

GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS



SOUTHEAST ASIA POWER

2013

Economy - Regulations - Generation - Renewables - Transmission

Exclusive Interviews

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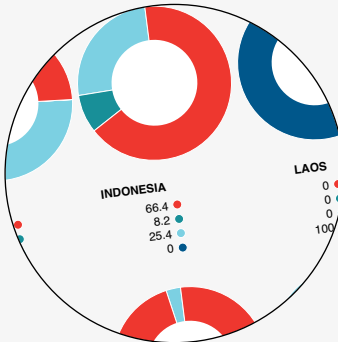
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An Introduction to Southeast Asia

A brief overview of the countries and economies

Southeast Asia represents the engine of global growth. While growth the emerging economies of Latin America has slowed after their rush of a few years ago, and sub-Saharan Africa's economic boom remains in its early stages, the 10 member states of The Association of Southeast Asian Nations (ASEAN); Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam; have been at the forefront of global economic growth for the past two decades. This trend is forecast to continue, at least in the short- to medium-term.

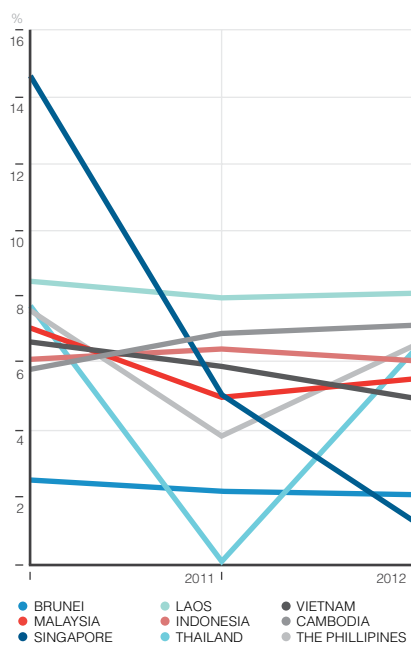
The reasons for this success are plentiful and diverse. The demographic weight of countries such as Indonesia, with its population of over 250 million the fourth largest in the world, and the growing middle classes throughout the region present a relatively untapped consumer market. The sound policies of countries such as Singapore, one of the original "Asian Tigers", has led to a remarkable economic transformation that serves as an example to neighbouring countries and provides a wealthy and stable base for companies operating in the wider region. Despite not holding the same reputation for natural resource wealth as Latin America or Africa, the region has nonetheless benefited from substantial reserves of minerals and hydrocarbons, and has made strong efforts to develop downstream industries based on these.

ASEAN and its constituent countries have been quick to promote political and economic links outside their borders, establishing large numbers of free trade agreements. Geographical proximity to the economic might of China has helped, and sensible exploitation of Islamic links to access Middle Eastern investment has been seen, particularly from Malaysia.

Established in 1967, ASEAN's long history (the oldest international organisation in the

GDP Growth Rates (%)

Source: World Bank, CIA World Factbook



region) has assisted in maintaining stability and economic connections throughout the region. This has been further assisted by the establishment of the ASEAN Free Trade Area (AFTA) in 1992. It is now quite common to see ASEAN-based companies operating in multiple locations throughout the region: the flexibility the organisation allows means that their headquarters, manufacturing facilities and various offices can be located according to the various strengths of individual countries. For foreign investors, the prospect of a single country site being able to access the entirety of ASEAN; an organisation that together represents the eighth largest economy in the world; has proved extremely appealing. A quick walk in the business districts of Singapore, Kuala Lumpur or Jakarta will pass offices of many of the world's major companies.

Despite the positive overall picture, it would be a mistake to view the Southeast Asian region as a single entity. Vast differences persist in ASEAN. Singapore ranks inside the top 10 highest GDP per capita countries in the world; Myanmar ranks only just outside the bottom 20. As an emerging economy, Laos has maintained annual GDP growth of over 8% for the past three years; the more mature economy of Brunei has managed just over 2% per annum over the same time period.

In terms of macroeconomic indicators, government policies, industry opportunities and regulatory environments, the Southeast Asian region is arguably the most diverse in the world, and those investors who view it as a homogenous bloc will struggle. Neither is the region defined by harmony and cooperation, despite their impressive cooperation on many issues. Singapore's long-held dominance as a hub for the chemical industry is being increasingly challenged by its neighbours, who can boast greater access to feedstock and a cheaper workforce. Singapore's status as the region's financial center is also being challenged as Malaysia develops its capacity for Islamic finance. With the governments of every country holding ambitious growth plans, competition for foreign investment is fierce.

