

Malaysia: Natural Gas Industry Annual Review

2015 Edition



Cover photo : PETRONAS Floating LNG 1 (PFLNG1). Photo courtesy of PETRONAS.

MESSAGE FROM THE PRESIDENT OF MGA



It gives me great pleasure to present the 3rd edition of the “Malaysia: Natural Gas Industry Annual Review” publication. I am pleased to note that this publication has attracted interest among professionals and students and I hope that it will continue to be the main reference of the Malaysian natural gas industry.

The past 12 months has been a very challenging time for the oil and gas industry in Malaysia and globally.

Oil prices continues to remain low. In June 2014, the benchmark Brent crude was traded at more than USD110/bbl but a year later the price went down to less than USD45/bbl in August 2015. The drop in the oil price is due to several factors. Chief amongst them are the supply glut due to increase in oil production from unconventional resources such as shale, as well as weak demand because of slowdown in major economies such as Europe and China.

While there are many differing views on how long it will take for the prices to recover, it's almost a consensus that the prices are not forecasted to recover any time soon. Many also believe that it will be a considerable time before we will see oil price of USD100/bbl again, if ever.

The industry has responded accordingly with companies instituting various measures to improve cost efficiency and protect their cash positions. I am confident that the industry will emerge from this crisis stronger and more resilient.

On a more positive note, I am pleased to report that the value of Malaysia's LNG exports in 2014 increased to RM64.3 billion on the back of higher gas production and plant availability. In many parts of the world, particularly in Asia, the gas prices are indexed to oil prices. Due to time lag in the calculation of LNG prices, the low oil prices were not yet reflected in the LNG prices for 2014 and hence, the higher value of our LNG exports. However, the figure for 2015 is expected to be significantly lower.

Malaysia's LNG liquefaction capacity which currently stands at 25.7 MTPA will increase by 4.8 MTPA when the Train 9 and Petronas Floating LNG 1 (PFLNG1) projects become operational in 2016. PFLNG1 will also take the honour of being the first floating LNG liquefaction facility in the world.

2014 also marked the first full year of operation for Melaka LNG RGT (RGT1) with 27 cargoes imported adding to a total of 50 cargoes since the facility became operational in May 2013.

It is encouraging for the industry that the Government of Malaysia has approved the upward revision by RM1.50/mmbtu of gas prices for volumes currently still on regulated price effective 1 January 2014 for power sector and 1 May 2014 for non-power sector, and once again on 1 July 2015 for both power and non-power sectors. The key to the success of the gas market liberalization efforts is the effective implementation of these approved gradual price revisions.

In addition to the above, the Government has also approved a new regulated pump

price for NGV of RM1.05/liter of equivalent petrol effective 20 September 2015. Even with this increase, the regulated NGV price remains very competitive when compared to petrol and diesel which are priced at RM2.05 and RM1.90/litre respectively in October 2015.

The industry and gas users need to recognize that cheap energy resources have encouraged inefficiency. This is supported by 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 11% compared to the global trends has seen a reduction by as much as 23%. There is therefore tremendous opportunities for Malaysia to improve energy efficiency through pricing energy at the appropriate market levels.

Recognizing the importance of educating the youngsters on energy conservation and the need to use energy efficiently, MGA embarked on Energy Efficiency Program for school students in 2014 in partnership with Petrosains Sdn. Bhd. When it was completed in August 2015, the program had been conducted at 44 schools in Kuala Lumpur, Selangor, Pahang, Johor, Kedah and Sabah involving more than 2,900 secondary school students.

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, the Department of Statistics and other organizations whose information, data and publications had been referred to in this publication.

Ir Pramod Kumar Karunakaran

President

Malaysian Gas Association

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Executive Summary

- The Malaysian economy grew by 6.0% in 2014, compared to 4.7% in 2013.
- The Malaysian population increased to 30.4 million in Q1 2015, compared to 30.2 million in Q1 2014, 28.3 million in 2010 and 23.3 million in 2000.
- The aggressive effort to reverse the decline in domestic production has boosted the country's total natural gas resource to be around 100 tscf.
- Gas discoveries include two major finds offshore Sarawak with gas-in-place of more than 3.0 tcf.
- Malaysia faces various challenges in upstream gas development such as depleting resources and ageing facilities, gas fields containing high CO₂ 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 2014 was 1,055 kboe/d, increased marginally from 1,046 kboe/d in 2013.
- In 2014, Malaysia's domestic gas consumption increased by about 4.6% to reach 2.65 billion scfd, from 2.54 billion scfd in 2013. This increase was attributed to better supply situation from increased domestic production and LNG import. Approximately 81% of the domestic demand was accounted by Peninsular Malaysia, followed by Sabah & Labuan at 10% and Sarawak at 9%. 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 2014, Malaysia LNG export increased but export of piped gas declined.
 - LNG sales volume increased to 25.8 MTPA (423 big cargo equivalent) from 25.1 MTPA in 2013 due to higher gas production from the domestic fields in Sarawak and higher plant availability.
 - LNG export in 2014 was valued at RM64.3 billion or 8.4% of Malaysia's exports.
 - Piped gas export to Singapore decreased to 145 mmscfd from 180 mmscfd in 2013 due to importation of LNG by Singapore.
- A total of 27 LNG cargoes were imported into Peninsular Malaysia through the

LNG RGT1 in Melaka in 2014.

- Final Investment Decision (FID) reached for Malaysia's RGT2 in Pengerang, Johor.
- Gas sourced from Malaysia-Thailand Joint Development Area (JDA) decreased from 403 mmscfd in 2013 to 315 mmscfd in 2014.
- The number of NGV vehicles in Malaysia was approximately 77,000 while the number of NGV refueling stations was 178.
- In 2014, the total revenue foregone by selling gas to the domestic market at regulated prices was RM22.9 billion, of which RM12.4 billion or 54% was accounted by the power sector. Meanwhile, subsidies to the non-power sectors - which include industrial, commercial and residential users, and NGV - was RM10.5 billion. Cumulative subsidy since May 1997 has reached RM230.6 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 Resources

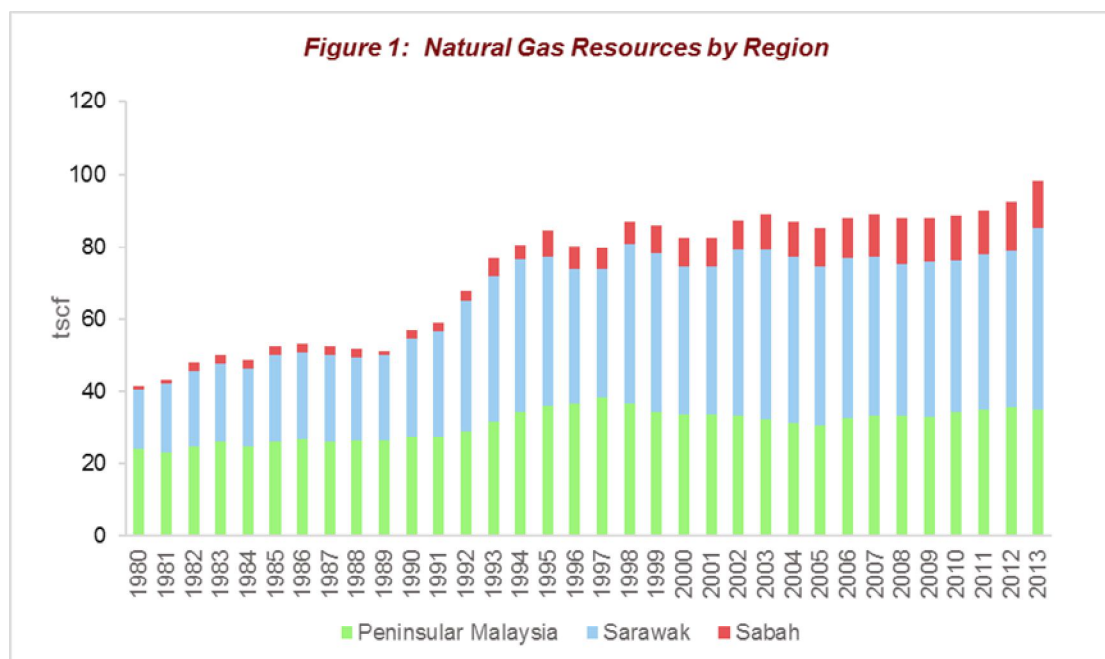
The upstream sector of Malaysia's natural gas industry registered an encouraging performance in 2014.

Malaysia recorded several major gas discoveries in 2014 amounting to 8.1 tcf following successful explorations including in Pegaga-1, Bakong-1 and Marjoram-1 offshore Sarawak.

Taking into account the additional volume from new discoveries, Malaysia's total natural gas resource 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 many more 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)

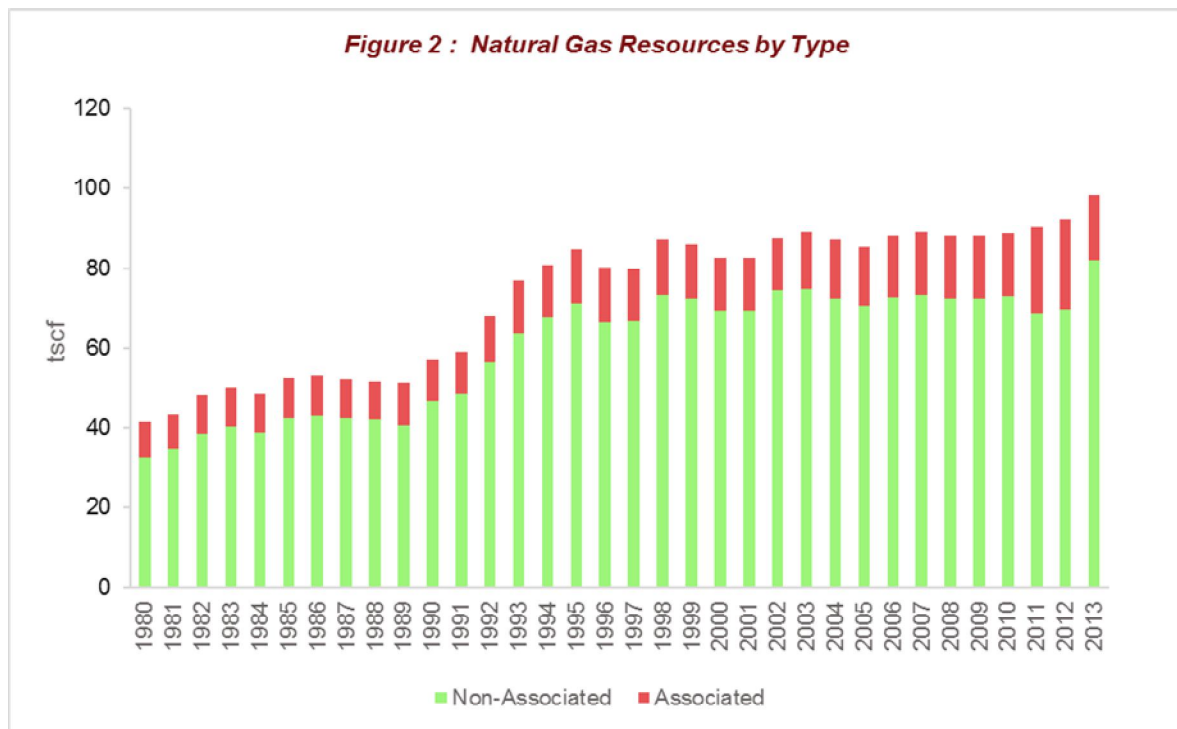
In 2014, PETRONAS recorded 101 active PSCs in Malaysia, encompassing exploration, development and production blocks.

