

## CHAPTER 5

### GAS DISTRIBUTION MARKET

#### 5.1 Introduction

This chapter discusses Gas Malaysia Sdn Bhd market i.e. the industrial, commercial and residential sectors. As for the transportation sector, GMSB will not directly supply to the end-users, but to Petronas NGV Sdn Bhd. This wholly owned subsidiary of PETRONAS will undertake the development and commercialization of the natural gas for vehicle (NGV) in Malaysia. Indirectly, the transport sector will also be a potential demand for natural gas.

Subsequently, this chapter shows the market demand from each of these sectors, besides explaining why the GMSB as targeted the industrial sector has its priority. The chapter further explains that GMSB has to develop the residential sector because of the social obligation imposed by the government, in the license. Finally, the chapter shows the success of GMSB in penetrating the

energy market due to its competitive pricing policy and the challenges faced in gas distribution.

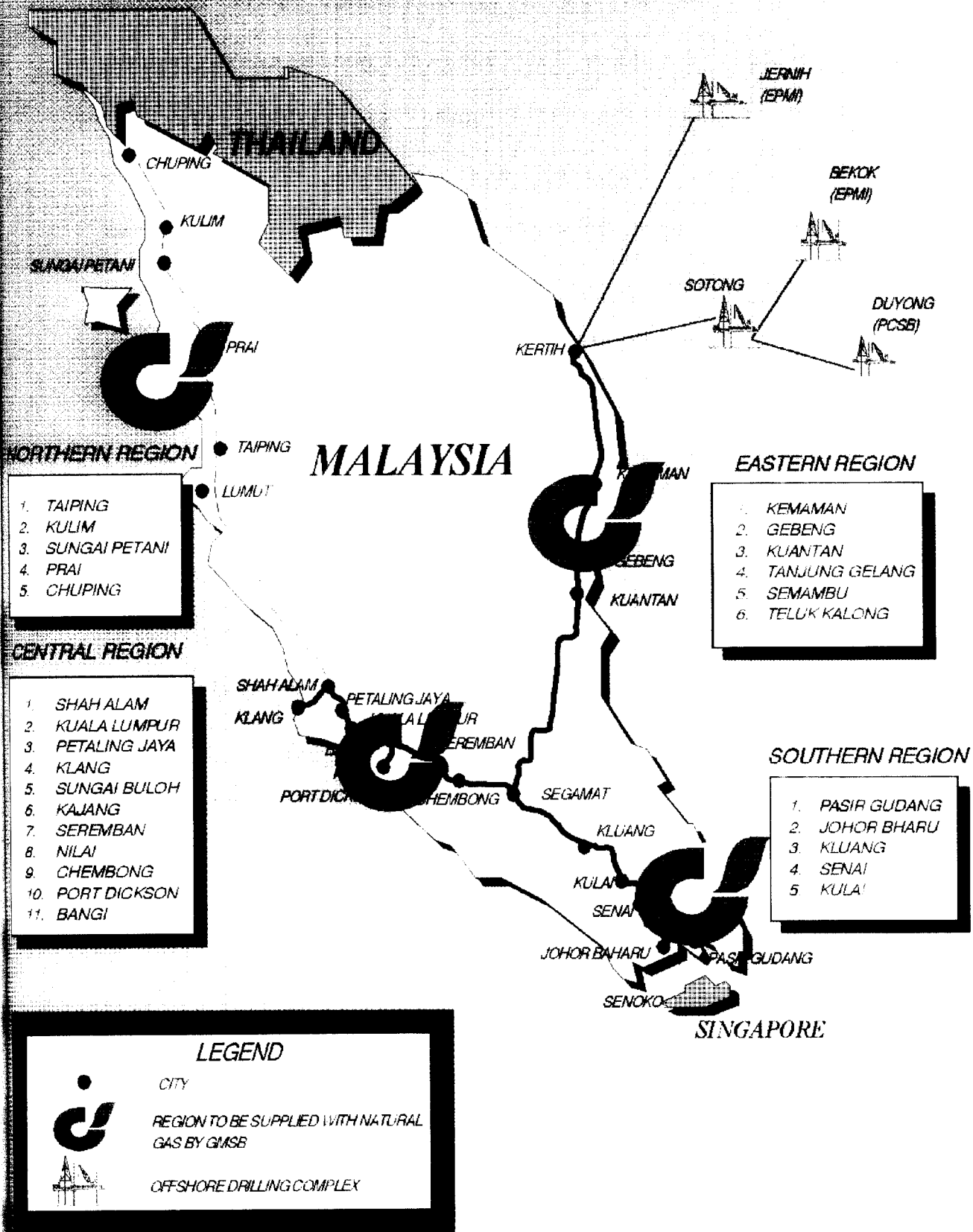
## **5.2 Market Demand**

In the gas distribution sector, the potential gas market is located along the PGU pipeline. Therefore, the route of the PGU pipeline will influence the implementation of the distribution system. The PGU pipeline passes through major industrial areas like Shah Alam, Klang, Klang Valley, Johor Baharu/Pasir Gudang, Seremban/Senawang, Port Dickson and Gebeng/Kuantan. These areas were targeted by GMSB to be supplied with natural gas (Map 5.1). The following section explains the demand for the gas distribution market.

