

UNITED STATES

- Primary energy demand is expected to grow at an annual rate of 1.2 percent through 2030.
- To reduce energy import dependency, the US is expected to increase the utilisation of coal growing at 1.4 percent per year – the fastest rate among the fossil fuels. Likewise, nuclear capacity is expected to expand with the addition of 10 GW sometime after 2010
- Voluntary targets to reduce CO₂ intensity by 18 percent in 2012 compared to the 2002 level are unlikely to be met due to the increasing use of coal for electricity generation.

RECENT ENERGY TRENDS AND ENERGY POLICY

Despite rising crude oil price, the US oil consumption has not shown any sign of slowing-down. Between 2002 and 2004, the US oil consumption continued to grow at an average annual rate of 2.2 percent, despite the NYMEX crude oil price posting the highest in history at US\$53 per barrel in October 2004. By product, motor gasoline consumption grew annually at 1.3 percent, at a time when gasoline prices reached US\$3 per gallon – the highest nominal level in history. Because of the sustained economic growth, and low interest rates, consumers in the US seem to have been unperturbed by rising high oil prices and have continued to increase their oil consumption.

The rising natural gas prices on the other hand, have had a greater impact on the economy. Faced with high natural gas prices, that have exceeded US\$7 per MMBTU, the economy reduced natural gas consumption at an average annual rate of 1.5 percent between 2002 and 2004. The burden of high natural gas prices was severely felt in the electricity generation and industry sectors, which together accounted for about 80 percent of the decline in total natural gas consumption in 2004.

As a result of the steady rise in oil consumption and the decline in oil and gas production, energy import dependency has been rising. In 2004, net energy import dependency reached to 29 percent, ten percent higher than a decade ago. Net oil import dependency increased from 49 percent in 1995 to 63 percent in 2004.

Rising energy import dependency and high energy consumption growth, combined with the surge in oil prices prompted the economy to institute measures to address energy security. To ensure affordable and reliable energy supply, the US Congress passed in July 2005 a comprehensive energy bill allocating a total amount of US\$11.5 billion. The bill was signed on 8 August 2005 by President Bush and became effective starting January 2006, termed as the US “Energy Policy Act of 2005”.

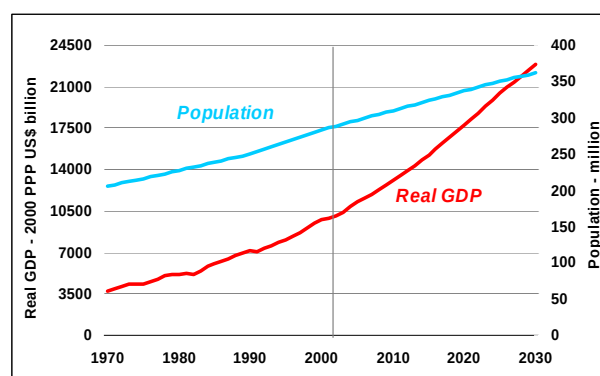
The law includes a number of provisions that are intended to increase domestic energy production, improve energy efficiency, and ultimately reduce energy import dependency over a ten-year time period.

ENERGY DEMAND DRIVERS

The US economy is projected to grow at an annual rate of 3.0 percent through 2030. The projected economic growth is higher in the near-term from 2002 to 2010 at 3.3 percent per year due to productivity improvements associated with ongoing automation of the manufacturing and service sectors. Over the outlook period, the structure of economy is expected to continue shifting towards the service sector from the heavy industry, increasing the share of value added of the service sector from 79 percent in 2002 to 82 percent in 2030.

The US population is expected to continue growing at a moderate pace of 0.8 percent in the next three decades. By 2030, population will reach 361 million from 289 million in 2002. Average fertility rate is near replacement levels of 1.9 children per couple, but immigration will ensure continued population growth for some time. According to the UN projection, immigration will account for about 45 percent of the total population growth over the outlook period.¹⁰⁹

Figure 116 GDP and Population



Source: Global Insights (2005)

