the farming and transport sectors still heavily rely on Diesel. Benzene or Gasoline, which is mostly used by passenger vehicles in big cities, will take a minor role after Diesel that is 20.5% in 1998 and will increase to 21.2% in 2009. However, consumption in furnace oil ( or fuel oil ) is expected to decline from 20.5% to 16.3% in 2009 due to replacement with Natural gas for some industries and electricity generation.

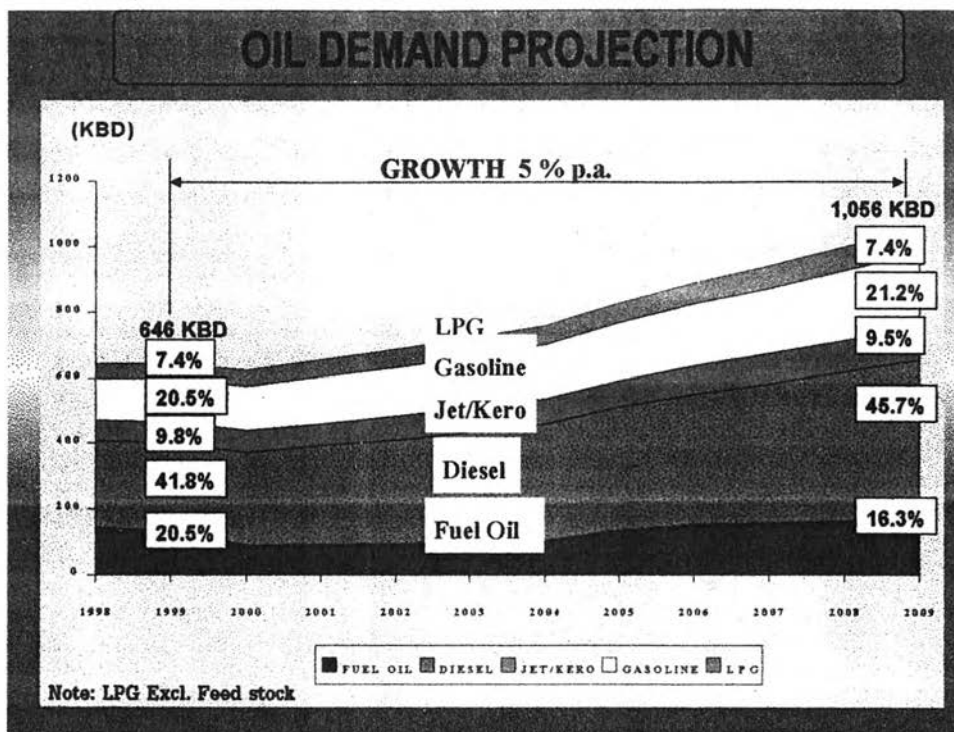


Figure 3.14 Oil Demand Projection (1998 - 2009)

Source : National Energy Policy Office.

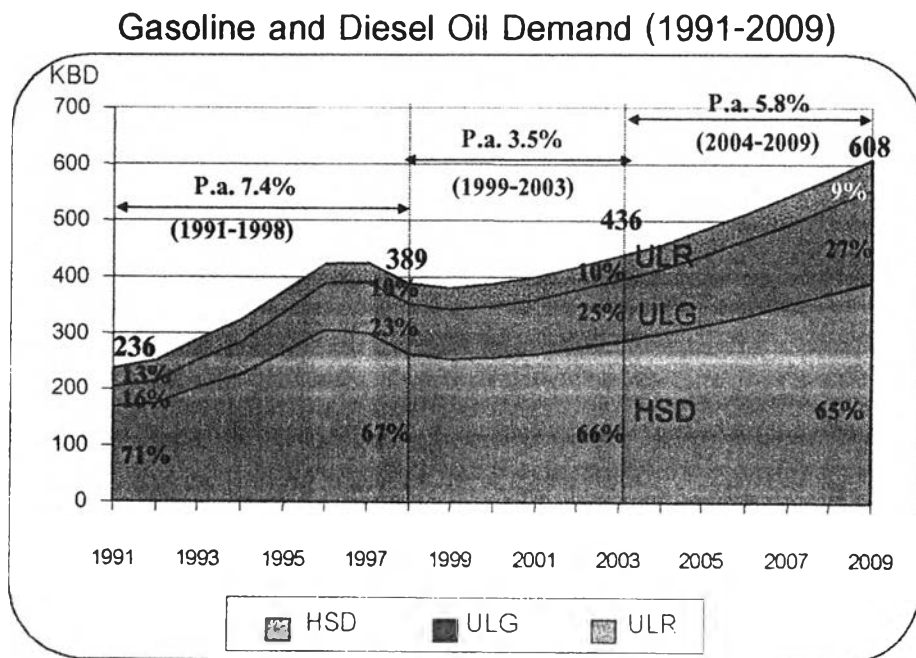


Figure 3.15 Gasoline and Diesel Oil Demand (1991-2009)

Source : PTT.



