

## VIET NAM

- Viet Nam's primary energy demand is projected to grow annually at 4.4 percent, from 42 Mtoe in 2002 to 142 Mtoe in 2030, as a result of industrialisation of the economy.
- Viet Nam is expected to become a net energy importing economy beyond 2020; with the energy import dependency projected to reach 15 percent in 2030.
- The total investment requirements are estimated to be between US\$136-172 billion; of which four-fifths of the investment will be required for electricity generation and transmission.

### RECENT ENERGY TRENDS AND ENERGY POLICY

Viet Nam's energy consumption has been growing rapidly in parallel with the economy's progress in industrialisation and economic reform to facilitate closer integration into the global economy. Between 2000 and 2005, total primary energy consumption, excluding biomass, grew at an annual rate of 10.6 percent, compared with that of 9.9 percent per year during the previous decade. Despite the fast growth, per capita energy consumption of Viet Nam is one of the lowest in the APEC region at 0.36 toe per person in 2005.

By energy source, natural gas grew at the fastest annual rate of 37 percent between 2000 and 2005, driven largely by the start-up of natural gas supply from Nam Con Son Basin to Phu My electricity complex in 2002.<sup>116</sup> During the same period, coal grew at the second fastest rate of 14.9 percent per year due to the growth in consumption from industry and electricity generation.<sup>117</sup> Oil grew at an annual rate of 8.2 percent driven by the robust growth in transportation sector.

Meeting the economy's growing energy demand, on the back of a surge in the world energy prices has resulted in significant increase in energy production. Oil production increased from 16.9 Mtoe in 2000 to 19.1 Mtoe in 2005<sup>118</sup>, and coal production more than doubled from 6.5 Mtoe in 2000 to 17.0 Mtoe in 2005. Natural gas production surged by six-fold from 1.1 Mtoe in 2000 to 6.7 Mtoe in 2005.

Viet Nam has been a net energy exporter since 1990. With continued expansion of domestic energy production, the net energy export position of the economy has grown considerably from 2 percent in

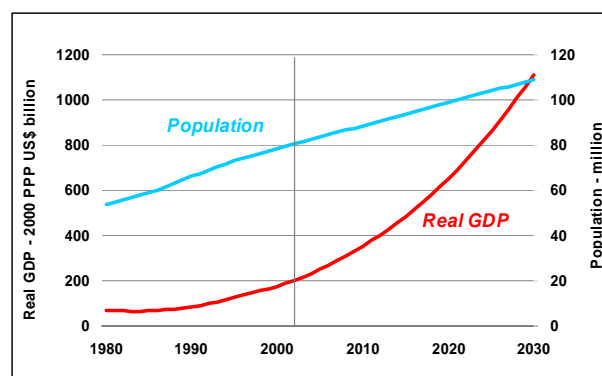
1990 to 55 percent in 2005. Foreign currency earnings from the export of coal and crude oil are important sources of revenue to the economy, accounting for US\$7.4 billion or 25 percent of the total export revenue in 2005.

To supply energy in a manner meeting the rise in consumption, the Ministry of Industry has formulated the National Energy Policy of Viet Nam. Main points of the Policy are: 1) development of energy infrastructure and enhancement of long-term energy supply, 2) development of energy in consideration of environment, 3) improvement of energy efficiency and 4) enhancement of international energy cooperation.

### ENERGY DEMAND DRIVERS

Viet Nam's economy is expected to grow rapidly at 7.3 percent annually in the near-term through 2010, but will slowdown thereafter to about 6.0 percent annually until 2030. The industry and service sectors are expected to continue to drive the economic growth.

Figure 123 GDP and Population



Source: Global Insights (2005)

The economy's population is projected to reach 109 million by 2030, growing annually at 1.1 percent from 80.5 million in 2002. The number of people moving from rural areas to cities will moderately urbanise the economy to 43 percent by 2030. The rate of urbanisation growth, at 1.9 percent per year,

<sup>116</sup> Natural gas in the Nam Con Son Basin is supplied through pipeline to six generating plants at Phu My with a combined capacity of 3,870 MW in 2005, which corresponds to one third of Viet Nam's total generation capacity.

<sup>117</sup> To meet the growing electricity demand, installed capacity of coal-fired generation more than doubled from 681 MW in 2000 to 1,631 MW in 2005.

<sup>118</sup> Sourced from the National Statistics of Viet Nam.

