

INDONESIA

- *Primary energy demand is projected to grow at an annual rate of 2.7 percent to reach 359 Mtoe in 2030, a two-fold increase over 2002.*
- *Indonesia is currently a net energy exporter. However, Indonesia is at the turning point of becoming a net energy importer and during the outlook period the net energy import ratio will increase from minus 55 percent in 2002 to 0 percent in 2030.*
- *To secure energy supply Indonesia needs to address both demand and supply-side issues. On the demand side improving efficiency and public infrastructure through economics incentives, mandatory standards, and optimal pricing and on the supply side, investment to increase the reserves of natural gas, oil and coal.*

RECENT ENERGY TRENDS AND ENERGY POLICY

With Indonesia's recovery from the Asian financial crisis of 1998, energy consumption has grown rapidly in recent years. Primary energy consumption increased from 137.4 Mtoe in 2000 to 168.9 Mtoe in 2004, growing at 5.2 percent per year compared with 2.9 percent per year between 1995 and 2000. Among the fossil fuels, coal increased at the fastest rate of 12.7 percent per year, due mainly to the increase in consumption for electricity generation between 2000 and 2004. Natural gas grew at the second fastest rate of 8.4 percent per year driven by the growth in the industry sector.

Indonesia is endowed with indigenous energy resources such as natural gas, coal and oil, and is self sufficient in terms of energy supply except oil. Indonesia is the world's largest LNG exporter and the second largest coal exporter after Australia. In 2004, coal accounted for 46 percent of total net exports, followed by natural gas (26 percent), crude oil (20 percent), and oil products (7 percent), thus the economy maintained a net energy export position of 56 percent in 2004, although exports have decreased from 62 percent in the early 1990s.

Indonesia has been a net oil importer since 2002.⁴⁸ Oil production decreased from 70.6 Mtoe in 2000 to 54.6 Mtoe in 2004 due to depleting reserves and lack of investment for exploration and development.

Natural gas production has been increasing at a moderate rate of 1.1 percent per year, growing from 71.1 Mtoe in 2000 to 74.2 Mtoe in 2004. In 2004, export of LNG accounted for about 41 percent of the total natural gas production, and export through pipeline to Singapore and Malaysia accounted for about 4.8 percent of total natural gas production. The economy is expected to remain the world's biggest LNG exporter in the next few years; however

LNG export capacity is likely to decline in the long-term due to dwindling natural gas reserves and increasing domestic demand. The initial sign of tightening supply of natural gas was observed when the economy announced the deferment of 51 LNG cargoes for export between 2005 and 2007.

Faced with falling oil production, and slowing growth of natural gas production, Indonesia places energy supply security as a priority of the energy policy goal. The "Blue Print Energy Policy 2025" was issued in 2005 to delineate measures through which Indonesia tries to enhance energy supply security. These measures include diversification of energy sources away from oil, rationalisation of energy pricing, and improvement of energy efficiency.

ENERGY DEMAND DRIVERS

Over the outlook period, GDP is projected to grow at 4.6 percent per year, from US\$790 billion in 2002 to US\$2,795 billion in 2030. The growth in GDP will be largely attributed to the services sector and will account for about 57 percent of the incremental GDP growth.

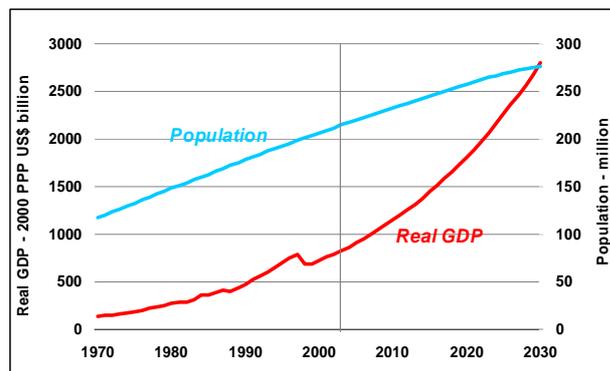
The economy's success in controlling the expansion of population will result in slower growth in population over the outlook period. Population is projected to grow annually at 1.0 percent from 2002 to 2030, slower than the average annual growth rate of 1.6 percent over the last two decades.

Population in Jakarta is expected to exceed 15 million in 2015, making the city one of the world's mega cities. Further urban migration will also increase the population of Surabaya city to more than 5 million. As a result, Indonesia's urbanisation level is projected to increase from a low of 44 percent in 2002 to 68 percent in 2030. Over the outlook period, it is estimated that about 18 cities will have population between 1 and 5 million. Growth of urban population will lead to higher demand for oil in

⁴⁸ Department Energy and Mineral Resources (2005a).

transport, and electricity in the residential and commercial sectors.

