A high-angle photograph of three workers on an oil rig platform. The workers are wearing hard hats and safety gear, working around a central vertical pipe and various mechanical components. The floor is made of yellow metal grates. A bright blue light streak cuts across the lower half of the image.

chapter 6

Oil, Gas
and Energy

Chapter 6: Powering the Malaysian Economy with Oil, Gas and Energy

“Oil, gas and energy are an essential driving force for any modern economy. Under the astute management of PETRONAS, the domestic oil and gas industry has played a crucial role in the growth of the Malaysian economy. However, after decades of oil and gas production, our domestic resources will inevitably start to deplete. To prepare for this, we will strengthen other value creating activities in the oil and gas value chain and ensure that we have a sustainable energy platform for the future. To this end, the Government will develop Malaysia into a leading oil and gas services hub in Asia, grow Malaysia’s role in oil storage, logistics and trading and import LNG to serve latent gas demand and attract new-gas based industries. At the same time we will ensure that we develop an energy efficient, diversified and sustainable energy mix to power our future.”

YAB Dato’ Seri Mohd. Najib Tun Abdul Razak

“The green economy is no longer a myth. Today, the Malaysian Government is taking decisive steps to ensure that our energy future is green, sustainable and diverse and that Malaysia uses energy in the most efficient manner. By practicing energy efficiency in our daily lives (which is expected to lead to savings of RM14 billion in GNI terms by the year 2020), as well as by exploring new sources of alternative energy such as nuclear, solar and hydroelectric power, we can work together to preserve the environment and energise the Malaysian economy towards becoming a developed nation by the year 2020.”

YB Dato’ Sri Peter Chin Fah Kui


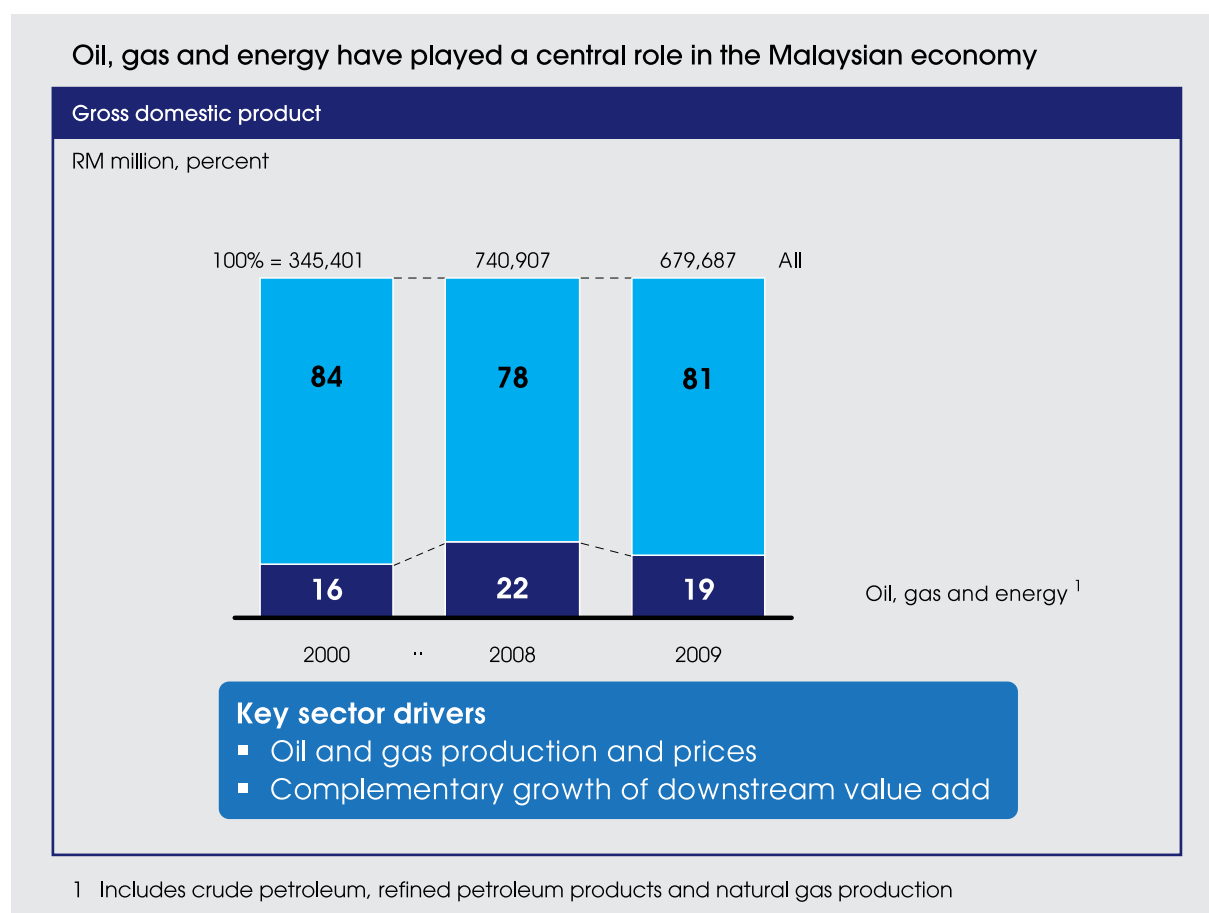
 Oil and gas production have been a mainstay of Malaysia’s growth since oil was first drilled in 1910 in Sarawak. The founding of PETRONAS in 1974 provided vital impetus to the development of oil and gas resources in Malaysia. In parallel, the consumption of electricity has grown steadily to 110 gigawatt hours, putting Malaysia on par with Thailand in terms of electricity usage per capita, driven by increased levels of prosperity and the industrialisation of the nation. The combined oil, gas and energy sectors represented RM127 billion or 19 percent of GDP in 2009, as shown in *Exhibit 6-1*.

Exhibit 6-1



SOURCE: Annual National Accounts, 2000-9, Department of Statistics, Malaysia

DEFINITION OF THE OIL, GAS AND ENERGY NKEA

The oil and gas industry is generally divided into upstream, midstream and downstream activities. Upstream activities consist of exploration, development and production of oil and gas resources. Midstream and downstream activities range from the transportation of oil and gas, to refining and processing through to marketing and trading of end products. The energy sector comprises power generation, transmission and distribution.

In terms of size, upstream oil and gas production including petroleum and gas contributes RM87 billion, while downstream activities including refining contributes RM24 billion. Separately, the energy sector contributes an additional RM16 billion to this sector.

The availability of domestic hydrocarbon resources gave Malaysia a natural impetus to develop the oil and gas sector. PETRONAS, the national oil corporation, continues to play a major role in driving the industry's growth through its development of oil and gas resources as well as the creation of opportunities for local companies to build up their capacity and capability across the value chain. PETRONAS' Petroleum Management Unit regulates upstream activities, while PETRONAS subsidiary Petronas Carigali participates in production sharing contracts (PSC) with other PSC contractors such as Shell, ExxonMobil, Murphy Oil, Talisman, Petrofac, Newfield and others.

The midstream segment consists of pipeline, transportation and other logistic assets that are mainly controlled by PETRONAS and other oil companies operating in Malaysia. The contribution of this segment amounts to approximately RM3.2 billion annually.

In the downstream segment, two major integrated petrochemical zones have been established in Kerteh, Terengganu and Gebeng, Pahang. These industrial zones have attracted foreign investments mainly from the USA, Germany and Japan (e.g. from Dow Chemical, BASF and Idemitsu), complementing investments from PETRONAS. These investments involve the production of petrochemical materials such as polypropylene, acetyls, and other such materials. There are also refineries operated by PETRONAS (in Kerteh, Terengganu and Sungai Udang, Melaka), Shell and ExxonMobil (both in Port Dickson, Negeri Sembilan).

The oil field services and equipment (OFSE) industry supports primarily upstream activities and currently contributes RM1 to RM2 billion in GDP. Included in this sector are land drilling services, offshore drilling services, geophysical services, engineering and contracting (E&C), equipment assembly and manufacturing, offshore structure fabrication and installation and operations and maintenance (O&M). While most of the major international players in OFSE such as Schlumberger, Baker Hughes and Technip are already present in Malaysia, PETRONAS has supported the development of local companies such as Scomi, SapuraCrest, Kencana, Petra Perdana and Wasco.

The oil, gas and energy NKEA also includes power generation, transmission and distribution. In 2009, energy contributed approximately RM16 billion to GDP. The industry is governed by the Ministry of Energy, Green Technology and Water (KeTTHA) and is regulated by the Energy Commission (Suruhanjaya Tenaga). Electricity is supplied by Tenaga Nasional Berhad (TNB) and a number of other major independent power producers (IPPs). Power in Malaysia is mainly fuelled by natural gas and coal, which accounted for 92 percent of power production in 2009. Hydroelectricity or hydropower accounted for only 6.5 percent of power generation in 2009. The total power generation capacity connected to the Malaysian national grid is 24 gigawatts, with a maximum demand of about 17 Gigawatts recorded in 2010.

MARKET ASSESSMENT

Oil and Gas Production

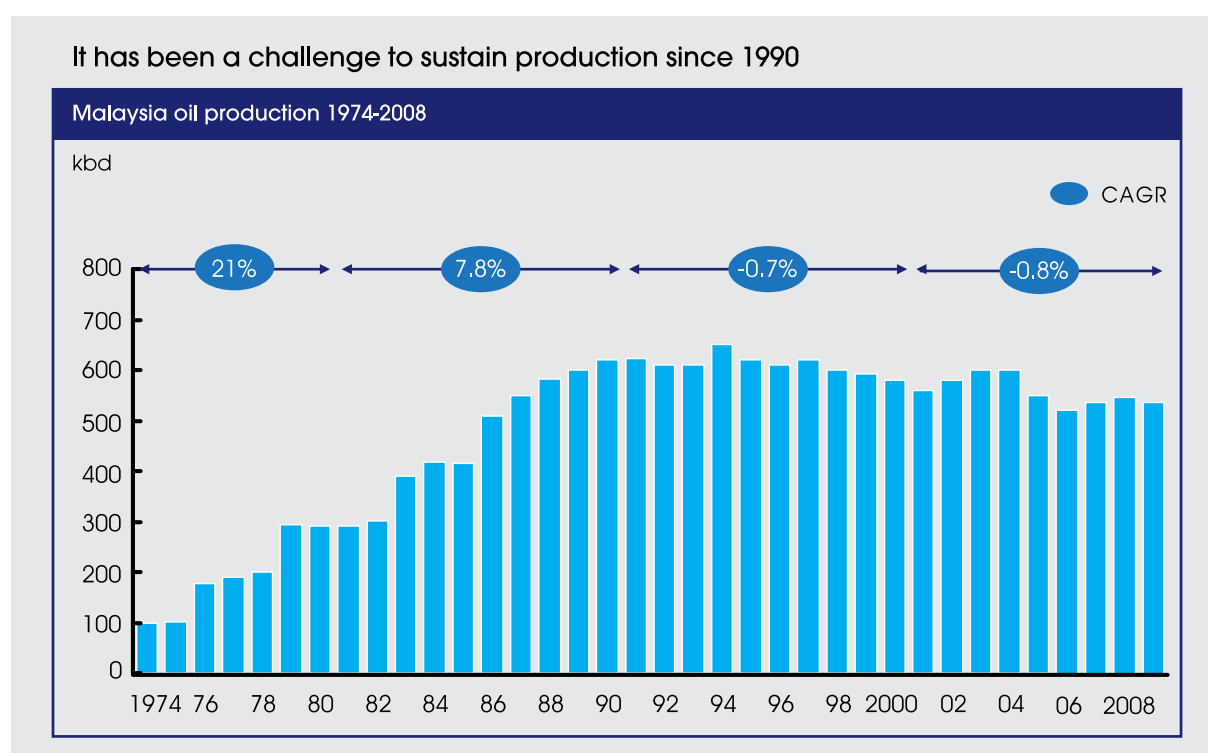
Global oil and gas production has grown by approximately 1.5 percent per year in the last decade, driven by robust demand in OECD countries and rapidly rising demand from developing economies, notably China and India. According to the International Energy Agency the global growth outlook for 2010 to 2020 for both oil and gas demand will shift further to developing economies in this decade. While “green” policies and de-carbonisation are taking place, especially in developed economies, any impact on oil and gas demand is not expected to be marked until the end of the decade. Demand for gas, especially, may actually benefit in the near term, as natural gas is both plentiful and green vis-à-vis other fossil fuels.

Global oil and gas supply capacity jumped ahead of demand during the financial crisis of 2008 and 2009. This created a temporary but significant price dip in oil prices and enduring turmoil in global gas markets. The ongoing volatility in gas markets has been exacerbated by significant supply additions in the USA from domestic production of shale gas. A tighter balance of supply and demand is expected in both oil and gas by the middle of the decade, as demand growth catches up with supply infrastructure.

In the last decade, growth in the upstream sector in Malaysia has been driven more by rising prices in oil and gas than by increases in production. PETRONAS' international expansion has also contributed to Malaysia's GNI.

Malaysian oil production peaked in the mid 1990s at approximately 600,000 barrels per day, as shown in *Exhibit 6-2* below. This is due to the normal maturation of the traditional shelf basins and means that most of the economically attractive fields are likely to have been found and developed, and new discoveries are more likely to be smaller and more technically demanding than those that were developed earlier.

