

# Executive Summary

## Primary Energy Demand by Source

- The regional members' overall economy is expected to recover from the current global economic slowdown sometime in 2010. Long-term prospects for economic growth of the regional members differ by member, while on average Asia and the Pacific will grow at a faster rate than the rest of the world.
- The projected rapid 3.5% average annual growth rate of gross domestic product (GDP) of Asia and the Pacific through 2030 may translate into a relatively faster growth of energy demand within the region at 2.4% per year between 2005 and 2030 than the world average of 1.5%<sup>1</sup> during the same time period.
- The projected energy demand growth represents a slower trend compared with the historical average annual growth rate of 3.5% between 1990 and 2005. The main underlying factors behind this slowdown in energy demand growth include a slower economic growth rate and the overall efforts toward energy efficiency improvement.
- Coal will maintain the highest share of total primary energy demand (TPED), at 38.3% in 2030. Despite maintaining the biggest share, coal demand is projected to grow at a slower rate of 2.1% per year through 2030, compared with the growth trend in primary energy demand of 2.4% per year. Energy efficiency improvement efforts in power generation and industry—in addition to the change in industry structure—are the factors behind this trend.
- Oil will maintain the second biggest share in TPED, at 27.0% in 2030. Driven by the motorization and road transport infrastructure development, oil demand is projected to grow at 2.2% per year through 2030.
- Natural gas is projected to register an annual growth rate of 3.6% through 2030—the fastest growth rate in fossil fuels. Despite the rapid growth, natural gas' share of TPED is projected to represent a smaller share—at 14.5% in 2030—compared with coal and oil.
- New and renewable energy (NRE) will represent the fourth-largest share of TPED, at 11.2% in 2030. In Asia and the Pacific, biomass will account for bulk of the NRE share. In view of the replacement of biomass with commercial energy sources, NRE is projected to increase slowly, at an annual rate of 1.3%.
- Nuclear energy demand is projected to increase at 5.1% per year through 2030—the fastest annual growth rate by energy type. This rapid growth in nuclear energy results from the expected expansion of nuclear installed capacity in the People's Republic of China (PRC).
- Hydro demand will increase at a relatively fast pace of 3.0% per year through 2030.

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<sup>1</sup> Energy Information Administration (EIA). 2009. *International Energy Outlook*. Washington, DC.

## Energy Production and Imports

- An increasing proportion of the rapidly growing energy demand in Asia and the Pacific will be met by imports. Net imports (imports minus exports) of fossil fuels in Asia and the Pacific are expected to more than double, from 584.9 million tons of oil equivalent (MTOE) in 2005 to 1,385.1 MTOE in 2030.
- Net imports of oil (including crude oil and petroleum products) are projected to increase substantially, from 655.1 MTOE in 2005 to 1,294.3 MTOE in 2030. The anticipated substantial growth in oil demand by the PRC and India—combined with the slow growth in domestic oil production—will lead to the need for oil imports in their respective subregions.
- A wide disparity is observed in the balance between projected energy demand and production. Central and West Asia may continue to be a net energy exporter, and is expected to export about 231.9 MTOE of fossil fuels in 2030, compared with 111.7 MTOE in 2005. The increase in oil and gas production from Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan explains the rising export position of this subregion.
- By contrast, East Asia's net imports are projected to nearly triple, from 348.9 MTOE in 2005 to 970.3 MTOE in 2030. In fact, the projected growth rate of energy imports into East Asia—at an annual rate of 4.2%—registers a faster pace than that of the total energy demand growth of 2.5%.
- The Pacific subregion will turn into a net importer of oil by 2030, while this subregion is expected to become a net natural gas exporter—reflecting the projected increase in natural gas exports from Papua New Guinea and Timor-Leste.
- Net energy imports of South Asia are expected to more than triple from 132.6 MTOE in 2005 to 447.6 MTOE in 2030, growing at an annual rate of 5.0%. India's expected increase in oil and gas demand will increasingly be met by imports.
- Southeast Asia is expected to become a net energy importer of 125.4 MTOE in 2030—changing from its net energy exporter position of 79.5 MTOE in 2005. The major natural gas-producing members, such as Brunei Darussalam, Indonesia, and Malaysia, are projected to continue to maintain their net export positions in natural gas. However, the growing natural gas imports of Singapore and Thailand, in addition to Southeast Asia's growing oil import dependency (as a result of the decline in production of the current major producers such as Indonesia, Malaysia, Thailand, and Viet Nam) will transform this subregion into a net energy importer.
- Net imports of fossil fuels by the Developed Group are projected to decline from 294.6 MTOE in 2005 to 73.7 MTOE in 2030. Australia's production increases for coal and natural gas—as well as their exports—explain the overall decline in the net imports of the developed region.