### **5.2.1 Industrial Demand**

About 65.0 million mmBtu<sup>16</sup> industrial demand potential has been identified along the PGU pipelines. Of these, the demand along PGU I & II accounts for 46.0 million mmBtu

# PENINSULAR GAS UTILISATION PROJECT



## LEGEND



• CITY  
 REGION TO BE SUPPLIED WITH NATURAL GAS BY GMSB  
 OFFSHORE DRILLING COMPLEX

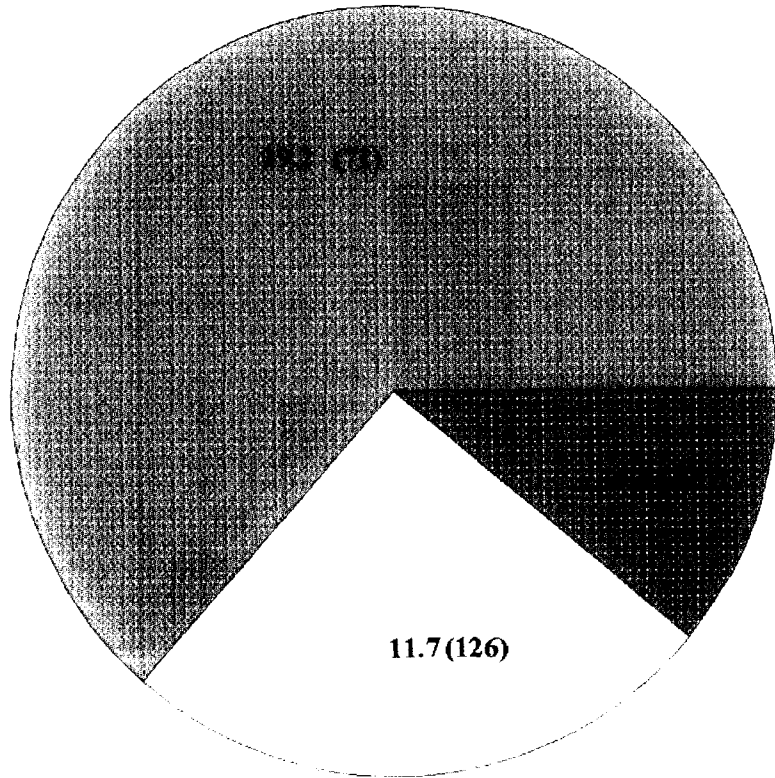
and PGU III accounts for the demand of 19.0 million mmBtu, as shown in Figure 5.1.

A total of 22 demand areas along the PGU I & II and 5 demand areas along the PGU III were identified by GMSB for gas penetration (Map 5.1). The market is divided geographically into 4 main regions. i.e. the Central Region, Southern Region, Eastern Region and Northern Region. The region with the highest demand potential is the Central Region, consisting of 11 areas which amount to a total demand of 24.0 million mmBtu. The highly concentrated industrial estates in this region are located at Klang, Shah Alam, Seremban, Kuala Lumpur and Petaling Jaya, with a total of 302 customers and fuel demand of 21.5 million mmBtu. These customers are categorized as small, medium and large by GMSB (Appendix I). This is followed by the Northern Region with a total demand of 19.0 million mmBtu and total customers of 110. (Figure 5.2).

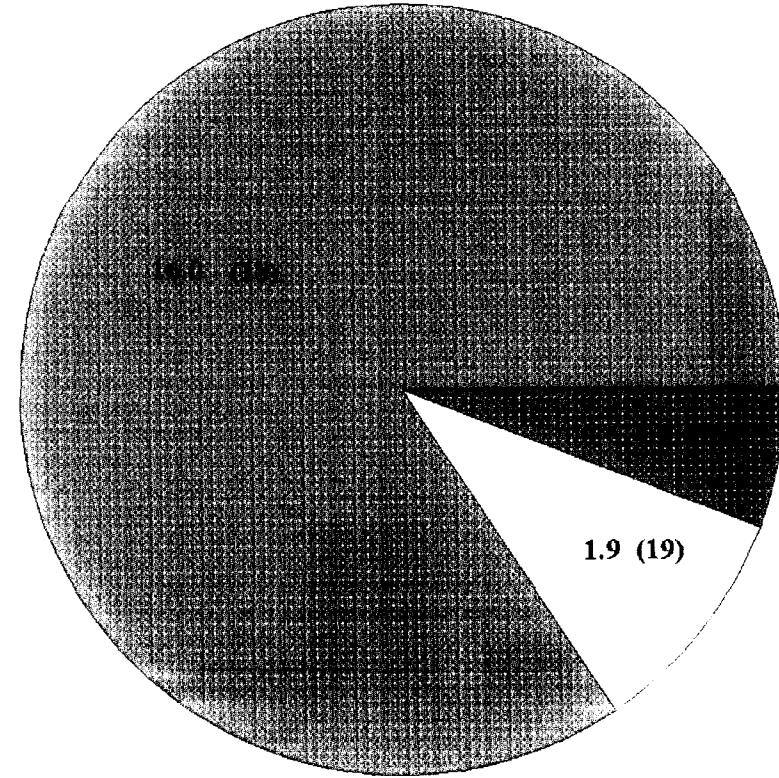
In the Southern Region, the highest demand markets are Pasir Gudang, Kluang and Johor Bharu. It has a total of 136 companies with a total demand of 17.3 million mmBtu.

