

MALAYSIA

- *Malaysia's primary energy demand is projected to grow at 3.5 percent per year from 56 Mtoe in 2002 to 147 Mtoe in 2030; mainly due to the increase in demand for coal, oil and gas; with coal demand accounting for the highest growth rate at 9.7 percent per year through 2030.*
- *Indigenous oil reserves are projected to be depleted within the outlook period, thus shifting the economy to a net energy importer. Net import dependency will reach 32 percent in 2030 from a net export position of 57 percent in 2002.*
- *Ensuring security of energy supply will be central to Malaysia's National Energy Policy.*
- *To strengthen energy security through regional cooperation, Malaysia is expected to extend full support to inter- and intra-regional trade and bi/multilateral-agreements, in all aspects of the energy supply chain, including among others cross border interconnection efforts like the Trans-ASEAN Gas Pipeline (TAGP) and the ASEAN Power Grid.*

RECENT ENERGY TRENDS AND ENERGY POLICY

In parallel with Malaysia's rapid economic development, final energy consumption grew at a fast rate of 5.6 percent between 2000 and 2005 to reach 38.9 Mtoe in 2005. A substantial portion of the energy consumed was from oil (63 percent) which was mainly utilised in the transport and industrial sectors. Natural gas consumption also increased in a rapid manner to fuel electricity demand. The share of natural gas in total installed electricity generation capacity remains high at 70 percent in 2005, but has fallen slightly from 77 percent in 2000. Despite the government's efforts to increase the share of coal in the electricity generation mix, the share of coal only reached 22 percent in 2005.

Malaysia is endowed with conventional energy resources such as oil and gas as well as renewables like hydro, biomass and solar energy. The economy is a net energy exporter with 11 percent of export earnings in 2004 derived from crude oil, LNG and petroleum products export. To develop the economy's oil and gas reserves in a sustainable manner, the government formulated the National Depletion Policy in 1980 that fixed the maximum daily oil and gas production levels. At 2005 production levels, proven oil reserves are expected to last another 19 years while natural gas reserves are expected to last for about 33 years.

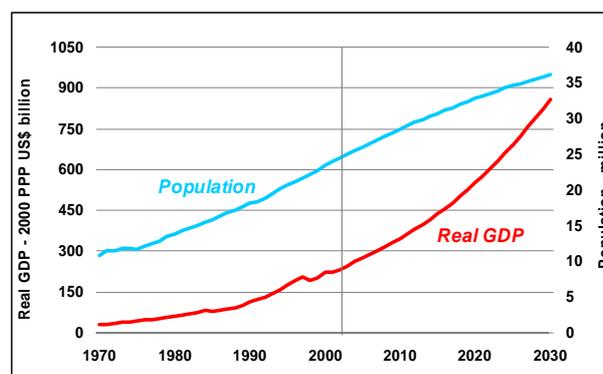
Taking into account the growing energy consumption and domestic energy supply constraints, Malaysia has set sustainable development and diversification of energy sources, as the economy's main energy policy goals. The Five-Fuel Strategy recognises renewable energy resources as the economy's fifth fuel after oil, coal, natural gas and hydro. The 9th five-year plan (2006-2010) emphasises the security, reliability and cost-effectiveness of energy supply, while focusing on the sustainable

development of the energy sector. The introduction of biodiesel for the transport sector in 2005 is one of the positive steps that the government has undertaken to achieve sustainable energy development through diversification of fuel sources.

ENERGY DEMAND DRIVERS

Malaysia's economy is expected to grow strongly over the outlook period with an annual average growth rate projected at 4.8 percent. The strongest growth will be from the industry (mainly the manufacturing sector) and the services sectors, attributing shares of 54 and 46 percent to total GDP in 2030 respectively.