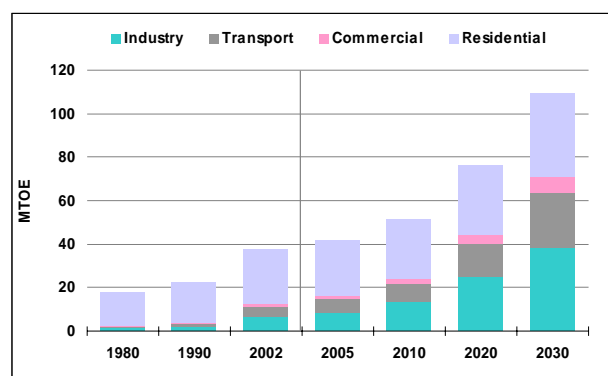
will however be higher than population growth over the outlook period.

## OUTLOOK

### FINAL ENERGY DEMAND

Viet Nam's final energy demand is projected to grow annually at 3.9 percent over the outlook period, from 38 Mtoe in 2002 to 109 Mtoe in 2030. The projected final energy demand growth is however slower than the past decade of 4.4 percent between 1990 and 2002, but among the fastest growth in the APEC region. The share of the residential sector is projected to remain the largest, but will reduce substantially from 67 percent in 2002 to 35 percent in 2030, as a result of biomass being replaced by commercial energy sources. The industry sector is expected to maintain the second largest share at 35 percent, followed by transport at 24 percent and commercial at 6 percent.

Figure 124 Final Energy Demand



Source: APERC Analysis (2006)

### Industry

Over the outlook period, energy demand in the industrial sector is projected to grow at the fastest annual rate of 6.6 percent, slightly faster than the past two decades at 6.4 percent. The rapid growth in industrial value-added of about 7.1 percent per year over the outlook period is as a result of the continued industrialisation of the economy. To achieve Viet Nam's goal of becoming an industrialised economy by 2020, Viet Nam plans to build a number of heavy industries such as cement, iron and steel, fertiliser, chemical, and petrochemical. The government also expects the manufacturing and construction industries to become the driving force for the development of the national economy, with a combined share to total value-added to reach over 42 percent in 2020 from 38 percent in 2002. Energy intensity is expected to continue to increase from 92 toe per US\$ million in 2002 to 95 toe per US\$ million in 2010, thereafter declining to 81 toe per US\$ million in 2030.

Coal has been and will continue to be the major source of energy in Viet Nam's industrial sector but will be replaced by other sources. This trend will continue and is projected to reduce coal's share of total industrial energy demand from 46 percent in 2002 to 35 percent by 2030. The share of oil is also projected to decline from 36 percent in 2002 to 32 percent in 2030 as gas pipelines are developed along the industry routes, marginally displacing oil. By contrast, recent large discoveries of natural gas have fostered the development of the fertiliser and petrochemical industries, and consequently, natural gas demand is projected to lead the growth at 21 percent per year through 2030. Natural gas demand will account for 11 percent of total industrial energy demand in 2030. Electricity is also projected to grow robustly at 7.4 percent per year, with the share increasing from 18 percent in 2002 to 22 percent in 2030, as newly-built industries are expected to introduce more efficient electrical equipment and automated systems.

### Transport

Viet Nam's transport sector is characterised by very fast growth in road transport energy consumption of 11.1 percent per year over the last 12 years to 2002. Despite the fast growth, per capita transport energy consumption remained one of the lowest in the APEC region at 0.06 toe per person in 2002, which is about one seventh of the APEC average at 0.42 toe per person in the same year.

During the outlook period, Viet Nam's transport energy demand is projected to continue to grow the fastest in the APEC region at 6.2 percent per year. With accession to the WTO likely from 2006-2007, Viet Nam's economy will be further integrated to the global economy, which will in turn translate into substantial increases in the energy requirements for freight transport. Income growth will spur the shift from motorcycles to passenger vehicles to facilitate the mobility of people. The government has announced plans to upgrade existing road and develop new infrastructure to accommodate the growing volume of freight traffic as well as passenger travel. Viet Nam's transport energy demand is therefore projected to grow by more than five times between 2002 and 2030.

By fuel type, gasoline will grow at the fastest rate of 6.5 percent per year. As of 2006, motorcycles are the largest consumer of gasoline, accounting for about 55 percent of the total gasoline consumption. In major cities such as Hanoi and Hochiminh, motorcycles account for more than 90 percent of total passenger traffic. Dependence on motorcycles is expected to continue, at least in the near-term.

