

# Malaysia: Natural Gas Industry Annual Review - 2014 Edition



*Cover photo : LNG Regasification Terminal in Sungai Udang, Melaka.*

## MESSAGE FROM THE PRESIDENT OF THE MGA



It gives me great pleasure to present the 2<sup>nd</sup> edition of the “Malaysia: Natural Gas Industry Annual Review” publication. I hope that this publication will continue to be the main reference of the Malaysian natural gas industry.

The year 2013 has been a very exciting and significant year for the natural gas industry in Malaysia.

The upstream sector achieved considerable success in new gas discoveries contributing to an increase in the Malaysian gas reserves. In addition, PETRONAS also recorded 100 active Production Sharing Contracts (PSC) in Malaysia. These are significant achievements and underscore the fact that Malaysia’s hydrocarbon potential is not yet fully exploited. It is also testament to the relentless efforts put in by PETRONAS and the upstream partners in pushing technology limits and employing innovative means in maximizing the recovery of our domestic basins.

The biggest and most important milestone in the natural gas industry in 2013 is the completion of Malaysia’s first LNG regasification terminal (RGT) in Sungai Udang, Melaka which delivered the first gas into the PGU system in May 2013. The completion of the RGT strengthens Peninsular Malaysia’s energy security further as it enables import of LNG from any LNG source in the world. The RGT is also an important step towards market liberalization as it allows any gas supplier to deliver gas into Peninsular Malaysia. In 2013, a total of 23 LNG cargoes were imported through the Melaka RGT.

Another important development is the Sabah Oil and Gas Terminal (SOGT) project in Kimanis. SOGT will further enhance gas supply in Sabah where the gas will be supplied to two new power plants in Kimanis which will improve the reliability of power supply in Sabah. In addition, gas from the SOGT will also be delivered to industrial and petrochemical users in Kimanis and Sipitang as well to PETRONAS LNG Complex in Bintulu via the 500 km Sabah-Sarawak Gas Pipeline.

Natural gas has always played a fundamental role in supporting Malaysia’s economic development and accounted for 46% of Malaysia’s primary energy supply in 2012. In addition, LNG remains a major foreign exchange revenue earner for the nation and LNG export in 2013 was valued at RM59 billion.

To address this issue, it is encouraging to note that the Government of Malaysia has approved the application of a market based pricing with an appropriate discount (weighted average LNG price ex-Bintulu with discount) be applied for volumes above a threshold for power sector and for new contracted volumes for the non-power sector. Additionally, the government has approved a gradual upward revision of prices for volumes currently still on regulated price effective 1<sup>st</sup> January 2014 for power sector and 1<sup>st</sup> May 2014 for non-power sector, to be implemented every six months. The key to the success of the liberalization efforts is the effective implementation of these approved price revisions.

The industry needs to recognize that cheap energy resources have encouraged

inefficiency in energy use as evident by the Energy Intensity Index (EEI) reported by the IMF World Economic Outlook report, which indicates that over the last two decades in Malaysia, the energy used to generate a unit of GDP has increased by about 12% compared to the global trend, which through the drive for energy efficiency has seen a reduction by as much as 23%. The trends across countries also show improving energy efficiencies in countries where energy is not subsidised. There is therefore tremendous opportunities for Malaysia to improve energy efficiency through pricing energy at the appropriate market levels.

Finally, I wish to record my sincere gratitude to PETRONAS Group of Companies and Gas Malaysia Berhad for their contribution and involvement in making this publication possible, and to Suruhanjaya Tenaga, Bank Negara Malaysia and the Department of Statistics whose information, data and publications had been referred to in this publication.

**Ir Pramod Kumar Karunakaran**

**President**

**Malaysian Gas Association**

## ***Table of Contents***

Executive Summary .....	4
Section 1: Upstream Sector .....	6
Section 1.1: Natural Gas Reserves .....	6
Section 1.2: Location of Malaysia's Gas Fields .....	8
Section 1.3: Natural Gas Production .....	12
Section 2: Downstream Sector.....	14
Section 2.1: Development of Malaysia's Natural Gas Industry .....	14
Section 2.2: Domestic Natural Gas Consumption .....	18
Section 2.3: Natural Gas Vehicles .....	27
Section 2.4: Gas Exports .....	29
Section 3: External Gas Sources .....	35
Section 4: Third Party Access .....	37
Section 5: Regulated Gas Prices .....	38
Acknowledgement .....	42

## ***Executive Summary***

- The Malaysian economy grew by 4.7% in 2013, compared to 5.6% in 2012.
- The Malaysian population increased to 30.1 million in Q1 2014, compared to 29.8 million in Q1, 2013, 28.3 million in 2010 and 23.3 million in 2000.
- In 2013, Malaysia's natural gas industry registered another year of respectable performance both in the upstream and downstream sectors.
- The aggressive effort to reverse the decline in domestic production has led to several new significant discoveries, boosting the country's total natural gas resource to be around 100 tscf.
- Malaysia faces various challenges in upstream gas development such as depleting resources and ageing facilities, gas fields containing high CO<sub>2</sub> and other contaminants, marginal fields and rising development costs. Innovative solutions such as integrated development utilizing the hub concept, and implementing floating LNG, will continue to facilitate monetisation of the new gas fields.
- Gas production in 2013 was approximately 6.2 bscfd, increasing from 6.0 bscfd in 2012 contributed by higher production in Peninsular Malaysia and Sarawak.
- In 2013, Malaysia's domestic gas consumption increased by about 5.7% to reach 2.5 billion scfd, from 2.4 billion scfd in 2012. This increase was attributed to better supply situation from increased domestic production and LNG import. Approximately 82% of the domestic demand was accounted by Peninsular Malaysia, followed by Sarawak at 10% and Sabah & Labuan at 8%. Since 2008, demand for Peninsular Malaysia has been constrained by the steady decline in production from maturing oil and gas fields offshore. The shortfall, however, was supplemented by gas from joint development fields in the Malaysia-Thailand Joint Development Area and the Malaysia-Vietnam Commercial Arrangement Area, LNG import as well as higher piped gas imports from Indonesia.
- In 2013, Malaysia gas export increased both in terms of LNG and piped gas.
  - LNG sales volume increased to 25.1 MTPA from 23.7 MTPA in 2012 due to higher gas production from the domestic fields in Sarawak and higher plant reliability.
  - LNG export in 2013 was valued at RM59.2 billion or 8.2% of Malaysia's total exports.
  - Piped gas export to Singapore also increased to 180 mmscfd from 143 mmscfd in 2012 due to improved gas supply from LNG import.
- LNG Regasification Terminal (RGT) in Melaka became operational and delivered

first gas to PGU system in May 2013. A total of 23 LNG cargoes were imported through the RGT in 2013.

- Gas sourced from Indonesia and Malaysia-Thailand Joint Development Area (JDA) decreased marginally from 597 mmscfd in 2012 to 571 mmscfd in 2013.
- The number of NGV vehicles in Malaysia was approximately 69,000 while the number of NGV refueling stations increased marginally to 177 stations.
- In 2013, the total natural gas subsidy – the revenue foregone by selling gas to the domestic market at the price below those stipulated in the contracts – was RM24.9 billion, of which 55% was accounted by the power sector. Meanwhile, subsidies to the non-power sectors - which include industrial, commercial and residential users, and NGV - was RM11.2 billion. Cumulative subsidy since 1997 has reached RM207.7 billion.

**Glossary:**

MT = million tonnes

MTPA = million tonnes per annum

GJ = giga joule

mmscfd = million standard cubic feet per day

bscf = billion standard cubic feet

tscf = trillion standard cubic feet

mmBtu = million British thermal unit

kboe = thousand barrels of oil equivalent

bboe = billion barrels of oil equivalent

LNG = liquefied natural gas

NGV = natural gas for vehicle

FLNG = floating LNG

GWh = Giga Watt hour

FY = fiscal year

CY = calendar year



## Section 1: Upstream Sector

### Section 1.1: Natural Gas Reserves

The upstream sector of Malaysia's natural gas industry registered yet another year of impressive performance.

Major discoveries made in 2013 include in B14 and Tembakau fields offshore Sarawak and Peninsular Malaysia respectively. Some of the major discoveries made in 2013 are listed in the table below.

**Figure 1: Gas Discoveries in 2013**

Well	Date	Block	Operator
Adong Kecil**	Jan-13	SK333	JX Nippon
Kelidang NE-1*	Mar-13	CA-2	Murphy Oil
B-14*	Apr-13	SK310	Newfield
Tembakau**		PM	Lundin
Pegaga-1	Oct-13	SK320	Mubadala
Sintok-1**	Dec-13	SK320	Mubadala

Sources:

\* - PFC Energy

\*\* - PETRONAS

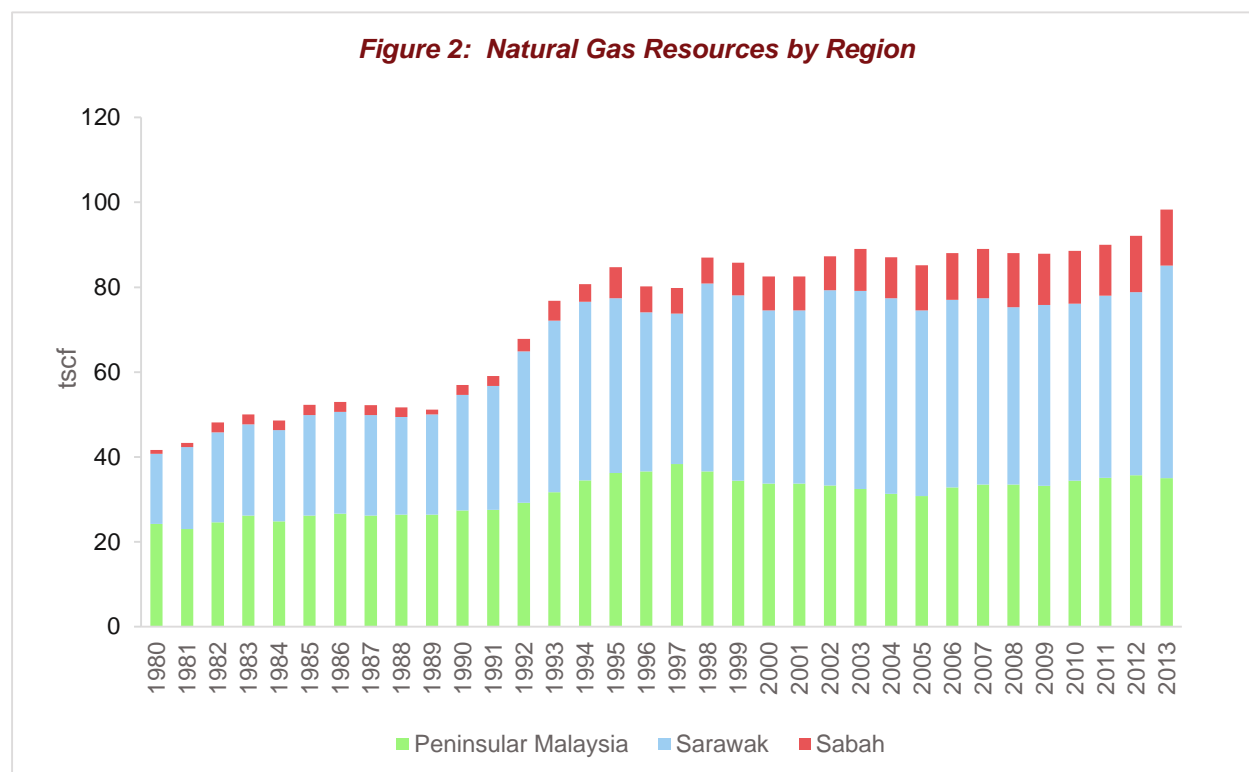
Taking into account the additional volume from new discoveries, Malaysia's total natural gas resource today is estimated to be around 100.0 tscf#. Thus, based on the current average daily production rate of some 6 bscf per day, Malaysia's natural gas resources should be able to last at least another 40 years. Natural gas therefore is expected to continue to play an important role in helping to power Malaysia's economy, as well as feature prominently in ensuring security of the nation's energy supply up to 2050. (# Source: *Crunch Time for PETRONAS, Business News, The Star, 22 March 2014*)

Equally important, the recent discoveries of significant reserves in the matured acreage of Malaysia's offshore areas will very likely attract renewed interest from multinational oil companies to invest in new rounds of exploration campaigns to explore for oil and gas in the country; thereby further increasing the possibility of finding more oil and gas reserves.

In 2013, PETRONAS recorded 100 active PSCs in Malaysia, encompassing exploration, development and production blocks.

