

SHIFTING INVESTMENT AWAY FROM FOSSIL FUELS IN SOUTHEAST ASIA

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Shifting investment away from fossil fuels in Southeast Asia

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Contents

Abbreviation.....	VI
Preface	VII
Introduction.....	VIII
Energy systems in Southeast Asia—Benchmarks, trends and projections	1
<i>Paris Agreement benchmarks for coal phase-out and renewable energy phase-in</i>	<i>1</i>
<i>Has the fossil fuel divestment movement reached Southeast Asia?.....</i>	<i>2</i>
<i>Southeast Asia energy systems at crossroads—Trends and projections.....</i>	<i>4</i>
Shifting investment from coal to renewable energy.....	10
<i>Current investment environment: Trends and drivers in Southeast Asia.....</i>	<i>10</i>
<i>Sources of finance</i>	<i>12</i>
<i>How can the trend be reversed and transition to 100 per cent renewable energy?.....</i>	<i>13</i>
Deep dive—the Philippines	16
<i>Current investment plans and financial flows</i>	<i>16</i>
<i>Stakeholders and investment environment.....</i>	<i>18</i>
<i>How can the trend be reversed away from fossil fuels?</i>	<i>19</i>
Deep dive—Vietnam.....	21
<i>Investment plans and financial flows.....</i>	<i>21</i>
<i>Stakeholders and investment environment.....</i>	<i>23</i>
<i>How can the trend be reversed away from fossil fuels?</i>	<i>24</i>
Recommendations.....	27
<i>General policy recommendations</i>	<i>27</i>
<i>Country-specific recommendations</i>	<i>29</i>
<i>Role of civil society organizations</i>	<i>29</i>
References	
Annex I Scenario analysis: Data sources and overview of scenarios	
Annex II Scenario assumptions	

Abbreviations

2DC	2 Degrees Celsius Scenario	LUT	Lappeenranta-Lahti University of Technology
APEC	Asia–Pacific Economic Cooperation	OECD	Organisation for Economic Co-operation and Development
ASEAN	Association of Southeast Asian Nations	PES	Planned Energy Scenario
B2DS	Beyond 2°C Scenario	STEPS	Stated Policy Scenario
ETP	Energy Technology Perspectives	SDS	Sustainable Development Scenario
EWG	Energy Watch Group	SR1.5	IPCC Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels
EVN	Electricity of Vietnam	TES	Transforming Energy Scenario
IEA	International Energy Agency		
IPCC	Intergovernmental Panel on Climate Change		
IRENA	International Renewable Energy Agency		

Preface

Southeast Asia has been described as one of the hotspots for global energy development. At the same time, it is a region that faces severe impacts of climate change. Together with China and India, the region will account for most of the growing energy demand within the next decades. That demand will be fuelled by economic growth, especially in industrial manufacturing, as well as transport, urbanization and population expansion.

So far, this increase in demand has been met mostly through the expansion of coal-fired power plants. This stands in stark contrast to the 1.5°C temperature goal set in the Paris Agreement on climate change and which cites coal-fired power plants as one of the main contributors to the CO₂ levels. The uptake of renewable energies would contribute towards limiting global warming. It would also make sense from an economic perspective due to the falling prices for solar and wind energy as well as their co-benefits for sustainable development.

An important aspect of accelerating the energy transition is the flow of investment. There is increasing commitment of financial institutions in Europe and multilateral development banks to divest from fossil fuels, not least because investment in coal plants, mines and other fossil fuel-related infrastructure could soon become stranded assets if they have to shut down before the end of their life cycle.

Against this background, the Friedrich-Ebert-Stiftung's (FES) regional project on climate and energy in Asia decided to take a closer look at the investment landscape of fossil fuels, especially coal, in Southeast Asia: Which

actors finance the ongoing expansion of coal-fired power plants, and can Southeast Asia continue shielding itself against the global trend away from coal? How could energy and investment scenarios look like that if aligned with the Paris Agreement, and what would it take to make this shift? After providing a regional overview, the authors of this paper deep dive into the specific trends in two countries, the Philippines and Vietnam.

The study falls in line with previous FES work on a socially just energy transition, including analyses of the barriers and opportunities of renewable energy development, especially in the socioeconomic dimension.

FES and its partners aim to further promote a social-ecological transformation that includes the decarbonization of the energy sector in a socially just manner.

We extend our sincere gratitude to Ursula Fuentes-Hutfilter and Anna Chapman, the authors of this paper, on shifting investment flows, for their thorough research. We hope that it contributes to fruitful discussions and provides valuable insights for future initiatives.

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Introduction

Southeast Asia is a region at a crossroads as a global hotspot of risks from continued investments into fossil fuels. The electricity sector has particularly high demand growth and a significant share of global coal consumption. While countries and investors around the world are starting to move away from coal, Southeast Asia is still expanding coal-fired power generation.

Stopping the expansion of coal and phasing out coal for power generation is the single-most important step towards achieving the Paris Agreement temperature limit and avoiding the catastrophic climate change impacts that threaten Southeast Asia's ability to reach the Sustainable Development Goals. Coal needs to be phased out by 2040 globally, including in Southeast Asia, with large reductions needed within the next 10 years.

Gas also needs to be eventually phased out to decarbonize the power sector and achieve net-zero emissions by mid-century. The increased investment in natural gas infrastructure, such as terminals to import liquefied natural gas in Southeast Asia, is therefore a worrying trend, because it risks cementing in fossil fuel infrastructure for decades to come.

Southeast Asia is highly vulnerable to climate change impacts. Countries in the region would benefit from achieving the Paris Agreement 1.5°C limit to avoid larger climate change impacts, such as sea level rise, higher frequency of heatwaves, flooding and other extreme events as well as the destruction of coral reefs.

The good news is that renewable energy, particularly solar and wind, are becoming increasingly competitive. So, too, is a range of storage technologies, especially batteries, along with other options to enhance the uptake of variable renewable energy, including electric vehicles. These options offer multiple benefits: avoided air pollution, regional sustainable employment creation and access to modern affordable clean energy, including for rural and remote areas that do not yet have access to electricity.

While the region is making encouraging progress with the uptake of renewable energy, and while expansion plans for coal are increasingly being questioned or partly

cancelled with revised power sector plans, current trends and targets in the region are still far from consistent with the Paris Agreement or a sustainable pathway towards net-zero emissions.

Even with the economic case for keeping new and existing coal use gradually dwindling in Southeast Asia, there are still strong drivers prevalent that shield this region against the global coal divestment trend. Importantly, even where divestment is starting to happen, policy uncertainty and other barriers are prompting investors to move to other regions; those countries may also lose out on the benefits from increased investment in renewable energy.

The purpose of this study is to provide an overview of the situation, the trends as well as fossil fuel investment projections and the need to shift investment towards clean energy. Along with those trends, we analyse the investment environment as well as funding sources of investment in the power sector. This includes the principal stakeholders—government, private sector and civil society—and their role in current and potential future investment patterns and flows in Southeast Asia.

Based on available literature, we identified possible future developments for the region, in line with both the Paris Agreement and the Sustainable Development Goals, and the investment needs and implications for the scale of shift in investment needed. From there, we drew out policy recommendations for governments as well as for advocacy and civil society organizations wanting to support fossil fuel divestment and the shifting of investment to clean energy in Southeast Asia. In addition to the focus on Southeast Asia generally, we take deep dives into the Philippines and Vietnam, supplemented with other regional country examples.

Section 2 outlines the coal phase-out and renewable energy phase-in benchmarks that would make Southeast Asia's power sector consistent with the Paris Agreement's 1.5°C limit. It builds on analysis of benchmarks derived from global and regional scenarios, including those assessed by the Intergovernmental Panel on Climate Change. We then sketch the global trend of divestment away from fossil fuels, in particular coal for power generation, and how this compares with the situation

and trends in Southeast Asia. This includes an overview of current trends and projections for the region's power sector.

Based on a range of recently published international scenarios, Section 3 presents analysis on what it takes to shift investment from fossil fuels to renewable energy, in line with the Paris Agreement and the Sustainable Development Goals. It looks at the investment environment, sources of funding for current investments (particularly into fossil fuels) and how these trends can be reversed.

Sections 4 and 5 provide the deep dive into the Philippines and Vietnam, respectively, highlighting country-

specific trends and projections, market developments, stakeholders and national scenario analysis.

Finally, Section 6 provides policy recommendations for both the region and the Philippines and Vietnam, including specific recommendations to support civil society organizations that would enable change in the region and in these two countries.

Energy systems in Southeast Asia—Benchmarks, trends and projections

Paris Agreement benchmarks for coal phase-out and renewable energy phase-in

Based on the analysis of the Paris Agreement's 1.5°C-compatible pathways (see the Annex), the following benchmarks have been identified for phasing out coal for power generation (Climate Analytics, 2019):

- Unabated coal use for power generation needs to peak by 2020 and be reduced quickly afterwards, regardless of the region.
- Unabated coal-fired power generation needs to be reduced by 80 per cent from 2010 levels by 2030 and phased out before 2040 globally.
- Between 2030 and 2040, all regions need to phase out coal.
- Asian countries that are not members of the Organisation for Economic Co-operation and Development (OECD) need to reduce coal generation by 63 per cent below their 2010 levels by 2030 and to phase out coal altogether by 2037, completing a global coal phase-out before 2040.

Unabated coal refers to coal without carbon capture and storage, which is often included in energy modelling scenarios as a technology added to allow the uptake of fossil fuels (coal and gas) in the power sector with reduced emissions. We judge coal with carbon capture and storage as very unlikely to be implemented, given the high costs and environmental footprint and the fact that renewables are often cheaper than coal without carbon capture and storage. And this trend will only accelerate (Climate Analytics, 2019). Carbon capture and storage is currently absent in the global pipeline.

Given that the carbon capture and storage technology is not available at scale and unlikely to be economically viable at scale in the time frame, these benchmarks refer to coal-fired power generation in general. However, the scenarios that include this technology support a narrative pushed by the fossil fuel industry and adopted

by some governments that retrofitting coal-fired power plants with carbon capture and storage can achieve emission reductions. Evidence shows that this has not yet materialized at scale even though substantial political and financial support have been provided for developing the technology (Climate Analytics, 2021).

Non-OECD Asia faces the most challenging gap, with coal-fired power generation already largely exceeding the Paris Agreement benchmarks. The large coal expansion pipeline in the region means any new coal-fired power plant would increase emissions above the benchmark. It would therefore increase the risk of stranded assets because it would have to be retired long before the end of its typical lifetime.

While gas has been claimed as a bridge to cleaner energy, its continued use for power generation would only be consistent with the Paris Agreement if used with carbon capture and storage. Even then it would have only a small role in electricity generation by 2050, at around 8 per cent of global electricity generation (IPCC, 2018). Due to incomplete CO₂ capture rates, the use of gas with carbon capture and storage would have to be balanced out with additional CO₂ removal. Despite this, vested interests continue to push liquefied natural gas as having a vital role in the Asia-Pacific region's economic revival and bridging the energy transition for the next 20 years (Yusof, 2020). Renewable energy, often with storage, is already cheaper than constructing new natural gas power plants in many economies (IEA, 2020b). And new investments in gas-fired power plants are increasingly at risk of becoming stranded assets in both developed and developing countries.

Based on these multiple lines of evidence, a range of benchmarks for the power sector have been derived through in-depth analysis of pathways as well as additional analysis using results from bottom-up models found in the literature, 100 per cent renewable studies and other literature (Climate Action Tracker, 2020c). An important aspect of the focus on renewable energy is the robust evidence of strong synergies with achieving the Sustainable Development Goals through access to reliable

and clean energy, avoiding air pollution and creating local and regional employment (Climate Analytics, 2021). Table 1 shows the results of this benchmark analysis for the

of this increase can be achieved with a shift away from fossil fuel investment. Increases in low-carbon investment must be accompanied with divestment from high-carbon

Table 1: Share of unabated coal-fired power and renewable energy in the electricity sector for 1.5°C-compatible pathways—at regional and national levels

Source: Paris Agreement final benchmarks for global, India, Indonesia: from Climate Action Tracker, 2020c. Benchmarks for ASIA, Southeast Asia, South Asia: Climate Analytics, 2021 (forthcoming), based on Climate Action Tracker, 2020c. See Climate Action Tracker, 2020c for details on methodology.

Country	Year	Paris Agreement benchmark Share of coal	Paris Agreement benchmark Renewable Energy
Global	2030	0–2.5%	55–90%
	2040	0%	75–100%
	2050	0%	98–100%
ASIA non-OECD	2030	5–10%	60–80%
	2040	0%	85–90%
	2050	0%	98–100%
Southeast Asia	2030	5–10%	50–85%
	2040	0%	80–98%
	2050	0%	98–100%
South Asia	2030	5–10%	50–80%
	2040	0%	80–90%
	2050	0%	98–100%
India	2030	5–10%	65–80%
	2040	0%	90–100%
	2050	0%	98–100%
Indonesia	2030	5–10%	50–85%
	2040	0%	80–100%
		0%	98–100%

share of coal and renewable energy for power generation at the global and regional levels.

To achieve these benchmarks and step onto a Paris Agreement-consistent pathway, global investment in low-carbon energy and end-use energy efficiency needs to be scaled up by about \$1.4 trillion per year between 2020 and 2024, amounting to some 10 per cent of the total pledged COVID-19 stimulus funding to date. Most

fossil fuels in the range of \$280 billion per year over the same period (Andrijevic and others, 2020).

Has the fossil fuel divestment movement reached Southeast Asia?

Globally, there is a growing movement away from investment in coal, driven by the fast reduction of the

cost of solar, wind and storage technologies, combined with policies against air pollution and an increasing awareness of the importance of climate change policies and the need to phase out coal to implement the Paris Agreement. An increasing number of governments and investors are moving away from financing new coal-fired power plants because of the risk of stranded assets. An initiative of more than 100 financial institutions has committed to strengthening policies to move away from thermal coal, including major Chinese and Japanese financial institutions (Buckley, 2019).

A few governments in Asia have also started making moves in the same direction. An example is Japan, where the government has committed to cutting support for coal-fired power plants, although this pledge has been assessed as not tight enough (Nikkei Asia, 2020).

- World-leading coal financiers from Japan—Sumimoto Mitsui and Mizuho—will no longer provide loans for coal-fired power generation (VIET, 2020).
- A banking group in Malaysia—CIMB Group Holding Bhd—is reportedly the first of its kind in Southeast Asia to divest from coal, setting a 2040 target to phase out coal from its portfolio (Reuters, 2020).
- The Malaysian electricity monopoly—Tenaga Nasional Berhad—recently announced it will no longer build any new coal-fired power plants, after having commissioned the last one in 2019 (Shahila, 2020).
- The World Bank and the Asian Development Bank will no longer finance new coal projects, although the World Bank continues to indirectly finance coal in Southeast Asia (VIET, 2020; IDI, 2019).¹
- The central banks of Cambodia, Indonesia, Malaysia, Philippines, Singapore and Thailand are members of the Network of Central Banks and Supervisors for Greening the Financial System, which launched in 2017 to facilitate green investment and manage climate risk in the financial sector.

