Monetising Gas Resources for National Development: Malaysia’s Experience

Gas Training Seminar
‘Access to Sustainable Energy for All With Gas’
Abidjan, Cote d’Ivoire : 4-5 November 2013

By :
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PETRONAS
• Malaysia at a glance
• The birth of petroleum industry
• PETRONAS’ roles in national development
• The Gas Era
• Key Issues & Challenges
• Way Forward
Malaysia at a glance
Malaysia at a glance

**Politics**
- Chief of State: King Tuanku Abdul Halim Mu'adzam Shah
- Head of government: Prime Minister Mohamed NAJIB Abdul Razak
- Political system: Parliamentary democracy with constitutional monarch

**Long-Term Economic & Social Development**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>GDP Billion (US$)</td>
<td>25</td>
<td>43</td>
<td>94</td>
<td>247</td>
<td>303</td>
</tr>
<tr>
<td>GDP per capita (US$)</td>
<td>1,800</td>
<td>2,500</td>
<td>4,000</td>
<td>8,700</td>
<td>10,400</td>
</tr>
<tr>
<td>Inflation (%)</td>
<td>6.7</td>
<td>2.6</td>
<td>1.5</td>
<td>1.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Population (mn)</td>
<td>13.5</td>
<td>17.9</td>
<td>23.2</td>
<td>28.3</td>
<td>29.6</td>
</tr>
<tr>
<td>Urban Population (%)</td>
<td>42</td>
<td>50</td>
<td>62</td>
<td>72</td>
<td>73</td>
</tr>
</tbody>
</table>

**Structure of GDP by Output (%)**

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Services</td>
<td>53</td>
</tr>
<tr>
<td>Industry</td>
<td>36</td>
</tr>
<tr>
<td>Agriculture</td>
<td>11</td>
</tr>
</tbody>
</table>

**Major Trading Partners (2011)**

<table>
<thead>
<tr>
<th></th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>13.6%</td>
<td>China</td>
</tr>
<tr>
<td>China</td>
<td>12.6%</td>
<td>Singapore</td>
</tr>
<tr>
<td>Japan</td>
<td>11.8%</td>
<td>Japan</td>
</tr>
<tr>
<td>US</td>
<td>8.7%</td>
<td>US</td>
</tr>
<tr>
<td>Thailand</td>
<td>5.4%</td>
<td>Thailand</td>
</tr>
</tbody>
</table>
The birth of petroleum industry
Oil was first discovered onshore in Sarawak in 1900, however, modern day drilling started in 1960s

- Oil first discovered in Miri in 1902 by Shell
- Miri was the first and only onshore production platform
  - Initial Production in 1910 - 83 bbl/d
  - Peaked at 29,000 bpd in 1929
  - The well was decommissioned in 1972

- In the earlier days, IOCs were given concessions rights to develop domestic oil and gas fields.

- In Peninsular offshore, the contract areas were mainly between Conoco, Esso and Mobil.
Developing Malaysia’s Upstream

Evolution of Malaysian PSCs to address the changing environment and sustain the attractiveness of upstream investment

Concession Agreement

Concession agreements between oil companies and State Governments

Pre-1976

1976

1976 PSC

Primarily to convert the then existing concession agreements into PSCs.

1976 PSC

1985

1985 PSC

Primarily to attract foreign investment to explore for oil and gas resources.

1985 PSC

1985 DW PSC

Target for big players with experience in Deepwater (DW) and Ultra-Deepwater exploration, development & production.

1985 DW PSC

1994

R/C PSC

To attract new foreign exploration investments.

1994 R/C PSC

To attract investments in operational challenging conditions of extreme High Pressure and High Temperature (HP/HT) of deep reservoirs.

1994 R/C PSC

1997

HP/HT PSC

To promote use of cost-effective new technology in the exploration for higher risk subtle plays.

1997 HP/HT PSC

2008

Risk Service Contract (RSC)

To attract development of Marginal/Small Fields resources which are stranded due to technical and commercial challenges.

2008 RSC

2011

2011

Progressive Volume Base

To attract further investments in mature producing fields, which are technically and commercial challenging.