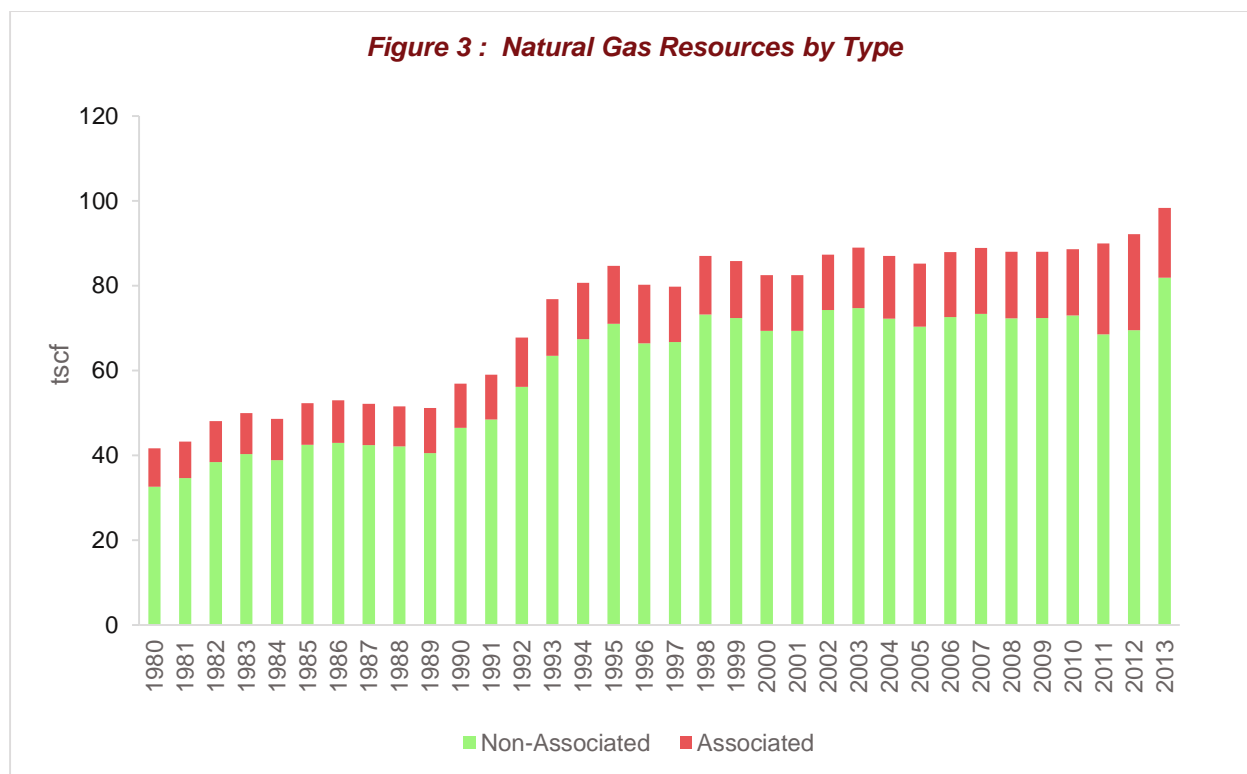


As depicted in Figure 2, Malaysia's natural gas resources as at 1 January 2013 was 98.3 tscf, rose by some 6.2 tscf, or 6.7% from 92.1 tscf on 1 January 2012. A breakdown of the country's natural gas resources by region is provided below.



Source : Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga

Natural gas resources by type on 1 January of each year is shown in Figure 3. 83% of Malaysia's natural gas resources comprise non-associated gas.



Source : Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga

According to PETRONAS' Annual Report 2013, Malaysia's natural gas reserves (2P) as of 1 January 2014 was 6.64 bboe increasing from 6.602 bboe on 1 January 2013, while contingent resources (2C) was 10.14 bboe as of 1 January 2014, increasing from 9.785 bboe on 1 January 2013.

Malaysia faces various challenges in upstream gas development such as depleting resources and ageing facilities, gas fields containing high CO<sub>2</sub> and other contaminants, marginal fields, and rising development costs.

## Section 1.2: Location of Malaysia's Gas Fields

Almost all of the country's existing oil and gas fields are located offshore. Based on data on 1 January 2013, Sarawak accounts for approximately 52% of the country's natural gas resources, followed by Peninsular Malaysia with about 36%, and Sabah with 13%.

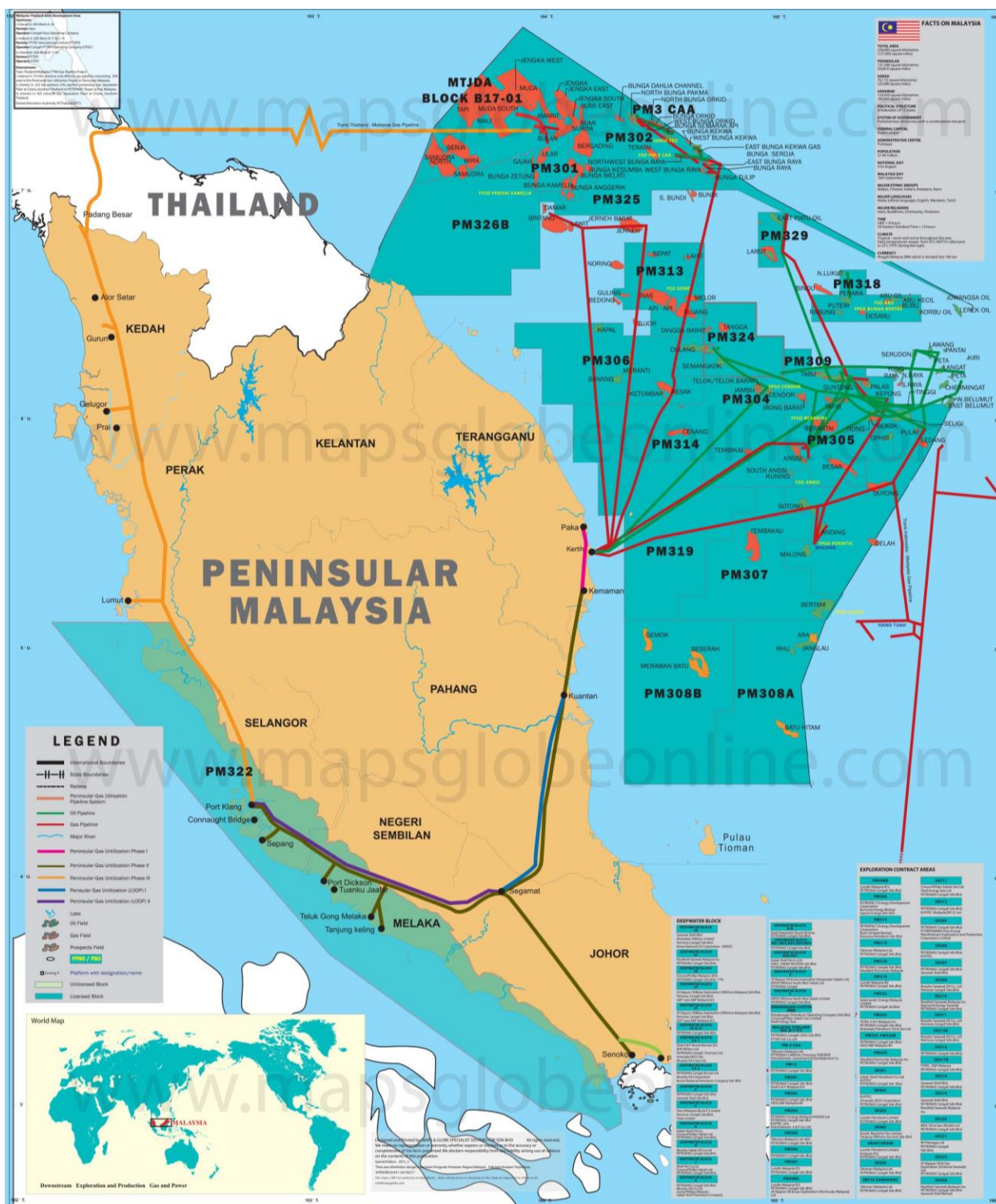
PETRONAS has completed the construction of a 500-km onshore Sabah-Sarawak Gas Pipeline (SSGP) which brings the natural gas offshore Sabah to the PETRONAS LNG Complex, and subsequently exported as LNG. The pipeline system also has provisions for future domestic consumption in Sabah and Sarawak.



*Sabah Oil and Gas Terminal (SOGT) in Kimanis*

The maps in the following pages showing the location of the gas fields in Malaysia are for illustration purposes only.

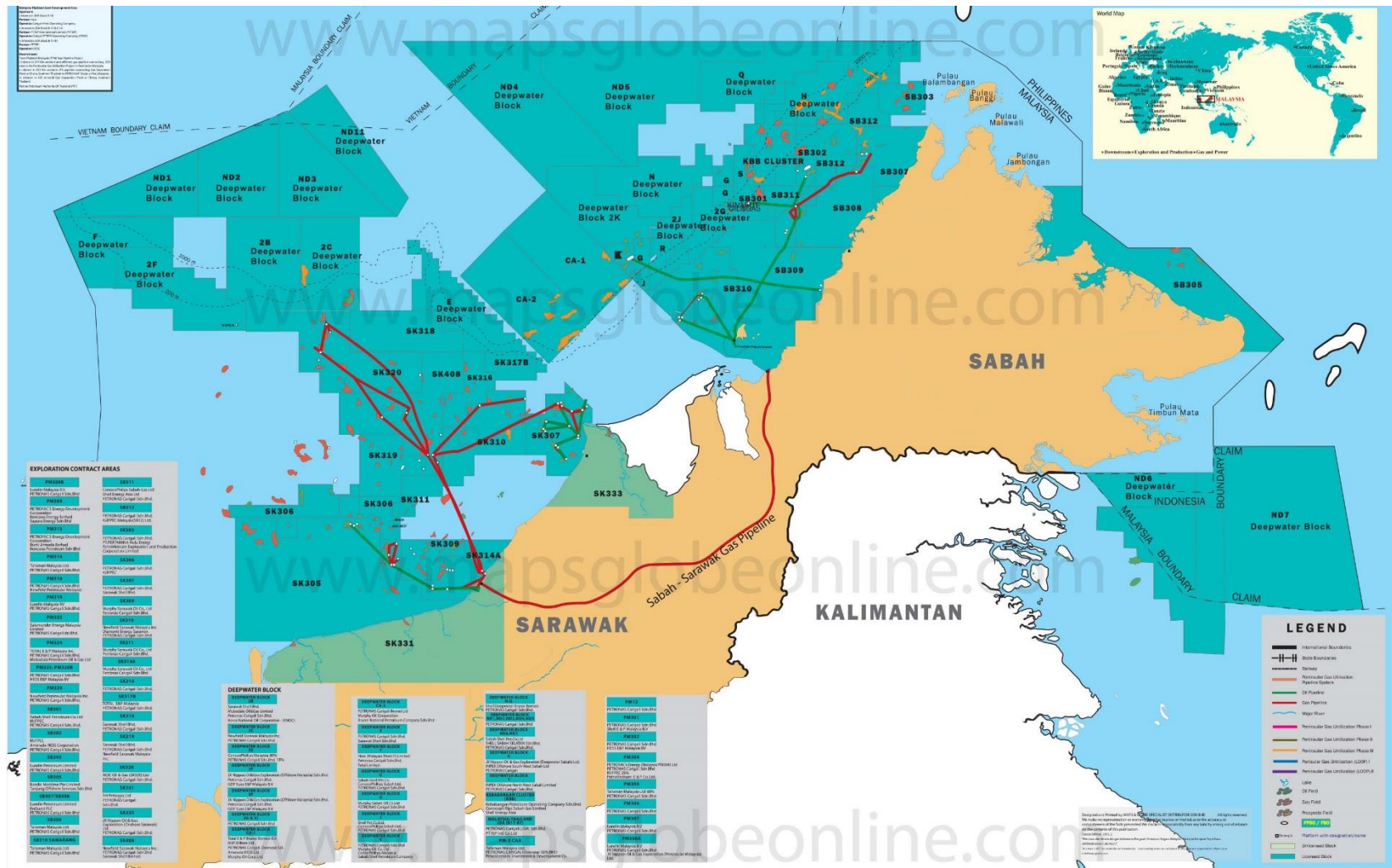
**Figure 4: Oil & Gas Map – Peninsular Malaysia**



Map courtesy of Maps & Globe Specialist Distributor Sdn. Bhd. ([www.mapsglobe.com](http://www.mapsglobe.com))



**Figure 5: Oil & Gas Map – East Malaysia**

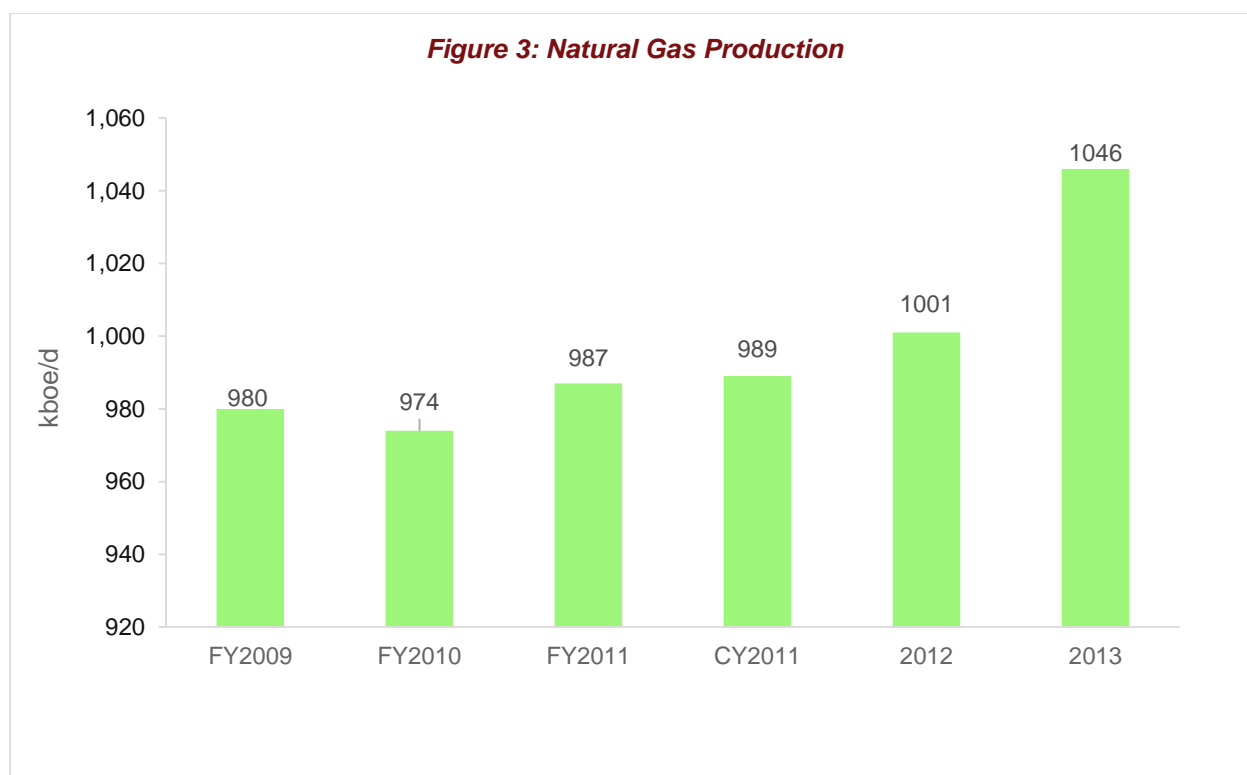


Map courtesy of Maps & Globe Specialist Distributor Sdn. Bhd ([www.mapsglobe.com](http://www.mapsglobe.com))

### Section 1.3: Natural Gas Production

Gas production was 1,046 kboe/d in 2013 (approximately 6.2 bscfd) increasing from 1,001 kboe/d in 2012 (approximately 6.0 bscfd) contributed by higher production in Peninsular Malaysia and Sarawak.

