

## Southeast Asia Energy Outlook 2017

EXECUTIVE SUMMARY

World Energy Outlook Special Report

International Energy Agency Secure Sustainable Together

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#### EXECUTIVE SUMMARY

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#### **INTERNATIONAL ENERGY AGENCY**

The International Energy Agency (IEA), an autonomous agency, was established in November 1974. Its primary mandate was – and is – two-fold: to promote energy security amongst its member countries through collective response to physical disruptions in oil supply, and provide authoritative research and analysis on ways to ensure reliable, affordable and clean energy for its 29 member countries and beyond. The IEA carries out a comprehensive programme of energy co-operation among its member countries, each of which is obliged to hold oil stocks equivalent to 90 days of its net imports. The Agency's aims include the following objectives:

Secure member countries' access to reliable and ample supplies of all forms of energy; in particular, through maintaining effective emergency response capabilities in case of oil supply disruptions.

- Promote sustainable energy policies that spur economic growth and environmental protection in a global context - particularly in terms of reducing greenhouse-gas emissions that contribute to climate change.
  - Improve transparency of international markets through collection and analysis of energy data.
    - Support global collaboration on energy technology to secure future energy supplies and mitigate their environmental impact, including through improved energy efficiency and development and deployment of low-carbon technologies.
      - Find solutions to global energy challenges through engagement and dialogue with non-member countries, industry, international organisations and other stakeholders.

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The European Commission also participates in the work of the IEA.

The ten countries of the Association of Southeast Asian Nations (ASEAN) represent one of the most dynamic parts of the global energy system, with their energy demand growing by 60% in the past 15 years. ASEAN countries are at various stages of economic development and have different energy resource endowments and consumption patterns. But they also share a common challenge to meet rising demand in a secure, affordable and sustainable manner. Ensuring sufficient investment in energy supply and energy efficiency is central to this task. These countries have made major efforts in recent years to upgrade policy frameworks, reform fossil-fuel consumption subsidies, increase regional co-operation and encourage greater investment in the region's considerable renewable energy potential.

While there are many encouraging signs, much more remains to be done. Access to modern energy is incomplete. With a total population of nearly 640 million, an estimated 65 million people remain without electricity and 250 million are reliant on solid biomass as a cooking fuel. Investment in upstream oil and gas has been hit by lower prices since 2014 and the region faces a dwindling position as a gas exporter, and a rising dependency on imported oil. At the same time, energy-related air pollution, both indoor and outdoor, also presents major risks to public health, while rising carbon-dioxide (CO<sub>2</sub>) emissions are contrary to the objectives of the Paris Climate Change Agreement, which has been ratified by all the countries in the region. Our analysis in this *World Energy Outlook (WEO) Special Report* confirms that Southeast Asian countries are looking towards a future in which energy demand is set to grow strongly. Our aim in this analysis is to provide a framework for understanding the region's energy choices, examining the pitfalls and opportunities that lie ahead and what different pathways might imply for future energy security, the environment and economic development.

#### A new heavyweight in global energy

In our main scenario, Southeast Asia's energy demand grows by almost two-thirds in the period to 2040. This represents one-tenth of the rise in global demand, as the region's economy triples in size, the total population grows by a fifth with the urban population alone growing by over 150 million people. This scenario reflects the impact of existing energy policies in Southeast Asia as well as an assessment of the results likely to stem from the implementation of announced policy intentions, such as the country pledges made as part of the Paris Agreement. There is strong growth in low-carbon energy, but increased energy needs lead to rising consumption of all fuels. Coal alone accounts for almost 40% of the growth, and overtakes gas in the electricity mix. Oil demand expands from 4.7 million barrels per day (mb/d) today to around 6.6 mb/d in 2040, as rising demand for mobility means the number of road vehicles increases by two-thirds to around 62 million. Demand for natural gas also grows strongly, by around 60% to 2040, due to rising consumption in power generation and industry. The share of renewables, excluding solid biomass but

including hydro, solar photovoltaic (PV) and wind power, almost doubles as their deployment helps to meet rising electricity demand and to extend energy access.

Electricity accounts for the largest share of the increase in final consumption, as rising incomes in the region translate into higher ownership of appliances and increasing demand for cooling. Two-thirds of the increase in Southeast Asia's electricity demand comes from the residential and services sectors, largely due to a rising urban middle class. Industrial electricity demand more than doubles, pushed higher by the lighter industrial branches that are a mainstay of the region's economic activity. One area where electrification makes less progress is the transport sector. In the absence, for the moment, of supportive policies, electric mobility does not gain much of a foothold in our projections. Instead, energy use in the transport sector remains dominated by oil products, with policy efforts to diversify the mix focusing on biofuels. Biofuels can bring energy security and environmental benefits, although that would require that palm oil production is managed sustainably, an important policy issue for the main producers, Indonesia and Malaysia.