Although the divestment movement is increasingly driven

¹ See www.ngfs.net/en/about-us/membership.

by the economics of higher cost and higher risk attached to investment in coal, compared to renewable energy, an important factor has been the increasing pressure of civil society and other stakeholders to divest from coal-fired power plants and other fossil-fuel energy assets. This is due to the local and regional negative impacts on people's health and the environment as well as an increasing awareness of the substantial climate-related risks, which are increasingly translating into a reputational risk for those making such investments (Johnson and others, 2020). As an example, Samsung found investing in coal had damaged its brand and pledged to quit coal, although only after completing two more coal projects in South Korea and Vietnam (GCR, 2020; Lee, 2020).

The fossil fuel-divestment movement has been gaining pace globally, and pressure mounts to remove financial flows from fossil fuels. Awareness of the negative impacts of the fossil fuel industry on climate and the environment has influenced individuals and organizations to pressure institutions to divest. Investment trends in Southeast Asia have not been as strongly influenced by this movement because of a lower level of awareness of the climate-related risks as well as a lower level of transparency in investment decisions (Johnson and others, 2020).

It is important to understand differences in the region: India and the Philippines both have liberalized power markets, leading to more awareness among investors of the risk of stranded assets. A move away from investment plans in coal is already happening in India (but India still has plans for more than 60 GW, or 12 per cent of the global coal pipeline (Climate Analytics, 2021), which is increasing the risk of stranded assets, given the drop in demand (Climate Action Tracker, 2020b). The Philippines recently announced a moratorium on new coal plans. Other Southeast Asian countries, like Indonesia and Vietnam, have more state-dominated power markets and strong linkages between incumbent state-owned utilities, state-owned financial institutions and the government, leading to a smaller perception of risk for regional investors (Johnson and others, 2020).

The international divestment movement is fast gaining momentum and beginning to have an impact on Southeast Asia through international asset management firms. But it is not necessarily leading to a shift in investment in the

region in countries where, for example, there are barriers to investing in renewable energy in a suitable time frame (Johnson and others, 2020).

Civil society groups in the region focus on highlighting the role of governments in countries that are the prime sources of finance for fossil fuel investments in Southeast Asia, such as Japan (Urrutia, 2020). Small-scale, community-driven movements to enhance renewable energy and push against coal-fired power generation are also growing in the region (Marquardt and Delina, 2019).

How fast this movement has gained traction among governments and private sector is visible in the success of the Powering Past Coal Alliance, launched in 2017 by the Canadian and United Kingdom governments. In just a few years, the Powering Past Coal Alliance has grown to a total of 110 members, including 34 national governments, 33 subnational governments and 44

business organizations. Members agree to goals that are in line with the Paris Agreement, in particular to phasing out coal by 2030 in OECD countries and globally to reduce unabated coal-fired power generation by two thirds by 2030 and to phase it out by 2050. It also includes a moratorium on new unabated coal-fired power generation. All members also commit to supporting clean energy investment and restricting financing for unabated coal power. No Southeast Asian government has joined, although two provincial governments in the Philippines (Ilocos Norte and Negros Oriental) joined in 2019.

Southeast Asia energy systems at crossroads—Trends and projections

Southeast Asian governments continue to face a rapidly increasing energy demand, especially for electricity. The growing demand, due to population and economic

Figure 1: Electricity mix in Southeast Asia, 2010 and 2019

Source: IEA, 2020b.

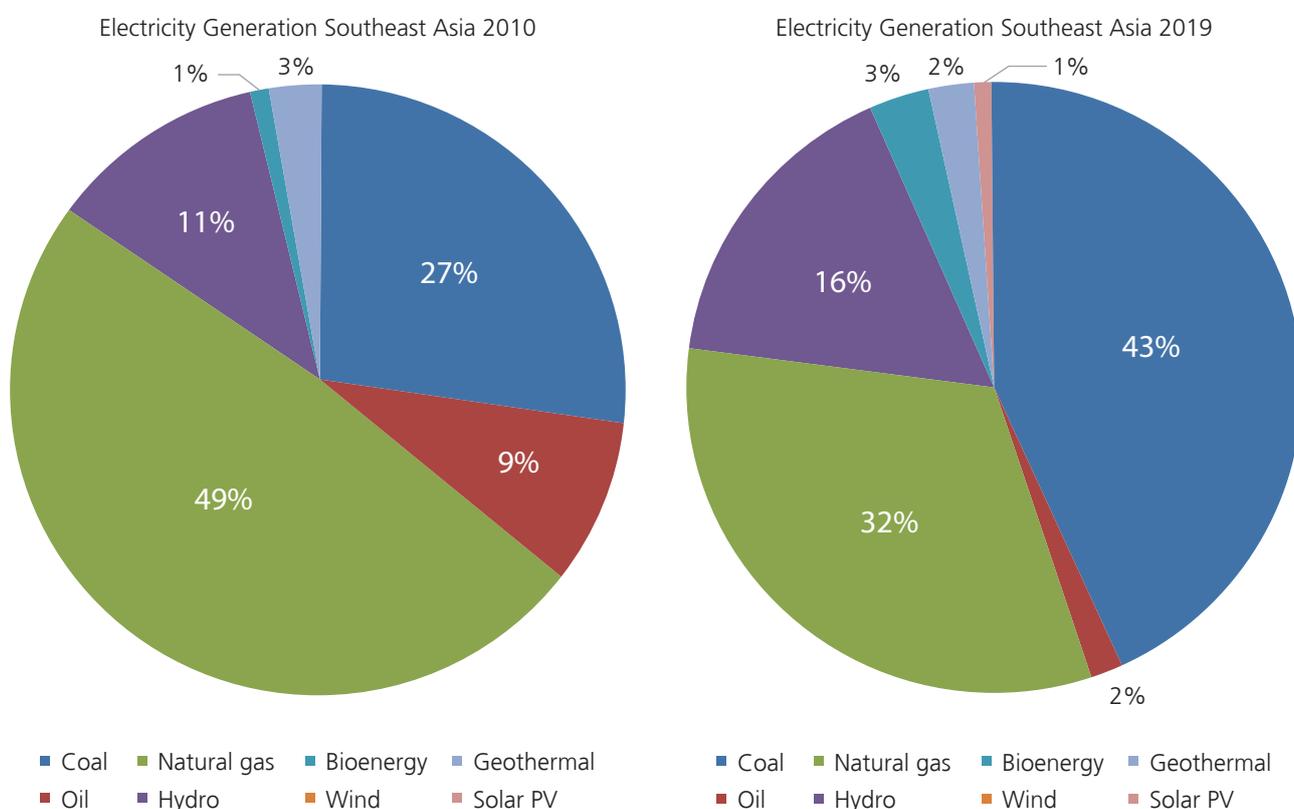
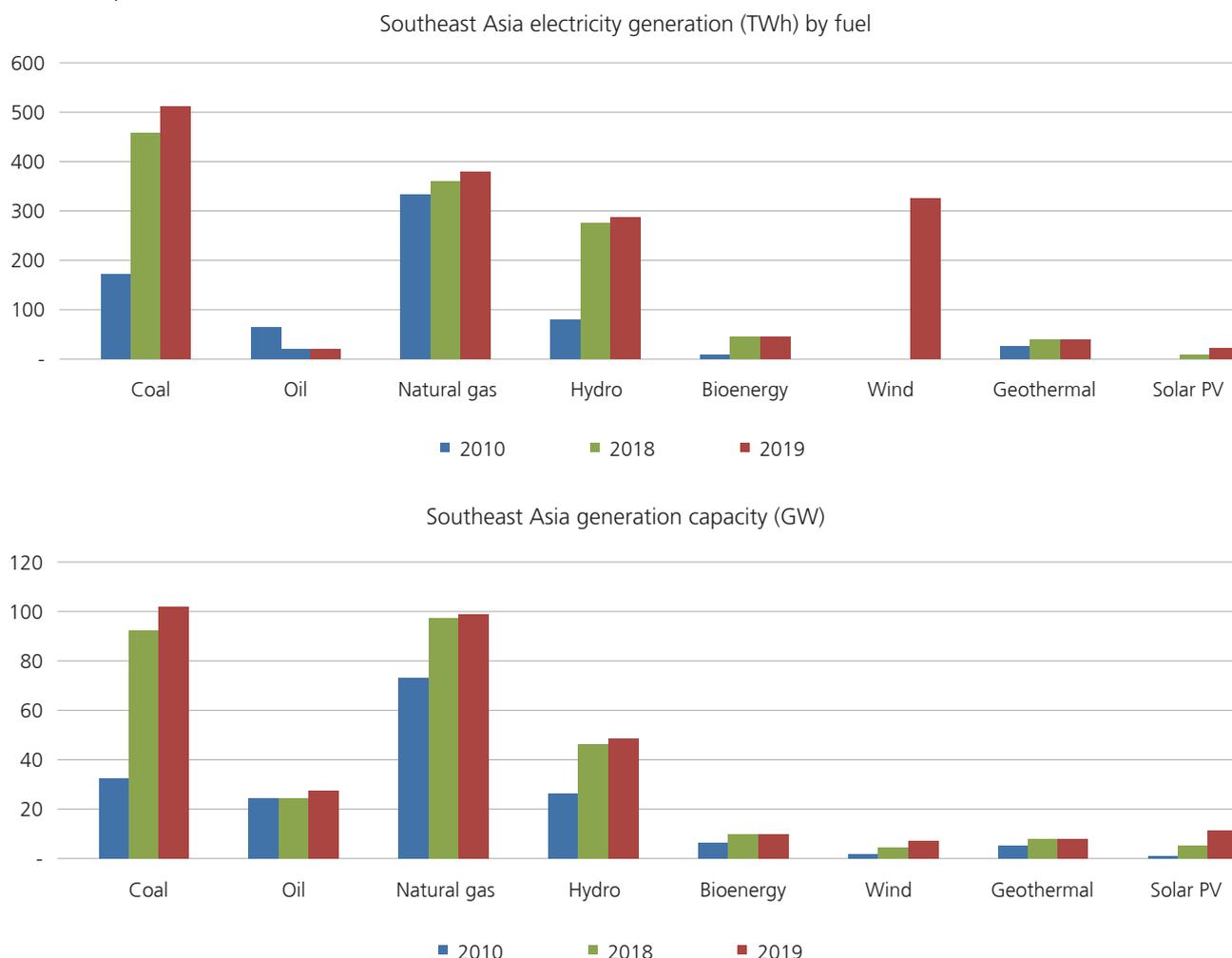


Figure 2: Growth in electricity generation (above) and capacity (below), by fuel in Southeast Asia

Source: IEA, 2020b.



growth, urbanization, and increasing access to electricity, has predominantly been met with fossil fuels and, to a large extent, with coal. Energy security is a priority for Southeast Asian countries, many of whom rely on fossil fuel imports, particularly oil (Fuentes and others, 2018). Apart from Indonesia, all Southeast Asian countries depend on imports of coal. Fossil fuel imports are increasingly risky due to their high degree of volatility in global energy markets, which was also visible recently as a result of the pandemic.

Southeast Asian electricity generation has seen large growth in the past decade, and the generation mix is dominated by fossil fuels. Total generation across the region has increased 73 per cent beyond the past decade (2010–2019) (IEA, 2020b). By 2019, fossil fuels

represented 77 per cent of the electricity generation mix (IEA, 2020b).

Coal is now the largest contributor to power generation, at 43 per cent of the mix. Renewable energy has a 23 per cent share of total generation (IEA, 2020b), mainly from hydropower, accounting for 16 per cent of the generation mix (IEA, 2020b). Other traditional renewable energy sources are bioenergy, at 3 per cent of total generation, and geothermal energy, at 2 per cent. The two sources that have the largest potential for expansion—solar and wind—contribute less than 1 per cent each to the mix in Southeast Asia (IEA, 2020b).

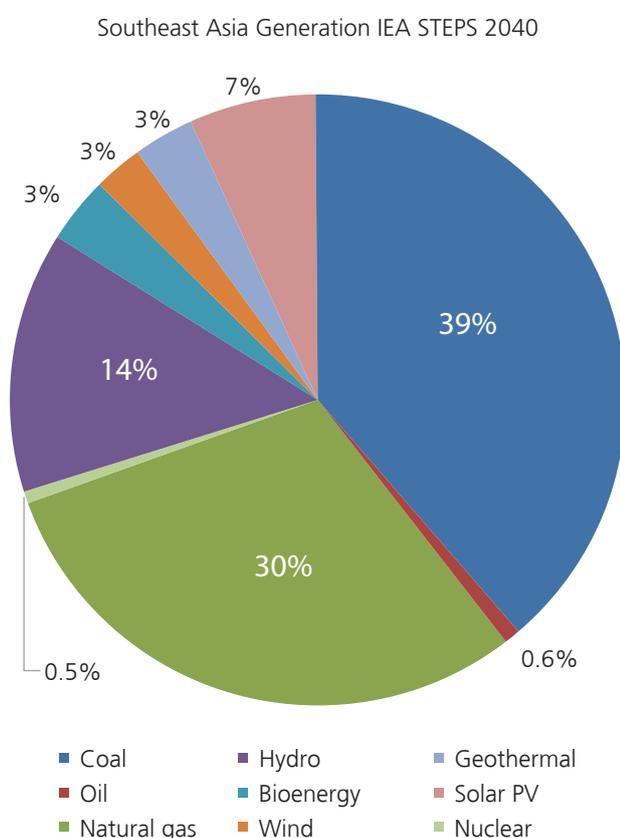
Around two thirds of the increase in generation from 2018 to 2019 in Southeast Asia was absorbed by additional

coal-fired power generation. Coal capacity has more than doubled since 2010, with an average 5 GW additional capacity every year and 6 GW in 2019. However, in 2019, more solar PV capacity was added (at 6.5 GW) than coal (at 6.1 GW).

The policy direction of the Southeast Asia region still follows a fossil fuel-intensive pathway. Under current policies, the electricity mix will see little change. Recent analysis by the International Energy Agency (IEA) provides regional scenario projections to 2040, based on policies announced in the region and incorporating the impact of coronavirus pandemic policy responses, assuming the pandemic will come under control in 2021 (IEA, 2020b). This Stated Policies Scenario (STEPS) includes stimulus packages announced to the mid-2020s. The scenario also assumes States will meet their Nationally Determined Contribution targets under the Paris Agreement (IEA, 2020b).

Figure 3: Electricity generation mix in Southeast Asia in 2040 in the IEA STEPS

Source: Authors' evaluations based on IEA, 2020b.



STEPS anticipates total electricity generation will double by 2040 (IEA, 2020b). By 2040, fossil fuels are projected to provide 70 per cent of total generation, with coal remaining the dominant fuel, at 39 per cent. Renewables will represent a 30 per cent share of total generation, again with hydropower accounting for the largest share (14 per cent).

These fossil fuel-heavy projections are optimistic in terms of the renewable energy share because the region's power development plans are not in line with targets (Fuentes and others, 2018). They are also not in line with ASEAN's original aspirational goal of 35 per cent renewable energy in its total primary energy supply by 2025. This goal implies a larger share of renewable energy in electricity, estimated at 35 per cent in the International Renewable Energy Agency's (IRENA) Renewable Energy Roadmaps scenario, which is more ambitious than the combined impact of national targets (Climate Analytics, 2019).