# Industrial Energy Demand

PGU I & II



PGU III

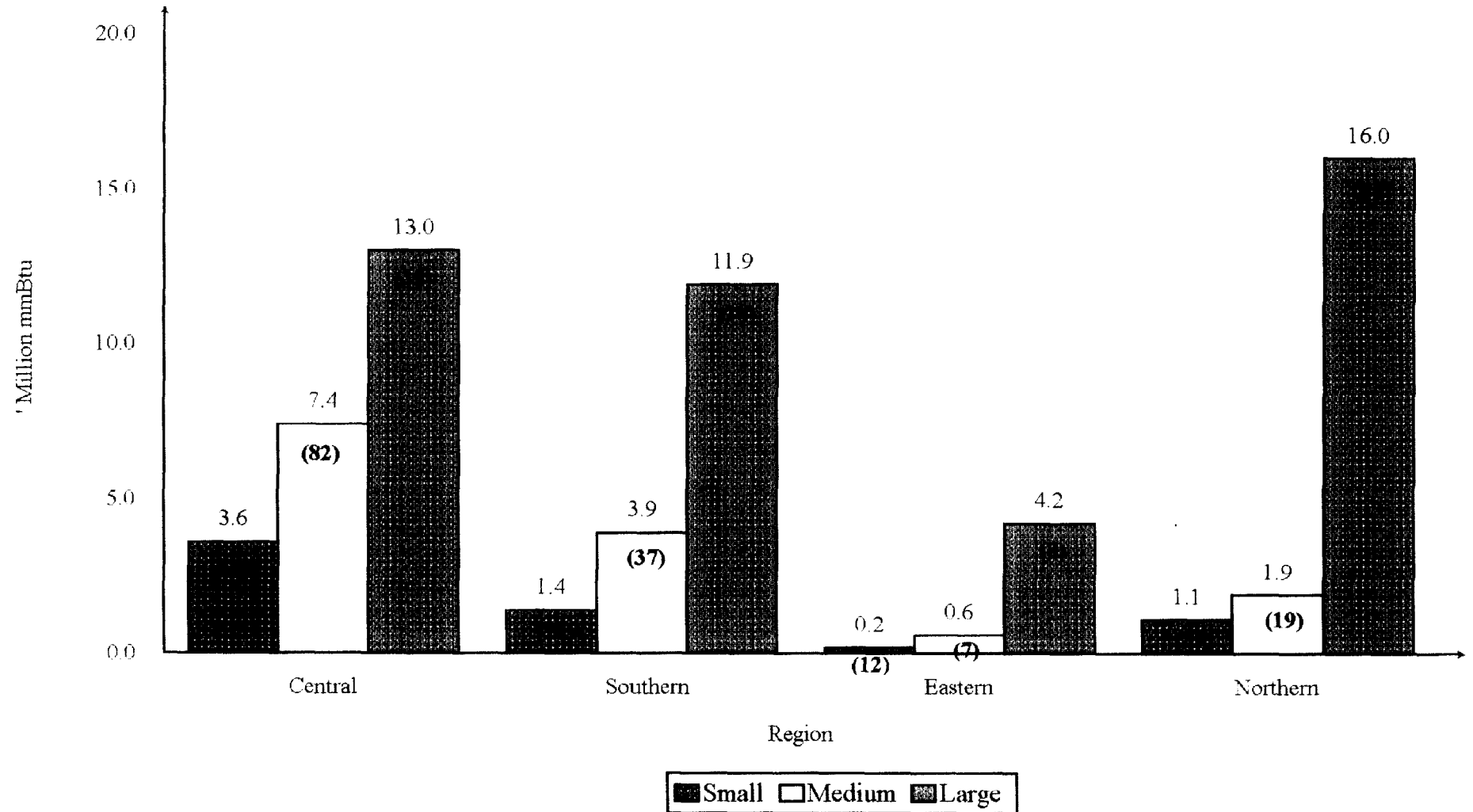


Legend: Large (dark grey), Medium (white), Small (medium grey)

Note : Volume in Million mmBtu  
( ) - no of customer

Source : GMSB Database as at mid - 1996

# Peninsular Gas Utilization Industrial Market



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FIGURE 5.2

Note : ( ) - no of customer

Source : GMSB Database as at mid - 1996

Lastly, the Eastern Region, has a demand of only 5.0 million mmBtu as it is a new industrial area. The new industrial estates are located at Gebeng, Tanjung Gelang and Kuantan. As for the Northern Region, the natural gas will only be supplied after the completion of the PGU III pipeline. Therefore, demand is highest at the Central Region, followed by the Northern, Southern and Eastern, respectively.

#### 5.2.2 *Residential & Commercial Demand*

It is evident from Table 5.1 that the residential and commercial sectors provide a significant demand for natural gas penetration. The final energy use has increased 100 per cent from 1,040 ktoe in 1983 to 2,069 ktoe in 1993. The main petroleum products consumption in these sectors are kerosene and LPG as shown in Table 5.2, used mainly for cooking. The comparison between the two products shows that usage of LPG has increased tremendously, nearly 340 per cent in the last 10 years compared to kerosene consumption which has dropped by 50 per cent. This is because kerosene is considered inferior good and with the increase in household income effecting

a rise in the standard of living, preference is given to gas stove using LPG.