As depicted in Figure 1, 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 2. 83% of Malaysia's natural gas resources comprise non-associated gas.



Source : Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga

According to PETRONAS' Annual Report 2014, Malaysia's natural gas reserves (2P) as of 1 January 2015 was 7.2 bboe increasing by 9.1% from 6.6 bboe on 1 January 2014, while contingent resources (2C) was 10.0 bboe as of 1 January 2015, compared to 10.2 bboe on 1 January 2014.

Malaysia faces various challenges in upstream gas development such as depleting resources and ageing facilities, gas fields containing high CO₂ 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%.

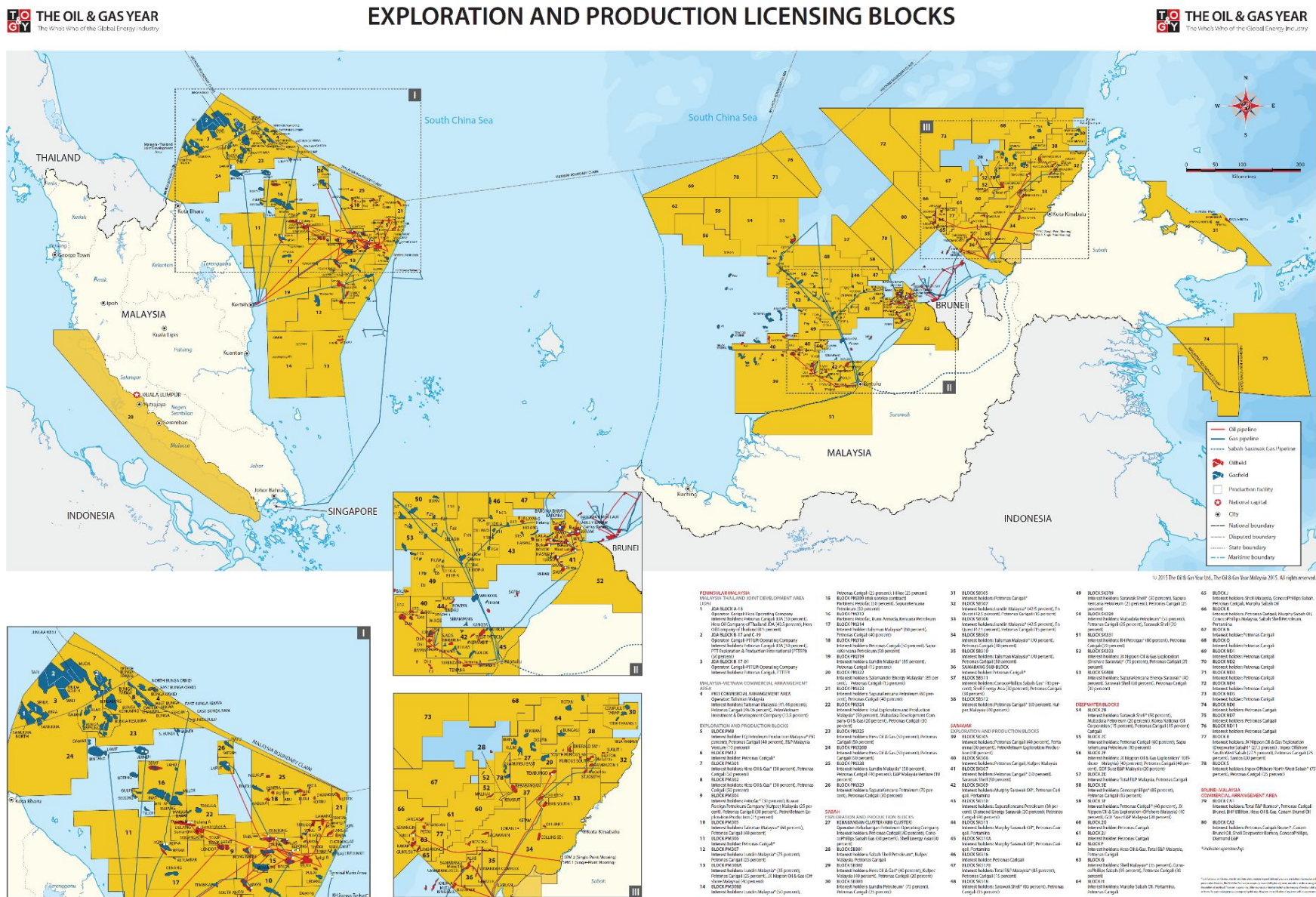


Guntong D Compression and Guntong E gas hub. (Photo courtesy of EMEPMI)

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.

The map in the following page showing the location of the gas fields in Malaysia is for illustration purposes only.

Map courtesy of The Oil & Gas Year (www.theoilandgasyear.com)



Section 1.3: Natural Gas Production

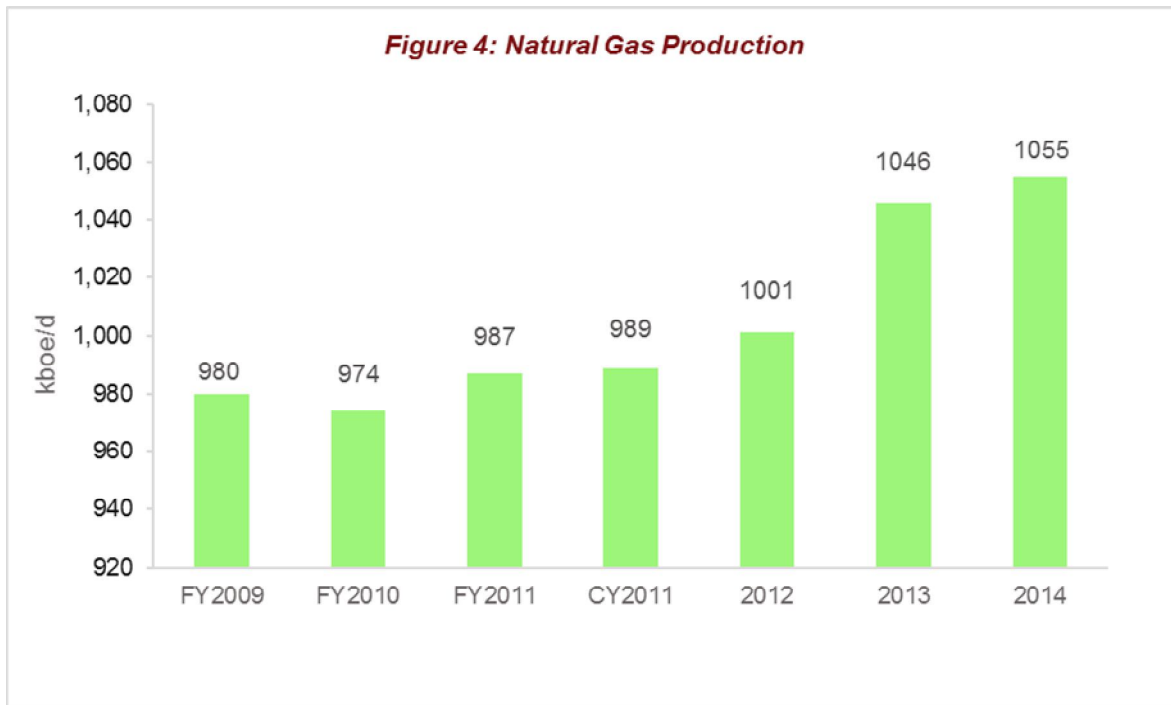
Gas production was 1,055 kboe/d in 2014 increasing from 1,046 kboe/d in 2013.

Gas fields which came onstream in 2014 include Damar gas field in Peninsular Malaysia and Laila gas field offshore Sarawak. First hydrocarbon from Keabangan gas field in Sabah was achieved in November 2014. The Keabangan integrated production hub was a part of bigger Sabah Sarawak Integrated Oil and Gas Project (SSIOGP) bringing development of hydrocarbon deposits in deepwater offshore Sabah to the onshore Sabah Oil and Gas Terminal (SOGT) in Komanis. The gas produced here is piped to Petronas LNG Complex in Bintulu, Sarawak for LNG production via the Sabah-Sarawak Gas Pipeline (SSGP).

In May 2015, ExxonMobil announced its plan to kick-start gas production from the second phase of the Telok gas development project, located off the east coast of Peninsular Malaysia. The project comprises of two satellite platforms, Telok A and Telok B, which together are able to produce more than 450 mmscfd of gas. (*ExxonMobil starts production from Telok B platform, The Star, 7 May 2015*)



Telok B offshore platform. (Photo courtesy of EMEPMI)



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 Sarawak is expected to enable the state to maintain its dominance as the country's largest producer of natural gas for the foreseeable future.

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 CO₂ 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.



Gas metering station. (Photo courtesy of Gas Malaysia Berhad)

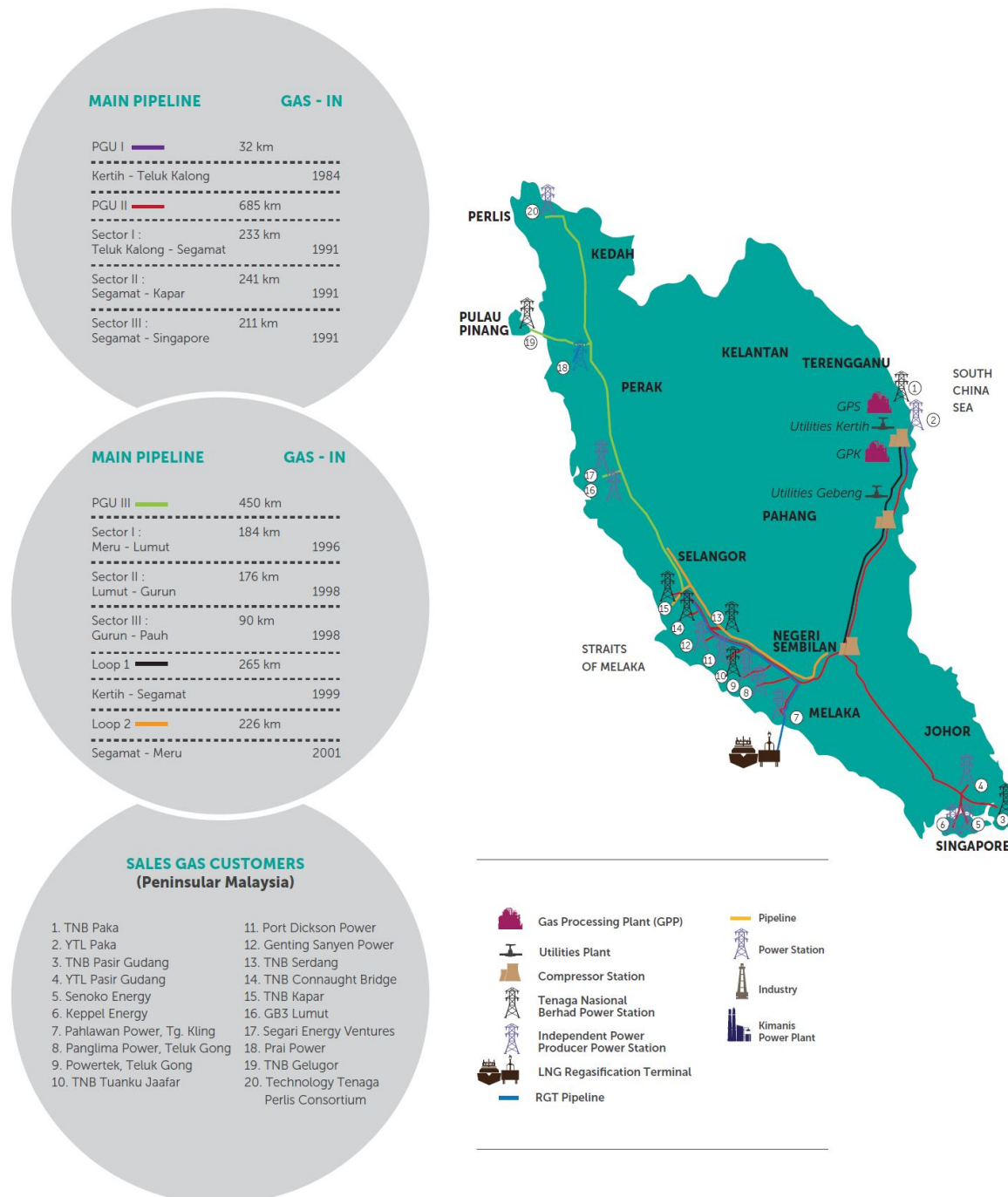
The Gas Masterplan Study commissioned by PETRONAS in 1981 set the stage and roadmap for the development of natural gas industry in Malaysia. One of the most important recommendations from the Study was the implementation of a project to put in place the necessary distribution grid for the Peninsular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