One of the significant gas fields which was brought onstream recently was Kinabalu Non-Associated Gas field (KNAG), located offshore Sabah and the gas is landed at Sabah Oil and Gas Terminal (SOGT) in Kimanis.

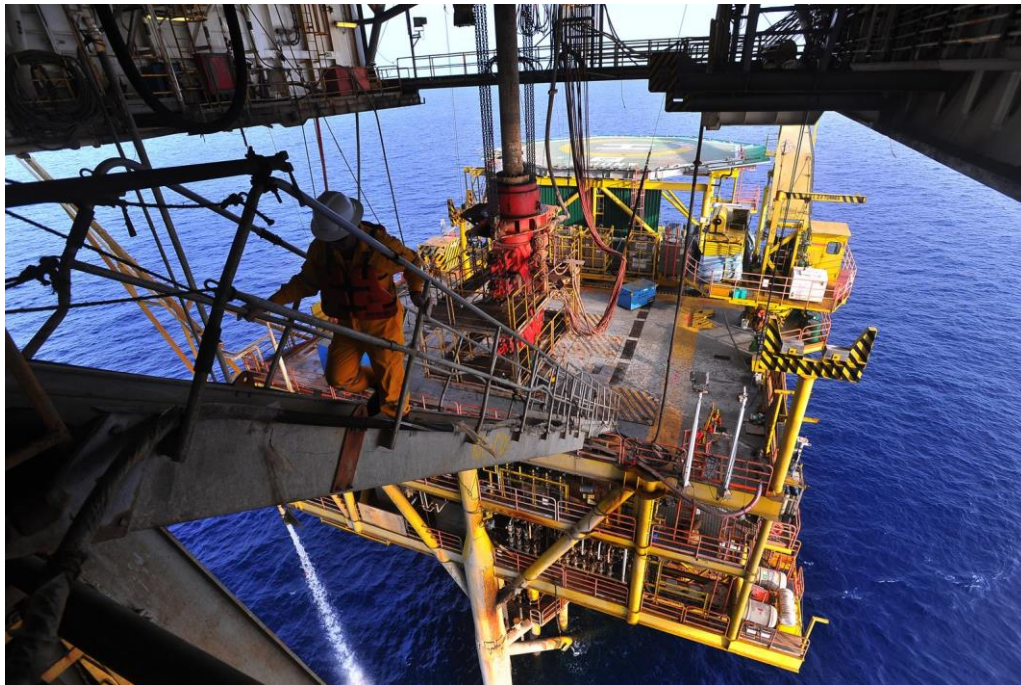


Source : PETRONAS Annual Reports. (Note : FY2009, FY2010 and FY2011 ends on 31 March of the corresponding financial year.)

Since 2005, Sarawak has been the largest producing state in Malaysia, with production at almost 4.0 bscfd, most of which went to LNG production in Bintulu. The recent discovery of several new significant fields offshore Bintulu is expected to enable Sarawak to maintain its dominance as the country's largest producer of natural gas for the foreseeable future.

It is very significant to note that for Peninsular Malaysia's PGU system supply, a volume of 1,679 mmscfd was sourced from offshore Peninsular Malaysia in 2013. This

represents an increase of 15% compared to 1,455 mmscfd in 2012. Gas sourced from Malaysia-Thailand Joint Development Area (JDA) and imported from Indonesia was lower at 571 mmscfd compared to 597 mmscfd in 2012. In addition, 23 LNG cargoes were imported through the LNG Regasification Terminal in Melaka from May to December 2013.



*Angsi Platform*

### **Looking Ahead**

- 1.0 *To sustain long term gas supplies, more resources will be developed in phases to replace volume produced from depleting fields.*
- 2.0 *The future of the upstream sector of Malaysia's natural gas industry however is not without challenges. PETRONAS is currently faced with a series of major challenges such as managing matured fields with depleting reserves, ageing facilities, higher CO<sub>2</sub> content and contaminants, and new fields which are located in the deepwater areas where operations are more challenging, especially with high temperature and pressure environment. As such, for future operations, it would appear that PETRONAS would have to brace itself for a much higher unit production cost, as well as more expensive development cost for the new gas fields. It is therefore critical that the Government close the gap between the current domestic natural gas tariff and the international market price.*



## ***Section 2: Downstream Sector***

The downstream sector of Malaysia's natural gas industry consists primarily of domestic consumption and exports. However, since about 82% of the country's natural gas demand is located in Peninsular Malaysia, domestic consumption practically refers to gas consumed in this part of the country. On the other hand, a significant portion of the natural gas produced offshore Sarawak is exported in the form of LNG; thus, Malaysia's natural gas exports primarily refer to exports of LNG via Bintulu, Sarawak.

### ***Section 2.1: Development of Malaysia's Natural Gas Industry***

Malaysia's ability to harness and obtain the best value for its natural gas resource is attributed to the orderly and systematic manner in which the country's gas resources were developed and exploited. One of the success factors is the mandate given to PETRONAS by the Malaysian Government to develop the industry, from the development of the gas fields up to the processing, marketing and distribution of the resource. As a result, PETRONAS was able to develop the country's natural gas industry in a fully integrated and efficient manner, thereby obtaining the optimum returns for the resource throughout the whole value chain.

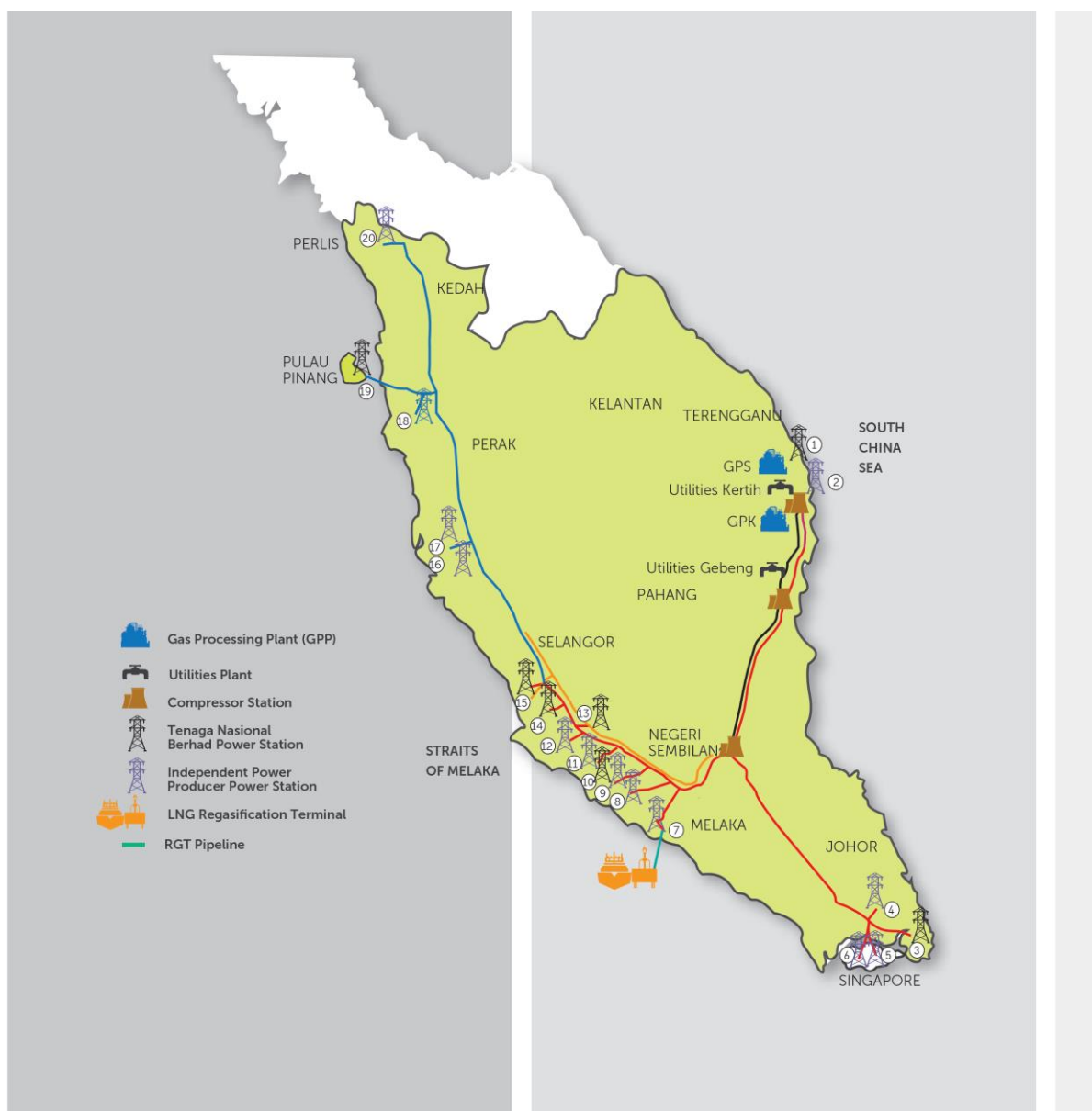
The Gas Masterplan Study commissioned by PETRONAS in 1981 set the stage and roadmap for the development of natural gas industry in Malaysia. One of the most important recommendations from the Study was the implementation of a project to put in place the necessary distribution grid for the Peninsular Malaysia, known as the Peninsular Gas Utilisation project, or PGU.

Under the PGU system, gas from the offshore fields off the east coast of Peninsular Malaysia is treated and processed at PETRONAS Gas Berhad's (PGB's) gas processing plants (GPPs). Here, the gas is separated into its main components, namely methane (or sales gas), ethane, propane, butane, and condensate.

The GPP complexes, located in Kertih and Santong, Terengganu have a capacity to produce 2,060 mmscfd of sales gas. In 2013, an average of 1,967 mmscfd of feed gas was processed at the GPPs.

The sales gas is distributed to the end users throughout Peninsular Malaysia via the PGU gas transmission network comprising more than 2,500 km of high pressure pipelines. The PGU system subsequently helped spawn petrochemical hubs on the east coast and encouraged gas-fired power plants to be built along its route, especially along the south and west coast of the peninsular. The PGU also has the historical significance of being the first Asian export pipeline as it enabled natural gas to be exported to Singapore. Equally important, the PGU is now linked to a pipeline grid from Thailand, where natural gas from the Malaysia-Thai Joint Development Area (JDA) is landed at Songkhla in south Thailand, and subsequently piped into Malaysia, via Padang Besar in Perlis.

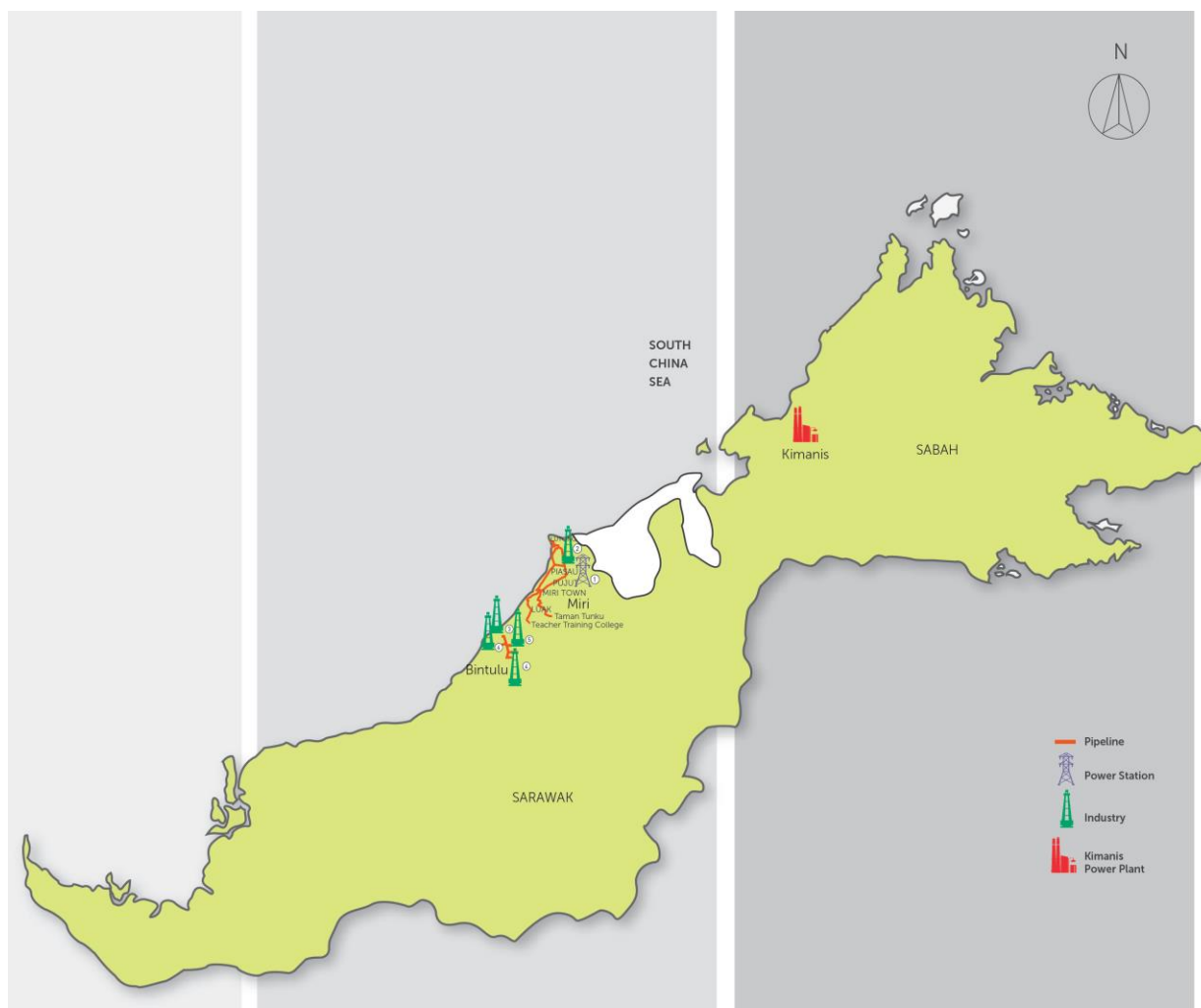
**Figure 7: Map of Peninsular Gas Utilisation Network and Distribution Network in Sarawak**