Figure 56 GDP and Population



Source: Global Insights (2005)

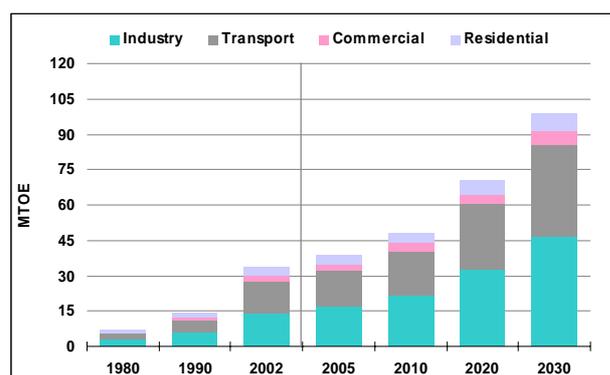
UN Habitat projects that the share of Malaysia's urban population will reach 78 percent in 2030 from 63 percent 2002. This factor combined with high per capita GDP growth of 3.4 percent per annum over the outlook period will lead to a change in lifestyle, where energy consumption will be based mostly on commercial energy sources, rather than traditional biomass sources. This will naturally cause a substantial growth in energy demand for the transport, commercial and residential sectors.

OUTLOOK

FINAL ENERGY DEMAND

Over the outlook period, final energy demand is projected to grow at 3.9 percent per year, reaching 98.7 Mtoe in 2030, nearly three times the 2002 level. The industry sector will have the highest growth rate of 4.3 percent, followed by transport at 3.9 percent, residential at 3.1 percent and commercial at 2.7 percent.

Figure 57 Final Energy Demand



Source: APERC Analysis (2006)

Industry

Energy demand in the industrial sector is projected to grow at an average annual rate of 4.3 percent until 2030, lower than its average annual growth of 7.5 percent over the past two decades. The shift in industry structure, from energy-intensive to non-energy-intensive industries, as well as improvements in energy efficiency will lead to the lower projected growth in energy demand. Consequently, over the outlook period, energy intensity in the industrial sector is expected to fall at an annual rate of 0.8 percent, reaching 105 toe per US\$ million in 2030 from 132 toe per US\$ million in 2002. The share of oil in industrial energy demand is projected to contract to 21 percent in 2030 from 35 percent in 2002; as the government promotes diversification of fuel sources. By contrast, natural gas with its large reserves and robust demand for petrochemical feedstock is projected to grow at 5.0 percent per year. Natural gas demand will surpass that of oil as the leading fuel, and will account for 43 percent of industrial energy demand in 2030. Renewable energy is projected to grow modestly at 2.7 percent per year; however, its share to total industrial energy demand will remain at less than 1 percent in 2030. Biomass, which is largely used in cogeneration by palm oil industries, will account for almost all of the demand for renewable fuels.

Transport

The transportation sector of Malaysia is heavily reliant on the road transport sub-sector. In 2002 for example, energy demand for road transport represented 86 percent of the total transport energy demand. Urban transport such as in Kuala Lumpur is heavily dependent on passenger vehicles, since rail infrastructure has not yet been well developed to connect the city centre with the residential suburbs. Inter-city passenger and freight movement depends on road transport, because of the limited availability of rail transport. Passenger vehicle ownership has been promoted as Malaysia considers the auto manufacturing industry as an important driver for economic development. As a result, Malaysia has a relatively high level of passenger vehicle ownership of about 180 per 1,000 population in 2002.

Energy demand in road transport is projected to grow at an annual rate of 3.5 percent. By fuel type, the trend of growth will show significant differences, with gasoline growing at 2.9 percent per year, diesel at 4.2 percent per year, and natural gas at 9.2 percent per year. The slower growth rate for gasoline, mainly for passenger vehicles, reflects several factors, such as a slow down in population growth towards the end of the outlook period, government measures to develop alternative modes of transport such as rail, and improvements in efficiency for passenger vehicles. By contrast, diesel demand for freight trucks will be largely driven by the constant growth in manufacturing and construction. Natural gas represents the fastest growth in road transport, as Malaysia plans to mitigate road induced air quality problems through converting diesel-powered buses to CNG, and promoting natural gas passenger vehicles. However, the natural gas share in the total road transportation energy demand will remain small at around 1 percent throughout the outlook period.

Energy demand for air transport is expected to grow at the fastest growth rate of 5.8 percent per year. Malaysia aims to become a regional hub for air transport, and is actively inviting international air carriers by providing landing tax incentives for a number of years. Along with integration of economic activities among ASEAN economies, Malaysia expects to increase the volume of international air travel.