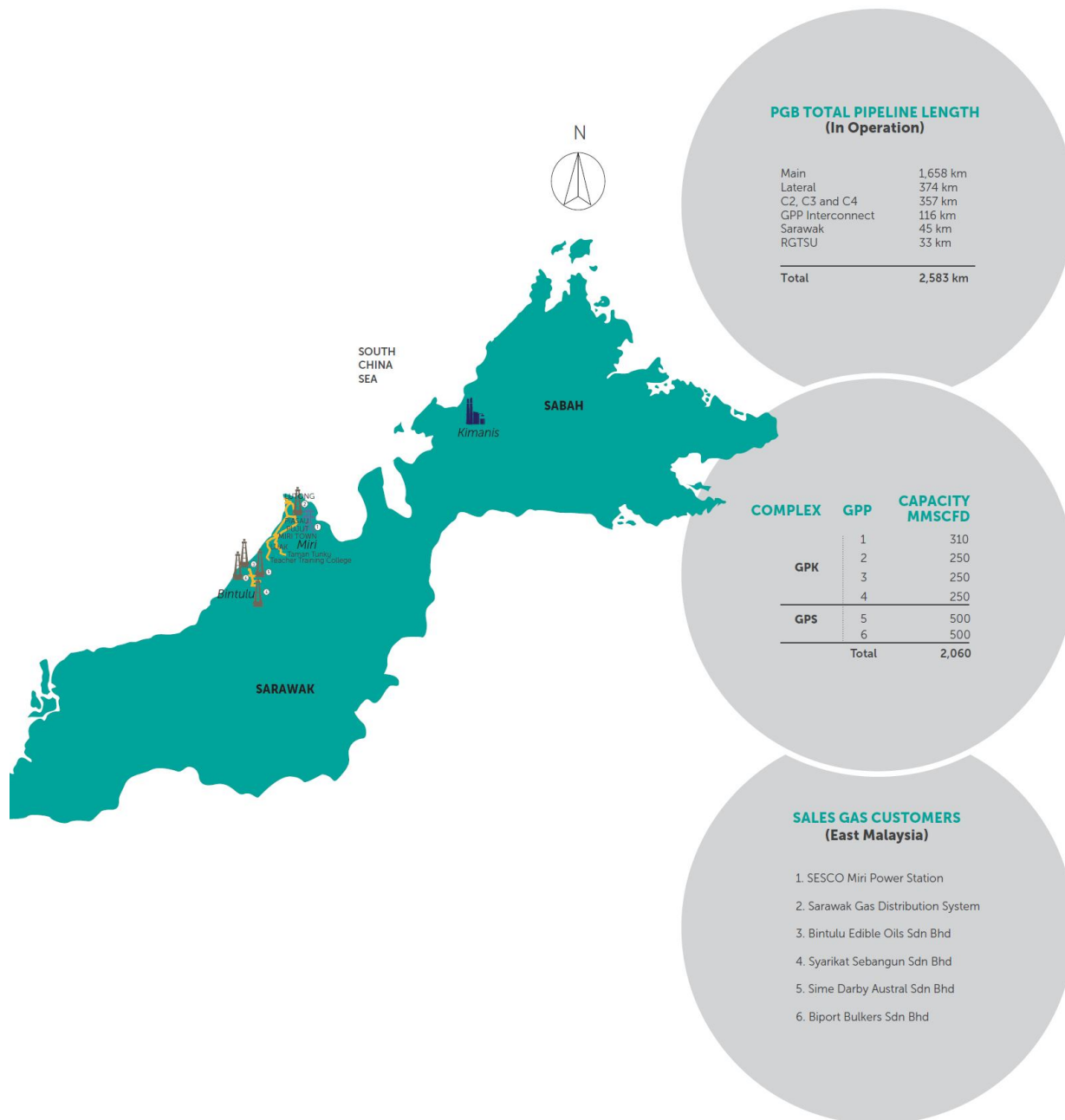
Under the PGU system, gas from the offshore fields off the east coast of Peninsular Malaysia is treated and processed at PETRONAS Gas Berhad's (PGB's) gas processing plants (GPPs). Here, the gas is separated into its main components, namely methane (or sales gas), ethane, propane, butane, and condensate. The sales gas (mostly methane) is supplied to power and non-power sectors while ethane, butane and propane are supplied to petrochemical plants as feedstock.

The GPP complexes, located in Kertih and Santong, Terengganu have a capacity to produce 2,060 mmscfd of sales gas. In 2014, an average of 2,011 mmscfd of feed gas was processed at the GPPs, increasing from 1,967 mmscfd in 2013.

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 5: Map of Peninsular Gas Utilisation Network and Distribution Network in Sarawak





Source: PETRONAS Gas Berhad Annual Report, 2014

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.

In terms of national economics, 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 RM5.00 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 area of Sabah 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 to domestic users and for processing into liquefied natural gas (LNG) at the PETRONAS LNG Complex for export.

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.

- The 300 MW Kimanis Power Plant achieved its full commercial operations in November 2014.
- The 100 MW SPR Energy's power plant, also located in Kimanis,

achieved commercial operations in August 2014.

Gas from the SOGT will also be delivered to industrial and petrochemical users in Kimanis and Sipitang.



Kimanis Power's 300 MW combined cycle gas fired power plant in Kimanis, Sabah. Kimanis Power is a joint venture between PETRONAS Gas Berhad and Yayasan Sabah. (Photo courtesy of PETRONAS)

In addition to the above, PETRONAS Chemicals Group is undertaking the Sabah Ammonia Urea (SAMUR) project, in Sipitang, Sabah which is expected to be fully completed in March 2016. The plant uses natural gas as feedstock.

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 time to support the commissioning of RAPID (Refinery and Petrochemical Integrated Development) in 2019.

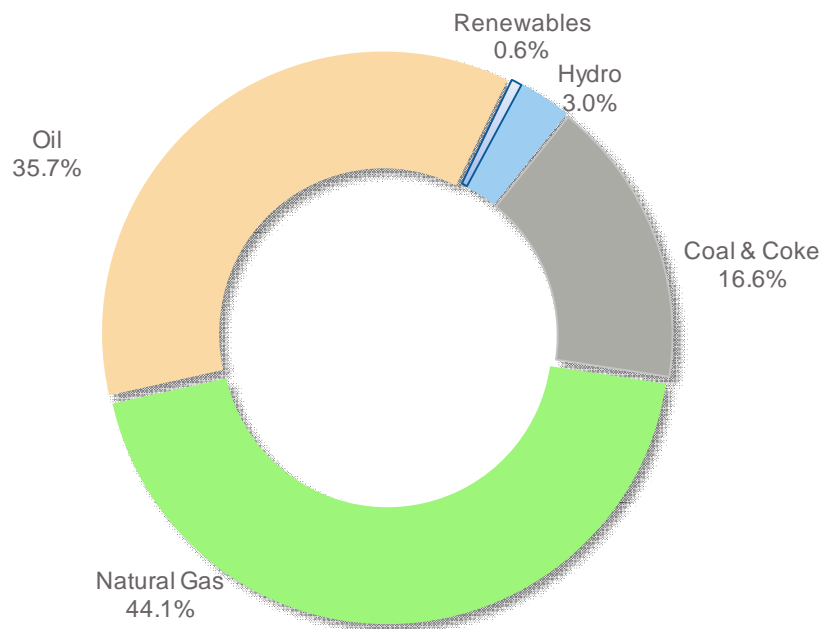
The gas-fired Pengerang Cogeneration Plant (PCP) will generate 1,220 MW of electricity and up to 1,480 tonnes per hour of steam. PCP will also supply 400 MW of electricity to the national grid.

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 44% in 2013, with coal meeting the country's incremental energy demand.

A chart showing natural gas' share of Malaysia's primary energy supply in 2013 is provided in Figure 8.

Figure 6: Primary Energy Supply, 2013



Source : National Energy Balance 2013, Energy Commission

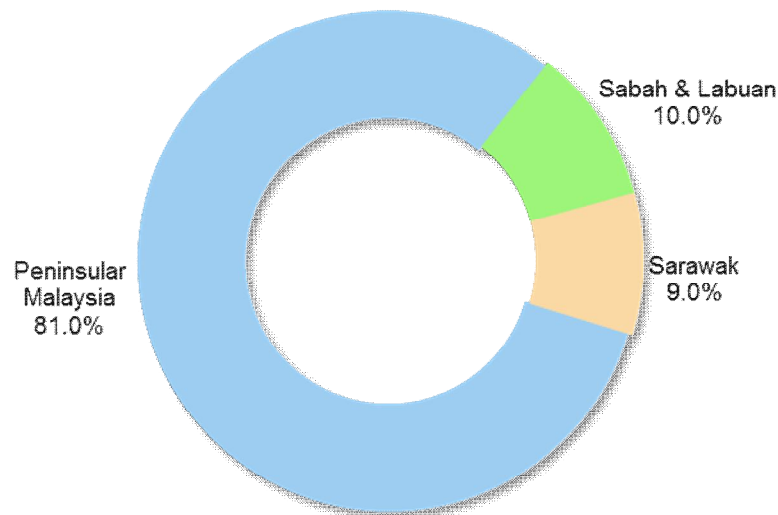
The gas consumption in Malaysia in 2014 was 2,654 mmscfd, an increase of 4.6% compared to 2,536 mmscfd in 2013. The increase in the consumption was due to higher gas supply availability from higher domestic gas production in Peninsular Malaysia as well as importation of LNG.

