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Towards the ASEAN Power Grid: Paving the way for ASEAN's Energy Transition

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Highlights

1. Enabling the ASEAN Power Grid (APG) can help harness the ASEAN region's vast renewable energy potential.
2. Collective political support among ASEAN member states is critical for the development of the APG.
3. Harmonisation of national regulations and technical standards is a key enabling factor.
4. ASEAN needs to establish dedicated regional institutions as independent (an) regulator(s) and (an) operator(s).

Summary

The ASEAN Power Grid aims to facilitate cross-border electricity trade and support the integration of renewable energy sources in the region. However, the project faces technical, political, and regulatory challenges due to differences in national grid codes, networks, and socioeconomic development. Despite some progress, achieving the region's energy transition goals requires harmonised regulatory and technical frameworks, enhanced regional coordination, and the establishment of (an) independent operator(s) and regulator(s) at the regional level.

What's the issue?

The Association of Southeast Asian Nations (ASEAN) adopted the idea of the flagship ASEAN Power Grid (APG) in 1997 as a regional transmission line to facilitate cross-border electricity trade and support the integration of renewable energy sources in the region. The APG is divided into three sub-regions: North, South, and East. The northern region, known collectively as the Greater Mekong Subregion, consists of Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam. The Southern region consists of Indonesia, Malaysia, and Singapore. While the Eastern

region consists of the Philippines, Brunei, Malaysia (Sarawak), and Indonesia (Kalimantan). Due to its geography, the Northern region has so far made the most progress, where member countries trade electricity with each other (mostly on a bilateral basis).

Many ASEAN Member States (AMS) have large untapped variable renewable energy potential, particularly solar, wind, and hydropower.¹ The ASEAN Centre for Energy (ACE) reported that the potential for solar

¹ Rika Safrina, M. Rizki Kresnawan, Andy Tirta, Cassandra P.C. Bong, Haslenda Hashim, Wai Shin Ho, Zarina Binti Ab Muis, Nor Alafiza Binti Yunus. "ASEAN Decarbonisation Pathway: A Policy Review on Variable Renewable Energy, Electric Vehicle, and Smart Microgrid." *ASEAN Centre for Energy*. 19 May 2022.

and wind energy in the region is estimated to be 66 GW and 8 GW, respectively. The region is also expected to see a significant increase in interconnection capabilities, with projections for a capacity of up to 30 GW by 2040, up from the current 7GW. Given the geographic location of the AMS, renewable energy potential is not evenly distributed. Indonesia, for example, is blessed with significant solar energy potential due to its proximity to the equator, while Vietnam and Lao PDR have abundant wind and hydropower potentials, respectively.

However, renewable energy currently only accounts for a small share of the region's overall energy mix; whereas the share of coal has increased more than fivefold in the past two decades.²

Considering that some AMS have announced plans to become carbon neutral by 2060, the need to ramp up the region's energy transition has become particularly important. As part of its decarbonisation efforts, AMS have committed to meeting the target of 23 per cent renewable energy by 2025. However, achieving such a highly ambitious target will require 19.9 GW of interconnection capacity, which is much higher than the current overall 5.5 GW installed capacity in the region.³ Even with 2.3 GW of interconnectors under construction as of December 2022, the combined infrastructure will still be below the required capacity, indicating the need to accelerate future interconnection plans.

While the APG can undoubtedly serve as a regional energy connectivity platform, the

diverse nature of AMS currently presents both technical and non-technical challenges. This includes meeting certain technical requirements, such as harmonizing national grid codes and network transmissions. The APG also faces a range of political, institutional, economic, and regulatory challenges due to the fact that ASEAN is a diverse region with various political systems and differing priorities among member states. This is compounded by the voluntary and non-binding nature of ASEAN's decision-making process, which can sometimes result in conflicting aspirations in the region.

One example is the development of the ASEAN Connectivity Master Plan (ACMP) that attempts to improve infrastructure and connectivity within AMS. Voluntary participation in the scheme means that not all member states have the same level of capacity or willingness to invest in and implement it, which can lead to difficulties in coordinating and achieving its goals. Additionally, geopolitical tensions and inward-looking policies in some countries have added challenges to APG development.

Indonesia, which assumes ASEAN Chairmanship in 2023, has delayed the implementation of its carbon tax until 2025, citing domestic energy security concerns.⁴ Due to differences in socioeconomic development, regulatory systems also differ across AMS. Singapore is a market-based economy where the electricity market is fully liberalised and electricity prices are determined by market forces. In contrast, the electricity markets in other AMS are

² International Energy Agency. "Southeast Asia Energy Outlook 2022." May 2022.

³ United States Agency for International Development. "The ASEAN Interconnection Masterplan Study (AIMS) III Overview and Progress." *ASEAN Centre for Energy*. 23 April 2021.