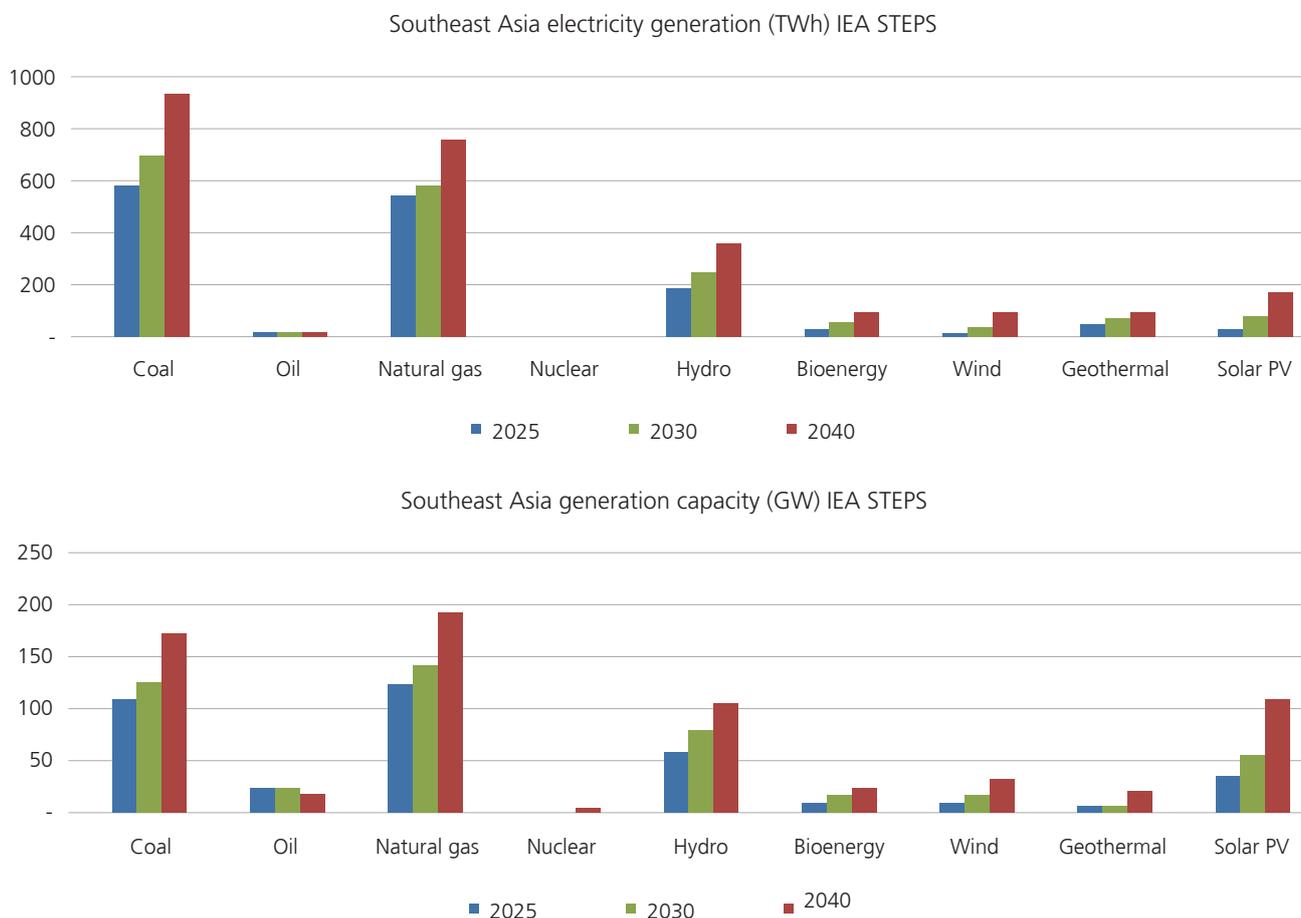
ASEAN energy ministers recently agreed to set a new target of 35 per cent renewable energy in installed power capacity by 2025, endorsing the ASEAN Plan of Action for Energy Cooperation Phase II: 2021–2025, with a subtheme of Accelerating Energy Transition and Strengthening Energy Resilience Through Greater Innovation and Cooperation (ACE, 2020; ASEAN, 2020).

Comparing the scenarios following planned policies or national targets, Southeast Asia would not achieve the share of 35 per cent of installed renewable energy capacity before 2030. And it would imply a smaller share of generation (only 25 per cent in the IEA STEPS in 2030), given the lower utilization rates, when compared to fossil fuel-fired power generation. The increase in capacity of hydropower in the scenarios reflects the large potential for this resource in the region (Figure 4). However, given that hydropower risks destroying natural habitats and can lead to additional methane emissions, there are recommendations to avoid adding more capacity when taking environmental impacts into account (Vidinopoulos and others, 2020).

Table 2 summarizes the results of this comparison and other scenarios for the region, in relation with the benchmarks outlined in the previous section. It also shows more ambitious scenarios developed by IEA—the

Figure 4: Growth in electricity generation (above) and capacity (below), by fuel in Southeast Asia

Source: IEA, 2020b.



IEA Sustainable Development Scenario, or SDS (2020b), the Asian–Pacific Economic Cooperation (APEC)—the 2 Degrees Scenario, or 2DC (2019) and IRENA—the Transforming Energy Scenario, or TES (2020b).

Although these goal scenarios claim to be in line with the Paris Agreement, they clearly do not achieve the benchmarks. An older IEA scenario with a different modelling approach, the IEA Energy Technology Perspectives' (ETP) Beyond 2°C scenario (B2DS) demonstrates a pathway close to the Paris Agreement under certain conditions (Climate Analytics, 2019; IEA, 2017). However, in the B2DS, renewables represent only 43 per cent of the electricity generation mix in 2030 in Southeast Asia and 81 per cent by 2050 (IEA, 2017).

Also shown are results of the 100 per cent renewable energy scenario developed by Energy Watch Group (EWG) with the Lappeenranta-Lahti University of Technology (LUT) model that was used to derive the renewable energy benchmarks outlined in table 1 for renewable energy.

Table 3 provides an overview of the scenarios evaluated in this section. They are described in more detail in Annex II.

While renewable energy, particularly solar and wind energy, is rapidly expanding across Southeast Asia, nuclear energy has no presence in this region but is still

Table 2: Comparison of scenarios for Southeast Asian coal and renewable shares of total electricity generation with Paris Agreement benchmarks

Source: IRENA, 2020b; APEC, 2019; IEA, 2017; IEA 2020b; EWG/LUT (Ram and others, 2019).

	Scenario	Percentage share of total electricity generation					
		2030		2040		2050	
		Renewables	Coal	Renewables	Coal	Renewables	Coal
Benchmark for Southeast Asia		50–85%	5–10%	80–98%	0%	90–100%	0%
Current Policy	APEC business as usual	24%	45%	24%	49%	25%	47%
Planned Policy Scenarios	IEA STEPS	25%	40%	30%	39%		
	APEC target	31%	39%	29%	45%	29%	45%
	IRENA PES	31%		34%		37%	
Goal Scenarios	IEA SDS	51%	19%	73%	3%		
	APEC 2DC	44%	26%	53%	10%	63%	11%
	IEA ETP B2DS	43%	8%			81%	(0)
	IRENA TES	53%		73%		85%	
	EWG/LUT 100% renewable energy	85%	7%	99%	0%	100%	0

Note: Scenario values that meet a Paris Agreement-consistent benchmark (see table 1) are in bold. See Annex II for descriptions of each scenario.

Table 3: Overview of scenario assumptions

Source: IRENA, 2020b; APEC, 2019; IEA, 2017; IEA 2020b; EWG/LUT (Ram and others, 2019).

Scenarios	Assumptions
Current or planned policy scenarios	
APEC business as usual	<ul style="list-style-type: none"> ■ Reflects current policies and trends
IEA STEPS	<ul style="list-style-type: none"> ■ Announced policies ■ Stimulus packages announced by mid-2020 ■ COVID-19 pandemic under control in 2021 ■ Nationally Determined Contributions will be achieved
APEC target	<ul style="list-style-type: none"> ■ APEC (including Southeast Asia) will achieve its goals <ul style="list-style-type: none"> ■ reduce regional energy intensity by 45% between 2005 and 2035 ■ double the share of renewables in the energy mix between 2010 and 2030
IRENA PES	<ul style="list-style-type: none"> ■ Based on current and planned policies, including Nationally Determined Contributions
Goal Scenarios	
IEA SDS	<ul style="list-style-type: none"> ■ Assumes Paris Agreement and sustainable development goals are met
APEC 2DC	<ul style="list-style-type: none"> ■ Assumes 50% chance of limiting global temperatures 2°C above preindustrial levels by 2050
ETP B2DS	<ul style="list-style-type: none"> ■ Reflects readily available technology and technology in the innovation pipeline ■ No technology breakthroughs assumed
IRENA TES	<ul style="list-style-type: none"> ■ Utilizing renewable energy and improving energy efficiency to ensure average global temperatures are below 2°C and aiming towards 1.5°C in this century
EWG/LUT	<ul style="list-style-type: none"> ■ High degree of renewables and storage technology, sector coupling through electrification of end-use sectors, achieving 100% renewable energy

Note: See Annex II for descriptions of each scenario.

assumed in many scenarios, such as in the IEA scenarios.

As discussed earlier, when introducing global benchmarks for coal use, some countries have promoted carbon capture and storage as an option to continue using fossil fuels and achieve greenhouse gas mitigation goals. But it is not deployed anywhere in the world in the power sector at commercial scale (see section 2.1). In Southeast Asia, there is no operational carbon capture and storage project linked to power generation, nor is anything in development. Globally, only two of the operating 21 facilities are linked to power stations, and one of them—the Petra Nova plant in the United States—was recently mothballed (Global CCS Institute, 2020; Wamsted and Schlissel, 2020).

An example of the prevalence of the narrative of so-called “clean coal” technologies that includes the use of carbon capture and storage is the recently adopted Phase II of the ASEAN Plan of Action for Energy Cooperation, 2021–2025 (ACE, 2020). Carbon capture and storage (or carbon capture, utilization and storage) is promoted as part of the “clean coal” technologies that form one of seven programme areas in that action plan.

Energy system scenarios, such as those published by IEA, typically underestimate the political, economic, social and technical feasibility of solar and wind energy and electricity storage technologies. These renewable and storage technologies have improved dramatically over recent years, with costs dropping rapidly and corresponding growth trajectories much faster than expected (IRENA, 2020b). These trends are expected to continue. There is strong evidence that nuclear energy and carbon capture and storage in the electricity sector have not experienced similar improvement. The costs of carbon capture and storage have not come down over the past decade, despite large funding efforts from some governments.

The IEA and APEC scenarios assume the development of nuclear energy (which has not been deployed in Southeast Asia) as well as the continued use of fossil fuels, for which they have to assume deployment of carbon capture and storage to reduce emissions from electricity generation. It is highly unlikely that this will actually happen. The adverse economics of carbon capture and storage power plants require them to operate at a capacity factor close to 90 per cent, which is increasingly unlikely due to pressure from cost-effective renewable energy options. Together with the benefits of renewable energy for sustainable development, this adverse cost trend makes carbon capture and storage technologies increasingly unable to compete with renewable energy and storage (Schaeffer and others, 2019).

Based on current policies, the electrification of transport is not making much progress in Southeast Asia, with the partial exception of two- and three-wheelers (IEA, 2019). Compared with other countries in Asia, such as China or India, there are no strong policies to support electric mobility, which would reduce air pollution and support the integration of greater shares of renewable energy. The success of the electrical vehicle policy, such as purchase subsidies and charging infrastructure in China, is demonstrated by the fact that 47 per cent of the global electric light-duty vehicle fleet and 80 per cent of fast chargers are found in China (IEA, 2020a). In Southeast Asia, only Indonesia, Malaysia and Thailand have electric car-deployment targets (IEA, 2020a).

Shifting investment from coal to renewable energy

Current investment environment: Trends and drivers in Southeast Asia

Globally, two thirds of coal is consumed for electricity generation (IEA, 2020b), and coal consumption for electricity was increasing up to 2019 but dropped in 2020. The Southeast Asia region is dominated by countries with expansion plans for coal-fired power generation, mostly from an already high current capacity (Indonesia, Philippines, Thailand and Vietnam). Two of these countries have expansion pipelines larger than their current capacity (Philippines and Vietnam—although the recently announced moratorium would change this for the Philippines), and some countries have low capacity but large expansion plans (Cambodia and the Lao People’s Democratic Republic).

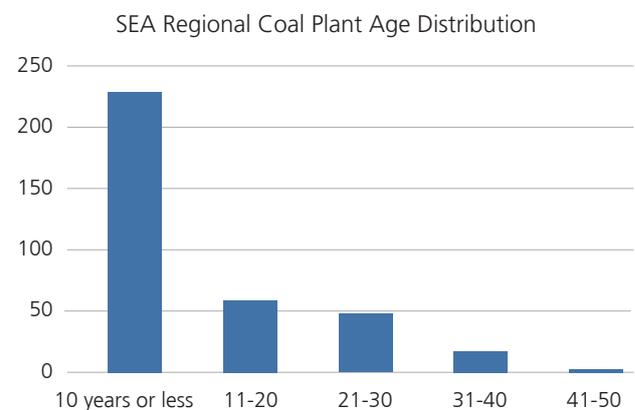
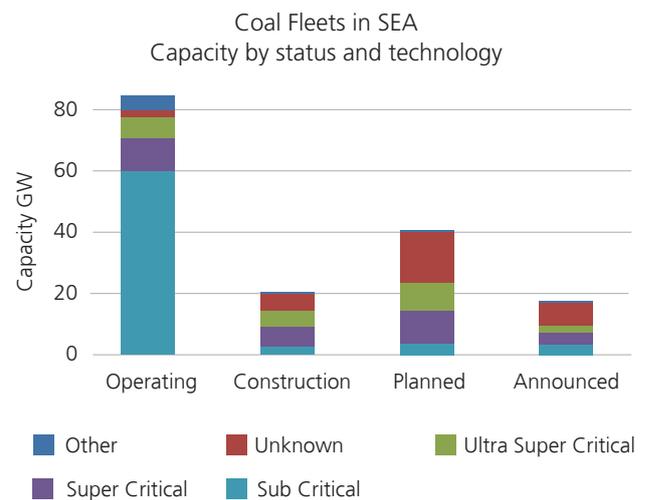
While Southeast Asia only has around 4 per cent of the global coal capacity, a full 15 per cent of the global coal pipeline (power plants in construction, planned and announced) is located in Southeast Asia. In contrast with the rest of the world, where coal-fired power generation dropped in 2019 before the COVID-19 pandemic, Southeast Asia recorded an increase of 12 per cent in coal-fired power generation in 2019, compared with 2018 (IEA, 2020b). Indonesia, Malaysia and the Philippines met higher electricity demand almost exclusively with coal (Buckley, 2020).

There are signs of a movement away from plans to increase coal capacity and generation. In 2020, the **Philippines** announced a moratorium on new coal, which could take a total of 10 GW of planned coal capacity out of the pipeline. Given the large number of relatively new coal-fired power plants, the Philippines’ challenge will be to plan for a transition to phase out existing coal generation before the end of the plants’ lifetime.

Vietnam saw a record increase in solar capacity in 2019 and the first half of 2020 and is moving towards plans to limit the development of coal and enhance the development of renewable energy (Chaturvedi, 2020). It takes a long time for developers to get their projects approved, however (Thoi, 2020).

