

**Q1 2016**

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# **MALAYSIA**

## **OIL & GAS REPORT**

INCLUDES 10-YEAR FORECASTS TO 2024



# Malaysia Oil & Gas Report Q1 2016

INCLUDES 10-YEAR FORECASTS TO 2024

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## Part of BMI's Industry Report & Forecasts Series

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## BMI Industry View

***BMI View:** Malaysia's long-term crude oil production will be hit as investment in deepwater exploration and production is curtailed amid low oil prices. A more competitive Asian LNG market will reduce foreign gas demand in the short term.*

**Table: Headline Forecasts (Malaysia 2013-2019)**

	2013	2014	2015f	2016f	2017f	2018f	2019f
Crude, NGPL & other liquids prod, 000b/d	647.0	675.0	663.8	647.3	642.7	643.4	641.4
Refined products production, 000b/d	545.7	534.8	535.8	455.5	409.9	410.7	410.7
Refined products consumption & ethanol, 000b/d	623.3	635.8	648.5	661.5	674.8	688.3	698.6
Dry natural gas production, bcm	64.4	64.9	63.0	61.7	62.6	63.4	64.1
Dry natural gas consumption, bcm	31.6	32.2	32.8	33.2	33.5	34.5	35.4
Brent, USD/bbl	108.70	99.50	55.00	54.00	53.00	60.00	64.00

e/f = BMI estimate/forecast. Source: BMI, EIA, National Sources

### Latest Updates and Key Forecasts

- In October 2015, Sweden-based Lundin Petroleum's subsidiary Lundin Malaysia has made a gas discovery at the Mengkuang-1 exploration well in licence PM307 offshore Malaysia.
- In September 2015, Malaysian oil and gas firm **Tanjung Offshore** and China-based **Yantai Jereh Oilfield Services Group** have signed a partnership deal, seeking to work together in the Malaysian oil and gas exploration sector.
- We retain our view that low oil price environment will weaken the incentives to raise production from existing fields to full capacity 2016. The rising cost of projects in Malaysia, as project types increasingly move towards more difficult developments such as deepwater and enhanced oil recovery (EOR), will also see investment into longer-term projects hit by subdued oil prices.
- Short-term gas production will be hit by a loose LNG market. 2015 gas production is estimated at 63.0bcm, which is 3% lower than in 2014. We keep our view that lower oil prices will continue to push lower gas production until 2017. We hold a more positive longer-term outlook as a number of recent discoveries and major projects will boost the country's gas output volumes to 71.1bcm by 2024.
- We believe that Malaysia's refining sector will undergo consolidation over the coming few years. This will push down the refining capacity from 588,000b/d in 2015 to 412,000b/d in 2017. The refining capacity is expected to receive a boost from the new Petronas' 300,000b/d RAPID petrochemicals facility, which is set for completion in the second half of 2019. This will raise the country's refining capacity to 712,000b/d.
- We forecast both refined products consumption and gas demand growth to average 1.7% per annum between 2015 and 2024. Malaysia's refined products consumption will increase from 648,170b/d in 2015

to 752,120b/d in 2024, while domestic gas demand will rise from 32.9bcm to 38.1bcm over the same period.

- Malaysia's oil trade will be largely shaped by the ongoing changes in the country's refining sector. Crude oil exports will see a sharp increase as Malaysia's downstream sector consolidates over the coming few years. However, the completion of the new Petronas RAPID refinery in 2020 will boost the domestic demand and push downwards the crude exports until 2024.
- This quarter we have kept our forecast for Malaysia's gas trade. We believe the net exports will decline from 30.1bcm in 2015 to 28.3bcm in 2020 on account of rising domestic consumption and highly competitive LNG environment in Asia. We see gas exports rebounding to 33.0bcm by 2024 due to increased regional demand.

# SWOT

## Malaysia Oil & Gas Swot

### Strengths

- Malaysia is the second largest LNG exporter in the world.
- Its oil reserves are of very high quality - light and sweet - and its benchmark Tapis crude is one of the most expensive in the world.
- Established market well-supported by auxiliary industry.
- A moving up of the value chain is supporting expansion in the downstream sector.
- Good geographic location for energy trade.

### Weaknesses

- Dominance of national oil company Petronas in the country's upstream and downstream.
- Growing production costs.
- Many of the producing oil fields are mature, resulting in our expectation of a decline in crude oil production over the next decade.

### Opportunities

- Deepwater potential is under-explored.
- Marginal fields could hold undiscovered potential as technology progresses.
- Shift of attention by large international oil companies to developed markets provide field opportunities for smaller local-based independents.
- Enhanced oil recovery techniques could help boost oil and gas output over the next few years.
- The de-commissioning of existing fields as hydrocarbon production dries up would be a sizable market opportunity for service companies.

### Threats

- Developing Pengerang as a regional oil and gas hub faces fierce competition from Singapore.

**Malaysia Oil & Gas Swot - Continued**

- The weak oil price environment will discourage investment in deepwater and other high-cost areas, ultimately weighing on longer-term production prospects.
  - Australia will pose significant competition to Malaysia for the Asia LNG market and will surpass Malaysia in 2016 to become the largest LNG exporter in Asia.
-

## Industry Forecast

### Upstream Exploration

***BMI View:** Weak oil prices in the coming years will slow overall exploration activity in Malaysia's oil and gas sector. Deepwater and marginal field exploration will take a backseat due to the high cost of these types of projects.*

### Latest Updates

- In October 2015, Sweden-based Lundin Petroleum's subsidiary Lundin Malaysia made a gas discovery at the Mengkuang-1 exploration well in licence PM307 offshore Malaysia.
- We hold our view that increasing domestic consumption and slower exploration activities (due to weak oil prices) will push Malaysia's oil and gas reserves lower over the coming decade. Between 2015 and 2024, oil reserves are forecast to contract by 10.3% from 4.0bn bbl to 3.59bn bbl. Gas reserves will shrink by 6.8% from 2.35tcm to 2.19tcm over the same period.

### Structural Trends

The US Energy Information Administration (EIA) reported that Malaysia has 4.0bn barrels (bbl) of proven oil reserves at the start of 2015, similar to 2013 and 2014. Moreover, the agency reported natural gas reserves of 2.35trn cubic metres (tcm), a figure which has remain unchanged since 2008.

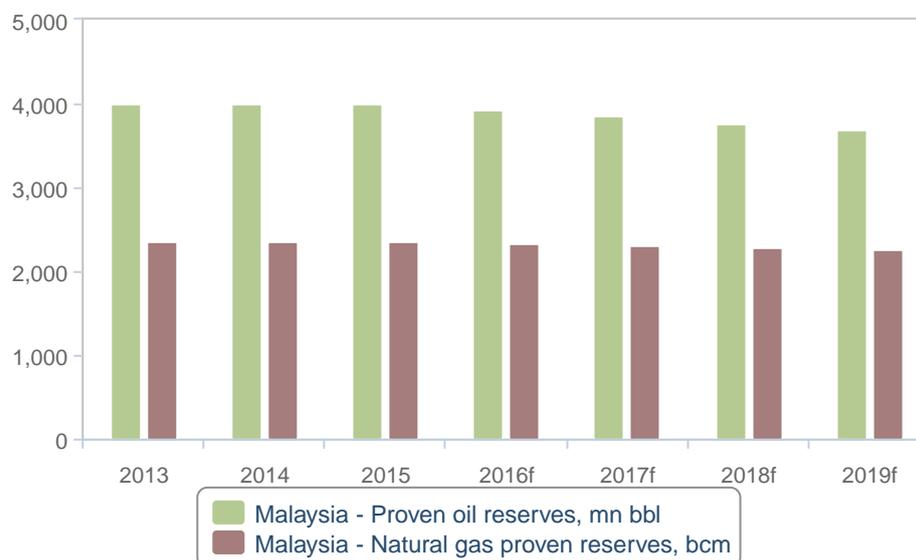
Malaysia's Energy Commission reports higher oil and gas reserve figures for Malaysia. Latest official statistics show that Malaysia had 5.85bn bbls of oil and 2.75tcm of natural gas in 2013. Oil reserves are falling across Sabah, Sarawak and Peninsular Malaysia, while growth in gas reserves has mainly come from Sarawak.

The higher statistics reported by the Energy Commission may be a result of different definitions used by the agency and the EIA, particularly in the consideration of gas condensates as oil reserves. Nonetheless, the number of discoveries announced in recent years has likely pushed the reserves reserve figures above the EIA's estimates.

These reserves are mainly located offshore and broadly in three basins: the Malay basin in Peninsular Malaysia - consisting of some of Malaysia's most prolific oilfields such as Tapis - and the Sarawak and Sabah basins in East Malaysia. The country's oil reserves had traditionally been located in the Malay Basin and have been noted for their light and sweet quality. However, the Sabah and Sarawak basins have been contributing to total reserve growth since 1992.

## Greek Oil and Gas Reserves Forecasts

2013-2024



*f = BMI forecast. Source: BMI, EIA*

Gas reserves growth in Peninsular Malaysia has been largely flat. East Malaysia has been propping up the country's gas reserves, as exploration off the coasts of Sarawak and increasingly Sabah continues to prove up more commercial resources. Gas fields are largely concentrated offshore Sarawak, and provide the feedstock for Petronas' liquefied natural gas (LNG) liquefaction plant in Bintulu.

Over recent years, strong economic growth has seen oil and gas consumption in Malaysia rise dramatically, necessitating a drive to uncover new sources of production in order to preserve lucrative export volumes. The issue is made more pressing as production from many mature fields started to decline after more than three decades of production.

Several high-profile discoveries and developments promise to support the country's oil and gas reserves. These discoveries and reserves upgrades have come from three major sources: deepwater fields, marginal and stranded fields previously thought to be commercially unfeasible, and from enhanced oil recovery (EOR) and improved oil recovery (IOR) developments.

## **Deepwater**

Malaysia's deepwater acreage remains relatively underexplored. At present, only 3bn barrels of oil equivalent (boe) of deepwater resources have been proven but at least 7bn boe could be waiting to be discovered, according to a report by Malaysia's Business Times. French oilfield services giant Technip's decision to establish a plant producing high-tech flexible pipes and umbilicals catering to deepwater development needs is an indication of optimism of the country's deepwater potential.

The latest deepwater discovery made was JX Nippon's Bestari-1, located in Deepwater Block R off the coast of Sarawak. Announced in April 2015, the firm pointed to a 70m column of oil-bearing sands across multiple horizons.

A lower oil price environment is a challenge to an intensification of deepwater exploration in the country. We expect exploration investment to slow as riskier exploration activities take a back seat to development and production.

## **Marginal And Stranded Fields**

Technological improvements, rising demand for gas and high oil prices had made marginal fields attractive for development. As a result, the re-exploration of marginal and stranded fields had seen firms upgrade their resource estimates. According to Petronas, the country has about 106 marginal fields that together could hold about 580mn bbls of oil. Petronas has awarded four RSCs so far, for the Kapal, Banang & Merantai (KBM) Cluster, the Berantai field and the Balai cluster.

For instance, Australia's Roc Oil and local firm Dialog Group have continuously hit oil pay at fields that fall within the Balai Cluster RSC. The Berantai field also achieved an increase in estimated recoverable gas resources of 15% in 2012 compared to 2011, as a result of development efforts. The most significant discovery from a supposed 'marginal' field is Petrofac's oil find at the Cendor field. Once thought to only hold 12mn bbl of recoverable oil, Petrofac announced in May 2013 that it has hit oil and gas-bearing reservoirs that led it to raise recoverable estimates to about 200mn bbl, transforming a field deemed marginal into one of the biggest oilfields in Malaysia.

However, the NOC stated oil prices of USD60/bbl as the minimum breakeven cost needed for these fields to be commercial. We forecast Brent to remain below USD60/bbl level up to 2017 (*see 'Oil: No Brent Recovery Until 2018', August 17 2015*), which does not bode well for marginal fields.

### **Enhanced Oil Recovery (EOR)/ Improved Oil Recovery (IOR)**

Various studies estimate that the average oil recovery factor of producing fields in Malaysia is 33-37% of oil-initially-in-place (OIIP). The wide-scale application of EOR could increase this by more than 5-10%.

In September 2013, Petronas identified 14 oilfields where EOR technology could be implemented in the coming years. Five of the fields lie offshore Sabah and Sarawak, such as Baram and St Joseph. The others are located offshore Peninsular Malaysia, such as Tapis and Dulang. Petronas' E&P Technology head of EOR Dr. Nasir Darman expects production from these 14 oil fields to reach between 750mn and 1bn barrels of oil for the duration of the fields' economic producing lives. Vice-president Wee Yiau Hin was even more upbeat about EOR projects, stating in a January 2014 interview with Bernama news agency that about half of the country's producing fields have EOR potential.

About 10 EOR projects are currently in the pipeline, to be developed over the next 10 years. However, these projects are technically challenging and expensive, with about USD14bn required to execute them. Innovations are therefore required to lower overall costs, improve the performance of existing technology and include the development of new technology, he said.

EOR projects include:

- **ExxonMobil** has invested a minimum of USD2.1bn on EOR at seven mature fields that together make up Malaysia's Tapis crude blend since 2009, which is to help recover an additional 5-10% of oil from the fields. ExxonMobil announced the start-up of the Tapis EOR project offshore Terengganu in September 2014.
- **Royal Dutch Shell** is working on the Baram Delta gas project off the coast of Sabah and Sarawak, which is expected to increase recovery rates from 36% to up to 50%, making another 14% of resources commercial.

However, Petronas' juggernaut position in Malaysia's oil industry means that its spending cut for 2015 will feed through to the entire industry. The rising cost of projects in Malaysia, as project types increasingly move towards more difficult developments such as deepwater and enhanced oil recovery (EOR), could see the NOC scale back plans to improve recovery rates and reserves in the short term.

**Table: Major Discoveries In Malaysia Since 2011**

Name	Nature	Block	Location	Type	Companies	Resource Estimate/ Results	Announced
Bestari-1	Oil	Deepwater Block R	Offshore Sarawak	Deepwater	JX Nippon*, Inpex, Petronas Carigali, Santos	70m oil column	Q115
Marjoram-1	Gas	SK 318	Offshore Sarawak	-	Shell, Petronas	-	Q314
Sirih-1	Gas and condensate	SK 320	Offshore Sarawak	Shallow water	Mubadala Petroleum, Petronas Carigali, Shell	850m gross gas column	Q214
Pagaga-2	Gas	SK 320	Offshore Sarawak	Shallow water	Mubadala Petroleum, Petronas Carigali, Shell	293m gross gas column	Q214
Teja-1	Gas	SK 408	Offshore Sarawak	Shallow water	SapuraKencana Energy, Petronas Carigali, Shell	219m gross column	Q214
Gorek-1	Gas	SK 408	Offshore Sarawak	Shallow water	SapuraKencana Energy, Petronas Carigali, Shell	235m gross column	Q214
Legundi-1	Gas	SK 408	Offshore Sarawak	Shallow water	SapuraKencana Energy, Petronas Carigali, Shell	139m gross column	Q214
Larak-1	Gas	SK 408	Offshore Sarawak	Shallow water	SapuraKencana Energy, Petronas Carigali, Shell	333m gross column	Q214
Rosmari-1	Gas	SK 318	Offshore Sarawak	Deepwater	Shell, Petronas	450m gas column	Q214
B-14	Gas	SK 310	Offshore Sarawak	Shallow water	SapuraKencana Energy, Partners Diamond Energy Sarawak, Petronas	483m net gas pay; 42-84bcm of gas-in-place	Q213
Sintok-1	Gas	SK 320	Offshore Sarawak	Shallow water	Mubadala Petroleum, Petronas Carigali	292m gas column	Q114
Pegaga-1	Gas	SK 321	Offshore Sarawak	Shallow water	Mubadala Petroleum, Petronas Carigali	247m gas column	Q313
Adong Kecil West-1	Oil and gas	SK 333	Onshore Sarawak	Onshore	JX Nippon, Petronas Carigali	349m net hydrocarbon column	Q113
Kuang North-1	Gas	SK 316	Offshore Sarawak	Shallow water	Petronas	636m gas column; 64bcm gas-in-place for Kuang North field	Q412
Kuang North-2							
Tukau Timur Deep-1	Gas	SK 307	Offshore Sarawak	Deepwater	Shell, Petronas	183m net gas pay; 58.8bcm	Q412

**Major Discoveries In Malaysia Since 2011 - Continued**

Name	Nature	Block	Location	Type	Companies	Resource Estimate/ Results	Announced
						gas-in-place for Tukau Timur field	
Tembakau-1	Gas	PM 307	Offshore Peninsular Malaysia	Shallow water	Lundin, Petronas	60m net gas pay; 16.8bcm gas-in-place for field	Q412
Kasawari-1	Gas	SK 316	Offshore Sarawak	Shallow water	Petronas	1,000m gas column; 84bcm of recoverable gas for Kasawari field	Q112
NC8SW-1	Oil and gas	SK 316	Offshore Sarawak	Shallow water	Petronas	440m gas column; 12.6bcm of recoverable gas for NC8SW field	Q112
Limbayong-2	Oil and gas	Block J	Offshore Sabah	Deepwater	Shell, Petronas, ConocoPhillips	136m oil column	Q114
Cendor	Oil	PM 304	Offshore Peninsular Malaysia	Shallow water	Petrofac, Kuwait Foreign Petroleum Exploration Company, PetroVietnam, Petronas Carigali	200mm bbl of recoverable oil	Q213
Wakid-1	Oil and gas	2G-2J	Offshore Sabah	Shallow water	Petronas	227mn boe of resource-in-place	Q411
Bertam	Oil	PM 307	Offshore Peninsular Malaysia	Shallow water	Lundin	64mn bbl of oil	Q112

Source: BMI

A weak market outlook will subdue Malaysia's reserves growth as exploration slows. In particular, addition to oil reserves will be outpaced by depletion from production as firms prioritise maintaining production over exploration. Instead of growth, we expect oil reserves to remain fall below 4.0bn bbl from 2016, though we see a slow and partial recovery by 2020. We estimate gas reserves to decline from about 2.35tcm in 2015 to 2.2tcm by 2024.

**Upside Risks**

The recovery of oil prices presents the greatest upside risk to our forecasts. This would spur strong recovery in exploration, though its effect on production will only be felt in the second half of our forecast period

from 2020 to 2024. We also note that better-than-expected exploration activity in Malaysia at present could see reserves grow faster-than-anticipated towards the end of our forecast period.

**Table: Blocks Offered In The Petronas Licensing Round 2014**

Block Name	Area	Acreeage (sq km)	Type Of Contract
PM-327	Peninsula Malaysia	3,990	R/C PSC
PM-331	Peninsula Malaysia	1,290	R/C PSC
PM-337	Peninsula Malaysia	2,452	R/C PSC
PM-403	Peninsula Malaysia	5,829	R/C PSC
DW-T	Sabah	1,537	Deep Water PSC
DW-V	Sabah	2,895	Deep Water PSC
SB-306	Sabah	9,058	R/C PSC
DW-2D	Sarawak	4,674	Deep Water PSC
SK-317A	Sarawak	1,306	R/C PSC
SK-332	Sarawak	6,357	Onshore PSC
SK-335	Sarawak	2,996	Onshore PSC

Source: Deloitte

Another area which poses upside risk to exploration over the next decade is joint exploration in the South China Sea by Brunei and Malaysia. On August 12 2015, the two countries reached an agreement to conduct joint oil and gas exploration in offshore blocks CA1 and CA2, which straddle the shared maritime boundaries between Sarawak and Brunei. However, political opposition from other countries and weak oil prices makes it unlikely for these activities to progress to the development stage over the coming years (*see 'Joint Exploration Faces Political And Economic Headwinds', August 20 2015*).

## Upstream Projects

**Table: Malaysia Major Upstream Projects**

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Block K & G	Siakap North-Petai (SNP)	Murphy Oil (32%), Royal Dutch Shell (21%), Petronas	2014	Production	35,000		Oil	Offshore	1,311

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies (26%), ConocoPhillips (21%)	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Block H	Rotan	Murphy Oil (60%), Petronas (40%)	2018	Final Investment Decision		2.1	Gas	Offshore	1,128
Block SK 314A	Block SK 314A	Murphy Oil (59.5%)		Exploration			Oil & Gas	Offshore	34
Block PM311	Kenarong Kenarong North, Pertang	Murphy Oil (75%), Petronas (25%)	2016	Appraisal			Gas	Offshore	74
Block P	Block P	Petronas (40%), Murphy Oil (60%)		Exploration			Oil & Gas	Offshore	
Block SK10	Layang	JX Nippon Oil & Energy Corporation (75%), Petronas (25%)	2016	Development			Oil, Gas & Condensate	Offshore	85
Block SK10	Helang	JX Nippon Oil & Energy Corporation (75%), Petronas (25%)	2003	Production	10,000	2.5	Oil, Gas & Condensate	Offshore	90
Block SK 408	Block SK 408	SapuraKencana Petroleum (40%), Petronas (30%), Royal Dutch Shell (30%)		Discovery			Gas	Offshore	
Block PM305	Ophir	Octanex (50%), Scomi Group Bhd (30%), Petronas (20%)	2016	Development			Oil	Offshore	60
Block PM307	Bertam	Lundin Petroleum (75%), Petronas (25%)	2015	Production	75,000		Oil	Offshore	76
Block PM303	Damar	ExxonMobil (50%), Petronas (50%)	2014	Production		2	Natural Gas	Offshore	55
Telok	Telok	ExxonMobil (50%), Petronas (50%)	2013	Production		4.5	Natural Gas	Offshore	70
Balai Cluster Risk Service	Balai	Petronas (20%), Dialog Group Berhad	2013	Production			Oil & Gas	Offshore	60

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Contract (RSC)		(32%), Roc Oil (48%)							
Balai Cluster Risk Service Contract (RSC)	Bentara	Petronas (20%), Dialog Group Berhad (32%), Roc Oil (48%)	2014	Production	3,000		Oil & Gas	Offshore	60
Block SK318	Block SK318	Petronas (15%), Royal Dutch Shell (85%)		Discovery			Gas	Offshore	800
Block S, Sabah Basin	Block S	INPEX Corporation (50%), Petronas (25%), Santos Limited (25%)		Exploration			Oil & Gas	Offshore	1,500
Balai Cluster Risk Service Contract (RSC)	West Acis	Petronas (20%), Dialog Group Berhad (32%), Roc Oil (48%)		Appraisal			Oil & Gas	Offshore	60
Balai Cluster Risk Service Contract (RSC)	Spaoh	Petronas (20%), Dialog Group Berhad (32%), Roc Oil (48%)		Appraisal			Oil & Gas	Offshore	60
PM328	PM328	E&P Malaysia Venture (10%), Petronas (40%), Lundin Petroleum		Exploration			Oil & Gas	Offshore	
North Malay Basin Project (PM302)	Kamelia	Hess Corporation (50%), Petronas (50%)	2013	Production	360	0.4	Gas & Condensate	Offshore	
North Malay Basin Project (PM302, PM325, PM326B)	Bergading	Hess Corporation (50%), Petronas (50%)	2017	Development			Gas	Offshore	60
North Malay Basin Project (PM302, PM325, PM326B)	Zetung	Hess Corporation (50%), Petronas (50%)	2017	Development			Gas	Offshore	

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
North Malay Basin Project (PM302, PM325, PM326B)	Melati	Hess Corporation (50%), Petronas (50%)	2017	Development			Gas	Offshore	
North Malay Basin Project (PM302, PM325, PM326B)	Anggerik	Hess Corporation (50%), Petronas (50%)	2017	Development			Gas	Offshore	
North Malay Basin Project (PM302, PM325, PM326B)	Kezumba	Hess Corporation (50%), Petronas (50%)	2017	Development			Gas	Offshore	
Balai Cluster Risk Service Contract (RSC)	Balai, West Acis, Spaoh, Bentara	Petronas (20%), Dialog Group Berhad (32%), Roc Oil (48%)		Production			Oil & Gas	Offshore	60
Tapis	Tapis	Petronas (50%), ExxonMobil (50%)	1979	Upgrade/ EOR	350,000		Extra Light Oil	Offshore	61
Block G	Malikai	Royal Dutch Shell (35%), ConocoPhillips (35%), Petronas (30%)	2017	Development	60,000	0.6	Oil & Gas	Offshore	565
Block K	Kikeh	Murphy Oil (56%)	2007	Production	120,000		Oil & Gas	Offshore	1,330
Block A-18	Cakerawala	Carigali-PTTEPI Operating Company (100%)	2005	Production			Gas & Condensate	Offshore	60
Block SK309/ SK311	Golok, Merapuh, Serampang, Belum & Pemanis	Murphy Oil (59.5%)	2009	Production	18,500	1.1	Gas & Condensate	Offshore	40
Bintang	Bintang	ExxonMobil (50%), Petronas (50%)	2003	Production		3.6	Natural gas	Offshore	

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Blocks SB307/ SB308	Kitabu	Petronas (15%), EnQuest PLC (42.5%), Lundin Petroleum		Exploration			Oil & Gas	Offshore	50
SK308 PSC	E6	Royal Dutch Shell, Petronas (50%)	2017	Final Investment Decision			Oil & Gas	Offshore	90
Block SK 309	West Patricia	Murphy Oil (59.5%)	2003	Production	20,000		Oil	Offshore	40
Block SK 320	Pegaga, Sirih, Sintok	Mubadala Petroleum (55%), Petronas (25%), Royal Dutch Shell (20%)		Appraisal			Gas & Condensate	Offshore	108
Block DW2B, Sarawak Basin	Block DW2B	Korea National Oil Corporation (KNOC) (15%), Royal Dutch Shell (50%), Petronas (15%), Mubadala Petroleum (20%)		Exploration			Oil & Gas	Offshore	
Block SB312	Block SB312	Kuwait Foreign Petroleum Exploration Company (KUFPEC) (40%), Petronas (60%)		Exploration			Oil & Gas	Offshore	
Block SB 302	Block SB 302	Kuwait Foreign Petroleum Exploration Company (KUFPEC) (40%)		Appraisal			Gas	Offshore	
Block PM 304	Cendor	Kuwait Foreign Petroleum Exploration Company (KUFPEC) (25%), Petrovietnam Exploration Production Corporation (PVEP) (15%), Petrofac, Petronas (30%)	2006	Production	30,000		Oil	Offshore	70

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Block PM 304	West Desaru	Kuwait Foreign Petroleum Exploration Company (KUFPEC) (25%), Petrovietnam Exploration Production Corporation (PVEP) (15%), Petrofac, Petronas (30%)	2013	Production	20,000		Oil	Offshore	
Block SK-305	D30	PetroVietnam (30%), Petronas (40%), Pertamina (30%)	2010	Production			Oil & Gas	Offshore	100
Block SK-305	Dana	PetroVietnam (30%), Petronas (40%), Pertamina (30%)	2011	Production			Oil & Gas	Offshore	50
Block R	Block R	JX Nippon Oil & Energy Corporation (27.5%), INPEX Corporation (27.5%), Santos Limited (20%), Petronas (25%)		Discovery			Natural Gas	Offshore	1,400
Block SK306	F9, Kumang, Kanowit, A3, F11, F22, F27, F12, Selar Marine, Bunga Pelaga	Petronas	2015	Development	22,000		Gas	Offshore	80
Block SK306	Kumang	Petronas	2015	Development			Gas	Offshore	100
K5	K5	Petronas	2018	Development			Sour Gas	Offshore	80
Block SK306	Kanowit	Petronas	2016	Development			Gas	Offshore	80
Block SK 316	Kasawari	Petronas		Development			Gas	Offshore	100

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
Block SK317B	Block SK317B	Petronas (15%), Total (85%)		Exploration			Oil & Gas	Offshore	1000
Tembikai	Tembikai	Petronas	2015	Production	2,000		Oil & Gas	Offshore	70
Chenang	Chenang	Petronas	2015	Development			Oil & Gas	Offshore	Offshore
KBM Cluster, Block PM 316	Kapal, Banang, Meranti	Petronas	2013	Production			Oil	Offshore	60
KBM Cluster, Block PM 316	Kapal	Petronas	2013	Production	13,000		Oil	Offshore	60
KBM Cluster, Block PM 316	Banang	Petronas	2014	Production	6,000		Oil	Offshore	60
KBM Cluster, Block PM 316	Meranti	Petronas	2019	Development			Oil	Offshore	60
Angsi	Angsi	Petronas (50%), ExxonMobil (50%)	2001	Production	65,000	4.5	Oil & Gas	Offshore	
Guntong	Guntong	ExxonMobil (78%), Petronas (22%)		Production			Oil & Gas	Offshore	64
Block PM6	Dulang	Petronas (100%)	1991	Production			Oil & Gas	Offshore	76
Bokor	Bokor	Petronas		Production	140,000		Oil & Gas	Offshore	67
Block SK309 and SK311	Patricia, Permas, Serendah & South Acis	Murphy Oil (59.5%)	2013	Production			Oil & Gas	Offshore	48
Block SB331	Block SB331	M3nergy, SapuraKencana Petroleum (70%)		Exploration			Oil & Gas	Onshore	
Block SB332	Block SB332	SapuraKencana Petroleum (70%), M3nergy		Exploration			Oil & Gas	Onshore	
Block PM 309	Berantai	Petronas	2012	Production	10,000	1.5	Gas	Offshore	

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
North Sabah PSC	St. Joseph	Royal Dutch Shell (50%), Petronas (50%)	1981	Upgrade/ EOR			Oil	Offshore	38.7
North Sabah PSC	South Furious	Royal Dutch Shell (50%), Petronas (50%)		Upgrade/ EOR			Oil	Offshore	
North Sabah PSC	SF30	Petronas (50%), Royal Dutch Shell (50%)	2001	Upgrade/ EOR			Oil	Offshore	
North Sabah PSC	Barton	Royal Dutch Shell (50%), Petronas (50%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Bakau	Petronas (60%), Royal Dutch Shell (40%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Baram	Petronas (60%), Royal Dutch Shell (40%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Baronia	Royal Dutch Shell (40%), Petronas (60%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Betty	Royal Dutch Shell (40%), Petronas (60%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Fairley Baram	Petronas (60%), Royal Dutch Shell (40%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC	Siwa	Royal Dutch Shell (40%), Petronas (60%)		Upgrade/ EOR			Oil	Offshore	
Baram Delta PSC, Block SK307	Tukau Timur	Petronas (50%), Royal Dutch Shell (50%)		Discovery			Gas	Offshore	
Baram Delta PSC	West Lutong	Royal Dutch Shell (40%), Petronas (60%)		Upgrade/ EOR			Oil	Offshore	
Block SK316	Kuang North	Petronas		Discovery			Gas	Offshore	
Block SK 310	Block SK 310	Petronas (40%), Mitsubishi Corporation (30%), Newfield		Discovery			Gas	Offshore	76

Malaysia Major Upstream Projects - Continued

Name	Field Name	Companies	Completion Date	Status	Est. Peak Oil/ Liquids Range (b/d)	Est. Peak Gas Output (bcm)	Type of Project	Onshore/ Offshore	Water depth (m)
		Exploration (30%)							
Block PM-322	Port Klang	Ophir Energy (100%)		Exploration			Oil	Offshore	
Block SK 2C, North Luconia basin	Block SK 2C	Murphy Oil (50%)		Exploration			Oil & Gas	Offshore	1,800
D18	D18	Petronas	1986	Production	5,300		Oil	Offshore	31
Block PM308A	Block PM308A	Petronas (25%), Lundin Petroleum (75%)		Exploration			Oil & Gas	Offshore	
Block PM302, PM325, PM326B	Kamelia, Bergading, Zetung, Melati, Anggerik, Kezumba	Hess Corporation (50%), Petronas (50%)	2013	Production			Gas & Condensate	Offshore	
Block K & J	Gumusut -Kakap	Royal Dutch Shell (33%), Murphy Oil (14%), ConocoPhillips (33%), Petronas (20%)	2012	Production	135,000		Oil	Offshore	1,220
Block B-17 & B-17-01	Muda, Muda South, Tapi, Jengka, Amarit, Mali, Jengka West, Jengka East, Jengka South	PTT Exploration and Production Public Company Limited - PTTEP (50%), Petronas (50%)	2010	Production			Oil & Natural Gas	Offshore	50

\*Operator. Source: BMI Upstream Projects Database

## Upstream Production - Oil

**BMI View:** *We forecast Malaysia's crude oil production to remain on a downtrend over 2015 to 2024 as weak oil prices limit the attractiveness of boosting output. Furthermore, we do not expect new FIDs in deepwater and marginal projects in the next several years given their high breakeven cost.*

### Latest Updates

- Malaysia's 2015 oil production is estimated to have declined by 1.7% (y-o-y) to 663,770b/d.
- We hold our previous forecast and see Malaysia's oil production levels declining from an estimated 663,770b/d in 2015 to 629,160b/d in 2022. We believe that new investments into production will slightly raise the country's oil output levels to 634,650b/d by 2024.