⁴ Teti Purwanti. "Pajak Karbon Ditunda Sampai 2025 [Carbon Tax Postponed to 2025]." *CNBC Indonesia*. 13 October 2022.

characterised by strong government intervention to ensure that electricity remains affordable. These differences reflect the incompatibility of the existing energy markets among AMS, which requires regulatory harmonisation as the APG develops. Harmonisation of regulatory frameworks is important to establish clear rules and common standards for the electricity market. A harmonised regulatory environment would enable APG to facilitate fair and equitable electricity exchange, while attracting investments and fostering interconnectivity among the AMS.

Nevertheless, there has been some progress. Countries in the ASEAN's northern region that are part of the Greater Mekong

Subregions have started trading electricity bilaterally. The first true multilateral electricity trade has also been implemented through the Lao PDR, Thailand, Malaysia, and Singapore Power Integration Project (LTMS-PIP), which transports electricity from Lao PDR to Singapore via Thailand and Malaysia.⁵ Separately, Indonesia and Malaysia, two countries previously hesitant to export renewable energy to Singapore, have recently shown a shift in attitude towards cross-border electricity trade. Both countries have signalled a growing interest in renewable energy exports and are no longer as protectionist as before. This change may pave the way for further collaboration in the APG and contribute to the region's energy transition goals.⁶

Why is this important?

The ten AMS have long sought to integrate their energy systems through the APG. ASEAN views the APG as an avenue to promote sustainable economic growth by enabling AMS to meet growing energy demand more efficiently. The region's influence on the global stage is increasing. More foreign direct investments are flowing as the economic outlook remains bright, and heightened trade tensions between the United States and China have encouraged manufacturing investment in AMS as companies seek to diversify their respective supply chain and reduce their dependence on China.⁷ As such, ASEAN energy demand has also grown 60 per cent over the past 15

years. As economies and investments boom, energy demand will continue to rise, pushing governments to source for reliable and sustainable energy supplies.

The APG also has the potential to reduce the region's reliance on fossil fuel, enable resource sharing and promote energy diversification to improve energy security. A study published in 2021 by the Asia Pacific Energy Research Centre (APEREC) finds that cross-border electricity trade through APG is likely to reduce emissions by 22 to 24 per cent as compared to the baseline scenario.⁸

⁵ Energy Market Authority of Singapore. "Singapore Commences First Renewable Energy Electricity Import via Regional Multilateral Power Trade." *Press Release*. 23 June 2022.

⁶ Cheryl Tan. "Singapore could soon import renewable energy from Indonesia". *The Straits Times*. 17 March 2023.

⁷ Frederic Neumann. "Production Shifts from China to ASEAN." *South China Morning Post*. 7 June 2021.

⁸ Gigih Udi Atmo, Takashi Otsuki and Eri Nurcahyanto. "Modelling Low Carbon Electricity Generation of an Integrated ASEAN Power Grid." *IOP Conference Series: Earth and Environmental Science* 997 (2022). 012011.

Singapore, which almost completely relies on imported gas, has committed to importing 30 per cent of its electricity from low-carbon sources by 2035.⁹ The APG could create new investment opportunities by allowing member states to access a wider range of electricity resources and potentially sell excess electricity to other countries. There are already infrastructure projects underway, such as the construction of floating solar power plants in Batam, Indonesia that are expected to export solar energy to Singapore via undersea cables in 2024.¹⁰

The Indonesian government's temporary halt on renewable energy exports and recent political rhetoric has not hindered the country's collaboration with potential partner countries, as Indonesia and Singapore inked an agreement in March 2023 to promote renewable energy cooperation.⁶ Their joint commitment involves creating a framework that encourages investments in the development of renewable energy manufacturing industries within Indonesia to support cross-border electricity trading.

What should the policymakers do?

1. Harmonise regulatory and technical frameworks for a common electricity market

To address the political and economic diversity within ASEAN, AMS must work towards harmonizing regulatory frameworks by creating a common set of rules for the potential common electricity market. These rules should include, but not be limited to, technical requirements, guidelines for pricing, market entry and exit arrangements, and the rights and obligations of market participants. It is worth noting that countries within the Greater Mekong Subregions have already collaborated on establishing common technical requirements to facilitate electricity trading, which includes the development of common technical codes and standards through technical harmonisation to ensure a reliable and safe electricity transmission system. This successful initiative could serve as a model and be expanded to include all countries participating in the APG projects.

2. Establish an independent regional regulator for a harmonised energy market

A harmonised energy market and technical framework can be achieved through the establishment of a regional regulatory institution. This institution can play a crucial role in managing regional power integration by ensuring efficient and fair electricity trade and exchange. Drawing inspiration from the EU's Agency for the Cooperation of Energy Regulators (ACER), ASEAN could benefit from a similar institution that harmonizes regulations, sets technical standards, and fosters a more integrated energy market. A more streamlined regional regulatory approach can reduce barriers to cross-border electricity trade, promote investment in the energy sector, and encourage the adoption of innovative technologies and best practices. Existing institutions like the ASEAN Secretariat and HAPUA could assume these roles. However, new institutions may be

⁹ Vanessa Lim. "Singapore intends to import 30% of its electricity supply from low-carbon sources by 2035." *Channel News Asia*. 25 October 2021.

