

APEC Energy Demand and Supply Outlook

Asia Pacific Energy Research Centre (APERC)

Executive Summary

- Energy demand in the APEC region is projected to rise by more than 70 percent between 2002 and 2030, at 2.0 percent per annum.
- Increasing demand for oil (1.7 percent per year) is not likely to be met by increased production within APEC (projected to be only 0.7 percent per year), and net oil import dependence is projected to increase from the current level of 36 percent to 52 percent by 2030.
- Coal demand is expected to grow at 2.8 percent per year – the fastest annual growth rate among fossil fuels, due to cost competitiveness and resources availability compared with other fossil fuels.
- LNG is expected to become an important natural gas supply source with total LNG imports to APEC increasing from 101 million tonnes in 2004 to 389 million tonnes in 2030.
- To enhance energy supply security, several APEC economies are expected to expand new nuclear capacity; with total installed capacity of nuclear power in APEC reaching 329 GW in 2030 from 204 GW in 2002.
- Electricity demand is projected to rise at a rate of 3.2 percent per annum, mainly driven by rising income and increasing electrification in developing economies.
- Electricity generation from new and renewable sources is expected to grow at the fast annual growth rate of 6.2 percent, while the share to total electricity generation is expected to remain small at around 4 percent in 2030.
- Robust energy demand growth in the APEC region will translate into substantial investment requirements for new energy infrastructure. Total energy investment requirements of the APEC region during the outlook period are estimated between US\$5.95 and US\$ 7.55 trillion.
- By 2030, emissions from various gases from energy consumption are estimated to almost double from the 2002 levels.
- To enhance energy security, APEC economies would have to improve energy efficiency through creating a more flexible energy supply infrastructure with (1) technological innovation and (2) improvement of resource allocation efficiency with cross border energy cooperation.

Note: The outlook report is posted on the APERC website at www.ieej.or.jp/aperc/.

ENERGY OUTLOOK BY FUEL TYPE

Total primary energy demand (TPED) in the APEC region is expected to grow from 5,939 Mtoe in 2002 to 10,332 Mtoe in 2030, at an annual growth rate of 2.0 percent .

Over the outlook period, **oil** demand is projected to grow at an annual growth rate of 1.7 percent from 2,165 Mtoe in 2002 to 3,488 Mtoe in 2030, and is expected to maintain the largest share of TPED in the APEC region in 2030 at 34 percent. Oil demand for the transport sector will dominate and contribute 68 percent of incremental oil demand growth through 2030. Oil production growth over the outlook period will be lead by Canada (prevailed with non-conventional oil from Alberta's tar sands), accounting for 37 percent of the incremental production in the APEC region, followed by the US at 25 percent and Russia at 21 percent. However, by 2030 some 52 percent of APEC's oil supply will be met by imports predominantly sourced from the Middle East.

