

CHAPTER 3

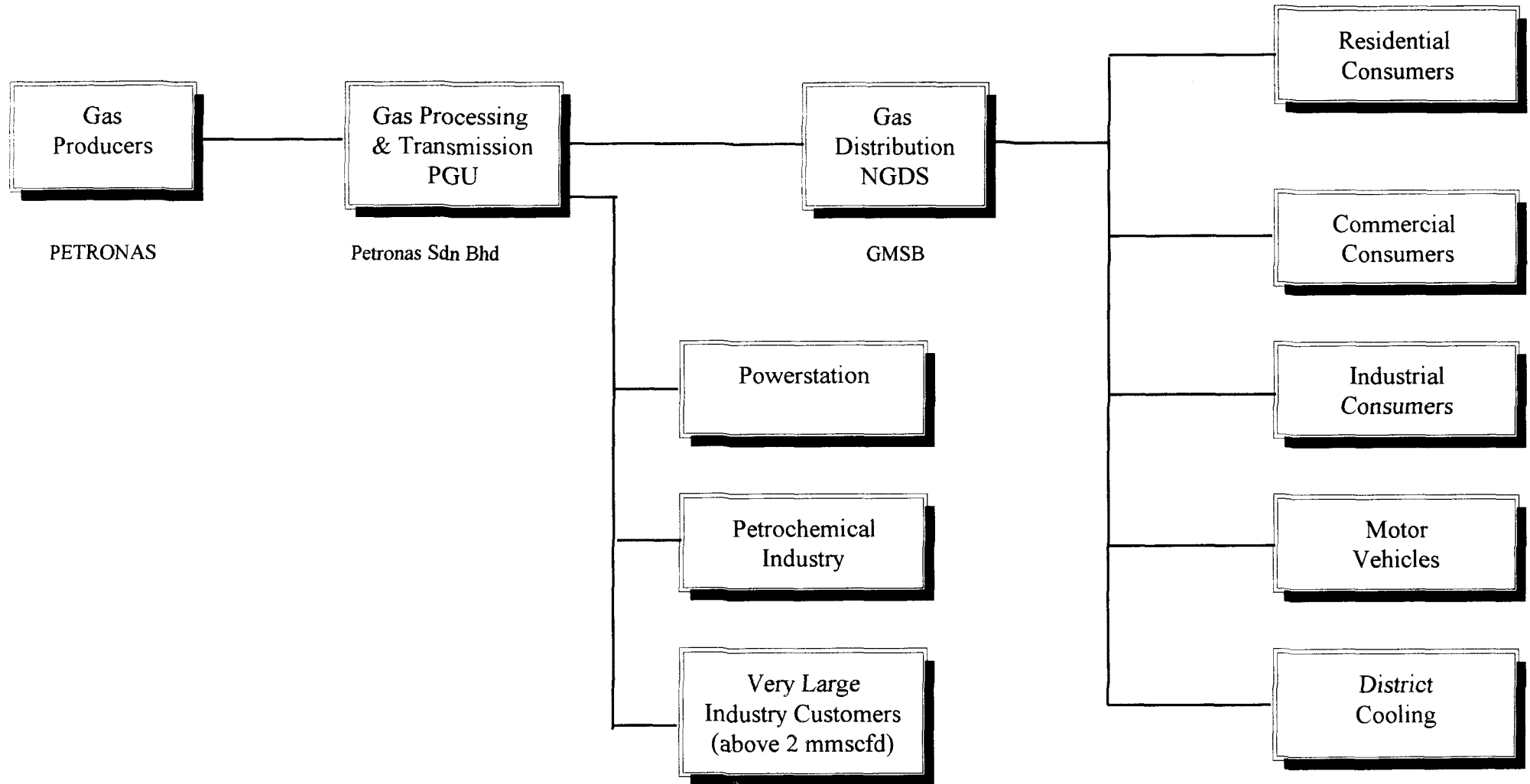
STRUCTURE OF THE GAS INDUSTRY

3.1 Introduction

This chapter discusses the structure of the gas industry which is segregated into the exploration and production sector; the processing and transmission sector; and the distribution sector. Diagram 3.1 shows the structure of the gas industry in Peninsular Malaysia. The upstream activities i.e. exploration and production are undertaken by PETRONAS, whereas the downstream activities of production, transmission and distribution are provided by Petronas Gas Bhd and Gas Malaysia Sdn Bhd. Petronas Gas Bhd is a subsidiary of PETRONAS. Its activities entail gas processing and transmission while Gas Malaysia Sdn Bhd, an associate company of PETRONAS, undertakes the distribution of natural gas through the Natural Gas Distribution System (NGDS).

It is evident that there is horizontal monopoly in each stage. The factor that contributes to this structure is

GAS INDUSTRY STRUCTURE IN PENINSULAR MALAYSIA



government policy, which aims to ensure that Malaysia gets optimum benefits from this depletable resource. Therefore, the government through PETRONAS which is a monopoly body because of the PDA 1974, controls the private sector's involvement in the petroleum industry through a system of license and permission³. Another reason for the government's involvement in the gas industry is because energy industries are vital to the nation and ensuring security of supply is of utmost important. Also, these infrastructure industries are natural monopoly because it requires considerable investment which is specific or sunk investments. Therefore the delivery of gas by a single infrastructure industry avoid waste of resources and achieves economies of scale i.e. decreasing cost per unit.

3.2 The Exploration & Production Sector

PETRONAS manages all upstream activities within Malaysia and engages a number of international petroleum companies to participate in the exploration, development and production activities pursuant to Production Sharing

Contract (PSC). If oil or gas is discovered and commercial production commences, PETRONAS and PSC contractors share such production in accordance with the terms of the governing PSC. PETRONAS has also gone into exploration, where its own subsidiary, Petronas Carigali Sdn Bhd, licensed under section 6 of PDA, was incorporated as its exploration and production arm to undertake the development in the upstream sector.

Malaysia's gas reserves come from 203 gas fields located offshore Terengganu in Peninsular Malaysia and offshore Sabah and Sarawak. Approximately 49 per cent of the gas reserve is found offshore Sarawak, 43 per cent offshore Terengganu and 8 per cent offshore Sabah⁴.