Peninsular Malaysia accounts for 2,161 mmscfd or about 81% of Malaysia's total natural gas consumption. Out of this, 60% or 1,286 mmscfd was delivered to the power

sector and 875 mmscfd to the non-power sector.

A snapshot of the country's natural gas demand by region is provided in Figure 7.

Figure 7: Domestic Gas Consumption by Region, 2014



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. Power sector accounted for 62% of total gas consumption in Malaysia in 2013.

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. 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 fuel mix has since dropped to around 44% prior to the commissioning of the LNG RGT1.

The completion of the LNG RGT1 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 to more than 50% since after the LNG RGT1 commissioning.

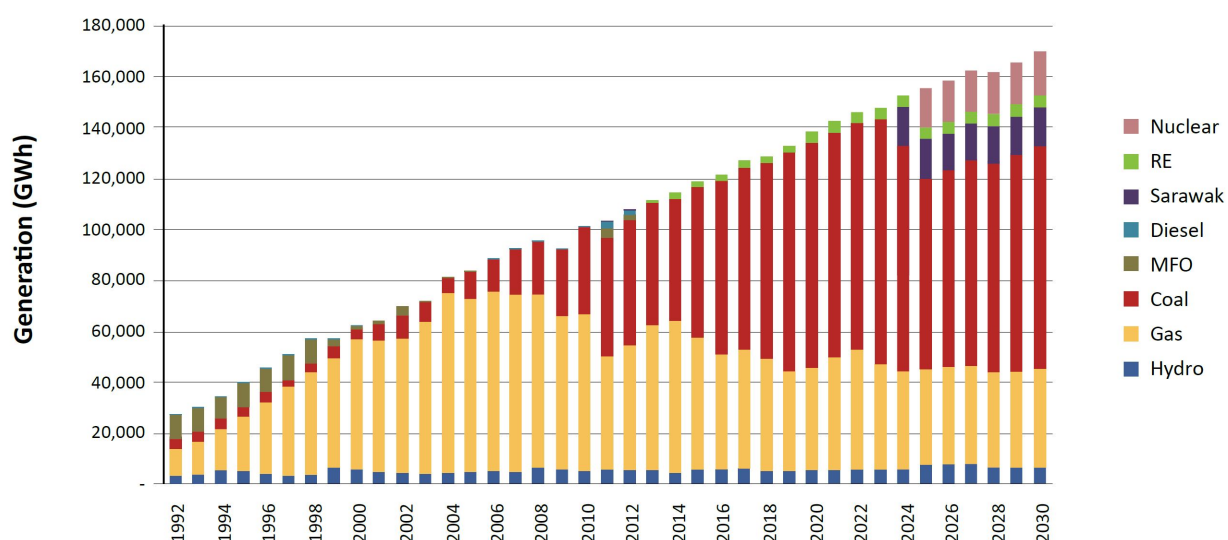
Meanwhile, the share of coal in Malaysia's electricity generation fuel mix has increased by more than four folds from 10% in 2000 to 44% in 2013.

Figure 8: New gas fired power plants

No	Projects	Capacity (MW)	Commercial Operation Date
1	CBPS Redevelopment	385	1 Sep 2015
2	TNB Prai	1,071	1 Jan 2016
3	Pengerang Cogeneration	400	1 June 2017
4	New CCGT	1,000	1 June 2018

Source: Peninsular Malaysia Electricity Supply Industry Outlook 2014, Energy Commission

Figure 9: Peninsular Malaysia' Power Generation Mix (1992-2030)

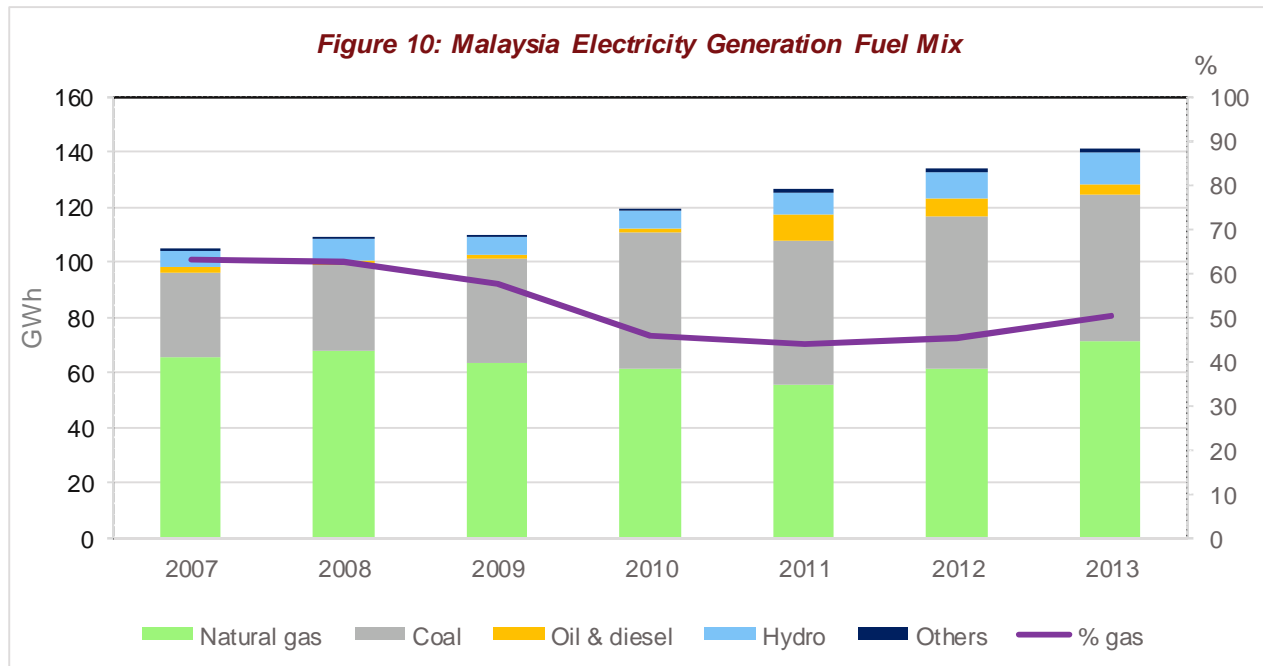


Source: Peninsular Malaysia Electricity Supply Industry Outlook 2014, Energy Commission

According to the Energy Commission, gas usage as fuel in power generation in Malaysia will decrease due to shift from gas to coal and admission of Sarawak Interconnection, with electricity generated from hydro that is expected to materialize by

2024. Coal consumption is projected to steadily increase due to introduction of new coal-fired generating units with a combined capacity of 5,010 MW by 2019. BY 2020, coal-fired power plants will make up 64% of total installed capacity compared to 45% in 2014.

Even though share of coal in power generation fuel mix is expected to increase, natural gas will still continue to contribute significantly due to its clean burning property and hence, lower Green House Gas (GHG) emission.



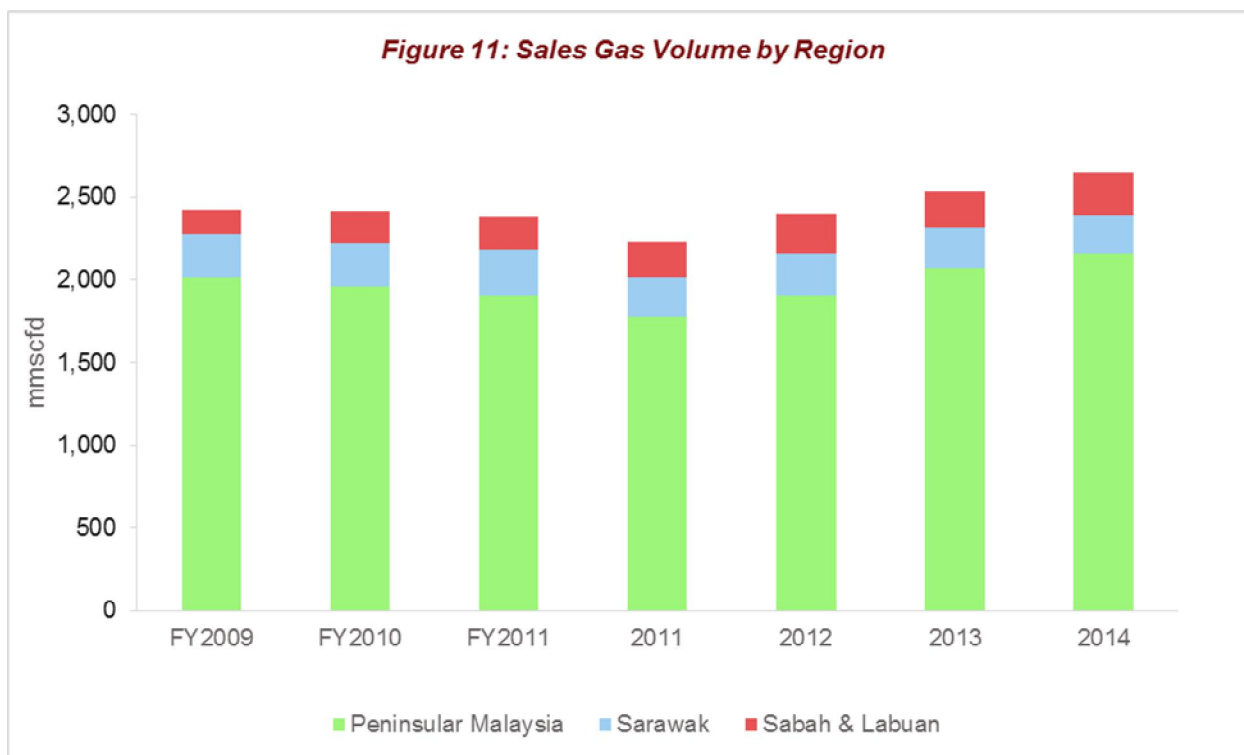
Source : Malaysia Energy Statistics Handbook 2014 and Performance and Statistical Information on Electricity Supply Industry in Malaysia, 2013 (Energy Commission)



SPR Energy's 100 MW combined cycle gas fired power plant at Kimanis, Sabah. (Photo courtesy of SPR Energy (M) Sdn. Bhd.)

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 in 2016. The 300-MW gas-fired Kimanis power plant achieved full commercial operations in November 2014. SPR Energy's 100 MW gas-fired power plant, also located in Kimanis achieved commercial operations in August 2014. These gas-fired power plants will strengthen the reliability of electricity supply in Sabah, enhancing socio-economic development and industrialization process.

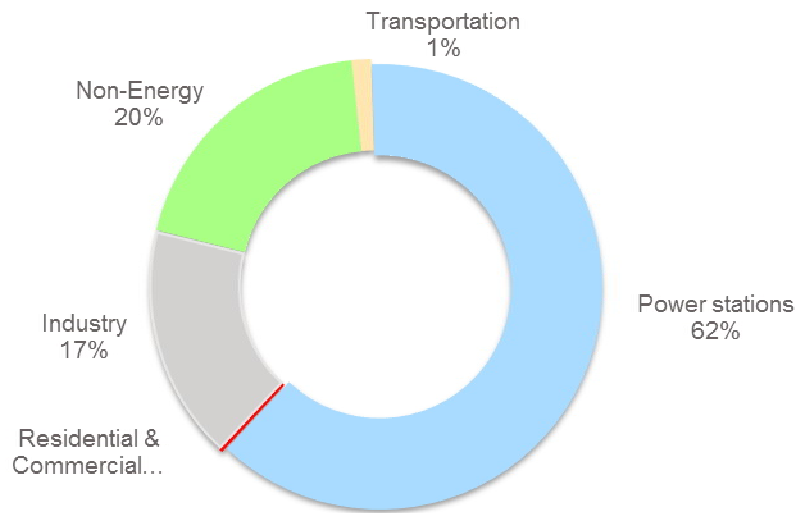
Similarly, the gas consumption in Sarawak is also expected to increase in the future due to increasing demand from both power and non-power sectors.