¹⁰ Fadli. "Batam Floating Solar Plant Project." *The Jakarta Post*. 19 December 2022.

required as responsibilities evolve. ASEAN should utilize existing institutions to the greatest extent, but also be open to establishing new ones if needed. The International Energy Agency underscores the importance of a regional regulator in enhancing cooperation and coordination among member states.¹¹

3. Establish an independent regional operator to optimize grid operation and address geopolitical uncertainties

An independent regional operator is essential for the efficient management of the APG, as it can optimize power generation, distribution, and transmission across member states. By pooling resources and coordinating energy management, a regional operator can enhance the reliability of the grid, reduce transmission losses, and enable better load management. This mutual benefit can result in lower energy costs for the region and more balanced supply-demand dynamics. In the face of geopolitical uncertainties, a regional operator can help mitigate the impact on energy supply, demand, and prices by coordinating grid maintenance, expansion efforts, and the integration of renewable energy sources. This collaboration can also facilitate the sharing of best practices, technologies, and innovations, driving the region's transition to a more sustainable energy future.

Various studies and proposals support the establishment of a regional operator. Nord Pool Consulting, in collaboration with HAPUA and TEPCO, conducted the "Study on the Formation of the APG Transmission System Operator Institution", which highlights the importance of an institution that manages

grid operations across the region. The study, published by ERIA, emphasizes that a regional operator can promote investment in critical infrastructure, reduce barriers to cross-border electricity trade, and enhance the overall energy security of the region.¹² This consolidation would streamline decision-making processes, improve information sharing, and create a more cohesive approach to managing the APG, ultimately leading to a more resilient and efficient regional energy market.

4. Enhance coordination and cooperation among ASEAN Member States

Political will among ASEAN member states varies. Some countries, such as Singapore, have strong political support for renewable energy imports, while others, like Indonesia, have shown less enthusiasm. Policymakers need to consider equitable distribution of the benefits of the integrated power grids. Exporting electricity could impact domestic energy markets, which may affect policy choices.¹¹ Despite these challenges, it is important to continue advocating for strong political support for regional integration given its benefits. One way is through bilateral agreements between member states, which allow national utilities and other stakeholders to move forward with necessary infrastructure developments. Such developments may also serve to incentivise and accelerate the harmonising of these bilateral agreements at the regional level to help ensure a more cohesive and efficient multilateral trading system in the region.

In addition, AMS need to establish regular, high-level regional dialogues between policymakers and industry leaders through both top-down and bottom-up approaches. These dialogues could serve as a platform for

¹¹ International Energy Agency. "Integrating Power Systems across Borders." June 2019.

¹² Economic Research Institute for ASEAN and East Asia. "Study on the Formation of the ASEAN Power Grid Transmission System Operator Institution." June 2022.

discussing current challenges and opportunities related to the development of APG as well as for developing strategies for cooperation and coordination among the various stakeholders. The dialogue is also useful to promote transparency and open communication between the public and private sectors which would help to build trust and productive relationship.

5. Consider the potential environmental impacts of the APG

As APG evolves, it is also crucial to consider the potential environmental impacts, such as the effects of submarine cables on marine biodiversity and local communities. Ensuring that strategies are in place to address or prevent these environmental damages is an important aspect of realizing the full potential of the APG initiative.

6. AMS governments can draw from the EU's experience in establishing regulatory bodies and operator institutions

Rather than starting from scratch, AMS governments can benefit from examining the experiences of other regions, such as the EU, in establishing regulatory bodies and operator institutions. The European Network of Transmission System Operators for Electricity (ENTSO-E) has successfully developed network development plans and harmonisation strategies. As an independent, non-profit organisation with a transparent and accountable governance structure, ENTSO-E provides a valuable model for an independent APG operator. Likewise, the EU's Agency for the Cooperation of Energy Regulators (ACER) serves as an example of a regional regulatory body, fostering cooperation among national regulators and harmonizing energy policies across member

states. ACER's role in promoting market integration and facilitating cross-border collaboration could provide valuable insights for ASEAN as it establishes its own regional regulatory body.

ENTSO-E's and ACER's coordination and cooperation mechanisms, such as regular meetings, data sharing agreements, and planning processes, can be adapted to improve collaboration among AMS member states and stakeholders. Additionally, the EU's support for the African Union in developing harmonised regulatory frameworks could also serve as an insightful example for the ASEAN region. By learning from the EU's experiences, ASEAN can establish robust institutions to promote regional power integration and enhance the resilience and efficiency of its energy market.