Meeting increasing electricity demand requires a huge expansion in the region's power system, with coal and renewables accounting for almost 70% of new capacity. Installed power generation capacity rises to more than 565 gigawatts (GW) in 2040 in our main scenario, from 240 GW today. The mix of fuels and technologies varies country-by-country, but overall reflects an emerging preference for a combination of high efficiency coal plants and increased deployment of renewables. By 2040, renewables account for the largest share of installed capacity (nearly 40%), but coal takes the most prominent role in the generation mix (40%) and 70% of the new coal-fired capacity uses high efficiency supercritical or ultra-supercritical technologies. Output from natural gas-fired plants rises by 60% in absolute terms, but the share of gas in the power mix falls back from the current 43% to 28% by 2040. The large penetration of renewables and wider deployment of more efficient coal-fired plants results in the carbon intensity of power sector declining by almost one-fifth, but it remains significantly higher than the world average.

#### The route to universal access

Extending connections to those without access to electricity is a top priority for policymakers in Southeast Asia. The large number of people living in island communities and remote areas makes the challenge more difficult. Countries across the region have made great strides in addressing the issue, with the electrification rate rising by 28 percentage points since 2000, and is now at 90%. The declining cost of renewables is opening new opportunities to achieve access and reduce reliance on costly diesel generators in isolated areas. But achieving universal access across a very diverse region requires careful consideration of the specific situation of different communities. This *WEO Special Report* includes a detailed geo-spatial analysis that considers population density and resource availability to determine the least-cost connection type and fuel technology for the four countries – Indonesia, Philippines, Myanmar and Cambodia – where 95% of those without electricity are concentrated. In our main scenario, all countries in Southeast Asia achieve universal access by the early-2030s, using a wide range of fuels and technologies, as well as both centralised and decentralised solutions. Varying resource distribution, distance from existing demand centres and population density means that there is no one-size-fits-all approach. In Indonesia, nearly 40% of those who gain access do so through extension of the existing grids, with mini-grid and off-grid approaches playing a prominent role in areas of the country, including Papua, which are more sparsely populated. The Philippines, which fulfils its goal of universal access well before 2030, relies more heavily on grid connections that account for around 90% of new connections, while renewables-based mini-grid and off-grid also play a role, providing access to around 1.6 million people. In Cambodia, grid connections are the least-cost solution for all but 3% of the 7.6 million new connections on the path to full electrification. Myanmar has ample scope to rely on renewables in its electrification strategy. Solar PV provides the least-cost connection to around 11.8 million people, around half of new connections by 2030.

#### A reversal of fortune for net energy trade

Southeast Asia remains an important producer of oil, gas and coal, but faces several challenges, especially in the near term. The oil supply outlook in our main scenario continues the recent trajectory of decline, falling from 2.5 mb/d today to 1.7 mb/d in 2040; offsetting production declines from mature fields becomes all the more difficult in the current period of lower prices and investment. A slight rise in production in Brunei Darussalam and the Philippines is not enough to offset declines in Indonesia, Malaysia and Viet Nam. Natural gas fares better, with the region as a whole successfully keeping production at around the same level as today in the period to 2040. The production outlook would be brighter still if investment in Indonesia's East Natuna field were secured, though this is contingent on finding a suitable solution for the very high levels of CO<sub>2</sub> associated with the field's production. Coal production, centred in Indonesia, falls marginally, although this reflects policy choices rather than resource constraints.

Decreasing domestic supply and increasing demand pushes Southeast Asia's annual net import bill to over \$300 billion in 2040, equivalent to around 4% of the region's total gross domestic product. Oil is by far the largest tranche of projected imports; net imports of 6.9 mb/d in 2040 require \$280 billion in annual outlays by 2040. While the region as a whole becomes a net importer of coal, Indonesia remains an important producer as well as an exporter to its Southeast Asian neighbours and India. Southeast Asia plays an increasingly prominent role as a market for liquefied natural gas (LNG), benefiting in the near term from prices depressed by the strong global supply outlook. The use of LNG extends to smaller scale projects in Indonesia and the Philippines, and plays an important role in displacing diesel-based generation in some island communities. Apart from the mounting import bill, the region's increasing dependence on imported energy raises significant energy security concerns.

#### The road ahead for Southeast Asia is not set in stone

The projections in our main scenario show that Southeast Asia is on track to achieve some key energy policy goals, including the difficult task of bringing universal electricity access and greater diversification of the energy mix. Yet they also highlight major potential risks. Despite the respite afforded by lower prices on oil import bills, energy security remains high on the agenda as the impact of lower upstream spending works its way into regional supply, while imports continue to grow. Concerns about air pollution in several of the region's largest cities amplify as urban populations and demand for mobility increase. Strong growth in fossil-fuel consumption leads to a 75% increase in energy-related CO<sub>2</sub> emissions.