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

In terms of demand by sector, the industrial sector has always been the second largest consumer of gas at 17% in 2013, 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, 2013



Source : National Energy Balance 2013, Energy Commission

Within the Malaysian manufacturing sector, iron and steel industry is the biggest user of gas followed by food, beverages & tobacco and chemical industries.



Pipeline coating inspection. (Photo courtesy of Gas Malaysia Berhad)

Further downstream, gas is made available to industries, commercial and residential

customers in Peninsular Malaysia by Gas Malaysia Berhad (GMB) which owns and operates more than 2,000 km of gas distribution pipeline network.

In 2014, GMB supplied natural gas to 771 industrial, 799 commercial and 12,568 residential customers. 99% of the volume of gas delivered was to industrial customers. The main customers were from the rubber products, food, beverage and tobacco sectors which collectively consumed 60% of total gas supplied by GMB.

In addition, GMB also supplied Liquefied Petroleum Gas (LPG) to 1,195 commercial and 22,985 residential customers.

Gas Malaysia has seen its sales increase sharply from only 0.7 million mmBtu in 1993, to 147.6 million mmBtu in 2014.

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

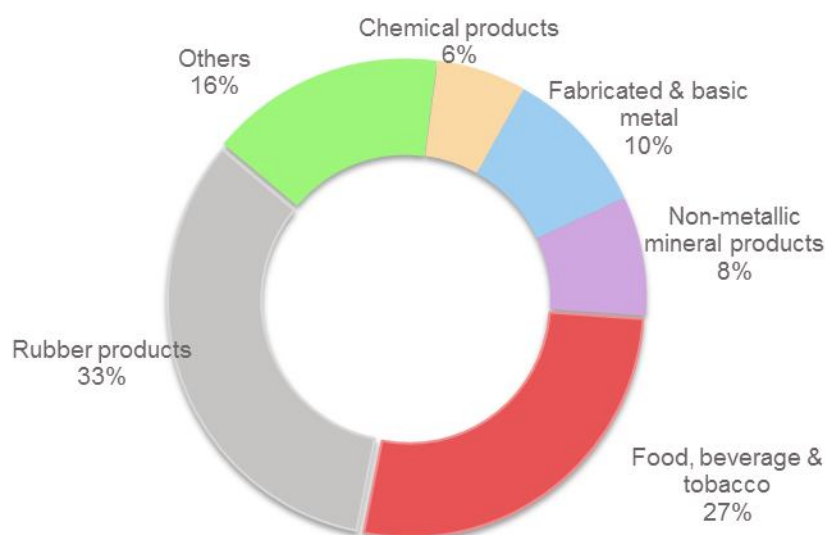
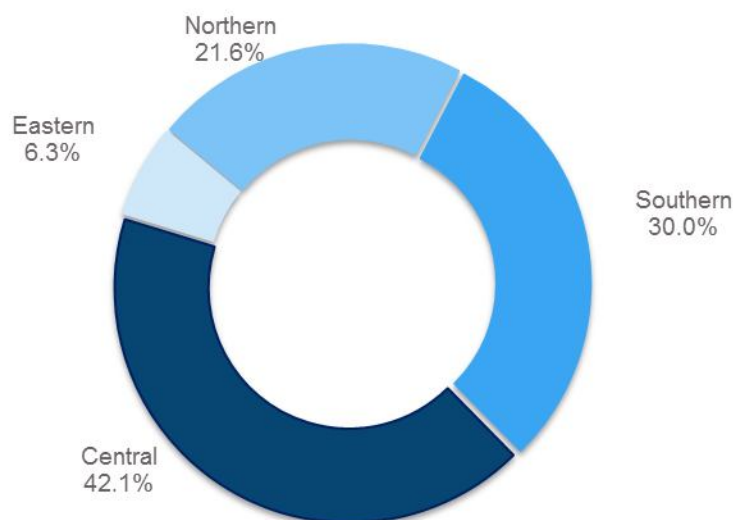


Figure 14: Breakdown of Gas Malaysia's Sales Volume by Region[#]



[#] as at June 2015.

Source : Gas Malaysia Berhad

GMB has taken the initiative to introduce and promote the Combined Heat and Power (CHP) system since 2014. 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.

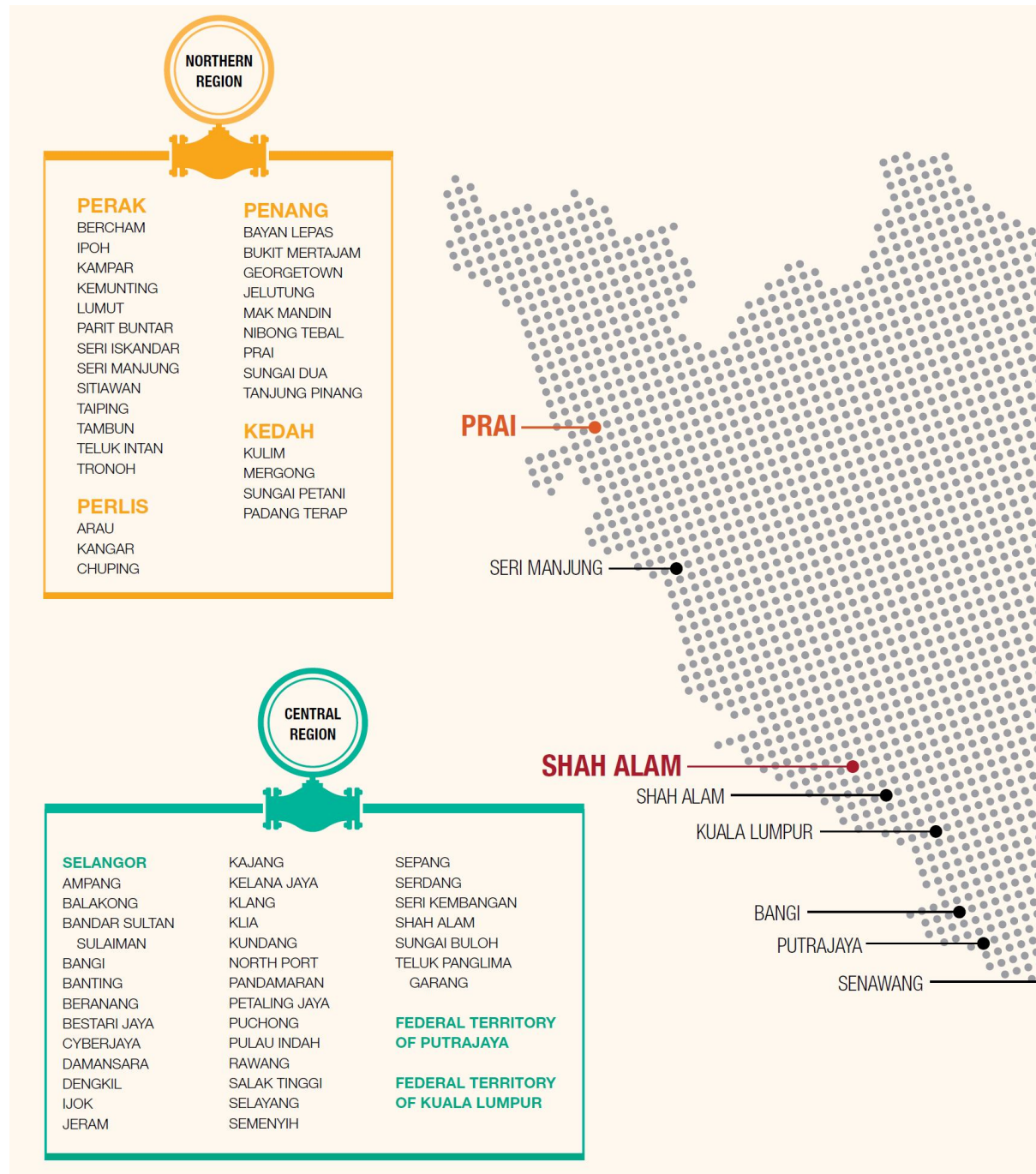


The Shell Middle Distillate Synthesis plant in Bintulu, Sarawak uses natural gas as feedstock. (Photo courtesy of Shell Malaysia).

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 Sdn Berhad (SGDSB).

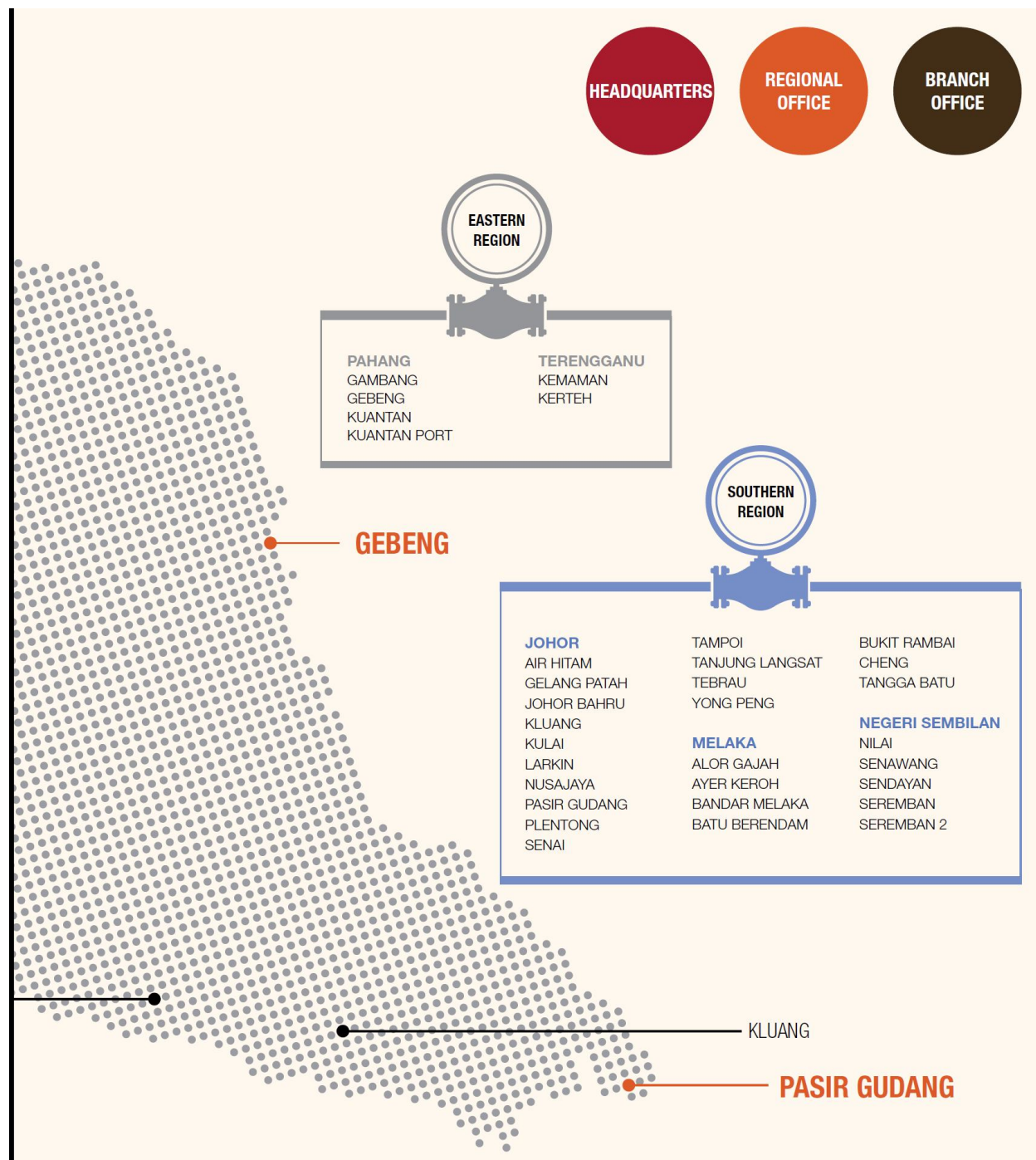
Gas distribution in Kota Kinabalu, Sabah and Labuan is managed by Sabah Energy Corporation (SEC). In 2013, SEC supplied 93,582 mmBTU of natural gas to 18 industrial customers. Gas was supplied using 8 km of steel and polyethylene pipelines as well using 'virtual pipeline' where the gas was compressed into special purpose built containers and transported to customers' premises.