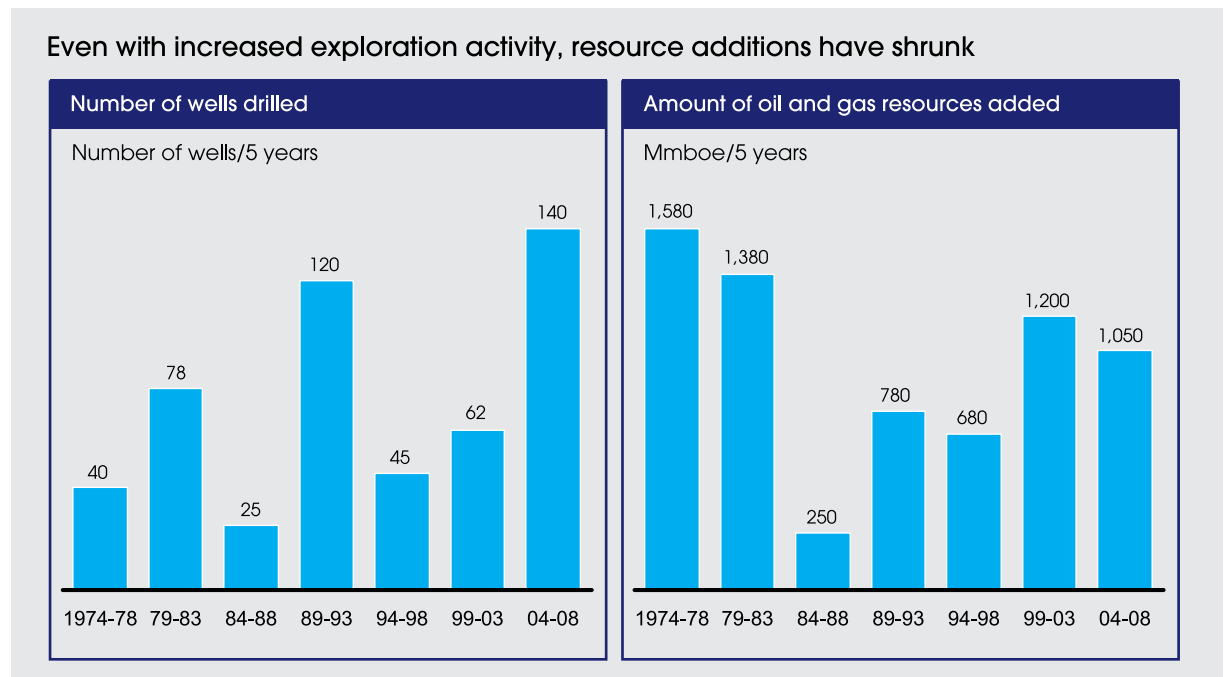
Exhibit 6-2



SOURCE: PETRONAS

It is unlikely that domestic oil and gas production will grow substantially beyond current levels, as the oil and gas discoveries from the mature basins are, on average, smaller than in the past. *Exhibit 6-3* shows that despite a stable number of exploration wells being drilled, the size of discovered resources is declining.

Exhibit 6-3



SOURCE: PETRONAS

Without significant efforts being made in upstream exploration, development and production, we expect oil and gas production in Malaysia likely to decline by 1 to 2 percent per year on average in the coming decade.

Despite the declining conventional oil and gas resource base, there remains significant potential in mature, small and technically more complex fields. Future growth could come from initiatives such as enhanced oil recovery, innovative approaches to the development of small fields, or through intensifying exploration activities to achieve a faster pace of oil and gas discoveries.

Oil Field Services

The Asian market for oil field services has grown by approximately 20 percent per year over the last decade, primarily driven by the shift towards more technically challenging fields, e.g. deepwater, and increases in the price of oil, which has boosted industry margins. The sector outlook continues to be bright, driven by the upbeat outlook for offshore exploration activity in Southeast Asia, tight gas developments across Asia and the liquefied natural gas (LNG) boom in Australia.

The market for OFSE in the region is quite fragmented, with most of the players setting up operations in Malaysia, Indonesia, Singapore and Thailand. This is unlike Europe and America, where OFSE activities are centred around hubs such as Aberdeen, Stavanger and Houston. This presents an opportunity for Malaysia, as most of Malaysia's offshore producing fields are more mature than those of our Southeast Asian neighbours (i.e., Indonesia, Thailand and Vietnam). This means that there will be significant opportunities for maintenance and replacement of assets, in addition to development of new fields, which will continue to drive growth in this subsector.

Mid- and Downstream Oil

The regional midstream logistics market (oil and oil product storage) also offers a positive growth outlook, as crude oil consumption in the Asian region is expected to grow by 420 thousand barrels per day in each year from 2010 to 2015. The increased flow of hydrocarbons in the region will require additional storage capacity (for transshipment, sales and marketing and trading purposes). At the same time, the region's existing trading hub, Singapore, is nearing full utilisation.

Downstream processing (petrochemicals and refining) and marketing industries are likely to also show at least modest growth levels. The opportunity to expand the large installed petrochemical complexes in Malaysia will depend on regional supply and demand balances as well as on the opportunity to introduce process and product innovations. Likewise, the pace of potential refinery expansion will be driven by regional supply-demand balances.

Mid- and Downstream Natural Gas

There exists a positive growth outlook for the Malaysian domestic gas market: economic growth will increase the volumes needed by existing gas consumers, and the lower gas prices compared with fuels like diesel and liquefied petroleum gas (LPG) will make switching to natural gas attractive. The depletion of gas resources in Peninsular Malaysia and the technical and economic challenge of sending gas from Sabah and Sarawak to Peninsular Malaysia by pipeline limit the availability of gas to feed this demand-growth. The import of liquefied natural gas (LNG) from international markets into Peninsular Malaysia could help to meet the growing demand for gas, provided that such gas is sold in Peninsular Malaysia at liberalised and unregulated market prices.

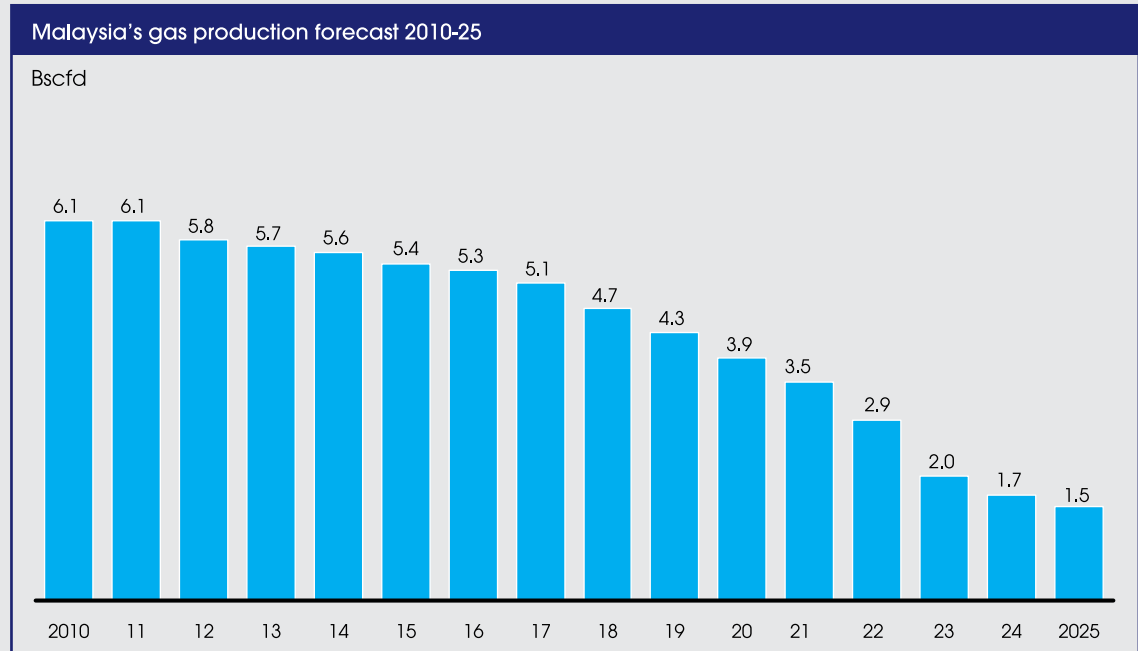
Energy

Malaysia is going to need more energy as our economy continues grow: 6 gigawatts of new generation capacity is expected to be needed by 2020 to provide energy for businesses and the growing population, representing an increase of about 25 percent over installed capacity in 2009.

The power sector faces a major challenge as declining gas production will have an impact on the power generation industry. Currently, 58 percent of power generation in Peninsular Malaysia is based on natural gas, with the remainder coming from coal (37 percent) and hydro (5 percent). However, domestic gas supply within the Pensinsula is projected to decline as shown in *Exhibit 6-4*.

Exhibit 6-4

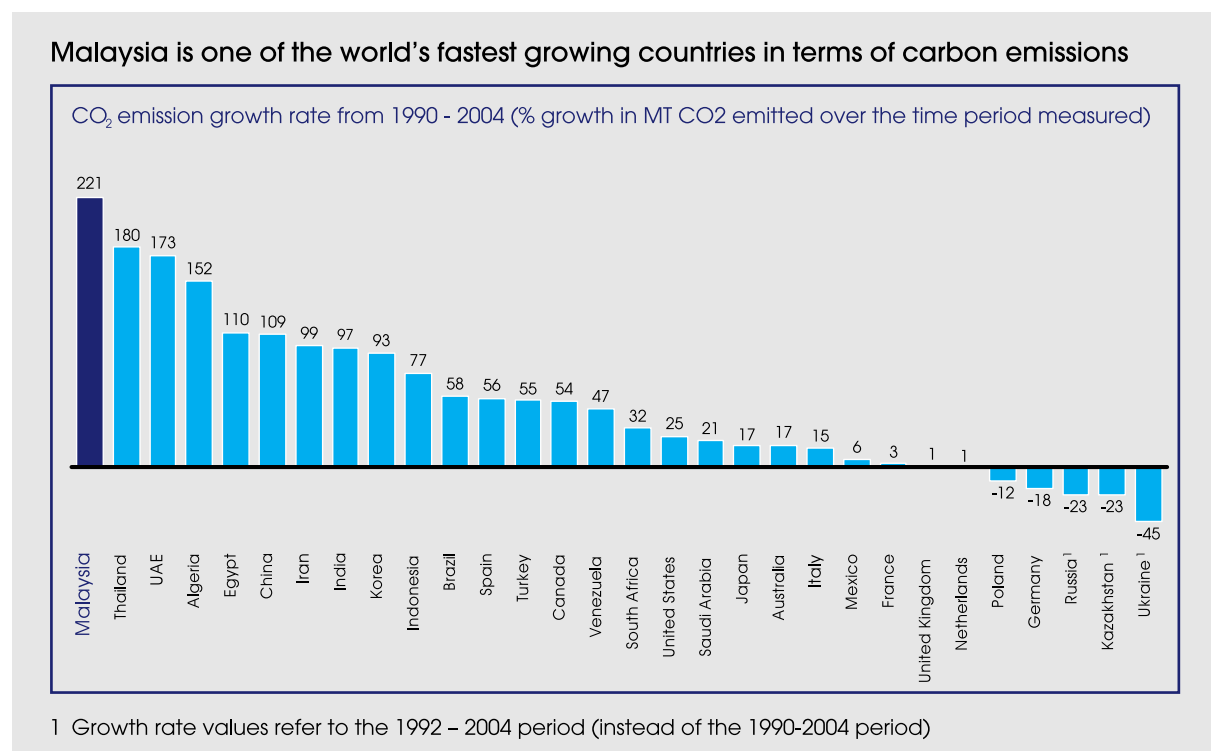
Based on projects already online, Malaysia's gas production is forecast to decline from around 2010



SOURCE: WoodMac

With the recent growth in energy consumption, Malaysia has experienced high growth in greenhouse gas (GHG) emission levels, compared with peers (*Exhibit 6-5*). Therefore alternative energy sources such as nuclear, power and solar will become more attractive in the future, as Malaysia strives to reduce its carbon emissions.

Exhibit 6-5



SOURCE: Human Development Report 2007 - 2008 with focus on "Fighting Climate Change"

TARGETS AND ASPIRATIONS

The Oil, Gas and Energy NKEA is targeting 5 percent annual growth for the sector in the decade from 2010 to 2020. This is indeed an ambitious goal, particularly against a backdrop of the natural 2 percent decline of oil and gas production. This target translates into an increase of RM131.4 billion in the period from 2010 to 2020. Beyond economic growth in this decade, the oil gas and energy sectors are also responsible for building a sustainable energy platform for the rakyat and business, in this decade and into the future.

12 EPPs, Business Opportunities and Baseline Growth to Deliver RM131.4 billion of GNI Impact

We have identified 12 EPPs, as well as two business opportunities within the oil, gas and energy sector. These EPPs will contribute RM47.1 billion to GNI to meet 2020 targets. An additional RM61.2 billion will come from business opportunities and baseline growth. Thus, the NKEA expects to deliver a RM131.4 billion GNI impact and create an additional 52,300 jobs in the oil, gas and energy sectors (*Exhibit 6-6*). A significant proportion of these jobs will be highly-skilled jobs, with an estimated 21,000 (40 percent) for qualified professionals such as engineers and geologists, with monthly salaries in the range of RM5,000 to RM10,000.

The incremental GNI includes RM23.1 billion of GNI from the multiplier effect created by EPPs from other sectors. The largest sources of the multiplier effect on the OGE NKEA are the Palm Oil, Tourism and Electronics and Electrical NKEAs, for example, an increase in usage of energy due to an increase in tourists visiting Malaysia.

To achieve this target, the Government and the oil, gas and energy industry will focus on four thrusts: sustaining oil and gas production, enhancing downstream growth, making Malaysia the number one Asian hub for oil field services and building a sustainable energy platform for growth.

Sustaining oil and gas production

This involves extending the lifecycle of existing resources by optimising exploration, development and production activities. Three EPPs have been identified:

- **EPP 1:** Rejuvenating existing fields through enhanced oil recovery;
- **EPP 2:** Developing small fields through innovative solutions; and
- **EPP 3:** Intensifying exploration activities.

Enhancing downstream growth

This thrust aims at tapping two sources of growth in the downstream sub-sector to take advantage of growth opportunities and improve the supply of oil and gas to end users:

- **EPP 4:** Building a regional oil storage and trading hub; and
- **EPP 5:** Unlocking premium gas demand in Peninsular Malaysia.

Making Malaysia the number one Asian hub for oil field services

This thrust aims at positioning Malaysia as an OFSE hub for Asia, leveraging the nation's strategic location at the centre of the Asia Pacific region and adjacent to international shipping lanes. Three EPPs have been identified:

- **EPP 6:** Attracting MNCs to bring a sizeable share of their global operations to Malaysia;
- **EPP 7:** Consolidating domestic fabricators; and
- **EPP 8:** Developing engineering, procurement and installation capabilities and capacity through strategic partnerships and joint ventures.