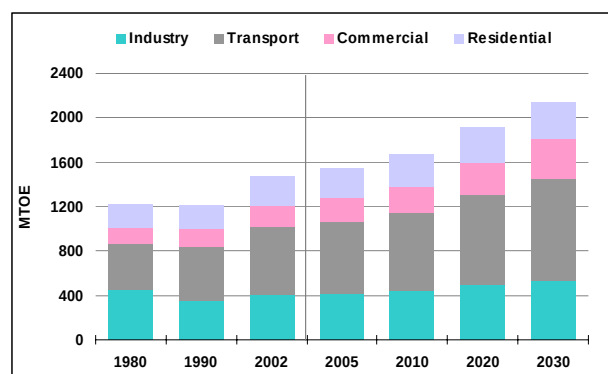
¹⁰⁹ United Nations (2004)

OUTLOOK

FINAL ENERGY DEMAND

Over the outlook period, final energy demand is projected to grow at 1.3 percent per year, a robust growth compared with an annual growth in the previous two decades at 0.9 percent. The transport sector will maintain the largest share at 44 percent, followed by industry sector (25 percent), commercial (16 percent) and residential (15 percent).

Figure 117 Final Energy Demand



Source: APERC Analysis (2006)

Industry

Energy demand in the industrial sector is projected to grow at an average annual rate of 1.0 percent through 2030, slower than that of the past decade at 1.4 percent. Gains in energy efficiency and structural shifts from the energy-intensive to non-energy-intensive industry will lead to the slower projected growth in industrial energy demand growth. Due mainly to the economy's structural shift, energy intensity¹¹⁰ in the industrial sector is expected to decline at an average annual rate of 1.4 percent from 182 toe per US\$ million in 2002 to 123 toe per US\$ million in 2030.

Natural gas, which accounted for 35 percent of industrial energy consumption in 2002, is projected to maintain the largest share through 2030. As a feedstock for bulk chemicals and fuel for manufacturing, natural gas is expected to grow at 0.9 percent per year. But natural gas demand is not expected to surpass its 2000 peak until after 2010 because price of natural gas is maintained at high level compared with history.¹¹¹ Oil products are

projected to take the second largest share at 28 percent in 2030. Demand for LPG as feedstock for petrochemical products is expected to lead the growth in industrial oil demand.¹¹² Coal demand is projected to rise at 1.0 percent per year as production shifts from integrated steel mills to electric arc furnaces, and reduce demand for coking coal. Demand for steam coal is expected to remain relatively constant.¹¹³ Renewable energy would be the fastest growing energy source, at a rate of 1.2 percent per year, but the share to total industrial energy demand will remain small at 8 percent in 2030.

Transport

With a steady economic growth at 3.0 percent per year through 2030, transport energy demand will continue to grow at an annual rate of 1.5 percent. Between 2002 and 2030, the growth of the US transport sector will account for 37 percent of the total incremental growth of transport energy demand in the APEC region; the largest contribution among the 21 member economies. With steady growth, per capita transport energy demand is expected to reach 2.6 toe per person in 2030, which is the highest among the APEC economies, followed by Canada at 1.9 toe per person and Australia at 1.8 toe per person.

Among the transport sub-sectors, the road sub-sector is projected to maintain the largest share at around 85 percent. By fuel type, gasoline, a major fuel for road transport, is projected to grow at 1.3 percent per year through 2030 - a slightly faster rate than previous three decades at 1.1 percent between 1972 and 2002. The faster trend of future gasoline demand growth is attributed to the consumers' preference for large-sized vehicles (or sport utility vehicles-SUVs). SUVs or light trucks as a share of total vehicle stocks, excluding heavy trucks, will increase from 39 percent in 2002 to 44 percent in 2030.¹¹⁴ Diesel will maintain the second largest share in the road transport sub-sector, growing at an annual

¹¹² Over the outlook period, LPG demand in the industrial sector is projected to grow at 1.4 percent per year.

¹¹³ Over the outlook period, demand for coking coal in the industrial sector is projected to decline at 2.9 percent per year, whereas demand for steam coal is projected to grow by 0.3 percent.

¹¹⁴ Light trucks are about thirty percent less efficient than the average passenger vehicles. The US government released a new fuel economy standard for light trucks in March 2006. With new standards, fuel economy of light trucks must average 24.1 miles per gallon (MPG) between 2008 and 2011 - 1.9 MPG higher than the 2007 target. The impact of the tighter standards will be felt in the long-term rather than in the near-term because it takes more than a decade to replace total vehicle stocks. Thus gasoline demand is projected to grow at a faster annual rate of 1.5 percent between 2002 and 2015, compared with that of 1.1 percent between 2015 and 2030.