2011 PSC

2012

Production Rate/Volume Based

Profitability Based

Performance Based

Legend:

- DW: Deep water
- R/C: Revenue over cost
- HP: High pressure
- HT: High temperature
- RSC: Risk service contract

Note: In 2011, improvement to DW PSC was made to encourage development of deepwater gas.

Source: Petroleum Management Unit (PMU), PETRONAS
Relationship and demarcation of roles between key stakeholders

**Features**
- Ownership of petroleum resources is vested upon PETRONAS.
- PETRONAS has exclusive rights to explore and develop petroleum resources.
- Converted Concession System to Production Sharing Contracts (PSC).
- PS Contractors provide all risk capital & financing
- Stipulates contractual period, management of operations, recovery of costs, division of profits, obligations of parties.

**PETRONAS’ Roles**
- As a custodian to manage the petroleum resources of the nation.
- Formulates relevant policy and guidelines.
- Provides incentives and conducive investment environment for upstream
- Adds value to the petroleum resources.
- Plans and secures long term development of nation's petroleum resource base.
- Promotes sustainable and orderly exploration, development and production of resources to maximize benefit for the nation.
- Monitor performance of PSC partners vis-à-vis:
  - Petroleum operations
  - Finance and cost competitiveness
  - Technology Transfer

PETRONAS is the policy instrument of the Government and serves as a conduit for nation building.
PETRONAS - custodian and manager of Malaysia’s petroleum resources

PETRONAS was incorporated on 17 August 1974 as a company under the Malaysian Companies Act 1965.

The Malaysian Petroleum Development Act 1974 vested upon PETRONAS the exclusive rights to explore and produce petroleum resources within Malaysia.

100% owned by the Government of Malaysia, PETRONAS reports directly to the Prime Minister.

Total workforce in 1974: 15
Institutional & organisational structure of the petroleum Industry in Malaysia

Prime Minister

- Ministry of Energy, Green Technology and Water
  - Department of Environment
- Ministry of Natural Resources & Environment
- Prime Minister’s Department
- Ministry of Finance
- Ministry of International Trade & Industry
- Ministry of Domestic Trade, Co-operatives & Consumerism
  - Malaysian Investment Development Authority
  - Economic Planning Unit
  - Custodian - manages the petroleum resources of the Nation

Custodian - manages the petroleum resources of the Nation

PS Contractors/Operators

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Institutional & organisational structure of the petroleum Industry in Malaysia

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- Custodian - manages the petroleum resources of the Nation
- PS Contractors/Operators

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Start on the right footing with the right principles

- Our country’s leaders had the foresight to establish PETRONAS on the right footing
- PETRONAS was set up as a commercial entity
  - Commercial mindset
  - Clear governance structure
  - Managing business in professional manner
  - Flexibility to expand and grow
- A highly supportive Government
Petronas vision, mission and values driving strong performance

**Vision: A Leading Oil and Gas Multinational of Choice**

**Mission**

We are a business entity

Petroleum is our core business

Our primary responsibility is to develop and add value to this national resource

Our objective is to contribute to the well-being of the people and the nation

**Shared Values**

Loyalty

Integrity

Professionalism

Cohesiveness
Who We Are Today

Fully integrated multinational oil and gas corporation with operations along the hydrocarbon value chain spanning over 50 countries

Global Fortune 500

- 75 by Revenue
- 19 by Profits
- 6 Most Profitable among Oil and Gas Companies

LNG production capacity

2 in the world*

Oil and gas production

2 million boepd

* tied with Shell
(Source: Wood Mackenzie)
...with robust financial standing

Strong balance sheet with robust cash holdings to capitalise on opportunities for growth

- **USD 94 billion** Revenue
- **USD 40 billion** EBITDA
- **USD 158 billion** Total Assets

5-year Capital Expenditure programme

- **USD 100 billion**

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**Return on Average Capital Employed (ROACE) in percentage (%)**

- **FY08/09**: IOC, 22.0; NOC, 17.2; PETRONAS, 21.8
- **FY09/10**: IOC, 16.0; NOC, 13.4; PETRONAS, 16.1
- **FY10/11**: IOC, 10.5; NOC, 13.3; PETRONAS, 14.9
- **FY11/12**: IOC, 10.2; NOC, 12.0; PETRONAS, 10.4

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...and a Fully Integrated Business

- Crude Oil
  - Exploration, Development and Production
  - Refining
    - Petroleum Products
    - Petrochemical Plant
  - Processing
    - Liquefied Petroleum Gas (LPG)
    - Processed Gas/PGU System
  - Liquefaction
    - Liquefied Natural Gas (LNG)
    - Regasification Terminal
PETRONAS’ roles in national development
Being a business entity, PETRONAS is focused on its role to support the Federal Government on national development.