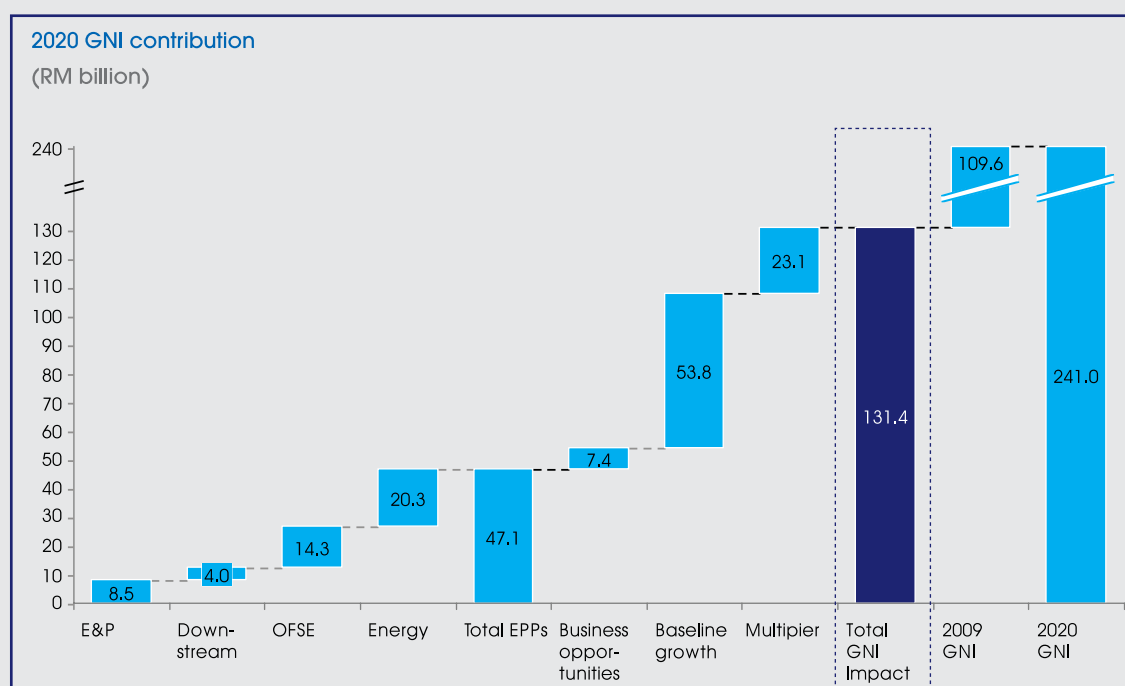
Building a sustainable energy platform for growth

This thrust includes initiatives that aim at ensuring energy security for Malaysia as the nation strives for growth towards becoming a high-income economy. This also involves reducing reliance on fossil fuels while growing our power generation capacity. Four EPPs have been identified to improve Malaysia's energy security and efficiency:

- **EPP 9:** Improving energy efficiency;
- **EPP 10:** Building up solar power capacity;
- **EPP 11:** Deploying nuclear energy for power generation; and
- **EPP 12:** Tapping Malaysia's hydroelectricity potential.

Exhibit 6-6

12 EPPs, two business opportunities, baseline growth and multiplier effect will deliver RM131.4 billion incremental GNI impact by 2020



SUSTAINING OIL AND GAS PRODUCTION

Without targeted intervention, domestic oil and gas production will decline by approximately 1 to 2 percent per year over the coming decade to approximately 1.44 million barrels of oil equivalent per day by 2020. Three EPPs focus specifically on addressing this decline and executing measures to maintain our current levels of oil and gas production. Achieving this will require a significant effort by PETRONAS, the PSC contractors in Malaysia and the multitude of industries that service the upstream sector and the Government. Success will mean a GNI contribution of approximately RM23 billion versus the base case by 2020. This represents an incremental GNI of RM8.5 billion (above expected losses of RM14 billion from declining production in existing fields if these EPPs are not deployed), with an incremental funding requirement of RM36.4 billion on top of an estimated RM64.9 billion directed to restore the loss from oil production decline (total investment required is RM100.3 billion). The three EPPs in tandem are expected to generate 400 additional jobs.

EPP 1: Rejuvenating Existing Fields through Enhanced Oil Recovery

Rationale

Enhanced oil recovery (EOR) refers to a technique that uses external energy to improve oil recovery from mature oil fields. Using methods such as gas or chemical injection or thermal flooding, the amount of oil recovered from the underground reservoirs can be increased from a range of 20 to 35 percent (industry norms) to 30 to 50 percent. EOR requires advanced technologies and focused efforts by some of the industry's leading minds as well as significant capital investments.

Actions

PETRONAS has a three-pronged strategy to ensure that EOR techniques are deployed in Malaysia to extract more oil from the nation's oil fields. Firstly, PETRONAS, where necessary, will review the production sharing contract (PSC) terms and introduce new petroleum arrangements to ensure that the right economic incentives are employed to implement EOR techniques. Such arrangements provide for agreed legal and financial terms for the exploration and production of oil, and could take the form of production sharing contracts, concession agreements, or other arrangements as appropriate to the specific context and needs of the parties involved. Secondly, PETRONAS will ensure that companies with specialised EOR expertise are aware of the opportunities in Malaysia and are attracted to operate here. Thirdly, PETRONAS will use its role as the industry regulator to ensure that the most innovative methods and technologies are being disseminated and deployed to reduce capital and operating costs.

Impact

It is estimated that EOR implementation in Malaysia will add approximately 166,000 barrels per day of oil production in 2020 versus the base case without the EPP measures being in place. The total investment needed to achieve this is approximately RM68.6 billion and the contribution to GNI is RM16.6 billion, which makes up for the GNI that would have been lost due to declining production if enhanced oil recovery were not deployed.

EPP 2: Developing Small Fields through Innovative Solutions

Rationale

A significant proportion of Malaysia's remaining resources lay in fields with less than 30 million barrels of recoverable oil. Developing these fields in an economically attractive manner is often challenging, as they need the same expensive infrastructure as large fields, while the expected revenue streams are smaller due to the smaller reserve sizes.

Actions

To make the most of these small fields, PETRONAS will work with the industry on three fronts. Firstly, PETRONAS, where necessary, will review the PSC terms and introduce new petroleum agreements to ensure that operators of these small fields receive enough economic incentives so that they find sanctioning investments in small field developments attractive versus their cost of capital and versus other opportunities available to them in Malaysia and abroad. Secondly, PETRONAS will attract E&P operators that specialise in small fields. These operators typically have a development and operating approach that is specifically adapted to the challenges of these types of fields. Thirdly, PETRONAS will facilitate collaboration between players to allow sharing of facilities and other synergistic measures to improve the economics of small field development.

Impact

Adjusting the development framework for small fields will increase Malaysia's oil production by approximately 55,500 barrels per day in 2020 versus the base case. The total investment needed to achieve this is approximately RM13.3 billion and the contribution to GNI is RM5.5 billion, which makes up for the GNI that would have been lost due to declining production if small field development were not deployed.

EPP 3: Intensifying Exploration Activities

Rationale

Sustaining Malaysia's position as one of Asia's large oil and gas producers will require discovery and development of remaining resources in a timely yet prudent manner. There is a significant likelihood that there are remaining resources that have not yet been discovered. However, these fields are likely to be high-risk, as the "low hanging fruits" are already in production.

Exploration involves a capital intensive sequence of activities and what reserves are discovered today are likely to take several years to develop. To arrest the decline of Malaysia's production, new and sizeable discoveries will need to be made during this decade to ensure timely development of resources. This would require more exploration activities, e.g. geological and geo-physical studies, seismic surveys, exploration well drilling, as well as enhancing the pace of conceptualisation and testing of new exploration methods.

Actions

To ensure that the necessary exploration investments are made, PETRONAS, where necessary, will (1) review the PSC terms and/or introduce new petroleum arrangements, and (2) review specific processes to expedite future exploration work.

Impact

The impact of these measures will be to sustain Malaysian oil and gas production in the long run, and hence production from any new oil and gas discoveries will need to come on-stream in a timely manner. An estimated total of RM18.4 billion investment is required for this EPP by 2020.

ENHANCING DOWNSTREAM GROWTH

Downstream, Malaysia has a substantial refinery industry, a number of large petrochemical complexes and a broad range of consumers of natural gas, including steel mills, metals manufacturers, and petrochemical plants. A major source of potential opportunity for the country going forward would be to capture value created from increasing international flows of crude oil, refined products and natural gas.

EPP 4: Building a Regional Oil Storage and Trading Hub

Rationale

Annually, an estimated 420,000 barrels of crude oil and 730,000 barrels of petroleum products are consumed daily across Asia. Petroleum product imports and exports for China, India and Southeast Asia are expected to increase by 1.8 million barrels per day from 2010 to 2020. The implications on oil storage

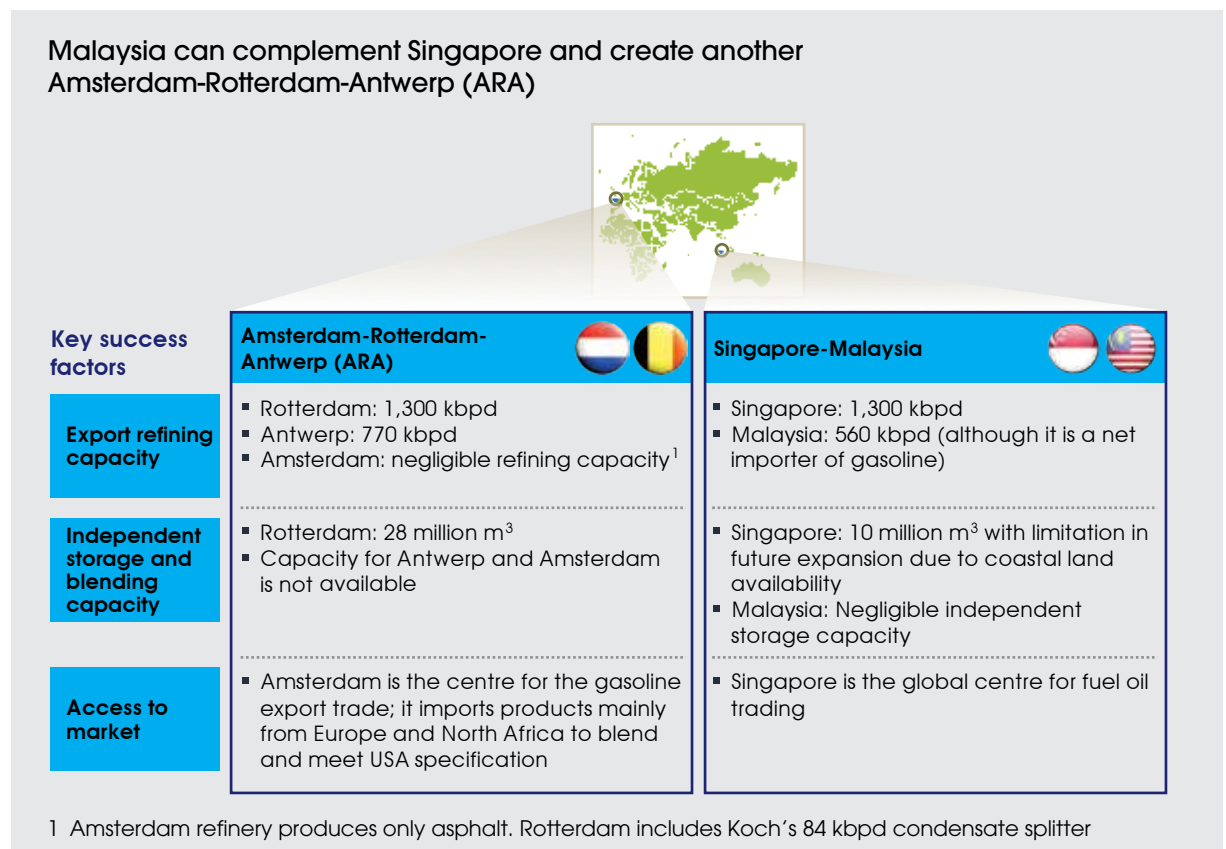
are two-fold, (1) the continued growth in demand for energy in this region will drive a need for increased storage capacity of crude oil and refined products, (2) increased inflow crude oil from Africa and Latin America would result in longer transit times and translate into a need for larger buffer storage of crude oil.

In Southeast Asia, Singapore has traditionally had a significant presence in the oil storage industry, with a total of 10 million barrels of independent storage capacity (capacity which is owned by third party operators and contracted out to oil companies, refiners and traders). In addition, by 2007 it had built a significant trading business worth more than RM1 trillion in physical oil trade and RM2 trillion in derivative trade. In the last three years it has more than doubled its independent storage capacity with the commissioning of the Universal and Helios terminals, which are already operating at capacity.

Actions

The main objective of this initiative is to build additional oil storage capacity within Malaysia. With (1) port locations on major shipping routes for crude oil and refined products; (2) close proximity to Singapore; (3) land availability; and (4) deepwater marine accessibility, Malaysia is well placed to complement Singapore in this industry. Together, Malaysia and Singapore could operate to form a hub like Amsterdam-Rotterdam-Antwerp (ARA), which complement each other in areas of refining capacity, independent storage and blending capacity as well as access to markets (*Exhibit 6-7*).

Exhibit 6-7



SOURCE: McKinsey Global Refining Capacity database; PFC Energy; Petroleum Economist; FACTS

There are four emerging business drivers that encourage building an oil storage and trading hub in Malaysia. (1) the splitting of large crude oil and fuel cargoes from outside the region is necessary to ship smaller cargoes within the region; (2) crude oil production from regional producers needs to first be aggregated before supplying to regional refiners; (3) various refinery outputs need to first be blended to meet the diverse mix of downstream products; (4) there are arbitrage opportunities that can be exploited with physical storage, e.g. hedging forward prices through storage.

In order to create this regional oil storage and trading hub, MIDA's Logistics Department will take the lead to encourage private investments in this sector. The implementation plan includes developing solutions around the key issues faced by investors and tracking the development of the identified projects. The development of the solutions involves discussion with the key industry members on issues such as permits, incentive schemes and marketing for Malaysia as an oil storage hub.

A pilot project to build an independent deepwater oil storage terminal in Pengerang has already been initiated by a public-private partnership between Johor State Government, VOPAK and DIALOG. Detailed project planning has now been completed, and the final investment decision is pending the outcome of incentive schemes and approval processes by Government agencies.

Impact

The Pengerang independent deepwater oil storage terminal will generate RM1.6 billion GNI by 2020 through three streams. First, independent logistic players will charge storage fees, generating approximately RM0.5 billion in additional GNI. Second, the availability of storage will drive additional shipping volumes, generating an expected RM0.3 billion in GNI. Lastly, trading of crude oil and petroleum products is expected to generate an additional RM0.8 billion in GNI. The planned terminal will require private investment of RM4.8 billion and will provide a total storage capacity of 5 million cubic metres. An estimated 800 new jobs will be created from the venture, excluding any spin-off from other sectors.