## Electricity

- Electricity demand in Asia and the Pacific will grow annually at 3.4% on average, reaching 11,593 terawatt-hours (TWh) in 2030, slower than the historical rate of 5.7% between 1990 and 2005.
- Almost three quarters of the total electricity generation in Asia and the Pacific may come from the following three members: the PRC (45.5%), India (17.2%), and Japan (9.4%).
- Coal-fired generation will account for the highest share of total generation, at 52.0% in 2030 compared with 56.5% in 2005.

## Carbon Dioxide (CO<sub>2</sub>) Emissions

- CO<sub>2</sub> emissions in Asia and the Pacific are forecast to increase from 10,064.8 million tons of CO<sub>2</sub> (Mt CO<sub>2</sub>) in 2005 to 17,763.3 Mt CO<sub>2</sub> in 2030, growing at 2.3% per year. The projected growth rate of CO<sub>2</sub> emissions represents a slightly slower growth rate than the projected energy demand growth of 2.4% per year.
- The transport sector's CO<sub>2</sub> emissions will increase at the fastest annual growth rate, 2.8% through 2030. With this growth, the transport sector's share of total CO<sub>2</sub> emissions will increase from 12.5% in 2005 to 13.7% in 2030. This is followed by the power sector, where CO<sub>2</sub> emissions are expected to increase at an annual rate of 2.6% through 2030. The industry sector's CO<sub>2</sub> emissions will grow relatively slowly at an annual rate of 1.5% through 2030.
- By subregion, East Asia's CO<sub>2</sub> emissions will represent the highest level in 2030 at 10,226 Mt CO<sub>2</sub>, followed by South Asia (2,843 Mt CO<sub>2</sub>), Southeast Asia (2,079 Mt CO<sub>2</sub>), the Developed Group (1,704 Mt CO<sub>2</sub>), and Central and West Asia (891 Mt CO<sub>2</sub>). The Pacific region will represent the lowest level at 22 Mt CO<sub>2</sub>.
- CO<sub>2</sub> emissions intensities of East Asia and the Developed Group in 2030 are expected to decrease from the 2005 level, due mainly to the increased use of nuclear and NRE.
- South Asia's and Southeast Asia's CO<sub>2</sub> emissions intensities are projected to increase as a result of the expected increase in coal demand—mainly for power generation.
- A wide gap is observed among the subregions in terms of projected per capita CO<sub>2</sub> emissions. Due to the diversity in economic development, industry structure, and living standards, the per capita CO<sub>2</sub> emissions in 2030 range widely, from the Pacific region's lowest at 1.54 tons of CO<sub>2</sub> to the Developed Group's 11.48.

## Investment Outlook

- Asia and the Pacific will require a cumulative total of between \$7.0 trillion (constant 2006 prices) and \$9.7 trillion of investment in the energy sector over the outlook period.
- More than 60% of the total investment in the energy sector will need to be dedicated to electricity generation, transmission, and distribution.
- The higher-income members will require less energy investment as a share of GDP, while the lower-income members will require higher energy investment as a share of GDP. Aside from the economic development level, other factors such as industry structure and resource availability will determine the necessary size of energy investment relative to the size of GDP.
- In view of the long-term energy demand growth and the necessity to create infrastructure to deliver energy sources, long-term planning of infrastructure development as well as coherent energy policy making are essential in the developing members of Asia and the Pacific. This would provide the basis for increasing investors' confidence in energy infrastructure development.
- Cooperation among the regional members is likewise important to achieve optimal resource allocation through energy trade by subregion. International cooperation in areas such as electricity trade may reduce overall investment requirements and contribute to enhanced energy supply security.

## Central and West Asia

- Central and West Asia's energy demand is projected to increase from 222.9 MTOE in 2005 to 416.9 MTOE in 2030, growing at an annual rate of 2.5% through 2030.
- Diverse economic development levels, industry structure, and climate conditions in Central and West Asia result in wide variations in per capita energy demand, ranging from Afghanistan's 0.12 TOE in 2030 to Kazakhstan's 5.19 TOE.
- Central and West Asia will maintain its position as a net exporter of energy over the outlook period, exporting about 231.9 MTOE of energy in 2030 compared with 111.7 MTOE in 2005.

## East Asia

- East Asia's primary energy demand will increase from 2,058.8 MTOE in 2005 to 3,776.6 MTOE in 2030, at an annual growth rate of 2.5%. East Asia may dominate the total energy demand in Asia and the Pacific in 2030, at 53.3% of the total.
- The bulk of the energy share in East Asia will be taken up by the PRC, which is projected to account for 86.9% in 2030, vs. 83.5% in 2005.
- East Asia's net energy import dependency will increase substantially over the outlook period, which is particularly true for oil, where import dependency will increase from 61.5% in 2005 to 78.1% in 2030.