Figure 5: Current coal fleet and pipeline in different stages of development (above) and age distribution of operating capacity (below) for countries in Southeast Asia

Source: Authors’ evaluation, based on data from *Global Energy Monitor*, 2020.



With the high growth in demand and the strong focus on fossil fuels, especially coal, as well as the strong and continuing support for it, the narrative of supposedly “cheap” coal and the need to provide “baseload power” to address the growing energy demand remain dominant in the region and are kept alive by vested interests largely favouring coal. Keeping prices low is an objective cited by those with strategic interests in preserving the dominant role of coal. Vietnam’s energy policy is largely reliant on political factors, such as the Communist Party’s need to assert power, and the influence of vested interests. There are complex political channels that connect the political support for coal: the political strategy for Party legitimacy and Vietnam’s

energy goals focusing on affordability, energy supply security, support for the domestic energy industry and environmental sustainability (Dorband and others, 2020).

In the case of **Indonesia**, another element is the importance of revenues from coal mining for regions and municipalities and a push towards more domestic use of coal—in light of expected downward trends in China and other export destinations (Fuentes and others, 2019; Fuentes and others, 2018). The state-owned utility PLN does not provide a level playing field in the market for renewable energy. It has a monopoly on transmission and distribution and controls the majority of power generation. The existing market structure favours coal with PLN, using capacity payments to incentivize private investment in new coal power capacity (Carbon Tracker Initiative, 2018). PLN is exposed to the risk of stranded assets and also faces a high risk by passing on costs to consumers to pay significantly more for electricity (Carbon Tracker Initiative, 2018). The financial sector is dominated by state-owned banks, which are important stakeholders (Healy and Marchand, 2019).

Inconsistent policy signals and targets and uncertainty regarding long-term goals as well as complex energy policy responsibilities within governments, coupled with a strong influence from state-owned enterprises such as utilities (see Fuentes and others, 2019 for Indonesia), are leading investors in Southeast Asia to hold back. This is in contrast with other regions, such as India.

These strong vested interests have led to a delay in developing the policies and energy plans needed to overcome the barriers to faster expansion and integration of larger shares of renewable energy, particularly solar and wind. For example, the need to develop transmission grids to accommodate renewable energy needs consistent long-term planning and policy support (Fuentes and others, 2019; Fuentes and others, 2018).

Governments or government-owned financial institutions or utilities in **China, Japan and South Korea** strongly support coal expansion in Southeast Asia, especially in Indonesia and Vietnam (Gençsü and others, 2019). However, there are signals of change,

including announcements that China, Japan and South Korea are adopting mid-century net-zero emissions goals.

It is useful to compare policies and their impacts with those adopted by **India**: While the country still relies strongly on coal for power generation, coal-fired power generation has decreased, and the pipeline is also shrinking. With strong policies and ambitious targets to enhance renewable energy uptake, including addressing barriers such as the need to develop transmission infrastructure, has led to renewable energy costs dropping faster than in Southeast Asia. And there is now potential for India to move away from coal faster.

India has ambitious targets to increase renewable energy capacity to 435 GW by 2030. This would lead to a non-fossil fuel share in installed capacity of 64 per cent by 2030, way over India's Nationally Determined Contributions target of 40 per cent renewable energy capacity. However, India is also an example of ambivalent policies: Although no new coal-fired power plants were built in 2020, the government is still actively encouraging more coal mining and increased coal production, which is inconsistent with a green recovery. India also continues to support coal expansion in Southeast Asian countries. So, while there is potential for India to become a regional leader building on its targets and policies to expand renewable energy, it still lacks consistent development of a just and swift transition away from coal as well as enhanced Nationally Determined Contributions in line with the Paris Agreement (Climate Action Tracker, 2020b).

By contrast, there is no sign of change in this direction in Indonesia. The country is also an example of the strong role of state-owned enterprises and their influence on the political economy and support for coal, including through investments by state-owned coal mining and coal-fired power companies (Gençsü and others, 2019; SEI and others, 2019).

As one of the world's major coal-exporting countries, Indonesia supports its coal mining and production industry with a range of subsidies and public finance (Gençsü and others, 2019; SEI and others, 2019). It is also one of only a handful of countries to have started

new coal plant construction in 2020 and plans to add 27 GW of coal-fired power by 2028 (Climate Action Tracker, 2020d). In July 2020, a syndicate of banks funded the Jawa 9 and 10 Indonesian coal plants (Market Forces, 2020), with banks from China, Malaysia, Singapore, South Korea as well as Indonesia among the lenders.

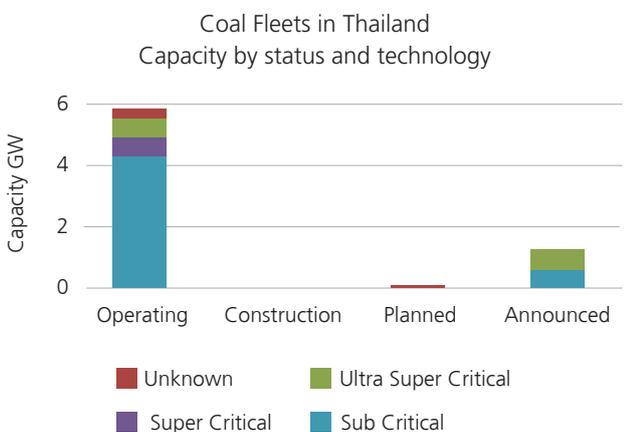
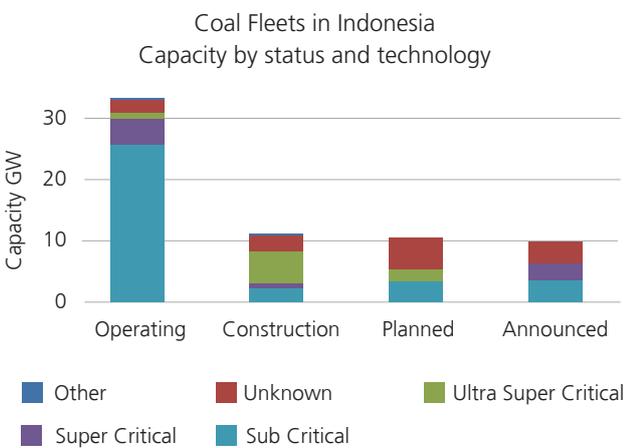
There is a risk that economic recovery efforts as a result of the coronavirus pandemic may push Indonesia towards further fossil fuel investment, risking even more stranded assets. So far, Indonesia has not initiated any green measures in its economic recovery stimulus policy but has bailed out the state-owned utility company PLN without conditions (Climate Action Tracker, 2020d). Most scenarios find that fossil fuels will maintain a large portion of Indonesia’s power mix (Fuentes and others, 2019).

Thailand is another fossil fuel-dominated economy but is more reliant on gas than coal. Fossil fuels represented 86 per cent of the power generation in 2016, with 21 per cent coal and 65 per cent gas. Most of the renewable energy share, at 14 per cent, comes from bioenergy (9 per cent) and hydro (4 per cent), with a share of 2 per cent of solar energy (APEC, 2019). There are strong ties between the government and the gas industry, with the government owning 51 per cent of the dominant player in the industry, PTT, which controls the gas pipeline system and other fossil fuel interests (Greenpeace, 2020).

A 2016 announcement by the Energy Regulatory Commission halted new ground-mounted solar and wind power from connecting to the grid (Greenpeace, 2020). Thailand has feed-in tariffs, auctions and community power programmes with little transparency over prices, and the COVID-19 recovery response included no solar or wind plans (Greenpeace, 2020). A new power development plan, approved in 2019, reduces the goal for coal and increases the 2027 goal for renewable energy (The Diplomat, 2019). The Electricity Generating Authority, the system operator, focuses on coal and gas and the narrative of the need for fossil fuel baseload power.

Both the type and location of investment are critical to meeting demand. Some locations have more than ample electricity reserve capacity, whereas other areas do not have electricity access to meet basic needs (IEA, 2019). For example, Central and East Java in Indonesia have huge reserve margins, more than enough to meet demand (IEA, 2019). Malaysia is set to boost its reserve margin past 40 per cent, which is beyond the peak power demand levels reached at the end of 2020 (Kaur, 2020).

Figure 6: Coal fleets in Indonesia and Thailand
 Source: Authors’ evaluation, based on data from Global Energy Monitor, 2020.



Sources of Finance

Coal-fired power generation in Southeast Asia is heavily subsidized, both through public finance from abroad as well as domestically. This creates an uneven playing field and therefore a barrier for faster expansion of renewable energy.

Public finance from China, Japan and South Korea has been an important source of funding for coal capacity in the region. Governments or government-owned financial institutions or utilities in these three countries are strongly supporting coal expansion in the Asia–Pacific region, with countries in Southeast Asia and South Asia the main recipients of this support (Gençsü and others, 2019).

Indonesia and Vietnam receive the largest financial support from public finance (in the form of loans, insurance or guarantees) from foreign countries for global coal capacity, with 16.4 GW in Indonesia (almost half of operating capacity), 14.6 GW in Vietnam (about three quarters of operating capacity) and 1.2 GW in the Philippines (about 10 per cent of operating capacity).

This is supported with public finance from public institutions in China, Japan and South Korea, such as export credit agencies, government-backed insurers, bilateral development banks and state-owned enterprises involved in overseas coal projects (EndCoal, 2020a). EndCoal (2020a) also identified public finance from these three countries as the main sources for large-capacity volumes of upcoming coal projects in the pipeline: 12.8 GW in Vietnam and 8.1 GW in Indonesia, with a smaller volume of about 1 GW in the Philippines financed through publicly funded institutions, mostly from China, Japan and South Korea.

In Indonesia, the export credit agencies JBIC and CEXIM loaned 45 per cent of the total debt to coal projects, while bilateral development banks provided 19 per cent between 2010 and 2017 for debt finance to 21 coal projects. Indonesian banks only provided 2 per cent to coal projects (Healy and Marchand, 2019).

Gençsü and others (2019) identified China and Japan as the largest sources of public finance for coal within the Group of 20 countries, with \$9.5 billion and \$5.2 billion of financing identified per year, respectively. All of the public financing in these two countries went to international projects. Also providing public financing for coal abroad are South Korea (\$1.1 billion per year) and India (\$800 million per year). Most of the public finance identified in China and Japan and all of the international public finance identified in South Korea and India were

for coal-fired power. The recipient countries are in South and Southeast Asia, with most of the financing going to Indonesia and Vietnam.

This model of foreign public finance has been applied for large-scale hydropower but not for renewable energy. It is a form of subsidy that creates an uneven playing field for renewable energy as well as debt and risk that ultimately must be borne by the population in these countries.

Subsidies have been key to incentivizing investment in coal-fired power generation. Coal producing countries, such as Australia, India and Indonesia, support their coal production sector. Indonesia also provides significant fiscal support for domestic coal use for power generation, and these subsidies are a major source of financing for coal (Gençsü and others, 2019). Subsidies are also applied to coal-consuming countries and their state-owned enterprises. For example, in Vietnam, domestic coal prices are 30 per cent lower than import prices in 2015 because the Ministry of Energy and Vinacomin mining company keep the prices artificially low through subsidies (Dorband and others, 2020).

Multilateral development banks are regional players in relation to investment and financial flows. A recent study on six banks active in the region found they are not making enough progress on their pledge to align with the Paris Agreement (E3G, 2019), and it highlighted fossil fuel exclusion policies as one area of work still needing improvement.

How can the trend be reversed and transition to 100 per cent renewable energy?

Southeast Asia has vast, largely untapped renewable energy resources (Climate Analytics, 2021; Vidinopoulos and others, 2020). It traditionally has relied significantly on large hydro and biomass resources and, in Indonesia and the Philippines, geothermal energy. But the region has lagged behind other regions in tapping into its resources for solar and wind.

Investment in renewables can come from either the public or private sector or public–private partnerships.

To date, large-scale renewable plants, particularly geothermal and hydro, have been predominantly funded with public finance because they require considerable upfront capital (IEA, 2019). Solar and wind have relied on private sector finance supported by policy incentives (IEA, 2019).

The Energy Watch Group scenario study shows a pathway for a high degree of renewable energy across the world, including Southeast Asia, moving towards 100 per cent renewable energy. It shows renewable energy can represent 85 per cent by 2030, and 100 per cent by 2050 in Southeast Asia, with solar PV and wind comprising 96 per cent of total generation in 2050 (Ram and others, 2019). This study looked into Southeast Asia connecting with Australia and New Zealand, taking advantage of complementary resources of solar and

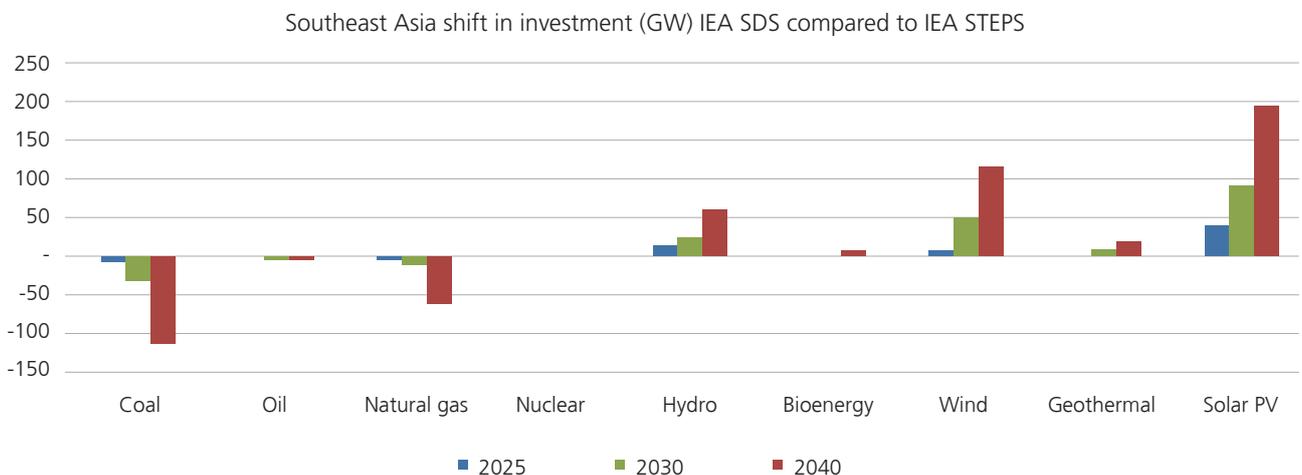
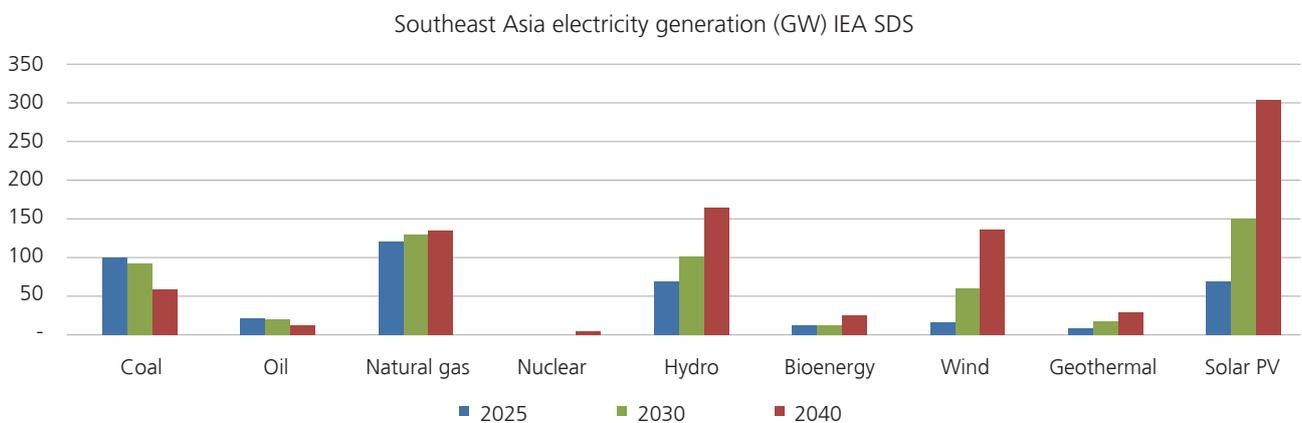
wind through a large, interconnected region. The study was used to develop the Paris Agreement benchmarks for renewable energy shown in table 1. We have summarized characteristics in comparison to projections based on current policies and targets in table 2.