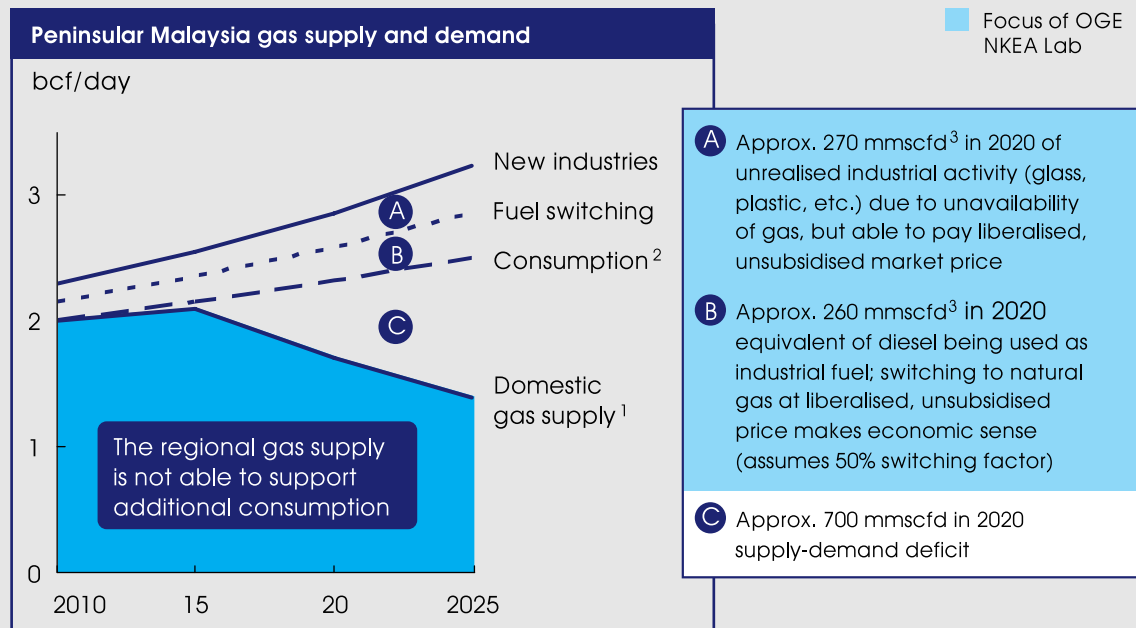
EPP 5: Unlocking Premium Gas Demand in Peninsular Malaysia

Rationale

In Peninsular Malaysia, the lack of gas supply, driven by declining domestic gas production, is cited to have resulted in the limited additional investment from new industries, e.g. glass and plastics manufacturers and semiconductor wafer manufacturers, as well as preventing current industrial diesel and LPG users from switching to more competitively priced natural gas. The alternative use of imported LNG would only be made economically viable if such gas were sold at an unregulated, or unsubsidised, market-driven, price. It is estimated that without intervention, there would be more than 500 million standard cubic feet per day (mmscfd) of additional latent gas demand by 2020; 270 mmscfd from companies that did not previously invest in Malaysia because of the lack of gas availability and 260 mmscfd from industrial users that are currently using higher-priced diesel but could switch to more competitively priced natural gas if it were made available to them (*Exhibit 6-8*).

Exhibit 6-8

About 500 mmscfd of latent high-value gas demand in Peninsular Malaysia can be served with imported LNG



1 Includes JDA and Indonesia

2 Growth is based on 2001 - 2010 gas consumption from power at 1.5%

3 Growth rate of 6% assumed on the 2010 volume based on historical GDP growth. In 2010, demand from new industries and fuel switching is 150 and 180 mmscfd respectively

SOURCE: FACTS Global Energy

The lack of gas supply is driven by declining domestic gas production. Domestic gas supply, including imports from Indonesia and the Joint Development Area with Thailand, is expected to decline at 12 percent per year in the coming decade. Furthermore, there is insufficient gas supply in the region to support additional piped gas import into Malaysia. The alternative, which is to import gas in the form of LNG, needs to take into account the fact that the current regulated price for gas in Malaysia is far below the expected market driven price of imported LNG.




Actions

In order to meet this growing latent gas demand, an LNG regasification terminal will be built to treat imported LNG. To make gas imports economically feasible, the gas will be sold at a liberalised and unsubsidised price.

The end-to-end delivery of the imported gas includes sourcing or purchasing LNG, shipping the LNG to Malaysian shores via specialised vessels, regasification terminal construction and operation, marketing and sales and distribution of the gas to the end consumer. For the first phase, which is to be commissioned by 2013, a capacity of 3.5 million tonnes of LNG per annum has been planned (actual capacity, cost and timing will be determined by PETRONAS). PETRONAS will execute all elements of the end-to-end gas delivery including partial marketing of this imported gas. MIDA will be involved in marketing the supplied gas to those customers requiring a large volume of gas (more than 2 mmscfd) with the support of PETRONAS and Gas Malaysia customers requiring smaller volumes. Required actions from various organisations have been summarised in *Exhibit 6-9*.

Exhibit 6-9

Although PETRONAS and MIDA will drive the EPP, actions from various organisations are required

Actions required			Actions required		
	Economic Planning Unit	<ul style="list-style-type: none"> Approve sale of imported gas (from LNG) at liberalised and unsubsidised price 		Ministry of Transport	<ul style="list-style-type: none"> Approve request for jetty licence
	MIDA	<ul style="list-style-type: none"> Market the new source of imported gas to new industries 		Ministry of Environment	<ul style="list-style-type: none"> Approve detailed Environmental Impact Assessment
	Energy Commission	<ul style="list-style-type: none"> Assume role of regulator 		Relevant state government	<ul style="list-style-type: none"> Approve land access

For the later phases of gas imports beyond that articulated here, open access to different elements of the end-to-end gas delivery will be studied by PETRONAS.

Enablers

A key enabler for this EPP is enhancing the governance of the gas market, specifically by (1) developing the gas network code (set of terms and conditions which govern the operations of a gas market), and (2) appointment of a fully independent regulator. PETRONAS will develop the gas network code with the help of the Energy Commission before the end of 2010. In order to segregate the roles of player and regulator, the Energy Commission of Malaysia should ideally assume the latter function and have the appropriate capability at least six months before the commissioning of the first phase of landing the LNG.

Impact

Unlocking this gas demand will have an estimated GNI impact of RM10.6 billion, of which RM2.4 billion will be in the Oil, Gas and Energy NKEA. It will also create 27,000 new jobs by 2020, largely in other sectors beyond oil, gas and energy. An investment of RM3.9 billion will be required to fund the construction of the fixed and floating elements of the LNG regasification terminal. The expected increase in GNI is summarised as follows:

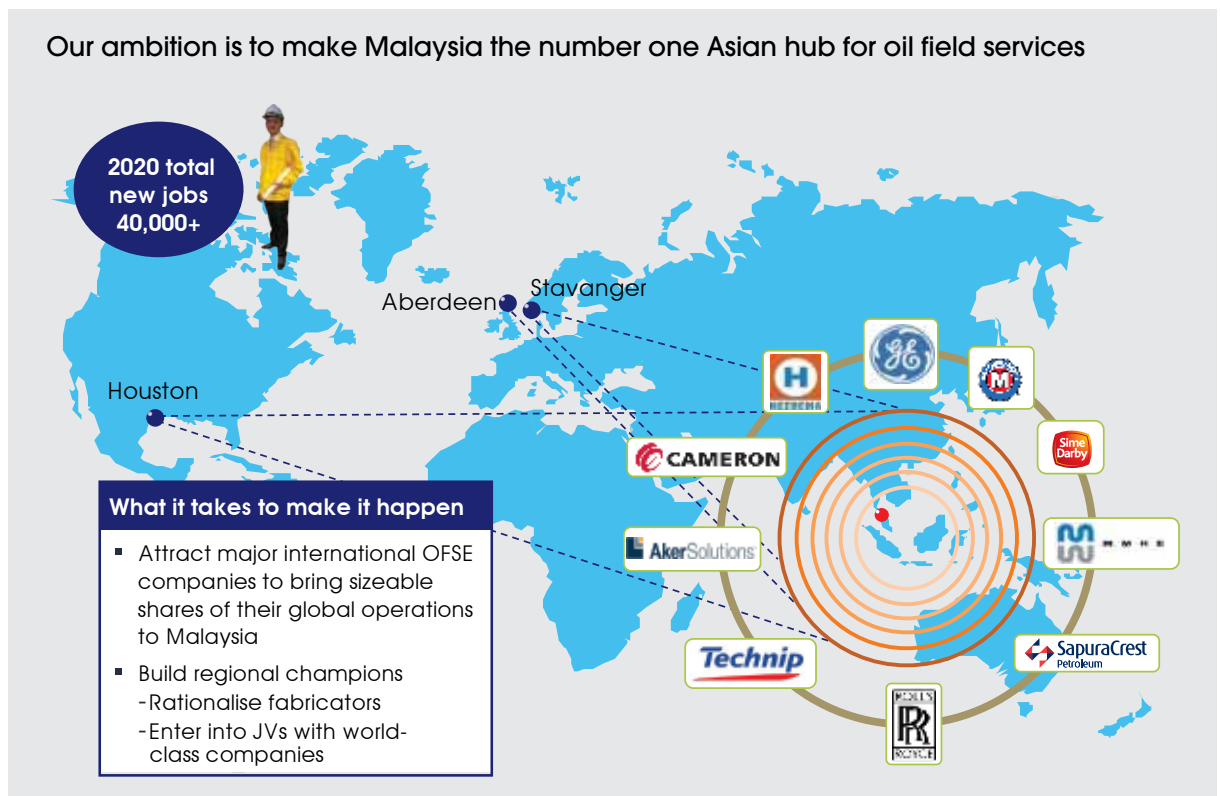
- Providing gas to companies that previously did not invest in Malaysia due to lack of gas supply would provide RM8 billion GNI increase and will create 27,000 new jobs. However this will not be included as GNI for the oil, gas and energy sector;
- Switching from diesel to natural gas will yield approximately RM1.9 billion in annual savings for Malaysian companies; and
- Operating the terminal and transmission pipelines will generate an additional RM0.6 billion in GNI to Malaysia.

MAKING MALAYSIA THE NUMBER ONE ASIAN HUB FOR OIL FIELD SERVICES

The global OFSE market is valued at RM800 billion and has undergone rapid growth of 25 percent per annum in recent years. This growth has been driven by two key factors. Firstly, high oil prices have improved industry margins, hence improving the economics for the oilfield services and equipment business. Secondly, the shift towards more exploration and production activities in geologically-complex fields has meant increased demand for OFSE. Both of these factors are expected to continue to drive growth in the Malaysian OFSE industry over the coming years.

There is significant OFSE activity in Asia and the Middle East (estimated at 20 percent of the global market), but while there are dispersed pockets of activity, there is no clear hub as is the case elsewhere in the world, e.g. Aberdeen, Houston and Stavanger. With a burgeoning domestic oil and gas industry, proximity to oil fields and a cost-competitive workforce, Malaysia is well-placed to become Asia's OFSE hub. In addition, by increasing competitive pressures in the domestic market, there is potential for Malaysian companies to first become domestic champions and then subsequently regional champions as it captures a larger share of the regional market (*Exhibit 6-10*).

Exhibit 6-10



EPP 6: Attracting Multinational Companies to Bring a Sizeable Share of their Global Operations to Malaysia

Rationale

Our ambition is to attract 10 to 20 major international companies in the OFSE industry to bring approximately 10 percent of their business operations to Malaysia. This translates to around 40 percent of their regional activities and would mean positioning Malaysia as a cost-competitive base for engineering, procurement and construction as well as a strategic base for installation activities in the Asia-Pacific region.

One key issue is that there is no existing Government body with sufficiently deep industry knowledge and expertise focused on coordinating and promoting the Malaysian OFSE industry. As a result, there is no real oversight of industry growth and development, which has meant that recent growth has been relatively unstructured.

Actions

A Government body called Oil Field Services Unit (OFSU) will be set up, tasked with the responsibility to oversee industry growth and development. OFSU would be a permanent Government body comprising 20 people, at least 10 of whom will have oil and gas industry experience. It will be fully operational within six months and will have four fundamental responsibilities:

- To make recommendations on how to restructure the domestic industry to create a more competitive environment and position the industry and its companies for growth;
- To have oversight of the domestic industry and ensure coordination between all existing, planned and potential clusters of OFSE activity;
- To create an attractive business environment for multinational companies by ensuring administrative ease and working with other Government departments to develop an attractive fiscal regime; and
- To promote the Malaysian OFSE industry and companies to overseas companies and investors.

OFSU will be supported in this role by an industry consultative council (ICC) comprising approximately 10 members from key industry associations. The ICC will meet with OFSU on a monthly basis and advise on industry requirements, specifically domestic regulation, talent development and availability, research and development and incentives.

Funding

OFSU will require only minimal funding of RM5 million a year to cover its operating expenses. However the success of this EPP is contingent on attracting foreign players to set up operations in Malaysia, which would require estimated funds totalling RM6.8 billion, composed of RM6.3 billion in private investment and RM0.5 billion in public investment. The private investment will fund the construction of factories and manufacturing plants for OFSE companies, while the public investment will fund basic infrastructure, e.g. building a dedicated berthing facility for installation companies and improving roads in activity clusters.

Impact

Underpinning OFSU's four roles would be the ambition to attract 10 to 20 major international companies in the OFSE industry so as to instigate these companies to bring approximately 10 percent of their global operations to Malaysia. If this aspiration is achieved it will have considerable impact creating over 20,000 jobs and almost RM6.1 of incremental GNI by 2020.

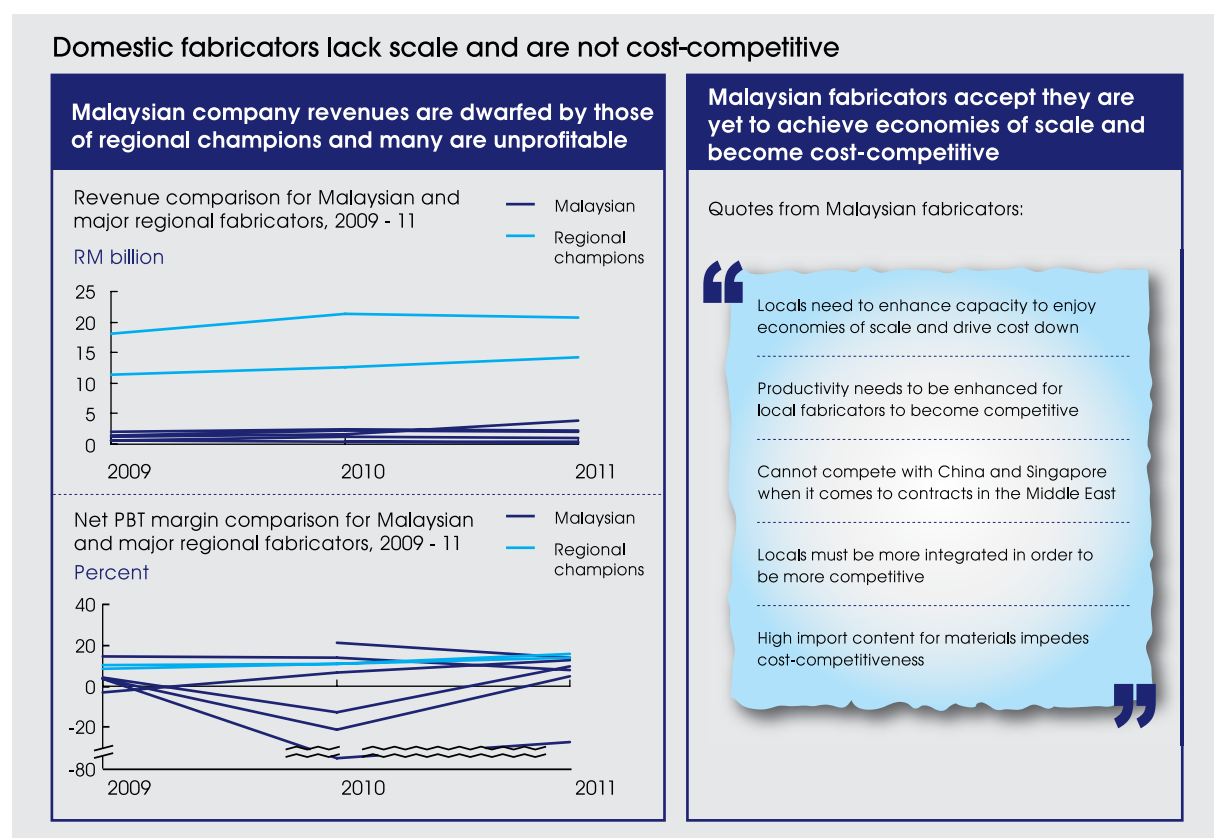
EPP 7: Consolidating Domestic Fabricators

Rationale

There are five major offshore structure fabricators in Malaysia, none of which has the required scale or track record to efficiently compete with major regional players (*Exhibit 6-11*). There are two key reasons. Firstly, domestic companies are not cost competitive with regional giants and thus have to work within tighter margins when bidding for international contracts. Secondly, whilst domestic work is tendered on a multi-contract basis, international work is generally put out to tender as one single contract. This means that domestic companies are less able to win and manage the main full-service contract, and if they do, they are less likely to be able to do so as efficiently or profitably.

