Low Carbon Energy Transition and Technology Pathways for Climate Stabilisation

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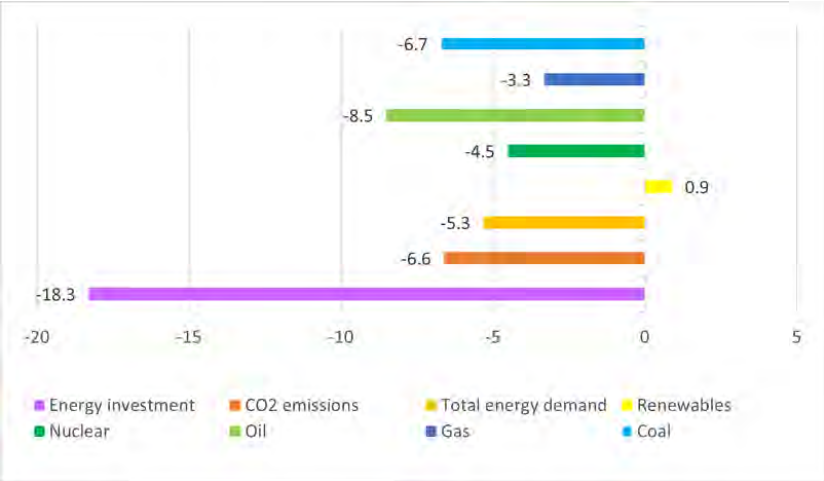
Synopsis

- Greenhouse gas (GHG) emissions have been increasing in line with fossil-fuel energy-based industrialisation even before the COVID-19 outbreak, exacerbated by climate-induced natural disasters.
- Low carbon energy utilisation as an effort towards low carbon energy transition is now essential to reduce energy-related CO_2 emissions to limit climate change impacts.
- Transitioning to low carbon technology and energy efficiency will bring great potential to speed up decarbonisation and improve economic development within the region, as advanced renewable technologies are already available nowadays.
- Policy framework, financing mechanisms, and regional and international cooperation are needed to maximise development of low carbon energy.

The impact of COVID-19 has been felt in three ways: disrupted supply chains and decreased manufacturing, a complete halt in tourism, and changes in patterns of domestic demand. Regulations preventing actions that may spread the virus, such as lockdowns, social distancing, and work-from-home orders reduced the percentage of emissions emitted, especially in mid-2020.

The IEA (2020) assessed that total energy demand globally dropped by around 5% during March-December 2020, followed by energy-related CO_2 emissions by 7%. Figure 1 shows the pandemic's effect on energy investment: a significant drop by 18%. The graph also illustrates how fossil fuel-based energy demand, notably oil and gas, plummeted significantly, around 8% and 7%, respectively. On the contrary, the contribution of renewables shows a slight rise.

Figure 1: Key estimated energy demand, CO_2 emissions, and investment indicators, 2020 relative to 2019

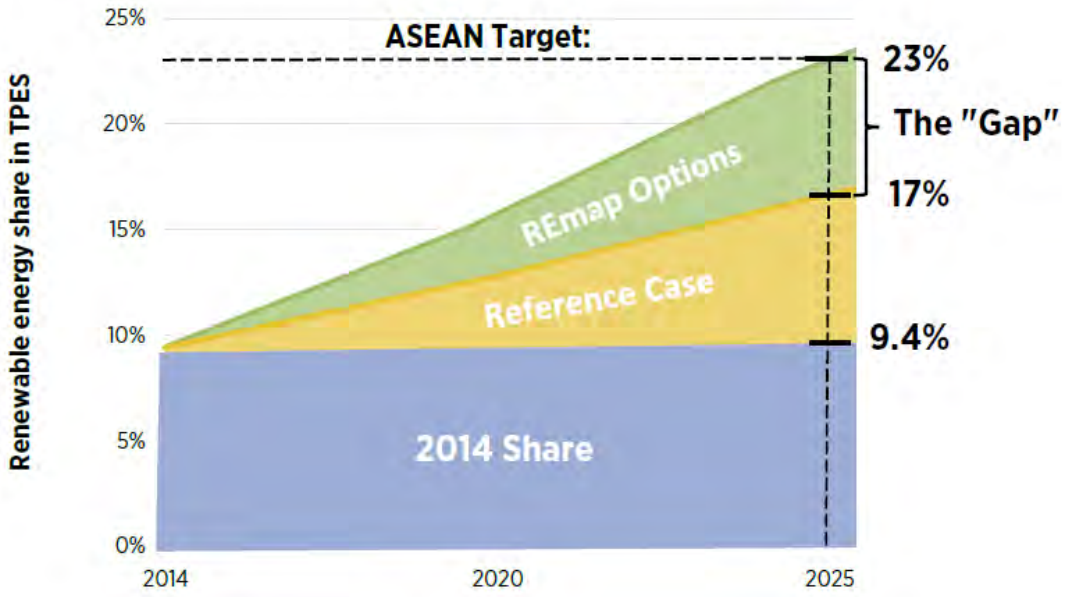


Source: International Energy Agency (IEA) (2020).

This situation could be seen as an opportunity to speed up the low carbon energy transition. However, major countries are still focusing their recovery programmes on health and social issues, postponing low carbon and renewable energy investments and projects. Within the ASEAN region, countries like Indonesia, Malaysia, the Philippines, and Thailand reported that COVID-19 caused a delay in the development of energy efficiency development projects due to changes in energy markets and disruption in the supply chains of clean energy technologies (The ASEAN Secretariat, 2021).

