Short Report

The Role of Natural Gas in Balancing ASEAN's Energy Transition Aspiration and Energy Supply Security

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Highlights

Importance of Fossil Fuels and Natural Gas in ASEAN's Energy Mix

Fuelling ASEAN's continued rapid economic growth requires enormous quantities of energy. Fossil fuels remain the dominant source of energy, accounting for 82% of the primary energy supply mix. Compared to oil and coal, natural gas emits less carbon dioxide, providing an interim fuel while clean energy sources and technologies are being gradually deployed.

Stagnation and Decline in ASEAN's Natural Gas Utilisation

In 2022, one-fifth of ASEAN's total primary energy supply was provided by natural gas. However, the actual quantity of natural gas used in the region has remained stagnant in recent years, and tending to decline. The share of natural gas in power generation across the region decreased from 35% in 2015 to 20 - 22% in 2022. Natural gas accounts for at least 40% of the power generation capacity in half of the ASEAN countries. Among them, Indonesia, Malaysia, Thailand and Viet Nam have the highest installed capacities reliant on natural gas, while in the non-power generation sectors, natural gas is used in heavy industries, transport, and residential and commercial buildings.

ASEAN's Gas Production Decline and Export Challenges

Since 2019, ASEAN has experienced a continuous decline in its gas production. It has continued to be a net gas exporter, with 80% of its exports being sent to countries outside the region. As ASEAN's traditional gas exporter countries prioritised their domestic demand over exports, net exports declined by 13% in 2023 compared to 2022 levels.

Challenges and Imperatives for Expanding Natural Gas Use in ASEAN

There are many obstacles in expanding the use of natural gas in ASEAN, including economic limitations like financial sustainability and affordability, and logistical regulatory issues related to liquefied natural gas (LNG) within the Trans-ASEAN Gas Pipeline framework. Moreover, geopolitical issues can impact gas supply and infrastructure development, complicating efforts to increase the use of natural gas in the region. Without doubt, the development of an integrated gas market with market-based pricing is essential.

Image Source: pixabay

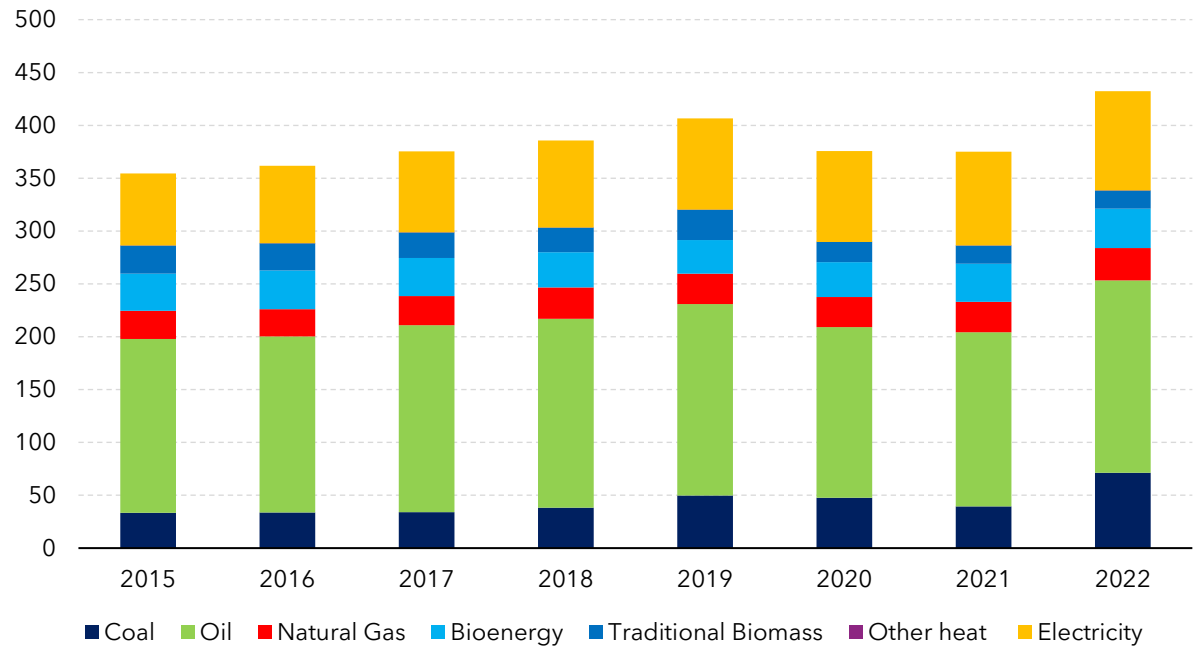
Introduction

Southeast Asia is witnessing critical transformations in both its economic and energy spheres. The region has become a vibrant hub for economic activities, characterised by sustained industrialisation and infrastructure expansion. Southeast Asia has displayed remarkable economic resilience amidst geopolitical tensions and global market instabilities, reflecting its inherent adaptability and endurance.

With its broadening economic development, the region is poised to experience a substantial increase in energy demand. From the historical data shown in **FIGURE 1**, it is evident that since 2015 final energy consumption was on an upward trend but the COVID pandemic caused a contraction in 2020. By 2022, however, energy consumption bounced back, amidst the steady increase in economic development, industrialisation, population expansion and urbanisation.

In terms of energy types, fossil fuels have remained the most important source of energy since 2015, accounting for 82% of the primary energy supply mix in 2022, as shown in **FIGURE 2**. In 2022, oil contributed 32% of the total primary energy supply (TPES) in ASEAN–almost all of which was transformed into oil products for both energy and non-energy end-uses–while natural gas provided nearly 20%. Unlike oil and natural gas, whose shares decreased, the share of coal in the primary energy supply mix grew to 30% in 2022, up from 20% in 2015. The increasingly heavy reliance on coal, at a compound annual growth rate (CAGR) of more than 25% between 2015 and 2022, outpaced the growth of the share of renewable energy (hydro, wind, solar, biofuels, waste, geothermal, etc.), which rose at only 5.2% every year over the same period.