In Section 2, we highlight a global scenario—the IRENA TES, which shows an increase in the share of renewable energy by 2030 at the lower end of the range compatible with the Paris Agreement benchmarks. We characterize the IEA SDS as not consistent with the Paris Agreement, although the increase in share of renewable energy by 2030 is consistent with the lower end of the benchmark.

In this section, we show the implications for the need to shift investments over the next decade or so to move towards a pathway consistent with the Paris

Figure 7: Generation capacity, by technology in Southeast Asia in the IEA SDS (above) and compared with the STEPS

Source: Source: Author's evaluation based on IEA 2020b.



Agreement. This builds on the analysis of the need to ramp up capacity of solar and wind energy as well as grid infrastructure.

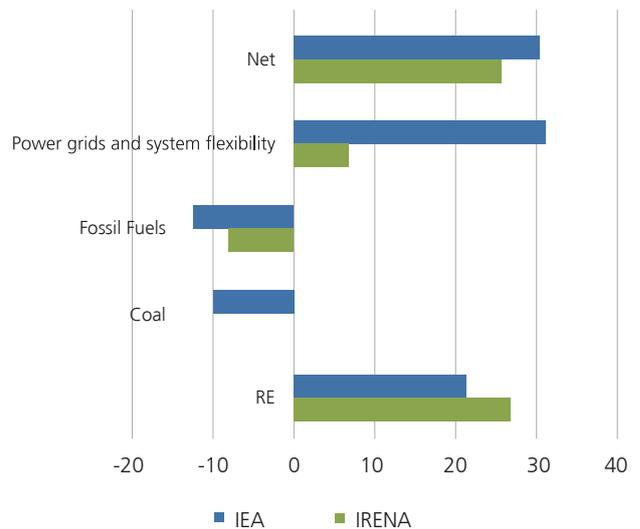
Comparing capacity additions and changes as well as average investment into capacity by fuel, we find that to get onto a pathway to Paris Agreement-consistent benchmarks, investments into solar and wind need to accelerate, accompanied by divestment away from fossil fuels (compared with current and planned investment flows).

The comparison of the IEA SDS with STEPS underscores the need for a substantial divestment away from fossil fuels by 2030, particularly coal, with an accelerated investment into renewable energy, mainly solar and wind (figure 7). Note that this would only be consistent at the lower end of the range for the benchmark for renewable energy uptake and not consistent in relation to coal capacity because coal-fired power generation would need to be phased out by 2040. The IRENA TES scenario is similar overall in terms of renewable energy growth by 2030. However, it is a little less ambitious than the IEA SDS, especially for wind, and projects more uptake of bioenergy and less hydro than the IEA scenario.

The EWG/LUT scenario shows a more aggressive growth of investment into solar energy than the IEA and IRENA scenarios, with no substantial increase in hydro. Applying the EWG/LUT growth rates to the Southeast Asia region would imply adding, on average, 19 GW a year by 2025 and 48 GW per annum by 2030 of solar, and 3 GW and 1 GW a year, respectively, for wind. For the IEA SDS, the values are 10 GW and 15 GW for solar a year by 2025

Figure 8: Shift in investment from fossil fuel to renewable energy and overall increase in investment in US\$ billion per annum in IEA (SDS compared with STEPS) and IRENA (TES compared with PES) scenarios

Source: Authors' evaluation based on data from (IEA, 2020b) and (IRENA, 2020b). IRENA does not provide a breakdown for fossil fuels.



and by 2030, and 3 GW and 9 GW for wind, respectively. This compares with an increase in solar energy capacity of only around 5 GW in Vietnam in 2019. Divestment from coal would start immediately, with 20 per cent of capacity retired by 2030. This would require a radical shift from current policy but would avoid increasing the risk of stranded assets from investment patterns.

Importantly, energy-transition scenarios in general indicate an increase in overall investment, including investment into power grids, transmission lines and grid flexibility measures to integrate larger shares of variable renewable energy.

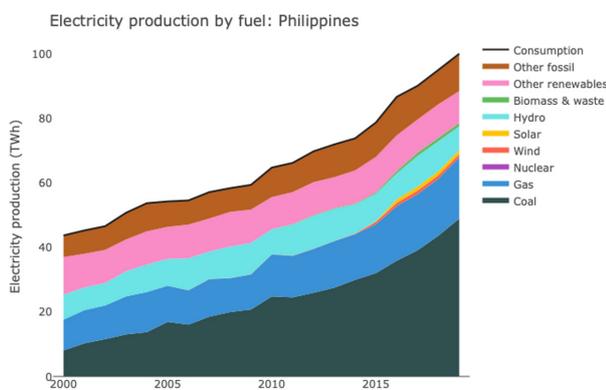
Deep dive—the Philippines

Current investment plans and financial flows

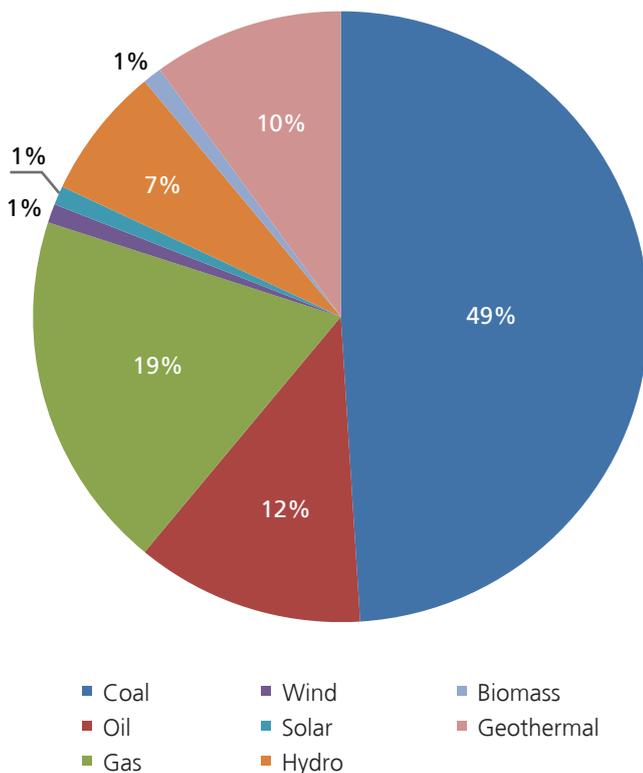
In 2019, the Philippines' electricity generation mix was 76 per cent fossil fuel, with near 50 per cent coal-fired power generation and 21 per cent renewables, consisting mainly of geothermal (10 per cent) and hydro (7 per cent) sources (Ember, 2020).

Figure 9: Electricity generation, by fuel (above) and mix, in the Philippines, 2019

Source: Ember, 2020.



Philippines Electricity Mix 2019

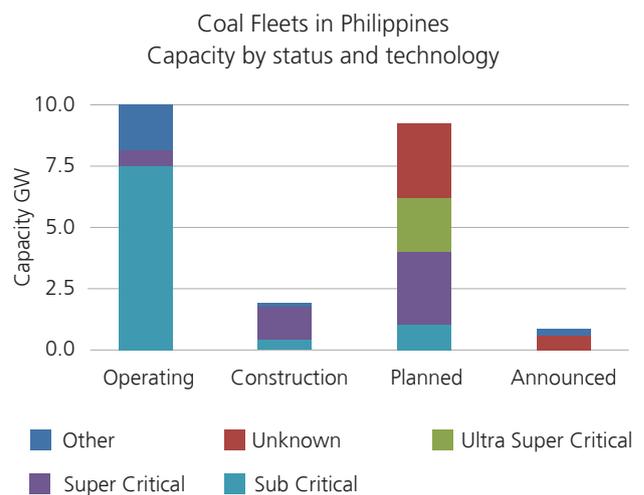


Under the APEC business-as-usual scenario, by 2050, fossil fuels will represent an 80 per cent share in the power mix, with 65 per cent of the total mix from coal and 20 per cent renewables (mainly hydro, solar, bioenergy and geothermal). However, the new coal moratorium will likely cancel 8–10 GW of its coal pipeline plans (Climate Action Tracker, 2020e). The new Philippine Energy Plan indicates that the draft National Energy Renewable Program, 2020–2040 (NERP) will have a larger uptake of renewables than the previous programme (DOE, 2020a).

Highly dependent on fossil fuels (figure 9), the Philippines is showing positive policy developments that may shift investment away from coal, particularly in light of the recently announced moratorium on new coal and with new renewable energy measures. The huge increase in coal for power plants requires imports and undermines the country's self-sufficiency. The Philippines is in the process of revising its Nationally Determined Contributions and is at a critical point in which decisions can change the course and potentially transition the economy away from coal.

Figure 8: Coal Fleet in the Philippines

Source: Authors' Evaluation, based on data from Global Energy Monitor, 2020.



In the Philippines, coal power projects are largely financed by domestic commercial banks, which tend to be technology neutral and invest both into fossil fuel and renewable energy projects (Healy and Marchand, 2019). The lower bankability of renewable energy projects is a

major barrier for renewable energy investors. As a result, there are investments in both low and high carbon energy.

The new Philippine Energy Plan forecasts a much larger uptake of solar energy, in comparison with the present NREP, which targets 285 MW of total installed solar capacity by 2030. The Energy Plan estimates 11.3 GW by 2030 (DOE, 2020a; Climate Change Commission, 2012).

A series of reforms are under way to create a more competitive electricity market that favours renewable energy, including new renewable market rules, under which renewable auctions will take place, and a carve-out clause allowing utilities to curtail coal-fired power generation (Climate Action Tracker, 2020e).

Recent developments in the energy sector remain contradictory, however. The new Energy Plan does not include the moratorium on new coal-fired power plants announced in October 2020. Based on this announcement, coal-fired power plants would no longer receive permits from the Department of Energy, putting the country's massive coal pipeline into question (Ahmed and Brown, 2020; DOE, 2020b).

Energy Secretary Alfonso Cusi has clarified that the moratorium will only cover yet-to-be-proposed coal projects. Therefore, the huge coal pipeline may remain (Velasco, 2020). The Department of Energy has not yet issued any policy nor legal documents on this matter. But if the coal moratorium included committed and indicative coal plans, the new policy could attract more than \$30 billion in renewable energy investments over the next 10 years (Ahmed and Brown, 2020).

Based on the recent Energy Plan, coal will remain the dominant energy source until 2040. The Department of Energy projects a coal share of 55 per cent by 2040 under the reference scenario and 33 per cent by 2040 under a clean energy scenario (DOE, 2020a). It remains to be seen whether this coal moratorium will translate into an actual shift within the Department of Energy's own strategic energy planning.

Several regulations supporting further uptake of renewables are under discussion or have been approved. For example, the Department of Energy has established

a framework for energy storage and off-grid power development (DOE, 2019c; 2019d). The draft circular on Green Energy Tariff Programme outlines plans for technology and location-specific renewable auctions. These developments are expected to promote real competition in the country's power market (IEEFA, 2020).

Meralco, the country's largest electricity utility, included a clause in its power purchase agreements in 2020 that allows for curtailment of coal power amid lower demand caused by the COVID-19 pandemic (Ahmed and Dalusung, 2020).

Recent plans to expand the role of gas in the system by building terminals to import natural gas (Plante and others, 2020) do not contribute to the country's energy independence and would lock in large-scale fossil fuel infrastructure. This would become a barrier to moving to zero-emissions power generation (Ahmed, 2020).

Coal use has led to an inflexible power supply and added to the national trade deficit, exacerbated further as electricity demand dropped due to the pandemic (Ahmed, 2020). The government has recognized the co-benefits of renewables relating to employment and energy independence (Ahmed, 2020; Ahmed and Brown, 2020; DOE, 2020b). Recently, communities also raised concerns, leading to slower coal development (Chavez, 2020; EndCoal, 2020b).

The Philippines has installed around 4.6 GW of coal-fired power capacity since 2015. There were 1.9 GW of new coal-fired power plants under construction and 10.1 GW in the pipeline by July 2020 (EndCoal, 2020a). Following these pipeline plans, coal capacity could more than double from the 2020 levels if and once all planned capacity comes online. Coal expansion plans risk stranded assets worth \$20.8 billion. Risks also are arising from overcapacity, increased regulations and taxes and competitive alternatives, such as renewables and gas (IEEFA and ICSC, 2017).

There have been recent positive renewable energy developments, some approved in 2019, and some under discussion. The NREP 2020–2040, for instance, is still in draft development (DOE, 2020a).

The Green Energy Option Program was improved to allow consumers to choose their renewable energy provider. The Net-Metering Program intends to encourage active participation of consumers in power generation. It aims to make the process clear for end users, renewable energy suppliers and network service providers to support consumer choices (DOE, 2019b and 2019e).

A feed-in tariff has been in place since 2010, relevant for solar, wind, biomass and small hydropower. The net metering scheme has been in place since 2013 for small generators up to 100 kW, and the renewable portfolio standard began in 2017 (Climate Action Tracker, 2020e). Yet, there is still slow progress, and only 1.9 GW of renewable energy capacity was installed between 2010 and 2018 (IRENA, 2020a).

The renewable energy share is declining in power generation as fossil fuel growth, especially coal, outpaces renewables growth (Climate Action Tracker, 2020e). The Philippine Energy Plan 2018–2040 indicates the draft NREP has a target of more than 30 GW renewable installed capacity by 2040, compared to the present NREP target of 20 GW by 2040 (DOE, 2020a).

Stakeholders and investment environment

The Philippines has a liberalized electricity market, with a wholesale electricity spot market and unbundled generation, and wholesale and distribution markets, with a privatized National Power Corporation (Carbon Tracker Initiative, 2018). The majority of existing coal plants are owned by independent power producers and privatized National Power Corporation companies. These large private conglomerates are influential in the energy sector (Greenpeace, 2020). Investors are shielded from price fluctuations because they can automatically pass-through fuel costs (Carbon Tracker Initiative, 2018), but recent developments introduced the option of curtailment to protect consumers.

The Philippines largely depends on imported coal, mostly from Indonesia. The reliance on long-term guaranteed contracts exposes residential and commercial consumers to some of the highest prices in Asia and shields both the power and the financial sector from the risk (Ahmed,

2020). However, the COVID-19 pandemic has exposed the weakness of this system, with unexpected demand reductions, volatility of prices and logistical constraints on the delivery of imported coal.