Industry players laud that there is a need for consolidation within the industry to match the scale and efficiency of major regional players. Such belief is driven by the fact that there is presently much duplication within the industry. In addition, the majority of domestic companies have not achieved the scale required to make the most efficient use of their existing staff and assets and are less able to invest sufficiently for further development of their assets. For example, domestic companies often hire large cranes for operation in large projects because their limited size precludes purchasing them. Major regional players by contrast directly own such cranes and are better able to operate more efficiently and cheaply as a result.

Exhibit 6-11



SOURCE: PETRONAS, Syndications with domestic fabricators, Open day feedback

Actions

Consolidating the many companies operating within the industry would require PETRONAS to award licenses to only a limited number of domestic fabricators. We have spoken to a number of domestic fabricators that are open to such intervention. However, this effort must be supported by the relevant Government agencies.

Contracts will be awarded for the full range of services instead of in separate tranches, in line with the practice in other regional markets. This would enable Malaysian companies to achieve cost efficiencies and help them to develop their skills and track record across a wider range of services. It will also allow them to prove their ability to manage a full-service contract in order to support advances into the regional market.

The objective of these actions will be to consolidate domestic companies together to provide the necessary scale to compete with major regional players such as Singapore's Keppel Corporation. The target is to have domestic companies win 10 major shallow water contracts and 2 major deepwater contracts a year by 2020.

Impact

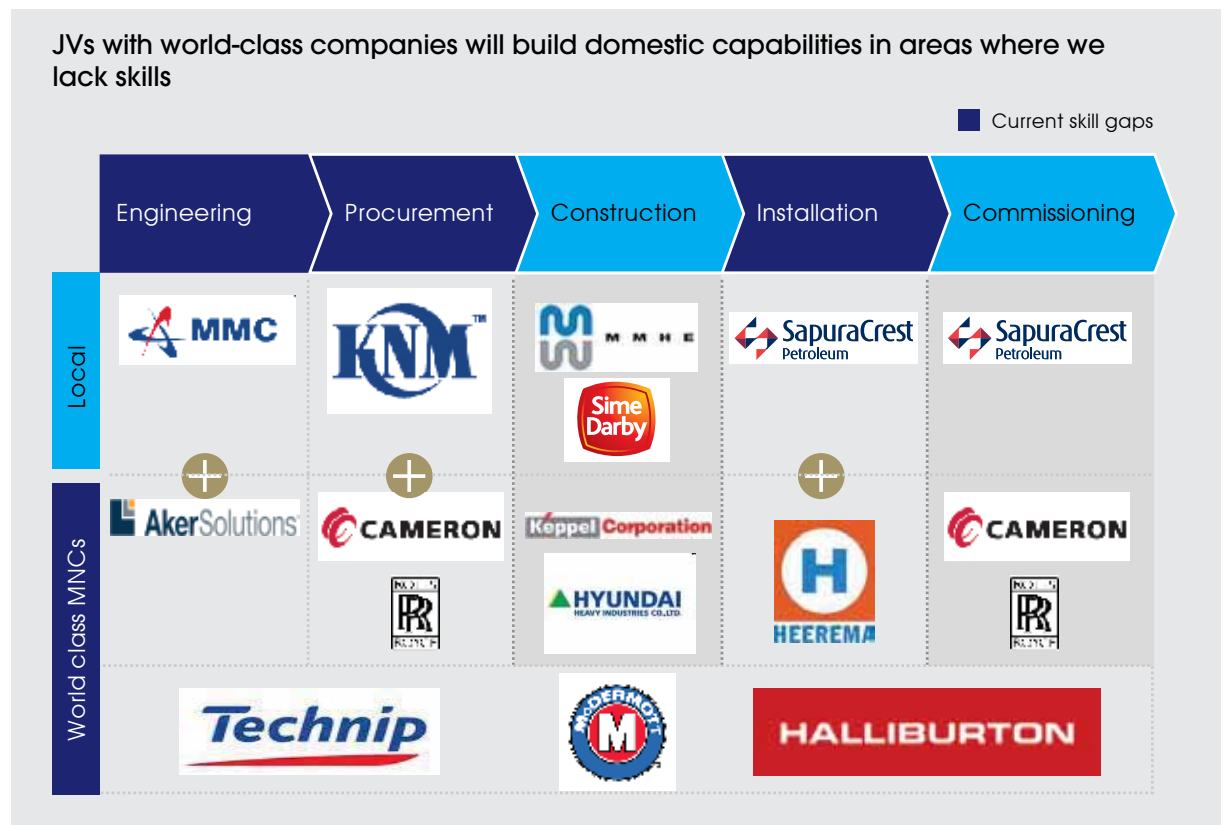
Achieving this would translate to a GNI impact of RM4.1 and the creation of 5,000 jobs. An estimated private investment of RM4.0 billion is required to pay for internal efficiency programmes such as the automation of non-destructive testing, steel-cutting and bending.

EPP 8: Developing Capabilities and Capacity through Strategic Partnerships and Joint Ventures

Rationale

At present there are considerable gaps in the domestic OFSE industry, with Malaysian companies lacking capabilities and experience particularly in engineering and installation (*Exhibit 6-12*). These capability gaps then prevent Malaysian companies from capturing certain parts of the domestic value chain, which consequently limit their ability to gain a strong share in the regional market.

Exhibit 6-12



Notably, there is significant improvement potential, particularly to encourage world class players to enter joint ventures with domestic players in key areas by the following actions; (1) further leverage our captive domestic industry, (2) grow deepwater exploration and production, and (3) increase PETRONAS's international footprint.

Actions

Under this EPP, domestic companies will be incentivised and encouraged to form joint ventures with world-class companies to build their capabilities and track records. In the short term, these joint ventures will help domestic companies capture a larger share of the domestic market, particularly in areas where much of the activity is currently performed by foreign companies, most significantly procurement and installation. In the long term, the aim will be to capture a larger proportion of the regional market through joint ventures, and later leveraging the depth and breadth of capabilities and track record developed to grow further across the regional market.

Impact

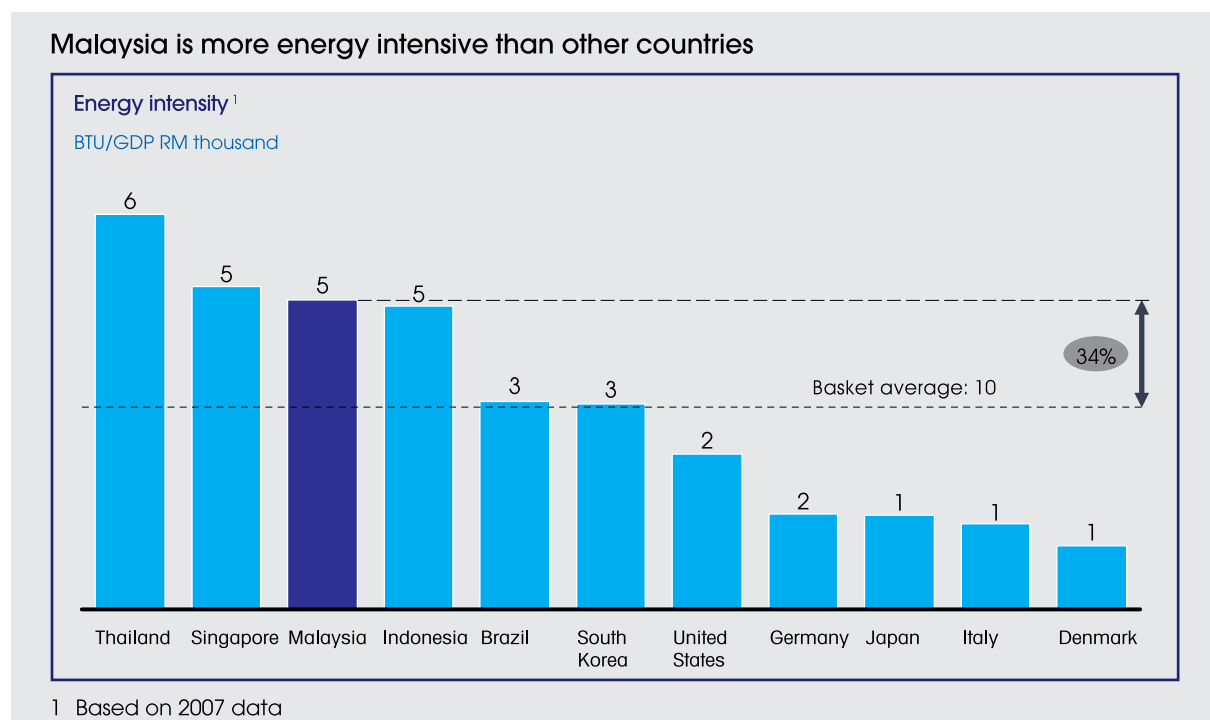
Our ambition is to gain 15 percent of the shallow water and 50 percent of the deepwater market in Asia Pacific (of which the vast majority are found in Malaysian waters) by 2020. Achieving this would mean a contribution of RM4.0 billion in GNI and job creation of some 15,000 jobs. As most of the investments made in domestic infrastructure, e.g. roads and berthing facilities are covered under other EPPs, the only additional investment of RM0.5 billion for this EPP would come from the private sector.

BUILDING A SUSTAINABLE ENERGY PLATFORM FOR GROWTH

In 2008, Malaysia generated a total of 109 terawatt hours of electric power, of which 91 percent was for supply to Peninsular Malaysia, 5 percent Sarawak and 4 percent Sabah. While Sarawak is blessed with the potential for 20 gigawatts of hydroelectric power, Sabah faces some challenges in meeting a 7 percent demand growth and another challenge of limited generation capacity for its east coast region. Similarly, Peninsular Malaysia faces difficulties given an expected 3.7 percent demand-growth in electric power and 95 percent dependency on depleting gas reserves and imported coal.

The overall sector will challenge to meet the Malaysia's ever growing electricity demand, especially towards the second half of the decade. This is due to a variety of factors. First, TNB expects power demand in Peninsular Malaysia to grow at 3.7 percent per year. Meeting this demand-growth means Malaysia has to plan for an additional 6 gigawatts of capacity between 2015 and 2020. Malaysia's energy consumption level, relative to the size of the population and the economy, is significantly greater than its peers as illustrated in *Exhibit 6-13*. This significant energy consumption goes hand in hand with our high growth in levels of GHG emissions, compared with peers.

Exhibit 6-13



SOURCE: International Energy Agency

Secondly, the majority of Malaysia's total power generation relies on domestic gas supply. Based on projects already online this domestic gas supply is expected to decline at 4 percent per annum in this decade – and at a higher rate after that. Thirdly, there is global pressure to lower carbon emissions, when in December 2009 YAB Prime Minister Dato' Seri Mohd Najib Tun Razak made a conditional commitment to reduce Malaysia's carbon intensity by up to 40 percent by 2020 compared with 2005 levels. To address some of these challenges, Peninsular Malaysia will undertake a three-pronged approach towards ensuring energy security in the future:

- Accelerate implementation of industry re-structuring, outlined as part of the Malaysian Electric Supply Industry (MESI) initiative;
- Pursue alternative energy sources such as hydro, nuclear power and large-scale solar; and
- Implement best practices in efficient energy use to reduce Malaysia's consumption by 10 to 15 percent versus the "business as usual" scenario and ensure that Malaysian businesses and households are able to control their energy costs.

The energy EPPs will specifically address the impending need for alternative energy sources as well as efficient energy use, while the business opportunities will capture the said MESI initiative.

EPP 9: Improving Energy Efficiency

Rationale

On average, Malaysia is 34 percent more energy-intensive than peer countries and can therefore improve on its power and fuel consumption. In fact, improving energy efficiency is a key opportunity for Malaysia: it will make our companies more competitive and reduce household electricity bills for the *rakyat*. A number of initiatives are easy to implement and can produce quick results.

Actions

We will focus on five relevant levers to improve energy efficiency in Malaysia: (1) the Government will lead by example on energy-efficiency practices and philosophy, (2) stimulate sales of energy-efficient appliances, (3) the Government will work with TNB to make co-generation economically viable, (4) regulate better insulated buildings and (5) stimulate the sale of energy-efficient vehicles.