¹¹⁰ The amount of energy needed to produce a dollar's worth of industrial sector's value added.

¹¹¹ Due to higher natural gas prices, gas-intensive firms, such as fertilizer producers, shutdown factories temporarily or moved production facilities to overseas. According to World Gas Intelligence (2004), about a fifth of fertilizer capacity in the US and Canada has been moved overseas since 2000 due to high prices.

rate of 2.2 percent. The continued economic growth at 3.0 percent per year will result in the increase for freight transport of goods and supplies, therefore substantially increasing the diesel demand.

Residential and Commercial

Energy demand in the residential sector is projected to grow at an annual rate of 0.9 percent between 2002 and 2030, mainly driven by the projected growth in electricity demand. Electricity is projected to take the largest share in total residential energy demand after 2015 and will grow by 1.5 percent annually throughout the outlook period. Natural gas is projected to grow at 0.6 percent per year while the share in total residential energy demand will decline from 43 percent in 2002 to 39 percent in 2030. The higher equipment efficiency and more stringent building codes will slow down the growth in natural gas demand.

Energy demand in the commercial sector is expected to grow at an annual rate of 2.0 percent – the fastest growth rate in all sectors. The fast growth is driven by the rapid increase in electricity demand. As a result of the increase in demand for cooling and lighting in commercial buildings, electricity is expected to grow at 2.3 percent per year. The share of electricity in total commercial energy demand is expected to reach 58 percent in 2030. Natural gas is projected to grow at 2.0 percent annually while the share in total commercial energy demand will slightly decrease from 37 percent in 2002 to 36 percent in 2030.

PRIMARY ENERGY DEMAND

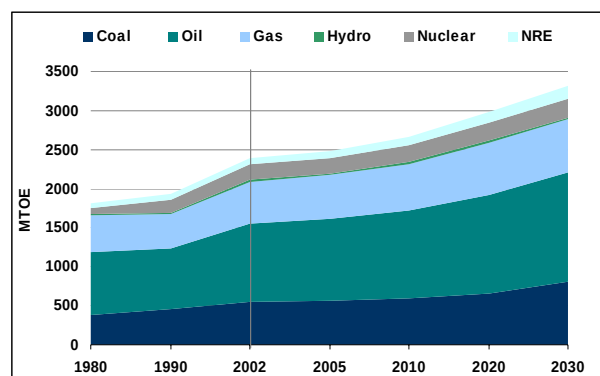
Primary energy demand is projected to grow at an annual rate of 1.2 percent through 2030. Among the fossil fuels, coal is projected to grow at the fastest annual growth rate of 1.4 percent per year, followed by oil at 1.2 percent and natural gas at 0.9 percent.

Coal demand is primarily driven by the electricity sector, which will account for 97 percent of projected incremental growth over the outlook period. The growth rate of coal is faster in the long-term at 1.9 percent per year (2015-2030) than in the near-term at 0.9 percent per year (2002-2015) as technological development will make advanced coal-fired generation system more cost competitive than other types.

The growth in oil demand will be largely attributed to the transport sector accounting for more than 85 percent of the incremental growth. To meet the expected demand growth, the US government has started to encourage drilling activities at domestic wells with provisions for a number of incentives in

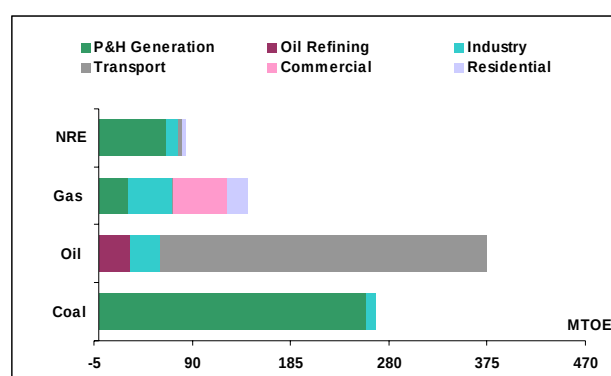
offshore Gulf of Mexico. This will result in an increase in crude oil production from 360 Mtoe in 2002 to 451 Mtoe in 2020, however thereafter crude oil production will decline and reach 430 Mtoe in 2030.