Figure 38 GDP and Population



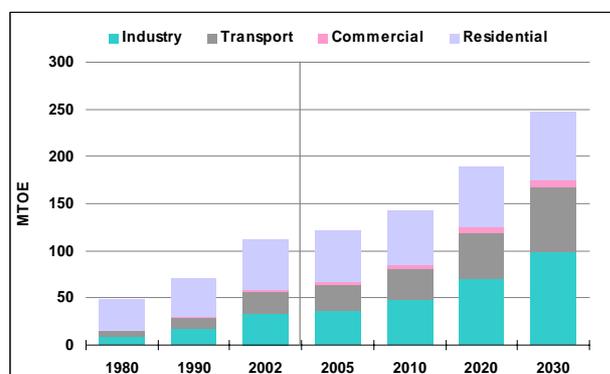
Source: Global Insights (2005)

OUTLOOK

FINAL ENERGY DEMAND

Indonesia's final energy demand is projected to grow at 2.9 percent per year, reaching 247 Mtoe in 2030, more than double that of 2002 at 112 Mtoe. The industry sector will maintain the largest share at 40 percent, followed by residential (29 percent), transport (28 percent), and commercial (3 percent) in 2030.

Figure 39 Final Energy Demand



Source: APERC Analysis (2006)

Industry

Energy demand in the industrial sector is projected to grow at an average annual rate of 4.0 percent until 2030, lower than the average annual growth of 6.5 percent over the past two decades. The shift in industry structure, from energy-intensive

to non-energy-intensive industries⁴⁹, will lead to the lower projected growth in energy demand in the sector. Indonesia's primary industries have accounted for 37 percent of the total industrial energy consumption in 2002, while the share is expected to decrease to 19 percent in 2030. By contrast with industry structural change, the share of the machinery and electronics industries in total industry energy demand will increase from 12 percent in 2002 to 19 percent in 2030. In addition to changes in industry structure, higher energy prices as a result of subsidy removal are expected to provide a stimulus for energy efficiency improvements in the long-term. As a result of the aforementioned factors, energy intensity⁵⁰ in the industrial sector will decline to be below that of the 2002 level, reaching 128 toe per US\$ million in 2030 after initially increasing to 143 toe per US\$ million in 2010.

By energy source, natural gas is projected to grow rapidly at 4.2 percent per year reflecting robust demand growth for fertilizers and minerals processing. Natural gas demand will surpass that of oil as the leading fuel, accounting for 34 percent of industrial energy demand in 2030, while the share of oil will decrease from 35 percent in 2002 to 30 percent in 2030. Coal and electricity are also projected to grow robustly at 4.7 percent and 4.4 percent per year respectively. Whereas, renewable energy is projected to grow the slowest at a rate of 3.0 percent per year accounting for 5 percent of total industrial energy demand in 2030. Biomass, which is largely used in cogeneration by the wood, food and palm oil industries, will account for almost all of renewable energy demand.

Transport

Despite the economic slow-down during the Asian financial crisis, transportation energy consumption of Indonesia grew at a robust rate of 6.3 percent per year over the past two decades. Transport energy consumption was mostly driven by the road sub-sector and accounted for about 87 percent of the incremental growth. Gasoline consumption for passenger vehicles and motorcycles

⁴⁹ Industrial sector's share to total value of output declined from 60 percent in 1980 to 56 percent in 2003, while that for the service sectors increased from 40 percent to 44 percent. The share of energy-intensive industries within industrial value-added also declined from 66 percent to 46 percent. Over the outlook period, industrial sector's share will decline further to 47 percent in 2030, whereas that for the service sectors will rise to 53 percent, and that the share of energy-intensive industries will decline to 35 percent in 2030.

⁵⁰ The amount of energy needed to produce a dollar's worth of industrial sector's value added.

increased two-fold, and diesel for buses and trucks also increased two-fold.

Over the outlook period, transportation energy demand is expected to grow at an annual rate of 3.9 percent. Most of the incremental transportation energy demand growth will come from the road transport sub-sector, accounting for 87 percent of the total transport energy demand by 2030. Continued income growth and development of a vehicle manufacturing industry⁵¹ will result in a substantial increase in the number of passenger vehicles from 3.4 million units in 2002 to 13.9 million units in 2030.⁵² GDP growth of 4.6 percent per year will result in an increase in freight transport volumes. As a result of these factors, gasoline demand and diesel demand is projected to increase about three-fold.