PGB Total Pipeline Length (in operation)	
Main	1,658 km
Lateral	374 km
C2, C3 and C4	357 km
GPP Interconnect	116 km
Sarawak	45 km
RGT	33 km
<b>Total</b>	<b>2,583 km</b>

Complex	GPP	Capacity mmscfd
GPK	1	310
	2	250
	3	250
	4	250
GPS	5	500
	6	500
<b>Total</b>		<b>2,060</b>

Sales Gas Customers	
1. TNB Paka	10. TNB Tuanku Jaafar
2. YTL Paka	11. Port Dickson Power
3. TNB Pasir Gudang	12. Genting Sanyen Power
4. YTL Pasir Gudang	13. TNB Serdang
5. Senoko Energy	14. TNB Connaught Bridge
6. Keppel Gas	15. TNB Kapar
7. Pahlawan Power, Tg. Kling	16. GB3 Lumut
8. Panglima Power, Teluk Gong	17. Segari Energy Ventures
9. Powertek, Teluk Gong	18. Prai Power
	19. TNB Gelugor
	20. Technology Tenaga Perlis Consortium



Main Pipeline	Gas - in	Main Pipeline	Gas - in	Sales Gas Customers
PGU I  32 km		Sector I : 184 km		1 SESCO Miri Power Station
Kertih - Teluk Kalong	1984	Meru - Lumut	1996	2 Sarawak Gas Distribution System
PGU II  685 km		Sector II : 176 km		3 Bintulu Edible Oils Sdn Bhd
Sector I : 233 km		Lumut - Gurun	1998	4 Syarikat Sebangun Sdn Bhd
Teluk Kalong - Segamat	1991	Sector III : 90 km		5 Sime Darby Austral Sdn Bhd
Sector II : 241 km		Gurun - Pauh	1998	6 Biport Bulklers Sdn Bhd
Segamat - Kapar	1991	Loop 1  265 km		
Sector III : 211 km		Kertih - Segamat	1999	
Segamat - Singapore	1991	Loop 2  226 km		
PGU III  450 km		Segamat - Meru	2001	

Source: PETRONAS Gas Berhad Annual Report, 2013

The completion of all the three stages of the PGU project in the late 1990s has since propelled natural gas to become the most important source of energy for Malaysia, reshaping the country's energy and economic landscape, whilst at the same time paving the way for the nation to embark on the path towards industrialization.

On the economic scene, natural gas helped Malaysia to generate significant valuable foreign exchange earnings, whilst at the same time help to substantially reduce the country's dependence on fuel oil, and its import. Exports of LNG and the cutback of fuel oil imports for power generation provided a very significant boost to Malaysia's economy. Natural gas' contribution to Malaysia's economy climaxed during the 1997/98 Asian Financial Crisis. With over 70% of its power needs then being generated by natural gas, Malaysia was able to avoid the full brunt of the Ringgit's devaluation, which went down to almost RM5.0 to one US Dollar. Because Malaysia was able to maintain domestic electricity tariff at a fairly low rate, the country was amongst the earliest in the region to recover from one of the worst ever economic recession to hit the Asian region.

Currently, PETRONAS is developing the Sabah-Sarawak Integrated Oil and Gas Project to harness the oil and gas resources in the offshore areas of Sabah and Sarawak in East Malaysia. Besides the development of the new oil and gas fields off the coast of Sabah, namely Gumusut/Kakap, Kinabalu Deep and East, Keabangan and Malikai, the project consists of two onshore developments:

1. Sabah Oil and Gas Terminal (SOGT)

The SOGT will receive, store and export crude oil as well as receive, process, compress and transport the gas produced from the fields offshore Sabah. Covering an area of about 250 acres, the SOGT will have the capacity to handle up to 300,000 barrels of crude oil per day and 1.0 billion standard cubic feet of gas per day. The crude oil and condensate received and stored at the terminal will be loaded into vessels for export through single point moorings located about 10km offshore Kimanis.

The new terminal will complement the operations of the existing Sabah Gas Terminal, the Labuan Crude Oil Terminal and the Labuan Gas Terminal which will continue to handle the oil and gas produced from other fields offshore Sabah.

2. Sabah-Sarawak Gas Pipeline (SSGP)

The 500-km SSGP will transport gas from the SOGT in Kimanis for processing into liquefied natural gas (LNG) at the PETRONAS LNG Complex for export. The pipeline system also has provisions for future domestic consumption in Sabah and Sarawak.

SOGT and SSGP will further enhance gas supply in Sabah and the gas from SOGT will be supplied to two new power plants in Kimanis, which will improve the reliability of power supply in Sabah. In addition, gas from the SOGT will also be delivered to industrial and petrochemical users in Kimanis and Sipitang.

In addition to the above, PETRONAS is also undertaking the Sabah Ammonia Urea

(SAMUR) project, in Sipitang, Sabah.

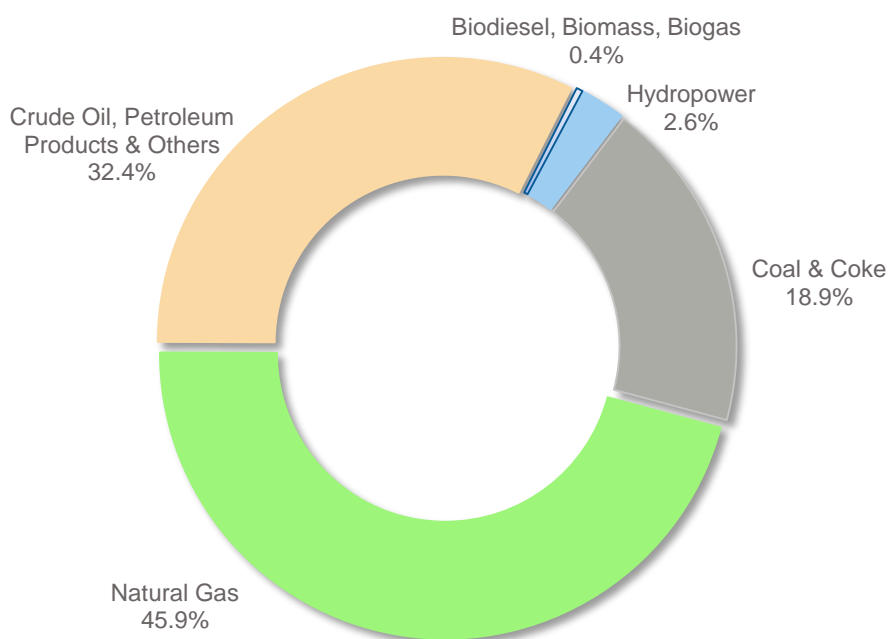
In April 2014, PETRONAS announced the Final Investment Decision of Pengerang Integrated Complex (PIC) in southern Peninsular Malaysia. This massive development is part of the larger Pengerang Integrated Petroleum Complex (PIPC) being promoted by the Johor State Government. PIC development will include, amongst others, a second LNG RGT and a co-generation plant which are targeted for completion in 2017. In addition to supplying steam and power to the PIC, the co-generation plant will also supply power to the national grid.

## **Section 2.2: Domestic Natural Gas Consumption**

Since 1991, when Phase Two of the PGU was commissioned, natural gas has become a very important source of energy for Malaysia. At its peak in 2006, natural gas accounted for almost 53% of Malaysia's primary energy supply. However, due to the decline in production from some of the fields offshore Peninsular Malaysia, the share of natural gas in Malaysia's primary energy mix has since dropped to about 46% in 2012, with coal meeting the country's incremental energy demand.

A chart showing natural gas' share of Malaysia's primary energy supply in 2012 is provided in Figure 8.

**Figure 8: Primary Energy Supply, 2012**

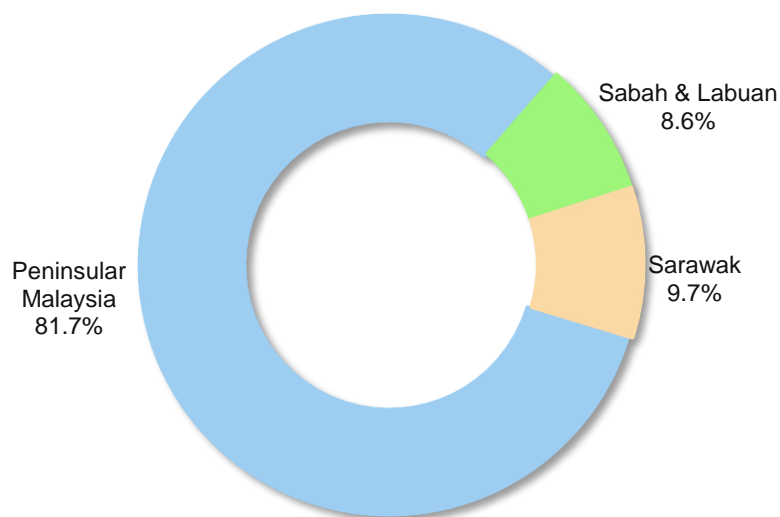


Source : Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga

The gas consumption in Malaysia in 2013 was 2,536 mmscfd, an increase of 5.7% compared to 2,399 mmscfd in 2012. The increase in the consumption was due to higher gas supply availability from higher domestic gas production in Peninsular Malaysia as well as importation of LNG from May 2013.

Peninsular Malaysia accounts for 2,070 mmscfd or about 81.7% of Malaysia's total natural gas consumption. Out of this, 58% or 1,210 mmscfd was delivered to the power sector and 860 mmscfd to the non-power sector. A snapshot of the country's natural gas demand by region is provided in Figure 9.

**Figure 9: Domestic Gas Consumption by Region, 2013**

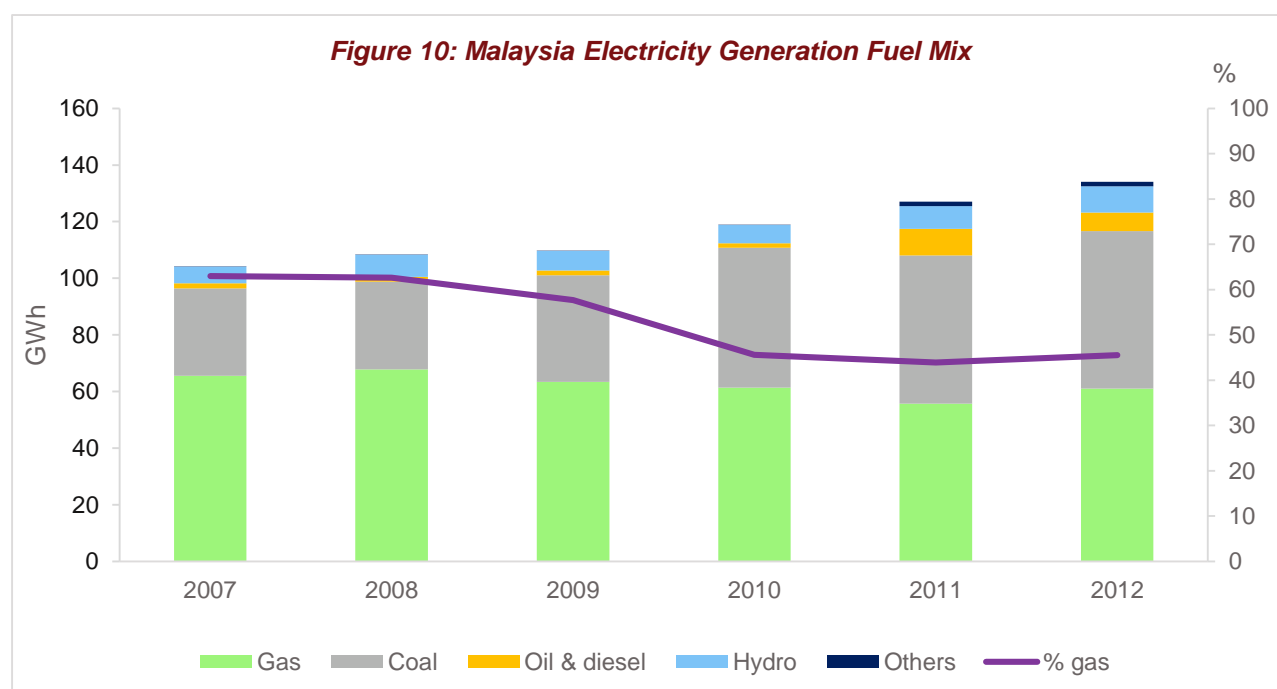


Source: PETRONAS

Ever since it was introduced to the country's power sector in the late 1980s, natural gas has continued to be the preferred fuel for power generation. The Malaysian Government's decision to regulate the gas price to the power sector has succeeded in keeping the country's electricity tariff to be amongst the lowest in the region. Furthermore, since it is being priced in Ringgit – thereby eliminating any foreign exchange risk for the power producing companies - demand for natural gas in the power sector continued to grow and reached a peak in 2000 when it accounted for 78% of electricity generation mix for the country. However, due to the decline in production from some of the older fields offshore Peninsular Malaysia since 2007, the share of natural gas in Malaysia's electricity generation mix has since dropped to around 45% in 2012.

