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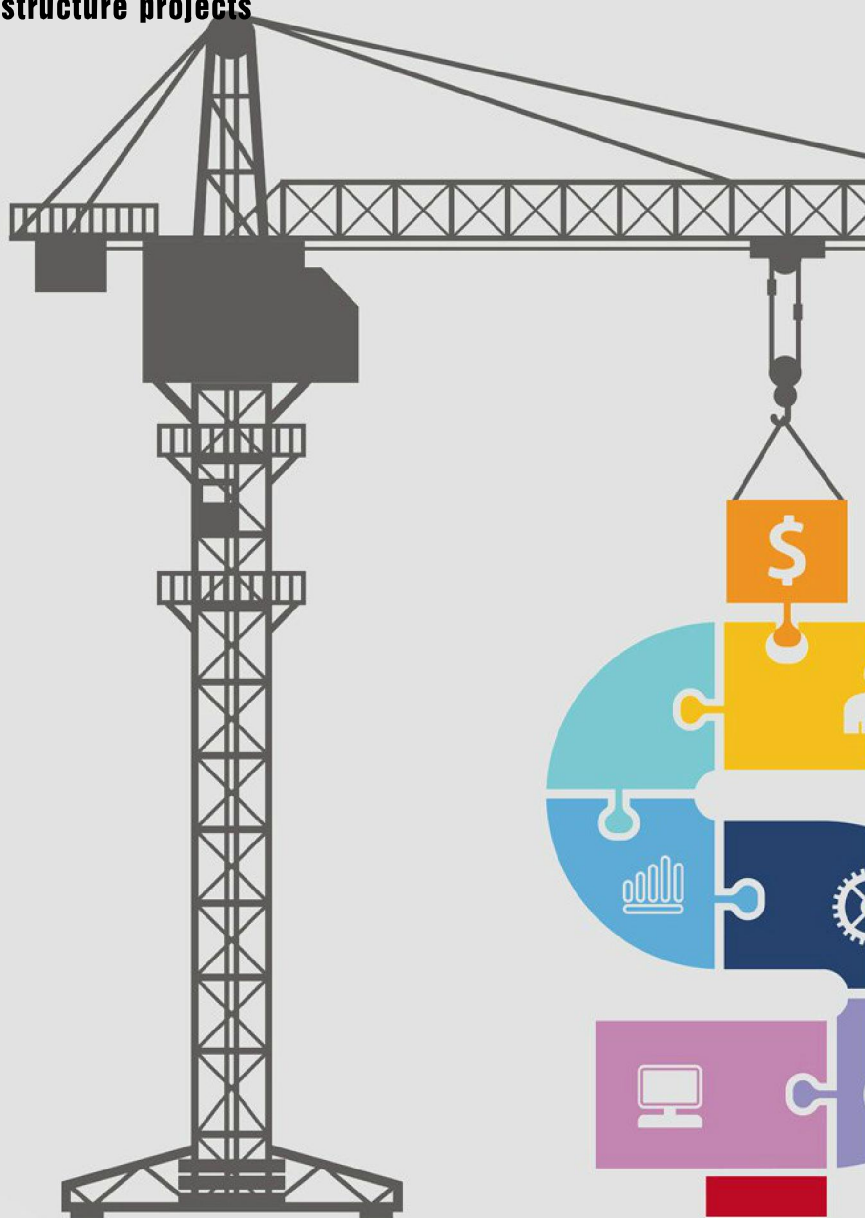
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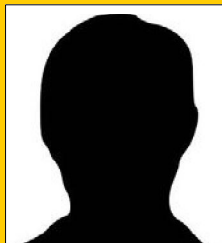
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Ang Kok Kiat

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Ang Kok Kiat

Director, Energy Efficiency and Conservation Department, National Environment Agency, Singapore

Under the Paris Agreement, Singapore has pledged to reduce our emission intensity by 36 per cent from 2005 levels by 2030 and stabilise emissions with the aim of peaking around 2030. To achieve this, we will continue to adopt more efficient technologies and increase the share of non-fossil fuels in our electricity mix. Solar energy is the most promising renewable energy option for us.