Figure 1: Primary energy demand in the APEC region

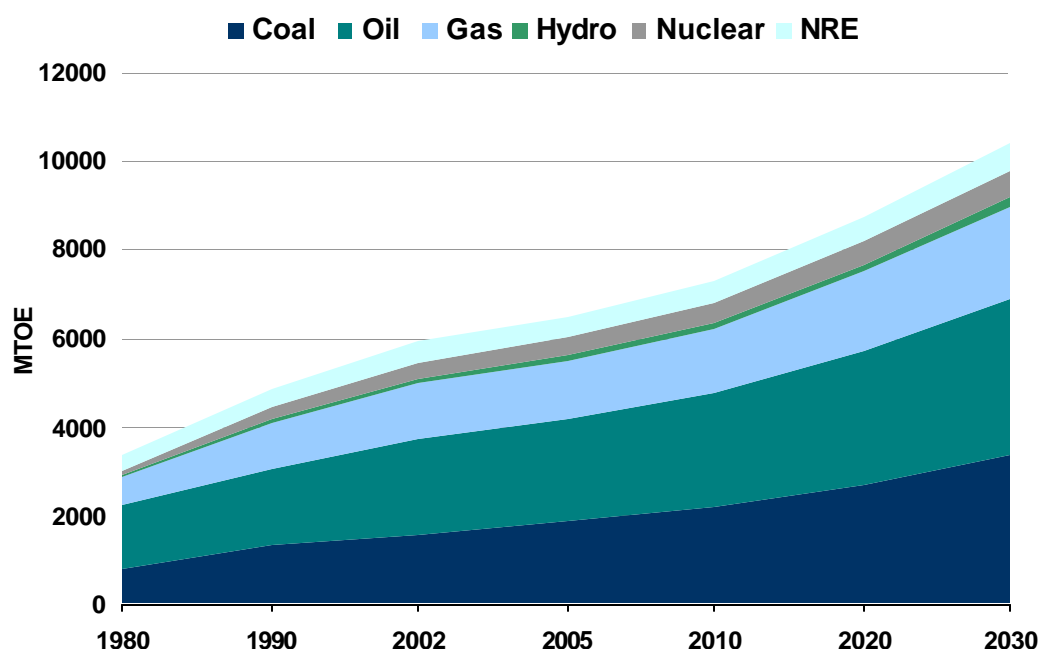


Table 1: Primary energy demand in the APEC region (Unit: Mtoe)

	Mtoe					Growth rate (% per annum)				
	1980	2002	2010	2020	2030	80-02	02-10	10-20	20-30	02-30
Total	3 363.2	5 938.6	7 265.5	8 705.8	10 332.2	2.6	2.6	1.8	1.7	2.0
Coal	822.3 (24%)	1 570.1 (26%)	2 210.6 (30%)	2 715.5 (31%)	3 366.3 (33%)	3.0	4.4	2.1	2.2	2.8
Oil	1 444.6 (43%)	2 164.6 (36%)	2 523.2 (35%)	2 981.7 (34%)	3 487.5 (34%)	1.9	1.9	1.7	1.6	1.7
Gas	595.3 (18%)	1 254.7 (21%)	1 468.6 (20%)	1 782.9 (20%)	2 049.8 (20%)	3.4	2.0	2.0	1.4	1.8
Hydro	65.0 (2%)	113.7 (2%)	131.9 (2%)	159.2 (2%)	196.9 (2%)	2.6	1.9	1.9	2.1	2.0
NRE	331.6 (10%)	460.1 (8%)	489.7 (7%)	526.9 (6%)	588.0 (6%)	1.5	0.8	0.7	1.1	0.9
Nuclear	104.3 (3%)	382.0 (6%)	442.2 (6%)	540.3 (6%)	642.8 (6%)	6.1	1.8	2.0	1.8	1.9

Source: APERC (2006)

Given the cost competitiveness relative to the other fossil fuels, and the relative abundance in the APEC region, **coal** demand is projected to grow at 2.8 percent from 1,570 Mtoe to 3,366 Mtoe, and account for the second largest share of TPED in 2030 at 33 percent. Approximately 87 percent of incremental coal demand is expected to be derived from the electricity sector, with China projected to be the major coal consumer in the APEC region accounting for 54 percent of TPED for coal in 2030. Coal production in the APEC region is concentrated in the six economies with the largest reserves: Australia, Canada, China, Indonesia, Russia and the US. These six economies are expected to account for almost 99 percent of APEC's incremental production over the projected period; however, APEC is expected to become a marginal net coal importer of 2.8 Mtoe in 2030.

Natural gas is projected to account for 20 percent of TPED in 2030. By 2020, natural gas is expected to experience fast growth of 2.0 percent per year, followed by more moderate annual growth of 1.4 percent between 2020 and 2030. Incremental natural gas demand growth will be primarily for the electricity sector at 42 percent, followed by industry and residential/commercial at 28 percent each respectively. Increased demand for natural gas is not likely to be met by increased production within APEC economies. Demand for natural gas is projected to grow at 1.8 percent per year, while the production is projected to grow at 0.7 percent per year through 2030. With slow production growth, APEC as a whole will become a net importer of natural gas by 2015.

The share of **nuclear** in TPED is expected to remain stable at 6 percent by 2030, growing at an annual rate of 1.9 percent from 382 Mtoe in 2002 to 643 Mtoe in 2030. China is expected to exhibit the highest growth over the outlook period rising at 10.5 percent per year. Viet Nam is likely to be the first Southeast Asian economy to utilise nuclear power starting from the second decade of this century.