### Structural Trends

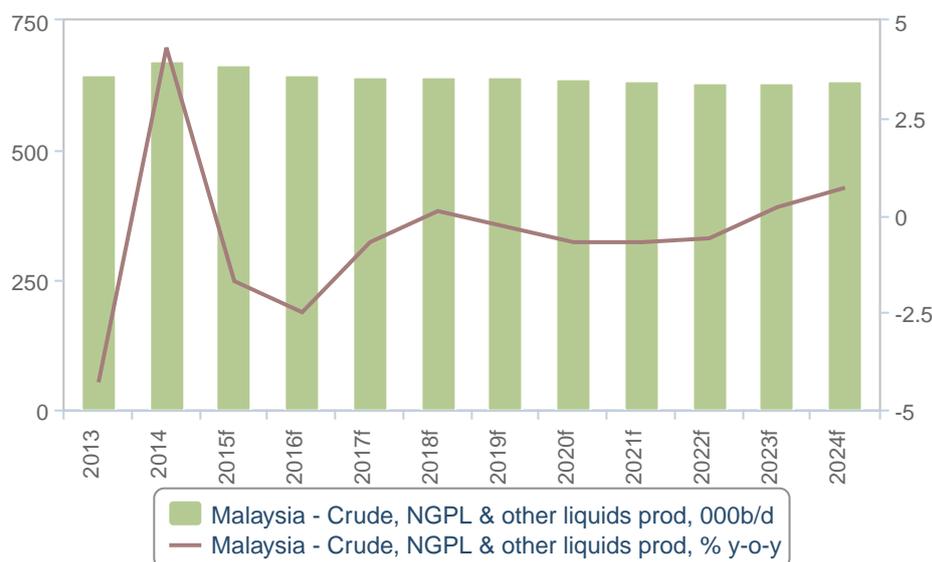
We estimate Malaysia's crude oil production to have decreased by 1.7% in 2015 to 664,000 barrels per day (b/d). We see a lower oil price environment hitting Malaysia's long-term production outlook. Much of its growth potential lies in expensive projects - deepwater, enhanced oil recovery (EOR) and marginal fields - where breakeven costs are high. Oil prices of USD55-65/bbl between 2015 and 2019, which we forecast for the period, will not adequately support some of these projects.

#### **Petronas Cuts To Hit Industry**

**Petronas** is taking the lead in capex cuts that will hit longer term output. In November 2014, the firm stated that it will be reducing capex by 15% in 2015; a failure for oil prices to recover beyond the USD80/bbl mark will see Petronas keep its capex below levels seen in the period 2012 to 2014. The dominant role of Petronas in the national oil market, where it maintains interest in every producing field, means that its capex cut will feed through to the entire industry. Shorter-term output is also set to be affected by Petronas' announcement that it will be cutting operating expenditure by 25-30% in 2015. One bright spot is enhanced oil recovery (EOR) techniques, which could help provide some support to output. Petronas has indicated that it intends to channel greater investment into this area to support brownfield production.

## Oil Production Forecast

Crude Oil and NGLs Production, 2013-2024



f = BMI forecast. Source: BMI, EIA

The reduction in Petronas' spending will be exacerbated by the capex cuts that foreign oil companies are embarking on worldwide. As such, western spending will not be able to support future production growth to make up for Petronas' more cautious investment approach.

### Limited Support From Weaker MYR

The MYR's depreciation vis-a-vis the USD provides little encouragement for oil production. While a more expensive USD could translate into more MYR earnings for local producers such as Petronas, we note that other than Petronas, the majority of the major oil players in Malaysia are foreign oil companies reporting their earnings in USD. Also, while lower production demand could bring about lower development costs as oilfield service providers cut prices to maintain market share, the cost savings could be negated by a weaker MYR, especially if contractors are billing in USD.

### No New Production Expected In Near Term

We expect Malaysia's crude oil production to trend downwards over the next decade from a forecasted 664,000b/d in 2015 to 635,000b/d in 2024. The start-up of the Tapis EOR project and Gumusut-Kakap may have boosted Malaysia's total production capacity, but unfavourable oil prices will see operators slow efforts to ramp up output to meet peak production in exchange for prolonging the life of these fields. Hence, we do not expect new output from these projects to make up for falling production in more mature fields.

While we expect a modest recovery in oil prices from 2018, the dearth of FIDs over the next several years will mean that significant volumes of new oil will not be brought online until 2022 at the earliest. Other than **Shell's** Malikai oil project, no other deepwater projects have been announced and we do not expect FIDs for any deepwater developments in the next two years. We note that a stronger than expected recovery in oil prices poses upside risk to our forecast as it will make marginal fields commercially viable once more.

**Table: Oil Production (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Crude, NGPL & other liquids prod, 000b/d	647.0	675.0	663.8	647.3	642.7	643.4
Crude, NGPL & other liquids prod, % y-o-y	-4.3	4.3	-1.7	-2.5	-0.7	0.1

BMI/EIA

**Table: Oil Production (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Crude, NGPL & other liquids prod, 000b/d	641.4	637.1	632.8	629.2	630.5	634.7
Crude, NGPL & other liquids prod, % y-o-y	-0.3	-0.7	-0.7	-0.6	0.2	0.7

BMI/EIA

## Upstream Production - Gas

**BMI View:** Weaker LNG export prices will result in a dip in Malaysia's gas production in 2015 and 2016. From 2017 onwards, the start-up of projects currently in the pipeline will see a resumption in the uptrend in Malaysia's gas output.

### Latest Updates

- 2015 gas production is expected to come in at 63.0bcm, which is 3% lower than in 2014. We keep our view that lower oil prices will continue to push lower gas production until 2017.
- We hold a more positive longer-term outlook as a number of recent discoveries and major projects will boost the country's gas output volumes to 71.1bcm by 2024.

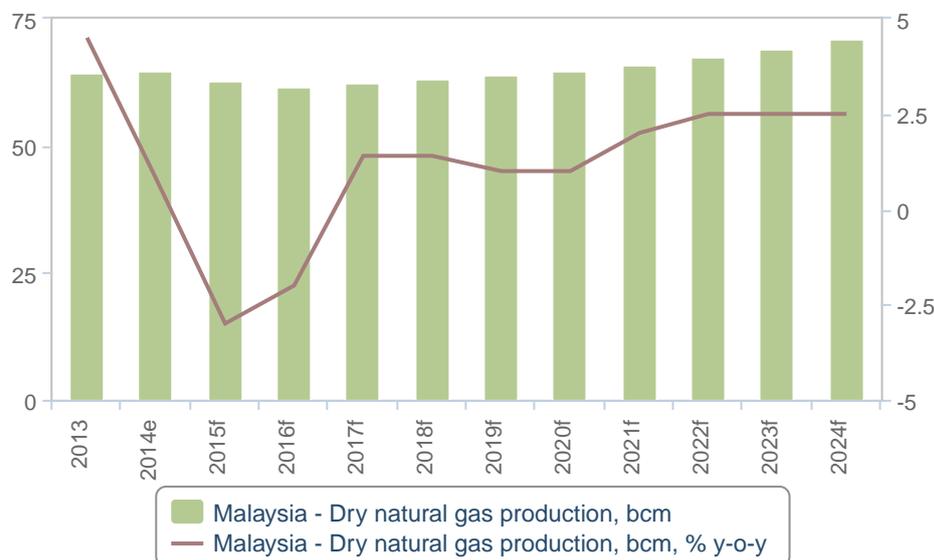
### Structural Trends

A string of prolific discoveries and major projects set to come online between 2015 and 2019 would see gas production grow from 2017, as output from new gas fields help to make up for declining production in older fields. Nearly all of these new projects are offshore Sarawak, East Malaysia, which will in turn support liquefied natural gas (LNG) production growth at **Petronas'** LNG complex in Bintulu. Amongst others, these projects include:

- **Hess' North Malay Gas Project:** Covering blocks PM302, PM325 and PM326B offshore Peninsula Malaysia, the first phase of the project came on stream in December 2013. The second phase, which will provide an additional 2bcm of gas at its peak, is tabled to start production in 2017.
- **Petronas' NC3 And NC8 Fields:** Scheduled for a 2016 start, the two fields in block SK 316 are expected to flow 16.8mn cubic metres per day (Mcm/d) - or a peak of 6.1bcm per year - and feed the ninth train at the Bintulu LNG complex;
- **Petronas' Kasawari Field:** Discovered early-2012, the NOC has been conducting early studies to develop the project, estimating that it could contribute 14-21Mcm/d (5.11-7.67bcm/y) to its liquefied natural gas (LNG) complex when online. We have factored in output from Kasawari from mid-2018.
- **Petronas' Tukai Timur Field:** Tukai Timur was included into **Shell's** Baram Delta development in July 2014, paving the way for its development. The field has about 58.8bcm of gas-in-place;
- **Shell's E6 Field:** Shell and **Petronas Carigali** will develop the E6 field in the SK308 production sharing contract area. The development concept leverages on existing infrastructure by evacuating gas from E6 to the E8 platform and crude oil to D35.
- **Petronas' K5 Field:** The NOC made a FID to develop Phase 1 of the K5 field, at a cost of USD500mn-1bn. It will be the world's most sour gas development. The firm estimates that Phase 1 can come online by 2018, though we have a more cautious forecast of the field's start-up in 2020.

## Gas Production Forecasts

2013-2024



BMI/EIA

However, we have moderated the rate of gas production growth in Malaysia, in view of a weaker oil price environment. As LNG prices in the region remain weak due to the oil-indexed nature of most contracts, Malaysia's gas production will decline in 2015 and 2016 as softer prices makes it less attractive to produce gas. New projects will lift output levels from 2017, accounting for our forecast for production to rise to 64.1bcm in 2019.

FID for new developments were put on hold particularly in 2015, as producers take on a wait-and-see approach. Market adjustments to the surge of LNG supplies coming from Australia in 2015 and 2016 will be keenly watched, to gauge the market's ability to absorb more gas supplies even as profit margins from gas sales narrow. However, we note that the following developments - if approved - pose significant upside potential to our forecasts:

- **Petronas' Kuang North discoveries**, which are currently being assessed for their commerciality. Gas-in-place estimates for this field is 64.4bcm;
- **SapuraKencana's SK310**, consisting of the B-14 and B-15 prospects; Newfield confirmed the commerciality of the prospects in April 2013, with estimated gas initially in place for B-14 of 42bcm, and recoverable resources of 8bcm in B-15.

- **SapuraKencana's discoveries in SK 408** - the Teja-1, Gorek-1, Legundi-1, Larak-1 and Bakong-1 shallow water finds;
- **Mubudala Petroleum's finds in SK 320** - Sirih-1 and Pagaga-2 - which are also shallow water discoveries off the coast of Sarawak.

**Table: Gas Production (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Dry natural gas production, bcm	64.4	64.9	63.0	61.7	62.6	63.4
Dry natural gas production, bcm, % y-o-y	4.5	0.8	-3.0	-2.0	1.4	1.4
Dry natural gas production, % of domestic consumption	204.0	201.6	191.7	186.0	186.7	183.8

BMI/EIA

**Table: Gas Production (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Dry natural gas production, bcm	64.1	64.7	66.0	67.7	69.3	71.1
Dry natural gas production, bcm, % y-o-y	1.0	1.0	2.0	2.5	2.5	2.5
Dry natural gas production, % of domestic consumption	181.1	177.6	178.5	181.1	183.8	186.6

BMI/EIA

## Refining

***BMI View:** Malaysia's push to move up the value chain and increase value-added exports will continue to support investment in the crude refining and petrochemical sectors. The start-up of the RAPID refinery project will increase refining capacity from 588,000b/d in 2015 to 712,000b/d by 2020.*

## Latest Updates

- We have kept our forecast this quarter and believe that Malaysia's refining sector will undergo consolidation over the coming few years. This will push down the refining capacity from 588,000b/d in 2015 to 412,000b/d in 2017.
- Malaysia's refining capacity is expected to receive a boost from Petronas' new 300,000b/d RAPID petrochemicals facility, which is set for completion in the second half of 2019. This will raise the country's refining capacity to 712,000b/d.

## Structural Trends

Malaysia has five oil refineries, which together provide the country with about 588,000 barrels per day (b/d) in refining capacity at the start of 2015. **Petronas** owns three of these refineries, while **Shell** and **Petron** own the remaining two plants that are both based in Port Dickson in Negeri Sembilan.

### **RAPID Will Boost Refining Capacity From 2020**

Malaysia's refining segment is set for a shake-up in the coming years. While Petronas' RAPID project promises to raise its refining capacity by 300,000b/d in 2020, this longer-term increase will be partly offset by consolidation in the short term. As such, we forecast a drop in refining capacity from 588,000b/d in 2015 to 412,000b/d in 2017. This will be as a result of possible consolidation of Melaka and the likely closure of the Port Dickson refinery.

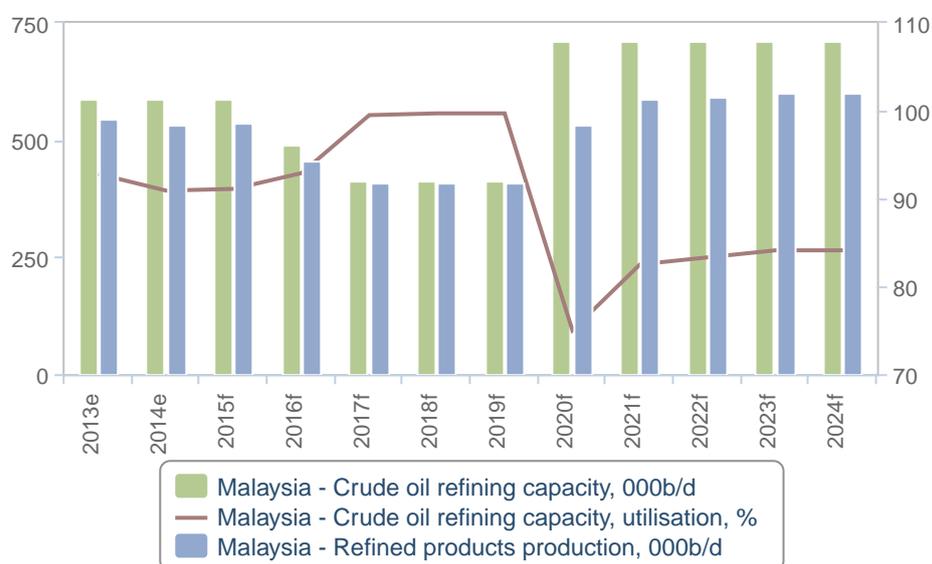
Shell announced in January 2015 that it is considering options for its Port Dickson plant, one of the likely options for which is turning it into a storage terminal. Petronas' purchase of **Phillips 66**'s stake in PSR-2 could also see it opt to consolidate operations in Melaka, which could entail a reduction of overall crude distillation capacity in view of strong market competition in South East Asia. Such a move could also support demand for products coming out from its RAPID refinery at the start of the new decade.

Petronas' RAPID refinery project, which is scheduled to come online in mid-2019, is a USD16bn project consisting of a 300,000b/d refinery and petrochemical complex. It will have a combined chemical output capacity of 7.7mn tonnes of various products, including differentiated and specialty chemicals.

The only significant upside potential comes from Petron, which is planning an USD1.5bn investment into its refining and retail business in Malaysia. We have not factored in an expansion of its existing plant in our forecast, until more details are available as to the distribution of investment that Petron will make in Malaysia. A less likely contributor is the Yan refinery project, which could add at least 400,000b/d to Malaysia's total refining capacity by 2023. However, an FID for the project in the short term does not look likely as an increasingly well-supplied oil products market in South East Asia, especially with new projects in Indonesia and Vietnam, will reduce the appeal of new refining projects.

### Refining Capacity Forecast

2014-2024



elf = BMI estimate/forecast. Source: EIA, BMI

### Refined Products Production

The majority of refineries in Malaysia are optimised to process light and sweet crude oil, in line with the nature of crude produced in the country. However, newer refineries are being optimised to process the heavier and more sour grades from the Middle East, and with the higher profits reaped from selling Malaysia's better quality crude to the market.

Middle distillates makes up the largest share of refined oil produced in Malaysia, followed by gasoline. This is a trend that is set to continue through our forecast period.

The country was looking to shift production towards Euro-4 standard gasoline and diesel by June 2015, but this target has been shifted to 2018. Nonetheless, this will put pressure on the country's refiners to upgrade their plants to produce cleaner fuels. Our projection for a short-term fall in domestic refining capacity between 2015 and 2019 underpins our expectations for Malaysia's refined oil production to fall during this period, from an estimated 535,830b/d in 2015 to 410,730b/d in 2018. The start-up of RAPID, currently projected to come online in 2019, will reverse this trend as production climbs upwards to 600,000b/d by the end of our forecast period in 2024.

### **Petrochemical Investments Aimed At Domestic And Export Markets**

Furthermore, the government has stated its intention to become a leading petrochemicals hub in the region together with Singapore, which still remains the top regional player. There is evidence to suggest that Malaysia has been increasingly moving up the value chain, with exports of petroleum products (including petrochemicals) increasing from 12.0mn tonnes in 2010 to 22.4mn tonnes in 2014. We believe this will continue over the coming years, with the start-up of the RAPID refinery further propelling this trend.

Malaysia's petrochemicals sector also plays an important role in producing intermediate products utilised in the production process of other higher-value added products such as high performance plastics and lubricants. A case in point is the joint venture (JV) between Petronas and German chemical company **BASF**. The JV, **BASF Petronas Chemicals Sdn Bhd**, is set to open a polyisobutene plant in late 2017, which will produce highly reactive polyisobutene (HR-PIB). This plant will be the first of its kind in South East Asia and will produce up to 50,000 tonnes of HR-PIB annually, which is an important intermediate product for the manufacturing of high-performance fuel and lubricant additives.

**Table: Refining Capacity and Refined Products Production (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Crude oil refining capacity, 000b/d	588.0	588.0	588.0	490.0	412.0	412.0
Crude oil refining capacity, % y-o-y	9.2	0.0	0.0	-16.7	-15.9	0.0
Crude oil refining capacity, utilisation, %	92.8	90.9	91.1	92.9	99.5	99.7
Refined products production, 000b/d	545.7	534.8	535.8	455.5	409.9	410.7
Refined products production, % y-o-y	-5.0	-2.0	0.2	-15.0	-10.0	0.2
Refined products production & ethanol, 000b/d	550.7	540.3	541.5	461.4	416.1	417.2
Refined products production & ethanol, % y-o-y	-4.3	-1.9	0.2	-14.8	-9.8	0.3

e/f = BMI estimate/forecast. Source: EIA, BMI

**Table: Refining Capacity and Refined Products Production (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Crude oil refining capacity, 000b/d	412.0	712.0	712.0	712.0	712.0	712.0
Crude oil refining capacity, % y-o-y	0.0	72.8	0.0	0.0	0.0	0.0
Crude oil refining capacity, utilisation, %	99.7	75.0	82.5	83.3	84.1	84.1
Refined products production, 000b/d	410.7	533.9	587.3	593.2	599.1	599.1
Refined products production, % y-o-y	0.0	30.0	10.0	1.0	1.0	0.0
Refined products production & ethanol, 000b/d	417.4	540.9	594.6	600.7	607.0	607.3
Refined products production & ethanol, % y-o-y	0.1	29.6	9.9	1.0	1.0	0.1

f = BMI forecast. Source: EIA, BMI

## Refined Fuels Consumption

**BMI View:** Malaysia's oil consumption will grow at a slower rate over the next decade as a slower pace of economic growth and falling energy intensity weigh on demand. The consumption mix will remain dominated by diesel and gasoline over our forecast period.

### Latest Updates

- We maintain our outlook for Malaysia's refined products consumption and forecast domestic demand growth to average 1.7% per annum between 2015 and 2024. Consumption will increase from 648,170b/d in 2015 to 752,120b/d in 2024.
- Motor gasoline and diesel are expected to remain the most popular fuels accounting for nearly 70% in the total fuels consumption mix.

## Structural Trends

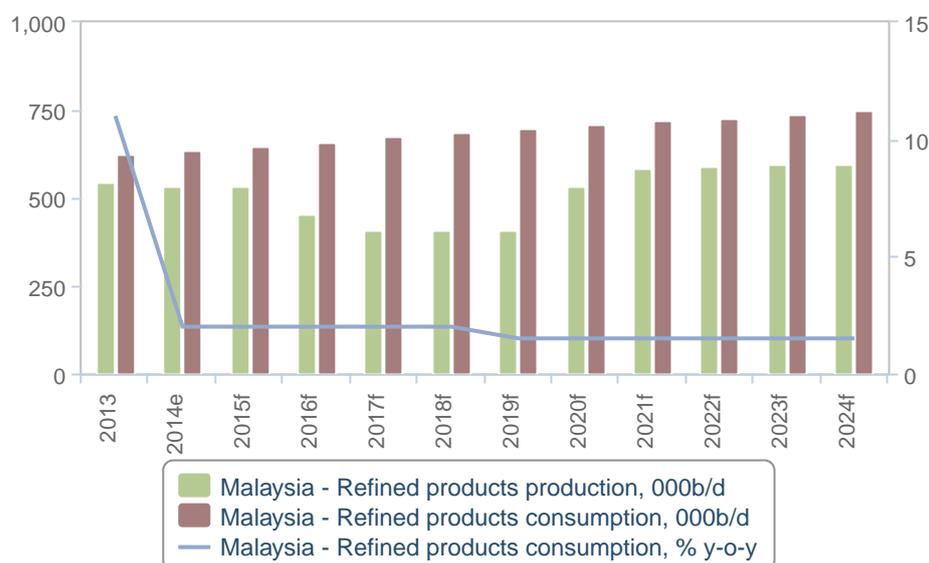
Malaysia's oil consumption has been on the upswing as a function of its economic growth. Between 2005 and 2014, oil consumption grew 21.8% from 521,850b/d to 635,460b/d. We estimate oil consumption to have risen 2.0% in 2015 to 648,170b/d. Despite a cut in fuel subsidies, consumption will be bolstered by sustained weakness in crude oil prices.

Nonetheless, we are forecasting a slower growth in oil consumption over the next decade, with growth to average 1.7% per annum over the 2015-2024 period. This will see oil consumption rise from a forecast of 648,170b/d in 2015 to 752,120b/d in 2024. We expect a slower rate of domestic oil consumption growth for the following reasons:

- **A more subdued economic outlook for Malaysia**, due to ageing demographics, a weaker oil and gas sector and external headwinds stemming from China's economic slowdown.
- **A shift from oil to other sources of energy in the power sector** to continue over our forecast period. Diesel demand, in particular, will see a slower increase in consumption, while fuel oil demand would fall.
- **Falling energy intensity per unit of GDP** in Malaysia will contribute to oil consumption growing at a slower rate than GDP in the long term.

## Refined Products Production and Consumption Forecast

2013-2024



*e/f = BMI estimate/forecast. Source: BMI, Energy Commission of Malaysia, EIA*

### Upside Risks

We note upside to risk to our forecast, particularly if Malaysia's large infrastructure project plans move ahead. Part of the buoyant construction outlook for Malaysia is boosted by the energy infrastructure projects especially in the state of Johor. However, several other projects may be in the pipeline, including a high-speed railway connecting Kuala Lumpur to Singapore. A better construction outlook will raise the country's demand for diesel, and its total oil consumption.

### Consumption Mix

The transport sector contributes the most to Malaysia's oil consumption. In 2015, jet fuel, gasoline and diesel made up 78% of the country's total demand.

We do not expect a change in Malaysia's oil consumption mix, with weaker oil prices supporting transport demand for both the passenger and commercial segments. However, we note that a robust construction

sector, particularly if the country's large infrastructure plans come into fruition, poses upside risk to our forecast for distillate fuel oil demand. This could swing the country's consumption mix away from gasoline and towards diesel, if construction growth outpaces that of passenger vehicle fuel demand growth.

**Table: Refined Products Consumption\* (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Refined products consumption, 000b/d	623.0	635.5	648.2	661.1	674.4	687.8
Refined products consumption, % y-o-y	11.0	2.0	2.0	2.0	2.0	2.0

*e/f = BMI estimate/forecast. Source: Energy Commission of Malaysia, EIA, BMI*

**Table: Refined Products Consumption\* (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Refined products consumption, 000b/d	698.2	708.6	719.3	730.1	741.0	752.1
Refined products consumption, % y-o-y	1.5	1.5	1.5	1.5	1.5	1.5

*National Sources/BMI*

## Gas Consumption

***BMI View:** Low oil prices are expected to boost gas consumption in the short term, though a shift away from gas in the power sector and the removal of gas subsidies would slow the rate of gas consumption growth in the longer term.*

### Latest Updates

- We forecast gas consumption growth to averaging 1.7% per annum between 2015 and 2024. Over this period, headline gas consumption figures are expected to increase from 32.9bcm to 38.1bcm.
- An upside risk for gas consumption comes from the low oil prices. Government failure to reduce energy subsidies could also increase the domestic demand.

### Structural Trends

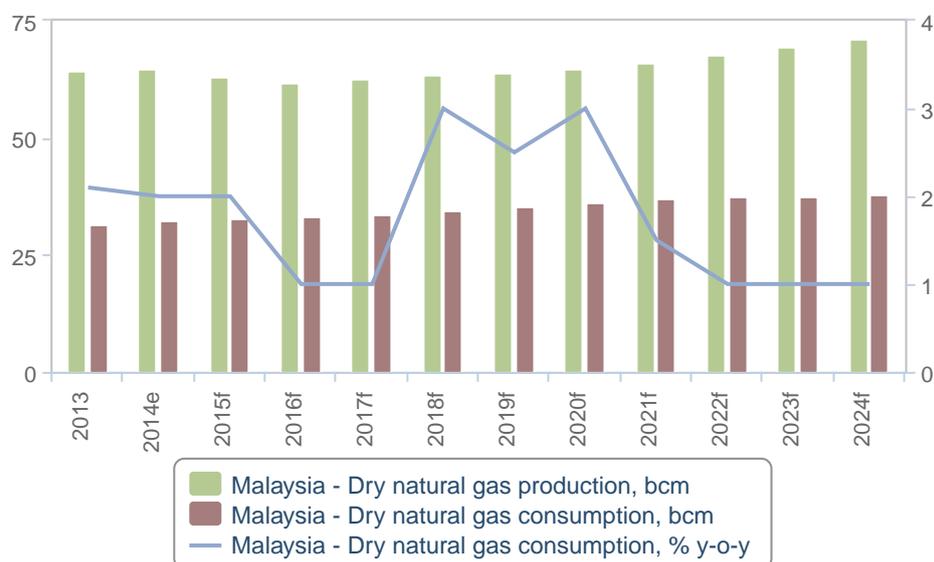
Malaysia has seen a strong growth in gas consumption in the past decade, which rose by 24.3% from 25.9bcm in 2005 to 32.2bcm in 2014. We estimate that gas consumption continued on an uptrend to come in at 32.9bcm in 2015.

