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Southeast Asia Access to Energy Brief

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Current Energy Landscape:

Southeast Asia, along with China and India, has been busy over the last decade shifting the centre of gravity of the global energy system to Asia, notes the International Energy Agency's (IEA) special report on Southeast Asia.[1] There are many strong reasons for this shift. For one, Southeast Asia's inordinate energy reserves mark it as a strategic location for the global energy system, and in particular for the economic juggernauts on its doorstep, India and China. Indonesia, for example, is currently the world's biggest coal producer, and by far the largest exporter of steam coal.[2] This important resource, although it is highly polluting and contributes to greenhouse gas (GHG) emissions, is nevertheless expected to increase its share of electricity production in Southeast Asia from less than one-third today to almost one-half in 2035.[3] The small countries of Brunei and Malaysia, with their extensive petroleum and natural gas fields, are the only two net oil exporters in the region.[4] Although the region holds just 3.5 per cent of global proven natural gas reserves, Brunei was the first country in Southeast Asia to export liquefied natural gas (LNG), and as a result has been transformed into the world's fifth richest nation since its independence in 1984.[5] Today, Malaysia and Indonesia are both among the world's top exporters of LNG.[6] When it comes to modern renewable energies, Southeast Asia is also handsomely endowed. Only the United States is ahead of Indonesia and the Philippines when it comes to installed geothermal capacity – a resource that is still highly under-uti-

1 IEA. "Southeast Asia Energy Outlook." World Energy Outlook. International Energy Agency, September 2013. https://www.iea.org/publications/freepublications/publication/SoutheastAsiaEnergyOutlook_WEO2013SpecialReport.pdf.

2 Patel, Sonal. "Southeast Asia's Energy Juggernaut." POWER Magazine, August 1, 2014. http://www.powermag.com/southeast-asias-energy-juggernaut/.

3 IEA, 2013.

4 Patel, 2014.

5 Ibid.

6 Ibid.

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lized.[7] The region's greatest renewable resource, however, is hydropower from the Mekong River and its tributaries. Interestingly, the majority of these resources are located in some of the region's most energy-poor countries, Cambodia and Laos. China has been investing heavily in exploration and construction in the area, with 44 gigawatts of new capacity expected to come online by 2035.[8] However, these hydro projects are often far from demand centres, and face increasing opposition because of their environmental and social challenges.

The other major reason the centre of gravity of the global energy system is shifting toward Asia is that the region is rapidly expanding. By 2035, the economy of Southeast Asia is expected to triple in size, and the population will expand by a quarter. These economic and demographic forces will drive an expansion in energy demand of 80 per cent – equivalent to the total demand in Japan today.[9] As seen in Figure 1, most of that expansion will be made up by coal, with natural gas second, and hydro third. Although the capacity of modern renewables will expand rapidly, they will continue to contribute relatively little to the region's overall

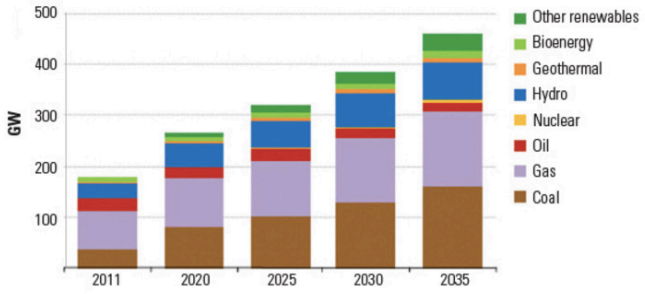

Figure 1: Total power capacity for the 10 member countries of the Association of Southeast Asian Nations (ASEAN) is slated to soar from 176 GW in 2011 to about 460 GW in 2035. Coal will represent 40 per cent of new additions, gas 26 per cent, and hydro 15 per cent. Source: Patel, 2014.

7 IEA, 2013.

8 Ibid.

9 Ibid.

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energy use.

In general, countries in Southeast Asia can be divided into three categories. First are the electrified countries – Thailand, Singapore, and Vietnam – in which most households are connected to the grid, and the emerging challenges are energy efficiency and increasing the share of renewables in the energy mix.[10] Next come the archipelago countries – Indonesia and the Philippines – where a large majority of the mostly urban population has access to electricity, but connecting the last part of the population is very challenging because they live in remote rural areas or on distant islands.[11] Finally, there are the energy-poor countries – Myanmar, Cambodia, and Laos – where most of the population is not connected to the grid, relies on kerosene or car batteries for electricity, and uses firewood or other biomass for cooking fuel.[12] As the histories, geographies, and resource endowments of these different thematic country groups all differ, splitting them up will help us to understand and analyze the region's access to energy challenges.