Luke Devine

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Luke Devine

Foreign Legal Consultant, Finance and Projects, Energy, Mining and Infrastructure, Baker McKenzie

Regulation 21 is a positive signal to the market as the government has taken a step to attract and address the concerns of investors in biomass and biogas power projects. In return, developers are being asked to speed up development of such power projects.



K.D. Sastrawijaya

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Kirana D. Sastrawijaya

Partner, Finance and Projects, Energy, Mining and Infrastructure, Baker McKenzie

However, the success of this biomass/biogas programme, and more broadly the renewable sector aims of the government, is going to be largely determined by the two other key stakeholders in the renewable energy sector: namely, PT PLN (Persero) and the Indonesian Parliament.



Nikolai Dobrott

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Nikolai Dobrott

Founder and Managing Partner, Apricum - The Cleantech Advisory
Thailand, the Philippines, Indonesia, Malaysia and Vietnam are the five big markets driving PV development. Combined, they represent 90 per cent of ASEAN's population; they have capacity targets in place and policies taking shape. According to Apricum's high case scenario, over 15 GW of PV capacity is expected to be installed by 2020 in these five markets alone.



Mohammad Chowdhury

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Mohammad Chowdhury

TMT industry leader, Australia, Southeast Asia and New Zealand, PwC

The Southeast Asian region as a whole will continue to remain attractive to outside investors. Data is the major area of opportunity and Indonesia, Philippines and Myanmar offer the highest potential in this regard. In addition, Thailand, Singapore and some other markets offer opportunities for the entry of new players.



Turning Wheels

ASEAN offers some of the most promising renewable energy markets



Nikolai Dobrott

Founder and
Managing Partner,
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Advisory

The Association of Southeast Asian Nations (ASEAN) is a political and economic organisation of 10 Southeast Asian countries. Formed in 1967 by Indonesia, Malaysia, the Philippines, Singapore and Thailand, membership has since expanded to include Brunei, Cambodia, Laos, Myanmar and Vietnam. Covering more than 4.5 million sq km and comprising a population of more than 600 million people, ASEAN is about the size of the European Union (EU). But these are probably the only similarities the two economic unions share.

While the EU currently has more economic power, is further developed and is a politically more integrated trade zone, when it comes to gross domestic product (GDP) growth, ASEAN is by far the more

dynamic. If ASEAN were a single entity, it would rank as the seventh largest economy in the world behind the USA, China, Japan, Germany, France and the United Kingdom. With such economic growth levels expected to continue, ASEAN is fast becoming a major economic force in Asia and a driver of global growth.

Energy-related challenges driving renewable energy growth

Installing sufficient additional power generation capacity is one of the most pressing issues for ASEAN countries to solve. Despite the rapid economic development, many parts of ASEAN remain under-electrified – 160 million of its people still do not have access to electricity today. For those that do, prices of grid electricity are high at 0.18 \$/kWh

or more in some markets.

The insufficient power generation structures currently in ASEAN are characterised by their strong reliance on fossil sources, such as natural gas, coal and oil, and the absence of nuclear power. ASEAN, one of the regions with the strongest growth in CO₂ emissions in the last decade, is also the region expected to experience some of the most harmful effects of climate change – more intensive storms, variable precipitation, a rise in sea levels, as well as more severe droughts and floods.

Like many emerging economies with sizeable populations, ASEAN must solve numerous economic and energy-related challenges such as providing sufficient energy services, improving industrial productivity and reducing poverty, and on top of that, adapting to global warming. As a result, ASEAN is increasingly turning to renewable energy.

Renewable energy: Immense potential, sound economics and extensive rollout underway

Rather than transitioning from existing, reliable and adequate fossil and nuclear energy infrastructure towards renewable energy sources driven by political will, as we have experienced in developed markets such as Europe, the USA or Japan, renewable investments in Southeast Asia are first and foremost driven by the need to increase energy capacity. Happily, ASEAN's excellent natural resources coincide very well with this objective.