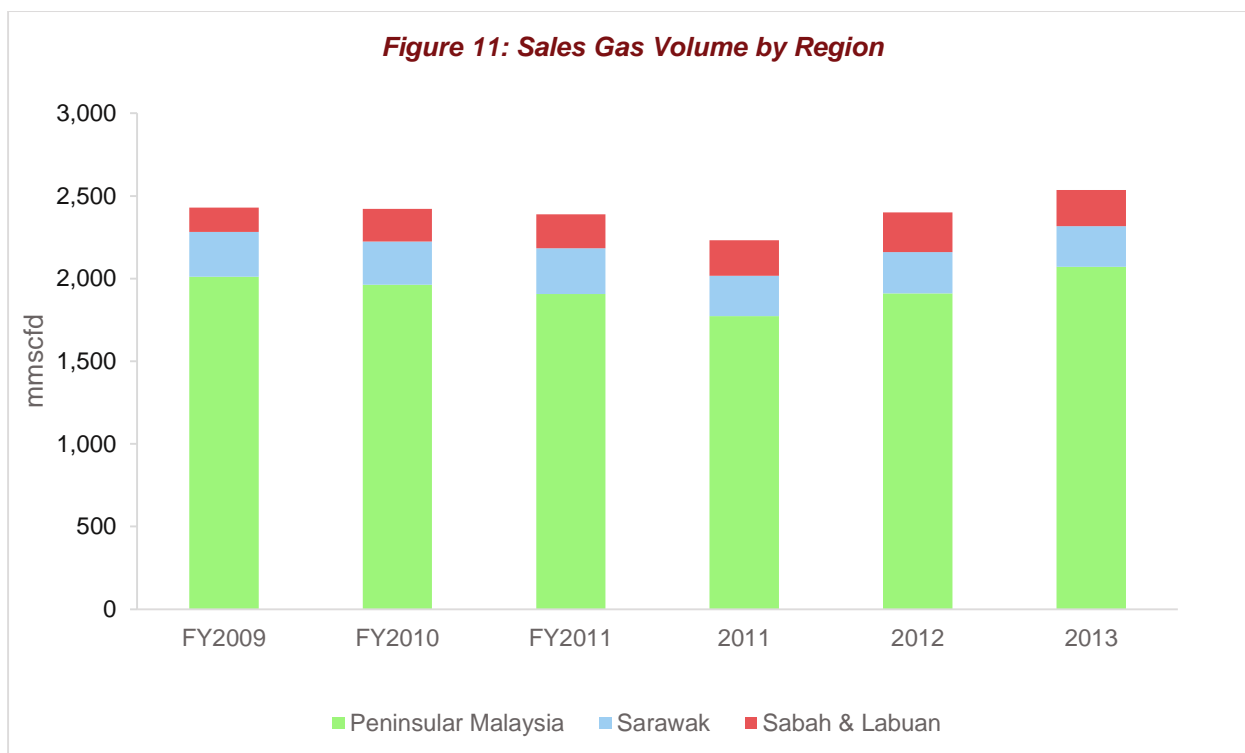
Meanwhile, the share of coal in Malaysia's electricity generation mix has increased by almost five folds from 10% in 2000 to 48% in 2012.

The completion of the LNG RGT in May 2013 contributed significantly towards enhanced gas supply and energy security in Peninsular Malaysia. LNG imports, coupled with higher domestic production in Peninsular Malaysia, have resulted in increased share of gas in Peninsular Malaysia's electricity generation mix from 45% in 2012 to more than 50% since after the LNG RGT commissioning.



Source : Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga





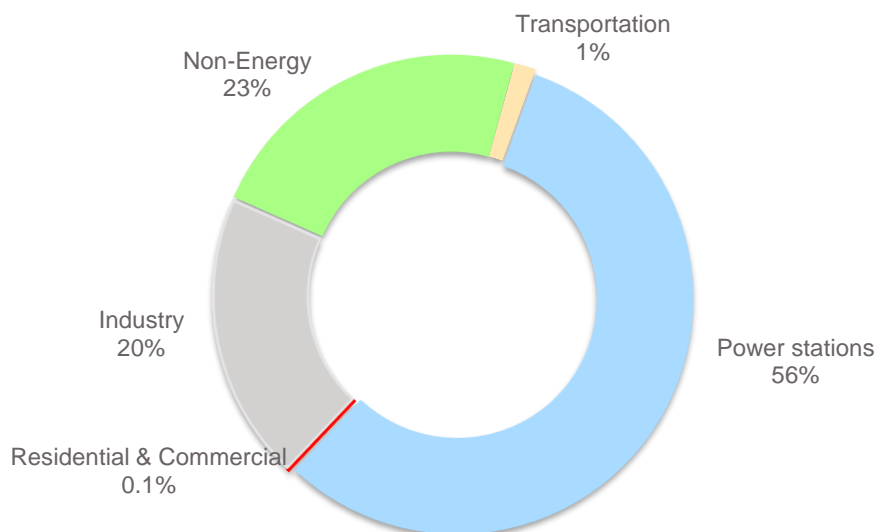
Source : PETRONAS Annual Reports. (Note : FY2009, FY2010 and FY2011 ends on 31 March of the corresponding financial year.)

Gas consumption in Sabah is expected to increase following the completion of SOGT and SSGP, two gas-fired power plants in Kimanis in 2014 and the SAMUR project in Sipitang.

Similarly, the gas consumption in Sarawak is also expected to increase in the future due to increasing demand from both power and non-power sectors.

In terms of demand by sector, the industrial sector has always been the second largest consumer of gas, after the power sector. In the 1990s, Malaysia's economic landscape experienced a transformation from an agricultural-based economy to one which is more industrial-based. In line with this development, the Malaysian Government had encouraged the establishment of integrated industrial and petrochemical complexes. Subsequently, PETRONAS built the Kertih Integrated Petrochemical Complex in Terengganu and Gebeng Integrated Petrochemical Complex in Pahang. The design of these complexes include a centralised utility facility which provides power, steam, and demineralized water to the tenants, thereby significantly reducing the owner's capital investment to setup their plants.

**Figure 12 : Gas Consumption by Sector, 2012**

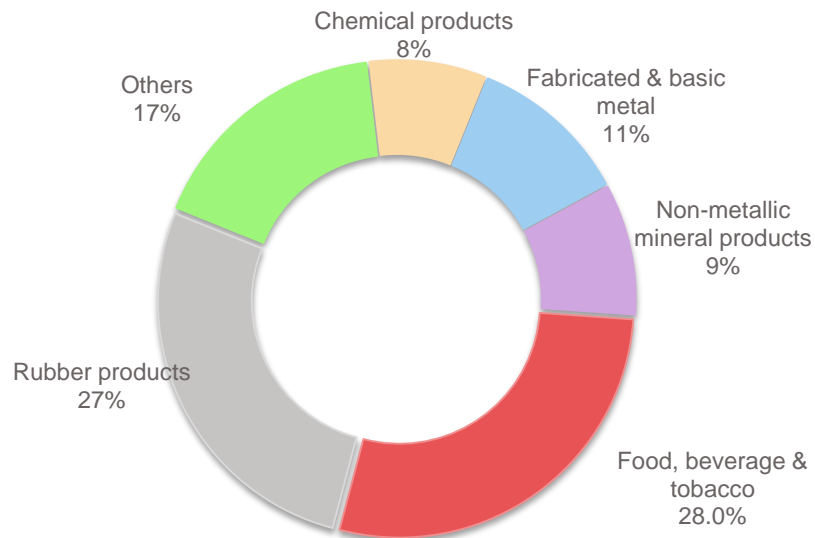


Source : National Energy Balance 2012, Suruhanjaya Tenaga

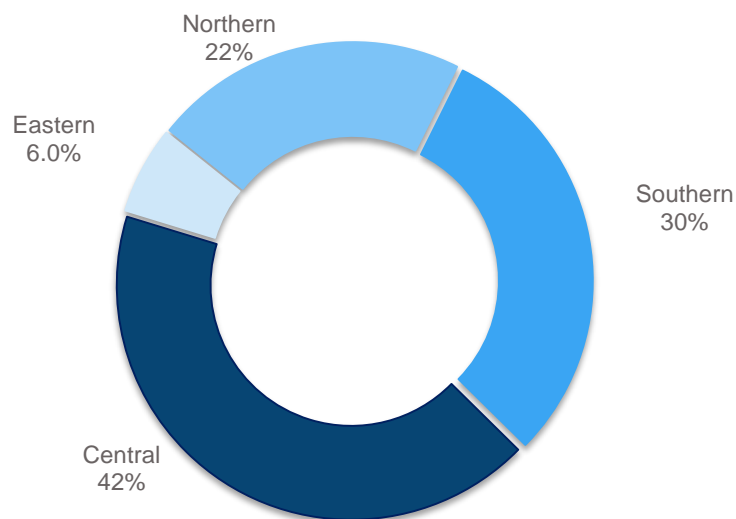
Further downstream, gas is made available to small industries, commercial and residential customers in Peninsular Malaysia by Gas Malaysia Berhad (GMB) which owns and operates approximately 2,000 km of distribution pipeline network. GMB supplies natural gas to 740 industrial, 630 commercial and 12,455 residential customers. For the industrial customers, the main consumers of natural gas are from the rubber products and the food, beverage and tobacco sectors which collectively consumed in total about 53% of natural gas supplied by GMB. In addition, GMB also supplies Liquefied Petroleum Gas (LPG) to 1,204 commercial and 22,480 residential customers.

Gas Malaysia has seen its sales increase sharply from only 0.7 million mmBtu (approximately 2 mmscfd) in 1993, to 127.6 million mmBtu (approximately 360 mmscfd) in 2012.

**Figure 13: Breakdown of Gas Malaysia's Sales Volume by Industry**



**Figure 14: Breakdown of Gas Malaysia's Sales Volume by Region**



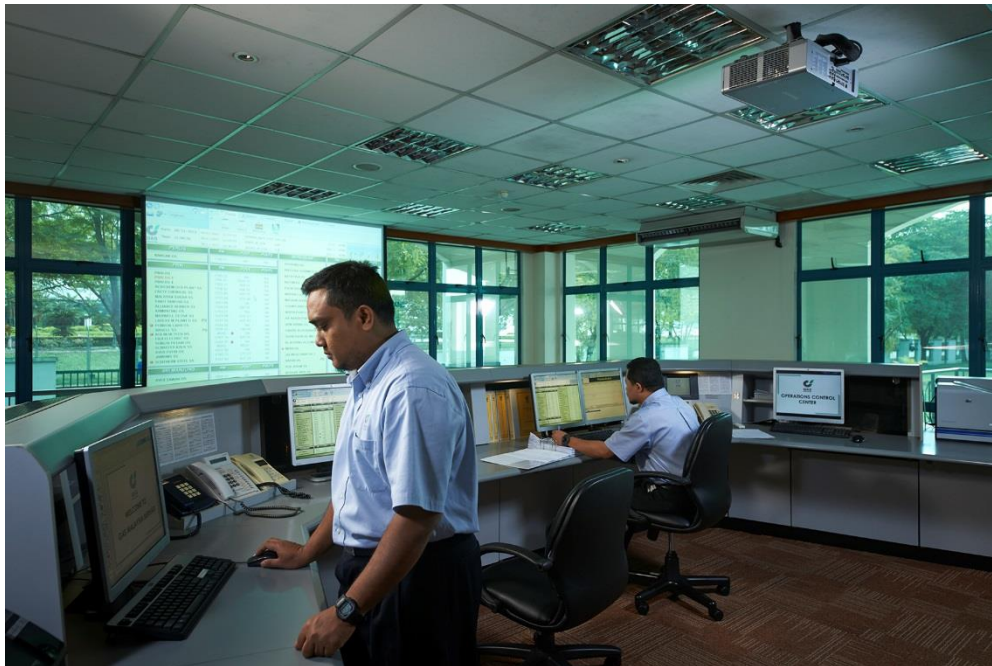
Source : Gas Malaysia Berhad

In February 2012, PETRONAS and GMB signed a renewed Gas Sales Agreement (GSA). Under the new GSA, PETRONAS agrees to sell an additional volume of up to 192 mmscfd at the prevailing market price.

Following the signing of the renewed GSA, GMB's sales volume increased by 8.5% in 2013 to 138.5 million mmBtu (approximately 390 mmscfd).

GMB has taken the initiative to introduce and promote the Combined Heat and Power system. Due to its high efficiency, the system enables customers to utilize more energy from the same volume of gas, thus significantly reducing their total energy cost.

Gas Malaysia also explores other avenues to create new demand for gas by introducing "virtual pipeline" to the customers – to supply compressed natural gas via land transportation to areas beyond the reach of its existing gas pipelines. This initiative would make natural gas accessible to wider consumers who would otherwise not have any access to this energy resource.



*Gas Malaysia Berhad's control room*

In Sarawak, PETRONAS Gas Berhad operates a 45-km gas pipeline network in Bintulu and Miri where gas is delivered to gas-fired power plants and industrial users. Further gas distribution to residential and commercial users is managed by Sarawak Gas Distribution Sendirian Berhad (SGDSB).

Gas distribution in Kota Kinabalu, Sabah and Labuan is managed by Sabah Energy Corporation (SEC).