Electrified Countries

Singapore stands alone as the country in Southeast Asia with full electrification and 100 per cent of its population with access to modern cooking fuels.[13] Thailand and Vietnam – with 99.3 and 98 per cent electrification respectively – still have 26 per cent and 56 per cent of their populations relying on traditional biomass for cooking.[14] However, this will likely change in the next two decades. The share of renewables in the primary energy mix of these countries is expected to fall steeply by 2035, despite large investments and the expansion

10 Rexel. "Study on Social Innovations Enabling Access to Efficient Energy in South East Asia." Rexel Foundation, 2015. http://www.rexelfoundation.com/en/platform-social-entrepreneurs/connaissances-et-savoirs/study-access-efficient-energy-south-east-as-0.

11 Rexel, 2015.

12 Ibid.

13 Ibid.

14 Ibid.

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of solar and hydro capacity. The reason for this steep fall is that the gains in modern renewables will be offset by reduced use of traditional biomass for cooking, as families transition to liquified petroleum gas (LPG) or other modern fuels. Although this transition has major health benefits, Southeast Asia's energy-related carbon dioxide emissions are also expected to almost double by 2035.[15]

Thailand has had remarkable success in transitioning even its poorest populations to the use of electricity and modern cooking fuels. A case study that looked at Thai populations living in the slums around two cities, Bangkok and Khon Kaen, found that even when inhabitants were very poor, with very few economic opportunities, about 100 per cent of households had access to electricity, and 80 per cent used modern fuels for cooking.[16] However, 30 years ago, only 25 per cent of Thailand's population had access to electricity.[17] Today's high rates of energy access are no accident, but the result of aggressive and successful policy on the part of the Thai government. The strategy began in the 1970s, when electrification was declared a major national priority. First, the Thai government borrowed heavily from multilateral banks, and focused grid extension in urban areas. By encouraging the growth of energy-intensive industries in cities, the country developed a strong financial base of large and reliable payments for power. These industrial customers allowed the government to subsidize rural expansion of the grid over the next 20 years, until virtually every village was connected, as they are today.[18] Energy poor countries in the region – and around the world – have much to learn from Thailand's successful, top-down, grid-focused electrification program.

15 IEA, 2013

16 Shrestha, Ram M., S. Kumar, Samuel Martin, and Arjun Dhakal. "Modern Energy Use by the Urban Poor in Thailand: A Study of Slum Households in Two Cities." Energy for Sustainable Development 12, no. 4 (2008): 5–13.

17 Wallace, Tom. "It Is Possible: Terrific Thailand." ONE, March 25, 2013. https://www.one.org/us/2013/03/25/it-is-possible-terrific-thailand/.

18 Wallace, 2013.

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Archipelago Countries

The archipelago countries in the region, Indonesia and the Philippines, have large urbanized and industrialized centres with high rates of electricity connection, and many outlying areas that remain stubbornly disconnected from any form of modern energy. In the Philippines, 15 per cent of the population lack access to electricity, and in Indonesia 35.5 per cent lack access. The archipelago effect is most visible when we look at the rural-urban divide: 97 per cent of the Philippines's urban population is connected, but only 65 per cent in rural areas. Ninety-four per cent of Indonesia's urban population is connected, but only 32 per cent in rural areas.[19] However, these two countries, because they are so populous, are actually home to the majority of Southeast Asia's 127.4 million people who lack access to electricity. Today, most island communities in Indonesia that do have electricity rely on diesel generators. This reliance is reflected in the country's statistics: 43 per cent of all energy used comes from oil.[20] This pattern is partly the result of history, and partly of convenience. With large oil reserves and an extensive subsidy program, Indonesia has for many years provided cheap and plentiful oil to its citizens. However, these oil reserves are expected to be fully depleted by 2020; already Indonesia is a net importer of oil, and in 2009 it withdrew from OPEC.[21] With domestic oil prices now subject to the unpredictable fluctuations of international trade, even those communities with generators are at risk of poor electricity access. This predicament makes Indonesia a prime candidate for renewable energy-based microgrids, although market assessments suggest that current regulatory frameworks are highly unfavourable to off-grid solutions.[22] The World Bank

19 Rexel, 2015.

20 energypedia. "Indonesia Energy Situation." Energypedia, September 21, 2015. https://energypedia.info/wiki/Indonesia_Energy_Situation.