### 3.3.3 Projected Growth Rate of Benzene and Diesel

Based on the Ministry of Commerce statistics, the total market consumption of Benzene and Diesel in 1998 was 2,264 million-litres for the Northern region. Due to the recent slowdown in economic growth, the demand for benzene and diesel in the Northern region is expected to decrease over the next few years.

The principal of Projected Growth Rate of Benzene and Diesel starts with Thailand's Gross Domestic Production Projection (GDP : the information from National Economic and Social Development Office). As there is a relationship between GDP and Energy consumption, so the Energy Demand Projection can be projected by using GDP. Then, Oil Demand Projection can be estimated from Energy consumption, in which the projection growth rate of Benzene and Diesel can be found out from the oil demand, respectively.

Thailand's projected growth rate of Benzene and Diesel consumption in the next decade is depicted in Table 3.1:

**Table 3.1 Benzene and Diesel Projected Growth Rate.**

Unit : %

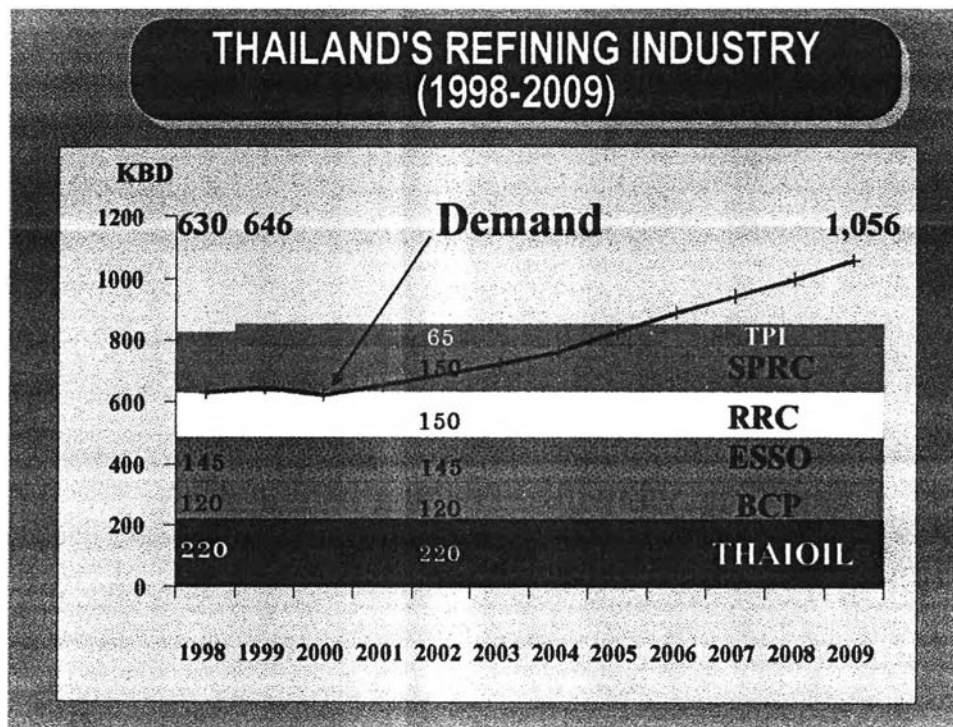
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Benzene (ULG&amp; ULR)</b>	-2.65	0.05	2.40	2.91	4.05	4.46	4.46	4.14	3.93	4.03	3.71	3.50	3.40
<b>Diesel (HSD)</b>	-12.3	2.29	3.84	4.43	4.25	3.95	4.35	4.13	3.87	3.94	3.62	3.41	3.31

Source : National Energy Policy Office and PTT.

As shown in Table 3.1, the total market demand is being held constant after 2010. This growth forecast is based on regional economic analysis and an energy demand model that is statistically valid and has similar basis to models that have been widely used in other developing economics (source : National Economic and Social Development Office).

### 3.3.4 Projection of Oil Supply in the Next Decade

In addition to the six existing oil refineries, a new major oil refinery in Southern Seaboard project of PTT with production capacity of 300 KBD is expected to carry out the product in 2003.



**Figure 3.16** The projection of Thailand's Refining Industry (1998-2009)

Source : PTT.

Therefore, oil surplus is inevitable, as oil supply will exceed the oil demand in the next decade. At the time, Thailand will become an oil exporting country instead of a major oil importing country.