**Figure 15: Gas Malaysia's supply area - Northern and Central regions.**

Source : Gas Malaysia Berhad Annual Report, 2013



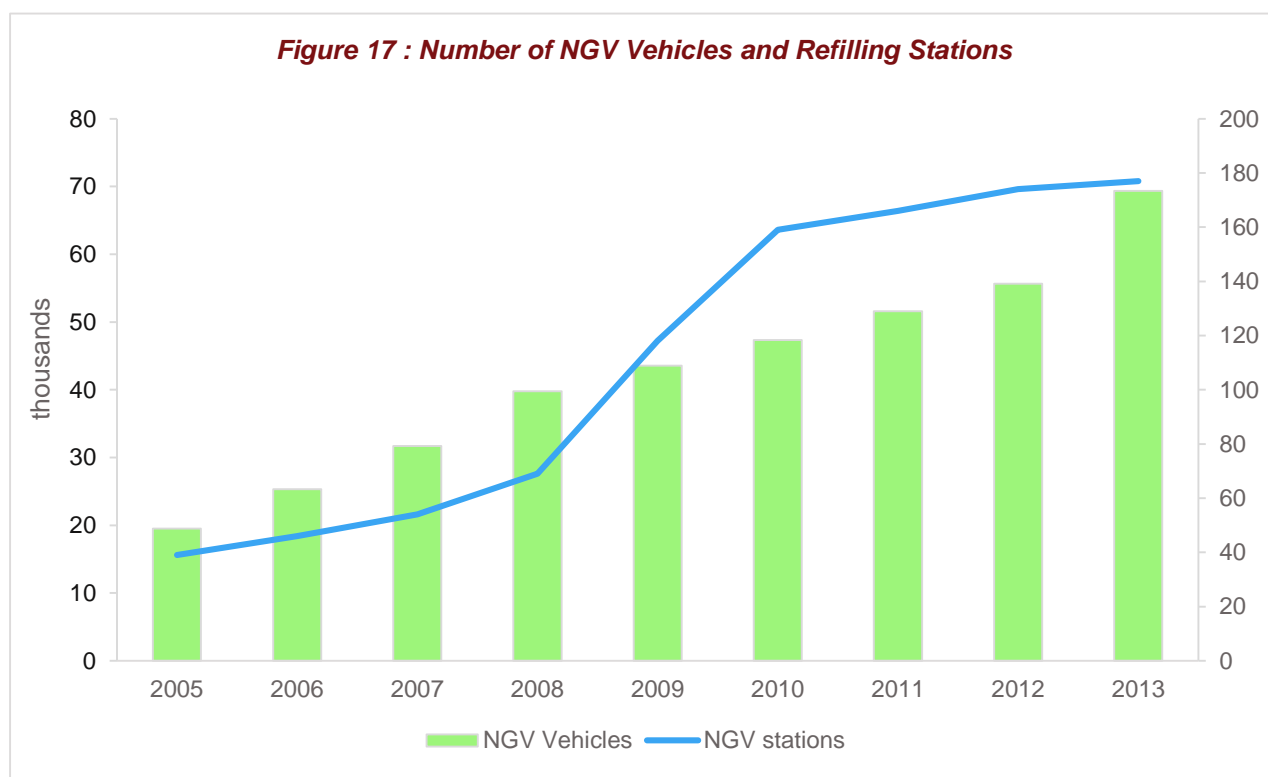
**Figure 16: Gas Malaysia's supply area - Eastern and Southern regions.**

Source : Gas Malaysia Berhad Annual Report, 2013

### Section 2.3: Natural Gas Vehicles

An equally important development made possible by the PGU system is the natural gas for vehicle programme or NGV. The availability of natural gas in major cities on the west coast of Peninsular Malaysia has enabled PETRONAS to promote the use of natural gas as a cleaner fuel for the transportation sector. This programme has received strong support from the Malaysian Government since it would also steer the transportation sector away from its dependence on oil products.

Currently, Malaysia has about 69,000 natural gas vehicles on the road, with 177 NGV refilling stations in operation. Most of the NGV users are taxis. The public bus system in Putrajaya also runs on NGV.

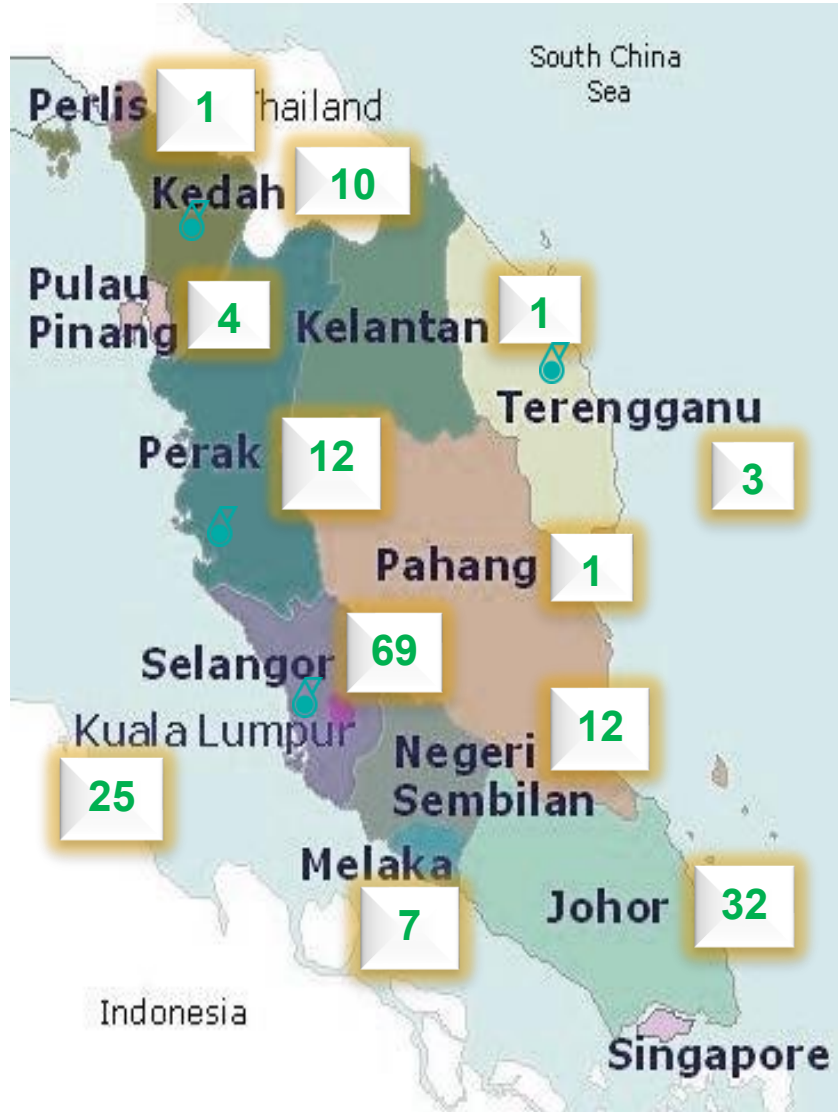


Source : PETRONAS NGV Sdn. Bhd.

The lower than targeted number of NGV vehicle population is due to the lower number of NGV refilling stations in operation. More than half of the refilling stations are located in the Klang Valley, with only 5 stations located throughout the east coast of the Peninsular Malaysia.



**Figure 18: Number of NGV Stations by States**



Source : PETRONAS NGV Sdn. Bhd

Increased use of natural gas in the transportation sector would help reduce environmental pollution and greenhouse gas emissions; hence, enhancing the quality of living and supporting sustainable development.

To ensure success of the NGV programme, the Government has been maintaining the natural gas pump price for NGV at 68 sen/litre of petrol equivalent since 2005 as shown in Figure 13. This price is approximately one-third of the subsidised price for RON 95

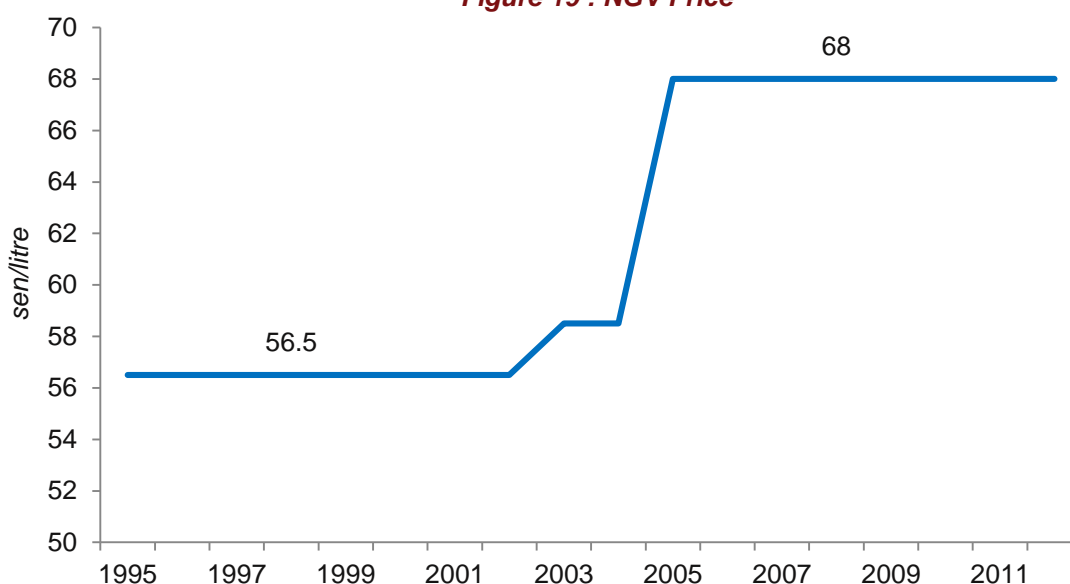
unleaded petrol, and only one-fourth of RON 97 unleaded petrol.

Currently, PETRONAS NGV Sdn. Bhd. (PNGV) is the only supplier of NGV in the country. The negative margin due to low regulated NGV pump price has not encouraged the sales of NGV by other suppliers. PETRONAS also incurs significant losses in this business, but is continuing the programme as part of its contribution and obligation to improve the quality of life and the environment in Malaysia.

Most of the gas delivery to the NGV refilling stations is by pipeline. A small amount of NGV is also delivered by NGV trucks to the refilling stations where there is no access to the gas pipeline.



**Figure 19 : NGV Price**



Source: PETRONAS NGV Sdn Bhd

## **Section 2.4: Gas Exports**

About 95% of the gas exports was in the form of LNG, whilst the balance is in the form of piped gas to Singapore. The volume exported represents approximately 60% of the total volume of natural gas produced by the country.

Malaysia recorded higher LNG export in 2013 at 25.1 MTPA, increased by 5.9% from 23.7 MTPA in 2012 mainly due to higher gas production from the domestic fields in Sarawak. In 2013, the PETRONAS LNG Complex in Bintulu recorded the highest production ever in a single year.

Ever since the country started exporting LNG in January 1983, natural gas exports have since emerged as a major contributor of Malaysia's export earnings. According to data

published by Department of Statistics, Malaysia exported RM59.2 billion worth of LNG in 2013 or 8.2% of Malaysia's total export value, increasing from RM56 billion in 2012.

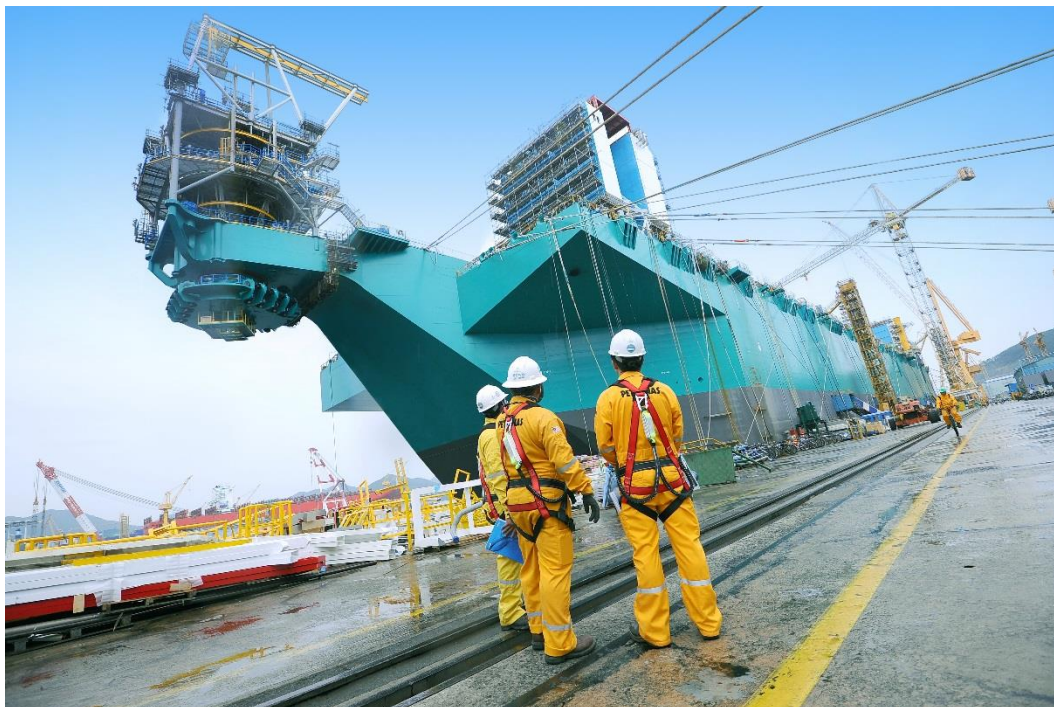
The PETRONAS LNG Complex, located in Bintulu, Sarawak has a capacity to produce 25.7 million tonnes per annum (MTPA) and this capacity will increase by 3.6 MTPA when the Train 9 project is completed in 2016.

In addition, the on-going PETRONAS Floating LNG Satu (PFLNG 1) project will add another 1.2 MTPA. PFLNG 1 will also be the first floating LNG liquefaction facility in the world when completed at the end of 2015.

The Floating LNG project is an innovative and bold solution to unlock and monetize Malaysia's marginal and stranded gas fields. FLNG is expected to change the landscape of the LNG business where the liquefaction, production and offloading of LNG, previously only possible at onshore plants, will be carried out hundreds of kilometers away from land and closer to offshore gas resources.

In February 2014, PETRONAS announced the Final Investment Decision (FID) of another floating LNG project, PFLNG 2, which will add another 1.5 MTPA to Malaysia's LNG production capacity when completed in 2018.

PFLNG 1 will be located offshore Sarawak while PFLNG 2 will be located offshore Sabah.