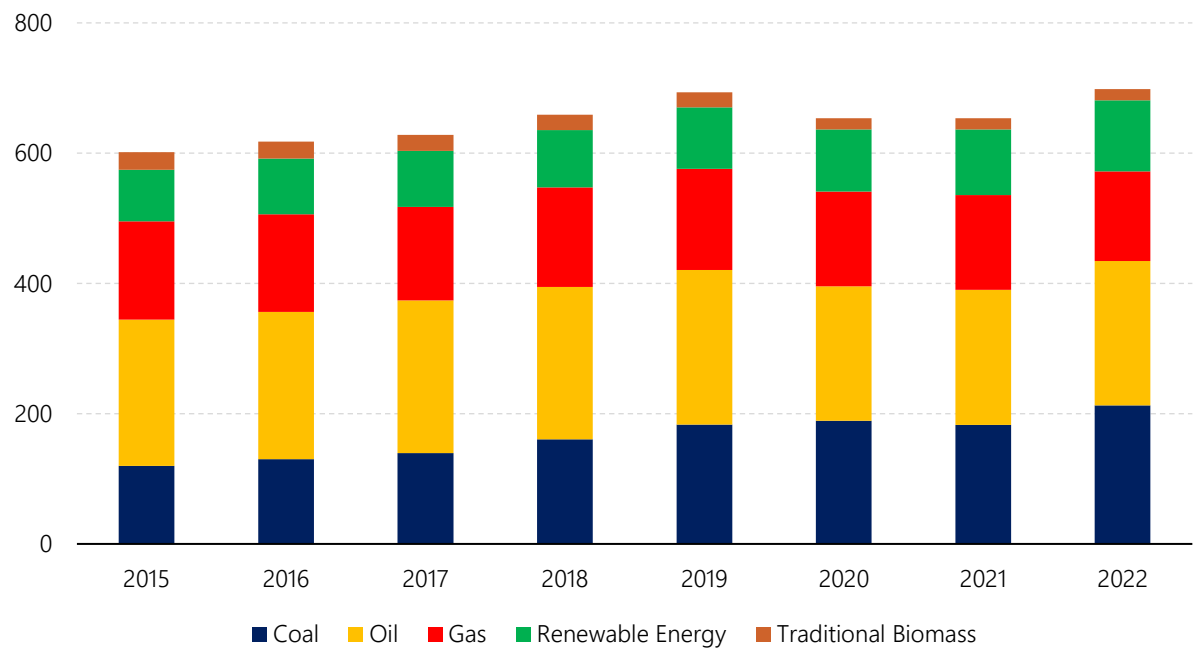
Figure 1. Total final energy consumption by fuel in Southeast Asia, 2015-2022 (Mtoe)



Source: 8th ASEAN Energy Outlook (AEO8).

While meeting the growing energy demand remains the primary objective of energy policies to ensure continued economic stability, careful and equitable energy transition efforts that balance economic indicators with environmental considerations are increasingly necessary to align economic growth with national climate ambitions. This has driven the switch from high-emission energy systems (fossil fuels) to low-emission ones (various forms of clean energy). Yet, given the slower-than-expected diffusion rate of the clean energy technologies critical to supporting the transition—partly due to soaring input prices, uneven and insufficient investments in clean energy deployment, and technical limitations of solar and wind in supplying stable electricity—the use of "transition fuels" emerges as the best way to address the bottlenecks [1], [2], [3].

Figure 2. Total primary energy supply in Southeast Asia by fuel source, 2015-2022 (Mtoe)



Source: 8th ASEAN Energy Outlook (AEO8).

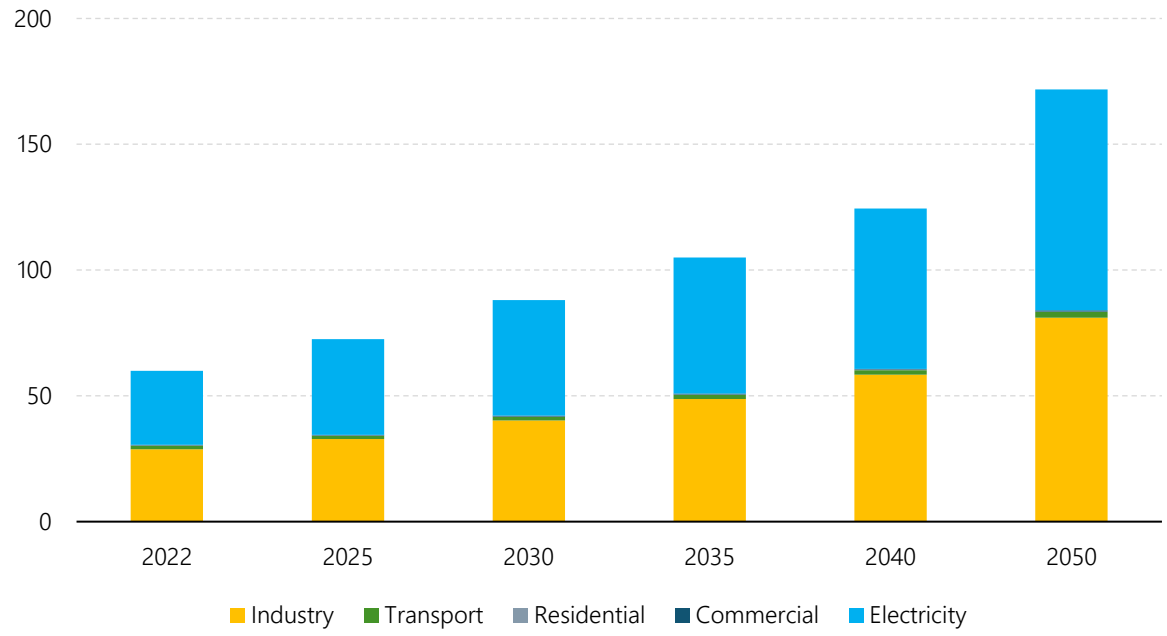
Natural gas is serving as a crucial bridging fuel in countries around the world that are striving to reduce carbon emissions and transition towards cleaner energy sources. Its lower carbon emissions make it a more environmentally friendly alternative to fossil fuels, while clean energy sources and technologies are being gradually deployed. Its ability to respond swiftly to both seasonal and short-term demand fluctuations makes it essential in maintaining energy security and grid stability around the world. Natural gas-fired power plants are known for their flexibility and ability to complement intermittent renewable sources like wind and solar, providing reliable backup power during periods of low renewable generation.