**Table 5.1 Fuel Energy Use by Sector, KTOE**

<i>Year</i>	<i>Industrial</i>	<i>Transport</i>	<i>Res. &amp; Com</i>
1983	3,320	3,190	1,040
1984	3,331	3,300	1,099
1985	3,726	3,477	1,123
1986	4,027	3,726	1,233
1987	4,399	3,929	1,297
1988	4,377	4,278	1,435
1989	5,356	4,684	1,495
1990	5,885	5,387	1,646
1991	6,413	5,806	1,747
1992	7,112	6,226	1,891
1993	7,012	6,558	2,069

\* Ktoe = 1000 tonnes oil equivalent

Source : Natural Energy Balance 1983 - 1993

**Table 5.2 Petroleum Products Consumption by Res. & Comm Sector, KTOE**

<i>Year</i>	<i>Diesel Oil</i>	<i>Fuel Oil</i>	<i>Kerosene</i>	<i>LPG</i>
1983	Neg.	Neg.	335	149
1984	Neg.	Neg.	333	155
1985	Neg.	Neg.	282	190
1986	Neg.	Neg.	283	230
1987	15	3	257	253
1988	39	2	241	330
1989	38	45	204	355
1990	22	39	197	471
1991	26	4	173	522
1992	42	4	152	580
1993	101	1	145	653

Source : Natural Energy Balance 1983 - 1993



In the commercial sector large hotels, medical centers, office complexes, institutions, restaurants and hawkers have been identified as potential markets. The natural gas demand in this sector relates largely to the use for cooking and as potential use for both water heaters and air conditioning (particularly, in hotels and hospitals). Currently, air conditioning is totally fueled by electricity. GMSB has identified Klang Valley and Pasir Gudang/Johor Bahru as high potential areas for natural gas supply. This is due to the high concentration of large commercial customers in these areas.

As for the residential sector, the information from the Department of Statistics, Malaysia indicates that in 1991 there were about 2,900,350 households in Peninsular Malaysia broken down into 1,594,070 urban, and 1,306,280 rural households. The urban households located along the PGU II pipelines are the prime target for natural gas consumption. In total, there are about 687,969 households in the selected districts of Johor, N.Sembilan, Pahang, Selangor, Terengganu and Wilayah Persekutuan (Table 5.3).

The residential demand for natural gas is basically for cooking. The GMSB survey has identified domestic demand in the Klang Valley to be between 2.0 to 2.5 million mmBtu per annum (based on the demand for LPG). It is estimated that some 300,000 households nationwide will subscribe to the natural gas system by the year 2010<sup>17</sup>.

**Table 5.3 Potential Number of Household In Selected State Along PGU II, 1991**

State & Administrative District		House Holds (units)		
		Urban	Rural	Total
Johor	Johor Bharu	123,380	29,109	152,489
	Kluang	20,731	26,243	46,974
N. Sembilan	P. Dickson	9,642	8,456	18,098
	Seremban	40,672	14,241	54,913
Pahang	Kuantan	40,836	10,216	51,052
Selangor	Klang	71,410	6,771	78,181
	Petaling	124,042	8,927	132,969
Terengganu	Kemaman	11,232	11,048	22,280
Wilayah Persekutuan		246,024	-	246,024
Total		687,969	115,011	802,980

Source : Laporan Kiraan Permulaan Bagi Kawasan Bandar dan Luar Bandar Banci Penduduk and Perumahan Malaysia 1991, Jabatan Perangkaan Malaysia.

This target is difficult to be met as the demand from the residential sector to use natural gas is minimal. One of the main reasons for this is due to the fixed charge of RM10 per month charged by GMSB excluding the commodity charge (Refer to

Appendix I) is less preferred, compared to the LPG cylinder which costs RM15 per month and its flexible life span which depends on how much the household consumes. Looking at the current trend in urban areas where most household members are working and tend to eat out more often; using LPG is cheaper as they only pay RM15 per month which can last them for more than a month compared to natural gas' RM10 every month. Another factor is that the residential houses have to bear the cost of internal piping if they want to use natural gas. The cost is estimated at RM1,000 to RM2,000 per unit, whereas LPG consumption does not need internal piping.

### 5.2.3 *Transportation Demand*

During the past ten years, the growth in the vehicles population (excluding motorcycles) averaged seven percent per annum, and the trend is continuing with the majority of the vehicles concentrated in the urban areas, particularly, in the big cities. Table 5.1 shows the energy use in the transport sector. It has increased 200 per cent from 3,190 ktoe in 1983 to 6,558 ktoe in 1993. Table 5.4 shows petroleum product consumption in the transport sector. The motor petrol consumption has

increased by 26 per cent between 1989-1993. Therefore, this sector provides substantial demand for natural gas penetration.

The feasibility study carried out by PETRONAS in 1984 to assess the possibility of utilizing natural gas in the transportation sector identified natural gas as environmentally friendly fuel can help reduce air-borne pollutants contributed by the transportation sector. Therefore, in 1995, PETRONAS established a wholly-owned subsidiary, PETRONAS NGV Sdn Bhd (PNGV) to undertake the development and commercialization of natural gas for vehicles in Malaysia.