However, in the long-term, passenger vehicles will gradually replace motorcycles, further increasing the gasoline demand growth. By 2030, the number of passenger vehicles is projected to increase by more than seven-fold to reach 870,000 units from 120,000 units in 2002. However, the number of passenger vehicles per 1,000 population will remain small at 10.2 in 2030, the lowest in the APEC region. Diesel for freight trucks and farm vehicles will grow the second fastest annual rate of 6.2 percent through to 2030.

### Residential and Commercial

Energy demand in the residential sector is expected to grow at 1.5 percent per year throughout the outlook period, slower in comparison with the 2.2 percent annual growth rate over the past two decades. The residential energy mix is expected to change significantly over the outlook period. Biomass – mostly from fuel wood – which plays an important role in rural areas particularly for cooking, is projected to maintain the largest share to total residential energy demand, although the share is expected to decrease from 90 percent in 2002 to 59 percent in 2030. Substitution of biomass for coal, LPG or gas, and electricity is the main reason for the decline. The share of electricity, on the other hand, will increase from 5 percent in 2002 to 29 percent in 2030, accounting for the second largest share after biomass. Due to strong income growth, moderate growth in urbanisation and the government's policy to promote rural electrification, households are expected to switch to electricity for lighting and electrical appliances. As a result, electricity demand is expected to grow at the fastest rate of 8.1 percent annually. For cooking in the residential sector, LPG is expected to replace coal in urban areas while coal use will be maintained in rural areas as the coal price is lower than that of LPG. Coal and LPG demand is expected to grow annually at 3.7 percent and 7.8 percent respectively, each accounting for 5 percent of total residential energy demand in 2030.

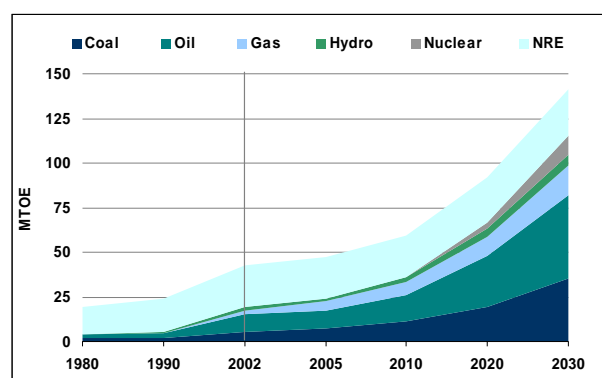
Energy demand in the commercial sector will be mainly driven by the strong growth in GDP, which is projected to grow at 6.1 percent per year. Petroleum products, which will account for 58 percent of total commercial energy demand in 2030, are expected to grow at 5.7 percent per year, supported by the increase in LPG demand for commercial buildings. Electricity is projected to take the second largest share in total commercial energy demand, accounting for 22 percent in 2030. As the demand for cooling and lighting increase, electricity demand will grow at the fastest rate of 8.1 percent annually throughout the outlook period.

With the increasing accessibility to resources, coal demand is expected to grow at 5.3 percent annually, however the share in total commercial energy demand is projected to decline from 22 percent in 2002 to 18 percent in 2030.

### PRIMARY ENERGY DEMAND

Viet Nam's primary energy demand is projected to increase more than three-fold from 42 Mtoe in 2002 to about 142 Mtoe in 2030, increasing annually at 4.4 percent over the outlook period. Commercial energy sources will increase rapidly at 6.7 percent per annum and surpass traditional energy sources (mainly biomass) in 2005, and account for more than 50 percent of the primary energy mix. Consequently, the share of biomass will decrease substantially from 55 percent in 2002 to 18 percent in 2030.

Figure 125 Primary Energy Demand



Source: APERC Analysis (2006)

Among the fossil fuels, oil will continue to account for the largest share in total primary energy demand, mainly utilised in the transportation and industrial sectors. In 2002, Viet Nam was an exporter of crude oil, but a net-importer of oil products. From 2009, the first oil refinery to be built in the economy will be commissioned, which will be supplied by domestic and imported crude oil – reducing the import dependence on oil products. However, as oil reserves decline over the outlook period, Viet Nam's oil import dependence is expected to increase to 57 percent in 2030.

Coal and natural gas demand will be mainly driven by rapid development of the electricity sector and industrial sector, accounting for 25 percent and 12 percent respectively in 2030. Over the outlook period both coal and natural gas supply is expected to be met through indigenous supply.