Important stakeholders are the Department of Energy and the Energy Regulatory Commission for regulation and market design. Utilities such as MERALCO could take decisions to move away from coal.

There are approximately 121 electric cooperatives in the Philippines serving more than 56 million people. In comparison with the large conglomerates, they are small players with less negotiation power and are member-owned not-for-profit entities (Ahmed, 2020). One of the larger cooperatives, the Benguet Electric Cooperative, has more access to resources and plans to build three hydro facilities with a total capacity of 33 MW (Energy Central, 2020).

Between 2009 and 2019, 15 national banks directed at least \$12 billion to coal developers and coal power plants. Half of the funds came from the Bank of the Philippine Islands and Banco De Oro Unibank. Other power stations faced similar resistance and delayed coal power plant development (Urgewald, 2020).

The Atimonan Power Station has commenced coal-fired power plant preconstruction activities in Quezon Province. Funders of the project are local and international, including ESB International, the World Bank through RCBC (a Philippine local bank), the Bank of the Philippine Islands and the Philippine National Bank. The project is not yet bankable because it has not secured a power supply agreement. A series of delays, in part related to resistance from communities and civil society organizations, has resulted in losses for the investors (Urgewald, 2020).

Pressure from civil society organizations and community groups are making an impact on the recent shift in the policy landscape. For example, the proposed Atimonan Power Station has been a site of contention since its inception (Urgewald, 2020). Local residents note that it was first proposed as a liquefied natural gas facility, and plans changed to a coal-fired power plant without public consultation. The project has generated strong local opposition and has faced issues related to displacement

of communities, environmental violations and public information non-compliance.

Local government units are also important stakeholders influencing policies, and, supported by environmental advocates and campaigns against coal power plants, some have issued executive orders declaring provinces to be coal-free, such as Ilocos Norte, Guimaras, Sorsogon, Negros Oriental, Masbate, Negros Occidental, San Juan and La Union (Perez, 2019).

Instrumental to the community pressure to shift from fossil fuels to renewables is the Power for People Coalition. It comprises communities, power consumers, religious groups and environmental and climate campaigners. The aim of the group is to transform the electricity sector in light of the high prices, need for electrification and in opposition to the high uptake of fossil fuels (Urgewald, 2020). Given the liberalized market, on one hand, but the strong influence of large private conglomerates on the other and the visible impact of current policies on consumers and taxpayers ultimately paying the bill, these—consumers and communities across the country including those still in need of clean energy—are important stakeholders to engage in the move to shifting investments to clean energy (Ahmed, 2017).

How can the trend be reversed away from fossil fuels?

The Philippines has significant varied renewable energy potential, which, apart from solar, wind and bioenergy, includes geothermal energy. A recent study identified 25 geographic areas with large concentrations of cost-effective renewable energy and strong private developer interest, with an estimated total capacity of 808 GW (Lee and others, 2020).

Peak demand in 2019 was recorded as less than 16 GW (DOE, 2019a). Just a small proportion of the renewable potential could meet the Philippines' power demand, even when including off-grid demand, because renewables offer solutions for remote locations. Renewable energy is ideal for the energy needs of the country, including the need to provide access to clean and affordable electricity, because small islands are more suitable for decentralized renewable electricity than centralized fossil fuel-based generation, which would require substantial grid investments.

The national circumstances of the Philippines make it clear there is a competitive advantage with decentralized, carbon-free and flexible renewable energy than with centralized and polluting coal. It would improve energy access in remote areas and isolated islands and

Table 4: Comparison of scenarios for the Philippines, fossil fuel and renewable energy share of total electricity generation

Source: APERC, 2019; EWG/LUT (Ram and others, 2019).

	Scenario	Percentage share of total electricity generation					
		2030		2040		2050	
		Renewables (solar,wind)	Fossil Fuels (coal)	Renewables (solar,wind)	Fossil Fuels (coal)	Renewables (solar,wind)	Fossil Fuels (coal)
Current policy and target scenarios	APEC business as usual	25 (1, 1)	76 (48)	24 (4,1)	76 (62)	20 (4,1)	80 (65)
	APEC target	31 (6,4)	69 (52)	32 (6,4)	68 (60)	28 (6,4)	72 (62)
Goal scenario	APEC 2DC	38 (9,9)	62 (25)	60 (12,26)	40 (10)	71 (12,35)	29 (0)
	EWG/LUT	89 (60,0)	11 (11)	100 (80,0)	0 (0)	100 (90,1)	0 (0)

create local employment opportunities. A transition to renewable energy could contribute to reducing energy security concerns and public expenditures on fossil fuel imports, thus freeing up resources for other investments. The increasing reliance on fossil fuel imports comes at considerable cost—in 2017, 3.5 per cent of the country's gross domestic product, or \$11 billion, was spent on fuel imports (Fuentes and others, 2019a).

Under the APEC target scenario based on current policy and targets, fossil fuels cover 72 per cent of the power mix (mainly coal, at 62 per cent) and renewables, at 28 per cent in 2050, with coal capacity increasing. The 2DC scenario, which is inconsistent with the Paris Agreement benchmarks, phases out coal entirely by 2050, with gas representing 29 per cent of the mix and 71 per cent renewables in 2050. Wind has the largest role, at 35 per cent of total generation, followed by 12 per cent for solar, 10 per cent for hydro, 9 per cent for geothermal and 7 per cent for bioenergy (with some carbon capture and storage). Renewable energy reaches a share of 38 per cent in 2030 (9 per cent for solar and wind each). Coal would still have 10 per cent in 2040.

The coal moratorium is already a big step forward but needs to be complemented with a transition plan for phasing out existing coal plant use by 2040 to be consistent with the Paris Agreement.

The EWG/LUT modelling for the Philippines shows a pathway to 100 per cent renewable energy by 2050 mainly relying on solar PV (more than 50 per cent in 2030) and battery storage, with around 5 GW solar installed yearly by 2030 and investment starting with small-scale (prosumer) battery storage and from 2030 also in large-scale battery storage (Ram and others, 2017). A more recent study by the same modelling team found that the Philippines can reach 100 per cent renewable energy by 2040, primarily through solar PV (80 per cent), with 13 per cent biomass or waste and 2 per cent from other forms

of renewables (Ram and others, 2019) (table 4). This scenario phases out gas and oil in electricity generation by 2030, demonstrating gas is not needed to transition to renewables and casting doubt on the viability of the large investments in gas infrastructure now in development. The coal phase-out is accelerated to near zero by 2035 and remains at less than 1 per cent from 2035 onwards, reaching zero coal by 2050.

Reaching the 100 per cent renewable energy scenario requires investment in renewables and a rapid phase-out of fossil fuels. By 2030, the total installed capacity can reach 54 GW of solar from utility solar and PV prosumers. By 2050, solar would need to be ramped up to 132 GW and onshore wind power would need to reach 2 GW, without any offshore wind in the scenario (Ram and others, 2017).

A World Bank study found there are reasonable offshore wind resources in the Philippines, with the technical potential for 178 GW, at 18 GW fixed and 160 GW floating (World Bank, 2019). The most promising locations are near the Manila demand centre for floating wind. The Philippines could benefit from offshore wind market regional development synergies with Indonesia, Taiwan and Vietnam.

While relevant for all countries in the region, the Philippines can particularly benefit from embedding the development of such a transition into a strategy towards modernization and enhanced resilience (Ahmed, 2017) of the energy system and communities particularly vulnerable to climate change disasters as well as to the COVID-19 pandemic and the weaknesses it has exposed.

Deep dive—Vietnam

Investment plans and financial flows

Vietnam’s power generation grew by 35 per cent between 2015 and 2019 to address the 10 per cent annual increase in demand. With increasing investment in solar energy, power capacity grew even more, by 42 per cent between 2015 and 2019, to 55 GW in 2019, given the lower capacity factors for renewable energy (Breu and others, 2019).

Vietnam has a good track record relative to its South and Southeast Asian peers, with electrification having reached 100 per cent. Vietnam’s electricity generation is increasingly fossil fuel-heavy, however, and policies and plans show this will continue into the future, despite recent movements focusing more on renewable energy (Climate Action Tracker, 2020f).

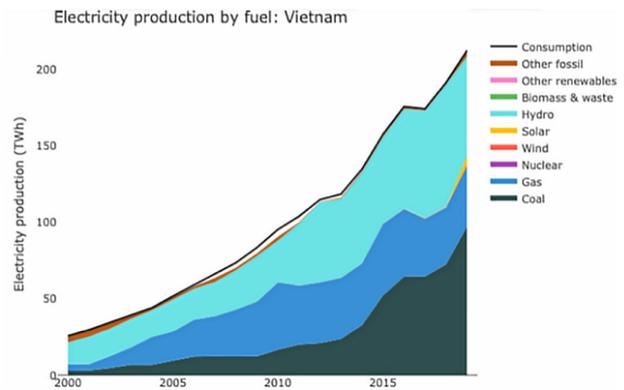
Fossil fuels represented about two thirds of Vietnam’s power mix in 2019, with 46 per cent coal and 19 per cent gas. Until recently, hydro was the only significant renewable source, with a share of 31 per cent (Ember, 2020). Installed solar capacity increased from negligible levels in 2017 to more than 5 GW by 2019, and Vietnam is meeting its 2025 solar target years in advance (Climate Action Tracker, 2020f) and has 11.2 GW of solar projects approved (Scully, 2020).

Electricity generation from hydro power depends on rainfall, and therefore the capacity factor varies from year to year. Vietnam has a grid infrastructure of about 450,000 kilometres of distribution lines, connecting almost 100 per cent of the nation to electric power and about 25,000 kilometres of transmission lines, including interconnections with China and the Lao People’s Democratic Republic (used primarily for imports) as well as Cambodia (used primarily for exports) (Breu and others, 2019).

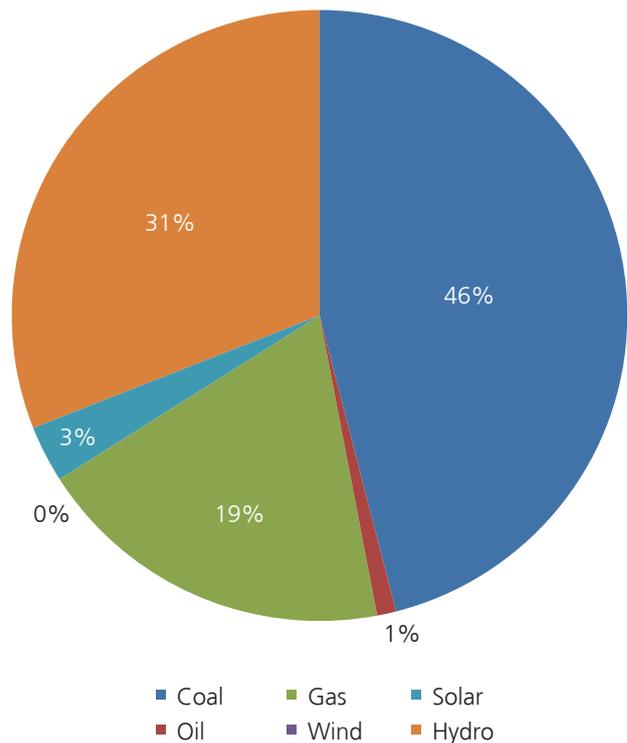
The feed-in tariff that led to a boom in solar PV use was replaced in 2020, and Vietnam plans to transition to a competitive bidding solar auction system (Climate Action Tracker, 2020f). These policy developments may spur private investment in the sector, but the government’s coal expansion plans suggest coal will retain a large portion of Vietnam’s power mix in the future. Vietnam

Figure 11: Electricity production, by fuel (above) and current (2019) electricity generation mix in Vietnam

Source: Ember, 2020.



Vietnam electricity mix 2019



is the ASEAN frontrunner, with 47 MW of floating solar installed and a further 330 MW planned, whereas other ASEAN countries have less than 1 MW of floating solar installed per country (Ahmed and Hamdi, 2020).

Vietnam’s power plan (Revised PDP7) requires an investment of roughly \$150 billion by 2030 in additional generation assets and grid infrastructure (Vietnam

Government, 2016). The power generation investments focus largely on coal (planning to add about 45 GW capacity by 2030, leading to more than a 42 per cent share of total capacity) and, to a lesser extent, renewables (18 GW by 2030, or 21 per cent of capacity) (Breu and others, 2019).

However, the coal plant build-out is well behind schedule, reflecting the relative cost and complexity of coal plant construction, creating cost escalation and reliability risks (Breu and others, 2019). This is also an indication of typically overestimated demand growth that must be adjusted downwards with subsequent revisions of plans. The revised PDP7 energy demand estimations rely on overly high projections of GDP growth rates and low projections for energy savings and energy efficiency, without considering electrification of the transport sector, such as the penetration of e-bikes (Neefjes and Dang, 2017).

Vietnam has seen a significant decrease in the cost of renewable energy. A market review by McKinsey & Company from early 2019, based on available market data and interviews with industry experts, suggested that even without factoring in externalities, renewables had become the cheapest form of new power generation in the country on a levelized cost of electricity basis, with a drop by 75 per cent in solar costs and 30 per cent in wind over the previous five years (Breu and others, 2019).

With costs expected to continue to fall, the next tipping point is expected to be reached soon: when renewable energy is a cheaper source of electricity than existing conventional thermal power sources, such as coal-fired power generation (Carbon Tracker Initiative, 2018). For rooftop solar, this is already the case. Vietnam has been able to increase its solar capacity at a staggering pace, from the 106 MW in 2018 to 5.7 GW in 2019 (IRENA, 2020a).

Resolution 55 was issued by the Politburo in February 2020, outlining the National Energy Development Strategy of Vietnam to 2030, with a vision to 2045 (Vietnam Government, 2020). PDP8 is expected to reflect the new energy sector's positioning in the Resolution (MDI, 2020). The Resolution includes targets for primary energy levels, total capacity of electricity generation,

the total primary energy share of renewables, total final energy consumption, primary energy intensity, energy efficiency in the total final energy consumption and greenhouse gas emissions for the energy sector.

The Resolution promotes renewable energy yet maintains coal development and building the capacity of gas imports. In terms of gas, the Resolution aims to build capacity for 8 billion cubic metres of liquefied natural gas by 2030 and 15 billion cubic metres by 2045. The Resolution has a guiding orientation to scale down coal-fired generation but includes a strategy for long-term coal imports, expanding coal exploration and extraction. Coal plants will require technology upgrades to meet environmental standards and the prioritization of high-efficiency units (Vietnam Government, 2020).

The soon-to-be-adopted new power plan (PDP8) is reacting to the change in the market and indicates a significant shift towards more investment into renewable energy and gas and a slowing of investment plans into coal (Carbon Tracker Institute, 2019). Based on the PDP8, solar and wind capacity would grow to representing 28 per cent of the system capacity in 2030 (compared with 21 per cent in the PDP7) and 41 per cent in 2045, overtaking coal (Brown and Vu, 2020). There is large potential for solar and wind in central and south of Vietnam, and a transmission connection to the north is scheduled for 2025 (Brown and Vu, 2020), adding to existing networks to increase transport capacity between the north and the south.