The rise in energy demand from road transport is expected to worsen the air quality in major cities.⁵³ With a view to improving air quality, Indonesia began implementation of the “blue sky programme” in 1996. This programme includes measures to phase out the use of leaded gasoline, and introduce catalytic converters for vehicles. The programme also includes the introduction of LPG vehicles and CNG buses. As a result, over the outlook period, LPG for road transport will increase six-fold and natural gas is projected to increase two-fold. However the combined share of LPG and natural gas in total road transport energy demand would remain small at 1.0 percent.

Because of Indonesia’s archipelagic nature, constituting about 17,000 islands, the marine and air sub-sectors will remain important modes of inter-island transport. Over the outlook period, the energy demand of the marine and air transport sub-sectors will increase at an annual rate of 1.0 percent and 5.3 percent respectively, the latter growing faster due to increased passenger and air freight traffic volume.

Residential and Commercial

The most significant variables affecting Indonesia’s residential energy consumption are

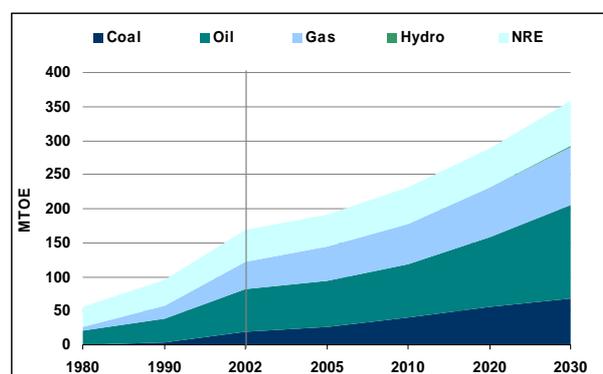
growth in income, the number of households and improvement of living standards. Energy demand in the residential sector is expected to grow at 1.1 percent per year, lower than the average annual growth of 2.1 percent over the past two decades. Switching from non-commercial to commercial energy sources explains the projected slow-down of growth in residential energy demand. Despite fuel switching, combustible renewables and waste are projected to maintain the largest share of total residential energy demand at 72 percent in 2030. The share of electricity is projected to increase from 6 percent in 2002 to 13 percent in 2030, growing at an annual rate of 4.3 percent, partly because of the government’s effort to increase electrification levels.⁵⁴ Kerosene demand will decline at 0.4 percent per year and the share will decrease from 19 percent in 2002 to 12 percent in 2030 as kerosene is replaced by electricity for lighting.

Energy demand in the commercial sector will grow in parallel with the growth in value added for services sector, at 4.0 percent per year through 2030. Electricity will grow at the fastest annual rate of 5.5 percent, and the share in total commercial energy demand will increase from 50 percent in 2002 to 73 percent in 2030. On the other hand, the combined share of kerosene and diesel will decrease from 32 percent in 2002 to 16 percent in 2030.

PRIMARY ENERGY DEMAND

During the outlook period, Indonesia’s primary energy demand is expected to more than double from 168 Mtoe in 2002 to 359 Mtoe in 2030. Coal is projected to grow at the fastest rate of 4.7 per year, followed by oil and natural gas at 2.8 percent, hydro at 2.6 percent and renewables at 1.3 percent.

Figure 40 Primary Energy Demand



Source: APERC Analysis (2006)

Coal demand will mainly be driven by electricity generation as Indonesia promotes the construction of

⁵¹ International auto makers are locating their manufacturing and assembly plant base in Indonesia. Companies such as Toyota and Daihatsu have been successful in manufacturing relatively low-priced vehicles such as “Kijang”, “Avanza” and “Xenia” of which 80 percent of the parts are produced in Indonesia, and these companies consider Indonesia as one of the manufacturing bases for export to the Southeast Asian economies.

⁵² The growth trend for passenger vehicle ownership is slower in the near-term than in longer-term. With the expected removal of subsidies for diesel and gasoline, cost of vehicle ownership – relative to the income level – would be higher in near-term.

⁵³ In Jakarta, for example, NO_x and particulate levels surpassed that of WHO guidelines by a factor of two.

⁵⁴ The electrification of Indonesia will increase from 58 percent in 2004 to 95 percent in 2030.

mine-mouth coal-fired electricity generation plants. As a result, coal demand is expected to increase from 19 Mtoe in 2002 to 68 Mtoe in 2030. A small portion of coal demand is expected to come from the residential sector as the economy promotes the utilisation of coal briquettes in the residential sector for cooking.