Policy choices can help mitigate these risks, and our new Sustainable Development Scenario describes an alternative pathway for the region that meets global sustainable development goals as well as putting the world on a trajectory consistent with the objectives of the Paris Agreement. In this new scenario, Southeast Asia's energy demand is 16% lower in 2040 than in the central scenario, helped by a broader adoption of more stringent efficiency standards. The reduced demand and increased use of renewables (around 20 percentage points higher as a share of primary energy demand versus our main scenario) helps reduce reliance on imported oil and gas, and by 2040, the import bill is lower by almost \$180 billion. The transition in the Sustainable Development Scenario has profound impacts on greenhouse-gas and air pollutant emissions, with energy-related CO<sub>2</sub> emissions 50% lower than in our main scenario.

Rising energy needs and changing supply-demand dynamics are creating tough challenges for Southeast Asia's policy-makers, but the energy transition is also opening up new affordable policy and technology options. Energy-efficient and low-carbon technologies offer a way to pursue multiple objectives of energy security, affordability and environmental goals. The rapidly declining cost of wind and solar PV provides an opportunity to help meet growing electricity demand in a cost-effective and sustainable manner, while also helping spur local manufacturing industries. Malaysia is already the world's third-largest producer of photovoltaic cells, while investment in Thailand's solar manufacturing industry is increasing PV output for global markets.

#### Our scenarios highlight three avenues that require particular attention from policymakers: investment, efficiency and regional co-operation and integration:

Adequate energy investment: Southeast Asia's cumulative energy investment requirement (in energy supply and efficiency) to 2040 is estimated at \$2.7 trillion in our main scenario. It is slightly higher in the Sustainable Development Scenario at \$2.9 trillion, although greater attention to energy efficiency in this scenario reduces the call for new supply infrastructure. In either case, mobilising investment on this scale will require significant participation from the private sector and international financial institutions. Attracting investment will be contingent on the incentives available to investors, which may be dampened by the presence of electricity price

controls or fossil-fuel consumption subsidies, or terms that are unfavourable compared with other investment opportunities worldwide. There is also a strategic choice to be made regarding the direction of investment flows. Realising the Sustainable Development Scenario requires a major shift towards low-carbon options and efficiency, with the savings in energy consumption and the lower fossil-fuel import bill more than offsetting the increased investment.

- More efficient energy use: Efficiency policies in place or under consideration today can curtail energy demand in end-use sectors in Southeast Asia by 10% by 2040, but this far from exhausts the potential gains. For instance, the limited adoption of fuel-economy standards for passenger vehicles means that average fuel economy in the region is projected to be 20% worse than the global average in 2040 in our main scenario. With growing economies and expanded road infrastructure, freight activity more than doubles by 2040 and fuel consumption by trucks (less than 15% of road transport fuel use today) accounts for around 40% of transport energy demand growth to 2040. Rising electricity demand means that reform of electricity subsidies, which are prevalent in some countries in Southeast Asia, becomes imperative in order to prevent wasteful consumption, incentivise investments in efficiency and avoid a drain on fiscal resources. National budgets would face a cumulative electricity subsidy bill of more than \$350 billion over the period to 2040 if they fail to achieve the subsidy reforms anticipated in our main scenario.
- More integrated gas and electricity markets: Better interconnection of natural gas supply networks, underpinned by harmonised regulation towards flexible and transparent markets, can enhance gas security in the region. In the power sector, realising the long-planned regional grid would make large-scale renewables-based projects more viable. It would also provide benefits to the power system as a whole, aiding the integration of rising shares of wind and solar power.

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### Southeast Asia Energy Outlook 2017

The ten Association of Southeast Asian Nations (ASEAN) countries are among the most dynamic parts of the global energy system and a rising force in international energy affairs. Thanks to its growing partnership with Southeast Asia, the International Energy Agency (IEA) has conducted regular in-depth studies of the energy challenges facing this region. This new report, which was prepared as part of the IEA's flagship *World Energy Outlook* series, provides insights for policy makers, industry and other energy stakeholders to help address the energy sector challenges facing Southeast Asia today.

The report highlights:

- The state of play across the Southeast Asia's energy sector, based on the latest data and announcements.
- How today's policies shape this region's energy demand and supply outlook to 2040, and the implications for energy security, the environment and development.
- The opportunities that broader changes in global markets and low-carbon technologies open up for Southeast Asia.
- The investment required to improve efficiency and expand energy supply infrastructure, especially in the electricity sector.
- The mix of fuels and technologies that can help Southeast Asia achieve universal electricity access.
- An alternative pathway, the Sustainable Development Scenario, to meet energy security and environmental goals.



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