Used to generate about a quarter of global electricity, natural gas serves as a flexible energy source that can be transported through pipelines or in liquefied form via ships. The latter mode of transportation is becoming increasingly important in diversifying supply routes, especially after Russia's invasion of Ukraine which triggered massive disruptions to Europe's natural gas supply. Significant investments are being made in liquefied natural gas (LNG)

infrastructure, facilitating the global trade of natural gas in a manner similar to oil [4]. These investments aim to enhance energy security by reducing dependency on specific transit routes and suppliers, thereby increasing resilience in the face of geopolitical uncertainties.

Despite the promising greenhouse gas (GHG) emission savings from natural gas, especially as a replacement for coal, the actual amount of natural gas used in ASEAN has remained stagnant. As shown in **FIGURE 3**, most of the natural gas consumed within the region in 2022 was used for industry purposes and power generation. The rest was used in the transportation, residential or commercial sectors.

Figure 3. Natural gas use in Southeast Asia by sector (Mtoe)

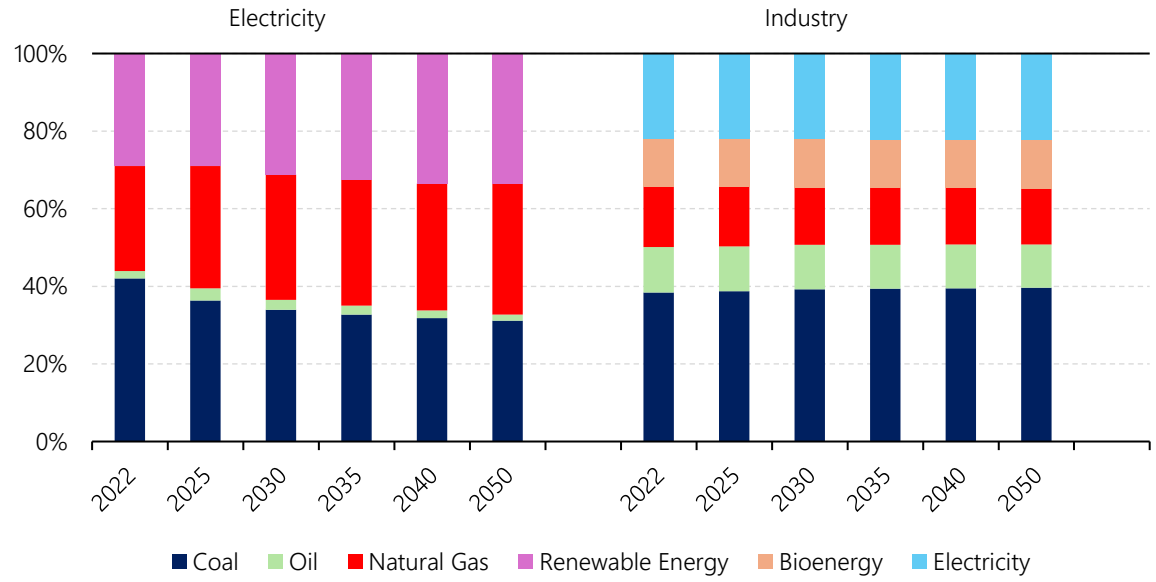


Source: 8th ASEAN Energy Outlook (AEO8).

In Southeast Asia, the electricity and industrial sectors are the top two consumers of natural gas, as shown in **FIGURE 4**. In the electricity sector, coal currently dominates with a 40% share, while natural gas accounts for a modest 28%. However, the Carbon Neutrality Scenario (CNS) indicates a major shift by 2050, when natural gas and renewables together are expected to supply 65% of the sector's energy needs. This transition reflects the region's growing emphasis on cleaner energy sources as it moves away from its heavy reliance on coal.

The industrial sector, on the other hand, is projected to maintain coal as its primary energy source. It is expected that coal will account for 38% to 40% of the energy mix well into the 2040s. Natural gas lags behind, providing less than 20% of the sector's energy needs. Meanwhile, the share of other energy sources in this sector is expected to remain relatively stable until 2050. This indicates that, unlike electricity generation, the industrial sector in Southeast Asia is likely to continue its dependence on coal for a significant portion of its energy requirements.

Figure 4. Structure of energy consumption in Southeast Asia's electricity and industrial sectors (%)



Source: 8th ASEAN Energy Outlook (AEO8).

This report aims to understand how the ten ASEAN Member States (AMS) position natural gas in their energy, climate and other related policies as they transition towards a low-carbon economy without jeopardising their energy security. The stated policies is used as the basis of the estimated demand outlook in the region. Natural gas supply projections and the overall readiness evaluation of natural gas infrastructure are also examined in this report. Policy recommendations are provided to bridge potential demand and supply gaps.

Image Source: Getty Images

Natural Gas Policies in the AMS

Several of the AMS are inclined towards the use of natural gas as a transitional energy source. As a large producer and consumer of natural gas in the region, Indonesia has emphasised the pivotal role that this energy source can play in securing energy supplies and supporting renewable energy integration [5]. Malaysia is the second largest producer and consumer. Its national oil and gas company, PETRONAS, regards natural gas as a clean fuel that is essential for addressing renewable energy intermittency [6]. Thailand, heavily reliant on natural gas, implemented measures to mitigate price shocks in the aftermath of the global natural gas market turmoil in 2022, while committing to enhance long-term supply security through LNG infrastructure development [7].

The Energy Market Authority (EMA) of Singapore also regards natural gas as one of the "four switches" in the country's approach to energy transition, especially in power generation, and emphasises LNG facility development as the key strategy to diversify natural gas sources [8]. The Philippines' Department of Energy (DOE) shares this view on the importance of natural gas and LNG infrastructure, believing that supply security is essential for the wider implementation of variable renewable energy [9]. Likewise, Viet Nam is calling for significant increases in domestic gas production and prioritisation of LNG imports from regional markets in order to meet rising energy demands. [10].