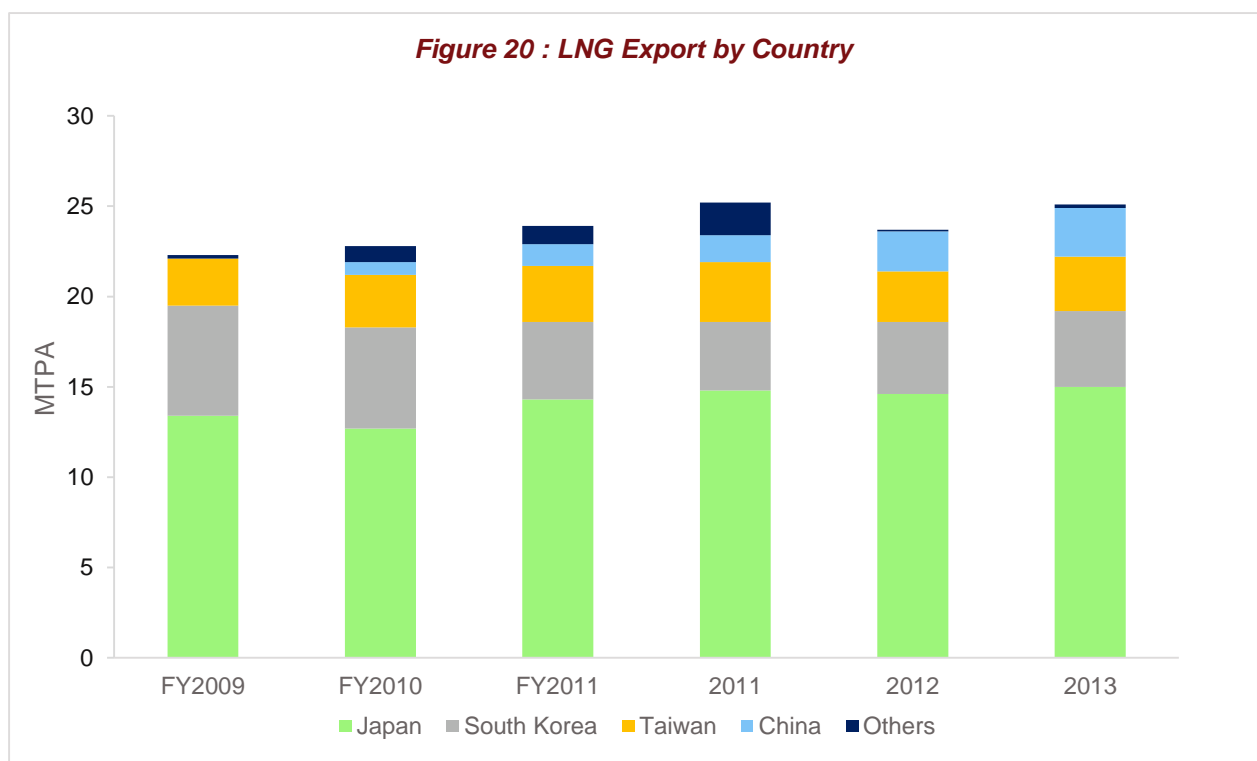


*The turret of the PETRONAS Floating LNG 1 (PFLNG1)*

Malaysia has historically been a major supplier of LNG for Japan, South Korea, and Taiwan. Malaysia LNG has had over 30 years of experience as an established and reliable supplier in delivering LNG to these major markets.

Japan continues to be the main buyer of LNG from Malaysia, accounting for 59.7% of LNG export in 2013, followed by South Korea (16.8%), Taiwan (11.9%), China (10.7%) while the balance of 0.9% is exported to other countries.

LNG export to China which began in 2009 has been increasing steadily from an initial volume of only 0.7 MTPA to 2.7 MTPA in 2013.



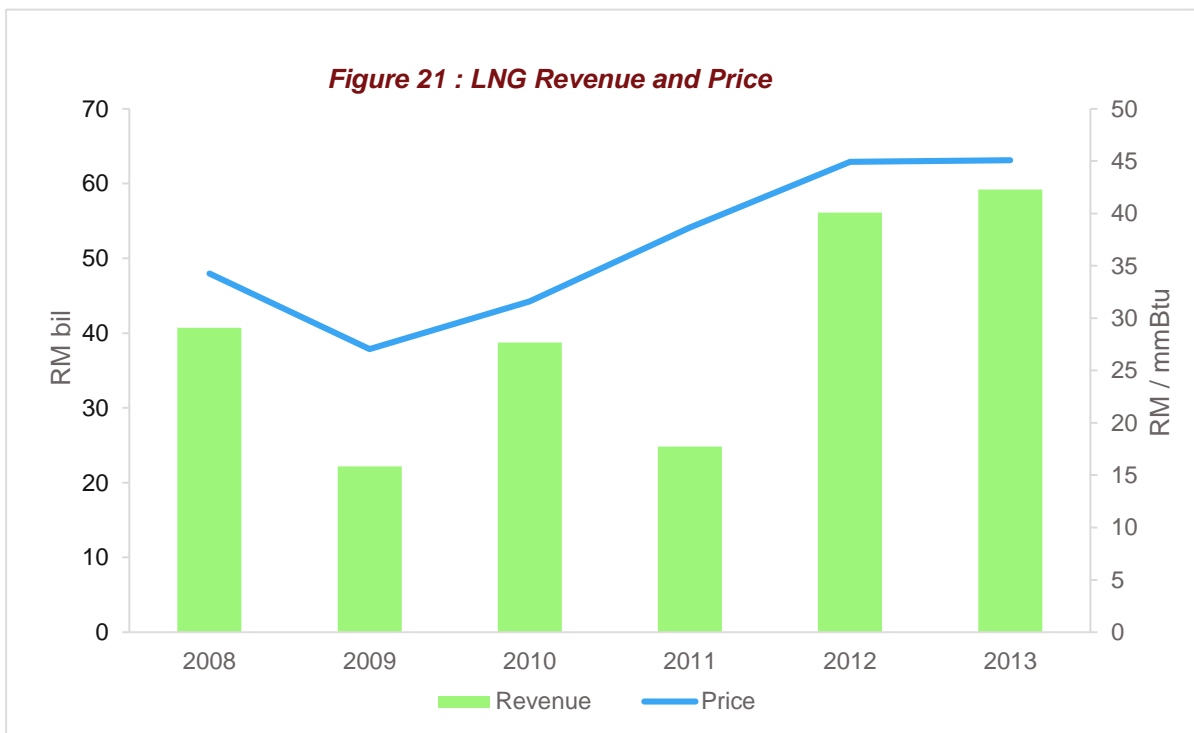
Source : PETRONAS Annual Reports.

Note : FY2009, FY2010 and FY2011 ends on 31 March of the corresponding financial year.



*LNG Storage Tanks, PETRONAS LNG Complex*

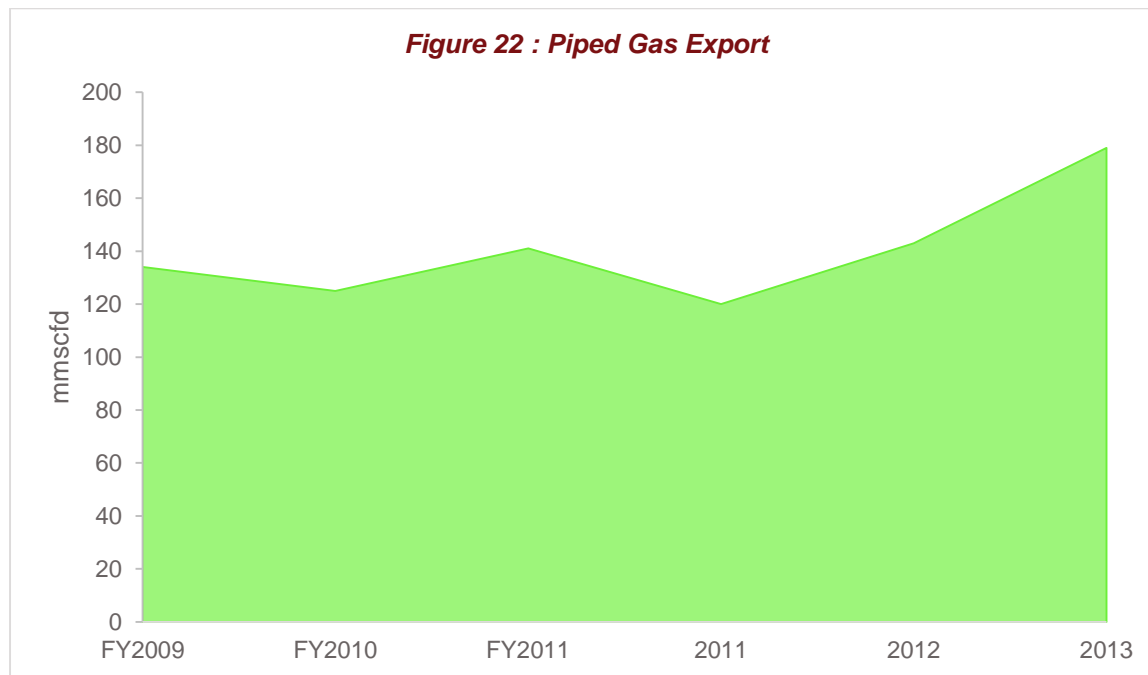
In 2013, the average price of LNG imported by Japan from various LNG sources in the world was USD15.3 / mmBtu.



Source : Department of Statistics.

LNG price was calculated based on value and volume data published by the Department of Statistics.

Pipeline exports to Singapore make up a small component of Malaysia's total natural gas exports. Singapore has been importing gas from Malaysia since January 1992 mainly as fuel to its gas-fired power plants.



Source : PETRONAS Annual Reports.

Note : FY2009, FY2010 and FY2011 ends on 31 March of the corresponding financial year.

In 2013, Malaysia's piped gas export increased to 180 mmscfd from 143 mmscfd in 2012. The increase was again due to improved gas supply situation after completion of the LNG RGT. These supplies were delivered under two separate contracts: Senoko Power and Keppel Gas. However, gas import from Malaysia represents a small portion of Singaporean piped gas imports as the country relies much more heavily on Indonesian volumes.

- Exports to Singapore are likely to decline in the near future as Singapore starts to import LNG to diversify its gas supply sources and enhance its energy security. Singapore's first LNG import terminal became operational in May 2013. The terminal has an initial capacity of 3.5 MTPA which will eventually be increased to 9.0 MTPA.



## **Looking Forward**

1. *The outlook for natural gas demand in Malaysia will very much depend on the price set by the Government. For Peninsular Malaysia, the demand will also depend on the price of the imported LNG.*
2. *There is general acceptance that higher energy prices, including electricity tariff, would promote more efficient use of energy. More efficient use of natural gas and electricity would result in reduced overall consumption of this resource, which in turn would lead to lesser subsidy from PETRONAS and the Government. Who is advocating the adoption of the more energy efficient systems such as distributed generation, co-generation, and district cooling?*
3. *China, Australia, and certain Western European countries, are pushing for the use of natural gas (both for CNG and LNG) as fuel for the public services and heavy duty vehicles segments of their transportation sector and LNG for the marine sector, which would further reduce the use of oil and also protect the environment. Considering that the world's natural gas reserves, including unconventional gas, can last more than 200 years, which is more than twice that for oil, should Malaysia also actively promote the use of natural gas for the transportation and marine sectors to further reduce its dependence on oil products and also enhance sustainable energy for the future?*
4. *The removal of subsidy for natural gas would make coal a much cheaper alternative for use in the power sector. However, this route would lead to higher carbon emission and possible degradation of the country's environment. Should the Government legislate and set a ceiling as to how much of the country's power should be generated by coal?*



### **Section 3: External Gas Sources**

PETRONAS has been sourcing gas from the Malaysia-Vietnam Commercial Arrangement Area (CAA) since 2003 and the Malaysia-Thailand Joint Development Area (JDA) since 2005.

PETRONAS has also been importing gas from Indonesia since 2002, where it currently has a contract to purchase 1.6 tscf over 20 years from the Block B development in Indonesia's Natuna field.

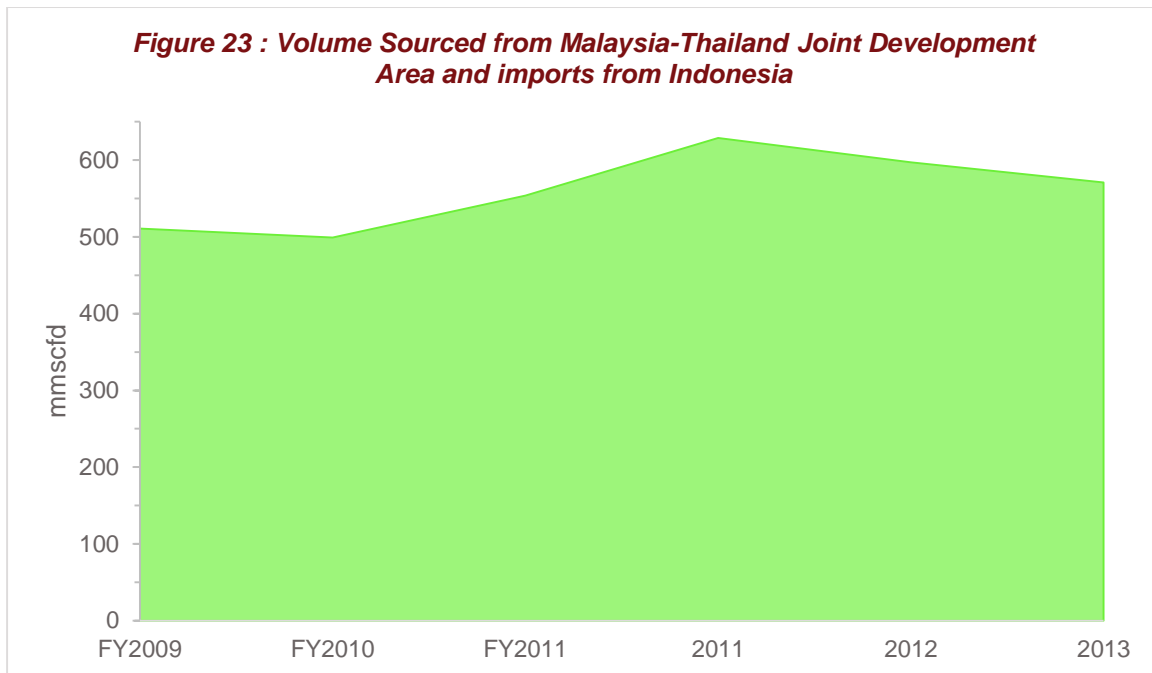
The additional volume sourced from the JDA, CAA and imports from Indonesia are needed to meet increased domestic demand and supplement the shortfall due to declining production from the gas fields offshore Peninsular Malaysia.

In 2013, Malaysia sourced a total of 571 mmscfd of natural gas from the JDA, and Indonesia's West Natuna. This volume was about 4% lower than the 597 mmscfd sourced in 2012. The decline was as a result of increased production from gas fields offshore Peninsular Malaysia and LNG imports.

Piped gas from CAA and imports from Indonesia's Natuna was processed at the PETRONAS Gas Berhad's gas processing plants (GPPs) together with domestic gas produced offshore Peninsular Malaysia.

Gas from JDA is first processed at Songkhla and subsequently enters the PGU system through the tie-in at Padang Besar, Perlis. In 2013, the PGU system received 403 mmscfd of gas from JDA.