**Table 5.4 Petroleum Products Consumption by Transport Sector, KTOE**

<i>Year</i>	<i>Diesel Oil</i>	<i>Motor Petrol</i>	<i>Fuel Oil</i>
1983	1,106	1,726	Neg.
1984	1,037	1,832	Neg.
1985	1,032	2,057	Neg.
1986	1,133	2,167	2
1987	1,218	2,274	2
1988	1,380	2,438	1
1989	1,552	2,573	60
1990	1,826	2,889	41
1991	1,941	3,123	52
1992	2,069	3,314	79
1993	1,951	3,654	77

Source : Natural Energy Balance 1983 - 1993

The Government supports the natural gas for vehicles (NGV), through exemption of duty on the sales of NGV. This has made possible to price NGV at 56.5 sen per liter, about half the price of unleaded petrol. The retail price of the various automotive fuels in the country are shown in Table 5.5. The government has also exempted the import duty and sales tax on car conversion kits to reduce the vehicles owners' capital cost. The government's initial target of NGV was taxis. By the end of 1995, a total of 925 vehicles had been converted to run on natural gas and about six NGV stations have been constructed by PETRONAS in the Klang Valley. As of 1996, 980 vehicles had been converted to run on NGV<sup>18</sup>.

**Table 5.5      Retail Price of Various Automotive Fuels in Malaysia**

<b>Fuel</b>	<b>Price</b>	
Petrol	110 sen/liter	RM33.74/mmBtu
Diesel	65.1 sen/liter	RM17.59/mmBtu
LPG (auto gas)	65.1 sen/liter	RM24.42/mmBtu
NGV	56.5 sen/liter equivalent of petrol	RM17.33/mmbtu

Source: Gasex NGV 1996

### 5.3 Development Plans

GMSB plans to invest RM2.0 billion in constructing the natural gas distribution system which will see the laying of 290 km of feeder pipelines and 6,000 km of distribution lines to supply to over 1,000 industrial, 5,000 commercial and 10,000-20,000 residential consumers<sup>19</sup> This distribution system is expected to be completed by the year 2011.

By studying the demand from the above sectors, the industrial sector is found to be the most profitable sector to be ventured into because of its huge demand. This sector will therefore influence the routing of gas distribution pipelines. The strategy for the industrial sector development involves:- a) selecting high base load industrial areas b) targeting large and medium industrial customers and c) penetrating the high premium fuel<sup>20</sup> market.

The NGDS has been laid in the Central, Southern and Eastern Regions. The Central and Southern Regions were

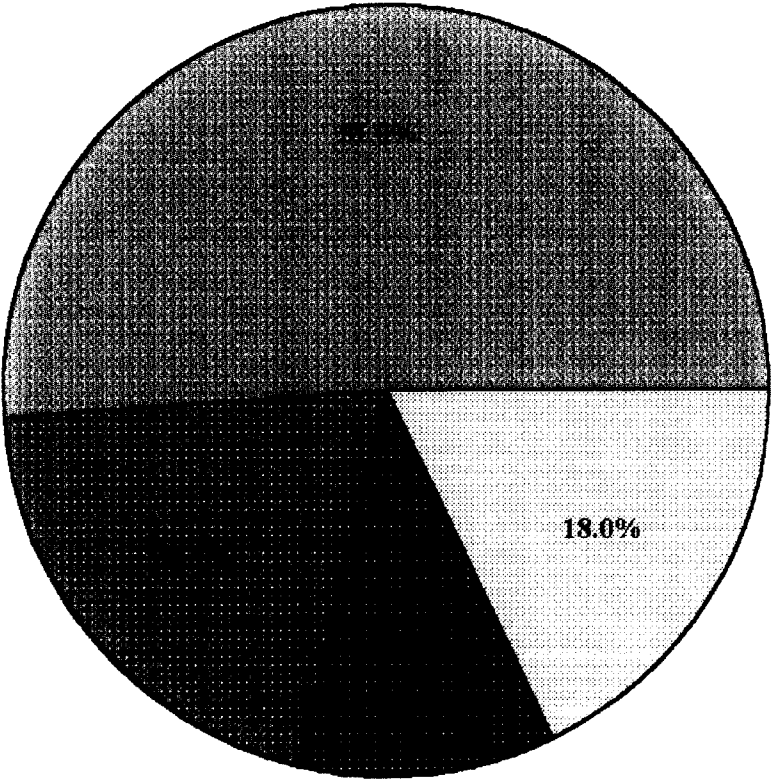
the initial targets because of the high industrial demand, whereby the revenue expected from these two regions could finance the early development of the NGDS. Subsequently, the Eastern Region followed by the Northern Region will be development.

The GMSB marketing strategy is to capture large industrial customers, because this segment generates the largest portion of the revenue required to sustain the high capital investment. Nevertheless, the medium industrial market will have a parallel priority because of the high average price<sup>21</sup> to generate a fairly large revenue per unit of sales volume, in spite of smaller consumption. To date, GMSB has captured about 36 large customers, 16 medium customers and 47 small customers.