The region's remarkable and sustained economic performance can be attributed to both this competition and the aforementioned cooperation. Given the ease of movement that businesses and investment enjoys throughout the region, countries must compete less on the availability of natural resources or their market size and more on creating a friendly business environment. There are undoubtedly still a multitude of challenges, yet with a few exceptions regulations are moving in the right direction, and Southeast Asia's growth continues. •

Southeast Asia at a Glance

Source: EY Global Vantage

MYANMAR

Population: 55,167,330 (July 2013 estimate)
Capital: Nay Pyi Taw
Head of Government: President Thein Sein
Currency: Kyat (MMK)
GDP: \$53.14 billion (2012 estimate)
Growth Rate: 6.3% (2012 estimate)
GDP per Capita: \$1,400 (2012 estimate)
Economic sector breakdown: agriculture: 38.8%, industry: 19.3%, services: 41.8% (2012 estimate)
Exports: \$8.23 billion (2012): natural gas, wood products, pulses, beans, fish, rice, clothing, jade and gems
Imports: \$7.477 billion (2012): fabric, petroleum products, fertilizer, plastics, machinery, transport equipment; cement, construction materials, crude oil; food products, edible oil
Major Trade Partners: China, Thailand, India, Singapore, Japan

VIETNAM

Population: 92,477,857 (July 2013 estimate)
Capital: Hanoi
Head of Government: Prime Minister Nguyen Tan Dung
Currency: Dong (VND)
GDP: \$138.1 billion (2012 estimate)
Growth Rate: 5% (2012 estimate)
GDP per Capita: \$3,600 (2012 estimate)
Economic sector breakdown: agriculture: 21.6%, industry: 40.8%, services: 37.6% (2012 estimate)
Exports: \$114.3 billion (2012): clothes, shoes, electronics, seafood, crude oil, rice, coffee, wooden products, machinery
Imports: \$114.3 billion (2012): machinery and equipment, petroleum products, steel products, raw materials for the clothing and shoe industries, electronics, plastics, automobiles
Major Trade Partners: China, USA, South Korea, Japan

CAMBODIA

Population: 15,205,539 (July 2013 estimate)
Capital: Phnom Penh
Head of Government: Prime Minister Hun Sen
Currency: Riel (KHR)
GDP: \$14.24 billion (2012 estimate)
Growth Rate: 6.5% (2012 estimate)
GDP per Capita: \$2,400 (2012 estimate)
Economic sector breakdown: agriculture: 36%, industry: 24.3%, services: 39.7% (2012 estimate)
Exports: \$5.794 billion (2012): clothing, timber, rubber, rice, fish, tobacco, footwear
Imports: \$7.837 billion (2012): petroleum products, cigarettes, gold, construction materials, machinery, motor vehicles, pharmaceutical products
Major Trade Partners: USA, Thailand, Vietnam, China, UK

THE PHILIPPINES

Population: 105,720,644 (July 2013 estimate)
Capital: Manila
Head of Government: President Benigno Aquino
Currency: Peso (PHP)
GDP: \$250.4 billion (2012 estimate)
Growth Rate: 6.6% (2012 estimate)
GDP per Capita: \$4,500 (2012 estimate)
Economic sector breakdown: agriculture: 11.8%, industry: 31.1%, services: 57.1% (2012 estimate)
Exports: \$46.28 billion (2012): semiconductors and electronic products, transport equipment, garments, copper products, petroleum products, coconut oil, fruits
Imports: \$61.49 billion (2012): electronic products, mineral fuels, machinery and transport equipment, iron and steel, textile fabrics, grains, chemicals, plastic
Major Trade Partners: Japan, USA, China, Singapore, South Korea

INDONESIA

Population: 251,160,124 (July 2013 estimate)
Capital: Jakarta
Head of Government: President Susilo Bambang Yudhoyono
Currency: Rupiah (IDR)
GDP: \$578.2 billion (2012 estimate)
Growth Rate: 6.2% (2012 estimate)
GDP per Capita: \$5,100 (2012 estimate)
Economic sector breakdown: agriculture: 14.4%, industry: 47%, services: 38.6% (2012 estimate)
Exports: \$187 billion (2012): oil and gas, electrical appliances, plywood, textiles, rubber
Imports: \$178.5 billion (2012): machinery and equipment, chemicals, fuels, foodstuffs
Major Trade Partners: Japan, China, Singapore, South Korea