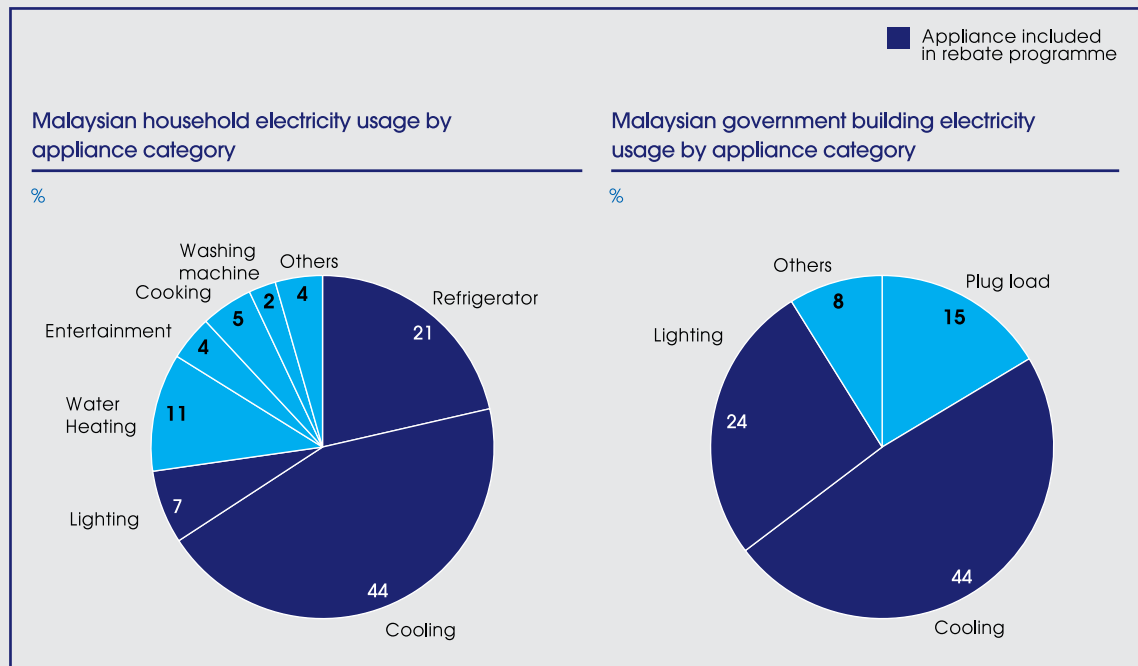
Government will lead by example on energy-efficiency practices and philosophy. This overall initiative will generate an estimated RM3.2 billion of GNI by 2020. In order to succeed, three steps are necessary. As a start, the Government will make a move to gradually rationalise the subsidy on electricity to create an incentive for both industries and consumers to adopt more energy-efficient practices. As a complement to the first step, the Government will launch large-scale education campaigns to help industries and consumers identify and apply energy-efficient practices. Last but not least, the Government will lead by example and apply energy-efficient practices in its own premises as detailed below.

In 2009, the Government's electricity bill amounted to approximately RM1.5 billion, of which 44 percent of the cost was for less than 1 percent of the Government entities. These 120 entities mainly consist of ministries, universities and hospitals, for which the Government will request for energy-efficiency plans from each of these entities in Q4 2010. This programme will be led by KeTTHA and will follow a clear process for energy-efficiency improvement. Firstly, plans will be put into place for the electricity budgets of these entities to be reduced over time. In return, they will be given allocations to invest in energy-efficient practices (light bulbs, new chillers, etc.). Each entity will nominate an Energy Efficient Champion who will be in charge of devising the entity's action plan to reduce electricity consumption. KeTTHA will mentor and monitor this group of champions in continuously achieving their targets.

Stimulate sales of energy-efficient appliances. This initiative targets the final end user through the retailers of electronic appliances and will generate up to RM5.1 billion of GNI by 2020. Consumers will receive rebates on particular appliances that account for the biggest part of household electricity bills as shown in *Exhibit 6-14*. This initiative will offer a 7 to 10 percent rebate on selected appliance models and for a limited number of units. These targeted appliances are refrigerators, air conditioners and light bulbs.

Exhibit 6-14

We will target the appliances that consume most electricity in households and government buildings



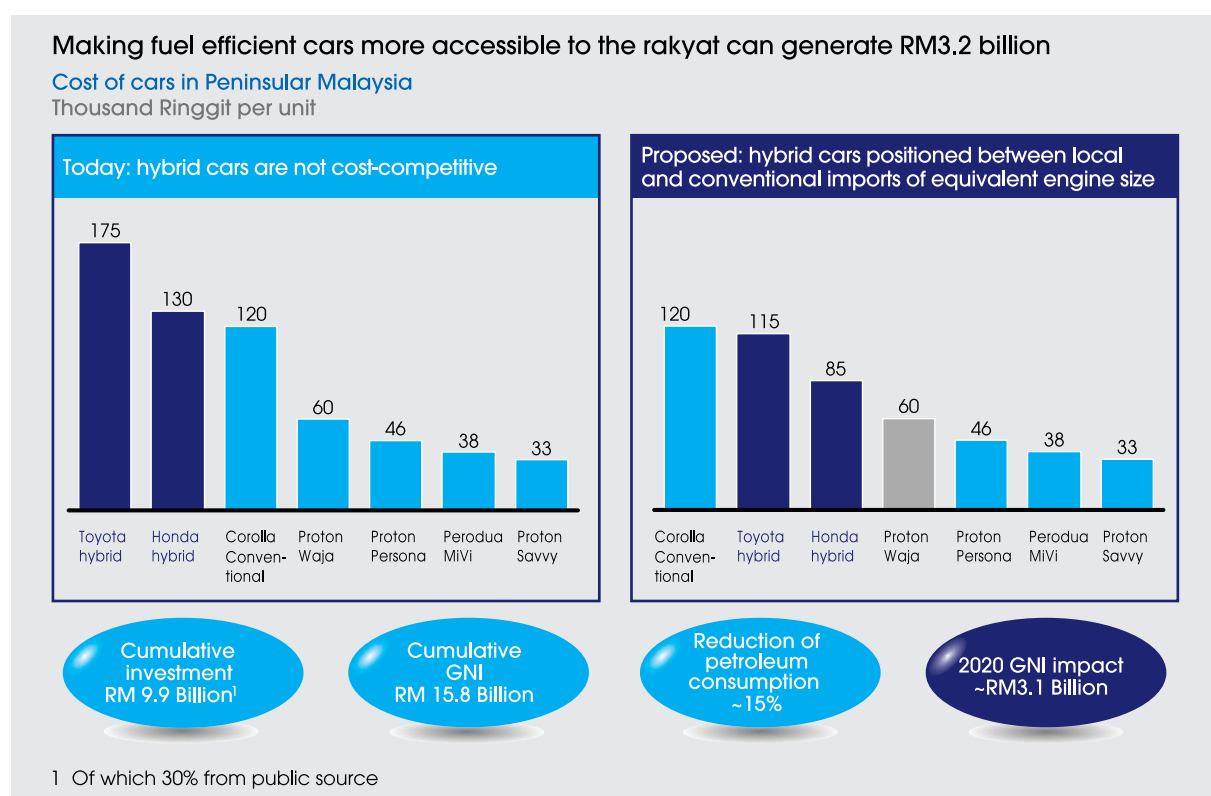
SOURCE: ST data, survey of office building 2003 - 2004

Government will work with TNB to make co-generation economically viable. This initiative is expected to generate RM1.3 billion of GNI by 2020 and will require a review of the TNB tariff on three fronts: (1) increasing the overall tariff by rationalising current subsidies to create a greater urge for more energy efficiency, (2) decreasing the stand-by tariff to encourage more users to use this option and lastly, (3) increasing the buy-back tariff to make it more attractive for industries to co-generate electricity and sell the excess energy back to TNB.

Regulate better insulation for new buildings and renovated buildings. This would bring an expected RM1.3 billion of GNI by 2020. Existing regulations on insulation of buildings are not adequate to encourage more efficient energy use, and as a result, developers are constructing properties (residential, commercial and industrial) that do not have proper insulation, thus creating a need for additional air conditioning. Going forward, better insulated properties will be ensured by (1) improving customer awareness via large-scale awareness campaigns, (2) enforcement measures through the approval process of building plans. In each, the Government will take a leadership role to ensure implementation. In time, better insulated buildings will also improve the living environment in low-cost premises where occupants cannot afford air conditioning and thus suffer heat-related stress that will lead to possible health problems.

Stimulate the sales of energy-efficient vehicles by offering rebates to encourage adoption of hybrid or electric vehicles. This will generate an expected RM3.2 billion in GNI by 2020. As illustrated in *Exhibit 6-15*, hybrid vehicles are currently still considered a luxury in Malaysia due to their lack of cost-competitiveness. The Government will promote the use of hybrid vehicles by reducing the import tax on these vehicles. As a start, the price of hybrid cars will be made more competitive so the *Rakyat* can comfortably choose hybrid cars instead of conventional imported cars. Most importantly, while this move will not undercut car prices of our local manufacturers, it will create healthy competition and urge our local manufacturers to develop hybrid or electric vehicles for the local market.

Exhibit 6-15



SOURCE: Websites of Toyota (Malaysia and USA), Honda, Proton Edar, Perodua

The key performance indicators for this EPP are: saving targets for government buildings, sale targets for energy-efficient electrical appliances, co-generation targets for electricity, implementation of an improved energy-regulatory framework and a market share target for energy-efficient cars.

Impact

This EPP will effectively require an estimated RM20.8 billion of funding. The majority of which will be from public sources used to fund import-tax rebates on energy-efficient vehicles (RM9.8 billion) and rebates for energy-efficient appliances (RM1.3 billion). The remaining total investment required to insulate buildings and develop co-generation will be RM9.6 billion and will almost entirely be funded by private sources. These levers can generate an estimated RM13.9 billion GNI by 2020.

EPP 10: Building Up Solar Power Capacity

Rationale

The renewable energy target in the Tenth Malaysia Plan is 5.5 percent of total capacity mix in 2015 (985 megawatts of generating capacity) from less than 1 percent of the energy mix today. Out of this 5.5 percent, solar power will contribute at least 65 megawatts. By year 2020, solar power is expected to contribute to a minimum of 220 megawatts, as per the target under the National Renewable Energy Policy target. Therefore, between 2015 and 2020, Peninsular Malaysia will need to build approximately 4 gigawatts of additional power capacity to meet rising demand while maintaining a healthy power reserve margin. Solar power should be considered as a viable energy alternative because of its many advantages, such as independence from fossil fuels and zero carbon gas emissions, increased energy security, high job creation potential and significant foreign direct investment (*Exhibit 6-16*). Furthermore, Malaysia has ample supply of natural sunlight which is currently not utilised to its full potential.

Actions

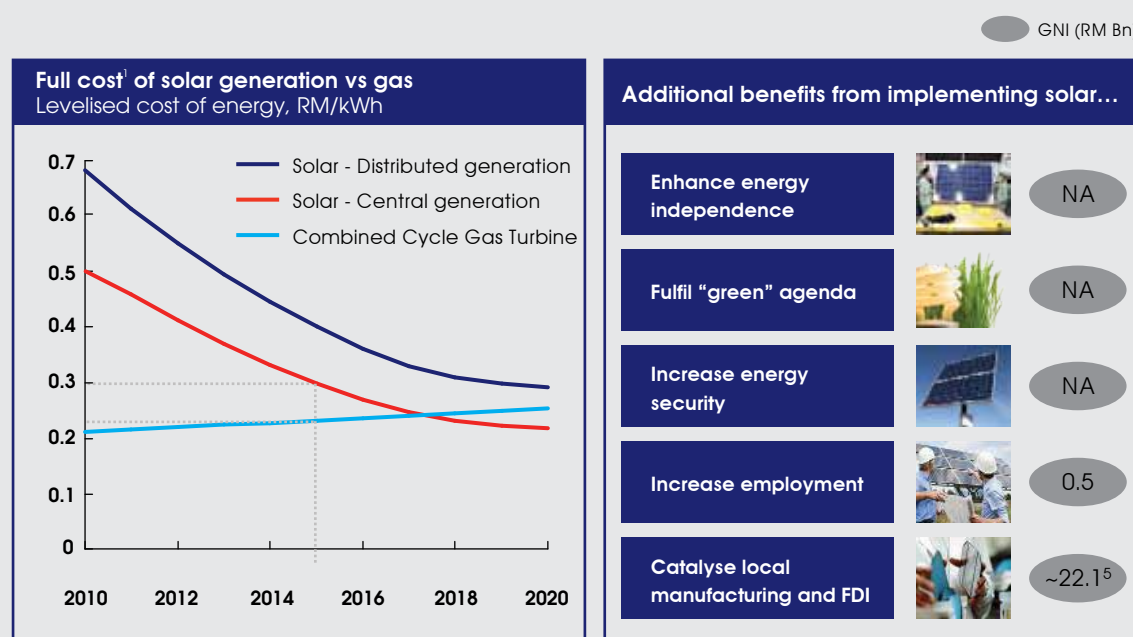
Based on analysis of the full cost of solar generation compared with the most viable alternative, combined cycle gas turbine (CCGT), centralised solar power generated by solar power plants, (as opposed to distributed solar power generated by solar panels installed on the rooftops) is expected to become an economically viable option by 2017 or 2018, as the capital cost of installing solar generation is expected to reduce by 4 to 10 percent per year. This timeline, however, will depend on a number of variables, including the rate of reduction in cost for solar power, the price of gas for power generation, and other relevant parameters.

For this EPP to succeed, three elements need to be addressed starting today. Firstly, a regulatory framework needs to be developed, both for the feed-in tariff mechanism that is due to be enacted at the end of 2010 as well as for any solar power plants that may come online once the cost of centralised solar power generation has reached parity with that of gas. Secondly, adequate business models need to be developed, including financing, public-private partnerships and the role of the Government, the incumbent generator, TNB and private operators. Finally, skills and learning need to be built in the form of small amounts of solar generation by leveraging the feed-in tariff mechanism targeted to start in January 2011.

In the event that centralised solar power achieves cost parity with gas between 2015 and 2020, there is a potential for solar generation capacity to be increased to as much as 1.3 gigawatts. KeTTHA will undertake the initiatives to set up the necessary infrastructure and ensure that the development of solar energy is undertaken in a robust but prudent manner.

Exhibit 6-16

Solar could be a good option for capacity build-up after 2015



- 1 Full cost, including CAPEX (LCE)
- 2 Assumptions for CCGT gas power generation: WACC 7.6%, CAPEX USD1000/KWe, plant efficiency 53%, gas price USD/mmbtu 8 in 2010 to 9.8 by 2020, O&M cost of 5USD/MwH load factor 85%
- 3 Assumptions for centrally generated solar: WACC 7.6% CAPEX 2812USD/Kw falling at 10% until 2016, then by 8%, 6%, 4% and 3% from 2017 to 2020, O&M 1% of CAPEX, lifetime: 20 years, hours utilisation 1,300/year
- 4 Assumptions for distributed solar: WACC 7.6% CAPEX 3,750USD/Kw falling at 10% until 2016, then by 8%, 6%, 4% and 3% from 2017 to 2020 O&M 2% of CAPEX, lifetime: 20 years, hours utilisation 1,300/year
- 5 GNI impact taken into account in the Electronics and Electrical NKEA Lab

Impact

Assuming that centralised solar power reaches cost parity with gas between 2015 and 2020, the overall GNI contribution from solar power generation in 2020 could grow to RM460 million mainly due to the creation of an additional 1,900 jobs. This would require an investment of RM5.7 billion. The GNI impact excludes additional impact of RM22 billion catalysing effect that this project would have on local manufacturing and the influx of foreign direct investment, which instead is included under the Electronics and Electrical NKEA.