Meanwhile, the role of natural gas in Myanmar's energy transition is not completely clear. On one hand, this country relies very heavily on natural gas to power its economy. On the other, it exports 80% of its own gas production. Nonetheless, it has declared its commitment to reducing GHG emissions between 2021 and 2030 [11].

Brunei Darussalam faces a similar challenge: it relies very heavily on upstream oil and gas revenues to avoid economic stagnation. Hence it encourages oil and gas downstream industries such as oil refineries and petrochemicals [12].

Cambodia and Lao PDR do not produce natural gas domestically nor do they use it extensively for either power generation or other final uses. However, Cambodia is poised to start using natural gas for power generation to displace its coal power generation facilities, while Lao PDR is anticipating greater energy infrastructure interconnectivity within the ASEAN region, including natural gas pipelines and LNG terminals, and believes that natural gas is key to a seamless energy transition [13], [14].

Image Source: NuwatPhoto's Images

Current Natural Gas Demand

Power Generation Sector

In Southeast Asia, natural gas is traditionally used to generate electricity that supplies the national grid before being used as the final energy service. As seen in **Table 1**, in half of the AMS, the share of natural gas in their power generation capacity stands at least 40%. Thailand has the largest natural gas power plants, at almost 37 GW, or equivalent to 72% of the country's total generating capacity. While Indonesia is the largest producer and user of coal in the power sector, it also has a significant installed capacity of natural gas power plants, totalling nearly 21 GW or about one-third of its total power generation capacity.

Table 1. Current Operating Power Generation Capacity in Southeast Asia as per 2022 data

Country	Installed Capacity		
	Total, GW	Natural Gas, GW	Natural Gas Share, %[i]
Brunei Darussalam	1.3	1.1	84.6
Cambodia	3.5	0	0
Indonesia	83.8	20.8	24.8
Lao PDR	11.0	0	0
Malaysia	33.1	11.7	35.3
Myanmar	7.3	3.5	47.9
Philippines	28.9	3.7	12.8
Singapore	12.3	10.7	86.9
Thailand	53.4	30.9	57.8
Viet Nam	75.6	7.2	9.5

i) Share of total power capacity addition coming from natural gas.

Source: ASEAN Power Update 2023.

Based on its Energy White Paper published in 2014, **Brunei Darussalam's** energy policy is designed to support the realisation of Wawasan Brunei 2035—Brunei's aspirations as a nation, which will require a significant expansion of the energy sector, including power generation [15]. Specifically, as part of its energy intensity reduction strategy, natural gas for electricity generation is to be gradually replaced by other more efficient energy sources, including renewable energy. Consequently, there are no plans to construct new natural gas power plants in the country.

In its power development plan (PDP) document, **Cambodia** states that natural gas has some role in meeting the growing demand for electricity while ensuring energy security, reliability and affordability, as well as fulfilling environmental commitments. The use of natural gas reflects a balanced approach towards meeting these objectives while also serving as a contingency option to address unforeseen delays in commissioning other power plants. Yet, natural gas is included only in its long-term scenario, with new additions only coming online by 2036. Nevertheless, according to the GEM database, a gas-fired power plant project in Khum Thma Sa with a capacity of 0.8 GW has been announced.

According to **Indonesia's** 2021 PDP, the government remained steadfast in pursuing its 35,000 MW programme, with PLN (state-run electricity company) aiming to increase participation from independent power producers (IPPs) to achieve this goal. The PDP focuses on ramping up its power-generating capacity from solar, hydro and geothermal. Combined, these constitute nearly half of the total capacity additions between 2022 and 2030, dwarfing those of coal and natural gas. Indonesia has nonetheless issued strategic policies to promote domestic natural gas use, including regulating its price for power generation and ensuring domestic supply by increasing indigenous production and building LNG import facilities.

The demand for electricity in **Lao PDR** is expected to grow at an average annual rate of 12% or 322 MW from 2016 to 2030, reaching a peak demand of 2.7 GW in 2020 and 5.9 GW by 2030. To meet this demand, the country plans to ramp up its power-generating capacity from 1.5 GW in 2015 to 19.1 GW in 2030, mostly from hydropower (both run-of-the-river and reservoir). While the PDP document mentions new thermal power plants, which make up 13% of the total capacity by 2030, it does not specify the fuel type. Yet, according to the GEM database, no prospective natural gas power plants have been identified so far, while coal power plant projects with a combined capacity of 4.4 GW have either been issued permits or have commenced construction.

The 2022-2040 National Energy Policy of **Malaysia** sets strategic targets to address the energy trilemma, from which action plans related to the power sector are derived. Specifically, the country aims to optimise the power generation mix partly by incorporating more indigenous natural gas resources to allow wider penetration of renewables and continuous reduction of coal. In the country's National Energy Transition Outlook under the 1.5°C scenario, however, natural gas power plants increase by only 1.34 GW in the medium term (i.e., by 2030), slightly lower than coal-fired capacity additions. In the long term (i.e., by 2050), coal and natural gas power plants will be completely phased out as renewable and alternative energy sources dominate Malaysia's power supply mix.

Myanmar's Energy Master Plan (EMP) sets targets for new natural gas and coal power generation plants to be completed before 2021. The use of conventional energy for power generation is intended to strengthen the overall system's reliability and resilience before the country turns its focus towards hydropower generation, which is considered a variable power supply source, for the medium term (i.e., 2022 – 2031). As a result, the country does not plan to add any more natural gas power plants during the period.

In the **Philippines'** Energy Plan 2020-2040, the country states its intention to impose a moratorium on coal power plants to reduce their role in the power generation mix as part of its clean energy transition vision. In pursuing the transition, the Philippines acknowledges the role of natural gas in providing flexibility in power generation by catering to intermediate or mid-merit supply requirements to adjust electricity production relative to demand fluctuations. The country's 2020-2040 PDP under the RE50 High Demand Scenario reflects this policy, where natural gas comprises 9% of the total new capacity addition between 2022 and 2030 to reach 16% of the total installed capacity in 2040.