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



Source : Gas Malaysia Berhad Annual Report, 2014

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

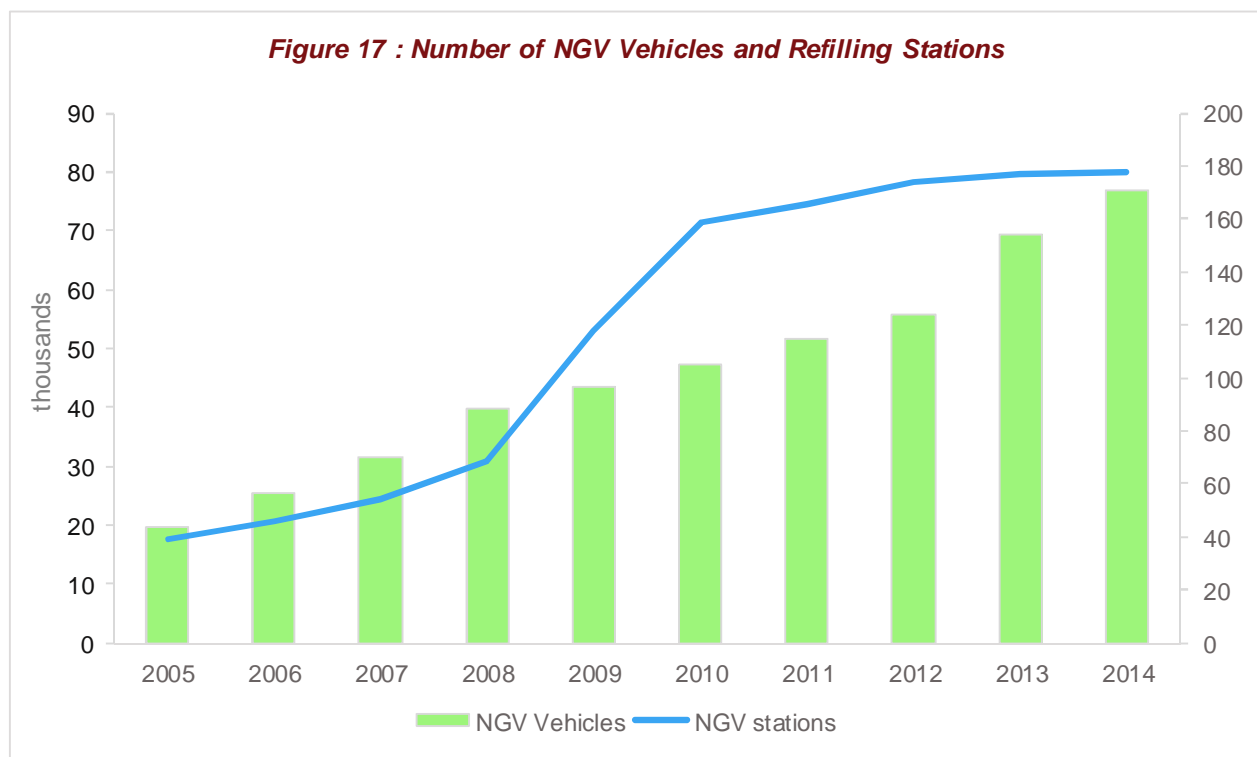


Source : Gas Malaysia Berhad Annual Report, 2014

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.

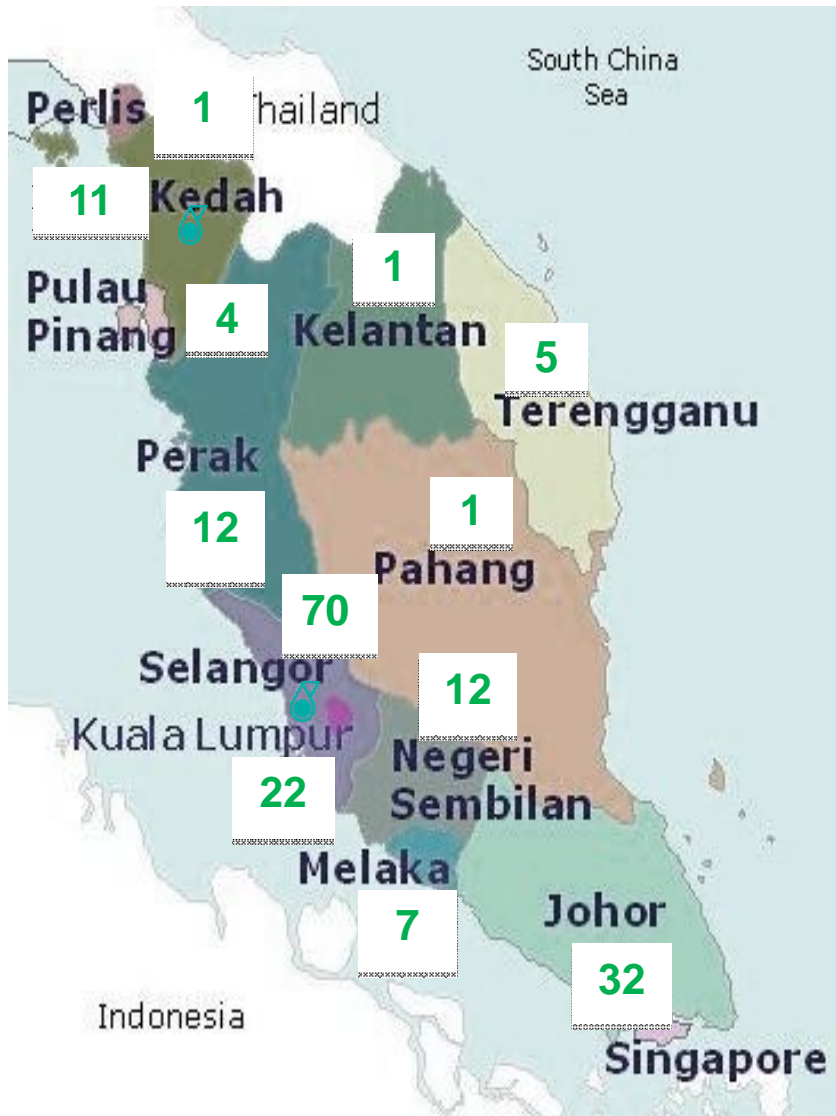
Currently, Malaysia has about 77,000 natural gas vehicles on the road, with 178 NGV refilling stations in operation. Most of the NGV users are taxis. The public bus system in Putrajaya also runs on NGV.



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 7 stations located throughout the east coast of the Peninsular Malaysia.

Figure 18: Number of NGV Stations by States



Source : PETRONAS NGV Sdn. Bhd

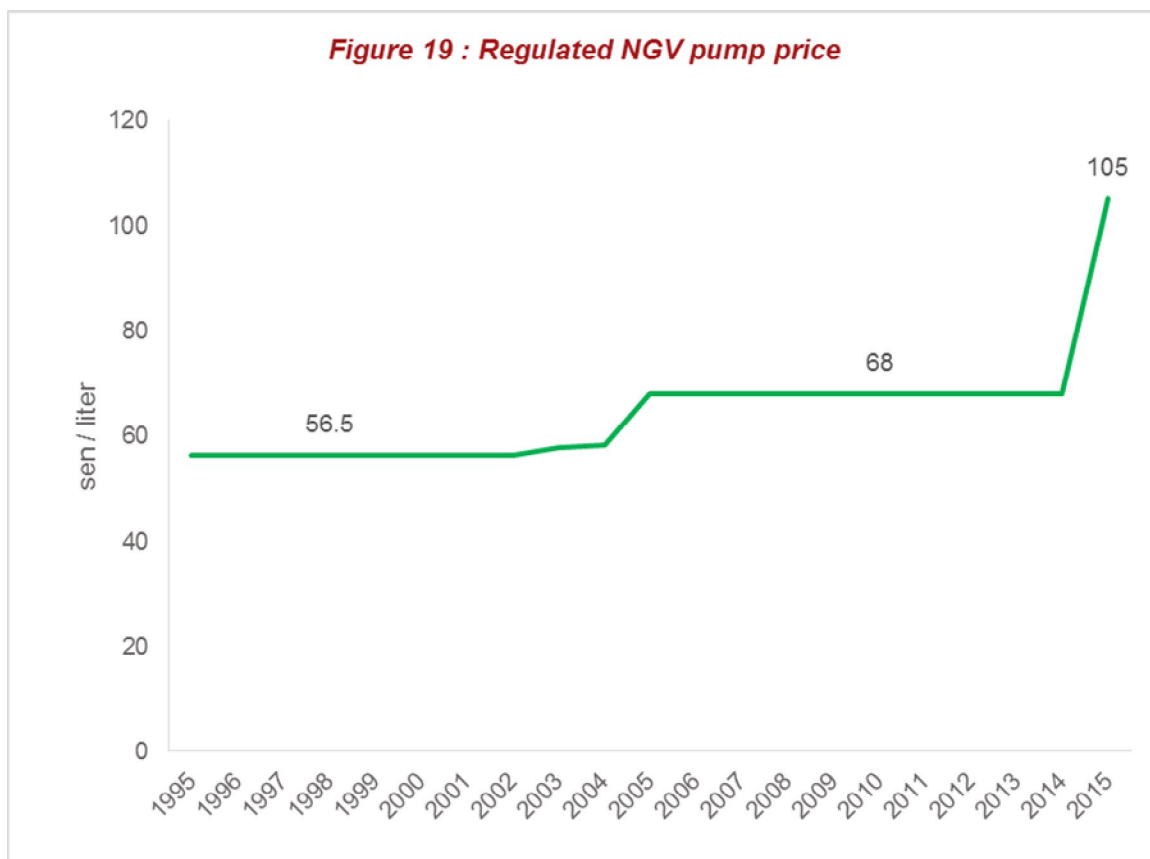
Increased use of natural gas in the transportation sector would help reduce environmental pollution and greenhouse gas emissions; hence, enhancing the quality of living and supporting sustainable development.