PETRONAS is the policy instrument of the Government and serves as a ‘conduit for nation building’.

A strategy of integration and value-adding has helped to spur and stimulate Malaysia’s economic growth.

To be a Developed Nation by 2020.

New Economic Policy
National Development Policy
Petroleum Development Act
Policies related to Energy
Industrial Master Plans

Master Plans for Gas and Petrochemicals
Upstream & downstream oil and gas development
Capability development

VISION & MISSION

GOVERNMENT

National Development and Industrialisation Drive
Malaysia has crafted a coherent and cohesive direction in energy policy to ensure orderly development of the energy industry in Malaysia.
Industrial masterplans provide the framework for gas utilization in key economic sectors

First IMP (1996-1995)
- Lay foundation for manufacturing to become leading growth sector
  - Continuation of export-led strategy
  - Renewed emphasis on promotion of resource-based industries

Second IMP (1996-2005)
- Strengthen linkages, increase value-added activities & enhance productivity
  - Development of clusters
  - Shift towards higher technology & capital-intensive activities
  - Target growth in productivity
  - Gear development towards equitable distribution

Third IMP (2006-2020)
- Achieve long-term global competitiveness through transformation and innovation of the manufacturing and services sectors
  - Enhancing Malaysia's position as major trading nation
  - Integrating Malaysian companies into regional and global networks
  - Strengthening role of private sector institutions

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Petronas helps to spur development of nation’s economy…

Entry Point Projects (EPPs) for Oil, Gas & Energy industry

GNI contribution of USD41 billion

- Rejuvenating Existing Fields Through EOR
- Developing Small Fields through Innovative Solutions
- Intensifying Exploration Activities
- Unlocking Premium Gas Demand in Peninsular Malaysia
- Increase Petrochemical Outputs

5 year intensified CAPEX programme

More than USD93 billion for:

- Aggressive E&P activities
- Unconventional Resources
- Regasification Terminals
- LNG expansion
- Power plant projects
- Refinery & Petrochemical complexes
- Asset integrity, maintenance & HSE programmes
… at the same time, PETRONAS has also been involved in education, knowledge and capability building.
In conclusion, the successful development of the petroleum industry has benefited the nation and PETRONAS

- Attracting foreign direct investment (FDIs)
- Creation of jobs
- Creation of small and medium industries (SMEs)
- Development of skilled manpower
- Broaden and diversify the industrial and manufacturing based industries
- Contribute to the continuous development of Malaysian economy

- Value creation for oil and gas resources
- Downstream integration
- Development of skilled manpower and expertise in the oil and gas industry
- Opportunity to pursue strategic alliance, collaboration and partnerships with major global players and NOCs
- Ability to leverage on domestic strength to go global
The Gas Era
Malaysia’s oil and gas reserves

Oil Reserves

<table>
<thead>
<tr>
<th>Year</th>
<th>Reserves (Billion Barrels)</th>
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<tbody>
<tr>
<td>1975</td>
<td>0.9</td>
</tr>
<tr>
<td>1985</td>
<td>3.3</td>
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<tr>
<td>1995</td>
<td>4.1</td>
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<tr>
<td>2000</td>
<td>4.5</td>
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<tr>
<td>2005</td>
<td>5.2</td>
</tr>
<tr>
<td>2010</td>
<td>5.8</td>
</tr>
<tr>
<td>2013</td>
<td>5.8</td>
</tr>
</tbody>
</table>