Singapore foresees significant growth in electricity demand driven by factors such as population changes and the emergence of electricity-intensive sectors like data centres and

electrified transport. Based on the 2021 Electricity Market Outlook, EMA anticipates a peak capacity addition of 2.4 GW between 2022 and 2030. As one of the "four switches" in the country's strategies to address the energy trilemma, natural gas remains critical in the power sector. According to the GEM database, there are 1.3 GW of prospective natural gas power plant projects that are expected to come online before 2030.

Thailand is a gas-dependent country and natural gas will remain critical in meeting the country's demand for electricity for some time. According to the 2018-2037 PDP, one of Thailand's key strategies to promote economic development while maintaining stability is to promote electricity generation from natural gas. Between 2022 and 2030, net capacity additions from natural gas will reach 5.5 GW, representing about 60% of the total capacity additions. As many of the existing power plants are planned to be decommissioned, net capacity additions from natural gas slow down by 2037 and settle to 6.1 GW or 19% of the total new capacity.

Natural gas plays a strategic role in **Viet Nam**. According to the country's PDP, the development of domestic gas-based power sources is to take priority while imports of LNG are under consideration. This emphasis on gas aligns with efforts to diversify energy sources and ensure national power security. Capacity projections show that natural gas will account for a significant portion of the total power generation mix by 2030. The 26 GW of new natural gas capacity, will represent 37% of the total capacity additions between 2021 and 2030.

Table 2 summarises the capacity additions outlined in the AMS' PDPs. It shows that there will be increasing reliance on natural gas for additional power generation capacity in Singapore, Thailand and Viet Nam, where it constitutes a significant portion of their respective total capacity additions. Indonesia, Malaysia and the Philippines, on the other hand, are taking a less aggressive approach in adding natural gas power plant capacity, both nominally and relatively. Meanwhile, natural gas is absent in the PDPs of Brunei Darussalam, Cambodia, Lao PDR and Myanmar.

Image Source: Getty Images

Table 2. Projections of additional (net) natural gas power plant capacity in Southeast Asia

Country[i]	Period (medium term)[ii]	Capacity Net Addition		
		Total, GW	Natural Gas, GW	Natural Gas Share, %[iii]
Brunei Darussalam[iv]	2022 – 2030	< 0.1	0	0
Cambodia	2022 – 2030	5.9	0[v]	0
Indonesia	2022 – 2030	26.8	1.7[vi]	6.4
Lao PDR	2022 – 2030	10.2	0[vii]	0
Malaysia[viii]	2018 – 2030	23.0	1.3[ix]	5.8
Myanmar	2022 – 2031	11.5	0	0
Philippines[x]	2022 – 2030	23.2	2.0	8.6
Singapore	2022 – 2030	2.4[xi]	1.3[xii]	54.2
Thailand	2022 – 2030	8.9	5.5	61.8
Viet Nam	2021 – 2030	69.6	26.0	37.4

i) All data is from each country's latest available PDP unless otherwise specified. If a PDP is being used, data is taken from the supply (i.e., planned capacity net additions) or the demand estimates. If the data is taken from documents other than the country's PDP, the scenario used as the reference is the one with the least additional demand for natural gas.
ii) The period is set from 2022 to 2030 whenever possible to ensure comparability.
iii) Share of total power capacity addition coming from natural gas.
iv) Based on the prospective power plant projects (i.e., announced, permitted, and under construction) obtained from the GEM database. The total installed capacity considers all available energy source data for power generation, i.e., coal, oil and gas, solar, wind, hydropower, geothermal, bioenergy and nuclear.
v) Power generation using natural gas is assumed to fall under the CCGT/ICE category in the PDP document; however, the document has not determined which technologies will be used.
vi) Natural gas-fired power generation is assumed to fall under the mobile natural gas power plant category in the PDP document.
vii) The natural gas power plant project is not directly mentioned in the PDP document as non-hydro power plants were only referred to as "Thermal". The number was then estimated from the power plant projects in the GEM database, which shows that prospective power plant projects categorised as thermal consist only of coal-fired power plants.
viii) Based on Malaysia's Energy Transition Outlook 2023, using the scenario aligned with the global net zero target by 2050 (i.e., 1.5-S).
ix) All additional natural gas power plants are abated (i.e., equipped with CCS).
x) Based on the Philippines PDP 2020 – 2040 using the RE50 High Demand scenario.
xi) Based on the projected system peak demand developed by Singapore's Electricity Market Authority (EMA) Electricity Market Outlook 2020 and 2021. Accordingly, from the supply perspective, the number represents the minimum (instead of expected) anticipated supply addition.
xii) Based on prospective natural gas power plant projects listed in the GEM database.

Non-power Generation Sectors

In addition to power generation, natural gas is used in various other sectors as an energy source, including heavy industries such as steel and cement manufacturing, transport (in the form of compressed natural gas), and residential and commercial buildings (for space and water heating). Natural gas is also used as a feedstock in chemical industries, including the production of fertilisers (ammonia and urea) and other more complex chemicals such as formaldehyde and acetic acid.

In **Indonesia's** National Industrial Development Masterplan 2015-2035, resource-based upstream industries from natural gas are identified as one of the key priorities to promote a strong and competitive industrial structure. In the chemical industry, natural gas is used as a feedstock in methanol and ammonia production, while in steelmaking and ironmaking, it is used in smelting processes.

Malaysia's New Industrial Master Plan (NIMP) 2030. serves as the foundational framework for forthcoming policy formulation and fostering industrial growth across various tiers. It is expected that three key sectors will need natural gas: petroleum products and petrochemicals (e.g., as feedstocks in ethylene and methanol production), chemicals (e.g., as feedstocks in urea and ammonia production) and metal industries (e.g., as reducing agents and heat sources in steelmaking processes).

Brunei Darussalam, another natural gas net exporter, but with smaller reserves, is pursuing similar industrial policies.It is striving to diversify its economy from oil and gas upstream activities by promoting downstream industries as stipulated in the Wawasan Brunei 2035 vision [15]. This policy expands natural gas use, notably for methanol and fertiliser production.