Figure 118 Primary Energy Demand



Source: APERC Analysis (2006)

Figure 119 Sectoral Contributions to the Incremental Growth by Source



Source: APERC Analysis (2006)

Natural gas demand will increase faster in the near-term at 1.5 percent per year (2002-2015), while in longer-term, the growth rate of natural gas is projected to be slower at 0.7 percent per year (2015-2030). After 2015 high natural gas prices, relative to coal will limit the use of natural gas for electricity generation. With the decline in domestic production, import dependency of natural gas will increase from 17 percent in 2002 to 23 percent in 2030. By 2030 natural gas imports from Canada are projected to decline to one-third of the 2002 level. To offset the decline in natural gas imports from Canada, more than 80 percent of total imports in 2030 will be supplied by LNG.

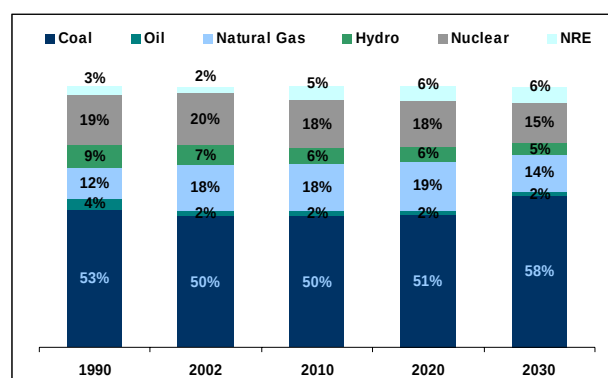
ELECTRICITY

Electricity demand is projected to grow at 1.7 percent per year through 2030. Reflecting the strong economic growth lead by the service sector, electricity demand will grow at a faster rate in the near-term. Between 2002 and 2010, electricity

demand will grow at 2.0 percent per year, but will slow down to 1.4 percent over the rest of the outlook period.

Coal is projected to maintain the dominant share in the economy's total electricity generation mix. The share is expected to increase from 50 percent in 2002 to 58 percent in 2030. The share of natural gas in the electricity generation mix will increase slightly through 2020, but will be replaced by coal thereafter once advanced coal-fired generation, compliant with environmental regulation, becomes cost competitive. The US will increase electricity production from nuclear to ensure security of electricity supply. By 2030, the US is projected to add 10 GW of nuclear generation units in addition to the existing 99 GW. Electricity generation from new and renewable sources is expected to grow fast at an annual growth rate of 5.2 percent, but the share to total electricity generation mix will remain small at around 6 percent.

Figure 120 Electricity Generation Mix

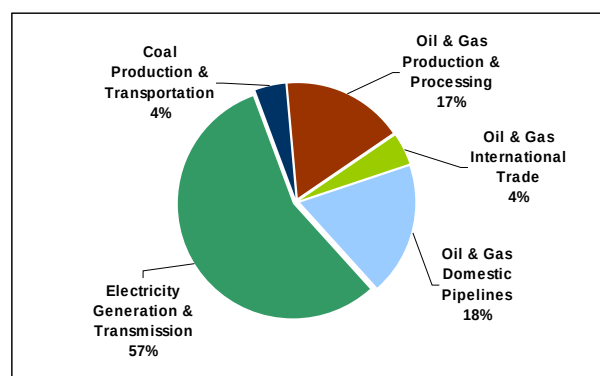


Source: APERC Analysis (2006)

INVESTMENT REQUIREMENTS

The projected energy demand growth will require total investments of between US\$1.3-1.8 trillion over the outlook period. Electricity generation and transmission will account for the largest investment requirements, with a total of between US\$808-982 billion, followed by oil and gas domestic pipeline at US\$224-320 billion and oil and gas production and processing at US\$204-297 billion.