THAILAND

Population: 67,448,120 (July 2013 estimate)
Capital: Bangkok
Head of Government: Prime Minister Yingluck Chinnawat
Currency: Baht (THB)
GDP: \$365.6 billion (2012 estimate)
Growth Rate: 6.4% (2012 estimate)
GDP per Capita: \$10,300 (2012 estimate)
Economic sector breakdown: agriculture: 12.3%, industry: 43.6%, services: 44.2% (2012 estimate)
Exports: \$226.2 billion (2012): electronics, computer parts, automobiles and parts, electrical appliances, machinery and equipment, textiles and footwear, fishery products, rice, rubber
Imports: \$217.8 billion (2012): capital goods, intermediate goods and raw materials, consumer goods, fuels
Major Trade Partners: Japan, China, USA, Malaysia

SINGAPORE

Population: 5,460,302 (July 2013 estimate)
Capital: Singapore
Head of Government: Prime Minister Lee Hsien Loong
Currency: Singapore Dollar (SGD)
GDP: \$276.5 billion (2012 estimate)
Growth Rate: 1.3% (2012 estimate)
GDP per Capita: \$61,400 (2012 estimate)
Economic sector breakdown: agriculture: 0%, industry: 26.8%, services: 73.2% (2012 estimate)
Exports: \$435.8 billion (2012): machinery and equipment (including electronics and telecommunications), pharmaceuticals and other chemicals, refined petroleum products
Imports: \$374.9 billion (2012): machinery and equipment, mineral fuels, chemicals, foodstuffs, consumer goods
Major Trade Partners: Malaysia, China, USA, Japan, South Korea

BRUNEI

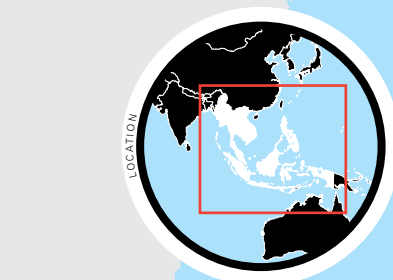
Population: 415,717 (July 2013 estimate)
Capital: Bandar Seri Begawan
Head of Government: Sultan and Prime Minister Sir Hassanal Bolkiah
Currency: Brunei Dollar (BND)
GDP: \$16.63 billion (2012 estimate)
Growth Rate: 1.3% (2012 estimate)
GDP per Capita: \$55,300 (2012 estimate)
Economic sector breakdown: agriculture: 0.6%, industry: 71.7%, services: 27.7% (2011 estimate)
Exports: \$12.75 billion (2012): crude oil, natural gas, garments
Imports: \$3.02 billion (2012): iron and steel, motor vehicles, machinery and transport equipment, manufactured goods, manufactured goods, chemicals
Major Trade Partners: Japan, Singapore, China, South Korea, UK

MALAYSIA

Population: 29,628,392 (July 2013 estimate)
Capital: Kuala Lumpur
Head of Government: Prime Minister Mohamed Najib bin Abdul Najib Razak
Currency: Ringgit (MYR)
GDP: \$303.5 billion (2012 estimate)
Growth Rate: 5.6% (2012 estimate)
GDP per Capita: \$17,200 (2012 estimate)
Economic sector breakdown: agriculture: 11.4%, industry: 40.2%, services: 48.3% (2012 estimate)
Exports: \$247 billion (2012): semiconductors and electronic equipment, palm oil, petroleum and liquefied natural gas, wood and wood products, palm oil, rubber, textiles, chemicals, solar panels
Imports: \$181.6 billion (2012): electronics, machinery, petroleum products, plastics, vehicles, iron and steel products, chemicals
Major Trade Partners: China, Singapore, Japan, USA, Thailand