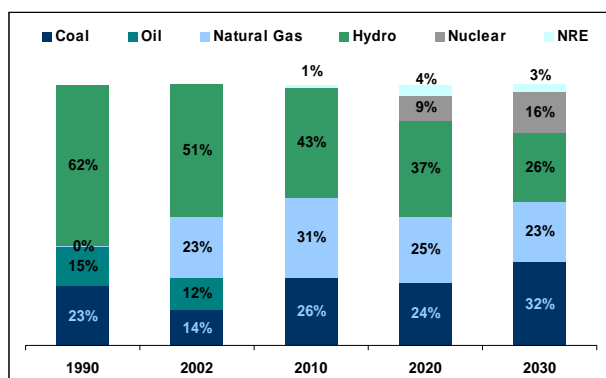
Excluding large-scale hydro, other types of new and renewable energy such as mini-hydro, wind, solar PV, geothermal, and MSW-landfill gas will continue to be promoted, raising the share of renewable energy to 18 percent in 2030. Nuclear power – to be

introduced in 2020 - is expected to account for 8 percent of total primary energy demand in 2030. Electricity import sources will commence from 2010 and account for 0.4 percent of primary energy demand in 2030.

**ELECTRICITY**

Electricity demand is projected to grow by 7.8 percent per year over the outlook period. The elasticity of GDP to electricity will continue to be above 1.0 although at a downward trend, from 1.4 during the period 2002-2010 to 1.1 during 2010-2030.

*Figure 126 Electricity Generation Mix*



Source: APERC Analysis (2006)

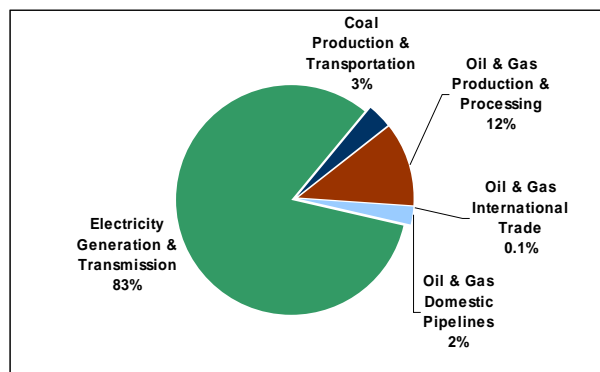
To meet the projected electricity demand, 54 GW of additional generation capacity is expected to be built, which will increase installed capacity to seven-times the 2002 level. Electricity generation will increase at an average growth rate of 7.4 percent per year to reach 266 TWh in 2030. From 2002 to 2030, the share of hydro will decrease considerably from 51 percent to 26 percent, as most possible locations for hydro are fully developed. By contrast, coal-fired electricity generation will gradually increase and take the biggest share at 32 percent in 2030, a two-fold increase over 2002. The share of gas-fired electricity generation is projected to increase in the near-term, however, with the introduction of nuclear power after 2020, the share of natural gas is expected to decrease to 23 percent in 2030. Meanwhile, the share of nuclear will increase from 0 percent in 2002 to 16 percent in 2030. In addition, as the utilisation of domestic resources is pursued, renewables are expected to contribute to electricity generation – especially in remote areas where connection with the national grid is not economically feasible – increasing from 0 percent in 2002 to 3 percent in 2030.

**INVESTMENT REQUIREMENTS**

The total investment requirements for energy infrastructure development over the outlook period

are projected to reach US\$136-172 billion. The majority of these investments will be required in the electricity sector. Oil and gas investments will rank the second in terms of importance.

*Figure 127 Investment Requirements*



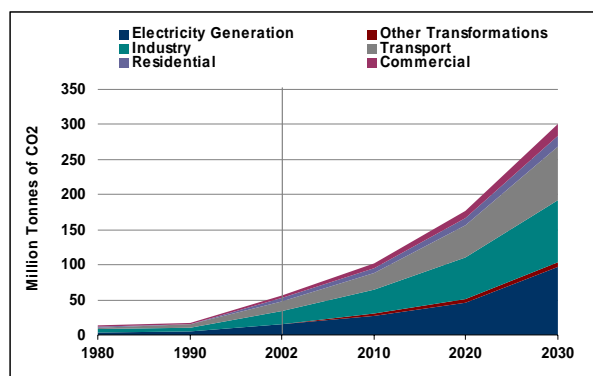
Source: APERC Analysis (2006)

As a percentage of GDP, Viet Nam’s cumulative investment requirements for the energy sector will account for between 4.2 and 5.3 percent during the outlook period, the highest percentage level among the APEC economies.