To enhance the national security of gas supply, an additional 50 mmscfd was secured from JDA Block A18 and the first gas flowed on 4 December 2013. A further 214 mmscfd of gas will be available from 2015 onwards as a long term measure under the Joint Development Authority (JDA) Gas Balancing Evacuation project.



Source : PETRONAS Annual Reports.

Note : FY2009, FY2010 and FY2011 ends on 31 March of the corresponding financial year.

The biggest and most important milestone in the natural gas industry in Malaysia in 2013 was the completion of PETRONAS Gas Berhad's LNG regasification terminal (RGT) in Sungai Udang, Melaka which delivered first gas into the PGU system in May 2013. The RGT, which has a capacity of 3.8 MTPA, is located offshore and is the first of its kind in the world. It comprises of two floating storage units and regasification facilities located on an island jetty.

The RGT was one of the first Entry Point Projects under the Economic Transportation Programme (ETP) Oil, Gas and Energy National Key Economic Area (NKEA). Originally planned for completion in 2015 under the 10<sup>th</sup> Malaysia Plan (2011-2015), the project was brought forward to meet the increasing gas demand and address the declining domestic production due to maturing gas fields in offshore Peninsular Malaysia. The completion of the RGT strengthens Peninsular Malaysia's energy security further as it enables import of LNG from any LNG source in the world. The RGT is also an important step towards market liberalization as it allows any gas supplier to import LNG and sells gas to domestic customers in Peninsular Malaysia.

In 2013, 23 LNG cargoes were imported through the Melaka RGT.

A second LNG RGT is planned to be built in Pengerang, Johor with target completion in 2017.

#### ***Section 4: Third Party Access***

The completion of LNG RGT in Melaka in May 2013 paved the way for the liberalization of gas supply industry as it allows any gas supplier to utilize the RGT facilities to bring gas into Peninsular Malaysia.

Market liberalization will promote competition, efficiency and supply security. Central to the liberalization of gas market in Malaysia is the implementation of the Third Party Access (TPA) regime. TPA regime allows any party to utilise Regasification Terminal (RGT) and Peninsular Gas Utilisation (PGU) pipeline system.

Third Party Access regime would also allow big gas users to purchase their own gas from any LNG source, and pay tariffs to use the RGT and pipeline facilities to bring the gas to their plants.

PETRONAS Gas Berhad (PGB) has been entrusted to develop, own and operate both the RGT and the PGU pipeline system. PGB published the PGB Network Code in December 2011 to provide a framework for TPA. The establishment of the PGB Network Code promotes access to the gas market by ensuring transparency, fair and equitable practices within PGU pipeline system in Peninsular Malaysia.

To facilitate the implementation of the Third Party Access scheme, the Suruhanjaya Tenaga is in the process of amending the Gas Supply Act which will expand its role as the regulator for downstream gas industry in Peninsular Malaysia and Sabah. The amendment is expected to be tabled to the parliament in 2015. The amended act will encompass the regulation of access arrangements, connection, regasification, transportation and distribution agreements, licenses, guidelines and regulations, and tariffs for the utilization of gas facilities.

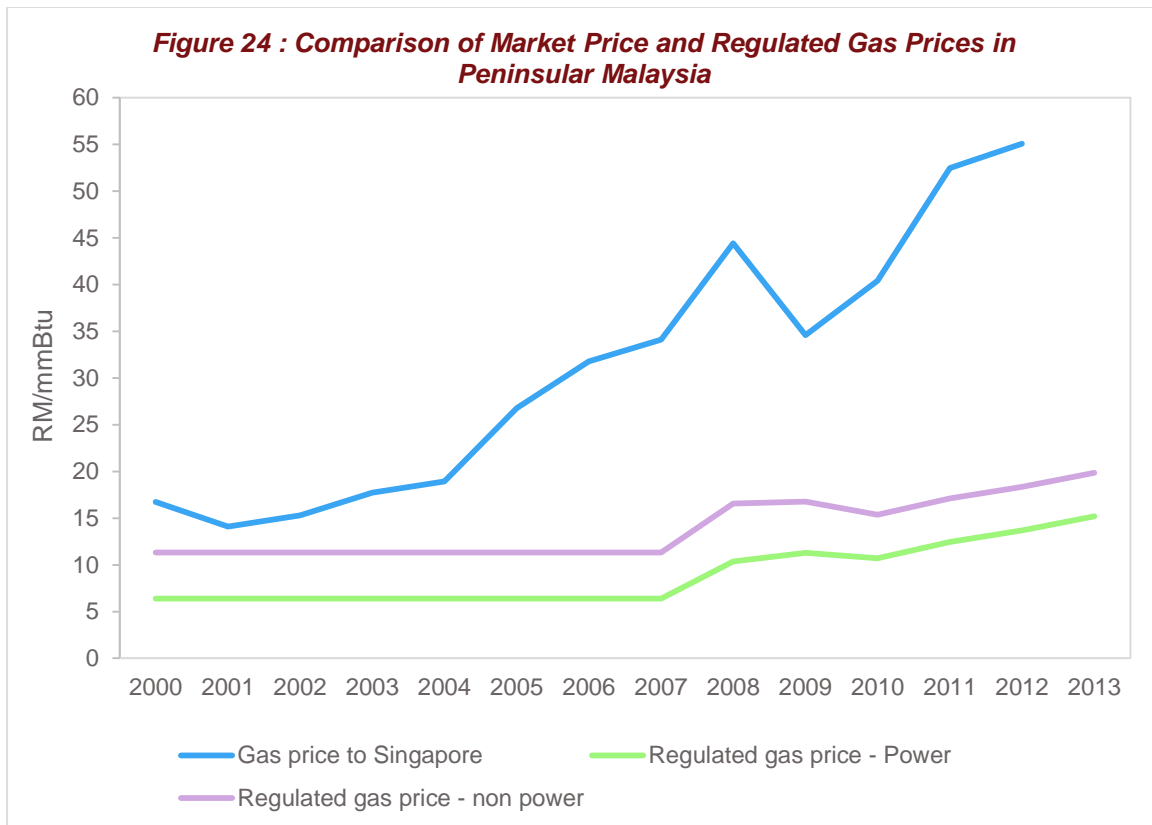
## Section 5: Regulated Gas Prices

Although Malaysia's oil and gas resources are owned by PETRONAS, the domestic price of natural gas however is being regulated by the Malaysian Government. In setting the domestic natural gas price, the Government takes into account several factors, such as the competitive advantage to be enjoyed by local manufacturers vis-à-vis their regional counterparts, and the desired level of domestic electricity tariff.



*Student at Institute Teknologi Petroleum PETRONAS (INSTEP)*

However, in recent years, the amount involved to provide the subsidy for natural gas has increased substantially. The price of LNG, which is the alternative market for PETRONAS to monetise its natural gas, has strengthened to new highs, due to strong demand from Japan and China. As a result, the gap between domestic and international prices has widened substantially. This has resulted in PETRONAS having to forego a very large sum in terms of “lost” revenue, in turn implying that optimal value is not being extracted from Malaysia's gas resources. In the meantime, PETRONAS also has to incur much higher cost to ensure sufficient volume for the domestic market, having to pay market-related prices for natural gas bought from Indonesia, Malaysia-Thailand JDA and Malaysia-Vietnam CAA.

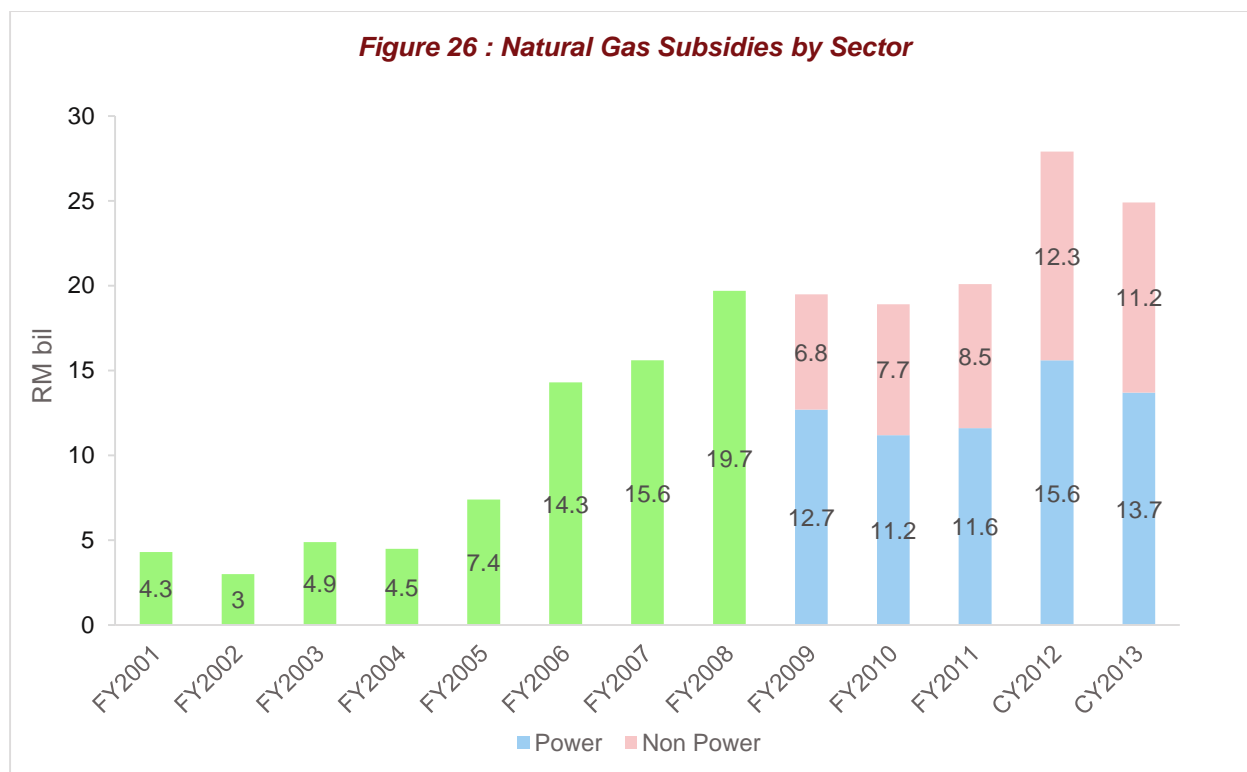


Source: 2000–2012 figures from Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga

For 2013, the total subsidy – in effect revenue lost by selling gas to the domestic market instead of at the stipulated contractual price – was RM24.9 billion decreasing from RM27.9 billion in 2012. The decrease was due to introduction LNG-based market pricing mechanism for gas consumption above 1,000 mmscfd after the commencement of LNG import when the RGT was completed.

Out of the RM24.9 billion, 55% or RM13.7 billion, went to the power sector, with the balance of 45%, or RM11.2 billion, going to the non-power sector – which includes industries, commercial users, residential users, and the NGV sector.

The cumulative total gas subsidy since 1997 has reached a staggering amount of RM207.7 billion.



The Government's ongoing Economic Transformation Programme, or ETP, has identified natural gas subsidy as one of the major issues which needs to be addressed.

As part of the on-going subsidy rationalization effort, the Government has increased the regulated gas price to power sector in Peninsular Malaysia from RM13.70/mmBtu to RM15.20/mmBtu for volume up to 1,000 mmscfd effective from 1 January 2014.

The regulated gas price to the non-power sector in Peninsular Malaysia was revised twice effective from 1 May 2014 and 1 November 2014. Effective 1 November 2014, regulated gas price supplied by PETRONAS to non-power sector in Peninsular Malaysia was increased to RM21.35/mmBtu while the regulated gas price supplied by PETRONAS to Gas Malaysia was increased to RM17.05/mmBtu. The average price of gas supplied by Gas Malaysia was increased to RM19.77/mmBtu.

Even with this recent price increase, Malaysia still have a long way to go before gas price reaches market parity.

The regulated tariffs for gas supplied by Gas Malaysia effective from 1 November 2014 are as shown in Figure 27.

**Figure 27: Tariff for Gas Supplied by Gas Malaysia Berhad in Peninsular Malaysia**

Category	Average Annual Gas Consumption (mmBtu)	Tariff (RM/mmBtu) (Effective 1 November 2014)
<b>A</b>	Residential	19.52
<b>B</b>	0 – 600	21.00
<b>C</b>	601 – 5,000	18.19
<b>D</b>	5,001 – 50,000	18.55
<b>E</b>	50,001 – 200,000	19.44
<b>F</b>	200,001 – 750,000	19.63
<b>L</b>	Above 750,000	20.11
<b>Average</b>		19.77

### Looking Forward

1. *It has been proven in the developed countries, especially Japan, that higher energy prices has led to more efficient use of energy. Burdened with higher energy bills, consumers would either reduce usage or adopt more innovative means which would help them achieve higher efficiency and savings, such as increased use of solar panels and district cooling system. These measures would ultimately help Malaysia reduce its consumption of power, and also natural gas.*
2. *The central issue in price reform is to strike a balance between what is a reasonable rate of increase, and how often should the increase be instituted. Too sharp an increase would probably result in a significant number of industrial users having to cease operations, and the resulting sharp increase in power tariff would also hurt a large segment of the “rakyat”. However, it is also widely accepted that the subsidies should not be continued, as in the long run they would also undermine Malaysia’s energy security.*

## **Acknowledgement**

MGA would like to thank the following organizations for the contribution and involvement in the drafting of this report:

1. PETRONAS Group of Companies
2. Gas Malaysia Berhad

Special thanks also to the following organizations whose information, data, and publications had been used or referred to in this publication:

1. Suruhanjaya Tenaga Malaysia (*Energy Commission, Malaysia*)
2. Bank Negara Malaysia
3. Jabatan Statistik Malaysia (*Department of Statistics, Malaysia*)
4. International Gas Union (IGU)
5. Maps and Globe Specialist Distributor Sdn. Bhd.

Photo on page 24 is courtesy of Gas Malaysia Berhad.  
Other photos are courtesy of Petroliaam Nasional Berhad (PETRONAS)

### **Disclaimer:**

The views expressed in this report do not necessarily reflect the views of the various organizations above that contributed data in this report.





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