

The Economics of Natural Gas

By : *Engr. Razmahwata bin Mohd. Razalli* M.I.E.M., P.Eng and *Mohd. Azlan bin Salim*

INTRODUCTION

The economics of the hydrocarbon market has always fascinated Malaysians, primarily due to the subsidisation of petroleum, the amount of subsidisation currently displayed at many locations throughout the nation, and the current volatility in crude prices. What might be forgotten is that there is a gaseous component to hydrocarbons, as well as liquid. It is not so much forgotten, but rather has not hit the headlines lately. This article is intended to introduce the reader to this topic, and to further gain an appreciation of the contribution of gas production to the country.

BRIEF INTRODUCTION OF THE UPSTREAM HYDROCARBON INDUSTRY

For those in the industry, it always comes as a pleasant surprise that hydrocarbon resources were first exploited onshore, specifically in the oil city of Miri. The production industry started of in the murky depths of the 1900's. The first well was spudded, that is drilling operations was initiated in 1908, while it was commercially exploited in 1910. This first well, named "Grand Old Lady" is a favourite Miri tourist attraction (Figure 1). She was a producing well until 1941, producing a total of 650,000 barrels.

As an outcome of the petroleum crisis of 1973, which was a result of an OPEC oil export embargo by many of the major Arab oil-producing states in response to western support of Israel during the Yom Kippur War, Malaysia realised the importance and the impact that oil had on the local economy. The Petroleum Development Act (PDA) was enacted in 1974, leading to the incorporation of PETRONAS (Petroleum National Berhad) on 17 August of the same year under the Companies Act 1965. It is wholly-owned by the Malaysian government and is vested with the entire ownership and

control of the petroleum resources in Malaysia. In essence, any company who wishes to take part in the exploitation of Malaysia's hydrocarbon resources act as a contractor to PETRONAS.

THE DEVELOPMENT OF THE MALAYSIA'S PRODUCTION SHARING CONTRACTS

The form of exploitation agreements between Malaysia and the oil companies has changed throughout the industry's history. Prior to the formation of PETRONAS, foreign companies were allowed to produce under concession type agreements. The company was given the rights to the crude product, in other words they owned the crude and could dispose of it in whatever manner they deemed most beneficial to the company's own interest. The host government collected revenue in the form of royalty on the total production, in addition to paying company tax. With the establishment of the 1974 PDA, these agreements were declared null and void. Companies who had previous concession agreements had to renegotiate with PETRONAS. The outcome of these negotiations were Production Sharing Contracts (PSC).

Production Sharing Contracts

The PSC concept was first used by Indonesia, though the version used by Malaysia was adopted to suit the



Figure 1: Grand Old Lady

country's needs. Under this arrangement, the Contractor (oil producer) bears all the risk of financing the exploration in return of rights to explore. It would provide the financing of the initial cost of investment in return of being allowed to produce the hydrocarbon (gas and oil). Contrary to the concession agreements, the Contractor is required to share the profits between itself, its joint venture partner and PETRONAS.

The PSC concept has further evolved to reflect the current operating environment where Malaysia is a mature area, and the current focus is on exploring and developing marginal fields economically. This state of play does not make the PSCs for old-style large fields attractive. The 'revenue over cost' concept (R/C PSC) was introduced in 1997 to encourage production of marginal fields. The underlying principle

is to allow the PSC Contractor a higher share of production when the Contractor's profitability is low and to increase PETRONAS' share of production when the Contractor's profitability improves. The concept of financing and rights is still retained as per the original PSC format.

Anatomy of a PSC

From a commercial standpoint, the PSC divides up the revenue gained from gas sales into three parts. The first part is royalty, which is payment to the host government, in this case Malaysia (Figure 2). The second part is called cost gas. We note that the Contractor has to provide the financing of the initial cost of investment. The Contractor recovers this cost from the cost gas. It is considered reimbursement for those up front costs. The Contractor is allocated this amount until all costs are recovered. However, it is not practical (and certainly not beneficial for joint venture partners) to allow the contractor to claim all revenue in excess of royalties as cost gas, as there will not be anything left over to claim as profit. Therefore, the amount a Contractor can claim as cost gas is capped. The remaining amount (profit gas) is then shared between PETRONAS and the Contractor.