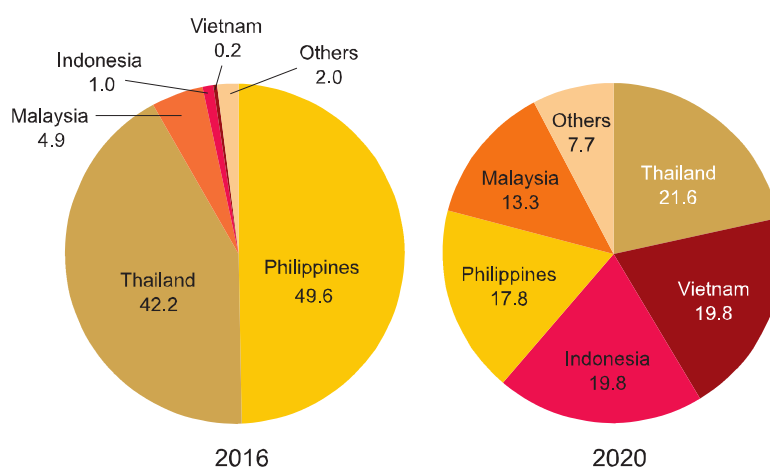
The most common and historically advanced form of renewable energy has been hydroelectric power, most prominently from the lower Mekong River, which flows through or along the borders of Myanmar, Laos, Thailand, Cambodia and Vietnam. Although the overall hydroelectric potential of the region is estimated to range between 170 GW to 250 GW, there are major concerns about the environmen-

tal impacts of damming the Mekong River system and other rivers in Southeast Asia. An independent assessment prepared for the Mekong River Commission recommended a 10-year delay in the current hydroelectric project schedule to evaluate environmental concerns.

The highest geothermal potential of any country in the world with more than 27 GW is in Indonesia. Although ASEAN's largest country by population and economy contains 40 per cent of the world's total geothermal reserves, it currently only utilises five per cent of its capacity. The Indonesian government plans to increase its geothermal capacity to 6 GW by the end of this decade. So far, its main challenge has been to attract the necessary foreign investment.

Wind energy has been a relatively low priority renewable sector in ASEAN. The region's best wind potential lies to the north in Vietnam, Cambodia, Myanmar, Laos, the Philippines and Thailand. Of these, only the Philippines, Thailand, and Vietnam have started to substantially promote the wind energy sector.

Fig.1: ASEAN PV markets by country and share of annual installations, 2016 and 2020 (%)



Source: Apricum Market Model Q3/2016

The largest and most unlimited potential for ASEAN in renewable energy is, of course, in solar power. With annual solar radiation levels ranging from 1,460 to 1,900 kWh/m² per year, the region has some of the highest yields in the world. Thailand began substantial implementation of solar power in 2011 with an attractive subsidy "adder" scheme.

Although Thailand with about 2.8 GW has currently more solar power cumulatively installed than all other ASEAN countries combined, the Philippines is expected to install the most PV this year. However, while Thailand and the Philippines dominate the market today, in just a few short years, four countries will be competing for the title of the top PV market in ASEAN's rapidly growing solar power region, as can be seen in Fig.1.

Next to Thailand, Malaysia has run a smaller feed-in tariff (FIT) programme for solar in the last few years amounting to a little over 220 MW up to now and has announced another 250 MW to be approved for FIT by 2020. Most dynamic in the last year, however, has been the Philippine solar market.

Driven by attractive FiTs, 800 MW has been built – more than 90 per cent of that within the very short timeframe of Q4/2015 and Q1/2016. Most interestingly, the FiT for projects had to be secured after the project's commissioning and was subject to a 450 MW cap for the FiT capacity.

This highlights another big difference to developed RE markets such as Europe and the USA: The market demand for PV is not dependent on a subsidized FiT in the Philippines because of growing demand for electricity and PV's cost competitiveness compared with other power generation options. Project financing has been available in spite of the uncertainty about securing a FiT. In recent months, both Vietnam and Indonesia announced the implementation of FiT programmes for 850 MW and 250 MW of solar respectively, which are to be carried out in 2016-2017.