Myanmar's National Comprehensive Development Plan (NCDP) highlights the significance of the chemical industry in the country's economy which will continue to rely heavily on natural gas to bolster fertiliser production.

As a net importer, **Singapore** may also have additional natural gas demand from non-power sectors. As outlined in its National Hydrogen Strategy, Singapore aims to produce clean hydrogen as feedstocks in manufacturing processes (e.g., food manufacturing) and chemical production (e.g., methionine), energy sources in heat and steam generation, and fuels in land, maritime and aviation transport. Singapore aspires to become a key player in the global hydrogen market in addition to meeting its national objective of substituting carbon-intensive feedstocks and fuels in domestic industries.

As the largest consumer of natural gas in ASEAN, **Thailand** is poised to maintain its domestic demand for it. However, overall demand growth is projected to be modest. According to Thailand's Natural Gas Management Plan 2018-2037, natural gas demand from the non-power sectors (i.e., chemical and LPG production, industry and transport) is expected to grow at 1.2% per year between 2021 and 2030, which is half the rate of the power sector.

Natural gas may not traditionally dominate the primary energy supply in the Philippines and Viet Nam, but it still plays a critical role in supplying energy for electricity generation. Nevertheless, under the **Philippines** Development Plan 2023-2028, the country aims to expand the production capacity of its chemical industries, including fertilisers and basic polymers. **Viet Nam** has pursued similar policies as outlined in its Industry White Paper 2019. The government is focusing on strengthening its industrial structure partly by promoting its chemical industry.

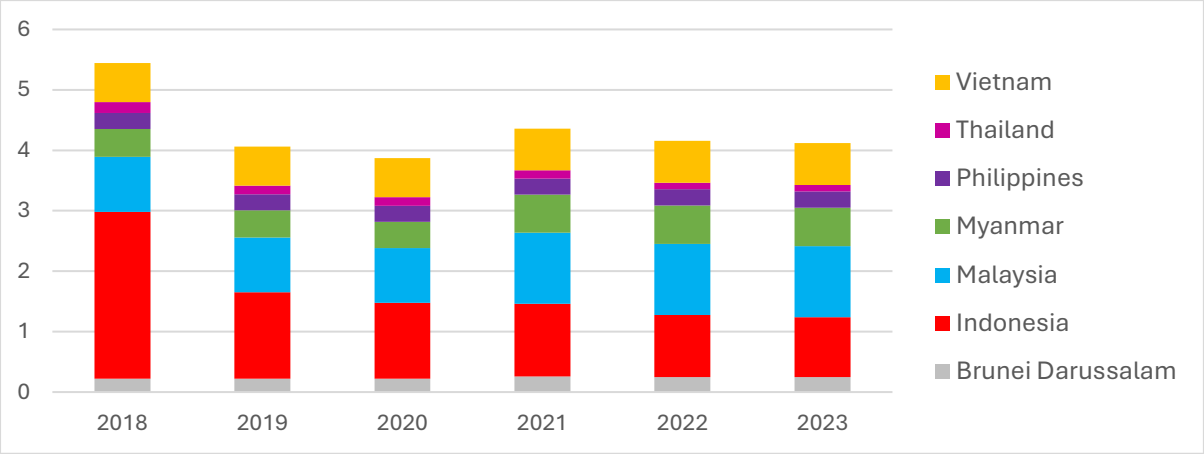
Meanwhile, **Cambodia** and **Lao PDR** face tremendous obstacles in developing their industrial sectors because they still lack interconnected electricity infrastructure, human capital, governance and leadership, among other things. Cambodia's Industrial Development Policy 2015-2025 and Lao PDR's Socio-Economic Development Plan 2021-2025 share some policy objectives on energy management and industrial development, including optimising energy sources that are domestically available, such as hydro, coal, biofuels and waste, to ensure energy security and promote industrialisation.

Image Source: Canva

Natural Gas Supply and Infrastructure

From an energy security perspective, the domestic availability of natural gas plays a critical role in governments determining which industries they want to promote. **FIGURE 5** shows that Indonesia and Malaysia have the largest natural gas reserves in Southeast Asia, accounting for more than half of the region's total. According to the ASEAN Oil and Gas Updates 2024, 76% of ASEAN's natural gas exports were directed to countries outside the region in 2023, indicating relatively weaker demand in domestic natural gas markets.

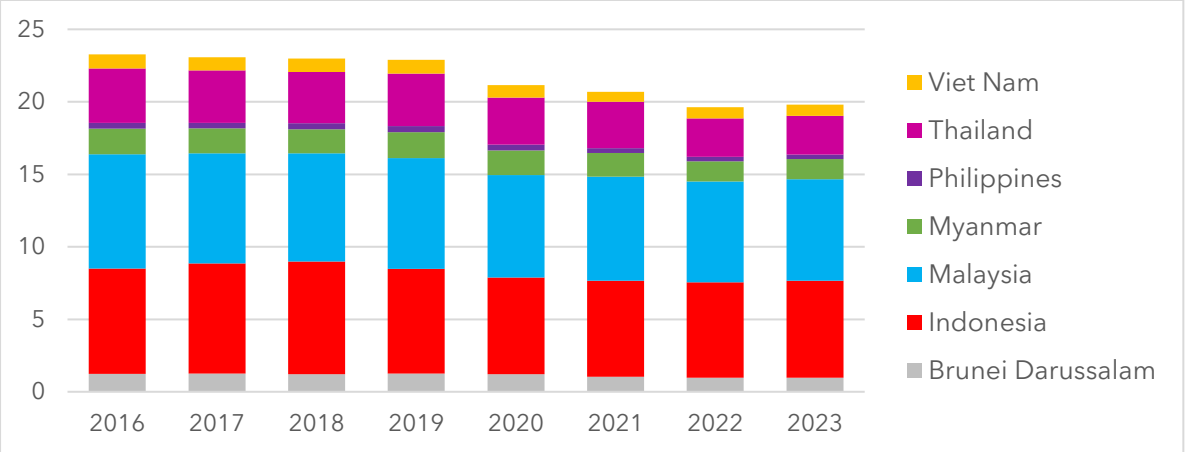
Figure 5. Natural gas reserves in Southeast Asia by country, 2018-2023 (TCM)



Source: ASEAN Oil and Gas Updates 2024.