EPP 11: Deploying Nuclear Energy for Power Generation

Rationale

Malaysia is exploring the option of deploying nuclear energy in order to meet future demand and diversify the energy mix for Peninsular Malaysia. A Nuclear Power Development Steering Committee, headed by the Ministry of Energy, Green Technology and Water, was set up in June 2009 to plan and coordinate the preparatory efforts towards deploying nuclear energy for electricity generation. The committee has been tasked to conduct various studies towards preparing a Nuclear Power Infrastructure Development Plan (NPIDP), which is targetted to be ready by 2013. Prior to conducting these necessary studies, a nuclear power pre-feasibility study and initial site selection study has already been undertaken.

Actions

The Steering Committee is studying the possibility of delivering a twin-unit nuclear power plant with a total capacity of 2 gigawatts, with the first unit in operation by 2021. The plan under development lays out a development timeline of 11 to 12 years from pre-project to commissioning. The plan presents a positive case for nuclear energy in Malaysia (*Exhibit 6-17*). Firstly, if Malaysia developed nuclear energy, it would be cost-competitive, supplying the cheapest source of energy. Secondly, nuclear power is a cleaner energy than coal and gas (0 grams of carbon dioxide equivalent per kilowatt hour vs approximately 800 and 400 grams respectively).

Funding

Building the twin unit nuclear plant is expected to require a RM21.3 billion investment up to 2020.

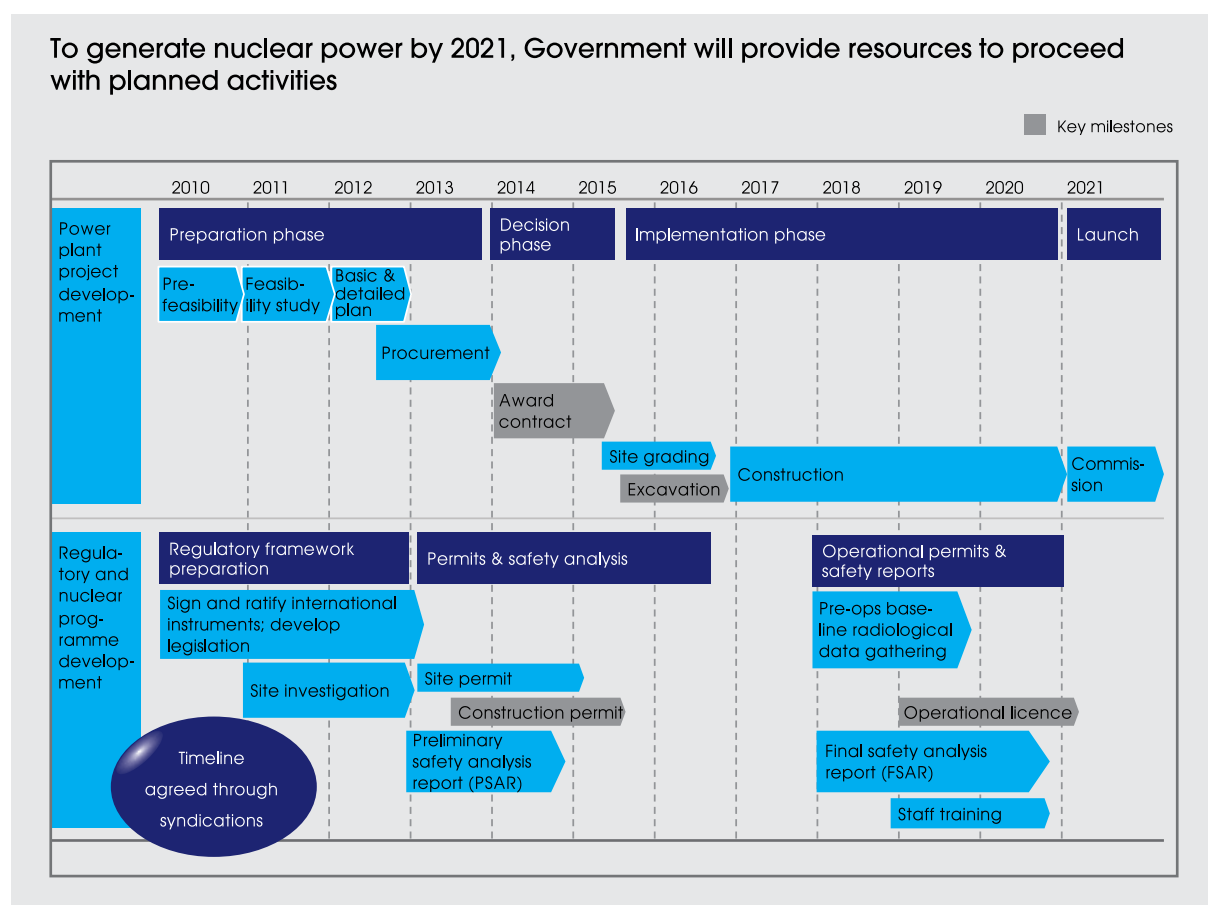
Enablers

In order to ensure prompt delivery, the project will be launched without delay and four critical path items must be addressed with highest priority. Firstly, there must be public acceptance of the project. Secondly, Malaysia must ratify the relevant international treaties. Thirdly, the Government must ensure that the correct regulatory framework is put in place. Finally, approvals for plan sites including from local populace must be obtained.

Impact

Construction of the nuclear power plants will have a temporary GNI impact in the construction sector, with GNI contribution of RM0.2 billion from the creation of 2,600 jobs. The jobs will include roles covering plant operation and maintenance, waste management and licensing and regulation. Once operational (post 2020), the two 1-gigawatt nuclear power plants will generate GNI amounting to RM1.8 billion per year from the electricity generated.

Exhibit 6-17



EPP 12: Tapping Malaysia's Hydroelectricity Potential

Rationale

Sarawak's hydroelectricity potential is virtually untapped: only 0.6 percent of the estimated 20 gigawatts of potential power capacity is currently being developed (based on the study carried out by the SAMA Consultancy in the 1980s for the state government of Sarawak). There are approximately 25 terawatt hours of latent power demand from industries operating in Sarawak, Sabah and the neighbouring countries of Brunei Darussalam and West Kalimantan, Indonesia.

Hydroelectricity has many advantages: it is a renewable energy, it helps reduce carbon dioxide emissions and it is a proven technology providing a secure, long-term supply of electricity. Brazil, Canada and Norway are examples of countries that make extensive use of hydroelectricity.

The earlier plan to export power to Peninsular Malaysia from Sarawak through under-sea high-voltage direct-cable transmission does not appear to be economically viable at the current point in time, though the situation may change. Preliminary estimates indicate that the landed cost of electricity from Sarawak hydroelectricity is more expensive than the cost of power generation using coal, nuclear or combined cycle gas turbines. This however does not take into account of the carbon emission and other environmental costs of thermal power plants. The Government may pursue its plan to transmit hydroelectricity to Peninsular Malaysia from Sarawak if these other factors are taken into deeper consideration and issues relating to under-sea cable crossing sovereign territory can be resolved.

Actions

The owner of this initiative is the state government of Sarawak and it is implemented through the Sarawak Energy Berhad (SEB) and the Regional Corridor Development Authority (RECODA). Their main roles are to plan, construct, own and operate the hydroelectricity dams, attract energy intensive industries to Sarawak, plan and construct the necessary infrastructure and utilities, as well as other services to support these industries and negotiate transmission lines connections for electricity supply with neighbouring countries.

The estimated total investment required to develop hydroelectricity dams is RM20.2 billion which will be funded by the private sector through a government-linked company. The investment is meant for the construction of five dams with a total capacity of 5 gigawatts, a transmission grid and the infrastructure needed to attract energy intensive industries to Sarawak.

Impact

This EPP will create 590 jobs and an estimated GNI potential of RM5.7 billion in Sarawak by 2020. Most of the GNI will come from energy-intensive industries operating within Sarawak, which will generate income to the state totalling RM4.5 Billion and have a further GNI multiplier effect in the region. The remaining RM1.2 billion of GNI will come from providing power to Sabah, Brunei and Kalimantan through land transmission.

BUSINESS OPPORTUNITIES

There are a number of business opportunities in the oil, gas and energy sector, which together with the baseline sector growth will provide RM61.2 billion of GNI contribution by 2020. This amount includes a RM32.0 billion increase in GNI versus the 2009 baseline GNI due to expected increases in the oil price, given relatively low oil prices in 2009. The business opportunities can be grouped into two clear themes. Firstly, there are opportunities to secure more output from the same input as current processes are improved and efficiency gains are realised. The second theme is opportunities stemming from the increased demand for energy deriving from a growing economy.

Business Opportunity 1: Process Improvements

Global benchmarks of refining and petrochemical facilities demonstrate that significant process improvements can be expected with these types of facilities over time. These improvements typically translate into efficiency gains of 0.5 percent per year representing an additional GNI contribution of RM3.4 billion. Improvement of overall processes and structure in the electricity generation sector is expected to add RM1.5 billion of GNI contribution.

Business Opportunity 2: Economic Growth

Malaysia has targetted GNI growth of 5.9 percent per annum. Achieving this economic growth is expected to raise consumption by 3 percent and will have a knock-on effect on the oil, gas and energy sector. The increased consumption will require an additional 2 gigawatts of installed capacity to be built at a cost of RM9.6 billion, creating an estimated 2,500 jobs and adding RM11.2 billion to GNI. The additional transmission and distribution of this energy will create a further RM5.6 billion GNI and require an investment of RM12.4 billion.

In the downstream sector this increased consumption will boost GNI by RM1.5 billion and create 3,200 jobs. An estimated 90 new petrol stations will also need to be built at a total cost of RM3.2 billion.

International E&P projects present a new business opportunity that is projected to generate RM5.9 billion in GNI, requiring RM79.0 billion in private investment.

COMMON ENABLERS

There are three key enablers that must be put in place to ensure the successful implementation of the 12 EPPs and the two business opportunities within the Oil, Gas and Energy NKEA. These enablers are:

- Provide effective investment support: the Government needs to ensure that investors are actively courted, investment deals are proposed and enabled and administrative processes are facilitated in oil, gas and energy related fields;
- Attract world-class expatriate talent: the Government needs to ensure that investors can bring in the required foreign talent in an efficient manner; and
- Ensure adequate supply of qualified domestic human capital: the Government needs to introduce measures to increase the supply of graduates in the next decade to staff the approximately 21,000 new jobs created at or above graduate level by 2020.

Provide Effective Investment Support

Overview

The majority of the aforementioned EPPs require at least one or more of the following four activities to first be successfully undertaken:

- Attract new domestic or foreign investors to the OGE sectors;
- Bring together multiple companies or agencies around a business arrangement or a partnership;
- Obtain federal, state or local permits to develop an economic activity; and
- Grant an economic incentive to facilitate investment.

Having an empowered authority to coordinate these activities and take a hands-on executive role with clear accountability to achieve results in this area will be a key enabler.

Actions

The investment support functions are best housed in a Government-related body that has sufficient line authority, industry expertise and accountability. The body should have the ability to compel relevant organs of state to take action in a manner consistent with the aims of the NKEA programme and with standards of good governance. To have sufficient expertise, it should be able to recruit senior talent from Government and the OGE sector to fulfil its tasks. This will require the ability, for example, to recruit industry executives

at salaries that are higher than the Government's typical pay scales. Lastly, the body should be held accountable for progress in the realisation of the investment objectives.

Given time and the right resources (e.g. Government officers and industry experts of the highest calibre), this body will gain positive reputation. Of existing agencies, MIDA is the most suitable to execute these functions. It will however still need to attract individuals with the appropriate expertise and skillset from the Government and from the private sector to be successful.

To ensure that momentum is not lost, specific bodies have been identified to push forward the initiatives that fall under the oil and gas unit in the interim period before it is set up. For instance, MIDA and the ETP Unit will work together to recruit the OFSU team and coordinate CEO roundtables on how to enhance competitiveness of the domestic OFSE industry and how to bring about the consolidation of the fabrication industry. PETRONAS will support these events by putting forward a proposal for how to restructure the licensing system and potential mechanisms for industry consolidation.

Attract World-Class Expatriate Talent

Overview

The OGE sectors require relatively specialised skill sets which our *Rakyat* will need to further develop to carry out the activities targetted in this NKEA. At the present time we lack the scale of expertise required and there is therefore a need to attract highly-skilled foreign workers to work here.

Actions

Some primary functions and pre-requisites regarding attracting foreign talent are the following:

- Ease of immigration so that work and residence permits are easy to obtain and renew, without needing to create overly burdensome administrative procedures or hire an intermediary. Processing time should be short and prescribed, and applicants should be able to enquire and monitor progress of their applications;
- Tax compatibility with source country of the foreign talent to avoid double-taxation. It is important to align the Malaysian tax system with other major tax systems and eliminate such occurrences of double-taxation;
- Highly liveable cities that offer good living conditions, e.g. Greater KL/KV;
- Good international transportation connections;
- Simple to follow procedures for necessary day-to-day activities such as opening a bank or utility account and obtaining a phone number; and
- Wide and easy access to information about living in the country, e.g. via the internet or local travel bureau's abroad.