21 energypedia, 2015.

22 Accenture. "De-Centralized Electricity in Africa and Southeast Asia: Issues and Solutions." Accenture Development Partners and The Rockefeller Foundation, 2015. https://assets.rockefellerfoundation.org/app/uploads/20150128205930/De-centralized-Electricity-in-Africa-and-Southeast-Asia.pdf.

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has prepared a report estimating the lowest cost option for electrification: when good micro-hydro resources are available, expanding the grid up to seven kilometres is the the cheapest option. When there are no micro-hydro resources, grid-extension still costs the least (up to 16 kilometres), after which point isolated biomass grids are the lowest cost. When neither micro-hydro nor biomass is available, grid expansion is lowest cost up to 28 kilometres, after which diesel generators are the cheapest option.[23] In this report, household level solutions, whether diesel generators or photovoltaic (PV) systems, are estimated to be considerably more expensive in all but the most isolated areas, or where technical constraints limit the use of stand-alone grids.[24]

Further reading: electricity-based public transportation in the Philippines (http://aseanup.com/electric-revolution-transport-philippines/)

Energy-Poor Countries

Just as in sub-Saharan Africa, it is the region's poorest countries that suffer from the worst effects of energy poverty, and face the greatest challenges in assuring universal and equitable access for their citizens. Myanmar provides one of the starkest examples, where 87 per cent of the population do not have access to electricity.[25] Myanmar is largely a biomass centred economy, with wood making up 70 per cent of all primary energy supply.[26] Most of the population is rural, where they are close to biomass resources, and only a fraction of people have access to the grid. Despite this high reliance on traditional biomass, oil, gas, and hydropower are major backbones of the economy, propelling an annual GDP growth rate of 8.5

23 World Bank. "Electricity for All: Options for Increasing Access in Indonesia." Jakarta, Indonesia: The World Bank, December 2005. http://siteresources.worldbank.org/INTEAPASTAE/Resources/Electricity_for_All-Increasing_Access_in_Indonesia.pdf.

24 World Bank, 2005.

25 Rexel, 2015.

26 Ross, Rachel Posner. "Myanmar's Path to Electrification: The Role of Distributed Energy Systems." Center for Strategic and International Studies, October 2015. https://csis.org/files/publication/151030_Ross_MyanmarPathElectrification_Web.pdf.

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per cent in 2014. After decades of isolation and military rule, Myanmar has started to implement political and economic reforms. These reforms lead many companies and foreign governments to see Myanmar, with its extensive energy reserves and strategic location between China and India, as a new economic frontier. This attention can be a double-edged sword; the wealth it generates is necessary to achieve electrification, but without the right policies in place the country's wealth will be siphoned away without benefiting its population.[27] The necessary frameworks and initiatives are no mystery – the literature is clear what policies work in improving energy access. Planners in Myanmar can offer financing for woodlots, nurseries, and renewable energy equipment.[28] They can create community mobilization funds to promote women's empowerment and offer skills training.[29] They can implement education and awareness campaigns for households and private sector entrepreneurs, and decentralize energy access programs to communities themselves.[30] The government can promote public-private partnerships for larger, grid-connected wind farms, hydroelectric dams, and other large-scale renewables.[31] Planners can harmonize the regulatory authority for energy to a single agency, they can establish national technology standards, and they can construct maintenance and training centres to ensure that communities care for energy equipment.[32] New laws and policies have been drafted at the highest levels, but detailed implementation guidelines are still vague and under development. This ambiguity leaves investors – and citizens – uncertain about the feasibility, or even legality, of

27 Ross, 2015.

28 Sovacool, Benjamin K. "Confronting Energy Poverty behind the Bamboo Curtain: A Review of Challenges and Solutions for Myanmar (Burma)." Energy for Sustainable Development 17, no. 4 (August 2013): 305–14. doi:10.1016/j.esd.2013.03.010.

29 Sovacool, 2013.

30 Ibid.

31 Ibid.

32 Ibid.

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electrification projects, particularly those off-grid.[33]

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33 Ross, 2015.