The power sector is by far the largest consumer of gas in Malaysia. In 2012, it made up 56% of total gas consumption, according to the Energy Commission of Malaysia. This is also due in part to the cheap price of gas in Malaysia; Malaysian end-user gas prices are the second lowest in South East Asia, behind just Brunei.

The oil and gas industry is the second largest gas consumer, using gas primarily to re-inject for production purposes, with the industrial sector making up the third largest consumer of gas in the country.

## Gas Production and Consumption Forecast

2013-2024



e/f = BMI estimate/forecast. Source: BMI, EIA

### Low Oil Prices A Short-Term Boon For Gas Consumption

Falling oil prices could be a short-term boon for consumption. It will reduce pressure on the country to consider other sources of power such as coal, as the price of oil-indexed gas prices fall. It would also continue to support the import of gas into Peninsula Malaysia. This would help gas maintain its importance in the country, though we expect the slower pace of oil and gas developments to reduce the sector's demand for gas and offset some of the growth effects on consumption.

However, in the longer term, the slow pace of gas production will still require Malaysia to decrease its rate of gas consumption growth should it not wish to become a net importer of gas. Also, the likely removal of gas subsidies - which the removal of fuel subsidies set a precedent for - and a policy encouraging alternative power sources will also tame the rate of gas consumption growth. According to Prime Minister Najib Razak, the government loses more than MYR2.0bn (USD614mn) a month as a result of the subsidies.

We forecast consumption to grow from an estimate of 32.9bcm in 2015 to 35.4bcm in 2019. Beyond that, gas consumption is projected to reach 38.1bcm in 2024.

## Risks To Outlook

There is significant upside risk to our outlook. A decision by Malaysia to maintain an energy policy skewed towards gas would see the country raise its gas consumption, which will be enabled by the existing LNG terminal at Melaka and a planned terminal in Johor. A failure to remove gas subsidies will similarly boost consumption beyond our current projections.

**Table: Gas Consumption (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Dry natural gas consumption, bcm	31.6	32.2	32.8	33.2	33.5	34.5
Dry natural gas consumption, % y-o-y	2.1	2.0	2.0	1.0	1.0	3.0

BMI/EIA

**Table: Gas Consumption (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Dry natural gas consumption, bcm	35.4	36.4	37.0	37.4	37.7	38.1
Dry natural gas consumption, % y-o-y	2.5	3.0	1.5	1.0	1.0	1.0

f = BMI forecast. Source: EIA, BMI

## Trade - Oil

**BMI View:** While a reduction in domestic crude demand would temporarily lift Malaysian exports, in the longer term we expect a downtrend in its crude export availability. Its export market share could also be threatened by strong light, sweet competition in the market, and smaller demand in its key market in Australia. It will remain a net importer of refined oil over our forecast period, with Singapore to remain the dominant supplier of refined oil to Malaysia.

## Crude Oil Trade Forecasts

### Latest Updates

- We have kept our previous forecast and expect Malaysia's crude exports to rise sharply due to lower domestic demand arising from the ongoing consolidation of the country's refining sector. We believe crude exports will peak in 2017-2018 at around 232,800b/d.

- We expect the new Petronas RAPID refinery to become operational in late 2019. This will push downwards the crude exports to 35,510b/d in 2024.

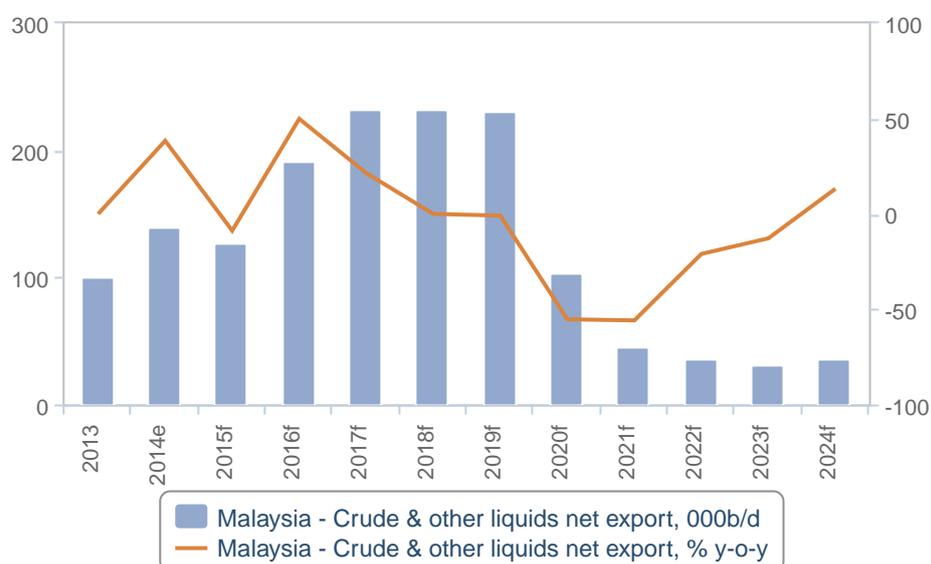
## Structural Trends

Malaysia is a net exporter of crude oil, given the slight surplus of crude oil it has compared to its total refining capacity. In 2015, we estimate net exports of crude oil and refined products came in 127,940b/d.

Despite weaker crude production projections, a considerable contraction in the country's refining capacity in 2016-2019 will lower the domestic demand of crude thus allowing greater export volumes. As such, we forecast crude exports to peak in 2017 and 2018 at 232,800b/d. However, the start-up of Petronas' 300,000b/d RAPID refinery, which we currently project will come online in the second half of 2019, will reverse this trend. Net crude oil exports are expected to fall sharply from 2020 onwards and reach 35,500b/d in 2024.

### Crude Oil Net Exports Forecast

2013-2024



National Sources/BMI

## Trade Partners

Malaysia's top 10 export markets are all located in the Asia-Pacific. In 2014, Australia was Malaysia's largest export market for crude oil, taking a 34.7% market share. India and Thailand are the second and third largest markets respectively, with Singapore, New Zealand, Japan, Philippines, South Korea, Indonesia and Papua New Guinea making up the remaining seven countries. Other export partners are China and Brunei.

It is notable that the share of North East Asian countries in Malaysia's total crude exports has fallen. This is in line with our expectations that the fall in crude prices, especially of West African light sweet crudes, will grab market share from Malaysia.

A global abundance of crude, especially of the light and sweet variety, will continue to challenge Malaysia's crude exports. Not only are West African crudes still looking for markets, the beginning of light condensate exports from the US also add to the availability of lighter grades. Low tanker rates from West Africa to Asia, thereby easing the total cost of West African crude, will pose a challenge to Malaysian crude, given that the flagship Tapis crude grade is the world's most expensive. Neighbouring countries, where shipping costs are lower, will likely take up the slack from weaker demand in North East Asia.

The reduction of crude distillation capacity in Japan and Australia between 2015 and 2017 poses further challenges to Malaysia. Given that Australia makes up the largest market for Malaysian crudes, its expected fall in crude import requirement would be of greatest significance to Malaysia.

**Table: Crude Oil Net Exports (Malaysia 2013-2019)**

	2013	2014	2015f	2016f	2017f	2018f	2019f
Crude & other liquids net export, 000b/d	101.3	140.2	127.9	191.8	232.8	232.7	230.7
Crude & other liquids net export, % y-o-y	0.0	38.4	-8.8	49.9	21.4	0.0	-0.9
Crude & other liquids net export, USDbn	3.9	4.9	2.4	3.6	4.2	4.8	5.1

*National Sources/BMI*

**Table: Crude Oil Net Exports (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Crude & other liquids net export, 000b/d	230.7	103.1	45.5	36.0	31.4	35.5
Crude & other liquids net export, % y-o-y	-0.9	-55.3	-55.9	-21.0	-12.8	13.2
Crude & other liquids net export, USDbn	5.1	2.4	1.1	0.9	0.8	1.0

*National Sources/BMI*

## Fuels Trade Forecasts

### Latest Updates

- Strong domestic demand and contraction of the domestic refining capacity will push Malaysia's refined products imports higher over the next few years. Imports are set to peak at 287,430b/d in 2019.
- The opening of the new Rapid refinery is expected to lower the imports to 153,000b/d in 2024.
- We believe Singapore will remain the key source of Malaysia's refined products imports.

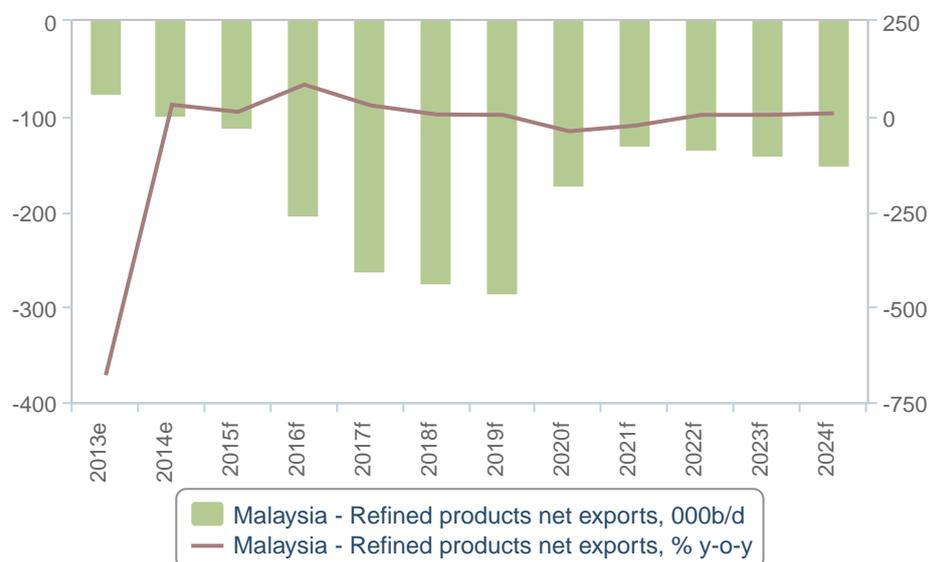
### Structural Trends

Malaysia has become a net importer of refined oil products since 2010, as domestic consumption outpaces domestic production. We estimate that it imported 112,300b/d of refined oil products in 2015, a figure which will rise to 287,400b/d by 2019 given our consumption and production forecasts. Our projections for lower domestic refined production, due to the expected reduction of refining capacity, will contribute to this uptrend.

The start-up of the RAPID refinery would relieve Malaysia's import requirement. Nonetheless, given domestic consumption growth, it would not be sufficient to revert its trade status. We expect a reduction of its net refined oil imports to 153,000b/d by 2024.

## Refined Products Net Exports Forecast

2013-2024



e/f = BMI estimate/forecast. Source: EIA/ BMI

Singapore is overwhelmingly Malaysia's largest source of refined oil imports, accounting for 50% of its refined imports. Other countries making up Malaysia's top 10 sources of imports have remained roughly similar over the past two years. With the exception of the USA and European oil hub Netherlands, all other countries in the top 10 are located either in Asia or in the Middle East. Singapore's proximity to Malaysia will ensure that it will remain a dominant supplier of refined oil products.

**Table: Refined Fuels Net Exports (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Refined products net exports, 000b/d	-77.3	-100.7	-112.3	-205.7	-264.4	-277.1
Refined products net exports, % y-o-y	-679.2	30.2	11.6	83.1	28.6	4.8
Refined products net exports, USDbn	-3.1	-4.1	-2.8	-4.8	-6.2	-6.9

e/f = BMI estimate/forecast. Source: EIA, National sources, BMI

**Table: Refined Fuels Net Exports (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Refined products net exports, 000b/d	-287.4	-174.7	-131.9	-136.8	-141.9	-153.0
Refined products net exports, % y-o-y	3.7	-39.2	-24.5	3.7	3.7	7.8
Refined products net exports, USDbn	-7.5	-4.7	-3.5	-3.7	-3.8	-4.1

f = BMI forecast. Source: EIA, National sources, BMI

## Trade - Gas (Pipeline And LNG)

**BMI View:** Malaysia's LNG exports will take a dip in the next few years due to a well-supplied global market, before recovering towards the latter part of our 10-year forecast on the back of growing demand in Asia.

### Latest Updates

- This quarter we have kept our forecast for Malaysia's gas trade. We believe the net exports will decline from 30.1bcm in 2015 to 28.3bcm in 2020, before rebounding to 33.0bcm by 2024.

### Structural Trends

Malaysia is a net exporter of gas, most of which is via LNG exports to countries in the Asia-Pacific region. It also exports 1-2bcm per year to Singapore via pipeline.

Despite our forecast for domestic gas consumption to increase, growth in gas production will support the country's gas exports. We estimate that Malaysia exported about 30.1bcm of gas in 2015. However, a more competitive LNG market in Asia, coupled with growing domestic gas consumption, would see net exports fall in the short term, before stronger demand and import infrastructure in developing countries in the region support an uptick in demand from 2020. We forecast net gas exports to rise to 33.0bcm by 2024.

#### LNG Trade

Like other nations which span the archipelagos of the Pacific, Malaysia is seeking to develop both import and export LNG capacity to meet the distinct energy needs of its separate regions.

Petronas has three major LNG production facilities at the Bintulu LNG complex in Sarawak - MLNG Satu, MLNG Dua and MLNG Tiga. These plants have a combined capacity of 25.7mn tonnes per annum (mtpa) -

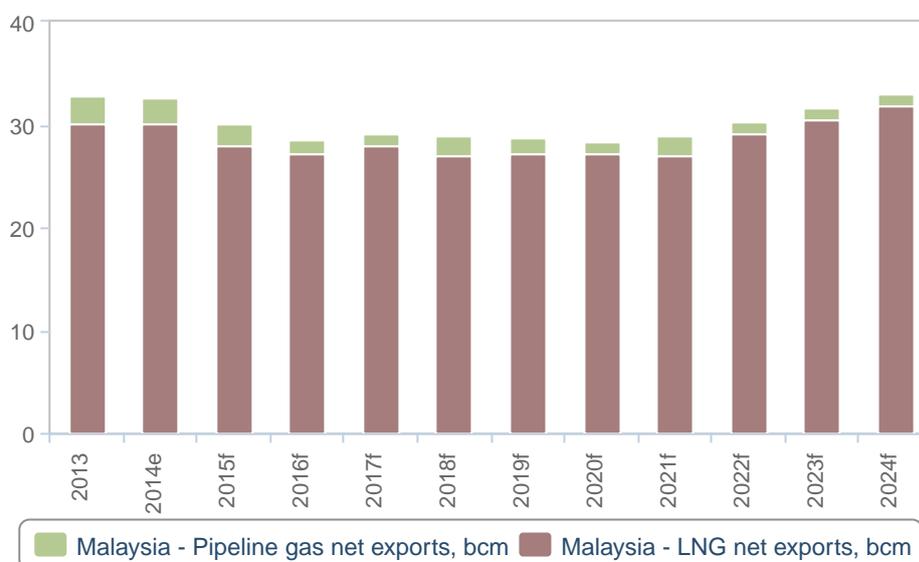
translating to 35.0bn cubic metres (bcm). Utilisation rate of the complex has been about 85-90% of its total capacity.

A few upcoming projects will expand Malaysia's LNG production capacity. The first is a floating LNG (FLNG) project designed to exploit the Kanowit gas field offshore Sarawak as well as the addition of a ninth train in Bintulu. These two projects will together add 6.6bcm to the country's LNG production capacity by 2016.

Petronas is also planning a second FLNG facility together with **Murphy Oil** - the Rotan LNG facility - which is expected to be operational in 2018 and increase LNG capacity by another 2.0bcm.

### Gas Net Exports Forecast

2013-2024



*e/f = BMI estimate/forecast. Source: EIA, BMI*

#### LNG Exports To Be Weak In Short Term, Pick Up In Long Term

However, we do not expect the roughly 25% increase in production capacity to translate into an equivalent boost to production. In a low price environment and muted demand in Asia in the short term, gas

developments feeding these terminals could slow, limiting feedstock delivered to the plants. In fact, gas production fell by 3% (year-on-year) in 2015 and we forecast this trend to continue in 2016, owing to a well-supplied regional market putting pressure on Malaysian gas sales. Moreover, the surge in Australia's LNG exports from 2016 will displace Malaysia as the largest LNG exporter in Asia. Furthermore, Australia will also ramp-up LNG exports to countries such as Japan and directly compete with Malaysia. However, we expect Malaysia's gas exports to rise strongly from 2022 as demand in Asia picks up.

### Malaysia Will Also Import More LNG

Rising domestic gas consumption, supported by an increase in import capacity, has also seen Malaysia import LNG from countries such as Brunei and Qatar. The Melaka LNG regasification terminal near Sungai Udang provides one port for imports. Two other LNG import terminals have been proposed: a terminal in Lahad Datu, Sabah, and a plant in Pengerang, Johor. Of the two, the Pengerang terminal has made more progress, though a FID for the plant has not been made. We forecast that the nation's rising demand, alongside its quest to boost the oil and gas hub status of Pengerang, will likely see the project move forward and come online at around the same time as the RAPID terminal. This would allow the country's LNG imports to rise from an estimated 3.1bcm in 2014 to about 5.9bcm in 2024.

As such, net LNG exports will be affected by its growing imports. We forecast net LNG exports to stagnate at 27.0-28.0bcm equivalent from 2015 to 2021, and subsequently rise to 31.8bcm by 2024. There is high upside risk to the tail-end of our forecast if FID for fields that are discovered in the period 2012-2015 are taken and the respective projects developed and brought online by 2024.

### Trade Partners

Japan is Malaysia's largest gas customer, representing 61% of total exports from Malaysia in 2014. It is followed by South Korea, which received 15% of total Malaysian exports. Taiwan and China are in third and fourth place with 12% and 11% respectively. With the exception of Singapore, Malaysia's exports to all these countries are in the form of LNG. Other marginal importers of Malaysian gas include Kuwait, the UAE and Thailand.

**Table: Gas Net Exports (Malaysia 2013-2018)**

	2013	2014	2015f	2016f	2017f	2018f
Dry natural gas net exports, bcm	32.8	32.7	30.1	28.5	29.1	28.9
Dry natural gas net exports, % y-o-y	6.9	-0.4	-7.9	-5.3	1.9	-0.4

**Gas Net Exports (Malaysia 2013-2018) - Continued**

	2013	2014	2015f	2016f	2017f	2018f
Dry natural gas net exports, USDbn	17.3	15.7	8.4	8.2	8.7	8.9
Pipeline gas net exports, bcm	2.8	2.6	2.1	1.3	1.2	2.1
Pipeline gas net exports, % y-o-y	30.2	-5.8	-19.4	-37.5	-10.2	75.1
Pipeline gas net exports, % of total	0.0	0.0	0.0	0.0	0.0	0.0
LNG net exports, bcm	30.1	30.1	28.0	27.2	27.9	26.9
LNG net exports, % y-o-y	6.4	0.1	-6.9	-2.9	2.4	-3.6
LNG net exports, % of total gas exports	0.0	0.0	0.0	0.0	0.0	0.0

BMI/EIA

**Table: Gas Net Exports (Malaysia 2019-2024)**

	2019f	2020f	2021f	2022f	2023f	2024f
Dry natural gas net exports, bcm	28.7	28.3	29.0	30.3	31.6	33.0
Dry natural gas net exports, % y-o-y	-0.8	-1.5	2.6	4.4	4.3	4.3
Dry natural gas net exports, USDbn	9.0	9.4	10.0	10.9	11.6	12.3
Pipeline gas net exports, bcm	1.6	1.1	2.0	1.1	1.3	1.2
Pipeline gas net exports, % y-o-y	-23.5	-30.3	86.2	-43.8	9.7	-5.4
Pipeline gas net exports, % of total	0.0	0.0	0.0	0.0	0.0	0.0
LNG net exports, bcm	27.1	27.2	27.0	29.2	30.4	31.8
LNG net exports, % y-o-y	1.0	0.2	-0.7	8.1	4.1	4.7
LNG net exports, % of total gas exports	0.0	0.0	0.0	0.0	0.0	0.0

BMI/EIA

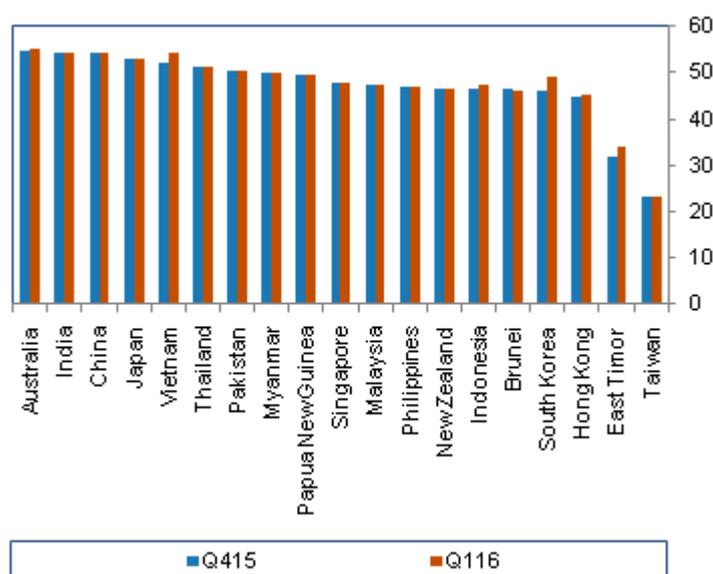
## Industry Risk Reward Ratings

### Industry Risk Reward Index

***BMI View:** Low oil prices continue to suppress Asia's Upstream Risk/Reward Index scores, slowing investment in upstream activities and hitting the region's long-term production potential. Downstream scores remain largely stable, with the exception of several emerging economies which have outperformed as a result of strong refined fuels demand growth and an improved refining sector outlook.*

### Q-o-Q Change In Regional Scores

Asia: Oil & Gas Risk/Reward Index



Source: BMI

#### Key Themes:

- Upstream scores remain largely unchanged this quarter as low oil prices continue to slow investment in upstream activities, hitting the region's long-term O&G production outlook.
- Downstream scores also remained stable, with low oil prices proving a boon for the region's net fuels importers. Persisting political uncertainty, lack of physical infrastructure and rising competition in the regional refined fuels exports market will pose downside risk to the region's Downstream RRI score in the future.

- Vietnam, Timor-Leste and South Korea saw gains in their Upstream RRI scores this quarter, largely owing to an improved reserves and production growth outlook. Diminishing state ownership of upstream assets supported Timor-Leste's scores.
- Strong refined fuels consumption gains in Hong Kong, Indonesia and Brunei, underpinned by low fuels prices, led these countries to outperform regional peers in our Downstream RRI.

**Upstream Risk/Reward Index: Low Oil Prices Dampen Long-Term Production Outlook**

**Table: Asia: Upstream Risk/Reward Index**

	Upstream Industry Rewards	Upstream Country Rewards	Upstream Rewards	Upstream Industry Risks	Upstream Country Risks	Upstream Risks	Upstream R/R Index
Australia	47.5	100.0	60.6	70.0	86.2	75.7	65.1
Myanmar	47.5	85.0	56.9	92.5	19.3	66.9	59.9
Papua New Guinea	51.3	75.0	57.2	80.0	28.4	61.9	58.6
Vietnam	52.5	70.0	56.9	55.0	42.6	50.6	55.0
China	62.5	30.0	54.4	50.0	53.0	51.1	53.4
Pakistan	48.8	77.5	55.9	55.0	30.6	46.5	53.1
Thailand	38.8	72.5	47.2	75.0	49.2	66.0	52.8
Malaysia	38.8	75.0	47.8	60.0	60.6	60.2	51.5
New Zealand	10.0	100.0	32.5	100.0	84.6	94.6	51.1
Brunei	46.3	75.0	53.4	40.0	55.6	45.4	51.0
India	50.0	47.5	49.4	40.0	59.5	46.8	48.6
Philippines	36.3	65.0	43.4	55.0	48.0	52.6	46.2
Japan	12.5	65.0	25.6	100.0	82.1	93.7	46.1
South Korea	20.0	33.0	23.0	90.0	70.0	83.0	41.0
Indonesia	32.5	55.0	38.1	35.0	45.5	38.7	38.3
Hong Kong	2.5	50.0	14.4	100.0	71.9	90.2	37.1
Singapore	0.0	50.0	12.5	100.0	73.6	90.8	36.0
East Timor	15.0	72.5	29.4	50.0	27.4	42.1	33.2
Taiwan	10.0	0.0	7.5	10.0	67.7	30.2	14.3
<b>Average</b>	<b>32.8</b>	<b>63.1</b>	<b>40.3</b>	<b>66.2</b>	<b>55.6</b>	<b>62.5</b>	<b>47.0</b>

Source: BMI

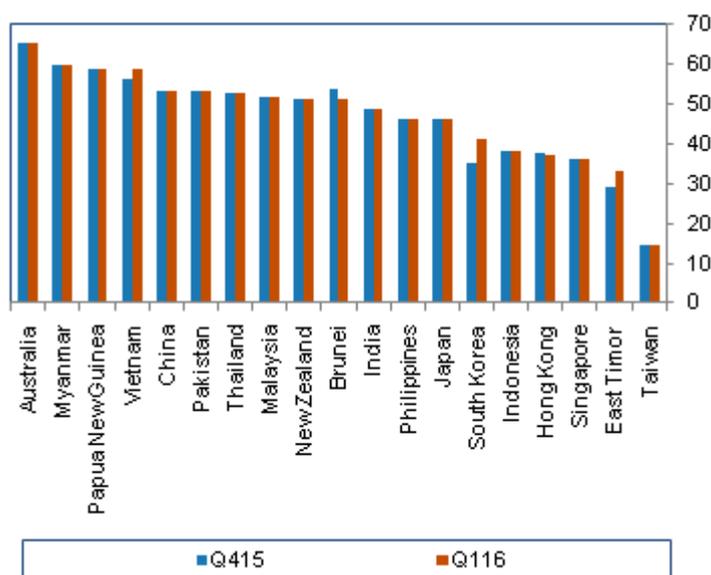
Asia's Upstream Risk/Reward Index (RRI) scores remain largely unchanged across Asia for Q116. Sustained weakness in global oil prices continues to weigh on the region's upstream scores. Investment in upstream activities has been relatively scarce as new developments in Asia generally offer smaller returns and have higher production costs compared to other parts of the world. In turn, we expect this to hit the region's long-term oil and gas (O&G) production potential.

**Better Reserves Outlook Underpin Improved Upstream Scores**

We have upgraded the Upstream RRI scores for Vietnam, Timor-Leste and South Korea. Vietnam's higher scores are a result of an improved short-to-medium term oil production growth outlook following first production at the H5 wellhead platform in the Te Giac Trang oil field, coupled with an improving O&G reserves growth forecast owing to relatively robust offshore exploration campaigns. Timor-Leste's sizable natural gas reserves and diminishing state ownership of upstream assets has boosted its Upstream Rewards score, while revised natural gas reserves estimate (accounting for newly available historical data) has led South Korea to leapfrog the likes of Indonesia, Hong Kong and Singapore in our index this quarter.

**Scores Remain Stable Across The Region**

Asia - Upstream Risk/Reward Index



Source: BMI

### Slowdown In Upstream Investment Impact Score

In contrast, Brunei fell from a respectable seventh place in the region to tenth (out of the 19 countries ranked) in our Q116 Upstream RRI. Upstream investment needed to shore up its declining O&G production has been slow amid the current low oil price environment, especially as most of Brunei's hydrocarbon resources are located in the deepwater and remote fields, which are costly to develop. The country's scores are further weighed down by its low scores for privatisation trends, political uncertainty and lack of physical infrastructure.