Vietnam has a capacity of 20 GW of coal power, and the draft plan indicates a further 18 GW of coal being added between 2020 and 2025 and 7.6 GW from 2030 (Climate Action Tracker, 2020f) (figure 12). This implies 9.5 GW of planned coal will be cancelled and 7.6 GW postponed to after 2030 (Brown and Vu, 2020; MDI, 2020). However, there is still an orientation towards continuing to rely on coal-fired power generation, including a strategy for long-term coal imports, extending exploration activities, increasing domestic coal extraction and upgrading coal plants to meet environmental standards as well as requiring efficient technology for future plants (Vietnam Government, 2020).

The draft plan estimates an investment requirement of \$133.3 billion over the next 10 years to increase the country’s energy capacity from 56 GW to 138 GW. It also includes investment requirement into grid infrastructure (Power Technology, 2020). The draft PDP8 scales up the investment requirements by more than \$25 billion than the Revised PDP7. The Revised PDP7 estimated \$108 billion was needed between 2021 and 2030 (Vietnam Government, 2016).

The draft PDP8 has a strong focus on renewable energy as well as gas infrastructure and continues the heavy reliance on coal. It requires around 1.2 million tonnes of liquefied natural gas imports and 35.1 million tonnes of coal annually for power by 2025. By 2030, this would increase to 8.5 million tonnes of liquefied natural gas and 45 million tonnes of coal (Power Technology, 2020). The draft PDP8 plans for a rapid growth of installed gas capacity, estimating 108 GW by 2040 (Brown and Vu, 2020). This is a big leap from the Revised PDP7 plans of 19 GW of natural gas and liquefied natural gas for 2030. Vietnam turned from a net energy exporter to a net-importing country in 2015 (DEA and MOIT, 2017). Nuclear energy has no role in Vietnam’s energy planning.

This plan can lead to more risks of stranded assets, when it is expected that renewable energy and storage can increasingly cover the demand at a lower cost than gas. The global market for gas is uncertain. And uncertainty in the sector risks investment in stranded assets, when the transition can focus on long-term decarbonization with renewables (Climate Action Tracker, 2020a; Plante and others, 2020).

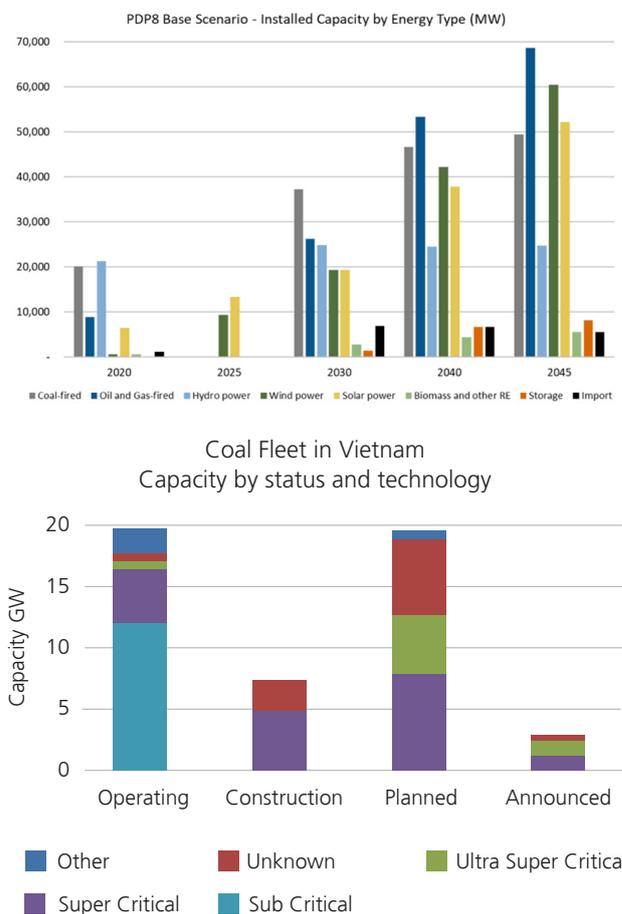
There is a high risk of stranded assets, with conservative assumptions in relation to renewable energy costs (solar and offshore wind) and capacity factors—with greater shares of renewable energy possible, including through grid balancing and storage (Brown and Vu, 2020).

Stakeholders and investment environment

The state-owned utility and monopoly power system operator, Electricity of Vietnam (EVN), and the Ministry of Industry and Trade have critical roles in the power sector market and investment decisions.

Figure 12: Draft PDP8 base case scenario—installed capacity by technology

Source: Above: 2025 (Brown and Vu, 2020) and current and planned coal capacity. Below: Global Energy Monitor, 2020.



Despite the opening of the market and the recent restructuring allowing private participation, EVN still owns 60 per cent of the power generation assets and holds a monopolistic position as a single buyer (Carbon Tracker Institute, 2019). With a real and even more projected increase in demand, both EVN and the Ministry of Industry and Trade have focused on a “race to expand capacity” (Brown and Vu, 2020). EVN is financially constrained by limited sources of domestic funding and lack of access to international capital markets, so it is having to rely on international developers and owns a decreasing share of the capacity.

Coal investments in Vietnam are largely financed through foreign public funding, and EVN is consequently locked into inflexible coal-burning through independent power

producers and now faces the challenge of having to attract investment into renewable energy and grid infrastructure (Brown and Vu, 2020).

In terms of foreign investment, China is a foreign country dominating this investment portfolio, with a 50 per cent share and a total of \$16.5 billion invested, followed by Japan (at 23 per cent) and South Korea (at 18 per cent). Other significant investors in the Vietnamese coal industry are France, Italy, Singapore, Switzerland and the United Kingdom (The ASEAN Post, 2020).

Prior to 2010, the electricity sector centred on public investment, chaired by the country's state-owned enterprises—EVN, PVN and Vinacomin, which received preferential loans from the government to develop coal power plants (VIET, 2020). A number of barriers for accessing capital have since developed. Due to the economic reforms in the 1980s and 1990s, Vietnam has become a middle-income country, which has reduced its access to international finance for coal (VIET, 2020). Future coal plant development in Vietnam will be affected by banks and international organizations ending their future finance to coal power.

In Vietnam, similar to Indonesia, the banking sector is state-dominated: a key actor is the State Bank of Vietnam. According to Healy and Marchand (2019), lack of transparency and large public debt are deterring investment. But Vietnam, a member of the Sustainable Banking Network, is showing early signs of greening the finance system. The State Bank introduced a directive on green credit growth in 2015 and, more recently, a definition of a green sector through the Green Project Catalogue.

There is increasing resistance to coal within Vietnam. Six of the 63 provinces have called for the cancellation of planned coal-fired power plants (totalling 17.39 GW) due to environmental concerns (MDI, 2020). The Vietnam Business Forum cited concerns over the financial, security, environmental and public health risks of coal and developed a business case for investment in clean energy rather than coal (Climate Action Tracker, 2020f; Vietnam Business Forum, 2019).

There is a strong push for investment into liquefied natural gas in current planning and strong interest by United States liquefied natural gas developers. However, there is a question as to who will fund such a large investment and whether it will actually happen, given the uncertainties and the fact that the liquefied natural gas sector is in the early stages of development, with two terminals under construction: one wholly privately owned and operated and the other owned by the natural gas arm of the state-owned oil and gas group PetroVietnam (PVGas and ThiVai LNG Terminal) (Brown and Vu, 2020). This is a different situation than the heavily subsidized development of coal infrastructure (see for example, UNDP, 2018).

Dorband and others (2020) found several barriers that will impact the investment environment for renewable energy uptake. Among them, Vietnam has a dependence on mainly international independent power producers for additional power capacity due to embedded financial and structural constraints. Market regulations in Vietnam are volatile and designed to prop up the state-owned enterprises. Vested interests in the fossil fuel industry, in addition to the government giving direct budget support to the state-owned enterprises to relieve financial pressure, and, in turn, they are under pressure to reform the energy system. International and local environmental support have a limited effect on the sector, and environmental strategies are ineffectively enforced.

Another study (Brown and Vu, 2020) detected a positive sign of reform that could enable future private financing of transmission infrastructure, which could be more efficient and effectively developed by the private sector than by EVN. Brown and Vu cite the example of the country's first privately funded and built transmission pilot project in the southeast province of Ninh Thuan in April 2020, which was followed a month later by the adoption of the Law on Public–Private Partnerships. This law specifically targets power grids as an eligible area for private sector participation: an important step that can reduce curtailment risks and therefore supports further investment into large-scale renewable energy projects.

Table 5: Comparison of scenarios for the Vietnam, fossil fuel and renewable share of total electricity generation

Source: APERC, 2019; EWG/LUT (Ram and others, 2019).

	Scenario	Percentage share of total electricity generation					
		2030		2040		2050	
		Renewables (solar,wind)	Fossil Fuels (coal)	Renewables (solar,wind)	Fossil Fuels (coal)	Renewables (solar,wind)	Fossil Fuels (coal)
Current policy and target scenarios	APEC business as usual	31 (1,0)	69 (34)	37 (5,3)	63 (36)	31 (4,3)	69 (48)
	APEC target	51 (4,3)	49 (28)	50 (8,5)	59 (32)	43 (6,4)	57 (42)
Goal scenario	APEC 2DC	50 (3,2)	50 (27)	57 (9,4)	37 (8)	68 (10,12)	21 (9)
	EWG/LUT	91 (56,8)	9 (9)	99 (74,5)	1 (1)	100 (81,6)	0 (0)

How can the trend be reversed away from fossil fuels?

Vietnam has large untapped renewable energy potential, in particular for solar and wind. Covering 1.5 per cent of the country's land area with optimally oriented PV panels could generate seven times as much electricity as is now consumed (Fuentes and others, 2019b). The coastal regions of Vietnam offer good wind potential.

Vietnam's coal pipeline is huge, even when considering plans for cancelling or postponing some coal plants, as suggested in the draft PDP8 (Climate Action Tracker, 2020f). Vietnam has an installed capacity of 20 GW of coal power, and the draft plan indicates another 18 GW of coal is planned for between 2020 and 2025 and 7.6 GW from 2030 (Climate Action Tracker, 2020f).

Under the current policy, fossil fuels will remain dominant in the power mix. Under the APEC's business-as-usual scenario, fossil fuels are on course to represent 69 per cent of the Vietnamese power mix by 2050, with nearly 50 per cent coal-fired power generation and 31 per cent renewables (predominantly hydro power) (APEC, 2019).

A study by McKinsey & Company modelled a renewables-led pathway (including gas and storage) representing 50 per cent of generation by 2030, compared with only 25 per cent in the current policy (Breu and others, 2019).

This renewables-led scenario offers a "cheaper, cleaner, more secure" pathway than the current plan for Vietnam's energy sector. It is 10 per cent cheaper (total cost from 2017 to 2030), even including costs for added transmission and storage. This pathway has less reliance on imported fuels for improving energy security. It reduced coal imports by 70 per cent and creates 465,000 additional jobs (from 2017 to 2030). The scenario includes an increase in solar and wind capacity by 61 GW and 39 GW by 2030, respectively, which is five times larger than what is planned in the PDP7. It would rely on 28 per cent less total fuel and 60 per cent fewer imports, significantly reducing Vietnam's reliance on fuel imports—and, more broadly, fossil fuels (Breu and others, 2019).

Similarly, Teske and others (2019) developed a renewable energy scenario for Vietnam whereby renewables reach 50 per cent of total generation by 2030, extending this to 90 per cent by 2050. Offshore wind forms the backbone of the renewable energy capacity, almost in line with the lower end of the benchmarks for a Paris Agreement-consistent scenario for the Southeast Asia region. Teske and others found that the most ambitious modelled renewable energy pathway was the most cost-effective. Renewable energy requires significant investment, but reducing the investment in coal power saves costs. Overall, the cost savings create a cost-benefit of more than \$6.5 billion from 2020 to 2030 in one of the study's scenarios. Renewables will be more cost-effective than fossil fuel alternatives due to the decline in the costs of solar and wind advances in storage technology. Gas

does not exceed a capacity of 15 GW in this scenario, highlighting the risk of stranded assets when investing in gas rather than in renewable energy to replace coal.

In addition, the Teske study found that construction times for solar PV and wind are less than gas or coal-powered plants, and the cost of onshore wind will be cheaper than coal within five years. It also found that by 2030, utility-scale solar PV and onshore and offshore wind will be cheaper than coal generation in Vietnam. This seems to be a conservative result, in comparison with the findings in the McKinsey study.

Other regional modelling studies show that faster decarbonization is possible for Vietnam, with an increase of renewable electricity up to 100 per cent by 2050, and energy efficiency and sector coupling allowing for the overall system transformation and decarbonization necessary for progress towards meeting the long-term temperature goal of the Paris Agreement (Fuentes and others, 2019b; Ram and Bogdanov, 2017).

An Energy Watch Group study found that renewables can reach 99 per cent of electricity generation in Vietnam by 2035 and 100 per cent by 2050. In this scenario, renewables comprise 91 per cent of the generation mix by 2030, with 56 per cent of the mix solar and 8 per cent wind (Ram and others, 2019). Solar continues to

dominate, increasing its share to 81 per cent by 2050. In this scenario, gas is phased down to 2 per cent of the power mix by 2025, confirming further gas planning is not required in Vietnam.

Investments will require a redirection from fossil fuels to renewables, particularly solar and some wind. Grid infrastructure will accommodate variable energy sources. In terms of total installed capacity, the EWG/LUT scenario requires 190 GW of solar by 2030 and 677 GW by 2050, a combination of utility scale PV and PV prosumers (end-use consumers who also produce their own electricity from rooftop solar). Utility-scale solar would need large-scale investment. PV prosumers would benefit from a positive policy environment for solar rooftop uptake.

For wind energy, the scenario shows 27 GW of installed onshore wind by 2030 and 44 GW by 2050. Solar and wind need a huge scale-up of investment, considering the 2019 levels of 4.5 GW solar and 0.45 GW wind (MOIT and DEA, 2019). The scenario does not include any offshore wind for Vietnam. However, a recent study found that Vietnam has the potential for 16 GW of offshore wind within 5–100 kilometres from shore (Danish Energy Agency, 2020).

Recommendations

General policy recommendations

The following general policy recommendations were drawn from our analysis and other assessments that we reviewed.

Southeast Asian countries are implementing a range of policies to support the uptake of renewable energy. But there are gaps in the application of some of the best practice policies that have proven successful in other countries in Asia and, more broadly, to accelerate a transition to clean energy and benefit from lower costs, higher reliability and less pollution.

Removing fossil fuel subsidies and introducing carbon pricing have been repeatedly highlighted as important for enhancing the signal to investors that there are strong economical and financial arguments favouring a fast transition away from fossil fuels and towards clean, efficient energy systems. For Southeast Asian countries, a crucial step in addressing this is to bring to light how subsidies are embedded and perpetuated in the respective national systems. They must also recognize the importance of political will to remove subsidies and the need to both counter the political argument that removing subsidies will cause hardship for people and to turn the argument towards the benefits of the transition to renewable energy.

- Regional cooperation and learning from best practice examples need to be expanded. This can include learning from some of the success stories in the Asia–Pacific region, for example, how early support for renewable energy is already slowing down coal development in India because of the economic benefits from the massive cost reductions.
- Despite existing efforts (some of them highly successful, such as in Vietnam), there are still barriers to an accelerated uptake of renewable energy, even though they are already cheaper than new fossil fuel power plants. These barriers need to be analysed and addressed within country-specific contexts and coupled with a move to accelerate the transition and with a focus on high upscale targets, in particular for solar and wind, including offshore wind (in particular

in Indonesia and Vietnam) as well as floating solar. Long-term tailored incentives are needed to enhance investment both in large-scale renewable energy projects as well as in distributed prosumer energy and storage, for example, auctioning for large scale—and keeping feed-in-tariffs for small scale—prosumer energy.