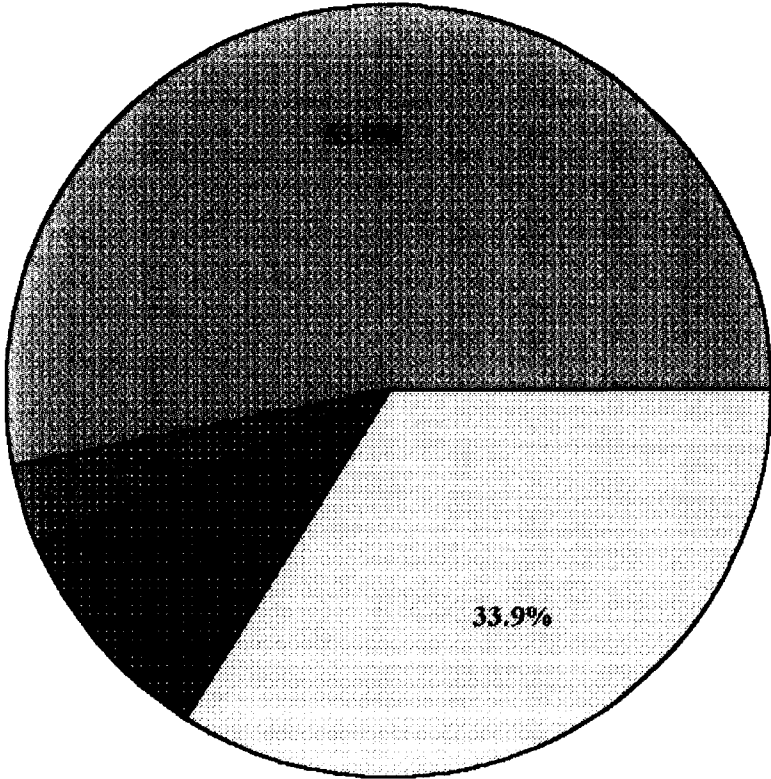
As natural gas competes with other fuel like LPG, Diesel, fuel oil etc., the identification of fuel pattern is important in market development. The fuel mix along the PGU I & II industrial customers, show that the majority of the customers are fuel oil users, i.e. 51.0 percent followed by LPG, 20.3 percent; diesel, 10.7 percent; and other fuel, 18.0 percent (Figure 5.3). In the PGU III

# Industrial Fuel Mix

PGU I & II



PGU III



■ Fuel Oil ■ LPG ■ Diesel ■ Other

Source: GMSB Database as at mid - 1996




market, fuel mix is accounted by fuel oil, 53 percent; diesel, 9.8 percent; LPG, 3.3 percent; and other fuel, 33.9 percent (Figure 5.3). The major types of fuel used by industrial customers in Peninsular Malaysia are fuel oil consisting of high fuel oil (HFO), medium fuel oil (MFO) and low fuel oil (LFO). This is because, the fuel oil prices are relatively lower than other fuels like LPG and diesel.

GMSB target fuels in the Central, Southern and Eastern regions will be the LPG and diesel users as natural gas price is lower than the LPG and diesel prices by 15 to 20 percent, making it very attractive to penetrate these fuel markets. Moreover, customers converting from LPG fuel to natural gas have an attractive recovery period for their investment i.e. within 2 to 3 years. Also, it is easy to convert the existing LPG pipeline for the use of natural gas. Furthermore, equipment conversion work is relatively simple<sup>22</sup>. Table 5.6 shows the ranking of natural gas price in the energy market.

**Table 5.6**

**Fuel Price Ranking**

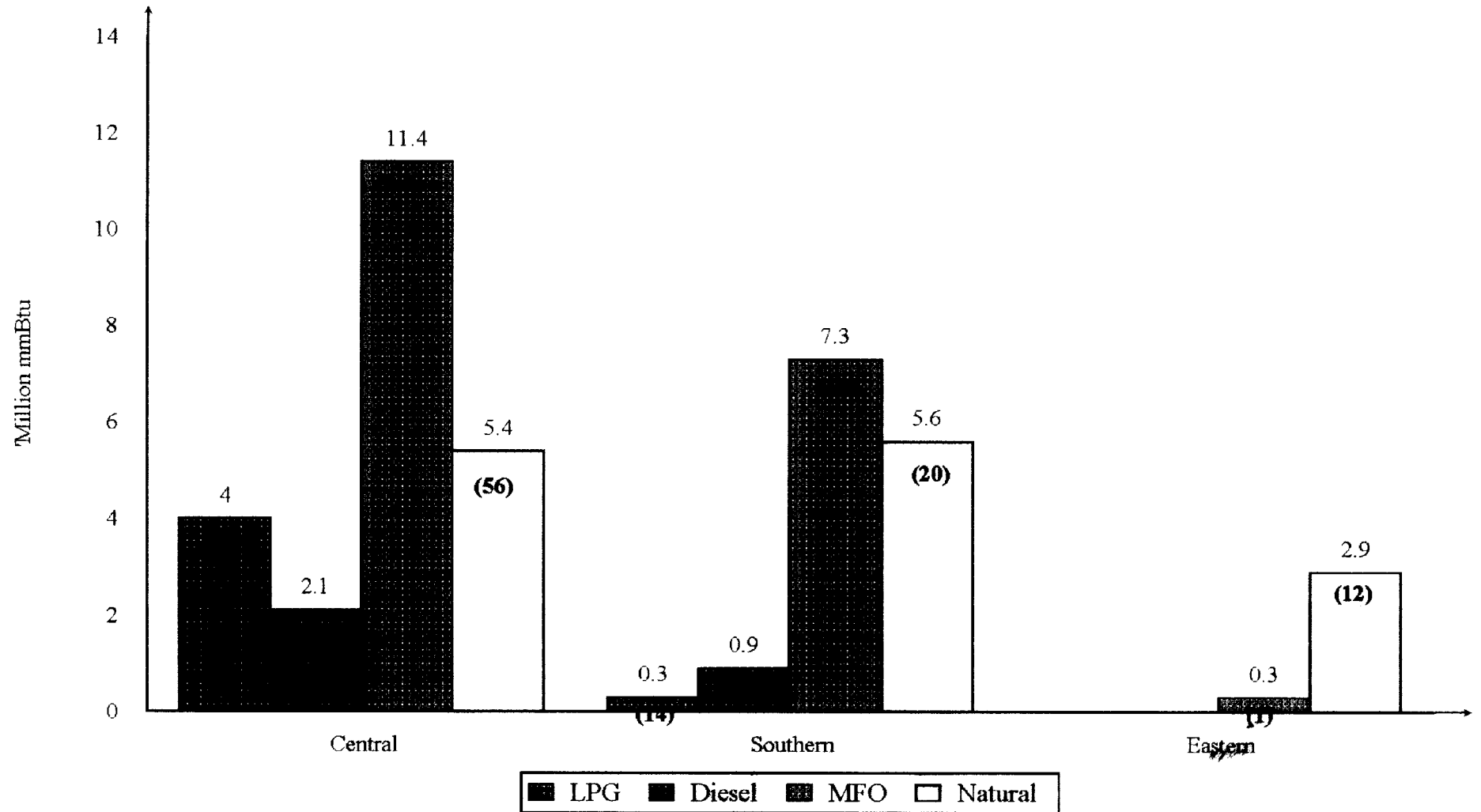
<b>Fuel</b>	<b>Price Level</b>
Liquefied Petroleum Gas	
Diesel	
<b>Natural Gas</b>	
Low Fuel Oil	
Medium Fuel Oil	
High Fuel Oil	
Coal / Wood	