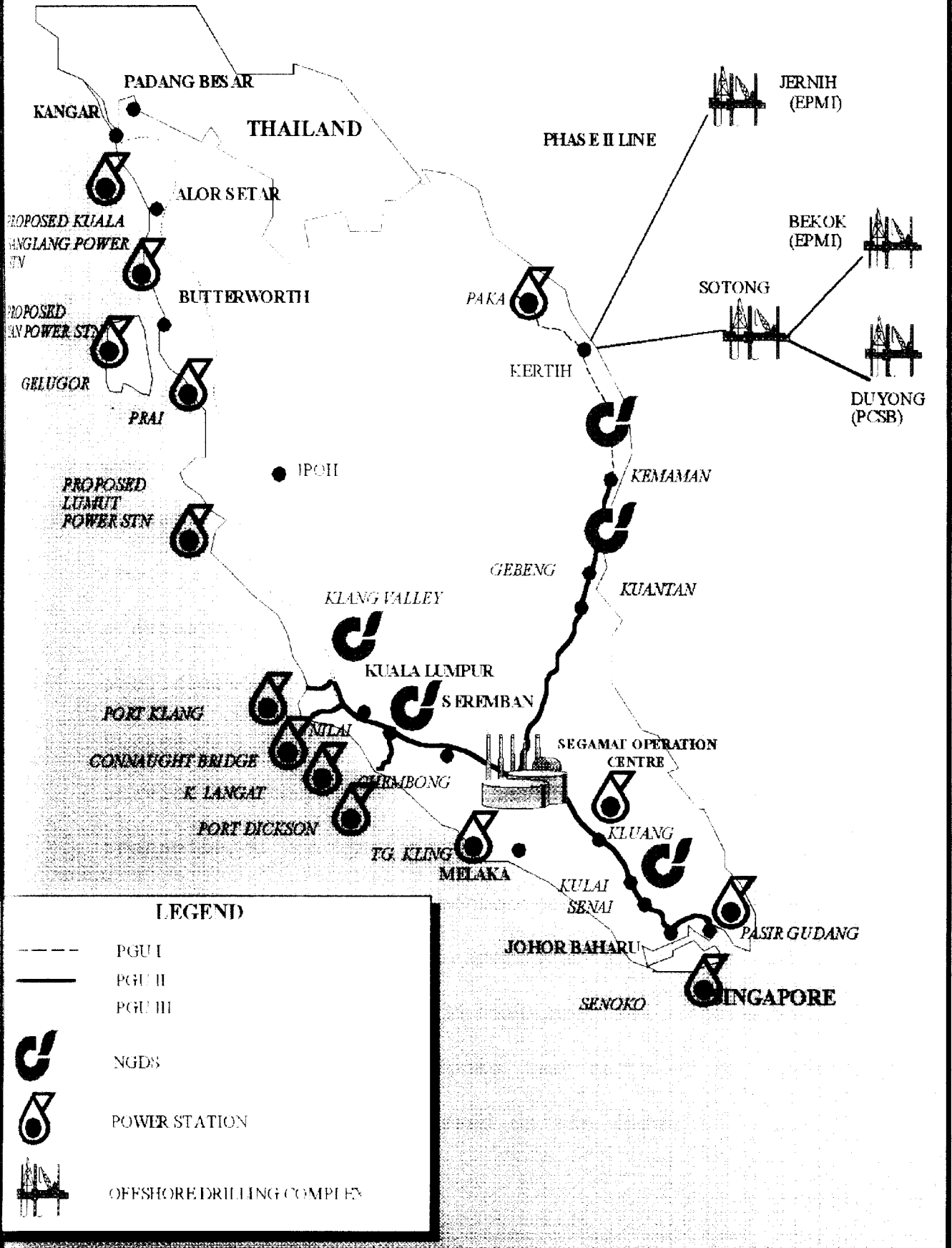
The gas fields offshore Terengganu supply Peninsular Malaysia's domestic gas consumption requirements, with some quantity of propane and butane and LPG (a mixture of propane and butane) for the export market. Most of the gas fields offshore Terengganu are located within a radius of between 160 to 240 kilometers offshore and natural gas is piped onshore to PETRONAS facilities through pipelines operated by PSC contractors i.e. Esso

Production Malaysia Incorporated (EMPI) and Petronas Carigali Sdn Bhd. Examples of the gas fields offshore Terengganu are Duyung, Jerneh, Lawit, Bekok and Sotong. Map 3.1 shows the location of some gas fields in Peninsular Malaysia.

The gas fields offshore Sarawak are mainly developed for the export market in the form of LNG and, a small portion for the Miri gas distribution scheme. The gas fields offshore Sabah are currently used for domestic users on the island of Labuan as well as for the manufacture of methanol for domestic consumption and export.

The current level of gas reserves and production volume from offshore Terengganu supplying to PGU I and PGU II is approximately 1,000 mmscfd, which can last for approximately another 100 years. However, with the full implementation of the PGU i.e. PGU I, PGU II and PGU III the current gas reserves are expected to last for approximately 50 years only. To ensure the sustainable development of gas resources, a long-term utilization limit of 2,000 mmscfd of processed gas was adopted for the Peninsula in 1993 by PETRONAS. Of this 1,300 mmscfd

PENINSULAR GAS UTILISATION PROJECT



Source: GMSB 1996

is reserved for electricity generation while the remainder is mainly for use as feedstock in petrochemical industries, as fuel in industrial, residential, commercial and transportation sectors and as well as for export to Singapore.