Natural gas demand is projected to increase from 40 Mtoe in 2002 to 87 Mtoe in 2030, at an annual growth rate of 2.8 percent. The electricity sector will lead natural gas demand, accounting for 53 percent of the incremental natural gas demand growth. Over the outlook period, natural gas demand will be met by domestic supply – by both pipeline and internal LNG shipments.

Oil demand is projected to increase from 63 Mtoe in 2002 to 136 Mtoe in 2030 as a result of robust transport demand growth, making up 61 percent of the incremental growth. Oil production is expected to decline, at an annual rate of 0.5 percent from 64 Mtoe in 2002 to 55 Mtoe in 2030. Due to demand growth and declining production, the net oil import dependency is projected to reach 60 percent in 2030 from 2 percent net oil export position in 2002.

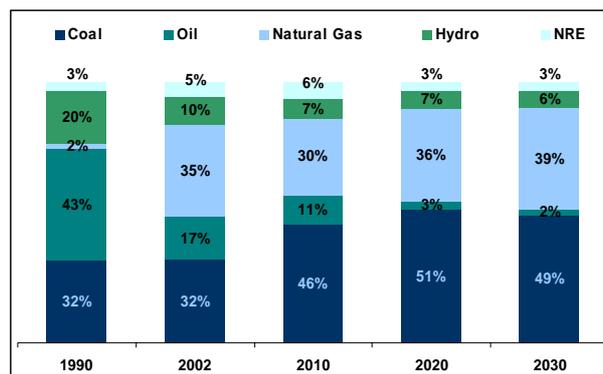
ELECTRICITY

Electricity demand is projected to more than triple, growing annually at 4.6 percent through 2030. By sector, demand in the commercial sector is projected to grow at the fastest rate of 5.5 percent per year, followed by industry at 4.4 percent and residential at 4.3 percent.

In 2004, electrification ratio was low at 58 percent, however, over the outlook period, it is expected that the electrification ratio will increase to 95 percent in 2030. As a result, total installed generation capacity is projected to increase almost four-fold, from 28 GW in 2002 to 108 GW in 2030. Of this total, coal will account for about 54 percent of the new capacity requirements, and natural gas at 40 percent.⁵⁵

In 2030 coal is expected to account for the largest share of the electricity generation mix at 49 percent, followed by natural gas (39 percent), hydro (6 percent), renewables (3 percent) and oil (2 percent).

Figure 41 Electricity Generation Mix



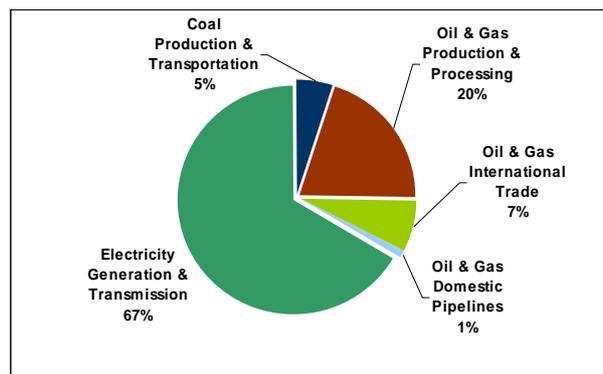
Source: APERC Analysis (2006)

In addition to Indonesia’s projected domestic electricity generation, it is envisioned that the economy will import some of its electricity requirements from Sabah, Malaysia through the ASEAN Power Grid Interconnection, initially at 1.5 TWh in 2009 increasing further to 6 TWh by 2014.

INVESTMENT REQUIREMENTS

Indonesia will need a total of between US\$219-274 billion in new investment to support the projected growth of energy demand. The majority of this investment will be required in the electricity sector (67 percent), followed by oil and gas production and processing (20 percent), oil and gas international trade (7 percent), coal production and transportation (5 percent) and domestic oil and gas pipeline (1 percent).