Source : GMSB

There is a potential demand of 7.3 million mmBtu from the LPG and Diesel markets from the Central and Southern region (Figure 5.4). The biggest LPG market is from Shah Alam, with a potential demand of 1.09 million mmBtu; followed by Klang, with a potential demand of 0.85 million mmBtu; and Seremban/Senawang, with a potential demand of 0.58 million mmBtu.

Gas Malaysia plans to develop the commercial and residential sectors gradually, in order to capture these markets effectively. The lack of awareness among the public on the use and benefits of natural gas is a factor to be considered. In order to penetrate these markets, Gas Malaysia plans to introduce incentive programmes. The

# Potential Energy Mix Market In Selected Areas



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FIGURE 5.4

Note : ( ) - no of customer

Source : GMSB Database as at mid - 1996

initial plan is to target 300 units of residential houses in Bukit Saga, Shah Alam and 20 units of commercial outlets, i.e. 8 restaurants in Hicom, Shah Alam and 12 units of hawker outlets in Pasir Gudang area as "show cases" to attract public attention on the natural gas usage and benefits.

Gas Malaysia's main plan for the commercial sector is to capture large commercial customers i.e. new hotels and office blocks. These will be the pivot points for gas distribution network and serve as the first destination of branching out into the commercial and residential markets. The utilization of natural gas will be in boilers for generating steam and hot water, absorption chillier for air-conditioning and kitchen equipment for cooking. GMSB has identified the PETRONAS Twin Tower, KLIA, Putra Jaya and KL Sentral as its initial targets.

In the residential sector, the demand for gas is mainly for cooking, where gas consumption is very low. The average yearly demand from the Malaysian residential sector is around 10 mmbtu which is much lower, in comparison to Japan or UK demand of 100 mmbtu. This is

because, in Malaysia the natural gas is mainly used for cooking only while in these countries gas is extensively used for heating during the long winter months, water heating throughout the year as well as year round cooking. Therefore, looking at the high investment and the relatively low revenue in the Malaysian residential sector, it is considered unprofitable to supply natural gas to this sector. Furthermore, the returns on the investment is expected only after 15 years. However, due to the social obligation imposed by the government on GMSB, i.e. to supply to the residential sector, GMSB plans to develop this sector by cross subsidizing it from the profits earned through the industrial sector<sup>23</sup>.

Therefore, the industrial sector gas prices was set at a higher average price, to recover some of the cost of supply natural gas to the residential sector. Hence, the actual value of gas in the market is not reflect. Here, the value of gas is defined as the maximum price the industrial consumer is willing to pay, taking into account the benefits of efficiency, capital and operating costs and environmental advantages of natural gas.

The development plan in the residential sector is to target new housing, apartment and condominium areas. Here, there is potential for the developers to bear most of the cost of reticulation/internal piping and pass this on to the buyer. Also, gas consumption in new residential areas are likely to be higher than that in existing residential areas. This is due to the higher income which effects popularity of using water heaters, apart from cooking. This would surely increase gas consumption.

As the target is to get new housing estates with high density residential units, GMSB has identified residential projects in Mount Kiara, Desa Sri Hartamas, Taman Puchong Utama and Bandar Baru Klang. GMSB estimates that a total of 8,800 units to be supplied with natural gas, over a period of 4 years<sup>24</sup>. The second priority will be given to high density areas such as flat dwellers with pre-piped LPG for easy conversion to natural gas. At present, there are over 200,000 residents in the Klang Valley piped with LPG. The current strategy is appropriate because it is difficult to convert the existing residential unit, as the cost of converting form LPG to natural gas was estimated to be RM1,000 to RM2,000

per unit, which is too high to be bear by the individual household unit.