### Downstream Risk/Reward Index: Low Oil Prices A Boon For Fuels Consumption Growth

Table: Asia: Downstream Risk/Reward Index

	Downstream Industry Rewards	Downstream Country Rewards	Downstream Rewards	Downstream Industry Risks	Downstream Country Risks	Downstream Risks	Downstream R/R Index
India	56.7	66.0	59.0	65.0	58.9	62.6	60.1
Singapore	42.2	58.0	46.2	100.0	79.1	91.6	59.8
Japan	40.0	70.0	47.5	100.0	71.1	88.4	59.8
South Korea	33.3	68.0	42.0	100.0	81.1	92.4	57.1
Indonesia	51.1	66.0	54.8	65.0	51.4	59.6	56.3
China	57.8	54.0	56.8	40.0	67.7	51.1	55.1
Hong Kong	32.2	56.0	38.2	100.0	72.0	88.8	53.4
Thailand	35.6	58.0	41.2	75.0	58.5	68.4	49.3
Vietnam	46.7	46.0	46.5	45.0	62.0	51.8	48.1
Pakistan	43.3	56.0	46.5	50.0	52.3	50.9	47.8
Philippines	35.6	63.0	42.4	60.0	61.1	60.5	47.8
Australia	11.1	68.0	25.3	100.0	75.0	90.0	44.7
Malaysia	37.8	44.0	39.3	40.0	71.8	52.7	43.3
New Zealand	18.9	30.0	21.7	100.0	75.9	90.4	42.3
Brunei	38.9	42.0	39.7	30.0	63.1	43.2	40.7
Papua New Guinea	25.6	54.0	32.7	75.0	33.6	58.4	40.4
Myanmar	40.0	42.0	40.5	42.5	32.3	38.4	39.9
East Timor	23.3	42.0	28.0	50.0	48.2	49.3	34.4
Taiwan	26.7	34.0	28.5	20.0	74.4	41.8	32.5

**Asia: Downstream Risk/Reward Index - Continued**

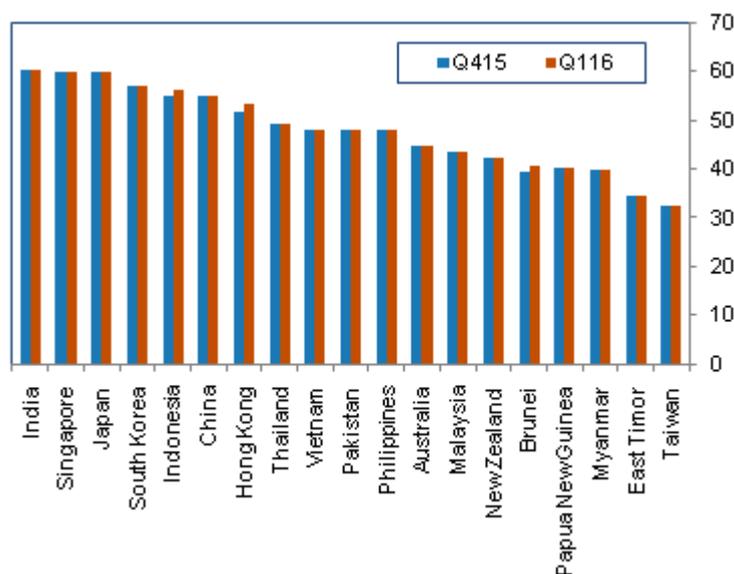
	Downstream Industry Rewards	Downstream Country Rewards	Downstream Rewards	Downstream Industry Risks	Downstream Country Risks	Downstream Risks	Downstream R/R Index
<b>Average</b>	36.7	53.5	40.9	66.2	62.6	64.8	48.0

Source: BMI

While political risks and lack of physical infrastructure continue to loom large in the region's downstream segment, Downstream RRI scores have remained largely stable across Asia, with the exception of few countries which have outperformed. This is a result of strong refined fuels consumption growth in the region's emerging economies, underpinned by solid economic growth and car sales, coupled with low oil prices which in turn have benefitted refiners. Three countries showed gains in their Downstream RRI scores this quarter, namely Hong Kong, Indonesia and Brunei.

**Net Fuels Importers Benefit From Low Oil Prices**

Asia - Downstream Risk/Reward Index



Source: BMI

### **Consumption Gains To Drive Outperformers**

Hong Kong's Downstream RRI profile continues to benefit from relatively low-risk factors, leading to high scores for privatisation trends, regulatory outlook, short-term policy continuity, short-term economic growth risk, legal framework and physical infrastructure. Moreover, although Hong Kong's consumer market is small, solid economic growth and strong auto sales growth over the next five years will nevertheless boost its refined fuels consumption and provide some support to its Downstream Rewards score.

Indonesia has overtaken China this quarter to place fifth among the 19 countries ranked in the region this quarter. Its Downstream Rewards score is boosted by large refining capacity additions planned over the next five years. Furthermore, we expect the country's growing refined fuels deficit to entail greater investment in its downstream sector over the coming years; Indonesia's decision to rejoin OPEC in December 2015 will likely pave the way for greater investment from the Middle East.

Brunei also makes gains in its scores this quarter, moving above Papua New Guinea (PNG) and Myanmar this quarter (from 17 to 15), owing to an improved refining sector outlook with the start-up of its second refinery expected over 2017-2018.

## Malaysia - Risk/Reward Index

### Malaysia Upstream Index - Overview

Malaysia's Upstream Risk/Reward Index scores are dragged down by its limited upstream market rewards, which is affected by the growing cost of production in the country. This is in spite of its relatively healthy performance for upstream market and country risks.

### Malaysia Upstream Index - Rewards

**Industry Rewards:** While scoring above regional average, Malaysia's industry rewards have been dragged down by its poorer outlook for oil production growth, which is curtailed by the country's national depletion policy and limited oil reserves growth in recent years. The fall in oil prices will also hit industry rewards, given the relatively high cost of newer developments that will prop Malaysia's growth. This has offset its healthier showing for proven gas reserves.

**Country Rewards:** **Petronas'** dominance of the market puts the state at the forefront of the market. Nonetheless, the industry is relatively competitive, with significant international oil company (IOC) involvement thanks to a well-developed sector and its good crude quality. With a score of 75, Malaysia scores relatively well in this aspect compared to other counterparts in Asia.

### Malaysia Upstream Index - Risks

**Industry Risks:** Malaysia scores slightly above the regional average in this area. While licensing terms may be more benign than some other countries in the region, they are still not as competitive as fully liberalised markets.

**Country Risks:** With a score of 61, Malaysia's broader Country Risk environment is mildly attractive. The state's relatively low scores for corruption, rule of law and physical infrastructure undermine its overall performance. However, continuity of policy across governments reduces the operational uncertainty for private companies.

### Malaysia Downstream Index - Overview

Malaysia has a relatively weak position in the Downstream industry rankings. Despite growing domestic consumption, the downstream segment is challenged by an abundantly supplied downstream market in Asia. A wider consolidation trend, especially in countries with smaller and less competitive refineries, has hit the

outlook for Malaysia as well. Depending on the state where the refinery is located, state ownership may or may not be necessary.

## Market Overview

### Oil And Gas Infrastructure

#### Oil Refineries

Malaysia has five oil refineries, providing a combined capacity of about 578,913 barrels per day (b/d), and a gas-to-liquids plant with a capacity of 14,700b/d. Three of the refineries are operated by **Petronas** (Melaka I and II and Kertih), one by **Shell's** Malaysian unit and one by **Petron**. Petronas' RAPID project paves the way for an expansion of the country's refining capacity, though this expansion could be offset by Shell's sale or conversion of its Port Dickson refinery.

**Table: Refineries In Malaysia**

Location	Name	Capacity, b/d	Status	Operation Date	Main Owner
Port Dickson	Petron Port Dickson	88,000	Active	1963	Petron
Terengganu	Kertih	49,000	Active	1982	Petronas
Malacca	Melaka-II (PSR-2)	171,213	Active	1998	Petronas
Malacca	Melaka-I (PSR-1)	100,000	Active	1994	Petronas
Port Dickson	Port Dickson	156,000	Will either be on sale or converted	1963	Royal Dutch Shell
Sarawak (Bintulu)	Bintulu GTL	14,700	Active	1993	Royal Dutch Shell
Johor	RAPID	300,000	Development	2019	Petronas
<b>Total</b>		<b>878,913</b>			
<b>Proposed Capacity</b>					
Kedah	Yan	400,000	Proposed	N.A.	Merapoh Resources
<b>Total</b>		<b>400,000</b>			

na = not available. Source: BMI, Company data

## Existing Refineries

### **Melaka (PSR-1)**

PSR-1 is based in Melaka and is owned by Petronas' subsidiary **Petronas Penapisan (Melaka) Sdn Bhd**. It has a refining capacity of 100,000b/d and processes sweet crude and condensates. It came into operation in 1994.

### **Melaka II (PSR-2)**

The Melaka II refinery, located on the same site as the Melaka I facility, is owned by the **Malaysia Refining Company**. It is operated by Petronas Penapisan. Melaka II is currently Malaysia's largest refinery, which, following expansion works in 2010, raised the plant's capacity by 45,000b/d. It now has a capacity of 170,213b/d. PSR-2 processes medium, high sulphur crude that is mostly sourced from the Middle East.

In November 2014, Petronas agreed to buy out **Phillips66**' 47% stake in Malaysia Refining Company at USD635mn in cash and other adjustments. The NOC is now the sole owner of Melaka II, and is looking for synergies between Melaka I and Melaka II.

### **Petron Port Dickson**

One of two refineries in Port Dickson, Negeri Sembilan, the 88,000b/d refinery was established in 1963. **San Miguel's Petron** acquired the refinery from ExxonMobil in August 2011.

The refinery processes mainly light and sweet crudes and its product slate includes gasoline, jet fuel, diesel, liquefied petroleum gas and low-sulphur residual fuel oil.

Unlike other foreign investors in Malaysia's refining segment who are winding down their interests, Petron is looking to upgrade its Port Dickson facility and network expansion at a cost of about USD1bn.

### **Shell Port Dickson**

Shell's Port Dickson refinery is the bigger of the two in the area with a licensed production capacity of 156,000b/d. Most of its output is consumed within Malaysia. It was also established in 1963. Its product slate includes gasoline, jet fuel, diesel, sulphur, liquefied petroleum gas and propylene.

In January 2015, Shell announced that it will 'explore options' for Port Dickson on the back of a poor outlook for refining margins. The two options it is considering are to either put the plant on sale, or to convert it to a storage terminal.

### **Kertih**

Kertih is operated by Petronas Penapisan and is based in the northern state of Terengganu. It has a refining capacity of about 49,000b/d and mainly uses local light, sweet crude for feedstock.

The refinery is part of a wider integrated petrochemical complex in the Petronas Petroleum Industry Complex.

### **Bintulu Gas-to-Liquids (GTL)**

Shell's Bintulu GTL plant - also known as Shell Middle Distillate Synthesis (SMDS) plant - is its first in the world. Based in Bintulu, Sarawak, the plant is located near gas fields and converts gas into synthetic petroleum products. The GTL plant opened in 1993 when and is capable of converting 3.92mn cubic metres per day of gas into 14,700b/d of transport fuels and products such as naphtha, kerosene, detergent feedstock and waxes.

Bintulu GTL is a JV between Shell, **Mitsubishi**, Petronas and the state government of Sarawak. In 2011, a company representative revealed that the plant was to expand its output to 29,400b/d - a doubling of its original capacity of 14,700b/d.

## **Planned Refineries**

### **Refinery And Petrochemicals Integrated Development (RAPID)**

After much delay, a FID was finally made in April 2014 for the RAPID refinery and petrochemical project, for a 2019 start. This refinery, based in the southern state of Johor in Peninsular Malaysia, will be part of a wider petrochemical complex in the town of Pengerang. The plant is part of Malaysia's plan to make Johor a major oil and gas hub in the region. The run-up to the FID has seen many obstacles, including local opposition to the project arising from the dislocation it has brought to local communities and difficulties in securing water supply.

It will have a capacity of 300,000b/d and produce Euro-4 and Euro-5 compliant gasoline and diesel, in addition to naphtha and liquefied petroleum gas. Naphtha produced would feed into petrochemical plants within the vicinity.

The entire Pengerang Integrated Complex (PIC) within which RAPID will be located within was initially estimated to cost USD20bn. However, Petronas raised the total cost of the complex to USD27bn when the FID was announced in April. RAPID alone is projected to cost USD16bn to develop. Other developments that will take place alongside the refinery include a raw water supply facility, power generation plant and a LNG regasification terminal.

## Proposed Refineries

### **Yan**

In July 2009, special purpose vehicle **Merapoh Resources** announced that it had secured investment in a USD10bn refinery in Sungai Limau, Yan, in the state of Kedah. The refinery was to be linked to the Trans-Peninsular Pipeline Project. The plant would be designed to process imported crude oil into refined products for export, mainly to East Asia.

**China National Petroleum Corporation** (CNPC) had been named as a strategic partner and was to buy 200,000b/d of the refinery's output under a 20-year deal. **Saudi Aramco** was to have been the main supplier of feedstock.

Technical and financial difficulties forced a suspension of the project. However, the project could be revived, following a cooperation agreement signed between Merapoh and **China Energy Huacheng Industrial Investment Co** (China Energy) in April 2014. Under this deal, state-owned China Energy will take a 70% stake in Merapoh while investing almost USD10bn so as to move the project forward. Merapoh is targeting a 400,000b/d refinery, which could be eventually expanded to process 800,000b/d.

We have not included production into our forecasts until more details of its customer base are available.

## Oil Storage Facilities

Malaysia has a number of oil storage facilities and has been able to take advantage of the lack of expansion space in neighbouring Singapore to increase its capacity, particularly in the south of the country. According to the Financial Times, the government had offered a 3.0% tax rate for trading companies and zero tax for companies - versus a 5.0% tax rate in Singapore - to incentivise the construction of storage capacity on the peninsula in a bid to compete with its cross-strait neighbour for title of the regional oil storage hub.

**Table: Oil Storage Facilities In Malaysia**

Name	Location	Owners	Capacity (bbl)	Type	Status
Sapangar Bay	Sabah	Sabah Ports Sdh Bhd	220,143	Refined petroleum products	Operational
Assar Oil Terminal	Sarawak	Assar Senari Port Sdh Bhd	3,144,900	Refined petroleum products	Operational
Tysun	Johor	Titan Petrochemical Group	2,012,740	Crude	Operational
Tanjung Bin	Johor	VTTI	5,597,931	Crude and refined petroleum products	Operational
Tanjung Langsat	Johor	Puma Energy, Dialog Group, MISC Berhad	2,515,900	Crude and refined petroleum products	Operational
Port Klang	Selangor	Zinol Universal Lubricants	157,250	Base oil	Operational
Gurun Hydrocarbon Hub Area	Kedah	Pristine Oil Capital	12,580,000	Crude and refined petroleum products	Construction
Pengerang	Johor	Vopak, Dialog Group, State Government of Johor	8,176,800	Crude and refined petroleum products	Operational
Tanjung Bin Phase II	Johor	VTTI	5,031,800	Crude and refined petroleum products	Planned
Pengerang Phase II	Johor	Vopak, Dialog Group, State Government of Johor	6,289,800	Crude and refined petroleum products	Planned
Tanjung Piai	Johor	Abu Dhabi	60,000,000	Crude and refined petroleum products	Proposed
Pengerang II	Johor	Concord Energy, Dialog Group	2,000,000	Crude and refined petroleum products	Proposed

Source: BMI

### **Tanjung Bin ATB Oil Terminal**

The ATB oil terminal, located in Tanjung Bin, came online in early 2012 and welcomed its first oil tanker in April 2012. The terminal is owned and operated by **VTTI**, a 50/50 venture between the **Vitol Group** and Malaysia conglomerate **MISC Berhad**. In its first phase of construction, the facility's 41 oil storage tanks provides for 840,000 cubic metres (cm), or 5.60mn bbl, of fuel oil, gasoline and middle distillates.

Work on the next phase has begun and development of a further 20 hectares of land will allow for an additional 800,000cm (5.03mn bbl) of storage, which was to come online by 2014. According to media reports this terminal is now due online in mid-2015.

### **Langsat Terminal One**

In February 2010, the Langsat Terminal One oil storage facility, in the southern Johor state, was officially opened. The MYR500mn (USD147mn) facility is part of a tripartite venture between MISC Berhad, **Dialog Group** and **PUMA** (a subsidiary of **Trafigura**). Under the first phase of development, seven 130,000cm (817,675bbl) tanks were opened in September 2009 for the exclusive use of Trafigura (which has a 20% stake in the project) and have since been used to store naphtha and diesel. A further 13 tanks with a total capacity of 270,000cm (1.7mn bbl) were due to have been commissioned in mid-March 2010, bringing total capacity to 400,000cm (2.5mn bbl).

Plans for a third 80,000cm (503,185bbl) phase for terminal one and a 176,000cm (1.1mn bbl) second terminal (also mainly for Trafigura's use) are progressing. The Langsat terminal is only 48km from Singapore, allowing it to take advantage of constrained spot storage capacity there.

### **Pengerang**

In line with government plans to develop Pengerang as a regional oil and gas hub, **Vopak** and Dialog Group made a FID to build and operate a storage terminal in the Johor town in June 2011. Initial storage capacity is at 1.3mn cubic metres (Mcm) (8.18mn bbl) and handles both crude and refined petroleum products. The terminal started operations in April 2014.

In December 2014, Petronas, Royal Vopak and Dialog Group agreed to embark on Phase II of the project, expanding its capacity by up to 2.1Mcm (13.21mn bbl). It will include 12 berths in water depths of up to

24m and capable of handling VLCCs. The additional terminal may also be able to unload and reload QMax-sized LNG vessels according to current plans.

### **Pengerang II**

In November 2013, Singapore-based **Concord Energy** and Dialog Group signed a memorandum of understanding (MoU) to look into a second crude oil and petroleum product storage terminal in Pengerang, Johor. This will be part of the wider Pengerang Deepwater Petroleum Terminal (PDPT) project. The initial capacity of this proposed terminal is 1Mcm, expandable to 2Mcm.

### **Tanjung Piai**

Abu Dhabi expressed interest in a MYR21bn (USD6.75bn) oil storage facility in Johor in March 2013. This will be part of a larger petroleum hub in the Straits of Johor, which seeks to tap on spillover demand from Singapore's Jurong Petrochemical Hub. It signed an agreement with the state's government and envisions a capacity of 60mn bbl.

In January 2015, **Benalec Holdings Bhd** scored an approval from the Department of Environment to proceed with land reclamation for the construction of the Tanjung Piai petroleum hub. However, this is likely to be contested by Singapore.

## **Oil Terminals/Ports**

Malaysia has oil tanker terminals at Lumut (Perak), Port Dickson, and Kerteh, all in peninsular Malaysia. There are also three terminals on the island of Borneo: Bintulu, Lutong and Labuan Bay.

The Labuan Crude Oil Terminal, located in Labuan Bay on Borneo, is owned by Sabah Shell Petroleum Company Ltd. The terminal deals with all crude oil produced from Shell and Petronas platforms offshore Sabah and exports oil via tankers that are loaded by single buoy mooring systems. The terminal is operated by Petronas.

A project to construct a new terminal at Kimanis, Malaysia's easternmost province of Sabah, was announced in January 2007. The Sabah Oil And Gas Terminal (SOGT), originally expected to be complete in 2010, came online in 2014. It has a capacity of 260,000b/d of oil and 12.8bcm of gas, while exporting about 25,000-70,000b/d of oil produced by the Gumusut-Kakap and eventually Malikai field. The SOGT

will receive, process, store and export oil from nearby offshore oil fields such as Gumusut and the Kinabalu non-associated gas field southwest of Sabah via a 120km underwater pipeline.

Another oil terminal project is the Pengerang oil terminal in Johor as the town builds up its status as the regional oil and gas hub. Like the storage facility, this terminal was developed by a JV between Vopak and Dialog, in conjunction with the state government of Johor. The terminal came into operation in April 2014.

## Oil Pipelines

Malaysia does not have any major oil pipelines. The most notable project that has been proposed is the Trans-Peninsular Pipeline project (TransPen), which would link the Andaman Sea and the Gulf of Thailand, and a Thailand-Malaysia pipeline.

### **Trans-Peninsular Pipeline (TransPen)**

The TransPen pipeline was proposed as a means to establish a new oil transport route between the Middle East and the South China Sea, so as to avoid the chokepoint of the Malacca Straits where there is a risk of piracy. It would be a 300km oil products pipeline through northern Malaysia that would transport refined products produced in the proposed Yan refinery in the northern state of Kedah to the city of Bachok in Kelantan along the north east coast of Malaysia. Bypassing the busy Malacca Strait, TransPen would cut three days off the oil transit time between the Middle East and China. The project was estimated to cost USD7bn.

According to **Asia Port**, TransPen is to be completed in two phases over a seven-year period from the start of construction. The first phase would be capable of transporting 2mn b/d of oil, roughly 17% of the daily volumes passing through the Malacca Strait. The pipeline's capacity would then be expanded by an as-yet unspecified amount during the second phase. CNPC and Merapoh signed a MoU on the project in 2007, which was followed by a 20-year marketing agreement in July 2009. The two firms also held discussions with Bangkok over a potential pipeline link between Thailand and the TransPen project.

However, financial problems faced by Merapoh in funding the Yan refinery project had also brought the TransPen pipeline to a standstill. An internal US document leaked by Wikileaks had suggested that this was more a pipedream than a realistic project. The revival of the Yan refinery, as suggested in June 2013, could perhaps revive the TransPen project though there were no updates on this at the time of writing.

## LNG Liquefaction Terminals

Table: Malaysia LNG Liquefaction Terminals

Name	Location	Status	Type	Capacity (mn tpa)	Capacity (bcm)	Owners	Start-Up Date
MLNG Satu	Bintulu, Sarawak	Operational	Onshore	8.40	11.59	Petronas, Sarawak Government, Mitsubishi	1983
MLNG Dua	Bintulu, Sarawak	Operational	Onshore	9.60	13.25	Petronas, Shell, Mitsubishi, Sarawak Government	1995
MLNG Tiga	Bintulu, Sarawak	Operational	Onshore	7.70	10.63	Petronas, JX Nippon, Diamond Gas, Shell, Sarawak Government	2003
Petronas FLNG	Bintulu, Sarawak	Construction	FLNG	1.20	1.66	Petronas	2015
MLNG Train 9	Bintulu, Sarawak	Construction	Onshore	3.60	4.97	Petronas	2016
Rotan	Sabah	Construction	FLNG	1.50	2.07	Petronas	2016

Source: BMI

Malaysia's LNG exports take place through three LNG terminals at a complex in Bintulu, Sarawak. The complex, known as Malaysia LNG (MLNG), is the world's biggest LNG centre with an aggregated production capacity of 25.7mn tpa (35.5bcm) spread across a total of eight trains. The three terminals receive gas from the Central Luconia area between 125km and 275km offshore Bintulu. The terminals are run by Malaysia's **Bintulu Port Holdings**, an investment holding company.

#### MLNG Train 9 & Petronas FLNG

As part of its plans to boost LNG production, Petronas is expanding the MLNG complex by adding a ninth train that is expected to come online in 2016. To tap offshore gas developed in marginal and stranded fields, the NOC is investing in a floating LNG liquefaction terminal located off the coast of Bintulu. At 1.2mn tpa (1.66bcm), it is a relatively small facility but will help unlock reserves that were previously deemed uneconomical to develop. It cut first steel in June 2013 in South Korea and its construction will be overseen by **Daewoo Shipbuilding & Marine Engineering (DSME)** and Technip, which won the EPCI contract for it in June 2012. It is expected to be commissioned in 2015 and would be one of the world's first FLNG liquefaction plants.

## Rotan FLNG

Petronas is looking into a second FLNG project offshore Sabah, to service gas from the Rotan field in Block H. Front-end engineering and design (FEED) is currently being conducted for this, as the NOC aims to bring this 1.5mn tpa (2.1bcm) plant on stream by 2018

A FID for Rotan FLNG was made in February 2014. Two consortiums will be competing for the EPCI contract when the FID is made: one consisting of **MODEC Inc, IHI Corporation, Toyo Engineering Corporation** and **CB&I**, and another that comprises **JGC Corp** and **Samsung Heavy Industries**.

## LNG Import Terminals

**Table: Malaysia LNG Regasification Facilities**

Name	Location	Status	Type	Capacity (mn tpa)	Capacity (bcm)	Owners	Start-Up Date
Melaka	Malacca	Operational	Onshore	3.80	5.24	Petronas	2013
Pengerang	Johor	Proposed	Onshore	3.50	5.24	Petronas	2017
Lahad Datu	Sabah	Proposed	Onshore	0.74	1.02	Petronas	2016

Source: BMI

## Melaka LNG

Melaka LNG (formerly known as Sungai Udang) came online in 2013, after nearly a year's delay from its start-up date of August 2012. The facility has a receiving capacity of 3.8mn tpa, equivalent to 5.2bcm.

In June 2009, Australian gas producer Santos signed a 20-year deal to supply Petronas with 2mn tpa (2.76bcm) of LNG from the Gladstone LNG export terminal in Queensland from 2015. Qatar's state-run **Qatargas** struck a LNG sales agreement with Petronas in July 2011. The two firms signed a HoA in Doha, under which Qatargas will export LNG cargoes to Malaysia for at least 20 years, starting in 2013, from its Qatargas-2 plant. Qatargas has agreed to deliver 1.5mn tpa of LNG, equivalent to 2.05bcm of dry gas and about 5% of Malaysia's annual gas demand.

### **New Proposed Terminals**

Two other LNG import terminals, located in Pengerang (Johor) and Lahad Datu (Sabah) are expected to come on stream in 2016. A consortium consisting of Dialog Group, the Johor government and Royal Vopak will jointly develop an LNG storage, loading and regasification terminal as part of the wider development of Pengerang. The terminal will import LNG for trading purposes as well as for domestic consumption. FIDs for these regasification terminals are expected in 2014.

Malaysia-based Dialog Group and Petronas agreed to jointly develop the Johor regasification facilities in November 2014. The project is expected to cost about MYR2.7bn (USD807mn). The facilities will include a regasification unit and two 200,000 cubic metre LNG storage tanks with an initial annual capacity of 3.5mn tonnes of natural gas. Petronas Gas will acquire a 65% interest, while Dialog will acquire 25% and Johor state will hold the remaining 10% interest. The plant is projected to come online in Q417.

### **Gas Pipelines**

The main domestic gas pipeline in Malaysia is the Peninsular Gas Utilisation (PGU), owned by Petronas subsidiary **Petronas Gas**. The 35km first phase of the PGU (PGU I) was completed in 1984 and links Tok Arun with a 2.58bcm gas processing plant in the port of Kerteh in the north east of the country. The second phase (PGU II) extends this pipeline southwards to the town of Segamat in Johor state before it runs south east to Pasir, where it branches into two sections - linking to Gudang and Johor Bahru - and thereafter to Singapore across the Straits of Johor.

Another branch of the PGU II runs north west along the Malacca Straits to Serdang, just north of Kuala Lumpur. The pipeline links three 2.58bcm gas processing plants and has a total length of 714km. PGU II was completed in 1992. The third phase (PGU III) extends the north-western branch of PGU II to near Kangar and includes two gas processing plants, each with a capacity of 5.16bcm, and a 5.16bcm Dew Point Control Unit.

The three sections of the PGU pipeline are supported by two additional loops, PGU Loop 1 and PGU Loop 2, which run from Kertih to Segamat (265km) and from Segamat to Meru (227km) respectively. There is also a multi-product pipeline, known as PGU IV, which runs from Dengkil in the north to Melaka in the south via Port Dickson, where it is linked to PGU II.

### **Trans-Thailand-Malaysia Gas Pipeline System**

The PGU is linked to an international pipeline known as the Trans-Thailand-Malaysia Gas Pipeline System, which starts at the town of Changlun in Kedah state. The pipeline links offshore fields in the Malaysia-Thailand joint development area to Malaysia, coming ashore north of Songkhla in Thailand, running south for 86km to the Thailand-Malaysia border, and linking into Malaysia's PGU system through a 9km interconnector in Perlis State.

In July 2013, the engineering and construction contract for the pipeline was awarded to Malaysia's largest oilfield services firm **SapuraKencana** for a period of three years.

### **Malaysia-Singapore Gas Pipeline**

The 1.55bcm Malaysia-Singapore pipeline is the southern extension of the PGU II spur to Johor Bahru and was the first cross-border pipeline in the Association of South East Asian Nations.

## **Malaysia Energy Market Overview**

### **Regulatory Structure**

#### **Key Legislation**

The country's energy policy goals were originally set out in the National Petroleum Policy, formulated in 1976. The policy has three elements.

- 1 Ensure adequate supplies at reasonable prices in order to support Malaysia's economic development. By implication this means that Malaysia's energy reserves are primarily earmarked to serve national needs.
- 2 Second, to promote greater Malaysian involvement in oil and gas projects and to improve the investment climate. Particular mention was given to the downstream segment.
- 3 Third, to manage Malaysia's hydrocarbon resources by controlling the rate of use of the country's reserves. This rate is supposedly determined by social, economic and environmental factors.

This third element of the country's hydrocarbons policy was elaborated in 1980 through the National Depletion Policy.

The National Petroleum Policy was supplemented in 2008, by an additional set of objectives published by the energy ministry. The elements relevant to the hydrocarbons industry are:

- 1 To secure supply (partly through diversification of energy sources);
- 2 Match supply and demand through forecasting and pricing;
- 3 Promote competition and create an energy supply plan;
- 4 Ensure the efficient use of energy;
- 5 To monitor and minimise negative environmental impacts.

**Relevant Government Ministries**

Energy policy in Malaysia is set and overseen by the Economic Planning Unit (EPU) and the Implementation and Coordination Unit (ICU), which report directly to the Prime Minister.

## Regulatory Bodies

The Petroleum Development Act of 1974 established Petronas as a state-owned company with exclusive rights of ownership, exploration and production. According to Malaysia's energy ministry, Petronas is also responsible for all upstream planning, investment and regulation. As of 2014, the Malaysia Petroleum Management division within Petronas is responsible for the country's upstream regulation and governance.

Downstream activities are regulated by two bodies under the Petroleum Regulations of 1974. The Ministry of International Trade and Industry is responsible for all licences for the refining, processing, and petrochemicals sectors, while the Ministry of Domestic Trade and Consumer Affairs is responsible for licences for the marketing and distribution of petroleum products.

## National Oil Company

State-owned energy firm **Petroleum Nasional Berhad** (Petronas) dominates both the upstream and the downstream segments of Malaysia's oil and gas industry, and is also the single largest contributor to government revenues. Privatisation is not on the near-term agenda.

## Fiscal Regime

**Table: Malaysia - Upstream Tax Regime**

Income Tax	Royalties	Fees and Bonuses	Petroleum Income Tax	Resource Rent Tax	Export Duty	Import Duty
25%*	10% of gross production	Payable to Petronas prior PSC signing.	38%*	None	10%	Oil and gas industry is exempt.

\*exemptions apply. Source: Ernst & Young, BMI

The taxation of income from petroleum operations in Malaysia is governed by the Petroleum (Income Tax) Act 1967 (PITA) whereas income derived from non-petroleum operations is subject to tax under the Income Tax Act 1967.