Total gas production in ASEAN increased by 0.84% in 2023 compared to 2022 (see **Figure 6**). The growth was driven by modest production increases in several countries, including the region's top three producers: Indonesia, which rose by 1.52%, from; Malaysia, which increased by 0.77%; and Thailand, which grew by 0.25%.

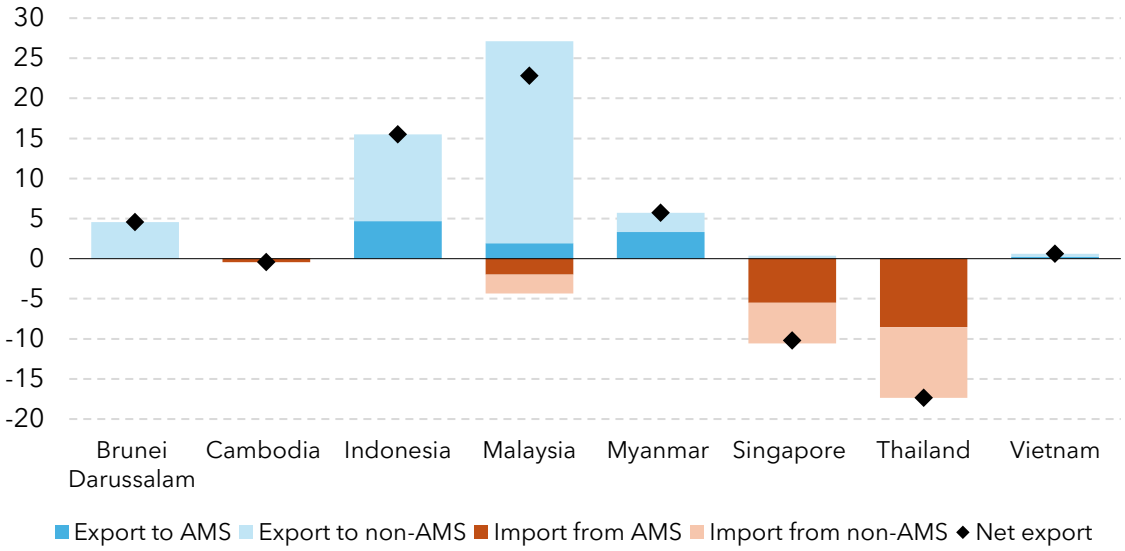
Figure 6. Annual natural gas production in Southeast Asia by country (BSCFD)



Source: ASEAN Oil and Gas Updates 2024.

Even though the region has experienced a continuous decline in gas production from 2019 to 2022, it continues to be a net gas exporter, with 80% of its exports being sent to countries outside the region. However, exports have been declining. In 2023, they fell 13% compared to 2022 levels due to some traditional gas exporter countries prioritising their domestic demand over exports. As shown in **FIGURE 7**, Malaysia and Indonesia continued to contribute the most to ASEAN's gas exports to the global market, while Singapore and Thailand were consistently the largest gas importers, with most of the gas coming from other AMS through pipelines. Projections from the 8th ASEAN Energy Outlook (AEO8) reveal that the region will become a regional net gas importer as early as between 2027 and 2033.

Figure 7. ASEAN gas dependency by country in 2023 compared to 2022 levels (million tons)

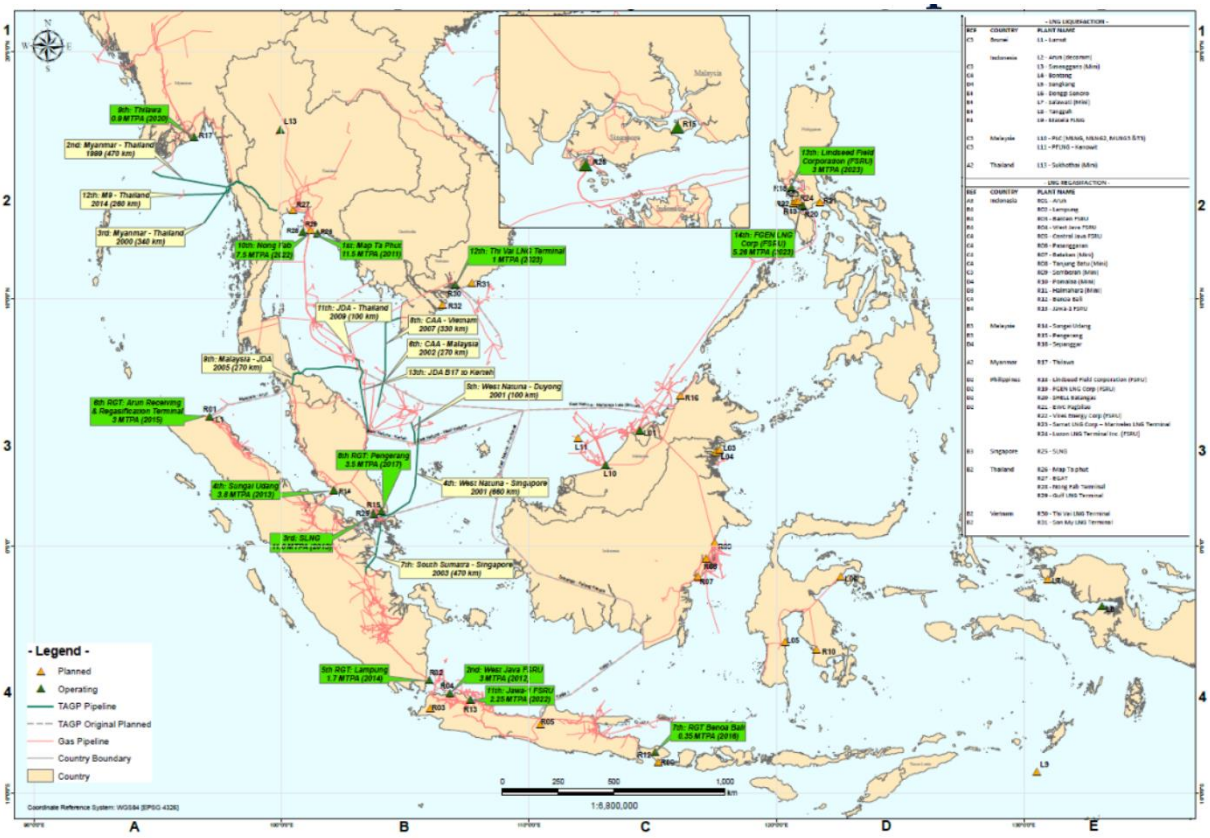


Source: ASEAN Oil and Gas Updates 2024.