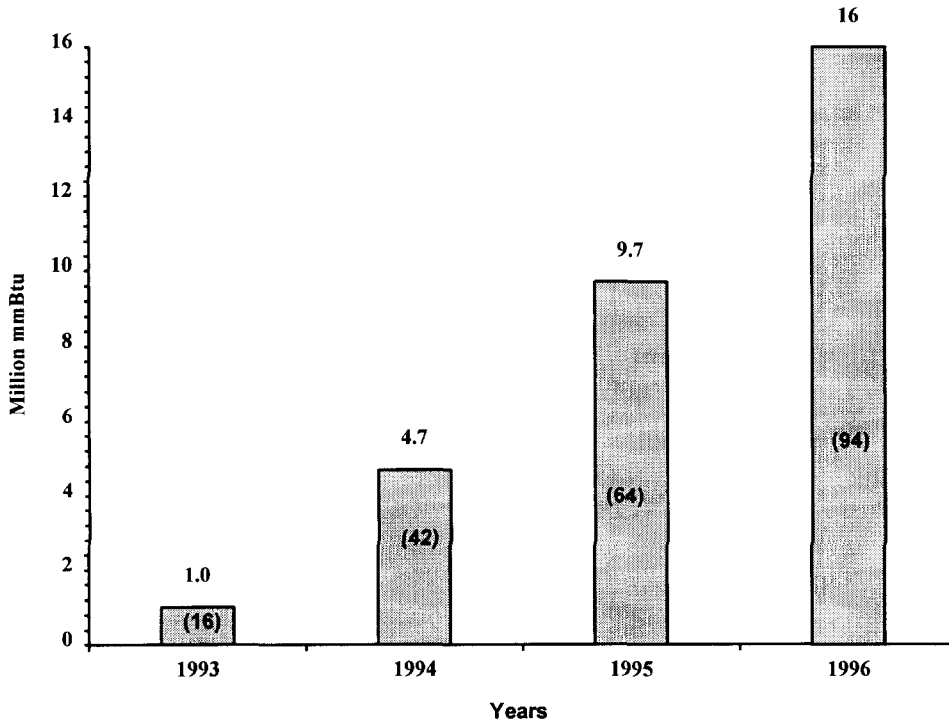
#### **5.4 Growth Rate of Natural Gas**

Since the establishment of the gas utility company in May 1992, the penetration of natural gas in the industrial sector has been very successful. This is seen in Figure 5.4 for the Central, Southern and Eastern Regions. As of 1996, GMSB has laid about 210km of feeder and distribution pipelines covering Shah Alam, Klang, Seremban, Gebeng, Kuantan, PJ-Segambut, Pasir Gudang and Kluang. By the end of 1997, GMSB is expected to lay a total of 290 km pipelines.

The growth rate of natural gas consumption in the industrial sector for the past four years is shown in Figure 5.5. In 1993, 16 customers were converted to natural gas with a total consumption of 1.0 million mmBtu. This increased to 42 customers with a volume of 4.7 million mmBtu in 1994 and to 64 customers in 1995 with a total volume of 9.7 million mmBtu. By the end of

1996, GMSB had captured a total of 94 industrial customers with a total sales volume of 16.0 million mmBtu.

**Figure 5.5 Growth Rate of Natural Gas Consumption In The Industrial Sector**



Note ( ) - no of customers supplied with natural gas

As of end 1996 market share, GMSB had captured about 52 percent of the LPG market, 20 percent of the MFO market and 5 percent of the Diesel market (source: GMSB 1996). The fast penetration into the LPG market is mainly due to the natural gas price being cheaper than LPG by 15-20 per cent in equivalent energy terms. Therefore, customers can



expect fuel cost savings if they switch to natural gas. Apart from this, the benefits of natural gas as energy savings or fuel efficiency, easier maintenance of equipment due to clean combustion that does not produce ashes or soot; space saving as storage tanks are not required; and supply continuity. This contribute to persuade the customers to convert to natural gas.

### **5.5 The Challenges In Natural Gas Penetration**

The biggest challenge for natural gas is to penetrate the fuel oil market i.e. Medium fuel oil (MFO) and low fuel oil (LFO). The potential demand in this market segment is 19.0 million mmBtu from a total of 158 industrial customers, (Figure 5.5) . The difficulty in penetrating the fuel oil market is mainly due to the natural gas price being higher than fuel oil prices by 10 to 15 percent.

The second challenge is, GMSB, being a utility company, is required to supply gas to the residential sector. But, GMSB anticipates that there might be resistance from this sector to change from the current fuel LPG which has been

in use for a long time in households. Also, the total cost of gas to the residential sector (including conversion of equipment and internal piping) is not attractive for the household to switch gas. In addition, the lack of interest from the residential sector can cause barrier for the supply of gas. At the moment, GMSB has no plans to advertise and educate the public on the potential use of gas. This is because GMSB plans to study/analyze the feedback obtained from the residential 'show case' customers and the new housing estate before it takes the next development plans in the residential sector.

Overall, it can be concluded that natural gas will be made available by GMSB to the industrial and commercial sector on a large scale because of two main factors. One, because of the large revenue generated due to the huge demand. Second, the customers' own request for natural gas because it is cheaper and the premium it commands in terms of greater efficiency. As for the residential supply it will very much depend on the customers request and to what extend the government imposes on GMSB to supply to this sector.