In late 2010, the government released details of tax incentives designed to boost investments in both EOR and exploration and development of marginal oil fields. The income tax rate for marginal fields was

dropped from 38% to 25%, and the government cancelled export duties on total oil production from these small fields.

In addition, the government provided incentives to reduce the tax burden for companies developing difficult or capital-intensive projects such as EOR, high-pressure, high-temperature (HPHT) fields and oil infrastructure projects. For example, Malaysia provided income tax allowances of up to 100% of capital expenditure (capex) for EOR projects.

## Licensing Regime

**Table: Malaysia - Contracts and Licensing Regime**

Main Contract Type	State Participation	Local Content Requirement	Domestic Supply Requirement	Stabilisation Clause	Arbitration
PSC	Yes - 15% stake in all upstream projects.	Payments to non-resident contractors are subjected to 13% charge.	Only in the case of emergency - 50%.	None.	ICSID member

Source: BMI, EY & Young

Upstream production is concentrated in six major basins:

- Peninsular Malaysia: Malay Basin, Penyu Basin;
- Sarawak: Sarawak Basin;
- Sabah: Sabah Basin, Northeast Sabah Basin and Southeast Sabah Basin.

Petronas holds exclusive ownership rights to all exploration and production (E&P) projects in Malaysia and all foreign and private companies must operate through production sharing contracts (PSC) with it. Petronas is required to hold a 15% minimum equity stake in PSCs with all foreign and private companies. There are about 70 PSC contractors in the country. The national oil company is also dominant in the midstream sector, controlling most of Malaysia's assets in this segment.

## Competitive Landscape

- State-controlled **Petronas** accounts for around two-thirds of the country's oil and gas production, almost 60% of the country's refining capacity and 30% of the fuels market through its Dagangan subsidiary. Petronas in November 2014 reached an agreement with Phillips 66 Asia Ltd to acquire its 47% interest in Malaysian Refining Company (MRC), which will result in Petronas wholly owning MRC. Under the terms of the agreement, Petronas will pay USD635mn in cash with adjustment at completion. MRC was commissioned in 1998 and has a refining capacity of 170,000b/d.
- Petronas will continue to implement cost-saving measures, focus on areas where there will be growth and value, and look for foreign opportunistic acquisitions to safeguard itself from the volatile oil market, reports Bernama. In this regard, the company is leading an industry-wide effort, the Cost Reduction Alliance initiative, involving 25 petroleum arrangement contractors, to implement a structural change in the oil and gas upstream business environment in Malaysia. The company will also maintain its priority towards Malaysia, which now accounts for around 65% of Petronas' business, noted Executive Vice President/CEO of Upstream Wee Yeow Hin.
- Petronas is slashing its 2016 dividend to the government by nearly 40%, after its quarterly profit fell 91% on weak global crude oil prices. The firm is being forced to shrink its contributions, compounding the woes of the country. Petronas said in November 2015 that it will pay MYR16bn in dividends to the government in 2016, down from MYR26bn in 2015. Its net profit for July-September tumbled to MYR1.4bn from MYR15.1bn in the same period a year earlier.
- **Petronas Carigali** is the principal upstream unit and works alongside a number of international oil companies (IOCs) and independent oil companies through production sharing contracts (PSCs) to exploit Malaysia's hydrocarbons resources. The unit is highly active internationally, taking operatorship positions as well as junior partner roles in key exploration provinces. The Petroleum Management Unit of Petronas acts as resource owner and manager of Malaysia's domestic oil and gas assets, managing the effective exploitation of hydrocarbon resources.
- Petronas has set up a subsidiary, which is to manage the firm's operations in small, marginal and mature fields. Also known as **Vestigo Petroleum**, its attention on marginal fields will allow the parent company to focus on 'larger and more technically complex' field developments as the firm looks further into the country's underexplored deepwater potential.
- **Shell** and Petronas have signed two new PSCs for enhanced oil recovery (EOR) projects offshore Sarawak and Sabah, Malaysia. The companies are planning to jointly spend USD12bn over a 30-year period and are targeting a near 14% increase in recovery factors.
- **Shell Refining Company** will explore options including the sale of its Port Dickson refinery or the conversion of its operations to a storage terminal in the face of the poor outlook for refining margins, it said in January 2015. 'The board has concluded that refining margins are expected to remain depressed due to overcapacity in the global refining industry,' it said in a filing with Bursa Malaysia, adding that it is exploring suitable long-term options.
- ExxonMobil is one of the country's leading foreign oil and natural gas producers. Oil production, however, has fallen considerably in the past five years. Gas output has remained steady. Net production in 2014 averaged 33,000 barrels per day (b/d) of liquids and 3.5bn cubic metres (bcm) of gas.
- **EQ Petroleum Production Malaysia** has bought ExxonMobil's stake in the Seligi oil field and PM8 PSC offshore Malaysia. EQ is a wholly owned subsidiary of UK oil and gas exploration company **EnQuest**. The agreement is part of the company's strategy to expand its presence in Malaysia. EnQuest has taken over operatorship from ExxonMobil and holds a 50% participating interest, with Petronas Carigali holding the remaining 50%.

- **Chevron** operates the **Caltex** network of around 420 fuel retail sites and has a target of opening up to 30 new retail sites annually. The company also operates three terminals in Malaysia: Pulau Indah, Prai and a joint venture in Pasir Gudang.
- In 2014, **Murphy Oil's** Malaysia net production was about 63,000 barrels of oil equivalent per day (boe/d) after selling a 30% stake in its Malaysian assets to Indonesia's **Pertamina** for USD2bn in cash, with the payment being received in two stages.
- **Talisman Energy** is a 41% stakeholder in the offshore PM-3 CAA development area between Malaysia and Vietnam. In 2014, Talisman's net share of production in Malaysia averaged 38,000boe/d, which accounted for approximately 30% of Talisman's total Southeast Asia production. **Repsol** of Spain is the new owner of Talisman.
- **ConocoPhillips'** involvement in Malaysia consists of interests in five blocks in varying stages of exploration, development and production. Four of these blocks are located off the eastern Malaysian state of Sabah: Block G, Block J, the Keabangan (KBB) Cluster and SB 311. These four blocks include eight discovered fields. The fifth block, Block 3E, is located offshore Sarawak. ConocoPhillips operates both SB 311 and Block 3E.
- **Murphy Oil** revealed that it has successfully drilled two exploration wells offshore Sarawak, Malaysia, with the firm now evaluating development options for these finds, the company said when releasing its third quarter 2015 results. 'The company successfully drilled both the Merapuh 5 and Marakas wells with positive results and is continuing to evaluate development options,' Murphy said in a press release. The firm however failed to encounter commercial quantities of hydrocarbons at the Paus-Kelasa well, which was expensed as a dry hole during the quarter.

**Table: Key Players - Malaysian Energy Sector**

Company	2011 Sales (MYRbn)	% Share Of Total Sales	No. Of Employees	Year Established	Total Assets (MYRbn)	Ownership (%)
Petronas	222.8*	60	36,027	1974	477.6*	100% state
ExxonMobil Malaysia	na	1.8	2,000	1961	na	100% ExxonMobil
Shell Malaysia	na	1.9	7,000	1911	na	100% RD Shell
Caltex Oil Malaysia	na	0.3	250	1937	na	100% Chevron
ConocoPhillips	na	0.1	200e	na	na	100% ConocoPhillips
Murphy Oil	6.8	49	400	1999	na	100% Murphy Oil
Hess	na	na	80e	1998	na	100% Hess
Talisman Energy	na	na	na	na	na	100% Talisman

\*Figures reflect performance from April 1 to December 31, due to changed in financial year end; e = estimate; na = not available. Source: Company data, BMI

## Company Profile

### Petronas

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#### Strengths

- Biggest domestic oil producer.
- Unrivalled access to exploration acreage.
- Operates national refining system.
- Substantial share of fuels distribution segment.
- Well-established partnerships with IOCs.

#### Weaknesses

- Limited financial or operational freedom.
- Some cost and efficiency disadvantages.
- Medium-term decline in crude production.
- Rising investment requirement.

#### Opportunities

- Considerable untapped gas export potential.
- Rising domestic energy consumption.
- New marginal fields strategy.
- Large areas of under-explored territory.

#### Threats

- Long-term fall in domestic oil production.
  - Competition in regional LNG supply.
  - Changes in national energy policy.
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**Company Overview** State-owned Petronas not only dominates the Malaysian energy sector, but has become one of the most successful national oil companies in terms of geographical diversification. It has fully integrated oil and gas operations, beginning with the exploration for and development and production of crude oil and natural gas, both in Malaysia and overseas. It is a significant player in liquefied natural gas (LNG) processing, transport and sale, and has extensive gas pipeline interests. The Petronas refining and marketing arm is the key player in the domestic market, with diversification into petrochemicals.

**Strategy** Petronas will continue to implement cost-saving measures, focus on areas where there will be growth and value, and look for foreign opportunistic acquisitions to safeguard itself from the volatile oil market, reports Bernama. In this regard, the company is leading an industry-wide effort, the Cost Reduction Alliance initiative, involving 25 petroleum arrangement contractors, to implement a structural change in the oil and gas upstream business environment in Malaysia. The company will also maintain its priority towards Malaysia, which now accounts for around 65% of Petronas' business, noted Executive Vice President/CEO of Upstream Wee Yeow Hin.

Petronas anticipates its floating liquefied natural gas (FLNG) facilities will unlock more opportunities in global projects, reports Bernama, citing a company statement. Petronas has already received enquiries from multinationals about its first FLNG facility, the PFLNG1, which is scheduled to start operations in early 2016, noted the company's Global LNG Project, Upstream Vice President Adnan Zainal Abidin. Petronas has two FLNGs in the pipeline, the PFLNG1, developed at an investment of over USD1bn, and the PFLNG2, expected to be ready by 2018. The company hopes to monetise gas fields that were earlier considered too small or stranded, using the new FLNG facilities.

The Malaysian state of Sarawak is negotiating with Petronas to seek more royalty for its oil and gas, according to Chief Minister Tan Sri Adenan Satem. The minister is pursuing talks till there is a positive response since the oil and gas is offshore Sarawak. Petronas recently agreed to provide contracts worth MYR2.1bn (USD570mn) to local companies in Sarawak.

Petronas agreed to distribute contracts to companies in Sarawak state under an agreement to boost local participation in the oil and gas sector. Sarawak's Industrial Development Minister Amar Awang Tengah Ali Hassan stated that the value of the contracts would be increased annually. The move is the result of negotiations between the national oil company and state government, where contracts and business opportunities were one of the five areas of discussion. The state has been successful in developing the upstream segment and entered downstream with the production of LNG and other petroleum products despite the challenging atmosphere in the oil and gas industry.

The company has long been planning a major strategic review of its extensive asset portfolio and is expected to place greater emphasis on developing domestic oil and gas

prospects. This could result in a reduction in international exploration and production (E&P) investment and a consequent downsizing of the global upstream portfolio. Malaysia would like to see a higher level of domestic E&P activity to boost energy self-sufficiency. Petronas may eventually limit its global presence to large stakes in key hydrocarbons plays.

Malaysian daily Business Times cited unnamed sources as saying Petronas was targeting Brazil, Russia, India, China and South Africa, which have a combined nominal gross domestic product of more than USD16bn. 'Brazil, Russia, South Africa and China have huge land base and there are a lot of opportunities for exploration and production works in these markets,' the source was quoted as saying. 'But the first hurdle Petronas has to go through is the political and country risk. That is what Petronas is concerned about.' Once that is done, the next step is to move in. It sounds easy, but there will be a lot of work involved. The last is, of course, the cost.'

In India, the source said Petronas was targeting the energy sector but noted that there were a number of barriers to doing business in the country. The source also told the paper that Petronas was looking to balance its portfolio from about 30% oil and 70% gas, currently, to a more balanced 50:50 mix. Business Times also quoted its source as saying the company was confident on prospects in Myanmar and Iraq.

Petronas in November 2014 announced it has reached an agreement with Phillips 66 Asia Ltd to acquire its 47% interest in Malaysian Refining Company (MRC), which will result in Petronas wholly owning MRC. Wan Zulkiflee Wan Ariffin, Chief Operating Officer and Executive Vice President & CEO Downstream, said, 'Our acquisition of Phillips 66's interest in MRC will enable us to realise greater synergy between our refineries in Melaka and it will also strengthen our presence in the refining and trading businesses.' Under the terms of the deal, Petronas agreed to pay USD635mn in cash with adjustment at completion. MRC was commissioned in 1998 and has a refining capacity of 170,000b/d. The refinery is located in Melaka, Malaysia.

Petronas Carigali has formed a new subsidiary, Vestigo Petroleum, according to Oil Voice. The new unit will be charged with developing and producing its parent's small, marginal and mature fields in Malaysia and overseas. Its attention on marginal fields will allow parent company Petronas Carigali to focus on 'larger and more technically complex' field developments as the firm looks further into the country's underexplored deepwater potential.

Vestigo Petroleum has been awarded its first risk service contract (RSC) to develop oil in the Tembikai field offshore Terengganu, Malaysia, according to Datuk Mohd Anuar Taib president of Petronas Carigali. Vestigo aims to produce 30,000-50,000 barrels of oil equivalent per day (boe/d) within the next three years. First oil from the Tembikai development is expected by mid-2015.

Petronas, Petronas Carigali and Shell Malaysia have expanded the terms of the 2011 Baram Delta (BDO) PSC for enhanced oil recovery projects (EOR) offshore Sarawak (2011 Baram Delta EOR PSC) to include gas rights. With the signing of the Heads of

Agreement (HOA) for Baram Delta Gas Gathering Project 2 (BARDEGG2), associated and non-associated gas rights linked with the Baram Delta Operations will be incorporated into the 2011 Baram Delta EOR PSC, said Shell Malaysia in a statement in July 2014.

The Tukai Timur field, previously part of the SK307 PSC, will also be integrated into the 2011 Baram Delta EOR PSC enabling non-associated gas to be developed as part of a single integrated development project. With the expansion of the 2011 Baram Delta EOR PSC, Shell and Petronas Carigali would gain access to gas rights not previously included under the 2011 Baram Delta EOR PSC, it said.

BARDEGG2 and Baronia EOR projects will be undertaken as a single integrated development project that is operated by Petronas Carigali. The projects will see a new central processing platform located at the Baronia field which will initially extract non-associated gas from the Baronia field. Together with the existing associated gas production, it will be used for re-injection together with water into the Baronia reservoir to enhance oil recovery. Excess gas and Tukai Timur gas would be sold to Petronas for domestic supply in Bintulu and Miri, and for export to the Bintulu Petronas Malaysia LNG complex, it added.

Shell will develop the E6 field in the SK308 production sharing contract. The development concept leverages on existing infrastructure by evacuating gas from E6 to the E8 platform and crude oil to D35, according to Shell and its joint venture partner Petronas Carigali. 'The development will enable Shell to sustain gas supply to the Tiga LNG plant and produce crude oil concurrently by 2017,' Shell Malaysia Chairman Iain Lo said. Shell is the operator of the field with a 50% stake, while Petronas Carigali holds the remaining 50% (The Star Online).

This streamlining of operations will allow Malaysia's marginal fields to be given due attention as high oil prices and technological advancements improve the economics of developing these fields, which the country defines as fields with 30mn boe or less. Petronas had previously cited oil prices of USD55-60 per barrel (bbl) as the minimum breakeven cost needed to produce from these fields. According to Petronas, there are 106 marginal oil fields in Malaysia and together they hold about 580mn bbl of oil - more than 10% of existing oil reserves as recorded by the US Energy Information Administration (EIA) as of the start of 2013.

Petronas plans to implement improved oil recovery (IOR) and enhanced oil recovery (EOR) technologies to boost domestic production by 150,000b/d by 2020. Adif Zulkifli, vice president for the company's petroleum management exploration and production business, said the IOR and EOR projects would lead to a 40-50% improvement in oil recovery, compared with a 35% average improvement through traditional methods. He added the projects had also 'reduced the declining oil production to between 2% and 3% from 8% and 10% without the technology' (Business Times).

Local fuels distributor Petronas Dagangan is to continue pursuing a growth strategy to increase its market share in petroleum products and improve profitability, while also

investing in higher yielding businesses. Investment is going towards its fast-growing and profitable retail business to build and upgrade its service stations, while the remainder is for added investments in its commercial, LNG and lubricants businesses.

Petronas has given the go-ahead to the final investment decision (FID) for the Pengerang Integrated Complex (PIC) in south Johor with a commitment of USD27bn, but the project will start up a year later than expected in 2019. The FID marks a 'significant milestone' for PIC, of which the Refinery and Petrochemical Integrated Development (Rapid) is a key component, Petronas said in an April 2014 statement. Rapid, an anchor project of the Economic Transformation Programme, is estimated to cost about USD16bn and its associated facilities, USD11bn. But based on current progress, Petronas acknowledged that the refinery would only be commissioned by early 2019.

In July 2012, Petronas agreed to buy Canadian natural gas producer Progress Energy Resources for CAD5.5bn, marking the latest foray into the North American energy patch by an Asian company. Petronas also said it plans to build an LNG export terminal in Prince Rupert, British Columbia, off Canada's western coast.

For Petronas, the deal represented its biggest foreign acquisition attempt so far, surpassing its USD2.5bn purchase in 2008 of 40% the Gladstone LNG project in Australia. The deal received approval from the Canadian government, which rules on big foreign takeovers based on whether they will have a 'net benefit' for the country. The deal gave Petronas control over Progress Energy's fields in the Montney shale-gas basin in north-east British Columbia. Thought to be one of the richest shale-gas basins in North America, the basin also is one of the farthest from major markets, making it ideal for LNG.

Malaysia-based Dialog Group and Petronas Gas will develop LNG regasification facilities in Pengerang in Southern Johor, Malaysia. The project is expected to cost about MYR2.7bn (USD807mn). The facilities will include a regasification unit and two 200,000 cubic metre LNG storage tanks with an initial annual capacity of 3.5mn tonnes of natural gas. Petronas Gas will acquire a 65% interest, while Dialog will acquire 25% and Johor state will hold the remaining 10% interest.

Petronas is planning to invest some MYR15bn in the state over the next five years to increase the production of LNG, says Malaysia LNG Group of Companies (MLNG) managing director and chief executive officer Zakaria Kasah. Speaking at the launching ceremony of Biodiversity, Environment and Conservation (Beacon) project in April 2013, he said Petronas, through its subsidiary MLNG, would implement more than 10 capital projects in Bintulu within the next five years.

'One of the projects is the Train 9 project, which is a new LNG processing plant with a capacity of 3.6mn tpa. This new processing train will be able to increase Petronas LNG Complex (PLC) production capacity to 29.3mn tpa by 2016 from 25.7mn tpa

currently.' MLNG would also undertake various plant improvements and value creation projects in the PLC to sustain and enhance its production capacity, added Zakaria.

Japan-based JX Nippon Oil & Gas Exploration Corporation has signed a PSC with Petronas for Deepwater Block 2F offshore Malaysia. Under the terms of the PSC, JX Nippon will acquire a 40% interest in Block 2F, which covers an area of around 5,500sq km and is located in north-west Sarawak. Subsequent to the acquisition, JX Nippon will become the operator of the block, while Petronas will hold a 40% stake and GDF Suez E&P Malaysia the remaining 20%.

The company is planning to build a Canadian LNG terminal located in Prince Rupert, British Columbia. It will process natural gas extracted by subsidiary Progress Energy and ship it through a pipeline built by TransCanada Corporation, according to the project's website. Petronas will invest CAD36bn to develop the LNG project. This figure includes Petronas' cost of acquiring Progress Energy, building the terminal and the pipeline, and completing upstream activities such as drilling wells, said Greg Kist, president of Pacific NorthWest LNG, the Petronas-owned company that will operate the LNG terminal. Shipments are expected to begin in 2018, he said.

Petronas has agreed to divest a 25% stake in its Canadian shale gas assets to unnamed companies from India and Asia, according to president and CEO Shamsul Azhar Abbas. This follows the sale of a 10% stake in Progress Energy Resources and an integrated shale gas development and LNG project to Japan Petroleum Exploration, as well as another 3% stake to Petroleum Brunei. Overall, the company plans to sell up to 50% of its Canadian assets. According to Shamsul, the company is in advanced talks with other buyers for the remaining 12% (Upstream).

Malaysia-based Ophir Production (OPSB) has signed a seven-year small field risk service contract with Petronas to develop and produce petroleum from the Ophir field in Terengganu, offshore Malaysia. The approved field development plans include drilling of wells, installation of a production platform, export and storage of oil using a floating storage facility. The development phase will cost about USD135mn, with first oil production expected by February 2016. OPSB is a joint venture between Australia's Octanex with a 50% stake, Scomi Energy Services' subsidiary Scomi D&P holding a 30% stake and Petronas Carigali's subsidiary Vestigo Petroleum with the remaining 20% stake.

Malaysian oilfield services provider SapuraKencana Petroleum Berhad (SKPB) will acquire the entire interest in three blocks offshore Vietnam currently held by Petronas. The transaction valued at USD400mn and SKP is entitled to net revenues from these blocks starting January 1 2014. 'The transaction gives SapuraKencana an immediate foothold in the promising oil provinces offshore Vietnam with cash generating assets that will be earnings accretive to the group,' SKPB CEO Shahril Shamsuddin said (Reuters).

Petronas is looking to buy Statoil's 20% stake in the Trans Adriatic Pipeline (TAP) project, reports Bloomberg. However, no final decision has been made so far, and

Petronas may not pursue the acquisition. Statoil reportedly plans to exit the project, which seeks to supply gas from the Caspian basin to Europe. From 2018, the 870km TAP pipeline will initially deliver 10bcm of gas yearly from the Shah Deniz gas field in Azerbaijan through Greece and Albania to Italy. The pipeline, which is expected to eventually be able to supply 20bcm of gas a year, will connect to the Trans-Anatolian Natural Gas Pipeline, a pipeline that will be extended 1,841km into Turkey. BP and State Oil Company of the Azerbaijan Republic (SOCAR) each hold 20% in the TAP, while Fluxys Belgium holds 19%, Enagas 16% and Axpo 5%.

#### **Market Position**

Owned entirely by the Malaysian government, Petronas not only dominates the Malaysian energy sector, it has become one of the most successful national oil companies in terms of geographical diversification. It has fully integrated oil and gas operations, beginning with the exploration for and development and production of crude oil and natural gas, both in Malaysia and overseas. It is a significant player in LNG processing, transport and sale, and has extensive gas pipeline interests. The Petronas refining and marketing arm is the key player in the domestic market, with diversification into petrochemicals.

Petronas Carigali is the principal upstream unit and works alongside a number of international oil companies and independent oil companies through production sharing contracts (PSCs) to exploit Malaysia's not inconsiderable hydrocarbons resources. The unit is highly active internationally, taking operatorship positions as well as junior partner roles in key exploration provinces. Petronas' Petroleum Management Unit acts as resource owner and manager of Malaysia's domestic oil and gas assets, managing the effective exploitation of hydrocarbon resources.

The Petronas Gas & Power business aims to be a leading integrated gas, LNG and power player. The unit has been restructured and streamlined into two major portfolios, namely a Global LNG business and an Infrastructure, Utilities & Power division.

Currently, the LNG unit comprises the production and sale of LNG through domestic operations in Bintulu, Sarawak and overseas operations in Egypt. Petronas operates one of the world's largest LNG facilities in Bintulu, which consists of three plants, MLNG, LNG Dua and MLNG Tiga, with a combined capacity of 24mn tonnes per annum (tpa).

Petronas is also involved in LNG and energy trading activities through its marketing arms in Malaysia and Europe. The group commands a sizeable LNG market share in the Far East, having sold more than 7,000 cargoes since the establishment of its first LNG plant in 1983.

The group's Infrastructure, Utilities & Power business focuses on ensuring long-term security and sustainability of the gas market in Malaysia, while expanding its portfolio in other high growth markets. Through its majority-owned subsidiary, Petronas Gas Berhad (PGB), the group operates the peninsular gas utilisation (PGU) system, comprising six processing plants and approximately 2,505km of pipelines to process

and transmit gas to end-users in the power, industrial and commercial sectors in peninsular Malaysia. Petronas also exports gas for power generation to Singapore.

The PGU system is the basis for the development of Malaysia's offshore gas fields, the use of natural gas products for power generation and utilities, and the expansion of the country's petrochemical industry through the use of gas derivative products, such as ethane, propane, butane and condensates. PGB is also developing Malaysia's first LNG re-gasification terminal in Melaka, which was completed in June 2012. This will facilitate the import of LNG by Petronas and third parties.

Globally, Petronas has investments in pipeline operations in Argentina, Australia, Indonesia and Thailand, as well as gas storage and LNG re-gasification facilities in Europe.

In the downstream oil segment, Petronas attempts to add value to its upstream production activities through refining, marketing and trading activities, as well as in the production of petrochemicals. Petronas owns and operates three refineries in Malaysia, two in Melaka (collectively known as the Melaka Refinery Complex) and another in Kertih (the Kertih Refinery). The first plant in Melaka is 100% owned while the second facility is 53% owned by the group.

Petronas also has an oil refining presence in Africa through its 80% owned subsidiary, Engen Petroleum Limited (Engen), a leading South African refining and marketing company that owns and operates a refinery in Durban, South Africa.

Through Petronas Dagangan Berhad (PDB), a majority-owned subsidiary, the group markets a wide range of petroleum products, including gasoline, liquefied petroleum gas, jet fuel, kerosene, diesel, fuel oil, asphalt and lubricants. PDB also has interest in Malaysia's multi-product pipeline and the Klang Valley Distribution Terminal that transports gasoline, jet fuel and diesel oil from the refineries to major demand centres in the Klang Valley. Besides marketing activities, PDB also jointly operates a jet fuel storage facility and hydrant line system at the Kuala Lumpur International Airport.

Outside of Malaysia, Petronas is active in the fuels segment. PT Petronas Niaga Indonesia operates retail stations as well as markets petroleum products to industrial and commercial customers, and manages a network of local lubricant distributors in Indonesia. In Thailand similar activities are undertaken by Petronas Retail (Thailand) Co, which also supplies jet fuel to the Don Muang International Airport and the Suvarnabhumi International Airport, Bangkok. In China and India, the Group's lubricant products are sold through Petronas Marketing China Company and Petronas Marketing India, respectively.

In Africa, the Engen subsidiary has the largest retail network in South Africa as well as a strong retail presence in the sub-Saharan region in countries including Botswana, Burundi, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Réunion, Swaziland, Tanzania, Zambia and Zimbabwe. There have been prolonged talks with

South Africa's PetroSA over its acquiring the 80% Petronas stake in Engen but, in January 2015, the deal appeared to have been called off.

Petronas Marketing Sudan Limited is engaged in the marketing and retailing of petroleum products and lubricants, as well as owning and operating retail stations. It also provides into-plane service at the Khartoum International Airport and El-Obeid International Airport.

Petronas first ventured into the production of basic petrochemical products in the mid-1980s and later embarked on several large scale petrochemical projects with multinational joint venture partners. These have included Dow Chemical, BASF, BP Chemicals, Idemitsu Petrochemical Co Ltd, Mitsubishi Corporation and Sasol Polymers International.

The parent group has now consolidated its petrochemical business under Petronas Chemicals Group Berhad (PCG). The leading integrated petrochemical producer in Malaysia and one of the largest in South East Asia, PCG is the listed holding entity for all of the group's petrochemical production, marketing and trading subsidiaries and has a total combined production capacity of over 11mn tonnes per annum (tpa).

Petronas has awarded an engineering and construction contract for the development of two gas fields, World Oil reports. The contract was awarded to the joint venture (JV) between Technip and Malaysia Marine & Heavy Engineering Holdings. The gas fields are located in Block SK316 in Sarawak State, Malaysia. Financial details have not been disclosed.

The company has announced that its subsidiary Petronas Carigali has awarded a five-year umbrella contract for design and engineering services for upstream projects to four local engineering services contractors. The contract, which commenced in September 2013, was awarded to Technip Consultant, RNZ Integrated, MMC Oil & Gas Engineering and Ranhill Worley. The contract will cover domestic upstream oil and gas engineering services and as well as front-end engineering design (FEED) and detailed design (DD) works.

Petronas has announced discoveries of hydrocarbon reserves offshore Malaysia and Indonesia. The company discovered gas offshore Malaysia and oil from a new well in the Ketapang production sharing contract (PSC), offshore East Java, Indonesia. The 2,775 metre (m) gas pay in Malaysia was discovered at the Sintok-1 well in offshore Block SK320. Petronas said that drilling of the Bukit Tua South-2 appraisal well reached a total depth of 2,176m and recorded an oil flow rate of 1,656b/d in early December 2013. Abu Dhabi's Mubadala Petroleum is the operator of the Malaysian block, while Petronas Carigali Ketapang is the operator of the new well in the Ketapang PSC.

France-based GDF Suez, jointly with Petronas Carigali and JX Nippon Oil & Gas Exploration, has secured a licence from Malaysian authorities for deepwater exploration Block 3F, offshore Sarawak.

Shell has announced the discovery of gas at its deepwater Marjoram-1 well on block SK318 offshore Sarawak, Malaysia. The deepwater well, in water depths of 800 metres,

is located 180km off the coast of Sarawak. 'We have a long history in the region, and the addition of new natural gas resources this year ensures we are able to continue to provide cost-effective, reliable, cleaner energy options for the future,' said Andrew Brown, Shell Upstream International Director (Rigzone). Shell is the operator of the block with a 85% work interest, along with Petronas Carigali which holds the remaining 15% interest.

Lundin Malaysia has entered into agreements to acquire a 50% interest in PM328 offshore Malaysia and operatorship of the block from Petronas Carigali. The initial PSC term is for three years, and Lundin Malaysia has committed to undertake the acquisition of 600 sq km of 3D seismic in the first 18 months. Lundin will be the operator of the block, working alongside Petronas Carigali with 40% and E&P Malaysia Venture with the remaining 10% interest. The effective date of the transaction is August 31 2014.