**CO<sub>2</sub> EMISSIONS**

Viet Nam is currently one of the lowest per capita emitters of CO<sub>2</sub>, at 0.7 tonnes of CO<sub>2</sub> in 2002, or about 12.3 percent of APEC average. But the CO<sub>2</sub> emissions per GDP are high, about 2.2 times the APEC average. CO<sub>2</sub> emissions from the energy sector are projected to grow by 6.2 percent per year over the outlook period, reaching about 301 million tonnes of CO<sub>2</sub> in 2030. Emissions are expected to increase rapidly as Viet Nam industrialises and the economy utilises more carbon intensive fuels, moving away from traditional fuels including biomass.

*Figure 128 CO<sub>2</sub> Emissions by Sector*



Source: APERC Analysis (2006)



## MAJOR ISSUES

### IMPORT DEPENDENCE

Despite government efforts to develop a more comprehensive policy to cover all energy sub-sectors from upstream to downstream, and promote the economic and efficient utilisation of energy, Viet Nam is expected to become a net energy importer beyond 2020 with an import dependence ratio of 8 percent in 2025 and 15 percent in 2030. The import dependence of oil is of particular concern and is projected to increase from an initial net oil exporter in 2002 to a net oil importer of 18 percent in 2020 gradually rising to reach 57 percent in 2030.

Since 2001, the state-owned oil and gas corporation PetroVietnam has started their oil and gas exploration and development overseas, such as in Indonesia, Malaysia, Algeria, Iraq and Mongolia.

### ENERGY EFFICIENCY IMPROVEMENT

Viet Nam has one of the lowest per capita energy consumption among the APEC economies, and has always been ranked one of the highest economies in terms of energy intensity.<sup>119</sup> During the period 1990-2005, the economy's energy intensity has continually increased at an average annual growth rate of 2.4 percent.<sup>120</sup> This can be attributed in part to the difficulties of a transitional economy developing from a low level, but also the weakness of Viet Nam on energy efficiency management.

Over the outlook period, Viet Nam's energy intensity is expected to have a downward trend, decreasing by 1.8 percent per year. That must be a result of Viet Nam's efforts to accelerate reforming comprehensively energy sector toward higher efficiency, better sustainability, especially from early 2000's.

### ENERGY INFRASTRUCTURE DEVELOPMENT

Viet Nam has amended many regulations, laws and codes in recent years to remove impediments to the attraction of domestic and foreign investment and create a fair competitive environment for all business enterprises. However, over the outlook period the investment requirements of the energy sector alone are projected to account for between 4.2 and 5.3 percent of GDP, the highest level in the APEC region. For the other Southeast Asian economies the average investment requirements as

a percentage of GDP is between 1.2 and 1.5 percent.<sup>121</sup> Therefore, mobilisation of sufficient investment for development of the energy sector over the outlook period is expected to remain a challenge for the economy.

### IMPLICATIONS

Population growth combined with the government's determination to maintain a high rate of economic development over the next two decades will translate into increased energy demand. Given the moderate supply potential of indigenous energy resources, future dependence on import sources is inevitable.

Key principles that Viet Nam needs to consider in building policies to attract investment in energy sector are: minimising financial costs, minimising direct financial responsibility of government, and diversifying financial sources. In addition, Viet Nam's regulations, laws and codes could be further amended to establish a more integrated energy-economic viewpoint that enhances the economy's long-term energy security and facilitates investment.

Among measures to strengthen national energy security, the government of Viet Nam continues to focus attention on diversification of supply sources and enhancement of energy efficiency on the demand side. In terms of diversification of supply side, Viet Nam's greater integration within the Greater Mekong Sub-region (GMS) through power grid interconnection projects and the Trans-ASEAN Gas Pipeline should be pursued. In addition, to secure oil supply, enhancing oil exploration and development, both domestically – especially in deep-water (400-1,000 m) concessions – and overseas is important.

Meanwhile, to increase the efficiency of energy use within the economy, a more rational pricing policy whereby producers and investors are able to recover production costs and the cost of imported energy and make a profit should be pursued, such that they are able to reinvest back into the economy to further facilitate infrastructural development. More rational energy pricing would also reduce the burden on the government to subsidise energy prices.

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<sup>119</sup> Fourth place in 2003 with an energy intensity as high as 590 toe per million 1995 US\$ of GDP, APEC-EWG database.

<sup>120</sup> National data, accounting for only commercial energy, excluding biomass

<sup>121</sup> The Southeast Asian economies include Brunei Darussalam, Indonesia, Malaysia, Philippines, Singapore and Thailand.

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