Residential and Commercial

Malaysia's residential energy demand is projected to grow at 3.1 percent per year throughout the outlook period. The promotion of energy conservation and implementation of other environmental protection measures explain the slow growth in total residential energy demand. In 2030,

electricity, biomass and LPG will contribute 57 percent, 24 percent and 17 percent respectively to the energy mix. Demand for electricity is expected to grow at an annual rate of 4.9 percent, which is slower compared with the 5.8 percent annual growth rate between 1997 and 2002; mainly as a result of the increasing efficiency of household appliances, such as refrigerators and air-conditioners. Biomass, a dominant fuel in rural areas mainly for cooking, is expected to grow at 0.9 percent annually over the outlook period. On the other hand, the demand for commercial energy sources, for example LPG, will also increase by 2.7 percent per year until 2030; slowly replacing biomass for cooking and water heating. LPG will however face some competition with natural gas in the future.

The main drivers influencing energy demand in the commercial sector is economic growth and weather condition. Owing to Malaysia's predominantly humid weather conditions, about 40 percent of total energy demand in the commercial sector will be required for space cooling. As with the residential sector, the government has taken initiatives to reduce the energy intensity of commercial buildings and office equipment. As a result, energy demand growth in the commercial sector will slow down to 2.7 percent annually while the value added for the services industry will grow at 4.7 percent per year. Over the outlook period, the energy mix in the commercial sector will not show any significant change, with electricity accounting for 68 percent, LPG (17 percent), heavy fuel oil (12 percent) and natural gas (3 percent) in 2030. Driven by the increasing demand for cooling and lighting in commercial buildings, electricity is expected to grow at an annual rate of 2.7 percent. LPG demand is projected to grow at 2.8 percent per year while heavy fuel oil demand will grow at 1.9 percent annually from 2002 and 2030. Natural gas demand is expected to grow at the fastest annual growth rate of 10.1 percent, although it will increase from a relatively small absolute value in 2002.

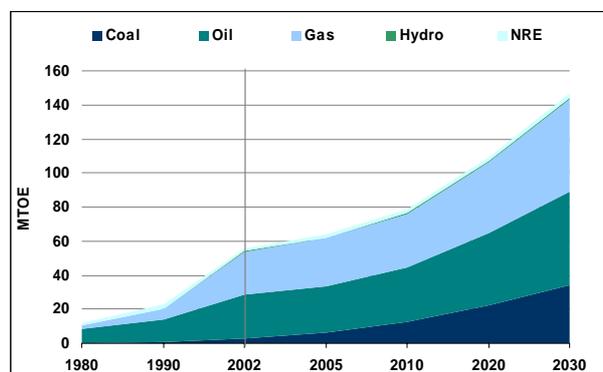
PRIMARY ENERGY DEMAND

Malaysia's primary energy demand is projected to grow at an annual rate of 3.5 percent, to reach 146.7 Mtoe in 2030, a 2.6-fold increase from 2002.

Among the fossil fuels, coal is projected to grow at the fastest rate of 9.7 percent per year, followed by natural gas at 2.9 percent and oil at 2.7 percent. Coal demand will increase substantially to meet the rising electricity demand, accounting for 93 percent of the total incremental coal demand (31.2 Mtoe). This is in line with Malaysia's target to increase the share of coal in the electricity generation sector. Malaysia is a

net importer of coal and imports will increase about 14 times from 2002 to 2030 reaching 33.4 Mtoe in 2030.

Figure 58 Primary Energy Demand



Source: APERC Analysis (2006)

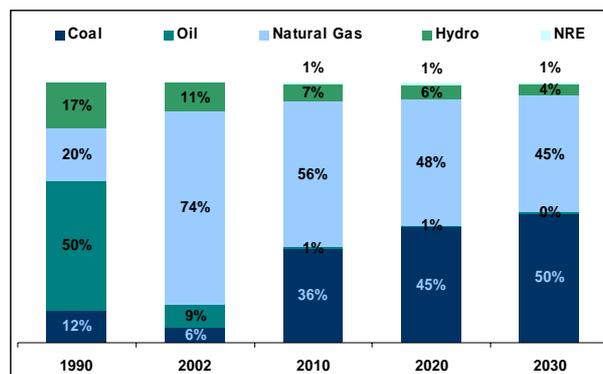
Growth in natural gas demand will continue at a steady pace with increasing natural gas demand in the industry sector, which is projected to account for 37 percent of total primary energy demand in 2030.