The next diagram shows the breakdown of how profit gas is further

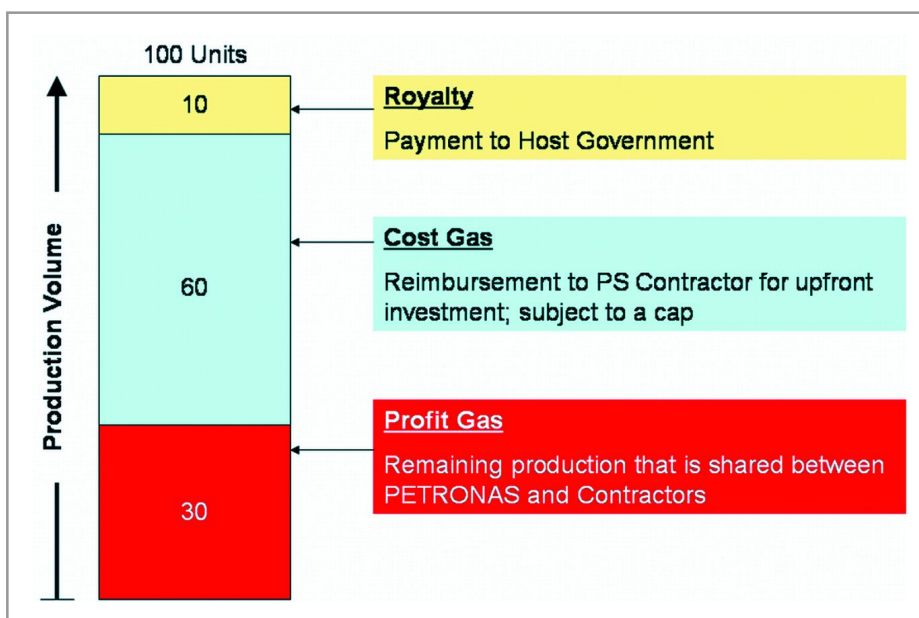


Figure 2: Breakdown PSC revenue

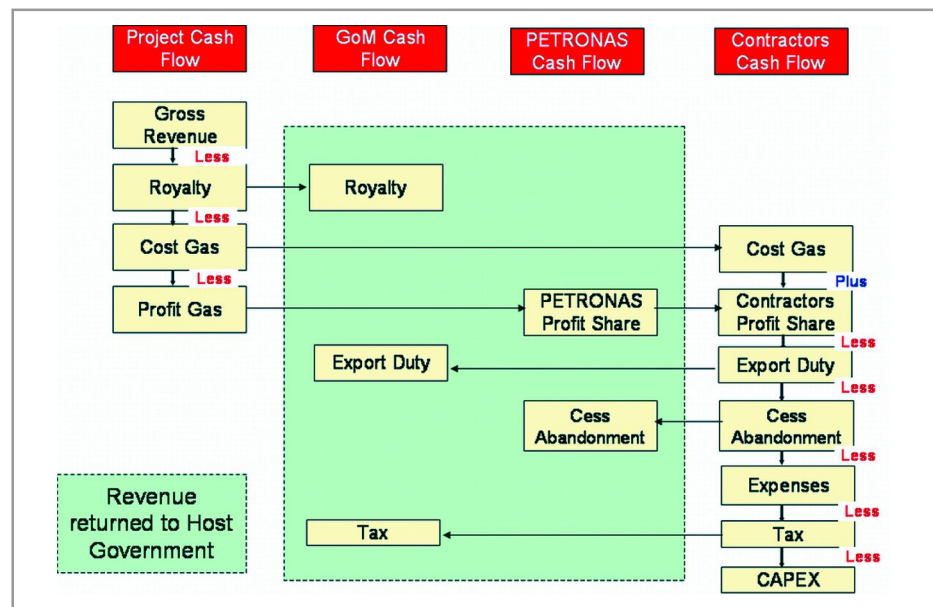


Figure 3: Detailed breakdown - PSC Revenue

split up into the Government, PETRONAS and the Contractor (Figure 3). It illustrates that there are five sources of income to Malaysia: royalty, PETRONAS profit share, export duty, cess abandonment, and the ever present taxes. There are two types of taxes here. The first is the Petroleum Income Tax Act (PITA), under which petroleum profits derived from petroleum operations will be taxed at 38% with effect from the year of assessment 1998. Oil refining, gas liquefying and oil related services such as supply of rigs, ocean tankers and barges are not considered as petroleum opera-

tions. The rules under the Income Tax Act apply to such non-petroleum activities.