In 2016, the International Renewable Energy Agency (IRENA) mapped renewable energy potential in ASEAN in order to provide renewable energy options to achieve the regional target of securing 23% of its primary energy from modern, sustainable renewable sources by 2025 (IRENA & ACE, 2016). Figure 2 shows the six percentage-point gap of renewable energy share between the 17% of the reference case and 23% of the renewable energy maps option by 2025. The ASEAN's target is in line with the global thinking and ambitions on renewables, but the use of renewable energy needs to be accelerated significantly in the coming decades. Advances in technology and innovation will fill the renewable energy penetration gap with great support from financing and policy.

Figure 2: Renewable energy share in ASEAN Member States, 2015 and 2030



Source: IRENA & ACE, 2016.

A deeper analysis of renewable technology options in the ASEAN region shows that hydropower offers most of the growth in the renewable energy share of power, followed by solar photovoltaic (PV) and wind sources (IRENA & ACE, 2016; Anbumozhi et al., 2017). However, the performance of solar PV and wind sources correlates with the availability of resources at a particular point in time, as opposed to demand for power. Consequently, solar PV and wind generators might not be able to meet the demand for power the way geothermal and hydropower can. Moreover, a high share of variable renewable power in a power system can pose a problem with grid stability. Therefore, the power system needs to be flexible. Additionally, geothermal has promising potential in Indonesia and the Philippines, which have the second and third most installed capacity globally for geothermal energy (IRENA & ACE, 2016). Application of Carbon Capture, Utilisation, and Storage (CCUS) for thermal power generation plants in ASEAN could also curb CO_2 emissions by 40% in 2050 in combination with Energy Efficiency and Conservation (EEC) and Renewable Energy under the Alternative Policy Scenario (APS) (Economic Research Institute for ASEAN and East Asia (ERIA), 2020).

According to the ASEAN State of Climate Change Report (2021), ASEAN Member States prioritised actions to reduce carbon emissions in the sectors that have a large share of emissions within the region, including energy, transport, industry, agriculture, forestry & land use, and waste. All 10 member states already mapped out and diversified renewable technology application in most sectors according to IRENA & ACE (2016) as shown in Figure 3. The power or energy sector has the most diverse set of technology options, such as hydro, bioenergy, biogas, solar PV, wind, and geothermal, and all countries have different levels of technology deployment. The map also indicates which renewable technologies contribute most to renewable energy options within the countries.

Figure 3: REmap Options: Importance by technology and sector

		Brunei Darussalam	Cambodia	Indonesia	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Viet Nam
Industry Sector	Bioenergy										
	Solar thermal										
Transport Sector	Liquid biofuels										
	Electric mobility										
Building Sector	Solid bioenergy										
	Biogas										
	Solar thermal										
Power Sector	Small hydro										
	Solid bioenergy										
	Biogas										
	Solar PV										
	Wind										
	Geothermal										

Note: red: a low contribution; blue: a moderate contribution; green: a high contribution; grey: no data. Source: IRENA & ACE, 2016

Some renewable technologies are at mature levels of development, yet show low deployment in the region. It is therefore important to improve regional cooperation on policies and funding mechanisms to promote and accelerate the market transition to low carbon technology. However, the challenge is to maximise the effort of integration to achieve the regional countries' commitments.

In the context of energy transition, ASEAN countries show support for the ASEAN Power Grid Programme. The ASEAN Power Grid (APG) is intended to contribute to accommodating higher shares of renewable energy through expanded multilateral electricity trading to provide affordable and resilient electricity, strengthen grid resilience and modernisation, and promote clean and renewable energy integration (Ahmad, 2021; EU-ASEAN Business Council, 2021). Exploiting the full potential of the APG would involve developing energy market mechanisms that support wider multilateral power trading.

The APG has the potential to play several roles, such as bolstering energy security, improving the economics of power system development, expanding accessibility, integrating the various renewable energies, and stimulating regional economic growth and development. Connectivity improvement in the ASEAN region led to an increase in power trade. As of 2020, 7 out of 16 key power interconnection projects have been completed, which increased the regional cross-border transmission capacity to 2,275 megawatts across Cambodia, Indonesia, Lao PDR, Malaysia, Thailand, Singapore, and Viet Nam (Ahmad, 2021).

To accelerate the low carbon energy transition and energy efficiency deployment in ASEAN, four points need to be considered: (1) Energy policy must be designed in a way to enable an energy market that can unlock new business and mobilise private sector engagement in the low carbon energy sector, (2) Strengthening ASEAN's sustainable finance ecosystem will allow the member countries to develop an energy transition mechanism as a solution for renewable energy and low carbon energy transition. It will maximise the benefits and reduce the costs of integrated energy markets, as well as remove barriers to energy market integration within the region. (3) An energy efficiency standard should be harmonised through mechanisms such as labelling or certification. ASEAN has the SHINE initiative (The ASEAN Standard Harmonisation Initiatives for Energy Efficiency), which aims to promote the adoption of sustainable consumption and production amongst small and medium-sized enterprises and consumer groups. (4) International cooperation should be improved through capacity building, knowledge sharing, and a policy network to innovate and disseminate advanced low carbon and renewable technologies and cost-effective technology deployment.

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