3.3 The Gas Processing and Transmission Sector

The downstream activities of processing natural gas produced from the gas fields offshore Terengganu and the transmission of the processed gas to end-users through the Peninsular Gas Utilization (PGU) pipeline are provided by Petronas Gas Berhad. Petronas Gas is a subsidiary of PETRONAS in which PETRONAS owns 75% of the shares and the public, 25%. It operates as a throughput service company providing the service of processing and transmission of gas to power plants, large industrial users and the gas distribution company i.e GMSB on behalf of PETRONAS for a fee, set out in a Throughput Fee Agreement. Under the Throughput Fee Agreement, the throughput fee for Petronas Gas service in Peninsular Malaysia is calculated based on the formula " $RC + (FC \times$

V)" where RC is the Reservation Charge, FC is Flowrate Charge per unit of gas processed and V is the volume of gas processed⁵.

3.3.1 *The Peninsular Gas Utilization System*

The Peninsular Gas Utilization (PGU) Project is an integral part of Malaysia's economic development plans and involves the construction and development of facilities to enable the processing and transmission of gas to end-users throughout Peninsular Malaysia. The PGU Project is being implemented in three stages, namely: PGU I, II and III with full completion expected in March 31, 2001. The PGU System comprises gas processing plant (GPP), a comprehensive network of gas pipelines and support facilities including a compressor station, an export terminal, regional operation centers, metering stations and lateral pipelines to the eventual end-users. The current estimated total cost of the PGU System is RM9.65 billion⁶. Map 3.1 shows the route of the PGU System in Peninsular Malaysia.

Petronas Gas receives from PETRONAS the feegas⁷ purchased by PETRONAS from the PSC contractors, as well as PETRONAS' own entitlement i.e. Petronas Carigali, at its facilities in Kertih. Upon receipt, feegas is separated from water and other impurities before being piped to the Gas Processing Plant (GPP). The GPP separate feegas into its components, namely methane, ethane, propane, butane and condensates. The condensates are returned to the PSC contractors and the various component or hydrocarbon belonging to PETRONAS are piped to the end-users by means of the PGU transmission pipeline, operated by Petronas Gas.

Drygas or natural gas is piped through the PGU to be used by the power plants, while the propane and butane are piped to the export terminal for export to Japan and Korea. As for ethane, it is piped to other industrial end-users as feedstock. Presently, Petronas Gas is operating four GPPs with a combined capacity of 1,000 mmscfd and a network of transmission pipelines measuring 1,065 km in Peninsular Malaysia. The development stages of the PGU I, II and II are explained below.

PGU I was launched in 1981 and completed in 1984, costing RM527.0 million. The facilities comprise the first gas processing plant (GPP 1) with processing capacity of 250 mmscfd and a 42 kilometer pipeline supplying to Perwaja Steel Mill Berhad in Telok Kalong, Paka power plant, Ethylene Malaysia, PETRONAS refinery, Tioxide Malaysia and 1,000 households in the PETRONAS Housing Complex in Kertih.

The capital expenditure for the PGU II is RM3.3 billion. The main facilities constructed under PGU II are three GPP processing plants named GPP 2, 3 and 4 with a total processing capacity up to 1,000 mmscfd and a 680 kilometer main pipeline from Telok Kalong, Terengganu heading southwards to Pasir Gudang, Johor and Senoko in Singapore and northwards from Segamat to Meru, Selangor. The main end-users of PGU II are gas-based power stations and gas feedstock industries. They are MTBE Malaysia, PETRONAS refinery in Melaka, Tenaga's power plant in Melaka, Negeri Sembilan, Selangor and Pasir Gudang, IPP power plant in Telok Gong and Pasir Gudang, and Senoko power plant in Singapore (Map 3.1).

Petronas Gas is currently planning stage III of the PGU. It is estimated that RM7.3 billion capital expenditure is needed for the construction of the PGU III. Main facilities to be constructed are two gas processing plants GPP 5 & GPP 6 increasing Petronas Gas gas processing capacity to a total of 2,000 mmscfd and a 550 kilometer main pipeline running northwards from Meru in Selangor to Pedang Besar, in Perlis, to the Malaysia-Thailand border will be constructed in three stages (Map 3.1). The construction of the PGU III pipeline is expected to be fully completed in 1998.