Hydroelectricity is expected to grow at 2.0 percent per year – the second fastest after coal – although the share will remain small at 2 percent in 2030. China, endowed with the largest hydroelectricity potential will see the fastest annual growth in the APEC region at 4.8 percent, and account for 78 percent of total incremental hydroelectricity growth through 2030.

New and renewable energy (**NRE**) which includes biomass, solar, wind, tidal and wave energy is expected to grow at 0.9 percent per year. The share of NRE is expected to fall from 8 percent in 2002 to 6 percent in 2030 due in part to a shift to commercial fuel sources in rural areas of less-developed regions that rely heavily on biomass for cooking and heating, as socio-economic conditions will improve.

ENERGY SECURITY

Energy security has been one of the most important energy issues facing APEC member economies, and it will be increasingly so in the years to come. The APEC Outlook 2006 indicates that oil import dependency in the APEC region will continue to increase particularly in Asia, where most of the supply may come from the Middle East. In view of the growing demand for fossil fuels, environmental challenges are becoming an indispensable part of broadly defined energy security as well.

Table 2: Increasing Net Oil Import Dependency by Region (2002-2030)

	APEC	Northeast Asia	Southeast Asia	North America	Oceania	China
2002	36%	100%	19%	55%	26%	22%
2005	37%	100%	27%	53%	29%	34%
2010	38%	100%	35%	49%	42%	44%
2015	41%	100%	44%	51%	50%	46%
2020	44%	100%	56%	50%	55%	57%
2025	50%	100%	63%	53%	59%	65%
2030	52%	100%	69%	56%	62%	70%

Source: APERC Analysis (2006)

What options do we have to enhance energy security in the APEC region? How can we secure energy at reasonable prices? Part of the answer lies in greater efficiency of energy use, including vehicles with better fuel economy. And part of the answer lies in a more flexible energy supply infrastructure, which we can bring about through (1) technological innovation and (2) improvement of resource allocation efficiency with cross border energy cooperation.

Technological innovation should focus on enhancing the efficiency of proven power options like combined cycle gas turbines, mini-hydro, nuclear, and clean coal technology. It should also focus on renewable energy sources, non-conventional oil, and LNG. New technologies can help our energy supply systems deal more flexibly with environmental challenges, while reducing oil import dependency.

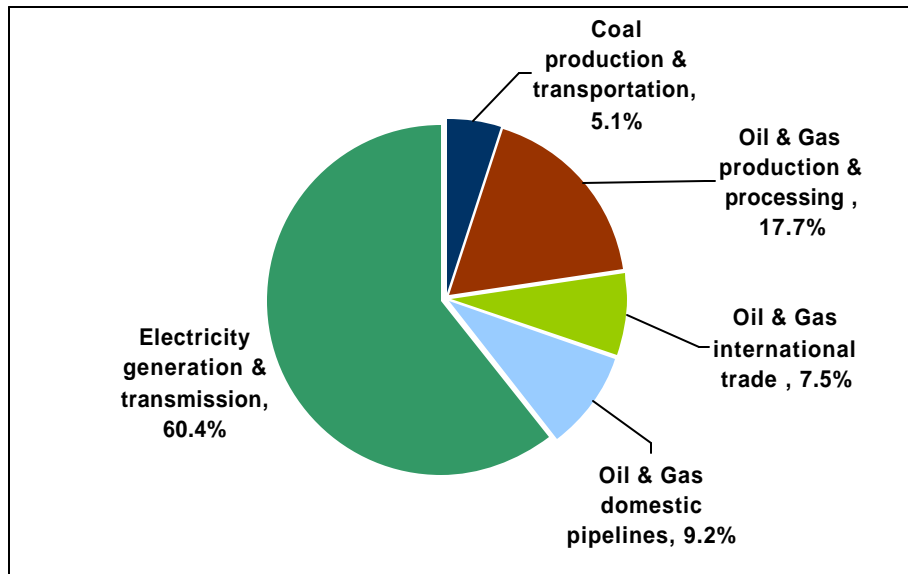
Cross-border cooperation can include power grid interconnections, gas and oil pipelines, and joint oil and gas stockpiling. By linking together economies with different resource endowments and demand patterns, such cooperation will expand our energy choices and reduce overall energy investment requirements. It will also help us respond more flexibly to short-term energy supply disruptions.