To ensure success of the NGV programme, the Government has maintained the natural gas pump price for NGV at 68 sen/litre of petrol equivalent since 2005 until September

2015 as shown in Figure 13. This price is approximately one-third of the price for RON 95 unleaded petrol, and only one-fourth of RON 97 unleaded petrol. After 10 years, the regulated NGV pump price was recently increased to RM1.05/liter of petrol equivalent effective 20 September 2015.

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.



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 2014 at 25.8 MTPA, increased by 2.7% from 25.1 MTPA in 2013 mainly due to higher gas production from the domestic fields in Sarawak and higher plant availability. In 2014, the PETRONAS LNG Complex in Bintulu also 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 RM64.3 billion worth of LNG in 2014 or 8.4% of Malaysia's total export value, increasing from RM59.6 billion in 2013.

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. Train 9 is expected to reach Ready For Start Up (RFSU) at the end of 2015.

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 it becomes operational in Q1 of 2016.

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 and is expected to become operational in Q1 of 2018.

PFLNG1 is located offshore Sarawak while PFLNG 2 will be located offshore Sabah.



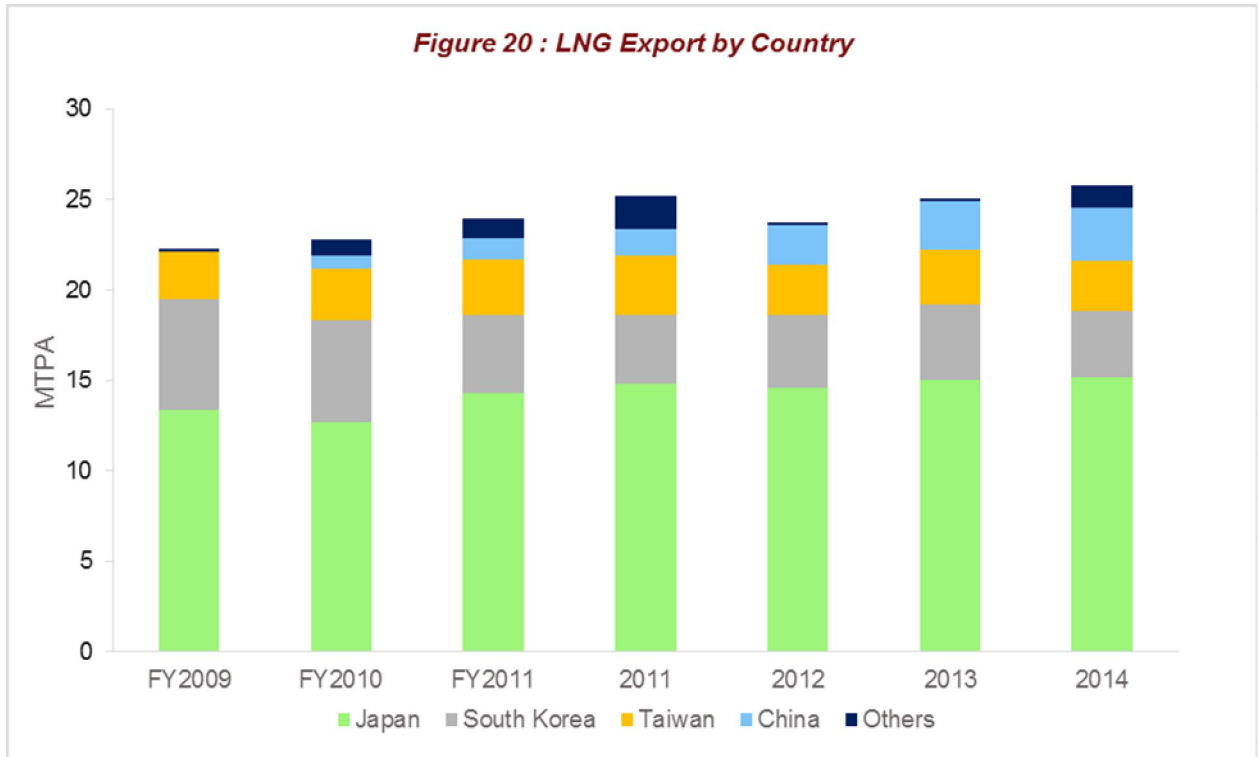
PETRONAS Floating LNG 1 (PFLNG1) is revolutionising the gas business landscape. PFLNG1 is expected to be operational by 2016. (Photo courtesy of PETRONAS)

Altogether, Train 9, PFLNG1 and PFLNG2 will add a total of 6.3 MTPA to Malaysia's LNG production capacity.

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.

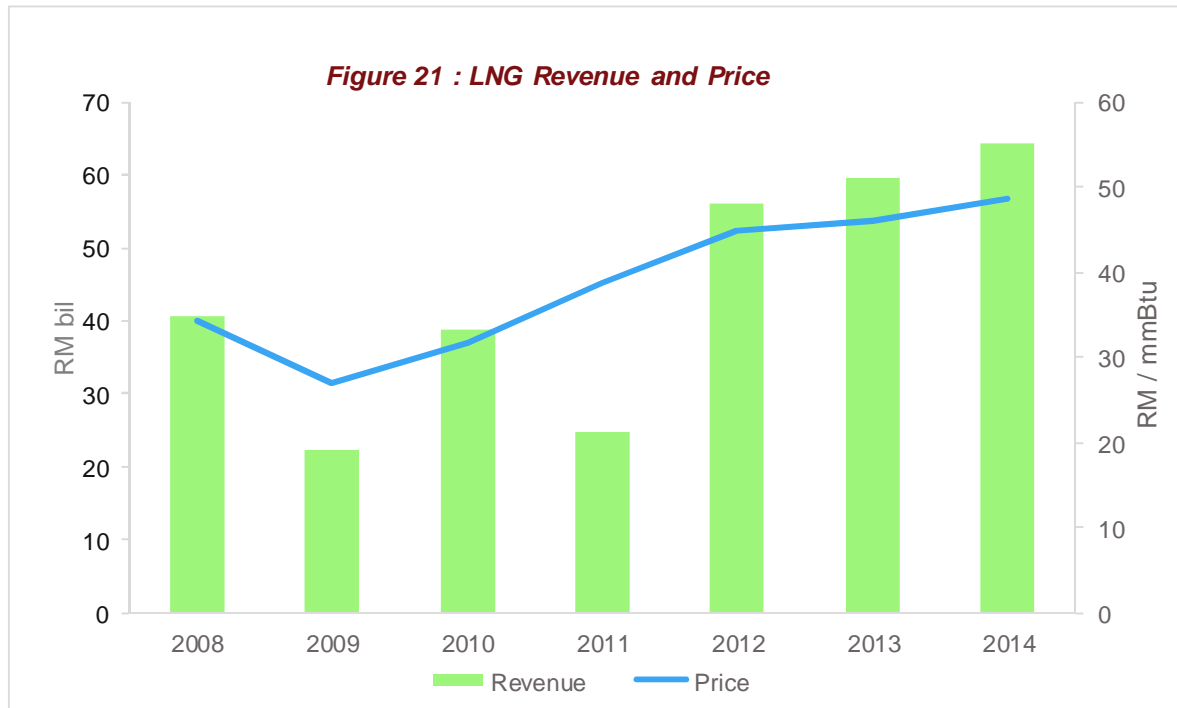
Japan continues to be the main buyer of LNG from Malaysia, accounting for 58.8% of LNG export in 2014, followed by South Korea (14.3%), Taiwan (10.8%), China (11.6%) while the balance of 4.5% is exported to other countries.

LNG export to China which began in 2009 has been increasing steadily from an initial volume of only 0.7 MTPA to 3.0 MTPA in 2014.



Source : PETRONAS Annual Reports.

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

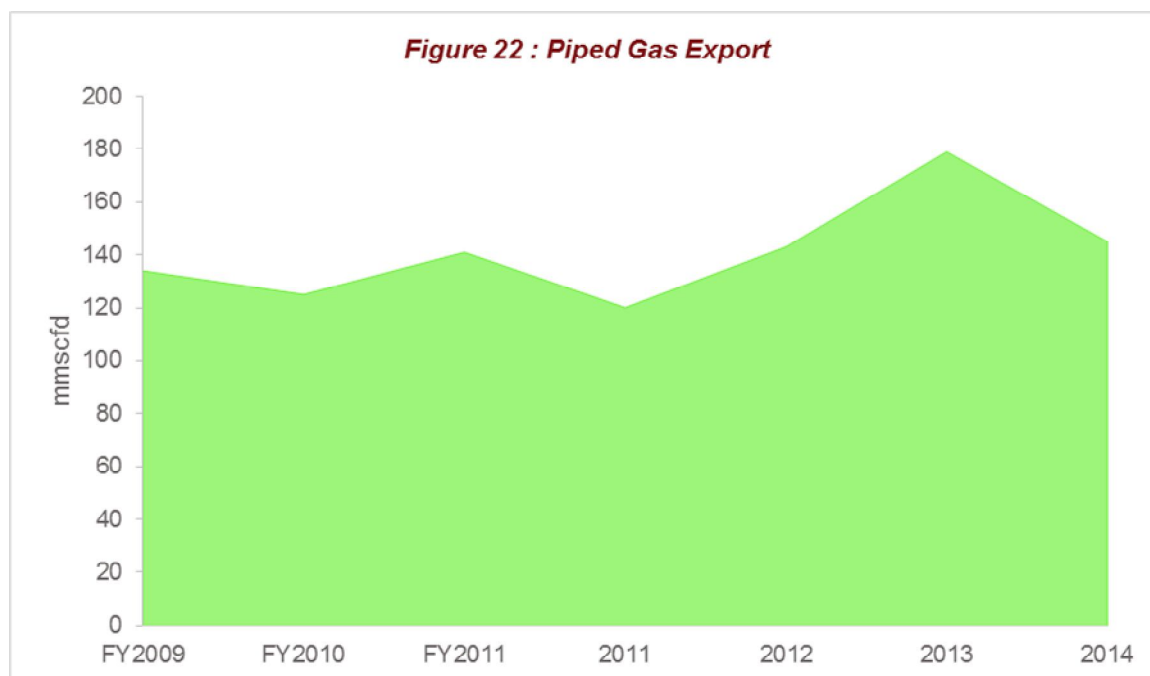


Source : Department of Statistics.

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

Piped gas 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.

About 90% of Singapore's electricity is generated using imported natural gas.



Source : PETRONAS Annual Reports.

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

In 2014, Malaysia's piped gas export declined to 145 mmscfd from 180 mmscfd in 2013. The decrease was due to importation of LNG into Singapore which is the country's initiative to diversify its sources of natural gas. The supplies of piped gas to Singapore 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.

- Piped gas export to Singapore is likely to decline in the future as Singapore uses imported 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 currently has a send-out capacity of 6 MTPA which will be increased to around 11 MTPA by 2018.

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. In this regard, MGA is a strong proponent for the adoption of more energy efficient systems such as 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, Malaysia should 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. MGA strongly advocates a wider use of natural gas as fuel in bulk transportation.*
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: Other 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 maturing gas fields offshore Peninsular Malaysia.

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.

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.