The share of oil is projected to decline from 47 percent in 2002 to 38 percent in 2030. Over the outlook period, oil demand in the transport sector will grow at 3.9 percent reaching 39.0 Mtoe in 2030, translating to 71 percent of total primary energy demand in the same period.

ELECTRICITY

The electricity demand of Malaysia will increase by 4.7 percent per year over the outlook period, to reach 274 TWh in 2030. The growth in electricity demand is heavily influenced by strong demand from the industrial sector, which is projected to increase at 5.4 percent annually over the outlook period. Electricity demand for the residential sector will also experience strong growth of 4.9 percent per year due to improving living standards. Per capita electricity demand is projected to more than double from 2002 to reach 7,571 kWh/person in 2030, higher than that of the APEC region average at 6,833 kWh/person.

Figure 59 Electricity Generation Mix



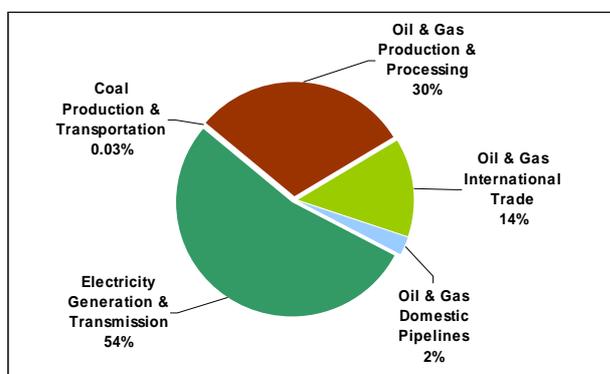
Source: APERC Analysis (2006)

Throughout the outlook period, natural gas is expected to be gradually replaced by coal in the electricity generation mix. Consequently, the share of natural gas in the electricity generation fuel mix will be reduced from 74 percent in 2002 to 45 percent in 2030, while the share of coal will increase from 6 percent in 2002 to 50 percent in 2030.

INVESTMENT REQUIREMENTS

The energy industry of Malaysia will need a total investment of between US\$107-135 billion during the outlook period. The majority of the investment will be required for electricity generation and transmission (US\$59-72 billion) and oil and gas production (US\$28-41 billion). These reflect the fast growth in the need for electricity in improving living standards and fuels for industry and transportation.

Figure 60 Investment Requirements

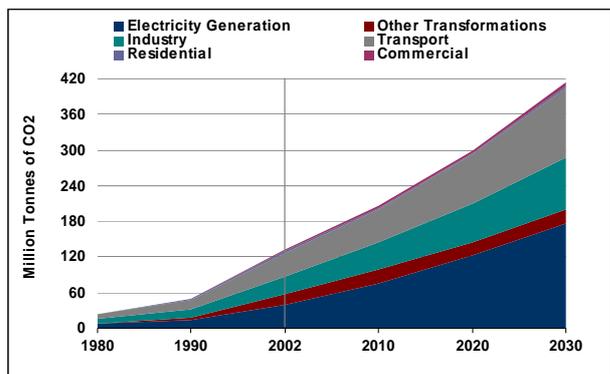


Source: APERC Analysis (2006)

CO₂ EMISSIONS

Over the outlook period, CO₂ emissions from the energy sector are projected to grow at 4.2 percent per annum, reaching 414 million tonnes of CO₂ in 2030, a three-fold increase over 2002. The electricity sector will be the biggest contributor to the incremental growth in CO₂ emissions at 49 percent, followed by the transport sector at 28 percent and the industry sector at 20 percent.

Figure 61 CO₂ Emissions by Sector



Source: APERC Analysis (2006)

MAJOR ISSUES

LONG-TERM ENERGY SECURITY

Despite government efforts to preserve declining energy reserves, Malaysia will become a net energy importer in the next 28 years. Net import dependency will increase from minus 57 percent (net energy export position) in 2002 to 32 percent in 2030. The increase in the share of coal in electricity generation will result in a substantial increase in coal imports, with import dependency rising from 2.4 Mtoe in 2002 to 33.4 Mtoe in 2030. The projected flat domestic production of natural gas together with increasing demand over the outlook period would reduce Malaysia's natural gas export capability, thereby reducing the net export position of natural gas from 79 percent in 2002 to 7 percent in 2030. Despite the reduction, Malaysia will remain a net exporter of natural gas over the outlook period. In the case of oil, import dependency is expected to reach 32 percent in 2030 from a net exporting position of 54 percent in 2002, due to the strong growth of demand in the transport and industrial sectors.