LAOS

Population: 6,695,166 (July 2013 estimate)
Capital: Vientiane
Head of Government: Prime Minister Thongsing Thammavong
Currency: Kip (LAK)
GDP: \$9.217 billion (2012 estimate)
Growth Rate: 8.3% (2012 estimate)
GDP per Capita: \$3,100 (2012 estimate)
Economic sector breakdown: agriculture: 26%, industry: 34%, services: 40% (2012 estimate)
Exports: \$1.984 billion (2012): wood products, coffee, electricity, tin, copper, gold, cassava
Imports: \$2.744 billion (2012): machinery and equipment, vehicles, fuel, consumer goods
Major Trade Partners: Thailand, China, Vietnam



Indic Ocean

400km

Pacific Ocean



INTERVIEW WITH

Adrian Koh

ASSURANCE PARTNER
ERNST & YOUNG LLP

According to an EY report, 'Securing the investment and delivering large capital projects, while maintaining a reliable supply, will be a key challenge for all utilities.' Is this magnified in Southeast Asia?

Southeast Asia has provided a slight sparkle to the gloomy global economic weather of recent years. Because of this, there are people extremely willing to invest in the region; there is enough liquidity, especially from the Chinese and Japanese, who have been here long enough to understand it well. Singapore's market is based on the New Zealand and Australia model, which gives investors more clarity on how things should be done, compared to the rest of the region. Having said that, power and politics interact quite significantly in the energy sector. Demand can be determined through sufficient groundwork, but the returns on investments are still highly dependent on the regulatory environment. This leaves the power sector susceptible to country risk. Governments, as well as gencos, are looking at cost transformation because people are unhappy about rising prices. It does not help that tariffs and the cost base are not transparent in this part of the world. There exist real regulatory risks for potential investors: the model works for now, but will it be changed?

Will the most successful companies in the power and utilities sector here be the ones most willing to take risks?

Operators that have experience running assets very efficiently elsewhere in the world are the ones who subsequently reaped rewards in their projects here. They are able to generate steady cash-flow in spite of market conditions. It is not by chance, but by hard work, discipline in managing costs, and the reinvestment of revenue into more efficient technologies. There are a lot of coal plants in

this region, and improving their efficiencies is not cheap.

Do you expect the geographical sources of investment in this market to remain stable over the next five years?

The sources of investment are dynamic. Most of the power deals in the first quarter of 2013 have been done in Europe. The alternative investment destinations in this part of the world include Australia and China. The project sizes in Australia are small compared to those in northern Asia, but there are some attractive ones in Southeast Asia. The returns to debt under current conditions are quite good, so there is value to be extracted. Liquidity is another question, but it has nothing to do with the power sector specifically.

Thailand and Indonesia have high electrification rates and good infrastructure bases. These are the two markets with the stiffest competition, followed by Malaysia, where there is a higher level of interest as things are clearer. The Philippines is on the rise and despite the uncertainties, there will be good deals there.

Many coal-fired developments have been announced in the last couple of years. Which power sources do you foresee playing a big role in the region?

Renewables in Southeast Asia still lags the world. The primary place the development of renewables will be Singapore, which is attracting significant R&D investments. Coal generators in Southeast Asia have not been very efficient, operating somewhere below the global 30% average. If they can improve efficiencies by five or eight per cent, there will be substantial savings in costs and carbon emissions. Unless there is a strong regulatory push to move to other energy sources, coal will remain the most important source in Southeast Asia for a while. Asia's LNG

market is different from the US': prices here are high, although shale gas will bring them down drastically. The only thing that can really benefit Southeast Asia in the long run is having a hub like US' Henry Hub. While not a solution on their own, hubs lead to greater price transparency and efficiency. However, they require a large amount of political will; an LNG trading hub would require the government to step back and play a monitoring and guiding role, which may not be possible in this region. Singapore might be the best choice because its government has already stepped back from the energy sector; Hong Kong could be another option. More LNG would be advantageous for countries highly dependent on coal, but for Singapore, which is already heavily reliant on LNG, diversification toward other sources might be a good idea. So there is no perfect scenario – every set of energy sources will come with its own problems.

How has demand for EY's services in the market changed in the last three to five years, and how do you anticipate it changing in the next five?