Figure 42 Investment Requirements



Source: APERC Analysis (2006)

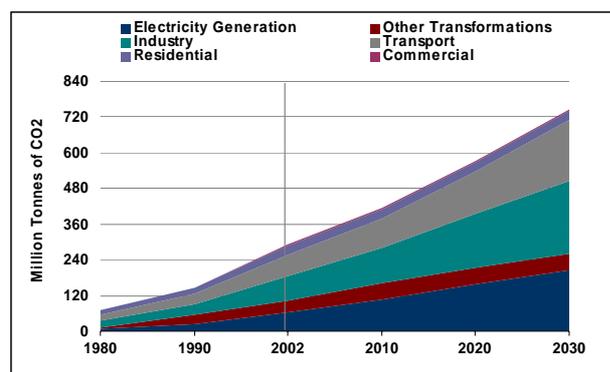
CO₂ EMISSIONS

Total CO₂ emissions from the energy sector are projected to increase from 292 million tonnes of CO₂ in 2002 to 746 million tonnes of CO₂ in 2030. CO₂ emissions for Indonesia are evenly distributed among

⁵⁵ Over the outlook period, nuclear is not expected to be constructed, however Indonesia considers nuclear as a viable option to ensure electricity supply security.

the industry, transport and electricity sectors, with each taking about one-third of total CO₂ emissions.

Figure 43 CO₂ Emissions by Sector



Source: APERC Analysis (2006)

MAJOR ISSUES

ENHANCEMENT OF ENERGY SECURITY

Indonesia is at a turning point from a net oil exporter into a net oil importer. Over the outlook period, oil production is expected to decline at an annual rate of 0.5 percent in parallel with the rising oil demand for transportation sector, resulting in Indonesia's net oil import dependency reaching 60 percent in 2030.

As a means to reduce oil dependency, the government encourages switching from oil to natural gas in the industry sector, and from oil to coal and natural gas in the electricity sector. In addition, the economy promotes the use of bio-fuels in the transportation sector.

On top of the aforementioned fuel switching efforts, the economy has been improving incentives to foster greater opportunities for investment in the development of upstream oil and gas resources. For example in 2003, the government raised the profit share for contractors operating in conventional oil and gas fields. For oil fields, the profit share was raised from 15 percent to 20 or 25 percent, and for gas fields, the profit share was raised from 30 percent to 35 or 40 percent. In addition, Indonesia provides incentives for those contractors that develop marginal fields.⁵⁶ As a result of those new incentives, the number of production sharing contracts reached 16 in 2004 compared with only one in 2002.

Aside from the development of domestic resources, Indonesia has pursued oil resource development overseas. For example, Pertamina and Medco Energy have been involved in oil exploration

⁵⁶ Contractors working in marginal fields are entitled additional 20 percent cost recovery if the rate of return of their investment is lower than 15 percent.

and production activities in Libya, Iraq, the US, Oman and Viet Nam. Although access to oil resources is still limited, the involvement of overseas projects could contribute to future oil supply.

RATIONALISATION OF ENERGY PRICING AND ENERGY EFFICIENCY IMPROVEMENT

Over the last two decades, with the subsidized low price, energy suppliers, including electricity generators, and refineries, could not earn a satisfactory rate of return for energy supply, resulting in the lack of investment to develop infrastructure and to replace obsolete technologies. For example, several regions in Indonesia experienced frequent brownouts or blackouts due to the lack of electricity generation and transmission facilities.

The low domestic energy prices and subsequent lack of incentive for energy efficiency improvement has resulted in Indonesia's high energy intensity in 2002 at 213 toe per US\$ million, the highest among the APEC member economies.

The provision of subsidies has created a significant burden on the government budget. In 2004, about IDR 73.6 trillion (US\$ 7.9 billion) or 14 percent of government expenditure went to fuel subsidies.

In 2005, Indonesia managed to reduce subsidies for oil products. Indonesia began to set up mechanisms to formulate industrial oil product prices and high grade oil product prices for transportation reflecting price changes in the world oil market. In addition, the economy has formulated new electricity tariff mechanisms to reflect changes in production cost to the end use price. According to Indonesia's Energy Blueprint, the economy plans to remove gasoline and diesel subsidies by 2006 and kerosene by 2007. However, to reduce the impact of energy price increases, Indonesia will continue to provide direct cash subsidies to the poor population.

With tight budgetary condition, the application of market prices in the domestic market is an option for Indonesia to limit government burden of subsidising energy prices. Reflecting increase in the world market energy prices to end-use prices could motivate the efficient use of energy.

IMPLICATIONS

Indonesia is at the turning point of changing from an oil exporter to a net oil importer. Because of the amount of investment needed to secure energy supply, Indonesia would be required to create attractive conditions to promote both domestic and foreign investments by simplifying approval procedures, removing restrictions and establishing

stable and consistent laws and regulation. Indonesia may need to address supply security, exploration of domestic energy resources, promoting investment, and improve energy efficiency through rationalisation of energy prices.

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