Figure 121 Investment Requirements

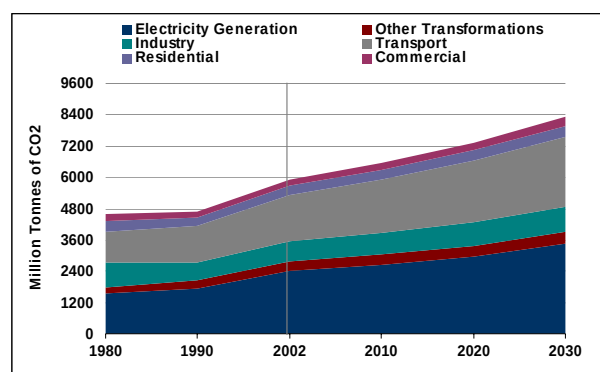


Source: APERC Analysis (2006)

CO₂ EMISSIONS

Despite efforts to limit CO₂ emissions from the energy sector, total emissions will increase from 5,895 million tonnes of CO₂ in 2002 to 8,326 million tonnes of CO₂ in 2030. The electricity sector is expected to account for the largest incremental growth in total CO₂ emissions at 44 percent, followed by the transport sector (39 percent).

Figure 122 CO₂ Emissions by Sector



Source: APERC Analysis (2006)

MAJOR ISSUES

ENHANCEMENT OF ENERGY SECURITY

The US Energy Policy Act of 2005 has included various provisions that offer, among others, incentives to both energy production and conservation. Some of these provisions are: 1) royalty relief for offshore deep-water oil and gas production, 2) loan guarantee to R&D for "innovative technologies" including advanced nuclear reactor, clean coal and renewable technologies, 3) subsidies for farmers to increase production of ethanol from 4 billion gallons to 7 billion gallons, 4) tax credits for the owners of hybrid vehicles, and 5) tax credits for home owners on their installation of energy efficient appliances.

Absent from these provisions however are measures that could have a greater impact on the future course of energy demand and supply in the US. For example, because of the strong opposition from auto manufacturing industry, the law did not include a provision that will tighten the Corporate Average Fuel Economy (CAFE) standards for passenger vehicles.¹¹⁵ The tightening of the standards for passenger vehicles will have an impact on the improvement in vehicle fuel economy in the long-term.

CARBON INTENSITY IMPROVEMENT

Although there are no mandatory requirements for the US to curb CO₂ emissions, because of its non-ratification of the Kyoto Protocol, a voluntary target to reduce CO₂ intensity has been set. In February 2002, the Bush administration announced the “Global Climate Change Initiative” to reduce CO₂ intensity by 18 percent in 2012 compared with the 2002 level. A number of measures were undertaken to improve the CO₂ intensity, mostly through technological innovations.

In addition, the US has engaged in extensive international efforts on climate change through its multilateral and bilateral activities. It offered the biggest funding for activities under the UNFCCC and the IPCC. Along with Australia, China, Japan, India and Korea, the US formed the “Asia Pacific Partnership on Clean Development and Climate” to curb the rising trend of CO₂ emissions from energy consumption.

Despite these efforts however, the target in 2012 seems unlikely to be achieved due to the expected growth in coal demand for electricity generation. It is projected that carbon intensity of the energy sector in the US will decline by about 13 percent in 2012, compared with 2002.

IMPLICATIONS

Despite rising energy prices, the US energy demand is expected to increase steadily to fuel its economic growth and to improve quality of life. Declining domestic energy production however along with continued energy demand growth will lead to an increase in energy import dependency.

The US government has implemented a number of measures to improve energy efficiency, and to increase domestic energy production, while the scope

of those measures is somewhat constrained by various institutional interests. Exclusion of a provision to tighten the CAFE standards for passenger vehicles from the Energy Policy Act of 2005 suggests that the US policy attempts to harmonise the industrial interest and the national interest, that is, energy security. Thus, policy needs to be well formulated to give appropriate incentives for both consumers and suppliers to improve energy efficiency and enhance energy supply security.

Energy security concerns are likely to outweigh climate change issues, at least in the near-term, as crude oil prices are expected to remain relatively high – above US\$50 per barrel. The electricity sector, for example, is expected to increase coal demand because of abundant domestic resources, and cost competitiveness against natural gas. Earlier development of advanced technologies such as coal-fired generation with carbon sequestration technology may be an important option that could resolve the conflicts between enhancement of energy security and mitigation of greenhouse gas emissions.

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¹¹⁵ Although the law did not include a provision to tighten CAFE standards for passenger vehicles, the law requires that the National Highway Traffic Safety Administration study the options to tighten the CAFE standards for the 2014 model year. In addition, the law requires the Environmental Protection Agency to update and improve fuel economy testing methods.