Our main challenges since the Global Financial Crisis have been in the refinancing of projects. Some privately owned power plants have refinanced two or three times in the last five years because rates have moved around considerably. Some assets in this part of the world have also changed hands a few times, sometimes due to the owners wanting to become asset-light in their home countries. This process will continue, as the world rebalances its books. After ownership stabilizes in the next couple of years, the challenges will be in cost-management and efficiency. I believe this will be a catalyst for a regional regulatory push toward efficiency and new power sources. •

Untapping the Potential of Mobile Devices in Industry

Mobile phones are an essential part of life today, enabling us to keep in contact through calls, emails, text messages and social media. These personal devices are also used for the media consumption, and to create content that can be shared with others. This means they have a powerful combination of technology that can be harnessed in the industry. The interaction techniques of these devices have evolved at breakneck pace in recent years. For example, the introduction of well-designed touch-enabled devices changed the smartphone market completely, while voice and gesture recognition continue to make strides.

Challenges for mobile devices

Despite the many potential benefits of adapting mobile devices for industrial use, ABB has identified five key challenges that can impede mobile device usage.

Network capability

An industrial plant may not have a network infrastructure for mobile connectivity. This might be obvious in an underground mine, where the rock makes it difficult to build a network with good signal strength. Yet open-pit mines may not have good network coverage either since they are often located in sparsely populated or remote areas, with little need for such networks.

Current work practices

In many plants, walkie-talkies are still an important means of communication between workers. In some factories, workers carry both a mobile device and a radio phone, as mobile phones have not been able to replace the functionality that radio offers.

IT infrastructure

Industrial IT systems usually contain a lot of legacy software after several decades of development, so it may be difficult to integrate mobile devices with existing process systems. Processes also require very secure IT systems, and com-

panies may be concerned about mobile devices introducing new risks.

Environment

Different environments also affect mobile device use. Dusty locations can affect touchscreen usage, while environments with large temperature variations may shorten mobile device battery life. Other challenges include high humidity, which can damage consumer devices, and reduced screen visibility in bright sunlight.

Safety equipment

Industrial environments require personnel to wear protective gear, such as helmets, gloves and safety glasses, which can make it difficult to use a mobile device.

Understanding needs

ABB has identified specific needs for mobile devices to be used in specialized environments. Understanding these needs is essential when designing mobile solutions to create more efficient operators and field workers.

The main advantage of a mobile device in an industrial setting is easy information accessibility, which includes equipment manuals and blueprints. At times, employees in industrial settings use their work or even private mobile devices to take pictures or videos of issues encountered, for documentation or to consult with their colleagues. As such, industrial mobile devices need to enable the collection and sharing of information.

ABB has also discovered that rugged mobile devices are not in demand at locations where spark-free equipment is not required. Users prefer to replace broken devices with new ones rather than pay extra for rugged options, and want backup solutions that will keep the device content safe in case of accidents. Security must be very high too, since a system break-in could be disastrous. Another important criteria for mobile devices should be pocket-friendliness.

Additionally, for a mobile solution to work, it is

Johan de Villiers, Senior Vice President, Power Systems, ABB in Singapore

The ABB Group is a leading power and automation company based in Zurich, Switzerland. Operating in about 100 countries worldwide, the ABB Group serves a wide range of customers with a team of over 145,000 employees. Our technologies deliver electricity over thousands of kilometers, let robots and people work together and turn wind into a reliable power source.

Johan de Villiers is responsible for leading the Power Systems Division, and spearheading growth in the power sector for South East Asia and Oceania. Johan joined ABB in 1997, and has held management positions within several ABB businesses globally. He has a master's degree in Electrical Engineering as well as an MBA.

important that everyone has access via a mobile device.

Regular app updates

The rapid development of Web and mobile applications is very different from the traditional release cycle of industrial systems. The mobile app Angry Birds, for example, has constantly been adding new levels and characters into the gameplay since its release in 2009, while Facebook for iOS has been regularly adding new functionality.

Constant and incremental software development is necessary in the mobile domain as hardware evolves rapidly. Likewise, the industrial sector will have to adapt to this by releasing frequent updates.

Looking to the future

As mobile technology evolves, human-machine interfaces need to evolve too, so employees can better utilize them for industrial purposes.

New developments such as augmented reality, pico projectors and sensors for detecting the environment can make these portable devices even more powerful. Augmented reality shows a live view of reality using the camera view of a mobile device, which is then overlaid with computer-generated content. Augmented reality could benefit maintenance engineers, by visualizing useful equipment information.

Pico projectors are small, handheld projectors that can be attached to or built-into mobile devices. Mobile devices also already include sensors such as a gyroscopes and accelerometers to detect orientation and movement, which can be useful for industrial applications too.