As of 2004, Malaysia is estimated to have about 87 trillion standard cubic feet of reserves and producing about 5 billion standard cubic feet per day (Figure 4). (Source: PETRONAS website) Analysis of the distribution of sales notes that there is almost an even split between the Peninsula and Sarawak, with Sabah sales a small fraction of the total (Figure 5). The analysis of gas sales indicate that most of the gas is destined to be exported as LNG, while the largest domestic consumer is the power industry.

If one was to focus on the Peninsula, then it can definitely be seen that the power industry is the main gas consumer (65% of pipeline sales). Industrial users are the second largest consumer, consisting of entities that use gas as a feedstock. Gas sales to Singapore are a distant third.

Looking at East Malaysia, the domestic market is obviously oversupplied if one compares its domestic demand against the amount of reserves. Given the lack of East Malaysia gas demand, the reserves are monetised for LNG export purposes, primarily to Japan, Korea and Taiwan. To date, the PETRONAS LNG Complex is the world's largest LNG production facility at a single location, and has a combined capacity of 23 million tonnes per annum (MTPA). The Complex houses the 8.1 MTPA MLNG plant, 7.8 MTPA MLNG

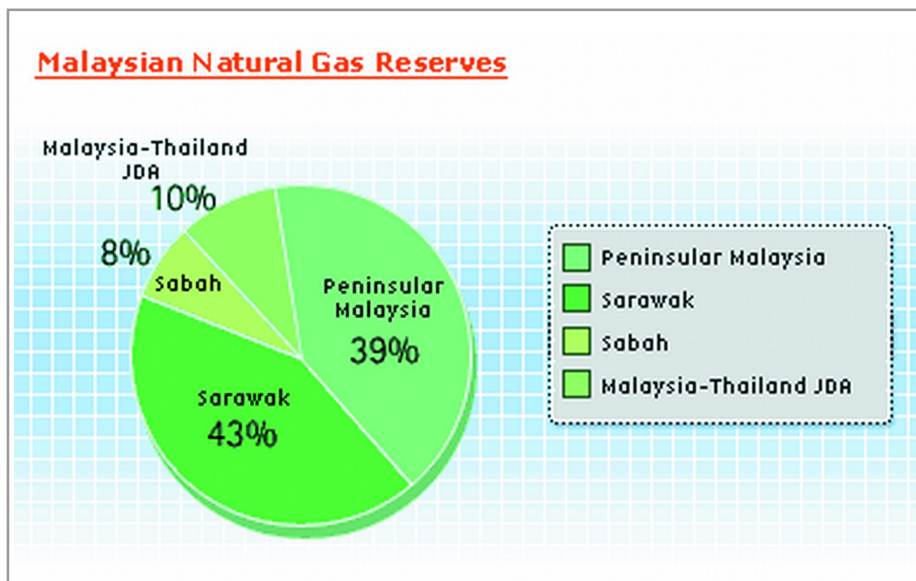


Figure 4: Malaysian natural gas reserves (Source: PETRONAS website)

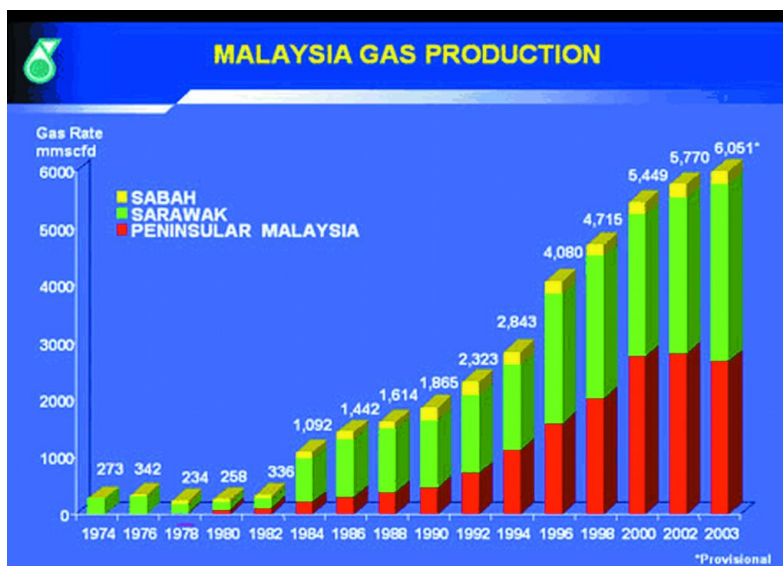


Figure 5: Malaysia gas production (Source: Petronas website)