In 2014, the PGU system received 315 mmscfd of gas from JDA. The gas was first processed at Songkhla and subsequently entered the PGU system through the tie-in at Padang Besar, Perlis.

In addition to the onshore pipeline, a 365-km offshore pipeline from JDA to Kertih was completed at the end of April 2015 under the JDA Gas Balancing Evacuation (EVA) project. Under the EVA project, a further 214 mmscfd of gas would be available as a long term measure.

Malaysia's first LNG Regasification Terminal (RGT1) was completed and delivered its first gas into the PGU system in May 2013. The RGT1, 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 RGT1 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 10th 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 RGT1 strengthens Peninsular Malaysia's energy security further as it enables import of LNG from any LNG source in the world. The RGT1 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.

The year 2014 marked the first full year of operation for LNG RGT1 in Melaka. 27 LNG cargoes were imported through the RGT1 in 2014, making 50 LNG cargoes imported into Peninsular Malaysia since the RGT1 became operational in May 2013.

Malaysia's second LNG RGT (RGT2) will be built in Pengerang, Johor. The RGT2 will

consist of an LNG regasification unit and two units of 200,000 m³ LNG storage tanks with a send out capacity of 3.5 MTPA (490 mmscfd) of natural gas which can be expanded to 7 MTPA (900 mmscfd). RGT2's jetty can accommodate LNG carrier of size 5,000-265,000 m³ and will also have a reloading export facility. RGT2 will supply gas to RAPID, PCP and the PGU system to enhance the gas supply availability in Peninsular Malaysia.

Section 4: Third Party Access

The completion of LNG RGT1 in Melaka in May 2013 paved the way for the liberalization of gas supply industry as it allows any gas supplier to utilize the RGT1 facilities to bring gas into Peninsular Malaysia.



Malaysia's first LNG Regasification Terminal (RGT1) in Sungai Udang, Melaka. (Photo courtesy of PETRONAS)

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 (RGT1) 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 RGT1 and pipeline facilities to bring the gas to their plants.

PETRONAS Gas Berhad (PGB) has been entrusted to develop, own and operate both

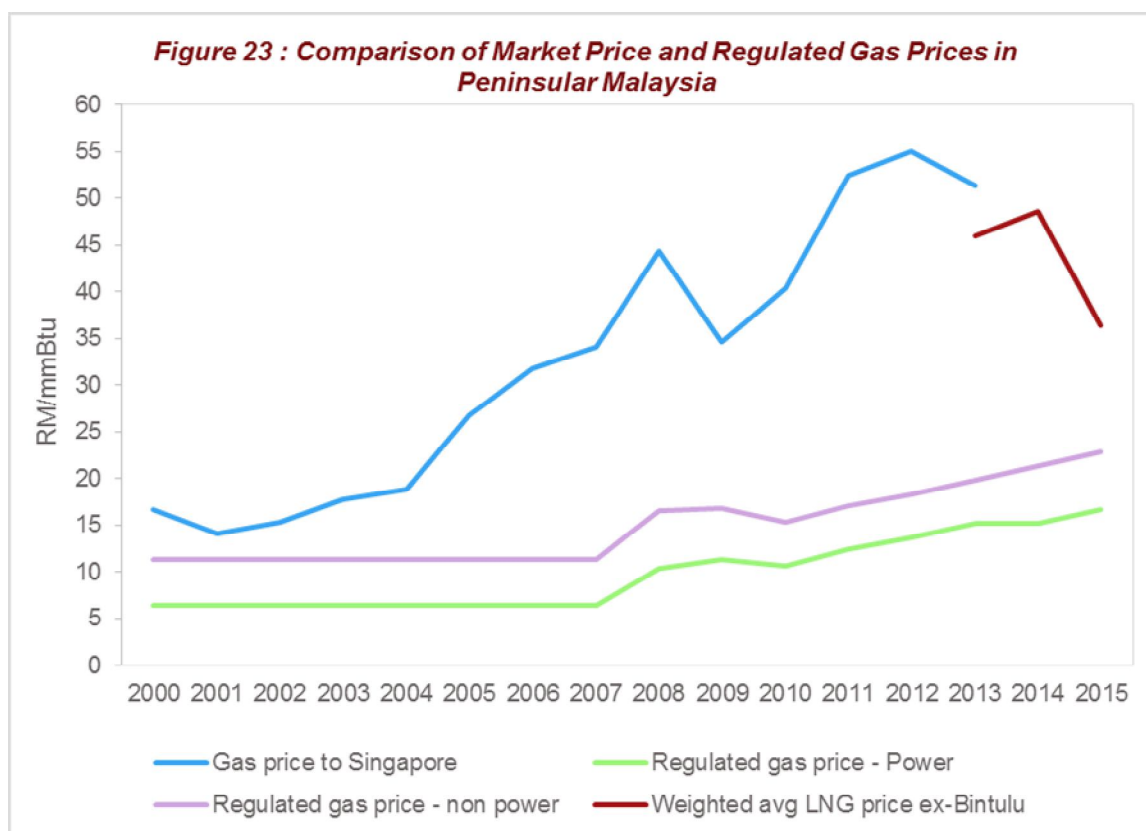
the RGT1 and the PGU pipeline system. PGB published the PGB Network Code in December 2011 to provide a framework for TPA. The establishment of the PGB Network Code promotes access to the gas market by ensuring transparency, fair and equitable practices within PGU pipeline system in Peninsular Malaysia.

To facilitate the implementation of the Third Party Access scheme, the Suruhanjaya Tenaga (Energy Commission of Malaysia) 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.

In recent years (prior to decrease in oil price in middle of 2014), 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 and high oil prices which is used as index in pricing of LNG in the far east. 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.



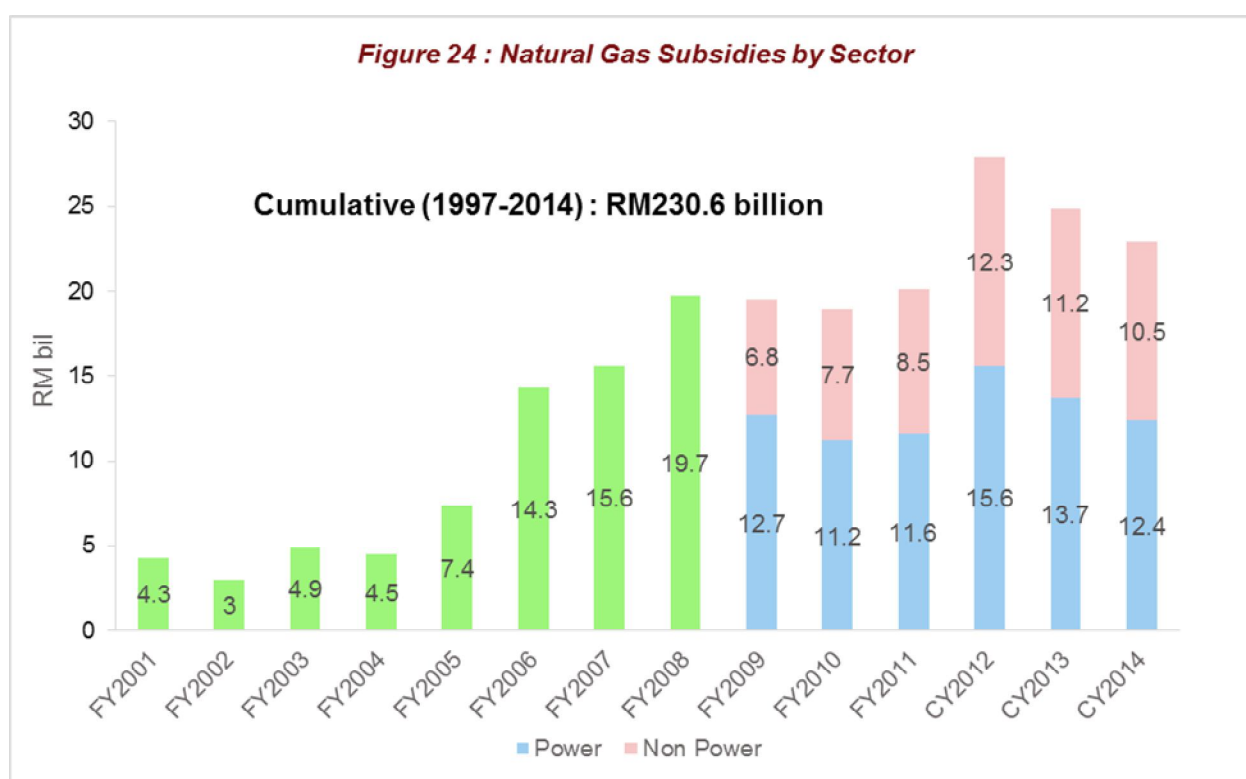
Source: 2000–2012 figures from Malaysia Energy Statistics Handbook 2014, Suruhanjaya Tenaga.

LNG weighted average price for 2015 is based on data from Jan-Sep 2015 only.

For 2014, the total subsidy – in effect revenue lost by selling gas to the domestic market instead of at the stipulated contractual price – was almost RM22.9 billion, decreasing by 8% from RM24.9 billion in 2013. The decrease was due to increase in regulated gas prices and introduction of LNG-based market pricing mechanism for gas consumption above 1,000 mmscfd for power sector and for all new volumes for non-power sector after the commencement of LNG import when the RGT1 was completed.

Out of the RM23 billion, 54% or RM12.4 billion, went to the power sector, with the balance of 46%, or RM10.5 billion, going to the non-power sector – which includes industries, commercial users, residential users, and the NGV sector.

The cumulative total gas subsidy since May 1997 has reached RM230.6 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 RM15.20/mmBtu to RM16.70/mmBtu for volume up to 1,000 mmscfd effective from 1 July 2015.

For non-power sector, the regulated gas price supplied by PETRONAS in Peninsular Malaysia was increased from RM21.35/mmBtu to RM22.85/mmBtu while gas supplied

by PETRONAS to Gas Malaysia was increased from RM17.05/mmBtu to RM18.55/mmBtu. The average price of gas supplied by Gas Malaysia was increased to RM21.80/mmBtu. All the price increase was effective from 1 July 2015.

The regulated tariffs for gas supplied by Gas Malaysia effective from 1 July 2015 are as shown in Figure 25.

Figure 25: Tariff for Gas Supplied by Gas Malaysia Berhad in Peninsular Malaysia

Category	Average Annual Gas Consumption (mmBtu)	Tariff (RM/mmBtu) (Effective 1 July 2015)
A	Residential	19.52
B	0 – 600	20.30
C	601 – 5,000	20.40
D	5,001 – 50,000	20.60
E	50,001 – 200,000	21.50
F	200,001 – 750,000	21.50
L	Above 750,000	22.22
Average		21.80

Looking Forward

1. *The Energy Intensity Index (EEI) reported by the IMF World Economic Outlook, 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.*
2. *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.

- 3. 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 they lead to inefficiencies and in the long run, would undermine Malaysia’s energy security.*

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1. Suruhanjaya Tenaga Malaysia (*Energy Commission, Malaysia*)
2. Bank Negara Malaysia
3. Jabatan Statistik Malaysia (*Department of Statistics, Malaysia*)
4. The Oil & Gas Year
5. International Gas Union (IGU)

Disclaimer:

The views expressed in this report do not necessarily reflect the views of the various organizations whose data was sourced from.



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