ENERGY INVESTMENT REQUIREMENTS

Robust energy demand growth of APEC will mean substantial investment requirements for energy infrastructure from upstream, midstream to downstream. Failure to make timely energy investment to secure energy supply can have serious socio-economic consequences.

To meet the rapid energy demand growth, APEC economies will require between US\$ 5.95 and 7.55 trillion. As Figure 2 shows, electricity generation and transmission are projected to account for about 60.4 percent of the projected total investment requirements through 2030. Oil and gas production and processing are projected to account for about 18 percent of the total projected during the same period. Domestic oil and gas pipelines represent about 9.2 percent of the total. Investment for the international trade of oil and gas, which include the costs of tankers, LNG facilities, and pipelines used for international trade, represent about 7.5 percent of the total. Coal production and transportation has the smallest share at 5.1 percent of the total investment requirements.

Figure 2 Total Investment Requirements by Infrastructure Category, Percent (Cumulative 2002-2030)

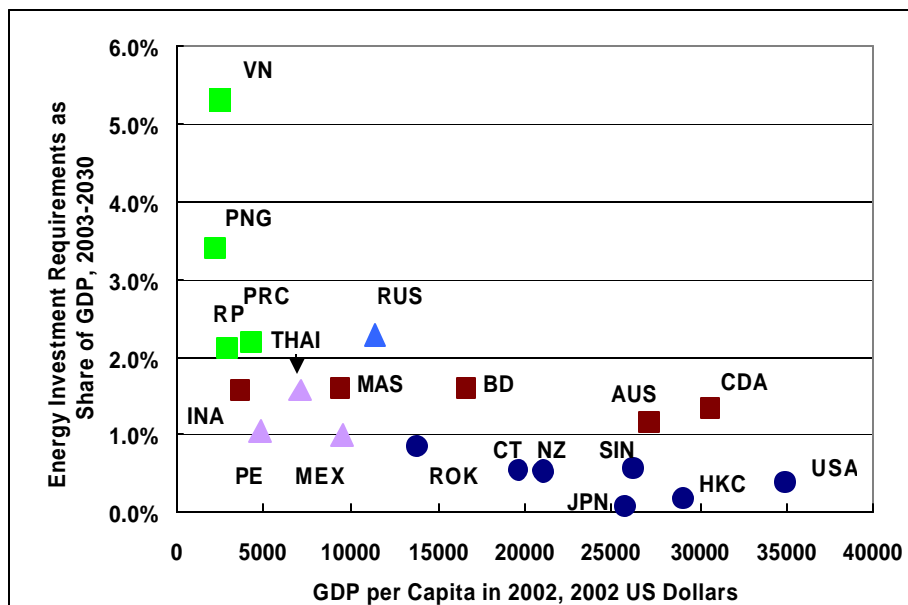


Source: APERC (2006)

The burden of energy investment is often greatest for developing economies. Figure 3 compares the share of gross domestic product that is taken up by projected 30-year total energy investment requirements in each APEC economy. It shows that investment requirements as a share of economic output decline as output per capita increases.

The most developed economies with highest GDP per capita, have low investment requirements relative to their size. But developing economies often have high investment requirements as a share of GDP.

Figure 3 Energy Investment Burdens and Development in APEC Economies



Source: APERC (2006)

Financing energy investment will be challenging for developing economies, not only because their investment requirements are large relative to GDP, but also because financial markets in developing economies are generally at an early stage of development.

Many developing APEC economies have high savings rate, representing 20 to 30 percent of GDP. Several also have large underdeveloped energy resources that can be leased or used as collateral. So if they work to develop their capital markets, especially corporate bond markets, they should be able to better attract the domestic and foreign capita they need to develop their energy sectors.

For developed economies of APEC, the challenge is more regulatory than strictly financial. As many energy markets are becoming more competitive the returns on investments are becoming less certain. In addition, environmental and land use regulations often make it difficult and time consuming to site and build needed facilities, making it harder to secure financing for their construction.