*including condensate

Gas Reserves

<table>
<thead>
<tr>
<th>Year</th>
<th>Reserves (Trillion Standard cubic feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>18</td>
</tr>
<tr>
<td>1985</td>
<td>52</td>
</tr>
<tr>
<td>1995</td>
<td>85</td>
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<tr>
<td>2000</td>
<td>84</td>
</tr>
<tr>
<td>2005</td>
<td>85</td>
</tr>
<tr>
<td>2010</td>
<td>89</td>
</tr>
<tr>
<td>2013</td>
<td>98</td>
</tr>
</tbody>
</table>

Reserve Life
- Gas: 20
- Oil: 16

World Ranking *
- Gas: 21
- Oil: 27

98.3 TCF
5.8 Billion bbls

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Gas development requires long term strategy and integrated planning

- Gas Masterplan Study was undertaken in 1981.
- Market demand is an important factor in gas planning and development.
- 64% of our gas reserves is in offshore Sabah and Sarawak.
- Peninsular Malaysia has a higher population density. Potential to develop gas reserves for domestic consumption and to spur economic growth.
- Peninsular Gas Utilisation Project was implemented arising from the Gas Masterplan Study
The gas industry is one of the major contributors to the Malaysian economy …

- Diversify Malaysia’s sources of revenue
- Promote foreign investment
- Expand the nation’s industrial & manufacturing base
- Trigger spin-off benefits in gas-based industry
- Create employment in various industrial zones
- Build knowledge, capability and competency
- Progressive liberalization of domestic gas market
Demand for natural gas comes from domestic & export markets

Gas Processing Plants in Kerteh

Methane
- Ethane
- Propane
- Butane
- Condensate

Petrochemical Feedstock

Power Industries GDC Households

MLNG Plants in Bintulu

LNG Export

LPG Extraction

Refineries

Households Industries Export

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PETRONAS promotes a sustainable and orderly petroleum industry for the nation.

Gas fields offshore the Peninsular provide fuel and feedstock for domestic consumption & export.

Gas reserves offshore Sabah & Sarawak are for domestic & export (LNG).

Malaysia has 95 PSCs and 3 RSCs in operation (as at Jan 2013).
In Peninsular Malaysia, the power sector remains the key market for gas

Downstream Facilities:
- Pipelines (excluding Sarawak) 2,505 km
- No. of City Gates 27
- No. of Slugcatchers 3
- Kertih GPPs 6 (2,060 mmscfd)
- TTM GSP 1 (316 mmscfd)
- Compressor stations 3
- Supply capacity:
  - From Offshore Terengganu 1,635 mmscfd
  - Imports 511 mmscfd
Gas also served as feedstock to develop the development of petrochemical industry in Malaysia.

**PENINSULAR MALAYSIA**
- Gurun
- Kertih
- Kuantan
- Pasir Gudang

- Propylene Based
- Ethylene Based Petrochemical Plants
- Ethylbenzene / Styrene Monomer

**SARAWAK**
- Bintulu
- Labuan

- Ammonia/ Urea
- Kalimantan (Indonesia)
Gas is also supplied via PGU pipeline for Gas District Cooling and transportation
NGV was introduced in 1984 as an environmentally friendly alternative fuel

There are now 174 NGV stations ..

NGV Stations Development

(Current average utilization = 48%)

NGV Vehicles In Malaysia

Notes:
1) Volume supplied by PNGV in 2012 amounts to ~ 320 million l
2) Historical year-on-year (2010 – 2012) growth of NGV volume is around 4 to 5%. This trend is expected to continue should NGV and RON 95 prices remain.

Notes:
1) Currently, around 200-300 vehicles are converting to NGV each month (mostly taxis)
In addition to meeting domestic demand for gas, Malaysia is also a major LNG exporter.