These are just a few of the possibilities that we see with mobile devices. But while there are significant challenges, ABB continues to pioneer for the future, analyzing the impact of emerging technologies, and exploring efficient use of existing and emerging mobile technology. •



INTERVIEW WITH

Gavin Barfield

DIRECTOR - ENERGY CONSULTING
PÖYRY

Pöyry sees a strong outlook in Asia. What are the company's objectives in the region for the next three to five years?

Pöyry is keen to become one of the leading electricity and gas consulting firms. The group is headquartered in Bangkok but the vast majority of our market related work is in Singapore and the Philippines as both these countries have deregulated markets. We are also keen to expand our services to other geographies in the region and assist with the energy reform that will take place in developing countries such as Indonesia, Vietnam, Myanmar and Laos. We also see Malaysia as a key market – it has been planning the deregulation of the electricity market for a number of years and we expect progress to be made in the near future. The big hurdle to be overcome there is the reduction of fuel subsidies, which are necessary for the introduction of a competitive market. Our growth in the coming years will come less from Singapore than other jurisdictions; our office here is used primarily for sales and for our clients in the banking and financial sector. On the technical side, there is no planned new builds in Singapore, although we do have a growing operational excellence team working on plant efficiency improvements.

The deregulation process of Singapore's power sector is still not quite complete after over a decade. What has changed since 2001 and what still needs to be done?

The concept of competition has been present since the launch of the National Energy Market of Singapore (NEMS) in 2003. Large customers can choose from a range of retailers who are able to offer customized deals with structured pricing. Unlike non-contestable customers who still receive their supply through SP Services, Contestable Customers are not bound by regulated tariffs. Full

retail contestability was originally planned 2006, but it has not yet materialized. Historically, part of the challenge is how to make it cost-effective in terms of the metering technology in order to gather data at the interval level. The market participants were not keen to go down the load-profiling route that other countries have involved due to the complexity and multiple adjustments to the settlement quantities as cumulative readings come in. The costs of interval meters for all customers and the necessary telecommunications infrastructure and IT systems required to process the data was prohibitive several years back. Now with the IES (Intelligent Energy System) project and advances in metering and communications technology, the EMA is looking to enable more customers to be contestable. EMA sees smart metering as the facilitator for full retail contestability with the simultaneous benefits of demand response and energy management. The move from large to small customers has already begun as EMA have announced a decrease in the contestability threshold from an average monthly consumption of 10,000 to 4,000 kWh by October 2014. This will allow an additional 67,000 customers to enter the market.

Can Singapore's model of deregulation be emulated elsewhere in the region?

Some people support the nodal gross pool model, while others say it is overly complicated. It has been implemented successfully in New Zealand, the Philippines, Singapore and (in a modified form) in other geographies. In my opinion it is a strong market model that offers some key advantages for certain countries. Governments in developing countries have other things to spend their money on besides making investments in power, so allowing independent foreign investment is one of the only solutions. Deregulation in

the Philippines is a good example of how the power sector has been reformed through private investment with efficiencies of plants significantly improving after privatization and the money being provided by central government to prop up loss making plants, or build new capacity. The introduction of competition in the generation sector ultimately leads to efficiency improvements, especially when capacity is not tight. People look to Singapore and learn from it; its road to market deregulation was fairly smooth and well controlled and it is often held up as a model example. Singapore is a very innovative country and the government is keen to embrace new technologies and drive forward developments in the market.

Looking at the Philippines, Moody's announced at the end of March that they rated the Philippines power sector as 'stable' in the next 12 to 18 months. Do you agree with this assessment of the Filipino market?

The power sector is stable in terms of financing and returns on investment. The challenge is building new plants and the barriers to entry. To promote further investment the Philippines should focus on lowering the barriers for creating new generation such as access the long-term Power Purchase Agreements (PPA's) with creditworthy offtakers and the approvals needed for new build. The newly introduced Retail Competition Open Access will have clear benefit for consumers but may make it even more difficult for generators to secure PPA's with retailers as their volume is more variable and they are likely to contract for less, relying on the spot market for the difference. •