## The Pacific

- Energy demand in the Pacific is projected to triple from 3.0 MTOE in 2005 to 9.0 MTOE in 2030, growing at an annual rate of 4.5%.
- Papua New Guinea will account for more than 70.1% of the subregion's TPED in 2030, increasing from 54.0% in 2005.
- Papua New Guinea and Timor-Leste are expected to expand natural gas production for export purposes, while the subregion will have to rely on imports for meeting its oil needs.

## South Asia

- South Asia's primary energy demand will increase from 582.1 MTOE in 2005 to 1,264.3 MTOE in 2030, with an average annual growth rate of 3.2%.
- India will continue to account for the bulk of the energy share in South Asia, at 92.7% in 2030, nearly unchanged from 92.4% in 2005.
- South Asia's growing energy demand will have to be met by imports. Oil import dependency, in particular, is expected to increase substantially, from 73.0% in 2005 to 90.9% in 2030.

## Southeast Asia

- Growing at an annual rate of 2.8%, Southeast Asia's primary energy demand will increase from 492.1 MTOE in 2005 to 988.2 MTOE in 2030.
- Oil will account for the largest share at 38.7% of primary energy demand in 2030. More than half of incremental oil demand growth will come from the transport sector.
- Net oil import dependency of this subregion will increase from 29.6% in 2005 to 71.9% in 2030, as production from Indonesia, Malaysia, and Viet Nam may grow slowly compared with the pace of demand growth.

## Energy Access

- Access to modern forms of energy is a necessary condition for economic development and a high standard of living. In Asia and the Pacific, about 930 million people did not yet have access to electricity in 2005.
- Due to financial constraints of utilities caused by low tariff levels and nonpayment problems, energy infrastructure necessary to meet demand growth is not well-developed in some developing regional members.
- More than 60% of the total energy sector investment in Asia and the Pacific needs to be dedicated to electricity, as electricity demand is expected to grow at 3.4% annually through 2030.
- Assuring financial viability is necessary to pursue both on-grid and off-grid power generation technologies. Electricity sector reform may be necessary to increase tariff levels to improve the financial status of utilities.
- Conditions conducive to foreign investment need to be provided in the power sector, including preferential treatment such as tax exemptions and guaranteed rates of return, at least for the project start-up.
- It may not be easy to raise tariffs due to social considerations. Financial assistance—including bilateral or multilateral cooperation with other countries and/or assistance from development banks—may also help the efforts toward energy infrastructure improvement and development.

## Energy Security

- Oil import dependency within the region is expected to increase substantially, from 57.5% in 2005 to 66.4% in 2030. Combined with the expected rise in the price of oil, oil import dependency is likely to increasingly affect the economies of regional members.
- Since a stable energy supply is an integral part of economic development, various short- and long-term measures may be necessary. Given the diversity in energy resource endowments, economic development levels, and energy demand structures within Asia and the Pacific, intra-regional energy trade, investment, and technology transfer would be effective methods for improving energy security.
- Efforts are needed to create a foundation that promotes regional energy cooperation for the benefit of regional and global economic development and mutual prosperity.

## Energy Efficiency

- Efficient use of energy to meet required demand is one of the key options for enhancing energy security and sustainable development. Introducing advanced technologies, both supply-side and demand-side, is likely to help slow the overall growth in energy demand. Operational efficiency improvements—such as in production processes and freight transport—may result in reduced energy requirements for producing given output levels and meeting product distribution needs.
- Although progress has been made in energy conservation and energy efficiency improvements in the PRC, India, and the Southeast Asian members, obstacles still exist.
- One major barrier is low domestic energy prices. In some developing members, prices for electricity, natural gas, gasoline, liquefied petroleum gas, and other energy products are maintained at low levels to ensure supply for low-income consumers. As a result, there is little incentive to improve energy efficiency.
- Due to financial constraints, developing members have had rather slow progress in applying advanced energy-efficient technologies.
- To implement effective measures for energy efficiency improvements, the most important elements may be the application of these advanced technologies and the transfer of knowledge for improving operational efficiency. Perhaps the establishment of a framework for cooperation among the regional members in Asia and the Pacific may offer an important platform to facilitate transfer of technology and knowledge.

## Urbanization and Energy Demand

- Urbanization in selected Asian members will lead to robust growth in energy demand. Energy demand for urban transport is expected to grow robustly in particular, due to rising vehicle stocks and the difficulty in shifting urban lifestyles away from vehicle dependence.
- Challenges posed by rising urban transport energy demand need to be overcome by bringing together the efforts of local and central government. Coordination of different policy goals, including those for energy, transport, urban planning, and construction, are essential to minimize the impacts on energy security and the environment.
- Transport infrastructure has a key role in integrating city centers with residential suburbs. Offering mass transit in sprawling suburban areas is an important option that can shift people away from passenger vehicle dependence and curtail energy demand growth.