Sustaining LNG Leadership Position

- Pacific NorthWest LNG, British Columbia
  - Target FID – 2014 for 2 trains of 6 mtpa each

- PETRONAS Floating LNG 1 & 2
  - 1st in the world
  - Target 2015 for PFLNG 1 of 1.2 mtpa

- Gladstone LNG
  - 7.8 mtpa
  - Target first export – 2014

- Train 9, PLC
  - Additional 3.6 mtpa LNG production

- PETRONAS LNG Complex (PLC) Bintulu
  - 25.7 mtpa LNG production

- Egyptian LNG, Idku
  - 4.5 mtpa LNG production

- MISC Fleet of 27 LNG Carriers
  - Worlds’ leading owner-operator of LNG carriers

- Dragon LNG, Wales
  - 5.4 mtpa regas terminal

- Regas Terminal 1 – 3, Malaysia
  - Melaka – 3.8 mtpa
  - Pengerang – 3.8 mtpa (2016)
  - Lahad Datu – 0.8 mtpa

- Japan, South Korea, Taiwan, China
  - Almost 30 years of on-time & on-schedule deliveries

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Key Issues & Challenges
Regulated prices have ‘artificially inflated’ gas demand

- Regulated and below market gas prices have created unsustainably high demand for gas
- End users preference to gas have increased compared to other higher cost alternative fuels such as diesel, LPG or fuel oil
  - Power generation highly dependant on gas
  - Conversion of fuel by industrial customers
Subsidized gas prices have their drawbacks

- Disincentive to supply fuel, potentially leading to shortages
- Hinders creation of fuel trading hub and associated high value added downstream activities
- Distorts allocative efficiency and encourages excessive energy consumption
- Artificially sustaining non-competitive industries, perpetuating the middle income trap
- Reduces attractiveness of sustainable RE
- Accelerates depletion of domestic fuel reserves
- Benefitting even those who can afford to pay market prices
Prolonged regulated pricing causes market imbalance & inefficiencies therefore market reform is necessary…

From inefficiencies…

Regulated Pricing

Gas Shortage

Single NOC Wholesaler (PETRONAS)

Lack of New Supply

..to a sustainable & efficient market

Closed System Regulated open access

D/STREAM PRICE

Market

Legacy Gas Supply

Legacy Supply, Marginal Fields & LNG

LNG, High CO₂ Marginal Fields & Open Market

Subsidised Partial Subsidized

SUPPLY SOURCE

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Way forward
In summary, OGE NKEA* makes up bulk of Economic Transformation Program investments

Oil, Gas and Energy NKEA

**SUSTAIN**
Continue domestic Oil & Gas production
1. Enhanced oil recovery
2. Develop small fields
3. Increase exploration activities

**GROW**
Grow in downstream
4. Create a regional oil storage and trading hub
5. Unlock latent gas demand through LNG import

Make Malaysia #1 Asian hub for oil field services
6. Encourage investment in oil and gas industry (DDI + FDI)
7. Local companies successful in going overseas
8. Attract MNCs to bring global operations to Malaysia
9. Increasing petrochemical output

**DIVERSIFY**
Build alternative energy capabilities
9. Reduce energy bill through energy efficiency
10. Build up solar power capacity
11. Ensure best practice nuclear deployment
12. Drive industrial growth in Sarawak with big hydro

*NKEA- National Key Economic Areas
OGE – Oil, Gas & Energy

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Government and PETRONAS are undertaking transformation efforts to ensure efficient and sustainable domestic gas market

- LNG imports
- FLNG monetization
- Supply from surrounding regions
  - JDA
  - Natuna
- Domestic E&P
  - Accelerating marginal fields monetisation
  - Intensifying exploration efforts

DOMESTIC GAS MARKET REFORM

- New Energy Policy 2010
- 10th Malaysia Plan
- National Key Economic Area (NKEA)
- Malaysia’s Competition Act 2010

Regulated Market

Open Market

Infrastructure

Supply Demand

Pricing Mechanism

Regulatory Framework

Gradual removal of subsidy
PETRONAS has put in extensive efforts which required considerable capital investment to enhance the country’s gas security

**IMMEDIATE SOLUTIONS**

- Intensify demand-side management to dampen substitution effect
- Enhance production from existing producing fields through debottlenecking, gas recovery improvement and production acceleration programs
- Supply sourcing from neighbouring countries

**LONGER TERM SOLUTIONS**

- Securing additional gas supplies from imported sources, e.g., LNG importation via regasification terminals, and supply from MTJDA and Indonesia
- Intensifying exploration efforts and embarking on new fields development particularly marginal fields
- Monetisation of stranded gas via Floating LNG production unit (FLNG)
- Actively advocating gas market transformation
The End