Another substantial difference to a developed solar market in for example, Europe or the USA, is the market segmentation. While residential solar represents a substantial share of solar power capacity in markets such as Germany or the USA, in

ASEAN, utility-scale solar accounts for more than 95 per cent of all capacity added to the grid. Residential has been slow to take off due to low household income, lack of necessary financing for residential applications and shorter amortisation expectations by ASEAN customers.

Thailand, the Philippines, Indonesia, Malaysia and Vietnam are the five big markets driving PV development. Combined, they represent 90 per cent of ASEAN's population; they have capacity targets in place and policies taking shape. According to Apricum's high case scenario, over 15 GW of PV capacity is expected to be installed by 2020 in these five markets alone, as illustrated in Fig. 2.

Even though the end of FiTs are in sight, sustainable market conditions are within reach

FiTs in markets such as Thailand and the Philippines have succeeded in opening up the market for solar in these countries; however, as these programmes come to an end, market players must turn towards the natural potential and economics of utility-scale power provision to utilities or commercial off-takers.

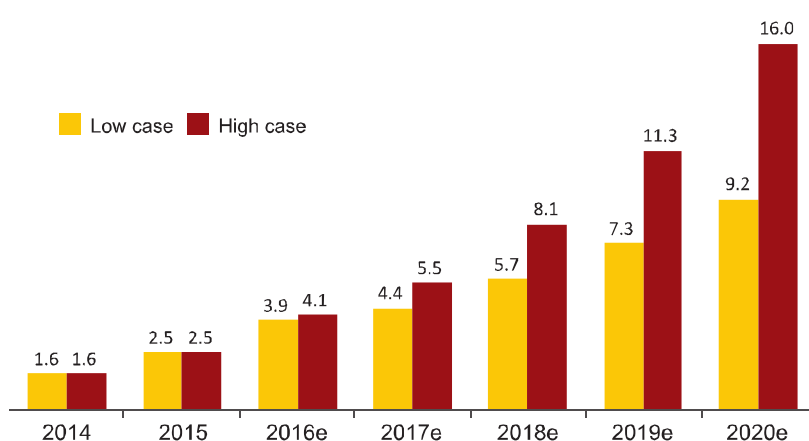
Utility-scale solar will compete with mostly LNG or other renewables, rather than with new coal power plants, which face strong public opposition and have recently been subject to political scrutiny. On the commercial off-take side, renewable generation will need to be competitive with electricity prices (including those that are subsidised in some markets such as Indonesia and Vietnam) from the utility at peak-times or diesel generation on site – which it already is in most cases.

Market entry for international players: Success requires careful preparation and on-the-ground commitment

In contrast to Asian markets such as China or Japan, ASEAN features much lower market-entry barriers for international renewable energy developers, EPCs or financiers. Solar markets such as Thailand and the Philippines demonstrate an almost equal balance between competent new local players and international renewable energy companies who are establishing a strong, even leading, market position. There are several key factors that are vital for international renewable energy companies wishing to successfully build a business in Southeast Asia. These include time-to-market, the level of commitment to the market, an in-depth understanding of the regulatory environment, the local organisational execution capabilities and the level of integration of the business model. ■

Nikolai Dobrott is founder and managing partner of Apricum – The Cleantech Advisory. Before establishing Apricum in 2008, Dobrott spent 15 years in leadership positions in the consulting and energy sectors. He started his career at Arthur D. Little as a management consultant focused on chemicals and energy. He then led corporate development and M&A at Rütgers (now Evonik) and later became director of renewable energies and resources at Invest in Germany. Dobrott holds a master's degree in business administration and chemical engineering from the Technische Universität Berlin.

Fig. 2: Cumulative PV capacity of five key markets (Thailand, the Philippines, Indonesia, Malaysia and Vietnam) 2014-20, (GWp)



Source: Apricum Market Model Q3/2016