Petronas Gas processing and transmission system has no direct competition. Although there are no regulatory limitations⁸ on the entry into the business of providing gas processing and transmission services in Malaysia, there are significant barriers to entry as it requires substantial capital investment. In addition, as natural gas offshore Terengganu is controlled by PETRONAS, it would be unlikely that there will be any new entrants to the gas processing and transmission market. The only regulation applicable is the Petroleum (Safety Measures) Act 1984 which covers all matters regarding safety,

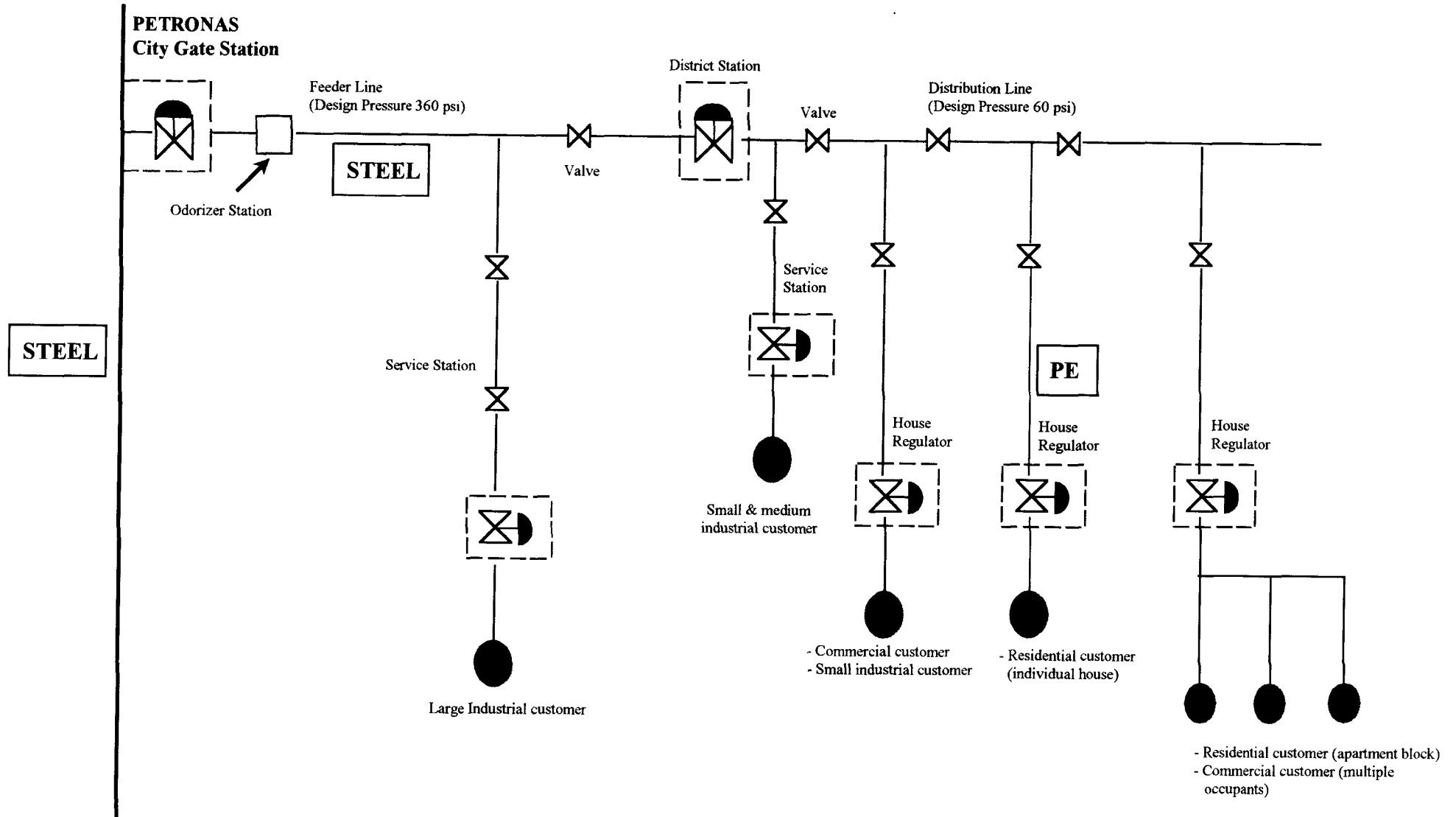
design, authorization, accidents, verification, records, etc. on the pipelines.