To boost oil and natural gas reserves, Malaysia has been intensifying the exploration of deepwater and extra-deep water areas. For example in 2005, intensive exploration activity resulted in the discovery of 1,084.7 million barrels of oil equivalent (mboe) of oil and natural gas reserves of which 70 percent are located in deepwater areas. To further improve energy supply security, Malaysia has ventured into energy-related industries and services abroad. For example PETRONAS has invested a total of RM29 billion in downstream and upstream activities in 35 economies and Tenaga Nasional Berhad (TNB) has also invested in the extraction of coal in Kalimantan, Indonesia.

In addition, the recent introduction of biodiesel as an alternative fuel for transportation will assist the economy in reducing diesel import. The utilisation of biodiesel in Malaysia, which is targeted to be enforced by 2008, is estimated to reduce diesel imports by 500,000 tonnes a year or 10 percent by blending 5 percent biofuel to diesel at pumps.

DEVELOPMENT OF A SUSTAINABLE TRANSPORTATION SYSTEM

The heavy reliance on passenger vehicles due to insufficient public transport infrastructure will result in strong demand for oil in the transport sector. As Malaysia will greatly rely on oil imports, with a net import dependency of 32 percent in 2030, there is an urgent need for the economy to improve its public

transport system subsequently reducing oil consumption in the transport sector.

NATURAL GAS DISTRIBUTION SYSTEM

The use of natural gas in sectors other than the electricity sector has been promoted as part of the government strategy to diversify energy sources. Over the outlook period, the share of natural gas in total final energy demand will grow at 5.1 percent per year mainly due to strong demand growth in the industry sector, as a result of domestic availability and competitive price. However, in order to utilise natural gas in the industrial sector more extensively a comprehensive pipeline system will be required. The Natural Gas Distribution System (NGDS) was expanded from 455 km in 2000 to 1,365 km in 2005. The NGDS network will be further expanded to a total of 2,005 km in 2010 with an estimated investment requirement of US\$168 million⁷². The network is projected to supply 6.9 Mtoe of natural gas in 2010. However, as natural gas demand is projected to grow strongly and reach 20.4 Mtoe in 2030, the domestic gas pipeline network will need to be expanded further over the outlook period at an estimated cost of US\$2-3 billion.⁷³

IMPLICATIONS

Malaysia's energy policy dates as far back as the 1970s and since then the economy had been in the forefront for the effective management of its energy resources, efficient utilisation and protection of the environment. Programmes and policies have been laid out to effectively institute the economy's energy policies and programmes.

The pressing concern that Malaysia needs to tackle is energy supply security as limited domestic energy resources coupled with increasing energy demand will reduce the economy's export capability and increase dependence on imported energy sources. One approach to reducing dependence on fossil fuels is to exploit the economy's abundant renewable sources such as solar, mini hydro, and biomass from palm oil industry. However, to boost the development of the renewables, review of current renewable energy development mechanisms, such as incentives and financing mechanisms, should be undertaken to identify barriers to the implementation of projects. In addition, the Clean Development Mechanism (CDM) could be utilised to increase the viability of renewable projects, by trading Certified Emission Reduction credits with Annex B countries.

In an effort to increase energy security, Malaysia should actively pursue a strategy of regional cooperation with neighbouring economies (for example, Brunei Darussalam), through which possible bilateral/inter-regional interconnection agreements, (for example the Trans-ASEAN Gas Pipeline) could bring the much needed natural gas and oil to the economy.

Another initiative that could be further promoted is the ASEAN Power Grid Interconnection Initiative. As at 2003, one link between Malaysia and Thailand was in operation. However, to enhance the regional electricity transmission network, additional links with neighbouring economies (such as Indonesia and Singapore) could be instigated to further strengthen energy security.

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⁷² Economic Planning Unit (2005)

⁷³ Estimate by APERC.