- Common aspects throughout the region, despite important differences, are policy inconsistencies, lack of clarity on targets and complex energy policy governance structures with a high influence of incumbents and vested interests through state-owned utilities. Collaboration between stakeholders should assess and develop pathways to remove these barriers.
- A common theme with variations across the region is the urgent need for power systems and market design to adapt to the reality of an increasing share of variable renewable energy and making this an objective. This requires clear, consistent long-term planning and appropriate investments in grid infrastructure, transmission lines, the introduction of energy storage, demand-side management and other flexibility options as well as adapting market design to provide incentives for grid flexibility and reliability services.
- Even more undeveloped is the awareness among policymakers of the benefits of a road map to an overall clean energy system through electrification of end use sectors, such as transport, buildings and industry, and planning for an integrated energy system, thus enhancing benefits beyond just the power sector. This awareness should be increased.
- Synergies should be explored within and across government agencies dealing with energy planning, climate policy and air pollution control, including implementing the Minamata Convention and addressing mercury pollution from coal-fired power plants.
- Beyond policies and sector-specific measures, a common theme for the region is the need to broaden awareness of the relevance and importance of the energy transition among a range of stakeholders.

This implies changing the narrative around so-called “clean” and “cheap” coal and the need for baseload power. This narrative continues to gain traction and is supported by highly influential vested interests, despite the clear economic and financial benefits sending a completely different message. For example, communication needs to be strengthened (both online and offline) and awareness raised on the benefits of renewables, and in particular rooftop solar both at the community or local level and with utility companies. One effective method of communication would be to establish green ambassadors within countries to transfer knowledge to residents.

- Governments have the opportunity to pursue the energy transition within a whole-of-economy approach, with long-term planning and consistent policies across sectors. The Paris Agreement provides incentives, tools and instruments: by the end of 2020 (or with the delays due to the COVID-19 pandemic, expected by the climate conference in 2021), countries should develop long-term low-carbon development strategies and significantly enhance their Paris Agreement Nationally Determined Contribution targets in line with the global effort to flatten emission curves and achieve the long-term 1.5°C temperature limit.
- There is a lack of both national and regional scenarios and detailed road maps on how a transition to 100 per cent renewable energy and zero-carbon emissions can be achieved—in each of the countries in the region and for the region as a whole. Encouraging financial support to develop these scenarios and road maps with the involvement of academic and research institutions and think tanks as well as the broad range of stakeholders, including civil society, would be an important step to realizing synergies between development objectives and helping to avoid countries locking into high-emitting, polluting fossil fuel infrastructure.
- A moratorium on new coal and the development of national transition plans to phase out existing coal-fired power generation by 2040, in line with the Paris Agreement, is an imperative for all countries in Southeast Asia, combined with Just Transition plans to address regional and local needs where employment in fossil fuel production and use is an important factor.

A moratorium would attract investments into clean energy and give the institutional investors a clear signal about the long-term policy and direction of the country.

- Avoiding investments into expanding gas infrastructure is key to avoid creating future stranded assets, given the renewable energy and storage technologies.
- COVID-19 recovery and stimulus packages are a unique opportunity to direct and incentivize investments into this energy transition and attract green finance for these investments. Tapping into opportunities for green investment and changing public financing flows, including those from China, Japan and South Korea, would imply supporting regulatory reform in the financial sector, in particular the requirement of banks and investors to disclose climate risk.
- Financial stakeholders need to connect and mobilize financial sources. Dialogue with donor governments, multilateral development banks, private sector finance and philanthropy can focus on identifying needs for support and finance to implement these steps and recommendations and accelerate the need to shift investments.
- Cooperation in the region through ASEAN and the ASEAN Centre for Energy or other institutions in the wider region, such as APEC, can be refocused around a joint vision to transition to 100 per cent renewable energy in line with the objectives of the Climate Vulnerable Forum. This cooperation can build on a good basis, including by enhancing grid transmission and integration. Such cooperation can enhance and accelerate the transition through joint learning, peer review and dialogue about barriers and best practice examples.

Country-specific recommendations

Our analysis has shown that all of the general recommendations offered here are relevant for both the Philippines and Vietnam, but there are country-specific aspects that need to be addressed in the national context

and through national stakeholders and civil society groups.

Indonesia has a unique situation in many ways as a globally significant exporter of coal and as a Group of 20 country. The deeply entrenched strong influence of incumbents, the damaging dominance of mining and coal power industry interests and the scale of subsidies for fossil fuels, especially coal, are particularly daunting. Removing fossil fuel subsidies and creating transparency about the role of these interests is a critical step to enable change in the country and would enable tapping into the vast renewable energy resources.

For **the Philippines**, combining the energy transition with the enhancement of resilience, both against climate change and other disasters, such as the COVID-19 pandemic, can be a pivot to align government and stakeholder awareness. A relevant theme for the Philippines is the need to move away from its inflexible, expensive coal import-reliant system that is harming particularly vulnerable consumers and tax payers.

Another theme is the importance of attracting investment into flexible off-grid and microgrid renewable energy and storage solutions to provide remote areas and islands with access to clean energy. The lack of long-term and integrated planning and transparency is particularly important for the Philippines.

Finally, given the high climate vulnerability of the Philippines and its communities, an approach to working on connecting COVID-19 recovery, disaster preparedness and resilience with the need to shift investment into renewable energy and providing access to clean energy for all communities is a particularly important theme when it comes to changing the narrative and engaging the wider public and stakeholders towards the necessary shift in investment.

Thailand is an example of a country at risk of relying on gas, which is a barrier to any aim for a transition and shift of investment into renewable energy. The close ties between the gas industry and the government is a key factor impeding a decisive and proactive move

towards an energy transition and the shift in investments that is needed for this. It is also an example of the lack of consistent planning and policy signals, despite some progress in adoption of policies and early deployment of renewable energy—but which is nowhere near the scale needed.

Vietnam has specific challenges with an extremely high growth in demand, along with the central role of the government-owned utility and its dependency on foreign funding. Vietnam can build on its successes and therefore aim for more ambition and a leadership role in the region. Moving to clear, ambitious targets and policy signals would be critical to shift investment and dependency from foreign public funding that currently dominates the energy sector.

While power system planning is already changing and adapting, there is much room for improvement by ensuring consistent long-term planning, transparency around assumptions and clarity on long-term goals—and how these translate into midterm targets and milestones. This is particularly important for phasing out coal, avoiding investment in gas and expanding renewable energy capacity, in particular solar and wind at scale. It would build on the recent success with the country's installation of 5 GW of solar energy within just one year. The need to invest in appropriate transmission grids has already been recognized as a critical element of an investment shift and acceleration strategy.

Role of civil society organizations

Civil society organizations have a significant role in supporting the implementation of these recommendations, in general by raising awareness of the risks of both sticking to the current narrative of delaying the necessary transition and of the need to shift investments.

Civil society organizations can be crucial for changing the narrative by enhancing awareness of the vulnerability of countries in the region to climate change and the benefits of achieving the Paris Agreement 1.5°C limit, both in terms of avoiding catastrophic impacts in a highly

vulnerable region as well as in terms of benefits for sustainable development.

Civil society organizations can assist in disseminating robust findings and translating them into clear demands on objectives and goals for national and subnational governments. Clear policy signals are critically important to national and international investors about the high priority of shifting investments at scale and within time frames consistent with the Paris Agreement. In particular, civil society organizations can:

- Call for a moratorium on new coal and the development of phase-out plans, including Just Transition plans to achieve the phase out of coal by 2040.
- Demand the development of a vision and road map to 100 per cent renewable energy, integrating the transport and industry sectors.
- Call for a moratorium on investment in large-scale gas infrastructure, and demand a clear assessment of alternative options.
- Call for renewable energy targets for 2030, 2040 and 2050 that are consistent with a pathway to 100 per cent renewable energy, taking into account the benefits of electrification of end-use sectors.

Given the importance of changing the overarching narrative and paradigm, civil society organizations can take on a pivotal role by developing and publicizing information and knowledge.

In dialogue with key stakeholders and with support from, for example, international foundations, civil society groups can support independent analysis and dissemination of insights. Civil society organizations can engage in the development and dissemination of this knowledge base, through

- analysis of successful strategies to overcome barriers and country-specific relevance of international, regional or national best practice policies;
- development of scenarios and road maps;
- analysis of energy markets and development of solutions involving all stakeholders;
- questioning assumptions, for example, about costs and benefits that underlie government or government agency power system plans and are supported by national and international experts; and
- creating awareness of the risk of stranded assets and the risks of ignoring climate-related risks.

Given the importance of funding from China, Japan and South Korea, another area of work for civil society organizations can be enhancing international cooperation and dialogue with civil society organizations in these countries to increase awareness of the important role of these funding streams.

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Annex I: Scenario analysis: Data sources and overview of scenarios

Paris Agreement 1.5°C compatible pathways and benchmarks for coal and renewable energy

In its Special Report on the Impacts of Global Warming of 1.5°C Above Pre-industrial Levels (IPCC SR1.5), the IPCC (2018) comprehensively analysed the socioeconomic mitigation paths that allow global warming to be limited to 1.5°C, compared with pre-industrial levels, using complex energy-economic and land-use models (Integrated Assessment Models). By using the 1.5°C compatible pathways identified in the IPCC SR1.5 that also comply with sustainability limits to the availability of carbon dioxide removal technologies or options, such as afforestation and reforestation or biomass for energy and carbon capture and storage, key milestones for Paris Agreement-consistent mitigation pathways can be identified (Climate Analytics, 2019).

One such crucial milestone is the need to peak total greenhouse gas and CO₂ emissions by 2020 and then reduce rapidly by about 45 per cent by 2030 from the 2010 levels. In these pathways, total greenhouse gas emissions need to reach net zero around 2070, while CO₂ emissions need to reach net zero by 2050 and then become negative. This implies the need for a large reduction in energy demand across all end-use sectors by 2030, a fully decarbonized primary energy supply by mid-century, decarbonized electricity generation by 2050, mainly through increased use of renewable energy, electrification of end-use sectors and decarbonization of final energy other than electricity.

Overall, a key strategy is phasing out fossil fuels and rapidly increasing the use of renewable energy. The IPCC highlights energy efficiency and renewable energy as showing particularly strong and robust synergies with the Sustainable Development Goals.

Benchmarks for coal phase-out and renewable energy at the global and regional levels were derived from an analysis of the pathways outlined above as well as additional literature, such as the IEA's ETP Below 2 Degree Scenario (B2DS) also analysed in Climate Analytics (2019) for South Asia and Southeast Asia and the EWG/LUT (Ram and others, 2019) scenario study for a high degree of renewable energy penetration across every region of the world. Global benchmarks shown in table 1 in this report as well as the benchmarks for India and Indonesia are from Climate Action Tracker (2020b). Benchmarks for ASIA, Southeast Asia and South Asia are from Climate Analytics (2021 and 2020), based on Climate Action Tracker (2020c). See Climate Action Tracker (2020c) for details on methodology.

Data from IEA and IRENA scenarios

The IEA provides investment data for the STEPS and SDS scenarios (IEA, 2020b). Specifically, for the power sector, the IEA provides cumulative investment from 2020 to 2040 for the Asia–Pacific region. Electricity capacity data are provided for the Asia–Pacific region and for Southeast Asia. From this data, our research calculates the addition electricity capacity added between 2019 to 2040 for each generation source for Asia–Pacific region and for Southeast Asia for both the STEPS and SDS scenarios.

We calculated the Southeast Asian share of the Asia–Pacific capacity and apply the Southeast Asian share to the Asia–Pacific investment to estimate the Southeast Asian investment. For the Southeast Asian generation and networks investment, we calculated the total share of Southeast Asia of the Asia–Pacific electricity capacity and applied the share to the total investment and then deducted the sum of investments from generation sources (coal, gas oil, fossil fuels, nuclear and renewable energy).

IRENA provides investment data for Southeast Asia for their PES and TES scenarios as average annual energy system investments for 2016–2050 in US billion dollars per year. We used their data for the power sector, which are only broken down in renewable energy, non-renewable energy and power grids and system flexibility.

We compared estimates of shifts in investment from IEA and IRENA by comparing the difference between annual investment in their ambitious scenarios (SDS for IEA and TES for IRENA) and their current policy and target scenarios (STEPS for IEA and PES for IRENA). These were compared with the IEA data scaled down to Southeast Asia, as explained.

Annex II: Scenario assumptions

Scenarios	Assumptions
APEC business as usual	The Asia-Pacific Economic Cooperation's business-as-usual scenario reflects current policies and trends.
IEA STEPS	This Stated Policies Scenario (STEPS) is based on policies announced in the region and incorporating the impacts of pandemic policy responses, assuming the pandemic will become under control in 2021. The scenario includes the stimulus packages announced by mid-2020s. The scenario also assumes states will meet their Nationally Determined Contribution targets under the Paris Agreement.
APEC target	The Asia-Pacific Economic Cooperation has a target for the 21 member States in the Asia-Pacific region, including Southeast Asia. APEC's goal aims at reducing "regional energy intensity by 45 per cent between 2005 and 2035 and doubling the share of renewables in the APEC energy mix between 2010 and 2030" (APEC, 2019). APEC developed the target scenario to achieve this goal.
IRENA PES	The International Renewable Energy Agency developed a Planned Energy Scenario (PES) based on current and planned policies, including Nationally Determined Contributions.
IEA SDS	The International Energy Agency's Sustainable Development Scenario (SDS) focuses on where the region aims to be in light of international commitments. The SDS was developed by focusing on the end goals of meeting the Paris Agreement and the Sustainable Development Goals. Specifically, it addresses universal access to affordable modern energy by 2030, a reduction of air pollution, action to combat climate change, keeping global average temperature well below 2°C and efforts to limit the average temperature to 1.5°C.
APEC 2DC	The Asia-Pacific Economic Cooperation developed a 2°C scenario (2DC) based on a 50 per cent chance of limiting global temperatures to 2°C above pre-industrial levels by 2050. This pathway is not in line with the Paris Agreement goal of reaching net-zero emissions or ensuring average global temperatures stay "well below" 2°C.
ETP B2DS	The International Energy Agency's Beyond 2°C scenario (B2DS) in the Energy Technology Perspectives (ETP) report considers readily available technology and technology in the innovation pipeline to assess how technology deployment can limit the average global temperature rise. It explores the practical limits of technology in the energy system to achieve net-zero emissions by 2060 and remain net zero, without requiring technology breakthroughs or placing limits on economic growth.
IRENA TES	The International Renewable Energy Agency produced a Transforming Energy Scenario (TES) that focuses on renewable energy and improving energy efficiency in the region. It is described as a pathway to ensure that average global temperatures are below 2°C and aiming towards 1.5°C in this century.
EWG/LUT	The Energy Watch Group and Lappeenranta-Lahti University of Technology scenario study shows a pathway for a high degree of renewable energy across the world, including the Southeast Asia and the Pacific Rim regions, with storage technologies.

Source: IRENA, 2020b; APEC, 2019; IEA, 2017; IEA, 2020b; EWG/LUT (Ram and others, 2019).

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