Dua plant and the 6.8 MTPA MLNG Tiga plant. PETRONAS' LNG business is supported by MISC, the world's largest owner and operator of LNG tankers, providing PETRONAS with the capability and flexibility to ensure a secure and reliable supply to its customers.

INFRASTRUCTURE

The Malaysian Peninsular gas infrastructure looks like a complex beast at first glance (Figure 6). However, one can group section to more easily analyse the said beast. The upstream component can be considered all facilities that are offshore. These facilities send gas to the

Peninsula via two gateways: the onshore gas receiving facilities at Kerteh, Terengganu and Changlun, Kedah where the source of gas comes from the Joint Development Area. Malaysia also gets gas from Indonesia via an offshore tie-in. These all feed into the Peninsular Gas Utilisation (PGU) system, which distributes gas to major consumer areas. It is noted that even though there are two gateways into the PGU, most of the gas comes through Kerteh. This indicates a potential gas supply vulnerability if ever this route was shutdown. On a similar note, it also indicates that the Contractors who supply gas to Kerteh have a strong initiative to maintain and maximise sales.

The four Peninsular gas supplier Contractors (ExxonMobil, PETRONAS Carigali, Talisman and Hess) sell their gas exclusively to PETRONAS, according to the terms in the PSC. The gas in turn is sent to PETRONAS Gas. PETRONAS Gas act as a service company, conditioning and transmitting gas for a fee, rather than sharing the gas profits. The conditioning process, which occurs that the GPPs, strips the heavier components (ethane, propane, butane and others), and use this as a feedstock for the petrochemical industry. The remaining gas which is primarily composed of methane, is called residue gas, and this is the fraction, which will be discussed with respect to end user demand. Even though it is referred to as residue, it still makes up more than 90% of the gas received at Kerteh.

In an effort to boost regional supply security, a Memorandum of Understanding (MoU) was signed for the realisation of the Trans-ASEAN Gas Pipeline Project (TAGP). The concept is designed to catalyse cross-border linkages connecting national gas grids, and encompasses a network that connects Myanmar, Thailand, Malaysia, Singapore, Indonesia and Philippines. To date, the Malaysia gas pipeline network is already linked to Thailand, Indonesia and Singapore via the Malaysia-Thailand Joint Development, West Natuna-Duyong and Malaysia-Singapore pipelines.

GAS SALES AGREEMENTS

Gas Sales Agreements (GSM) dictate the commercial conditions at which gas is sold. A typical Malaysian GSA covers the responsibilities of the Buyer and Seller, the duration of the contract, the amount of gas transferred and the pricing of the commodity (Figure 7).

The Annual Delivery Quantity (ADQ) is the quantitative contractual amount that the Seller has to deliver, and which the Buyer has an obligation to receive. This amount may be measured in several forms. For example, it could be based on the net amount of hydrocarbons produced offshore or alternatively administered on an energy basis.

It is self-evident from day to day experience that the Seller is open to penalisation if it cannot meet the ADQ.



Figure 6: Peninsular gas infrastructure



Figure 7: Breakdown - Typical gas supply agreement

However, what is not so evident is that there is a mechanism for the Buyer to be penalised as well. This could happen if the Seller can deliver the Annual Minimum Quantity (AMQ), but the amount of sales has to be cut back due to the Buyer's request. This may threaten the Seller's return on investment, as capital has been sunk into facilities to meet the Buyer's demands. In this case, there is a take-or-pay (ToP) clause in the agreement for the Seller to be

compensated if the AMQ is not met.

The actual delivery amount is dependent on PETRONAS' daily nominations, which determines the expected sales amount from each Seller. If the seller is unable to meet the daily nominations in a contractual period, then the Buyer will purchase the same amount in the next contractual period at a discount. This gives the Seller a great incentive to meet the daily nominations, or risk a smaller profit margin. ■