Petronas has announced first oil from the Kapal, Banang & Meranti cluster fields off Malaysia. The KBM cluster is operated by Malaysian company Coastal Energy KBM and has been developed with JV partners under a risk service contract (RSC). Production started from the cluster on 16 December 2013. This is the third RSC that has achieved oil production, after the Balai cluster and Berantai fields, according to Petronas. According to the company, this is an eight-year development with Kapal in its first development and production phase. The Kapal field consists of one mobile offshore production unit, a storage tanker with a 600,000 barrel capacity, a drilling rig with an attached well bay module and two flexible flowlines. Initial production rates from the cluster were more than 10,000b/d, with peak production reaching around 13,000b/d. To date, Petronas has awarded 10 fields in four clusters under the RSC arrangements, with four fields already producing a total of more than 30,000boe/d.

ExxonMobil has announced the start-up of the Tapis enhanced oil recovery (EOR) project offshore Terengganu. Operations started with a water-alternating-gas injection from the recently installed Tapis R central processing platform into targeted wells on the existing Tapis A platform. The Tapis EOR project will recover remaining oil reserves from the Tapis field using an immiscible water-alternating-gas process and increase the overall recovery of the field by gradually sweeping remaining oil to the producing wells. ExxonMobil and its JV partner Petronas Carigali have invested USD2.5bn in the project.

Shell has started commercial production from the Gumusut-Kakap floating platform in water depths of up to 1,200m offshore Sabah, East Malaysia. Peak oil production is expected to be around 135,000b/d, once the platform becomes fully operational. Oil from the project will be transported to the Sabah oil and gas terminal onshore at Kimanis, Malaysia, through a 200km pipeline. Shell is the operator of the field with a 33% stake, working alongside partners ConocoPhillips Sabah with 33%, Petronas Carigali with 20% and Murphy Sabah Oil with the remaining 14% stake.

Malaysia-based Carimin Petroleum's subsidiary Carimin Sdn has secured its first contract from Petronas Carigali to provide pure marine services. The contract is effective for a period of two years until 2017 with an option for a further one-year

extension. Under the contract Carimin will provide two types of vessels, an anchor handling tug/supply (AHTS) vessel and a workboat. The spot charter contract specifies usage of the vessels by the client on requirement within the contract period.

Kebabangan Production Oil Company (KPOC) has started gas production from the Kebabangan (KBB) gas field in Sabah, East Malaysia. The Kebabangan integrated drilling and production platform in a water depth of around 137.16 metres has been put to use. Initially using six wells, gas production from the KBB field will be increased when pipeline capacity becomes available. The gas produced will be exported using a pipeline to the Sabah oil and gas terminal in Kimanis. The field is operated by KPOC, a jointly operated company with ConocoPhillips and Sabah Shell Petroleum, each holding a 30% interest, alongside partner Petronas Carigali with the remaining 40% interest.

Petronas has concluded the handover of 50% equity owned by Sarawak Shell Berhad (Shell) to Petronas Carigali Sdn Bhd (PCSB). Previously, MLNG Dua was operated by Shell via a production sharing contract (PSC) signed with Petronas in 1993. With this handover, PCSB and its subsidiary E&P Malaysian Ventures Sdn Bhd (EPMV) now own 90% and 10% equity respectively, as PSC operators. The previous PSC expired August 20. Petronas views the handover of MLNG Dua to PCSB as a positive addition to the company's ongoing efforts to position the state of Sarawak as the gas hub in the region.

Petronas has begun oil production at the Tembikai field in the Tembikai-Chenang Cluster small field risk service contract (RSC) located offshore Terengganu, Peninsular Malaysia. The field lies in water depths of around 70 metres and is being developed and operated by VESTIGO Petroleum, a company formed in 2013 and wholly owned by Petronas Carigali, the upstream division of Petronas. Currently, oil is being extracted from one well at Tembikai, while two more production wells are now being drilled. When completed, the three wells are likely to achieve peak production of about 2,000b/d.

Petronas is slashing its 2016 dividend to the government by nearly 40%, after its quarterly profit fell 91% on weak global crude oil prices. The firm is being forced to shrink its contributions, compounding the woes of the country. Petronas said in November 2015 that it will pay MYR16bn in dividends to the government in 2016, down from MYR26bn in 2015. Its net profit for July-September tumbled to MYR1.4bn from MYR15.1bn in the same period a year earlier.

Earnings were dragged down by impairment losses on property, plant and equipment to the tune of nearly MYR6bn and net losses on foreign exchange and derivatives of almost MYR4.5bn, a company statement showed. Revenue for the quarter fell by 25% to MYR60.1bn. Petronas announced in the previous quarter that its cash from operations wasn't able to cover its capital expenses nor committed dividends for 2015, forcing it to draw on reserves and accelerate cost savings.

Operational highlights for the third quarter include:

- A 4% production growth for upstream business from the same period in 2014 to 2.3mn boe/d. The growth was driven by production enhancements or new productions mainly from Malaysia, Vietnam, Indonesia and Azerbaijan.
- The Gladstone LNG project in Australia achieved first production in Q3 and successfully delivered its first cargo to South Korea in October 2015.
- The Pacific North West (PNW) Integrated LNG project in Canada remains at conditional FID stage, pending the close-out of the final condition to obtain an approval from the Canadian Environmental Assessment Agency.
- The company's Melaka Refinery Complex recorded better plant reliability, higher refining margin and realised operational synergies after completing the acquisition of remaining interests from Philip66.
- The group's petrochemicals segment recorded higher plant reliability.
- Petronas led the domestic market in launching the Euro 4M RON 97 fuel in mid-August.
- The RAPID project is on-track for Phase 2 of site preparation while the refinery and cracker constructions are progressing on-schedule.
- France-based Technip has secured an engineering, procurement, installation and commissioning (EPIC) contract from Petronas Carigali for the D18 Project offshore East Malaysia. The project covers the procurement and installation of two units of 8-inch water injection flexible pipes totalling 9.5km. The flexible pipes will connect three fixed jacket platforms which form the existing D18 infrastructure offshore Sarawak, at a water depth of 236 metres. Asiaflex Products, Technip's flexible pipe manufacturing plant in Johor, will execute the contract with support from Technip's operating centre in Kuala Lumpur. The project is scheduled to be completed in late 2015.

**Financial Data**

**Sales**

- MYR329.1bn (FY14)
- MYR317.3bn (FY13)
- MYR291.2bn (FY12)
- MYR241.2bn (FY11)
- MYR210.8bn (FY10)
- MYR264.2bn (FY09)
- MYR223.1bn (FY08)
- MYR184.1bn (FY07)

**Financial Data**

**Net profit**

- MYR47.6bn (2014)
- MYR65.6bn (FY13)
- MYR59.5bn (FY12)
- MYR68.7bn (FY11)
- MYR40.3bn (FY10)
- MYR52.5bn (FY09)
- MYR61.0bn (FY08)
- MYR46.4bn (FY07)

**Operational Data**

Year established: 1974

- No. of employees: 23,000
- Proven reserves: 28.3bn boe (2011)

- Oil/gas production: 2.08mn boe/d (2012)
- Oil and Condensate production: 745,000b/d (FY12)

**Company Details**

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## ExxonMobil

- Strengths**
- Strong presence in producing projects.
  - Major share of development upside.
  - Rapid near-to-medium-term output growth.
  - Involvement in gas export infrastructure.
  - Good relationship with state and Petronas.
- Weaknesses**
- Substantial and rising investment requirement.
- Opportunities**
- Considerable untapped gas export potential.
  - Rising domestic energy consumption.
  - Large areas of under-explored territory.
- Threats**
- Long-term fall in domestic oil production.
  - Competition in regional LNG supply.
  - Changes in national energy policy.

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**Company Overview** ExxonMobil is one the country's leading foreign oil and natural gas producers. Oil production, however, has fallen considerably in the past five years. Gas output has remained steady. ExxonMobil operates 34 platforms in 12 fields in Malaysia. Net production in 2014 averaged 33,000b/d of liquids and 339mn cubic feet of gas per day (3.5bcm). The Tapis Enhanced Oil Recovery project (Exxon 50%) started up in September 2014 and is Malaysia's first large-scale, full field offshore implementation of water-alternating-gas injection. The project will significantly rejuvenate and improve oil recovery from the Tapis field, which has been in production since 1978. The main component of the project is the Tapis R central processing platform equipped with 390mn cu ft/d gas compression and 270,000b/d water injection facilities. The Telok and

Damar projects that started up in 2013 and 2014 respectively, add over 600mn cu ft/d (6.2bcm) of gas facility capacity to supply the Malaysian domestic market.

### **Strategy**

Given the decision to sell its downstream assets in Malaysia to San Miguel in a USD610mn deal, Exxon is now dependent on developing its upstream portfolio for growth in the country. In January 2011 ExxonMobil said that it will team up with Petronas' subsidiary Petronas Carigali Sdn Bhd to spend MYR10bn (USD3.3bn) on new oil and gas properties in the country. The downstream sale was completed in January 2013, with Exxon's refinery company fetching USD206mn and the retail units realising USD404mn.

ExxonMobil E&P Malaysia has begun drilling for natural gas in the Telok field, offshore Malaysia, reports World Oil. ExxonMobil has taken on the role of operator at the project, for which it has a 50% stake in partnership with Petronas, which controls the other 50% of the PSC. The South China Sea gas development project will help meet growing gas demand in the country, according to ExxonMobil Development Company President Neil W Duffin. The company has planned 14 development wells for the Telok A and B platforms, with the Telok A platform representing the first phase of the Telok natural gas project.

### **Market Position**

Net production in 2014 averaged 33,000b/d of liquids and 3.5bcm of gas. The Tapis Enhanced Oil Recovery project (Exxon 50%) started up in September 2014 and is Malaysia's first large-scale, full field offshore implementation of water-alternating-gas injection. The project will significantly rejuvenate and improve oil recovery from the Tapis field, which has been in production since 1978. The main component of the project is the Tapis R central processing platform equipped with 390mn cu ft/d gas compression and 270,000b/d water injection facilities. The Telok and Damar projects that started up in 2013 and 2014, respectively, add over 600mn cu ft/d (6.2bcm) of gas facility capacity to supply the Malaysian domestic market.

The Tapis EOR project will recover remaining oil reserves from the Tapis field using an immiscible water-alternating-gas process and increase the overall recovery of the field by gradually sweeping remaining oil to the producing wells. ExxonMobil and its joint-venture partner Petronas Carigali have invested USD2.5bn in the project.

Notable projects include the Bintang gas field in the South China Sea, a 50:50 PSC between Exxon and Petronas. It is expected to produce around 28bcm of gas, with a peak production of 10mn cubic metres per day. Gas from Bintang's two platforms, A and B, will flow via an 11km pipeline to Lawit A for processing and then to shore via existing pipelines. The Bintang development will help to meet increasing natural gas demand on the Malaysian peninsula. Project development costs are estimated at USD80mn, excluding drilling costs.

Production commenced in February 2014 from Malaysia's Damar field, where Exxon Mobil shares ownership with state-controlled Petronas. ExxonMobil said it expects the

field to eventually generate 200mn cubic feet per day of natural gas (2.1bcm per annum).

ExxonMobil is also constructing an offshore gas compression platform as part of its plans to build a production hub in Malaysia. The Guntong E gas compression platform is sited some 210km off the east coast of Peninsular Malaysia. Guntong E, the first phase of the Guntong hub development, will be followed by new drill wells, work-over of existing wells, satellite platforms, inter-field pipelines and retrofit of existing platforms. The Guntong hub is expected to process, over its lifetime, 113bcm of gas for sale in Peninsular Malaysia. ExxonMobil Exploration and Production Malaysia's chairman Rob Fisher said Guntong E would form the processing hub for a series of future gas resources development commitments under a gas PSC with Petronas.

ExxonMobil is the operator and holds working interests of between 78% and 80% of the Satellite Field Developments, in partnership with Petronas.

Oilfield services firm Wood Group announced in December 2014 that it has been awarded a multi-year contract by ExxonMobil Exploration and Production Malaysia. The firm said its Wood Group PSN and Wood Group Mustang subsidiaries will deliver brownfield engineering, procurement and construction-management services to support Exxon's offshore operations in Malaysia. The contract is the first that Wood Group PSN has secured in the Malaysian market.

EQ Petroleum Production Malaysia has bought ExxonMobil's stake in the Seligi oil field and PM8 PSC offshore Malaysia. EQ is a wholly owned subsidiary of UK oil and gas exploration company EnQuest. The agreement is part of the company's strategy to expand its presence in Malaysia. EnQuest has taken over operatorship from ExxonMobil and holds a 50% participating interest, with Petronas Carigali holding the remaining 50%.

EnQuest assumed offshore field operations in October 2014, and the overall transition completed in December 2014, with strong production from the fields. The PM8/Seligi asset has delivered strong production performance due to improved production efficiency resulting from work that has been undertaken after assuming operatorship. The 2015 PM8/Seligi work programme is focused on well interventions activities and improvements to the field infrastructure, including work on gas compressors, pipelines and generators. Well intervention and rectification is proving successful, resulting in production improvements.

EnQuest will continue to enhance production through, increasing facilities uptime, idle well rectifications and interventions and facilities improvement upgrades. The subsurface programme is also being developed.

- Operational Data**
- Year established: 1960
  - No. of employees: 2,400

**Oil/liquids production**

- 33,000b/d (2014)
- 36,000b/d (2013)
- 40,000b/d (2012)
- 38,000b/d (2011)
- 48,000b/d (2010)
- 52,000b/d (2009)
- 56,000b/d (2008)
- 67,000b/d (2007)
- 64,000b/d (2006)
- 82,000b/d (2005)

**Gas production**

- 3.5bcm (2014)
- 3.8bcm (2013)
- 3.9bcm (2012)
- 4.3bcm (2011)
- 5.3bcm (2010)
- 5.4bcm (2009)
- 6.0bcm (2008)
- 6.0bcm (2007)
- 5.4bcm (2006)

- Company Details**
- ExxonMobil Sdn Bhd
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## Shell

- Strengths**
- Strong presence in producing projects.
  - Major share of development upside.
  - Rapid near-term output growth.
  - Extensive fuels retail involvement.
  - Key role in gas export development.
- Weaknesses**
- Substantial and rising investment requirement.
- Opportunities**
- Considerable untapped gas export potential.
  - Rising domestic energy consumption.
  - Large areas of under-explored territory.
- Threats**
- Long-term fall in domestic oil production.
  - Competition in regional LNG supply.
  - Changes in national energy policy.

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**Company Overview** Shell has invested around MYR75bn in the country during the last century. It entered the country in 1910 and, as contractor to Petronas, the company explores for and produces oil and gas located offshore at Sarawak and Sabah under 19 PSCs, in which its interests range from 20% to 85%.

Offshore Sabah, Shell operates five producing oil fields (Shell interests ranging from 29% to 50%). These include the Gumusut-Kakap deepwater field (Shell interest 29%) where production via a dedicated floating production system commenced in October 2014. It has additional interests ranging from 30% to 50% in PSCs for the exploration and development of four deep-water blocks. These include the Malikai field (Shell interest 35%) which is currently being developed with Shell as the operator. The

company also has a 21% interest in the Siakap North-Petai field, which commenced production in 2014, and a 30% interest in the Keabangan field.

Offshore Sarawak, it is the operator of 17 producing gas fields (Shell interests ranging from 37.5% to 70%). Nearly all of the gas produced is supplied to Malaysia LNG in Bintulu where Shell has a 15% interest in the Dua (licence expired in August 2015 and transferred to Petronas) and Tiga LNG plants. Sarawak Shell Bhd in August 2015 transferred its stake as operator of the MLNG Dua LNG plant to Petronas. Shell has a 40% interest in the 2011 Baram Delta EOR PSC and a 50% interest in Block SK-307. Additionally, it has interests in five exploration PSCs: Deep-water Block 2B, SK318, SK319, SK408 and SK320.

Shell operates a gas-to-liquids (GTL) plant (Shell interest 72%) adjacent to the Malaysia LNG facilities in Bintulu. Using Shell technology, the plant converts gas into high-quality middle distillates, drilling fluids, waxes and speciality products. The Shell group owns 51% of one of the two Port Dickson refineries (the other is held by Petron after its purchase from ExxonMobil), with the remaining 49% publicly held. The refinery produces a comprehensive range of petroleum products, most of which are consumed within Malaysia.

## Strategy

Shell Malaysia Ltd (SML) chairman Iain Lo said the company will by June 2015 have reached a decision over the future of its refinery in Port Dickson. Lo said the board of Shell Refining is proactively investigating long-term options including potential sale of the refinery assets and conversion of operations to a storage terminal.

'Shell Refining is a business that's very, very challenging, we've had losses the last four years now. So the board has decided that something has to be done about it. Clearly, operating as a refinery, as a going concern, we see it as quite a challenge because the refining environment globally is very challenging. Refining margins are very, very thin and it is very difficult to make profits.

'One of the options is to convert it to a terminal so that we can continue to supply fuel to the Malaysian market. Of course in the same process, we will look to see if there are other people who feel that they can operate the refinery. So these two processes are going on in parallel,' he added.

Having reduced its exposure to underperforming assets in its downstream portfolio, Shell is now concentrating on its strategy of 'more upstream and profitable downstream'. Recent upstream discoveries will encourage the firm to further efforts.

Shell's EOR schemes with Petronas may take the lion's share of medium-term upstream expenditure, and have the potential to yield significant additional volumes. The new deepwater exploration concessions, also with Petronas, arguably hold the key to significant long-term reserves and production expansion.

Shell is going all out to 'rejuvenate' its GTL plant in Bintulu to ensure that the plant continues producing innovative products. Shell Singapore vice president of Integrated

Gas Ventures East, Ate Visser said Shell has approved a USD15mn rejuvenation investment for the 20-year old plant in Bintulu, also known as Shell Middle Distillate Synthesis Malaysia Sdn Bhd (Shell MDS), the Borneo Post reported.

Petronas, Petronas Carigali and Shell Malaysia have expanded the terms of the 2011 Baram Delta (BDO) PSC for enhanced oil recovery projects (EOR) offshore Sarawak (2011 Baram Delta EOR PSC) to include gas rights. With the signing of the Heads of Agreement (HOA) for Baram Delta Gas Gathering Project 2 (BARDEGG2), associated and non-associated gas rights linked with the Baram Delta Operations will be incorporated into the 2011 Baram Delta EOR PSC, said Shell Malaysia in a statement in July 2014.

The Tukai Timur field, previously part of the SK307 PSC, will also be integrated into the 2011 Baram Delta EOR PSC enabling non-associated gas to be developed as part of a single integrated development project. With the expansion of the 2011 Baram Delta EOR PSC, Shell and Petronas Carigali would gain access to gas rights not previously included under the 2011 Baram Delta EOR PSC, it said.

BARDEGG2 and Baronia EOR projects will be undertaken as a single integrated development project that is operated by PETRONAS Carigali. The projects will see a new central processing platform located at the Baronia field which will initially extract non-associated gas from the Baronia field. Together with the existing associated gas production will be used for re-injection together with water into the Baronia reservoir to enhance oil recovery. Excess gas and Tukai Timur gas would be sold to Petronas for domestic supply in Bintulu and Miri, and for export to the Bintulu Petronas Malaysia LNG complex, it added.

Shell and Petronas are planning to spend jointly USD12bn over the next 30 years on the EOR schemes and are targeting a near 14% increase in recovery factors. The Sarawak project includes the Bokor, Bakau, Baram, Baronia, Betty, Fairley Baram, Siwa, Tukai and West Lutong oil fields in the Baram Delta. The North Sabah project involves the St Joseph, South Furious, SF30 and Barton fields.

Shell, will develop the E6 field in the SK308 production sharing contract Sarawak offshore Malaysia. The development concept leverages on existing infrastructure by evacuating gas from E6 to the E8 platform and crude oil to D35, according to Shell and its joint venture partner Petronas Carigali. 'The development of the E6 field further strengthens Shell's position in Malaysia. It will enable Shell to sustain gas supply to the Tiga LNG plant and produce crude oil concurrently by 2017,' Shell Malaysia Chairman Iain Lo said. Shell is the operator of the field with a 50% stake, while Petronas Carigali holds the remaining 50% (The Star Online).

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**Market Position**

Shell is an active participant in Malaysia's upstream and downstream sectors, having invested around MYR75bn in the country during the last century. It entered the country in 1910 and, as contractor to state-owned Petronas, the company explores for and

produces oil and gas located offshore at Sarawak and Sabah under 19 PSCs, in which its interests range from 20% to 85%.

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Shell has announced the discovery of gas at its deepwater Marjoram-1 well on block SK318 offshore Sarawak, Malaysia. The deepwater well, in water depths of 800 metres, is located 180 kilometers off the coast of Sarawak. 'We have a long history in the region, and the addition of new natural gas resources this year ensures we are able to continue to provide cost-effective, reliable, cleaner energy options for the future,' said Andrew Brown, Shell Upstream International Director (Rigzone). Shell is the operator of the block with a 85% work interest, along with Petronas Carigali which holds the remaining 15% interest.

The Shell group owns 51% of one of the two Port Dickson refineries (the other is held by Petron after its purchase from ExxonMobil), with the remaining 49% publicly held. The refinery produces a comprehensive range of petroleum products, most of which are consumed within Malaysia. In 1999 Shell completed its MYR1.4bn investment in Malaysia's first long residue catalytic cracking (LRCC), transforming a medium-sized simple refinery into a modern complex plant capable of processing 125,000b/d. The

LRCC has quadrupled the refinery's LPG production and doubled its motor gasoline output. It also enabled the refinery to manufacture propylene for the first time.

Shell will explore options including the sale of the Port Dickson refinery or the conversion of its operations to a storage terminal in the face of the poor outlook for refining margins, it said in January 2015. 'The board has concluded that refining margins are expected to remain depressed due to overcapacity in the global refining industry,' it said in a filing with Bursa Malaysia, adding that it is exploring suitable long-term options.

Shell Refining Co (SRC), which underwent a 44-day maintenance shutdown in the third quarter of 2015 for a 'major turnaround event', saw its Q3 2015 revenue more than halved due to lower production, but it managed to cut its losses. Announcing its interim unaudited results to Bursa Malaysia, the company said revenue plunged 62.9% y-o-y to MYR1.27bn for the quarter ended September 30. SRC said net loss narrowed by 24.3% to MYR151.13mn. For the first nine months of 2015, SRC managed to post a net profit of MYR255.29mn against a net loss of MYR271.86mn in the same period of 2014, thanks partly to better refining margins in the first six months.

Shell has more than 900 retail stations in the country, and plans to build a further 30 in the immediate future. In Malaysia, Shell makes and sells more than 600 different lubricants for the automotive sector, heavy-duty transport, food processing and power generation. It is the lubricants market leader in Sabah and Sarawak.

Sarawak Shell has awarded French engineering company Technip a contract to build and maintain two new gas export lines in support of its Laila and D12 fields, World Oil reports. The contract covers the design, fabrication and installation of 4.8km and 9.6km flexible pipelines of 17.78cm and 32.5cm in diameter respectively, which will serve as flowlines to transport gas away for processing. Technip is in charge of project management and will also install riser clamps at both jacket platforms. Shell's total production of natural gas in Malaysia rose 14.5% y-o-y to 18,547Mcm/d in 2013 (6.8bcm per annum). The company's liquids output increased to around 42,000b/d during the year, from 41,000b/d in 2012. The company currently holds interests ranging from 20% to 85% in 19 exploration and production blocks offshore Sabah and Sarawak in Malaysia, and is the operator of 17 gas fields offshore Sarawak alone.

Shell in April 2014 made a natural gas discovery with the Rosmari-1 well, which was drilled 135 km offshore Malaysia on Block SK318. The well, drilled to a total depth of 2,123 m, encountered a 450-m gas column. Shell said the discovery is a positive indicator of the gas potential in the area.

'This adds to Shell's sequence of recent exploration successes in Malaysia, with these discoveries expanding the company's heartlands positions,' said Iain Lo, Shell Malaysia chairman.

In March 2014, Sabah Shell Petroleum let a contract to Flowserve for supply of custom designed water injection and liquid transfer pumps for the Malikai oil field project 68

miles offshore Sabah, Malaysia. Shell operates Block SK318 with an 85% share. Petronas holds the remaining interest.

Kebabangan Production Oil Company (KPOC) has started gas production from the Kebabangan (KBB) gas field in Sabah, East Malaysia. The Kebabangan integrated drilling and production platform in a water depth of around 137.16 metres has been put to use. Initially using six wells, gas production from the KBB field will be increased when pipeline capacity becomes available. The gas produced will be exported using a pipeline to the Sabah oil and gas terminal in Kimanis. The field is operated by KPOC, a jointly operated company with ConocoPhillips and Sabah Shell Petroleum, each holding a 30% interest, alongside partner Petronas Carigali with the remaining 40% interest.

Petronas has concluded the handover of 50% equity owned by Sarawak Shell Berhad to Petronas Carigali Sdn Bhd (PCSB). Previously, MLNG Dua was operated by Shell via a PSC signed with Petronas in 1993. With this handover, PCSB and its subsidiary E&P Malaysian Ventures Sdn Bhd (EPMV) now own 90% and 10% equity, respectively, as PSC operators. The previous PSC expired August 20. Petronas views the handover of MLNG Dua to PCSB as a positive addition to the company's ongoing efforts to position the state of Sarawak as the gas hub in the region.

- Operational Data**
- Year established: 1910
  - No. of employees: 7,000
  - Refining capacity: 109,000b/d

**Oil/liquids production**

- 46,000b/d (2014)
- 42,000b/d (2013)
- 41,000b/d (2012)
- 40,000b/d (2011)
- 40,000b/d (2010)
- 39,000b/d (2009)
- 38,000b/d (2008)

- Operational Data** Gas production

- 6.9bcm (2014)
- 6.8bcm (2013)
- 5.9bcm (2012)
- 7.9bcm (2011)
- 8.3bcm (2010)
- 9.1bcm (2009)
- 9.0bcm (2008)

- Company Details**
- Shell Malaysia Ltd
  - Bangunan Shell Malaysia  
Off Jalan Semantan, Damansara Heights

Kuala Lumpur

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## ConocoPhillips

- Strengths**
- Substantial refinery involvement.
  - Exploration upside potential.
  - Established local joint ventures.
- Weaknesses**
- Limited upstream production.
  - Only modest downstream presence.
- Opportunities**
- Rising domestic/regional energy consumption.
  - Large areas of unexplored territory.
- Threats**
- Long-term fall in domestic oil production.
  - Changes in national energy policy.
- 

**Company Overview** ConocoPhillips' involvement in Malaysia consists of interests in five blocks in varying stages of exploration, development and production. Four of these blocks are located off the eastern Malaysian state of Sabah: Block G, Block J, the Keabangan (KBB) Cluster and SB 311. These four blocks include eight discovered fields. The fifth block, Block 3E, is located offshore Sarawak. ConocoPhillips operates both SB 311 and Block 3E.

Petronas in November 2014 announced it had reached an agreement with Phillips 66 Asia Ltd to acquire its 47% interest in Malaysian Refining Company (MRC), which will result in Petronas wholly owning MRC. Under the terms of the agreement, Petronas agreed to pay USD635mn in cash with adjustment at completion. MRC was commissioned in 1998 and has a refining capacity of 170,000b/d. The refinery is located in Melaka, Malaysia.

**Strategy** With the likes of Shell and Exxon partnering Petronas for major enhanced oil recovery and deep water exploration schemes, it hasn't been easy for ConocoPhillips to carve out a useful upstream niche. It is now working alongside Shell, Petronas and Murphy in a number of attractive oil and gas prospects that, over the medium term, have the

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potential to deliver considerable volumes. Plans to shed Indonesian upstream and gas assets make Malaysia a still more significant part of the Asian portfolio.

ConocoPhillips may have left it rather late to strengthen its modest upstream position in the country and, without acting as operator for its key concessions, it cannot necessarily dictate the ultimate pace of investment and activity. However, if there are disappointing results or progress is too slow, it should be relatively easy for the company to move the assets on to existing upstream participants. In the meantime, it seems likely that management will be seeking other investment options in the exploration and production sector that can deliver more immediate volumes and longer-term upside potential.

Around the time of the group's third quarter results, it discussed openly the prospect of reducing deepwater exploration and development activity, focusing instead on the lower cost and lower risk onshore and shallow water properties in its portfolio. At the time of writing, it was not clear if the Malaysian deepwater strategy would be impacted.

Petronas in December 2012 awarded a production sharing contract (PSC) for Block SB311 offshore Sabah to a partnership of ConocoPhillips Sabah Gas, Shell Energy Asia and Petronas Carigali. The block, measuring 1,046 sq km, is located in the central part of the Sabah Basin in water depths ranging from 50 to 100 metres. The area is located within a proven hydrocarbon fairway with key discoveries such as Keabangan, Kinarut, and Erb West. Under the terms of the PSC, ConocoPhillips will operate the block with a participating interest of 40%. Petronas Carigali and Shell Energy Asia will each own a 30% interest in the block. For the SB311 PSC, the partners are committed to drill two wildcat wells in 2015, acquire 400 line km of new 2D seismic data and re-process existing 3D seismic data on the block.

Drilling is planned in 2016 and 2017 on offshore Sarawak Block 3E (Conoco 85%) awarded in November 2013.