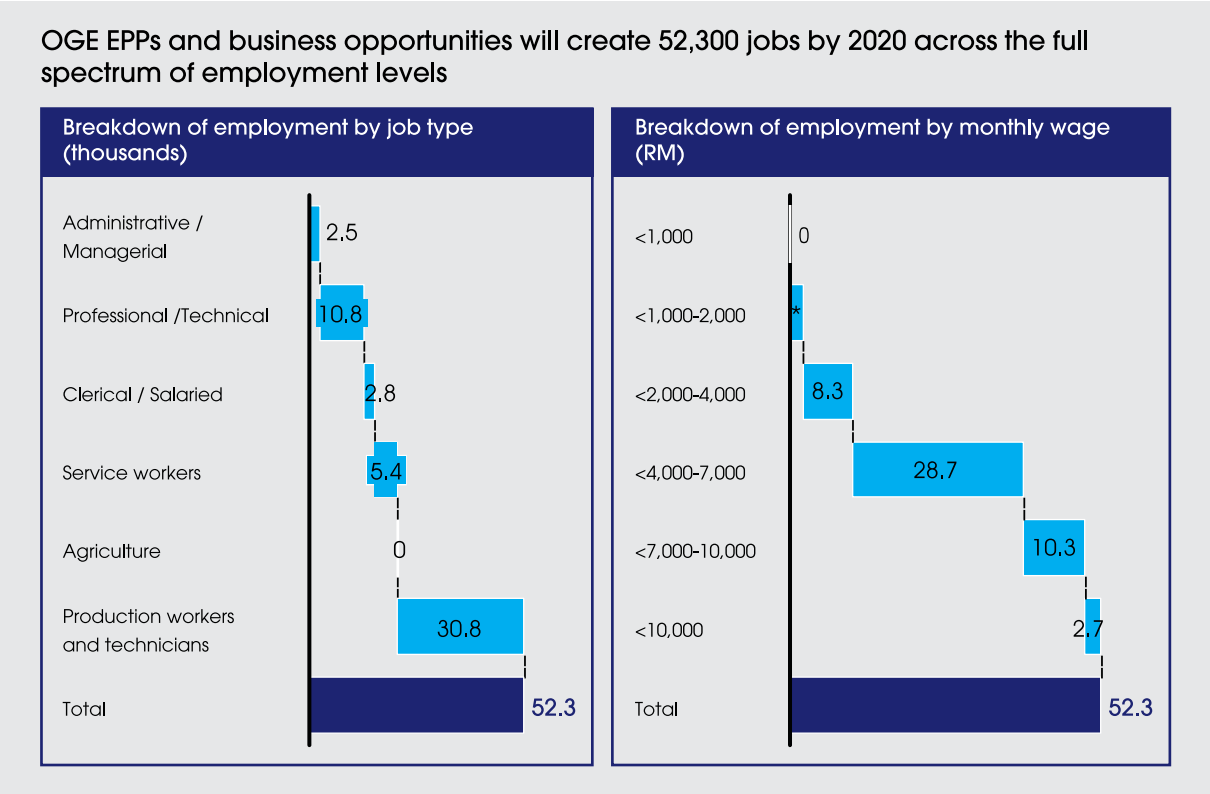
Measures to fortify Malaysia’s ability to attract highly-skilled foreign workers in a number of its NKEAs are already being implemented. For instance, TalentCorp, an agency tasked with attracting foreign talent into Malaysia, is being set up.

Ensure Adequate Supply Of Qualified Domestic Human Capital

Overview

The OGE EPPs and business opportunities will generate 52,300 new jobs and thus require a supply of talent of equal amount. *Exhibit 6-18* illustrates how these jobs break down across sub-sectors and pay levels. In reality, some of these types of talent are in relatively short supply in Malaysia. An amplified effort will therefore be needed to ensure that sufficient talent is trained in order to fill the demand in the OGE NKEA.

Exhibit 6-18



Actions

In line with the concept of discipline clusters developed for the Education NKEA, it is proposed that an oil, gas and energy discipline cluster be developed in Malaysia. This cluster would be a collaborative effort between the industry leaders, leading institutions of higher education and relevant vocational training institutes. The OGE discipline cluster will be facilitated through the following measures:

- The Ministry of Higher Education (MoHE) and the Ministry of Human Resources (MoHR) will provide incentives for OGE industry players to set up training centres to meet their specific manpower requirements, and facilitate the connections between these industry players and relevant institutes of higher learning;
- Industry associations and leading players will be asked to identify the anchor institutions in Malaysia around which a virtual academy of relevant disciplines and technical skills will be built; and
- Industry associations will work with MoHE and MoHR to develop and propagate the relevant discipline standards and certifications for the OGE sectors and ensure that they meet industry requirements.

The OGE lab has worked together with the Education NKEA lab to ensure that these requirements are captured in developing the Education NKEA's plans.

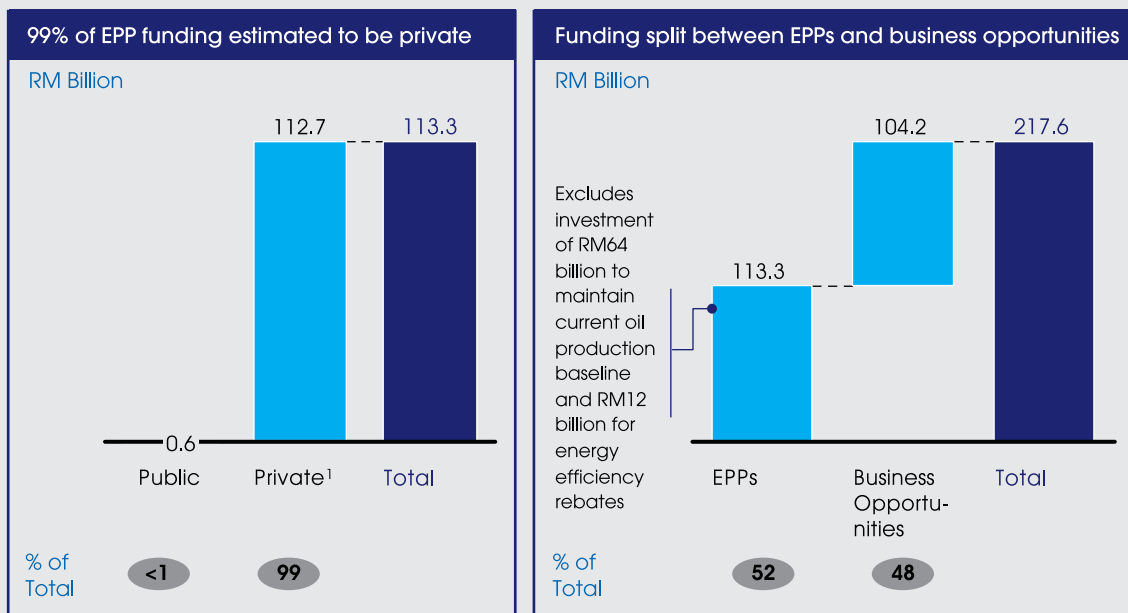
FUNDING

Achieving our ambitious growth target of more than doubling the contribution from OGE by 2020 will require a significant amount of funding. As shown in *Exhibit 6-19*, in order to deliver the GNI growth targets, the EPPs will require incremental investment amounting to 113.3 billion. The total cumulative funds that will need to be invested from 2010 to 2020 thus amounts to RM217.6 billion, where RM104.2 billion of these funds (48 percent) is required for investment in business opportunities. Of this total, less than 1 percent of investment will be from the public sector and the remaining 99 percent will come from the private sector.

Most of the public funding requested is to develop a berthing facility for the OFSE hub EPP. Additionally, RM64.0 billion of private investment is required to offset the current decline in oil production, whereas a further estimated RM12.0 billion will be in the form of tax rebates for the energy-efficiency EPP. Much of the private investment will come from GLCs, primarily PETRONAS and TNB. The majority of public sector funding will be used to put in place the infrastructure to support major international OFSE companies.

Exhibit 6-19

For the 12 EPPs, RM113.3 billion of investment is required, of which 99% of will come from the private sector



Funding will be spread evenly over the next 10 years, where each year's funding will range between 7 percent and 12 percent of the total NKEA funding. The 12 EPPs are expected to be core drivers of growth in OGE. In order to successfully implement these 12 EPPs, a total of RM113.3 billion (less than 1 percent public, 99 percent private) will be required cumulatively from 2011 to 2020.

In addition, a total of RM104.2 billion of private funding will be required to fund business opportunities which will deliver incremental GNI impact of RM29.2 billion by 2020. The investment will be required for:

- **International E&P projects:** RM79.0 billion investment in shares in foreign E&P projects;
- **Increased distribution and marketing:** RM3.2 billion to build 90 new petrol stations;
- **Increased electricity consumption:** RM9.6 billion investment to fund the construction of power plants generating 2 gigawatts of installed capacity; and
- **Increased electricity transmission:** RM12.4 billion investment in upgrading transmission lines and stations.

GOVERNANCE AND DELIVERY

Successful implementation of the various EPPs hinges on ownership and accountability for each of the projects. To ensure proper ownership and accountability, a dedicated owner has been identified for each of the initiatives proposed. In addition, a detailed delivery plan consisting of implementation details, key performance indicators and targets, as well as a risk and mitigation plan has been developed for each for the high impact EPPs.

Table 6-1: Overview of the agencies in charge of the various initiatives

EPP	Lead initiative owners	Other key agencies, companies and organisations
Rejuvenating existing fields through enhanced oil recovery	PETRONAS	Production sharing contracts (PSC) Contractors
Developing small fields through innovative solutions	PETRONAS	Production sharing contracts (PSC) Contractors
Intensifying exploration activities	PETRONAS	Production sharing contracts (PSC) Contractors
Building a regional oil storage and trading hub	Malaysian Industrial Development Authority (MIDA)	Project owners Ministry of Transport Ministry of Natural Resources and the Environment Ministry of Finance
Unlocking premium gas demand in Peninsular Malaysia	Malaysian Industrial Development Authority (MIDA)	PETRONAS Relevant state governments Ministry of Energy, Green technology and water (KeTTHA) Gas Malaysia Economic Planning Unit Energy Commission
Attracting MNCs to bring a sizeable share of their global operations to Malaysia	Oil Field Services Unit (OFSU)	Industry associations (e.g. MOGSC, OSFAM) PETRONAS Malaysian Industrial Development Authority (MIDA) Ministry of International Trade and Industry (MITI) Malaysia External Trade Development Corporation (MATRADE)
Consolidating the domestic fabricators	Oil Field Services Unit (OFSU)	PETRONAS Offshore Structural Fabricator Association of Malaysia (OSFAM) Malaysia External Trade Development Corporation (MATRADE)
Developing engineering, procurement and installation capabilities and capacity through strategic partnerships and joint ventures	Oil Field Services Unit (OFSU)	Industry associations (e.g. MOGSC, OSFAM) PETRONAS Malaysian Industrial Development Authority (MIDA) Ministry of International Trade and Industry (MITI) Malaysia External Trade Development Corporation (MATRADE)

Table 6-1: Overview of the agencies in charge of the various initiatives (contd)

EPP	Lead initiative owners	Other key agencies, companies and organisations
Improving energy efficiency	Ministry of Energy, Green Technology and Water (KeTTHA)	Ministry of Finance (MOF) Ministry of International Trade and Industry (MITI) Ministry of Transport (MOT)
Building up solar power capacity	Ministry of Energy, Green Technology and Water (KeTTHA)	Tenaga Nasional Berhad (TNB) Energy Commission (Suruhanjaya Tenaga, ST)
Deploying nuclear energy for power generation	Ministry of Energy, Green Technology and Water (KeTTHA)	Nuclear Malaysia Energy Commission (Suruhanjaya Tenaga, ST) Tenaga Nasional Berhad (TNB) Atomic energy licensing board
Tapping Malaysia's hydroelectricity potential	Sarawak State Planning Unit (SPU)	Sarawak Energy Bhd Sarawak Ministry of Public Utilities RECODA (Sarawak Renewable Energy Corridor Development Authority) Tenaga Nasional Berhad (TNB) Ministry of Energy, Green Technology and Water (KeTTHA) Energy Commission (Suruhanjaya Tenaga, ST)

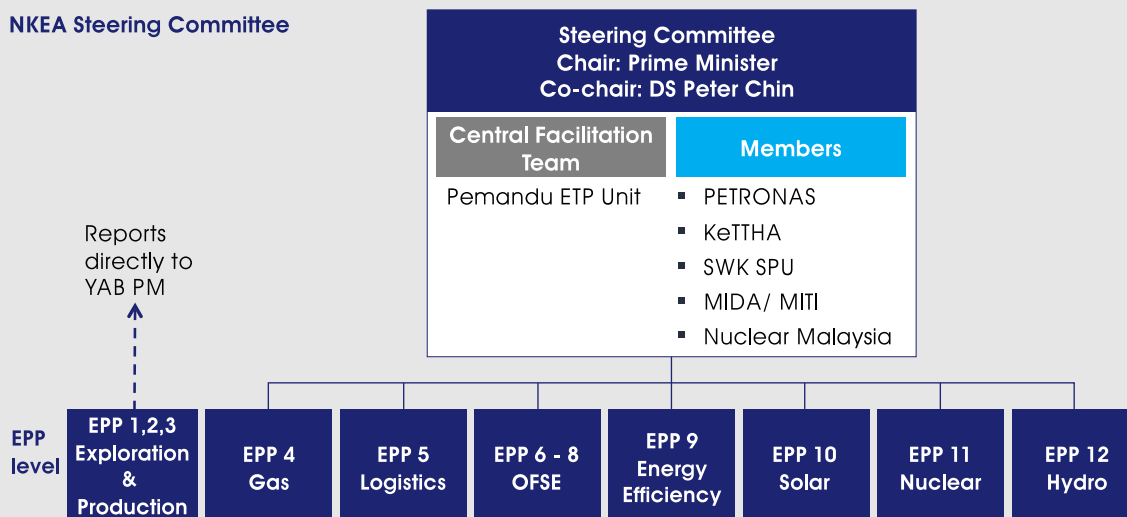
For each of the EPPs, detailed implementation plans have been developed. The owners and most of the stakeholders for each of these EPPs have given input and are aligned on the implementation plans. Given the need for both co-ordination and focus, an overall governance structure is also required. The goal is to monitor implementation and deliver on not only the 12 EPPs above, but also the broader list of business opportunities and to ensure the timely co-ordination across all stakeholders and relevant Government bodies. A Steering Committee co-chaired by YAB Prime Minister and the Minister of Energy, Green Technology and Water (KeTTHA) will continue to give direction on the implementation of the OGE recommendations.

The broader governance structure that will be put in place is summarised in *Exhibit 6-20*. It is designed to be empowered enough to drive successful execution of the EPPs, but not so intrusive that it duplicates functions of existing Government bodies and agencies. It achieves this by creating just three roles above the EPPs: a Steering Committee, a line management function to drive execution (split between PETRONAS and the ETP Unit) and a reporting and secretariat function, secured by the ETP Unit to support the Steering Committee.

Exhibit 6-20

Governance for Oil, Gas & Energy NKEA: two-tiered implementation governance structure will set direction and catalyse implementation

NKEA Steering Committee



Note: EPP 1 to 3 will be executed by PETRONAS and PETRONAS will report to PM on a regular basis

Summary of Wholesale and Retail NKEA

• Incremental GNI impact in 2020

RM131.4 billion

• Additional jobs in 2020

52,300

• Critical targets and milestones within 6 to 12 months

- LNG regasification concept (on-shoreland vs offshore or Floating Storage and Regasification unit (FSRU) finalised
- Grant funding and private jetty licence for deepwater oil terminal pilot project in South East Johor approvals obtained
- Local Engineering, Procurement, Construction and Installation and Commissioning firms that can bid for regional EPC contracts formed
- Government and GLC initiative to lead by example on energy-efficiency (circular for changes in procurement and on new EE behaviours, monitoring programme for key Government buildings) launched
- Feed-in tariff to kick-start the market for distributing solar power generated on residential roof-tops and in commercial and industrial premises commenced in 2011.