Biography

Dr Victor Nian is a Co-Founder and Chief Executive Officer of the Centre for Strategic Energy and Resources. His expertise is in energy, sustainability, and net-zero policy and strategies. He is one of the go-to-persons in nuclear energy and the hydrogen economy in Southeast Asia. Dr Nian holds a PhD in Mechanical Engineering and BEng (Hons) in Electrical Engineering with a Minor in Management of Technology, all from the National University of Singapore.



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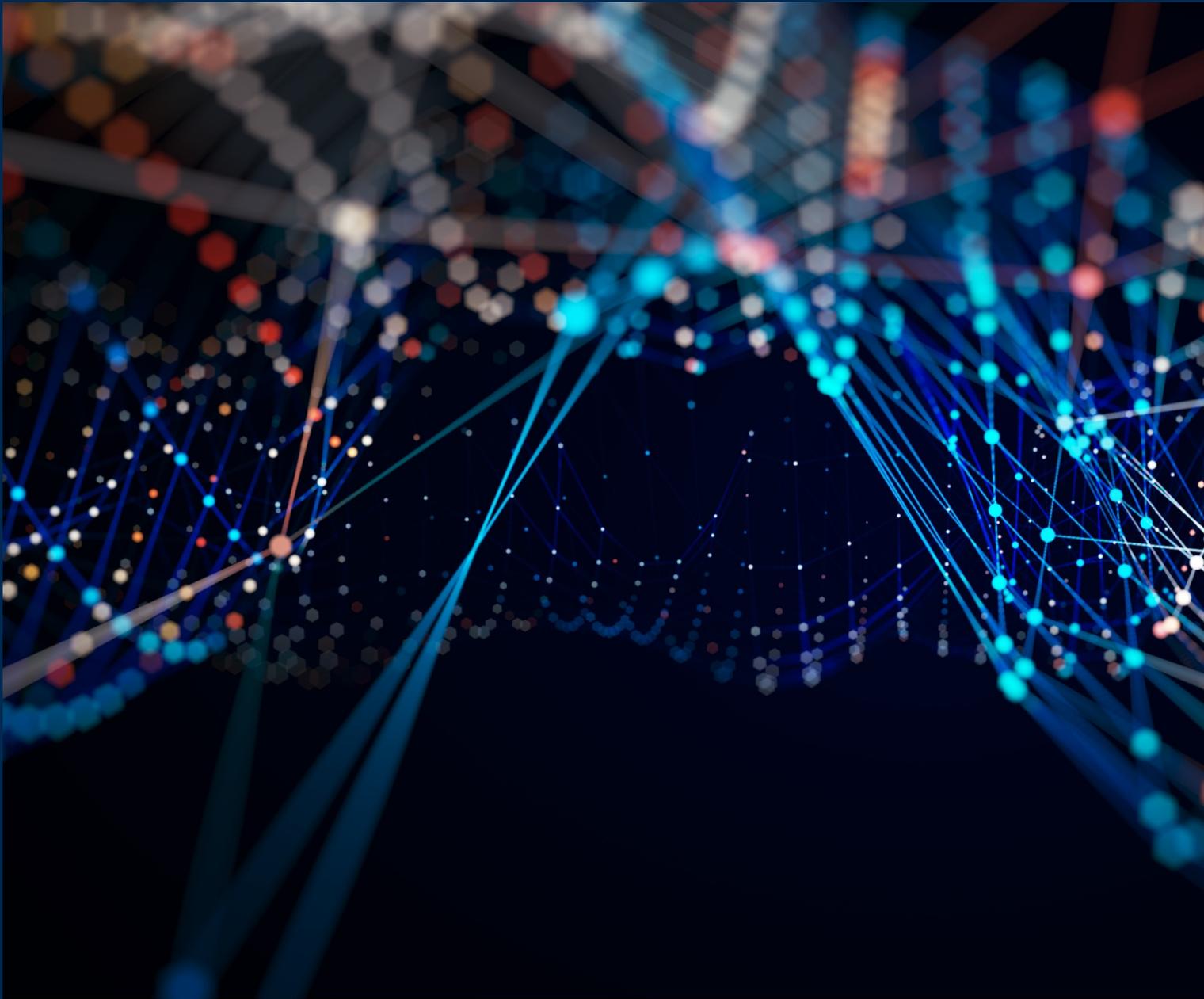
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Kristiyanto is an Associate at the Centre for Strategic Energy and Resources, contributing his knowledge to research and analysis in the field of sustainability and energy transition. His work focuses on providing insights that aid governments and policymakers in navigating the complex landscape of energy transition. Kristiyanto holds a master's degree in public policy from the Lee Kuan Yew School of Public Policy at the National University of Singapore.



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