#### **Market Position**

ConocoPhillips involvement in Malaysia consists of interests in five blocks in varying stages of exploration, development and production. Four of these blocks are located off the eastern Malaysian state of Sabah: Block G, Block J, the Keabangan (KBB) Cluster and SB 311. These four blocks include eight discovered fields. The fifth block, Block 3E, is located offshore Sarawak. ConocoPhillips operates both SB 311 and Block 3E.

Block G (Malikai, Ubah and Pisagan) is operated by Royal Dutch Shell (35%), with ConocoPhillips and Malaysia's state-owned Petronas holding 35% and 30% respectively. The Malikai-1 and the Ubah-2 exploration wells were drilled in Block G in 2004 and 2005, resulting in oil discoveries. An additional oil discovery was made on the block with the Pisagan-1A well in 2005. The Malikai discovery was appraised in 2005 and 2006, and development execution is now underway, with first production from the Malikai Field expected in early 2017. Successful appraisal wells were completed on Ubah in 2008 and 2010.

The Petai-1 well was drilled in 2007, resulting in an oil discovery, with additional drilling was completed in 2008. Unitisation of Petai and the Siakap North Field in Block K was completed in 2011, with ConocoPhillips holding a 21% initial interest in the unit. First production from the SNP Field began in February 2014.

ConocoPhillips has a 30% interest in the KBB Cluster, operated by Keababangan Petroleum Operating Company and featuring Petronas (40%) and Shell (30%) as the other partners. The Keababangan Cluster production sharing contract was signed in 2007 for appraisal and development of the Keababangan, Kamunsu East and Kamunsu East Uplifted Canyon gas and condensate fields. Development of the Keababangan Field was sanctioned in early 2011, and first production is targeted for late 2014. The Kamunsu East-2 appraisal well was drilled in September 2013 resulting in a gas discovery. This field will be tied into the KBB facility.

Petronas in November 2014 announced it has reached an agreement with Phillips 66 Asia Ltd to acquire its 47% interest in Malaysian Refining Company (MRC), which will result in Petronas wholly owning MRC. Datuk Wan Zulkiflee Wan Ariffin, Chief Operating Officer and Executive Vice President & CEO Downstream, said, "Our acquisition of Phillips 66's interest in MRC will enable us to realise greater synergy between our refineries in Melaka and it will also strengthen our presence in the refining and trading businesses." Under the terms of the agreement, Petronas agreed to pay USD635mn in cash with adjustment at completion. MRC was commissioned in 1998 and has a refining capacity of 170,000b/d. The refinery is located in Melaka, Malaysia.

Shell has started commercial production from the Gumusut-Kakap floating platform in water depths of up to 1,200 metres offshore Sabah, East Malaysia. Peak oil production is expected to be around 135,000b/d. Oil from the project will be transported to the Sabah oil and gas terminal onshore at Kimanis, Malaysia, through a 200km pipeline. Shell is the operator of the field with a 33% stake, working alongside partners ConocoPhillips Sabah with 33%, Petronas Carigali with 20% and Murphy Sabah Oil with the remaining 14% stake.

Keababangan Production Oil Company (KPOC) has started gas production from the Keababangan (KBB) gas field in Sabah, East Malaysia. The Keababangan integrated drilling and production platform in a water depth of around 137.16 metres has been put to use. Initially using six wells, gas production from the KBB field will be increased when pipeline capacity becomes available. The gas produced will be exported using a pipeline to the Sabah oil and gas terminal in Kimanis. The field is operated by KPOC, a jointly operated company with ConocoPhillips and Sabah Shell Petroleum, each holding a 30% interest, alongside partner Petronas Carigali with the remaining 40% interest.

**Operational Data**

- Refining capacity: 76,140b/d (2012)
- Oil Production: 13,000b/d (2014)
- Gas Production: 3mn cu ft/d (2014)

- Company Details**
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## Murphy Oil

- Strengths**
- Biggest independent operator.
  - Large exploration and production portfolio.
  - Rapid output growth.
- Weaknesses**
- Rising investment requirement.
  - No downstream presence.
- Opportunities**
- Considerable untapped gas export potential.
  - Rising domestic energy consumption.
  - USD2bn from Malaysian asset sale to Pertamina.
- Threats**
- State-imposed production limits.
  - Changes in national energy policy.

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**Company Overview** Murphy Oil has been an active participant in the Malaysian upstream sector since 1999. It has, until recently, considered the country to be part of its core portfolio, accounting for more than 40% of its total 2013 net production. It holds majority interests in seven separate production sharing contracts (PSCs): Block K, Block H, Block P, SK 309, SK 311 and SK 314A, and three gas holding agreements in PM 311. In 2014, Malaysian production was near 89,000boe/d, representing approximately 40% of total net production. After completion of the sell-down in Malaysia, pro forma net production in 2014 was near 63,000boe/d, approximately 32% of total net production. In December 2014, Murphy announced that it had closed on the first phase of the sale of 30% of Murphy's Malaysian oil and gas assets to Pertamina. The transaction has an aggregate purchase price of USD2.0bn and an effective date of January 1 2014.

**Strategy** Murphy revealed that it has successfully drilled two exploration wells offshore Sarawak, Malaysia, with the firm now evaluating development options for these finds, the company said when releasing its third quarter 2015 results. 'The company successfully

drilled both the Merapuh 5 and Marakas wells with positive results and is continuing to evaluate development options,' Murphy said in a press release. The firm however failed to encounter commercial quantities of hydrocarbons at the Paus-Kelasa well, which was expensed as a dry hole during the quarter.

Murphy announced in July 2010 that it planned to divest its downstream assets in the US and UK in order to focus on its more profitable exploration and production business. However, the group put a 30% stake in its Malaysian E&P arm up for sale, with considerable interest among Asian NOCs and an eventual winning bid of around USD2bn submitted by Indonesian state firm Pertamina. In December 2014, Murphy announced that it had closed on the first phase of the sale of 30% of its Malaysian oil and gas assets to Pertamina. Murphy will remain operator and continue to execute its development plans as well as grow through future exploration in both deep-water and shallow-water Malaysia.

#### **Market Position**

Murphy entered Malaysia in 1999 and held majority interests in eight separate production sharing contracts (PSCs): Block K, Block H, Block P, SK 309, SK 311, SK 314A and SK 2C, and three gas holding agreements in PM 311. In 2014, production was near 89,000boe/d, representing approximately 40% of total group net production. After completion of the sell-down in Malaysia to Pertamina, pro forma net production in 2014 was near 63,000boe/d, approximately 32% of total net production. Total proved reserves at year end 2014 were 95mn bbl and 636bn cubic feet (18bcm).

Royal Dutch Shell has started commercial production from the Gumusut-Kakap floating platform in water depths of up to 1,200 metres offshore Sabah, East Malaysia. Peak oil production is expected to be around 135,000b/d. Oil from the project will be transported to the Sabah oil and gas terminal onshore at Kimanis, Malaysia, through a 200km pipeline. Shell is the operator of the field with a 33% stake, working alongside partners ConocoPhillips Sabah with 33%, Petronas Carigali with 20% and Murphy Sabah Oil with the remaining 14% stake.

Third quarter 2015 production averaged nearly 207,600boe/d, ahead of the group's 200,000boe/d guidance, primarily due to Sarawak oil and natural gas fields performing better, Eagle Ford Shale new well volumes exceeding the plan due to enhanced drilling and completion techniques, Kakap-Gumusut scheduled maintenance being completed early and higher natural gas production from the Montney.

Sarawak natural gas production in the third quarter was 129mn cubic feet per day, supported by strong natural gas nominations and liquids production was near 15,800boe/d. The company achieved record average daily gross production of 291mn cfd from Sarawak natural gas during the quarter. At the Kakap-Gumusut main facility, planned maintenance activities to install natural gas handling and injection systems were completed three weeks ahead of schedule in late July. The company successfully drilled both the Merapuh 5 and Marakas wells with positive results and is continuing to evaluate development options. The Murphy-operated well, Paus-Kelasa, failed to

encounter commercial quantities of hydrocarbons and was expensed as a dry hole during the quarter.

Murphy completed a five-well drilling campaign at the Belum gas field in shallow water offshore Sarawak, east Malaysia in the second quarter of 2015, the company said in its July quarterly results statement. The company indicated that the 'Belum field has lower nitrogen content that will blend into our current gas production fields and allow us to de-risk our 250mn cubic feet per day (mn cfd) contractual volume on demand.' Murphy, currently drilling oil wells at the Permas shallow water development, added that Sarawak gas production for the second quarter was 111mn cfd and liquids production was around 14,700b/d.

Offshore production in neighboring Sabah state averaged around 30,900boe/d in the second quarter, with liquids comprising 85%. Elsewhere in offshore Sabah, Murphy said planned maintenance activities at the Gumusut-Kakap main facility to install gas handling and injection systems commenced June 9 and were completed ahead of schedule.

The firm also revealed that gas was found at the Permai exploration well in deepwater Block H offshore Sabah where it is the operator with a 42% working interest. The Permai discovery was Murphy's eighth consecutive success in the area around the Rotan field floating LNG project. 'Our recent gas discovery at Permai in Block H Malaysia will reduce complexity and development costs in our floating LNG project,' Roger W. Jenkins, president and CEO, commented in the press release.

#### **Financial Data**

##### **Sales:**

- USD5.48bn (2014)
- USD5.31bn (2013)
- USD4.61bn (2012)
- USD4.22bn (2011)

##### **Net income:**

- USD0.01bn (2014)
- USD1.12bn (2013)
- USD0.97bn (2012)
- USD0.87bn (2011)
- USD0.79bn (2010)
- USD0.84bn (2009)
- USD1.74bn (2008)
- USD0.77bn (2007)

**Financial Data**

**Operational Data**

- Year established: 2000

**Oil and Gas Production (Malaysia):**

- 63,000boe/d (2014 adj for asset sales)
- 86,000boe/d (2013)

**Oil Production**

- 52,663b/d (2012)
- 48,551b/d (2011)
- 66,897b/d (2010)
- 76,322b/d (2009)
- 57,403b/d (2008)

**Gas Production:**

- 2.2bcm (2012)
- 2.2bcm (2011)
- 2.2bcm (2010)
- 0.77bcm (2009)

**Company Details**

- Murphy Sarawak OilCompany
- Level 26, Tower 2  
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Kuala Lumpur  
  
50088  
  
Malaysia

## Other Summaries

### **Chevron**

Chevron has no upstream oil and gas interests in Malaysia, and its focus in the country remains as a dedicated downstream business. Chevron does business in Malaysia through its subsidiary Chevron Malaysia Limited. It imports fuels and lubricants from its refinery and blending facilities in Singapore and Thailand. Unleaded gasoline, diesel and lubricants are received through three terminals that it operates in peninsular Malaysia. It has more than 420 Caltex service stations in Peninsular Malaysia. Chevron also markets asphalt and fuels to businesses.

### **Hess**

The Malaysia/Thailand Joint Development Area (JDA), in the northern Malay Basin was established in 1979. In 2001, Hess acquired a 26% interest in JDA Block A-18, which grew to a 50% stake in 2003. The block is operated by Carigali Hess, a joint venture with Petronas Carigali. The Malaysia/Thailand Joint Development Area achieved first production during 2013 at wellhead platforms 8 and 9. The operator continued progress on wellhead platforms 10, 11 and 12, as well as the Booster Compression project.

Also in Malaysia, where Hess was selected by Petronas to develop the North Malay Basin project (50% working interest, operator), the Early Production System achieved first production in October 2013. Progress continues on the second phase of development, and is on target for first gas in late 2016. Work has commenced on the evacuation route consisting of a natural gas export pipeline and an onshore gas plant.

Petronas Carigali agreed a deal with Hess on the joint development of gas reserves in the North Malay Gas Basin. The deal will see some USD5.2bn invested in the project to commercialise 48bn cubic metres (bcm) of gas reserves over the next five years, while Hess acts as operator with a 50% interest.

### **Talisman Energy**

Canada's Talisman Energy, now owned by Spanish energy group Repsol, holds a 41% operated interest in Block PM-3 CAA PSC between Malaysia and Vietnam and associated production facilities. In addition, Talisman holds a 33% interest in Block 46-Cai Nuoc adjacent to PM-3 CAA and a 60% interest in each of Block PM-305 and Block PM-314. In Block PM-3 CAA, Talisman operates facilities referred to as the 'Southern Fields' and the 'Northern Fields'. Licenses in the PM-3 CAA are currently subject to negotiations for extension. A multi-well drilling programme is ongoing at Block PM-3 CAA. Four wells were successfully drilled and completed and a fifth well was drilling at year-end 2013.

Talisman holds a 70% working interest in exploration licences for SB-309 and SB-310, offshore Sabah in east Malaysia. The first commitment exploration well was drilled and abandoned in April 2013. Talisman holds a 60% equity interest and operatorship of the Kinabalu Oil PSC, which is a mature offshore oilfield in the Malaysian Sabah Basin. In 2013, one infill well was drilled at Kinabalu and production commenced in December 2013. A second infill well was drilling at year-end.

In 2014, Talisman's net share of production in Malaysia averaged 38,000boe/d, which accounted for approximately 30% of Talisman's total Southeast Asia production.

**Total**

French major Total's Malaysian activities are at present confined to exploration. On deep-offshore exploration Block SK 317 B (85%, operator), which is located in Sarawak, an exploration well was started in December 2013. Following disappointing geological exploration results, Total withdrew from the PM303 offshore exploration block at the start of 2011 and was to do the same for the PM324 license (50%, operator) in May 2014 upon expiration of the operating period. An agreement has been reached with the regulator to convert the second commitment well on PM324 into expenditures on other exploration blocks.

**Others**

The Bertam field produced first oil in April 2015 and is Swedish company Lundin Petroleum's first operated producing field in its South East Asia core area. Lundin operates in two core areas, offshore peninsular Malaysia and offshore Sabah, east Malaysia. The Plan of Development for the Bertam field was approved in September 2013. The fast-track development included a wellhead platform and an FPSO upgrade which was completed on budget in less than 18 months from approval of the Plan of Development. First oil from the Bertam field commenced in April 2015 and a gross plateau production rate of 15,000b/d is expected towards the end of the year. The field is estimated to contain gross reserves of 18.4mn boe. A gas discovery was made on the Tembakau prospect in PM307 which was successfully appraised during 2014.

Lundin Malaysia has started drilling of the Selada-1 exploration well in the PM308A block offshore Malaysia. The well will target hydrocarbons in Miocene-aged sands and is located 14km to the south of the Bertam field operated by Lundin Malaysia. The well will be drilled with the West Prospero (400' ILC) jackup to a total depth of about 1,700 metres (m) below mean sea level. The drilling of the well is expected to take about 30 days. Lundin Malaysia is the operator of the PM308A block with a 75% working interest, while Petronas Carigali holds the remaining 25% interest.

Lundin Malaysia has made a gas discovery at the Mengkuang-1 exploration well in licence PM307 offshore Malaysia. The well was drilled to a total depth of 1,259 metres (m) below mean sea level and encountered 9m of gas pay in the I-35 group Miocene channel sands. The well has been plugged and abandoned. Lundin Malaysia holds a 75% working interest in PM307, while Petronas holds the remaining 25% working interest.

Malaysia's Dialog Group has entered into a shareholders' agreement with Petronas and Australian independent Roc Oil. The agreement paves the way for the formation of a joint venture (JV) company, to be named BC Petroleum. The JV company will be the operator of the small field risk service contract for the development of oil and gas fields in the Balai Cluster offshore Sarawak, Malaysia. Roc will have a 48% stake in the JV,

working alongside partners Dialog with 32% and Petronas Carigali with the remaining 20%.

Dialog intends to invest up to MYR10bn (USD3.28bn) in developing an independent oil and LNG terminal in Pengerang, Malaysia. A consortium consisting of Dialog Group, the Johor government and Royal Vopak will jointly develop an LNG storage, loading and regasification terminal under the proposed project. The terminal will import LNG for trading purposes as well as for domestic consumption. It would be built in two phases, with Phase 1 expected to be built between 2013 and 2016 and Phase 2 between 2013 and 2018, according to the company's chairman, Ngau Boon Keat.

Dialog and state-owned Petronas Gas will develop LNG regasification facilities in Pengerang in Southern Johor, Malaysia. The project is expected to cost about MYR2.7bn (USD807mn). The facilities will include a regasification unit and two 200,000 cubic metre LNG storage tanks with an initial annual capacity of 3.5mn tonnes of natural gas. Petronas Gas will acquire a 65% interest, while Dialog will acquire 25% and Johor state will hold the remaining 10% interest.

A consortium led by ROC Oil has started production from the Bentara oilfield in the Balai Cluster, according to partner Petronas Carigali. The marginal field is estimated to produce at an initial rate of more than 1,000b/d of oil, increasing to an average rate of between 2,000b/d and 3,000b/d. Roc Oil received official approval for the first phase of development on Bentara, which is being produced from two wells using the Balai Mutiara early production vessel (EPV). Roc Oil holds a 48% stake in the consortium under a risk service contract, working alongside partners Dialog Group with 32% and Petronas with the remaining 20% stake.

BC Petroleum has discovered hydrocarbons pay with its Bentara-3 pre-development well in the Balai Cluster Risk Service Contract (RSC) offshore Eastern Malaysia. Initial assessment based on preliminary logs indicates an estimated net hydrocarbon pay of around 91 metres across 18 sandstone reservoir intervals. The well is being cased and completed in preparation for extended well testing with the early production vessel (EPV) Balai Mutiara. BC operates the Balai Cluster RSC, whose shareholders include Roc with a 48% stake, Dialog Group with 32% and Petronas with the remaining 20%.

BC has obtained approval from Petronas for the initial phase of the field development plan for the Bentara oil field in the Balai cluster offshore Sarawak. Output from the first phase of development is scheduled to begin in Q214, with expected average production of 2,000-3,000 barrels of oil per day. BCP was incorporated to operate and manage the Balai cluster risk service contract (RSC) of the Bentara oil field.

Coastal Energy secured a risk services contract (RSC) in July 2012 for the development of the Kapal, Banang and Meranti oil fields offshore Peninsular Malaysia. The company has reached a deal with Petra Energy, under which the latter will subscribe for a 30% stake in the former's subsidiary Coastal Energy KBM. This will give Petra Energy a 30% stake in the RSC, while Coastal will hold the remaining 70%. Coastal is planning to drill four wells at the Benang field, three wells at the Meranti field and 10 wells at the Kapal

field. Under the RSC, the marginal fields will be developed with mobile offshore production units and floating, storage and offloading vessels.

Japan-based JX Nippon Oil & Gas Exploration Corporation has signed a production sharing contract (PSC) with Petronas for Deepwater Block 2F offshore Malaysia. Under the terms of the PSC, JX Nippon will acquire a 40% interest in Block 2F, which covers an area of around 5,500sq km and is located in north-west Sarawak. Subsequent to the acquisition, JX Nippon will become the operator of the block, while Petronas will hold a 40% stake and GDF Suez E&P Malaysia the remaining 20%.

JX Nippon and its partners have hit oil with the Bestari-1 well in Block R offshore Malaysia. The well encountered a 70 metre (m) column of oil-bearing sands across multiple horizons. The block is in water depths ranging between 100m and 1,400m. JX Nippon is the operator of the block and holds a 27.5% interest, working alongside partners Inpex with 27.5%, Petronas Carigali with 25% and Santos Sabah Block R with the remaining 20% stake.

EQ Petroleum Production Malaysia has bought ExxonMobil's stake in the Seligi oil field and PM8 PSC offshore Malaysia. EQ is a wholly owned subsidiary of UK oil and gas exploration company EnQuest. The agreement is part of the company's strategy to expand its presence in Malaysia. EnQuest has taken over operatorship from ExxonMobil and holds a 50% participating interest, with Petronas Carigali holding the remaining 50%.

EnQuest assumed offshore field operations in October 2014, and the overall transition completed in December 2014, with strong production from the fields. The PM8/Seligi asset has delivered strong production performance due to improved production efficiency resulting from work that has been undertaken after assuming operatorship. The 2015 PM8/Seligi work programme is focused on well interventions activities and improvements to the field infrastructure, including work on gas compressors, pipelines and generators. Well intervention and rectification is proving successful, resulting in production improvements.

EnQuest will continue to enhance production through, increasing facilities uptime, idle well rectifications and interventions and facilities improvement upgrades. The sub-surface programme is also being developed.

Malaysian oil and gas firm Tanjung Offshore and China-based Yantai Jereh Oilfield Services Group have signed a partnership deal, seeking to work together in the Malaysian oil and gas exploration sector. Under the terms of deal, Tanjung will explore potential activities and market Jereh's services in Malaysia, while Jereh will offer oil field equipment for projects awarded by state-owned Petroliam Nasional Berhad. Tanjung CEO Muhammad Sabri Abd Ghani stated that Jereh's technology will enhance its operating efficiency, decrease costs and enable continuous technology improvement (New Strait Times).

Santos has acquired a 10% participating interest the deepwater block R, offshore East Malaysia, from Inpex Corporation's subsidiary Inpex Offshore South West Sabah. The

block covers an area of 672sq km with a water depth ranging between 100m and 1,400m. Santos' subsidiary Santos Sabah Block R Limited has also separately agreed to buy a 10% participating interest in the block from JX Nippon Oil & Gas Exploration. The transaction will bring Santos' total participating interest in the block to 20%, upon completion of the required procedures. Based on the result of the 3D seismic survey, geological and geophysical studies, the drilling of a total of three wildcat wells is planned to start in the block in 2015.

## Regional Overview

### Asia - Weak Oil Prices Will Hit Region's Long-Term O&G Production

***BMI View:** Upstream investment appetite will remain muted for Asia Pacific over 2016, which will hit the region's long-term oil and gas production potential. Cheaper import costs will prove a boon for the emerging economies to increase their uptake of oil and gas. We note that deepening oversupply in the global refined fuels and LNG market poses a risk to refiners and high-cost LNG projects in the region.*

The key trends we highlight for the Asia oil and gas sector this quarter, covering our 2014-2024 forecast period are:

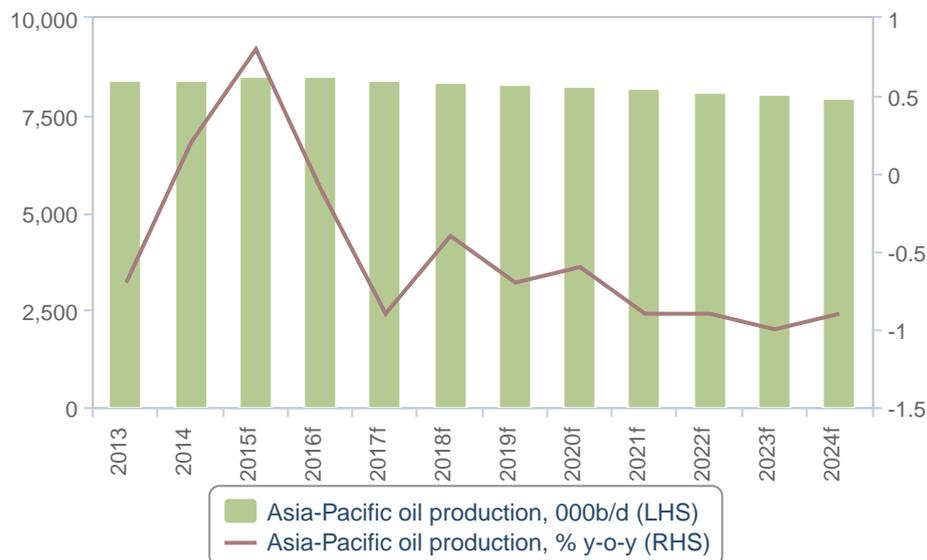
- Lower oil prices slowing upstream investments, which in turn will hit long-term crude oil and natural gas production;
- Deepening oversupply in the global LNG market, which poses risk of long-term delays or cancellations to pre-FID projects;
- Growing competition in the regional refined fuels export market;
- Economic growth and lower oil prices boosting energy consumption in the emerging economies, while demand stagnates in the developed markets;
- India and Indonesia as key markets with sizable consumption growth potential.

#### **Oil Production: Natural Declines Weigh On Long-Term Oil Production Growth**

We forecast a 1.1% y-o-y increase in Asia's crude oil and liquids production in 2015, from 8.4mn barrels per day (b/d) in 2014 to 8.5mn b/d in 2015. This increase will be supported by the start-up of several new projects in India and Vietnam, as well as associated condensates production from gas developments feeding LNG export terminals in Australia and Papua New Guinea (PNG).

## A Structural Decline

Asia - Crude Oil And Liquids Production & % y-o-y Change



f = BMI forecast. Source: EIA, BMI

However, we expect total liquids output to fall thereafter as natural declines at existing fields weigh on production in the region's largest producers, notably China, Indonesia, Malaysia and Thailand. Although production will continue to grow in India, the pace of growth will slow considerably in the latter half of our forecast period to 2024. We expect India's liquids production to grow by an average rate of 2.7% per annum over 2020-2024, compared to 7.6% over 2014-2020.

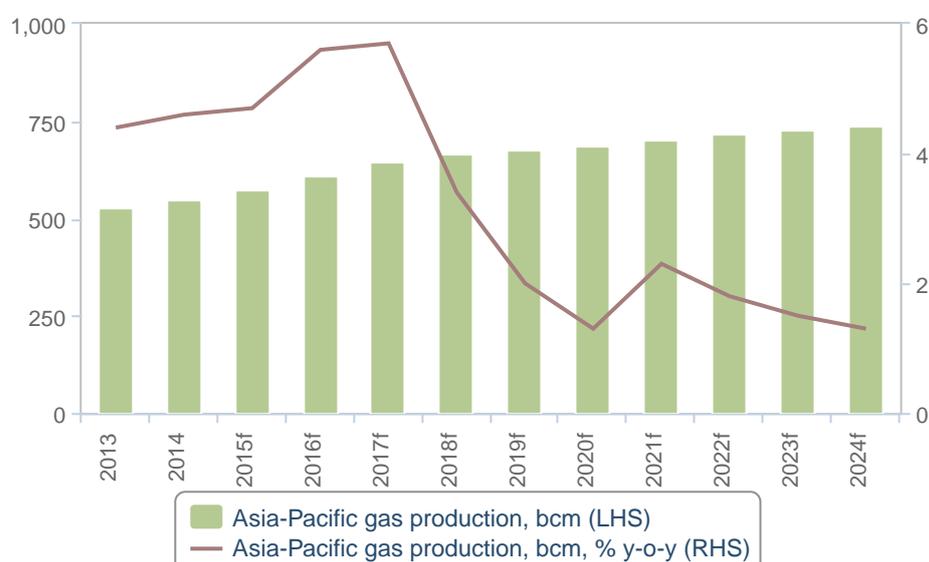
Furthermore, sustained weakness in global oil prices (which we expect to remain below USD70.00/bbl up to 2020) will dampen investment in potential new projects in the region, many of which lie in the deepwater or require advanced recovery techniques. Given the time lag between investment and production, current investment delays will hit the region's medium-to-long term production potential.

### Gas Production: LNG Projects Drive Steady Gas Output Gains

In contrast to oil, Asia's natural gas production will continue on a strong uptrend over the next decade, rising by 25.3% from 576.6bn cubic meters (bcm) in 2015 to hit 737.4bcm by 2024. A large part of this increase will come from Australia, with start-ups of several large LNG projects in the next few years set to nearly double its production from about 56.5bcm in 2014 to 105.2bcm in 2018.

### Australia Spearheads Gas Output Growth

Asia - Natural Gas Production & % y-o-y Change



f = BMI forecast. Source: EIA, BMI

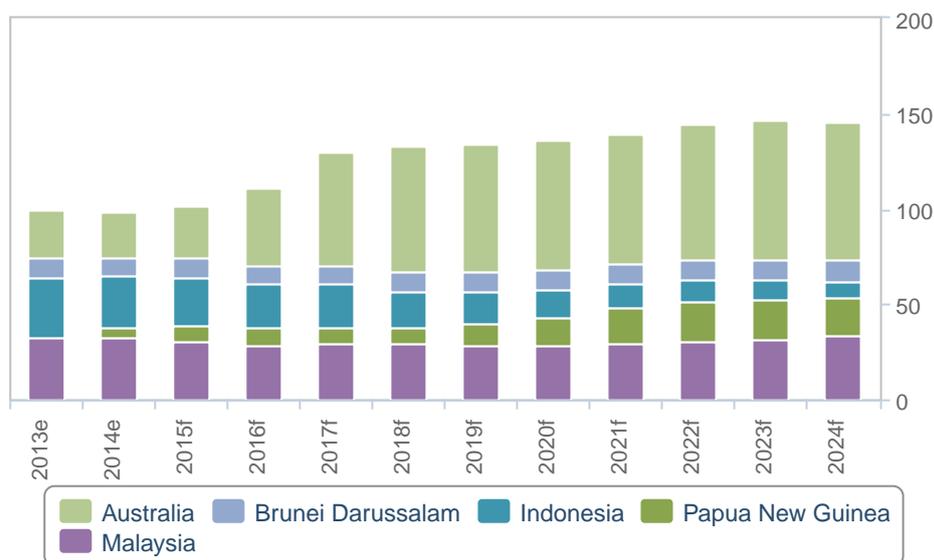
Post-2018, we expect the pace of gas production growth to moderate as low oil prices slow down the upstream investments needed to bring new sources of gas production online. This will hit countries such as Australia, India, Myanmar and Vietnam, where much production potential lie in the deepwater reserves and unconventional plays. While shale gas production will likely increase in China over the coming years, output gains from greater shale gas development will be cancelled out by cutbacks in output from conventional plays as a cooling economy eases industry demand for gas.