3.4 The Gas Distribution System

With the development of the gas transmission infrastructure under the PGU project, a natural gas distribution network was initiated to supply natural gas to the various sectors of the economy. The project is called the Natural Gas Distribution System (NGDS), aimed at supplying natural gas to the industrial, commercial, residential and transportation sectors throughout Peninsular Malaysia.

The basic concept of the distribution system is depicted in the Diagram 3.2. As stated in the Gas Supply Act 1993 section (1), distribution companies or gas utility companies are to tap the natural gas from the city gate stations. This means that Petronas Gas will build the city gate stations and the NGDS will tap the natural gas from these stations. The city gate station is basically a regulator and metering station which will "step down" the

GAS DISTRIBUTION SYSTEM



high pressure PGU pipeline to be used by the NGDS. The city gate stations are usually chosen at strategic location depicting consumer load demand. The city gate stations that have been built are shown in Table 3-1.

Table 3-1 Petronas Gas City Gate Station

Region	Location
1. Central	Shah Alam Glenmarie Meru Kapar Senawang <i>Bangi</i> <i>Nilai</i>
2. Southern	Kluang Pasir Gudang <i>Senai</i>
3. Eastern	Gebeng (Regulating Kemaman)

In Italic :Future City Gate Station

The gas distribution network utilizes two types of pressure system. First, the main feeder pipelines with a maximum pressure of 360 psi to deliver large volume of gas from the city gate station to the service station to large industrial customers. These feeder lines are the backbone of the NGDS. Second, is the distribution

pipelines where a district station is installed to step down the pressure from 360 psi to 60 psi. These distribution lines supply natural gas to small and medium industrial customers including residential and commercial customers.

At the end of the feeder pipelines or distribution pipelines, there will be a service station or house regulator installed inside the customer's premises. The service station or house regulator steps down the pressure according to customer's requirement as well as includes a metering station where a gas meter is installed to compute consumption by the customers. An internal pipe is extended from this metering station to the various customer equipment. This customer equipment include boiler, furnace, kilns, spray dry etc. for industrial customers and gas stove, water heater, air-condition etc for the commercial and residential customers.

As for the cost-sharing facilities, from feeder lines (including odorizers installed within the city gate station) to service stations, will be constructed,

operated, maintained and owned by the gas utility company i.e. Gas Malaysia Sdn Bhd. The internal piping from the service stations to the gas appliances or equipment will be installed by the consumers.

The responsibility of developing the natural gas distribution system is given to Gas Malaysia Sdn Bhd. In countries like the US, UK, Argentina and Italy, there are more than one suppliers in the distribution sector. However, because there is only one company operating in the distribution sector in Peninsular Malaysia, the company has monopoly over the supply of natural gas to the end users, indicating that Gas Malaysia Sdn Bhd (GMSB) is a statutory monopoly. Since its operation in 1992, GMSB has constructed its distribution grid in Shah Alam, Klang, Seremban, Pasir Gudang, Kluang and Gebeng. It plans to complete the NGDS throughout Peninsular Malaysia by 2011.

Overall, it can be concluded that the gas industry in Peninsular Malaysia is still in the developing stage, unlike in countries like the US, UK and Japan, where the gas industry is more than 100 years old. Therefore, it

can be said that the Malaysian gas industry is a relatively new industry. Here, the government's involvement in the early stages is important in developing the gas market. In the next few chapters, the discussion will focus on the development of GMSB in the gas distribution sector.