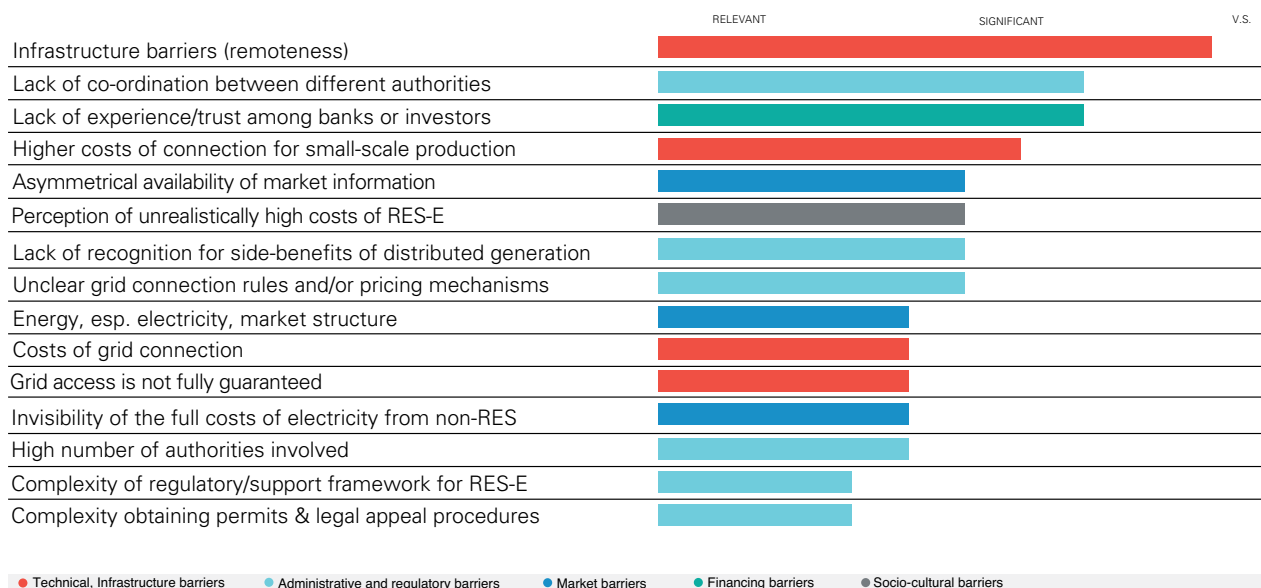
Renewable Energy Targets in ASEAN

Source: ASEAN Centre for Energy

COUNTRY	RENEWABLE ENERGY AND BIO-FUELS TARGETS	NUCLEAR ENERGY TARGETS
Brunei Darussalam	10 MW of solar PV capacity by 2030 No biofuels target	No target No target
Cambodia	Solar Photovoltaic 1.5 MW Biomass Gassification 87 kW Micro-hydro 500 kW No biofuels target	No target
Indonesia	2025 - the energy mix of Indonesia should contain: 5% biofuels, 5% geothermal, 2.6% hydro, 0.03% wind, 0.74% biomass	2025: 1.4% nuclear of energy mix
Lao PDR	Development of hydro projects for domestic use and export No biofuels target	No target
Malaysia	Installed renewable energy capacity by 2030: 1340 MW Biomass, 410 MW Biogas, 490 MW Mini-hydro, 854 MW Solar, and 390 MW Municipal Solid Waste Biofuels to displace 5% of diesel in road transport	2000 MW by 2023
Myanmar	15%-20% share of renewable energy to total installed electricity generating capacity Displace 8% conventional liquid fuels with biofuels in road transport	No target
Philippines	Target by 2030: ~1500 MW of new geothermal capacity, ~2100 MW of new hydro capacity, ~950 MW of wind capacity, ~71 MW of solar capacity, ~102 MW of biomass capacity Displace 15% of diesel and 20% of gasoline with biofuels	2000 MW by 2025
Singapore	Solar energy to take 5% share of the country's power generation mix No biofuels target	No target
Thailand	Install 6239 MW of various RE electricity generating facilities Biofuels to displace 12.2% of transport energy demand	Develop 5000 MW (2020-2028)
Vietnam	RE targets by 2030: 2100 MW Wind, 2400 MW Small Hydro, 400 MW biomass No biofuels target	1000 MW by 2020 to increase to 10700 MW by 2030

Non-Economic Barriers to Renewable Energy Development in ASEAN

Source: IEA



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THANK YOU

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