### LNG Exports: Pre-FID Projects At Risk

LNG exports by the region's five net LNG exporters - Australia, Malaysia, Indonesia, Brunei and PNG - over the next decade will rise in tandem with greater availability of gas supplies. This growth will largely be driven by new LNG projects coming online in Australia, Malaysia and PNG over the next five years. Growth will be particularly pronounced in PNG - based on our forecasts, the country is set to overtake Indonesia and Brunei in 2021 and 2019, respectively to become the region's third largest LNG producer and exporter behind Australia and Malaysia.

### Exports Growth To Slow Over 2019-2024

Selected Countries - Net LNG Exports (bcm)



e/f = BMI estimate/forecast. Source: EIA, BMI

That said, we note that several pre-FID projects - which have not sold the bulk of future production on long-term contracts - remain at risk of long-term delays and cancellations. We expect weak spot LNG prices, persistent oversupply in the global LNG market and slower-than-anticipated LNG demand from major consumers such as Japan, South Korea, China and India to weigh on firms' decisions to bring these facilities online (see 'LNG Next In Line For Commodities Crunch', September 18). As such, we forecast LNG export growth to drop-off from 2019.

### **Technology Poses Upside To Long-Term Production**

Despite Asia's good below-ground potential, international oil companies (IOCs) have been increasingly looking away from the region amid the lower oil price environment, given that new developments in Asia generally have smaller returns and higher production costs compared to those along the Atlantic basins in South America and Sub-Saharan Africa.

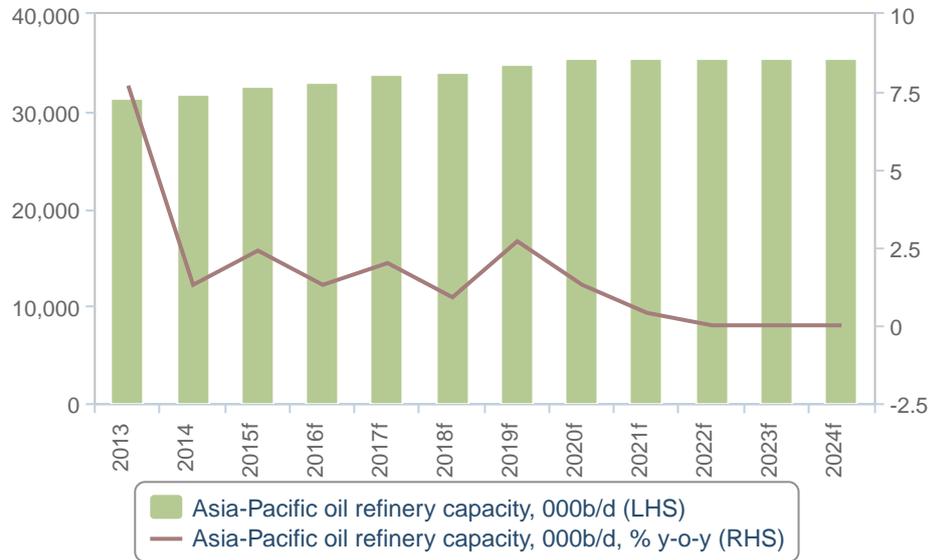
As IOCs tighten their purse strings to focus on higher-margin projects elsewhere, we see opportunities for the Asian national oil companies (NOCs) to invest in advanced drilling technology and oil recovery techniques. This will help to lower production cost, improve accessibility to unconventional reserves and enhance recovery rates at existing fields, thereby posing upside risk to our production forecast. In fact, firms such as **PetroVietnam** and **Petronas** have already disclosed plans to boost their technological capability over the coming years.

### **Refining Capacity: Overcapacity To See Greater Consolidation**

We forecast Asia's refining capacity to expand by 8.4% over the next decade, from 32.6mn b/d in 2015 to 35.6mn b/d in 2024, driven by large capacity expansions in China and India. We forecast China to add over 2.0mn b/d of new refining capacity by 2020, and India to add just under 1.0mnb/d.

## Refining Capacity Growth To Taper Off

Asia - Refining Capacity & % y-o-y Chg

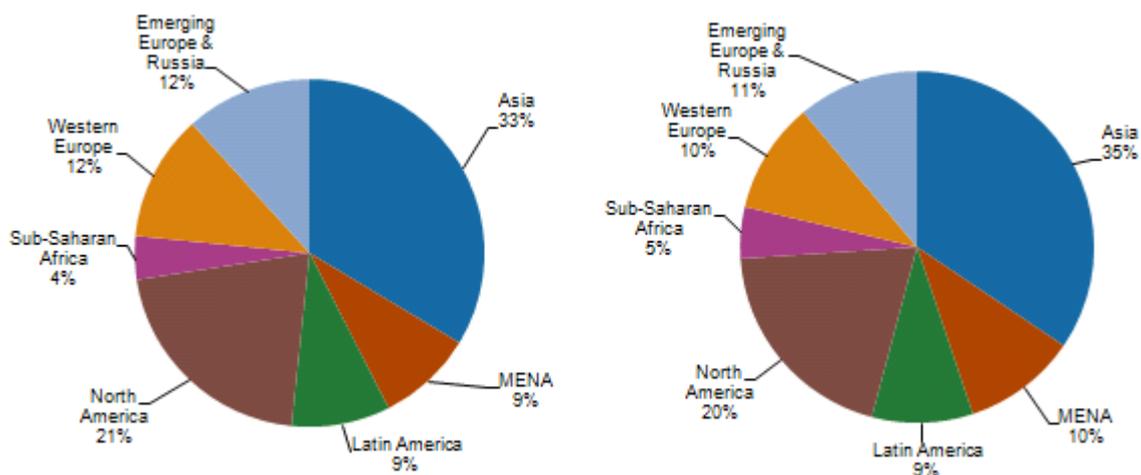


f = BMI forecast. Source: EIA, BMI

This will ensure that Asia continue to account for the largest share of the world's total refining capacity (33.6% in 2014, 34.4% in 2024).

## Asia To Maintain Largest Share Of Global Refining Capacity

Distribution Of Global Refining Capacity, 2014 (LHC) vs 2024 (RHC)



Source: EIA, BMI

However, we note that Asian refiners will face intensifying competition from producers outside the region. Fuel efficiency gains in North America and Western Europe will weaken domestic demand in these regions and push their refiners to compete abroad. Additionally, massive capacity expansions in the Middle East will exacerbate competition for shares in the Asian market.

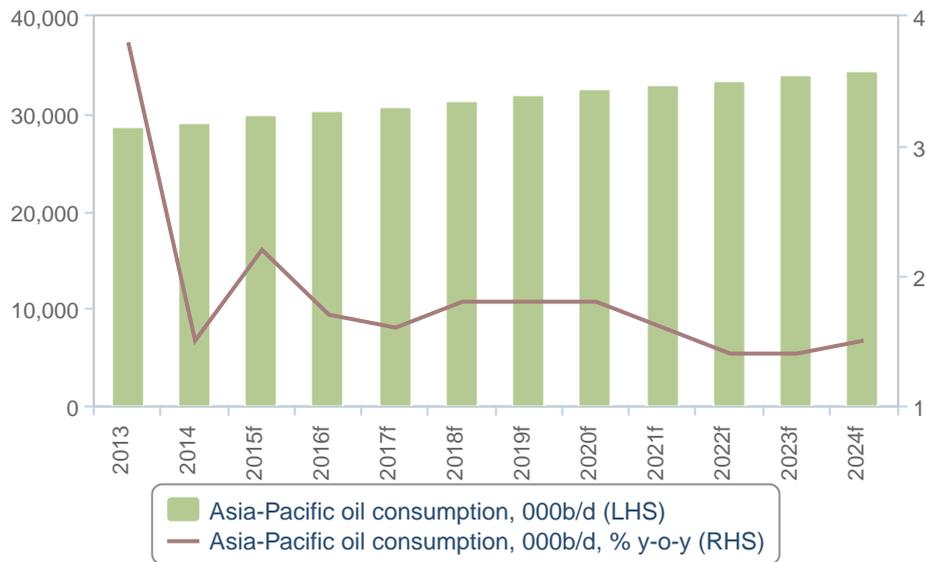
This, combined with slower-than-anticipated demand growth for refined fuels in China, South Korea and Japan will likely see substantial under-utilisation of Asia's total refining capacity. This leads us to believe that there will be greater consolidation among the region's refiners in the coming years, as overcapacity drives down refining margins and impacts the least efficient facilities (*see 'Refining Sector To Consolidate As Capacity Outstrips Demand', July 29*).

**Oil Consumption: Emerging Economies Lead Consumption Growth**

The expansion of the region's refining capacity will be matched by its growing oil consumption, which we forecast to increase by 13.5% between 2015 and 2024.

**Low Oil Price A Boon For Fuels Consumption Growth**

**Asia - Total Oil Consumption & % y-o-y Chg**



f = BMI forecast. Source: EIA, BMI

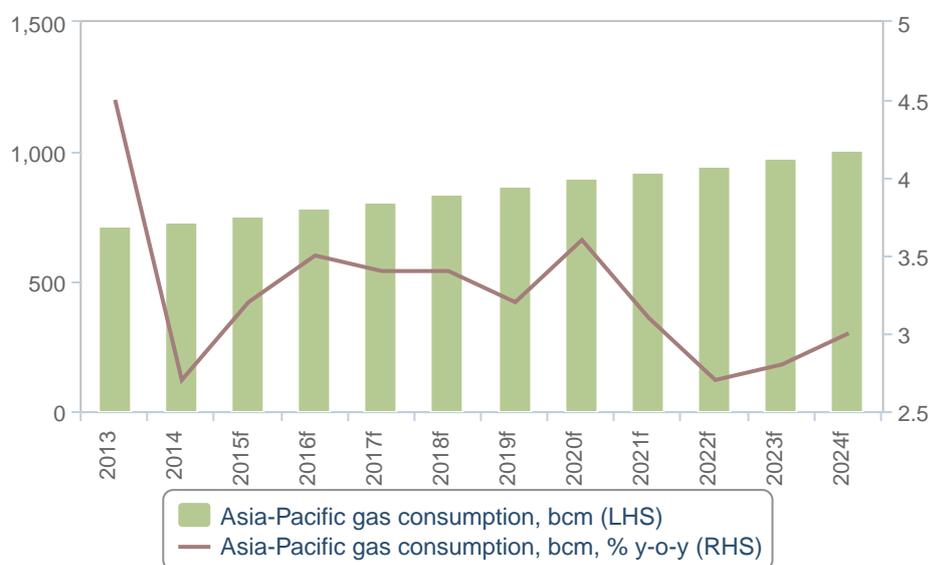
Refined fuels consumption growth in India, Indonesia and Vietnam is set to outperform over the coming decade, driven by solid economic growth, strong car sales growth and low oil prices, which will help to cushion the impact of fuel subsidy cuts in these countries. Meanwhile, demand will noticeably decrease in Japan and South Korea, as fuel efficiency gains in the transport sector temper domestic demand for refined fuels.

**Gas Consumption: China And Japan To Remain Dominant**

As with oil consumption, Asia's gas consumption will remain on an uptrend, from 757.5bcm in 2015 to 1.0trn cubic meters (tcm) in 2024.

**A Firm Uptrend**

**Asia - Gas Consumption & % y-o-y Chg**



*f = BMI forecast. Source: EIA, BMI*

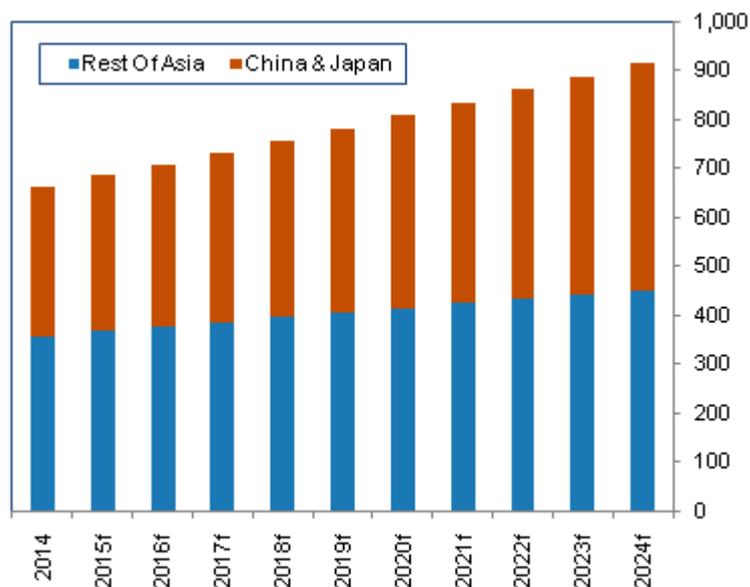
The increase will be underpinned by greater electrification across the region's emerging markets, as well as greater shift to cleaner energy sources in the developed economies (primarily at the expense of coal).

Moreover, the beginning of LNG imports in Pakistan and the Philippines will boost gas consumption in these countries; while the fall in oil prices will benefit countries which already import LNG as oil-indexed gas contracts become cheaper.

Even as gas intake increases among the Asian emerging markets, China and Japan will continue to remain Asia's largest consumers of natural gas. The two countries will continue to account for nearly half of the region's total gas consumption over the next 10 years.

## China And Japan Will Remain Largest Gas Users

Asia - Distribution Of Gas Consumption, bcm



*f = BMI forecast. Source: National Statistical Agencies, EIA, BMI*

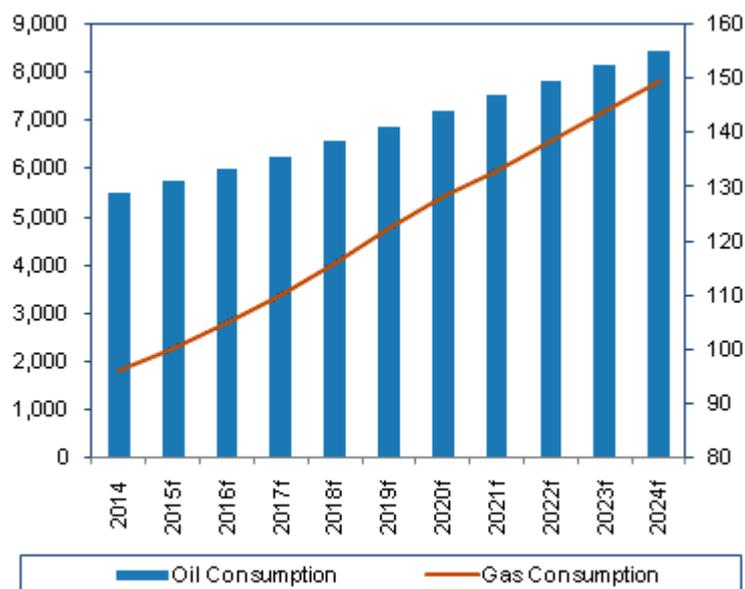
### Markets To Watch: Indonesia & India

We highlight India and Indonesia as markets with sizable consumption growth potential in the region. The pro-reformist agenda of both governments will likely stimulate greater economic activity and increase consumer wealth in the coming years, which in turn will boost domestic energy consumption. Our Country Risk team expects India and Indonesia's real GDP growth to average about 6.7% and 5.9% per annum, respectively, over the next 10 years.

Indeed, we see the two countries' combined oil consumption increasing by 36.5% and gas consumption by 35.8%, respectively, over 2014-2024. Strong car sales growth up to 2019 will underpin surging demand for gasoline and diesel, while greater economic activity and shift to gas-fired generation will see greater gas uptake by the industries and the power sector.

## Reforms Underpin Consumption Growth

India & Indonesia - Oil Consumption, 000b/d (LHS) & Gas Consumption, bcm (RHS)



f = BMI forecast. Source: National Statistical Agencies, EIA, BMI

### Indonesia's Downstream Outlook Improving

While a lack of a strong regulatory framework and legal certainty has largely deterred private investment in Indonesia's upstream sector in the past, business environment in its downstream sector is improving. Recent regulatory changes have been favourable, with cutbacks in fuel price subsidies and raising of domestic retail prices increasing the sector's appeal to potential private investors.

Given the country's deficit in refining capacity and increasing dependence on fuels imports, we expect the Indonesian government to enact additional measures to attract more private capital to its refining sector. In fact, Indonesia's looming re-entry to OPEC is likely to have been motivated by its desire to attract greater investment flow into its downstream segment (*see 'Fuel Need Drives OPEC Return', September 10*).

# Glossary

**Table: Glossary Of Terms**

<b>AOR</b>	additional oil recovery	<b>KCTS</b>	Kazakh Caspian Transport System
<b>APA</b>	awards for predefined areas	<b>km</b>	kilometres
<b>API</b>	American Petroleum Institute	<b>LAB</b>	linear alkyl benzene
<b>bbi</b>	barrel	<b>LDPE</b>	low density polypropylene
<b>bcm</b>	billion cubic metres	<b>LNG</b>	liquefied natural gas
<b>b/d</b>	barrels per day	<b>LPG</b>	liquefied petroleum gas
<b>bn</b>	billion	<b>m</b>	metres
<b>boe</b>	barrels of oil equivalent	<b>mcm</b>	thousand cubic metres
<b>BTC</b>	Baku-Tbilisi-Ceyhan Pipeline	<b>Mcm</b>	mn cubic metres
<b>BTU</b>	British thermal unit	<b>MEA</b>	Middle East and Africa
<b>Capex</b>	capital expenditure	<b>mn</b>	million
<b>CBM</b>	coal bed methane	<b>MoU</b>	memorandum of understanding
<b>CEE</b>	Central and Eastern Europe	<b>mt</b>	metric tonne
<b>CPC</b>	Caspian Pipeline Consortium	<b>MW</b>	megawatts
<b>CSG</b>	coal seam gas	<b>na</b>	not available/ applicable
<b>DoE</b>	US Department of Energy	<b>NGL</b>	natural gas liquids
<b>EBRD</b>	European Bank for Reconstruction & Development	<b>NOC</b>	national oil company
<b>EEZ</b>	exclusive economic zone	<b>OECD</b>	Organisation for Economic Cooperation & Development
<b>e/f</b>	estimate/forecast	<b>OPEC</b>	Organization of the Petroleum Exporting Countries
<b>EIA</b>	US Energy Information Administration	<b>PE</b>	polyethylene
<b>EM</b>	emerging markets	<b>PP</b>	polypropylene
<b>EOR</b>	enhanced oil recovery	<b>PSA</b>	production sharing agreement
<b>E&amp;P</b>	exploration and production	<b>PSC</b>	production sharing contract
<b>EPSA</b>	exploration and production sharing agreement	<b>q-o-q</b>	quarter-on-quarter
<b>FID</b>	final investment decision	<b>R&amp;D</b>	research and development
<b>FDI</b>	foreign direct investment	<b>R/P</b>	reserves/production
<b>FEED</b>	front end engineering and design	<b>RPR</b>	reserves to production ratio
<b>FPSO</b>	floating production, storage and offloading	<b>SGI</b>	strategic gas initiative
<b>FTA</b>	free trade agreement	<b>SoI</b>	statement of intent
<b>FTZ</b>	free trade zone	<b>SPA</b>	sale and purchase agreement
<b>GDP</b>	gross domestic product	<b>SPR</b>	strategic petroleum reserve

<b>Glossary Of Terms - Continued</b>			
<b>G&amp;G</b>	geological and geophysical	<b>t/d</b>	tonnes per day
<b>GoM</b>	Gulf of Mexico	<b>tcm</b>	trillion cubic metres
<b>GS</b>	geological survey	<b>toe</b>	tonnes of oil equivalent
<b>GTL</b>	gas-to-liquids conversion	<b>tpa</b>	tonnes per annum
<b>GW</b>	gigawatts	<b>TRIPS</b>	Trade-Related Aspects of Intellectual Property Rights
<b>GWh</b>	gigawatt hours	<b>trn</b>	trillion
<b>HDPE</b>	high density polyethylene	<b>T&amp;T</b>	Trinidad & Tobago
<b>HoA</b>	heads of agreement	<b>TTPC</b>	Trans-Tunisian Pipeline Company
<b>IEA</b>	International Energy Agency	<b>TWh</b>	terawatt hours
<b>IGCC</b>	integrated gasification combined cycle	<b>UAE</b>	United Arab Emirates
<b>IOC</b>	international oil company	<b>USGS</b>	US Geological Survey
<b>IPI</b>	Iran-Pakistan-India Pipeline	<b>WAGP</b>	West African Gas Pipeline
<b>IPO</b>	initial public offering	<b>WIPO</b>	World Intellectual Property Organization
<b>JOC</b>	joint operating company	<b>WTI</b>	West Texas Intermediate
<b>JPDA</b>	joint petroleum development area	<b>WTO</b>	World Trade Organization

Source: BMI

# Methodology

## Industry Forecast Methodology

**BMI**'s industry forecasts are generated using the best-practice techniques of time-series modelling and causal/econometric modelling. The precise form of model we use varies from industry to industry, in each case being determined, as per standard practice, by the prevailing features of the industry data being examined.

Common to our analysis of every industry is the use of vector autoregressions. Vector autoregressions allow us to forecast a variable using more than the variable's own history as explanatory information. For example, when forecasting oil prices, we can include information about oil consumption, supply and capacity.

When forecasting for some of our industry sub-component variables, however, using a variable's own history is often the most desirable method of analysis. Such single-variable analysis is called univariate modelling. We use the most common and versatile form of univariate models: the autoregressive moving average model (ARMA).

In some cases, ARMA techniques are inappropriate because there is insufficient historic data or data quality is poor. In such cases, we use either traditional decomposition methods or smoothing methods as a basis for analysis and forecasting.

**BMI** mainly uses OLS estimators and in order to avoid relying on subjective views and encourage the use of objective views, **BMI** uses a 'general-to-specific' method. **BMI** mainly uses a linear model, but simple non-linear models, such as the log-linear model, are used when necessary. During periods of 'industry shock', for example poor weather conditions impeding agricultural output, dummy variables are used to determine the level of impact.

Effective forecasting depends on appropriately selected regression models. **BMI** selects the best model according to various different criteria and tests, including but not exclusive to:

- $R^2$  tests explanatory power; adjusted  $R^2$  takes degree of freedom into account;
- Testing the directional movement and magnitude of coefficients;
- Hypothesis testing to ensure coefficients are significant (normally t-test and/or P-value);
- All results are assessed to alleviate issues related to auto-correlation and multi-collinearity.

**BMI** uses the selected best model to perform forecasting.

Human intervention plays a necessary and desirable role in all of **BMI**'s industry forecasting. Experience, expertise and knowledge of industry data and trends ensure that analysts spot structural breaks, anomalous data, turning points and seasonal features where a purely mechanical forecasting process would not.

### **Sector-Specific Methodology**

There are a number of principal criteria that drive our forecasts for each energy indicator.

#### **Energy Supply**

This covers the supply of crude oil, natural gas, refined oil products and electrical power, which is determined largely by investment levels, available capacity, plant utilisation rates and national policy. We therefore examine:

- National energy policy, stated output goals and investment levels;
- Company-specific capacity data, output targets and capital expenditures, using national, regional and multinational company sources;
- International quotas, guidelines and projections from organisations such as OPEC, the International Energy Agency (IEA), and the US Energy Information Administration (EIA).

#### **Energy Consumption**

A mixture of methods is used to generate demand forecasts, applied as appropriate to each individual country:

- Underlying economic (GDP) growth for individual countries/regions, sourced from **BMI** published estimates;
- Historic relationships between GDP growth and energy demand growth in an individual country are analysed and used as the basis for predicting levels of consumption;
- Government projections for oil, gas and electricity demand;
- Third-party agency projections for regional demand, from organisations such as the IEA, EIA and OPEC;

Extrapolation of capacity expansion forecasts based on company- or state-specific investment levels.

## Cross Checks

Whenever possible, we compare government and/or third-party agency projections with the declared spending and capacity expansion plans of the companies operating in each individual country. Where there are discrepancies, we use company-specific data as physical spending patterns to determine capacity and supply capability. Similarly, we compare capacity expansion plans and demand projections to check the energy balance of each country. Where the data suggest imports or exports, we check that necessary capacity exists or that the required investment in infrastructure is taking place.

## Source

Sources include those international bodies mentioned above, such as OPEC, IEA, and EIA, as well as local energy ministries, official company information, and international and national news, plus international and national news agencies.

## Risk/Reward Index Methodology

**BMI's Risk/Reward Index (RRI)** provides a comparative regional ranking system evaluating the ease of doing business and the industry-specific opportunities and limitations for potential investors in a given market. The RRI system is divided into two distinct areas:

**Rewards:** Evaluation of sector's size and growth potential in each state, and also broader industry/state characteristics that may inhibit its development. This is further broken down into two sub-categories:

- Industry Rewards (this is an industry-specific category taking into account current industry size and growth forecasts, the openness of market to new entrants and foreign investors, to provide an overall score for potential returns for investors);
- Country Rewards (this is a country-specific category, and the score factors in favourable political and economic conditions for the industry).

**Risks:** Evaluation of industry-specific dangers and those emanating from the state's political/economic profile which call into question the likelihood of anticipated returns being realised over the assessed time period. This is further broken down into two sub-categories:

- Industry Risks (this is an industry-specific category whose score covers potential operational risks to investors, regulatory issues inhibiting the industry, and the relative maturity of a market);
- Country Risks (this is a country-specific category in which political and economic instability, unfavourable legislation and a poor overall business environment are evaluated to provide an overall score).

We take a weighted average, combining Market and Country Risks, or Industry and Country Rewards. These two results in turn provide an overall Risk/Reward Index score, which is used to create our regional ranking system for the risks and rewards of involvement in a specific industry in a particular country.

For each category and sub-category, each state is scored out of 100 (with 100 the best), with the overall Risk/Reward Index score a weighted average of the total score. Importantly, as most of the countries and territories evaluated are considered by **BMI** to be 'emerging markets', our index is revised on a quarterly basis. This ensures that the index draws on the latest information and data across our broad range of sources, and the expertise of our analysts.

### **Sector-Specific Methodology**

**BMI**'s approach in assessing the Risk/Reward balance for oil and gas industry investors is three-fold:

- First, we have disaggregated the upstream (oil and gas exploration and production) and downstream (oil refining and marketing, gas processing and distribution), enabling us to take a more nuanced approach to analysing the potential in each segment, and identifying the different risks along the value chain.
- Second, we have identified objective indicators that may serve as proxies for issues and trends that were previously evaluated on a subjective basis.
- Finally, we have used **BMI**'s proprietary Country Risk Index in a more refined manner in order to ensure that only those risks most relevant to the industry have been included.

Conceptually, the index is organised in a manner that enables us clearly to present the comparative strengths and weaknesses of each state. The headline oil and gas index score is the principal score. However, the differentiation of upstream and downstream and the articulation of the elements that comprise each segment enable more sophisticated conclusions to be drawn, and also facilitate the use of the index by clients who have varying levels of exposure and risk appetite.

Our sector-specific industry indices include:

- Oil & Gas Risk/Reward Index: this is the overall index score, which comprises 50% upstream and 50% downstream;
- Upstream Oil & Gas Risk/Reward Index: this is the overall upstream index score, which is composed of rewards/risks (see below);
- Downstream Oil & Gas Risk/Reward Index: this is the overall downstream index score, which comprises rewards/risks (see below).

The following indicators have been used. Overall, the index uses three subjectively measured indicators and 41 separate indicators/datasets.

**Table: Bmi's Oil & Gas Upstream Risk/Reward Index**

<b>Rationale</b>	
<b>Upstream RRR: Rewards</b>	
<b>Industry Rewards</b>	
<b>Resource Base</b>	
- Proven oil reserves, mn bbl	Indicators used to denote total market potential. High values given better scores.
- Proven gas reserves, bcm	
<b>Growth Outlook</b>	
- Oil production growth, 2009-2014	Indicators used as proxies for BMI's market assumptions, with strong growth accorded higher scores.
- Gas production growth, 2009-2014	
<b>Market Maturity</b>	
- Oil reserves/production	Indicator used to denote whether industries are frontier/emerging/developed or mature markets. Low existing exploitation in relation to potential is accorded a higher score.
- Gas reserves and production	
- Current oil production versus peak	
- Current gas production versus peak	
<b>Country Rewards</b>	
State ownership of assets, %	Indicator used to denote opportunity for foreign NOCs/IOCs/independents. Low state ownership scores higher.
Number of non-state companies	Indicator used to denote market competitiveness. Presence (and large number) of non-state companies scores higher.
<b>Upstream RRR: Risks</b>	
<b>Industry Risks</b>	
Licensing terms	Subjective evaluation of government policy towards sector against BMI-defined criteria. Protectionist states are marked down.
Privatisation trend	Subjective evaluation of government industry orientation. Protectionist states are marked down.
<b>Country Risks</b>	
Physical infrastructure	Score from BMI's Country Risk Index (CRI). It evaluates the constraints imposed by power, transport and communications infrastructure.
Long-term policy continuity risk	From CRI. It evaluates the risk of a sharp change in the broad direction of government policy.
Rule of law	From CRI. It evaluates government's ability to enforce its will within the state.
Corruption	From CRI, to denote risk of additional legal costs and possibility of opacity in tendering or business operations affecting companies' ability to compete.

*NOC = national oil company; IOC = international oil company. Source: BMI*

## Weighting

Given the number of indicators/datasets used, it would be inappropriate to give all sub-components equal weight. Consequently, the following weighting has been adopted:

<b>Table: Weighting</b>	
<b>Component</b>	<b>Weighting, %</b>
Upstream RRI	50, of which
Rewards	70 of Upstream RRI, of which
- Industry Rewards	75
- Country Rewards	25
Risks	30 of Upstream RRI, of which
- Industry Risks	65
- Country Risks	35
Downstream RRI	50 of Oil & Gas RRI, of which
Rewards	70 ,of which
- Industry Rewards	75
- Country Rewards	25
Risks	30, of which
- Industry Risks	60
- Country Risks	40

Source: BMI