While the ASEAN Energy Cooperation framework notes the increasing demand for natural gas and LNG, it also highlights the establishment of the Trans-ASEAN Gas Pipeline (TAGP) to enhance the accessibility and connectivity of gas and LNG through pipelines and regasification terminals. To date, the TAGP has connected six (6) AMS through 13 pipelines measuring a total length of 3,631 km, as depicted in **FIGURE 8** and 14 LNG regasification terminals (RGT) with a combined total capacity of 57.76 Mtpa, as presented in **TABLE 3**.

Image Source: Getty Images

Figure 8. Existing ASEAN gas pipeline networks



Source: ASCOPE.

According to the latest data from ASCOPE, all of the already constructed and proposed gas pipelines are within countries. There are no bilateral or multilateral gas pipelines planned. In contrast, LNG has emerged as one of the key commodities in the ASEAN energy sector.

Table 3. ASEAN LNG key processes capacity by country in 2023

Country	Regasification capacity (Mtpa)[i]	Liquefaction capacity (Mtpa)[ii]
Brunei Darussalam	0	7.2
Cambodia	0	0
Indonesia	10.3	21.1
Lao PDR	0	0
Malaysia	7.3	32
Myanmar	0.9	0
Philippines	8.26	0
Singapore	11	0
Thailand	19	0
Viet Nam	1	0
Total	**57.76**	**60.3**

i) Data as of May 2024 from ASEAN Oil and Gas Updates 2023, Global Energy Monitor and the 8th ASCOPE Mid-Year Task Force Meeting 2024.

ii) Data as of November 2023 from ASEAN Oil and Gas Updates 2023.

Natural Gas Development Challenges

Looking ahead, the future supply of natural gas is a pressing concern. While ASEAN anticipates maintaining gas production levels until 2050, there has been a marked decline in proven gas reserves [16]. This decline is attributed to limited new field discoveries, low gas prices, inadequate infrastructure for upstream investment, and high operational costs in gas fields with increased CO_2 content, such as Natuna D-Alpha [17]. Although up to 19 new gas fields are already approved and expected to reach final investment decisions between 2022 and 2025, the overarching declining production trend raises questions about the viability of these new projects in reversing the negative data trajectory [18].

Economic limitations

Between economy and sustainability

As the third largest energy commodity in the region's TPES, natural gas plays a significant role in ASEAN's energy landscape. [16]. This position shows its importance not only as a critical energy source but also as a fundamental component of economic stability for many of the AMS. Most of these countries are in the developing phase, heavily reliant on their natural resources, such as coal, oil and gas for economic growth. The role of natural gas is especially pronounced, as it contributes to the revenues of these countries, aiding their efforts to support their economies and improve living standards.

The potential repercussions of cutting off natural gas supplies to the ASEAN region would be far-reaching, leading to severe economic turmoil [19]. Such a disruption would not only cripple the AMS' economies but would also hinder their ability to address pressing global responsibilities, particularly in relation to climate change and sustainability. The AMS are tasked with the formidable challenge of balancing their economic needs with their commitment to the global community's objectives, including the pursuit of net-zero emissions. A critical pathway towards achieving this goal involves mainstreaming the use of renewable energy sources. However, the transition to renewables is not straightforward, especially when a significant portion of the region's energy needs are currently met by natural gas.

Natural gas is not merely a transitional energy source. It serves as a vital bridge in the shift towards a more sustainable energy framework [19]. While there is an increasing emphasis on renewable energy, the immediate need for affordable and reliable electricity cannot be overlooked. Natural gas currently plays a key role in providing this essential service. It is relatively cleaner than other fossil fuels, making it an attractive option to improve the AMS' energy mixes while simultaneously pursuing greener alternatives. The ongoing reliance on natural gas thus poses a complex dilemma for policymakers who must navigate the intricacies of economic dependency and environmental sustainability.

The complication then lies in effectively defending the argument that ASEAN still needs to rely on natural gas, particularly in attracting the necessary investment for its development. As the region grapples with the dual pressures of economic growth and environmental responsibility, convincing stakeholders of the continued relevance of natural gas is crucial. Investors may be hesitant to commit to natural gas projects amidst a growing global focus on renewable energy. Therefore, a robust argument is needed to illustrate how natural gas can coexist with, and even facilitate, the transition to renewables.

It is essential to communicate that while the long-term vision for ASEAN should prioritise renewable energy, the short- to medium-term realities necessitate a more flexible approach that includes natural gas. This dual strategy can help secure investments that are vital for the region's energy infrastructure, ultimately allowing ASEAN to meet its energy demands while progressing towards its sustainability goals. In this intricate balancing act, the narrative surrounding natural gas must evolve to highlight its role as a transitional ally rather than a hindrance to the pursuit of a sustainable energy future.

Affordability of natural gas product

Affordability continues to be a critical problem for LNG importers in Southeast Asia, especially for emerging markets that are seeking to transition away from coal and diversify their energy sources. The disconnect between producer pricing and consumer affordability is a prominent issue that requires urgent attention from various stakeholders, including governments, energy producers and financial institutions.

For instance, while producers may be willing to offer LNG at prices around USD 12 per million British thermal units (MMBtu), many consumers in the region are looking for prices closer to USD 8 per MMBtu to make LNG a feasible option for their energy needs [20]. This price gap not only hampers the growth of LNG imports but also jeopardises the region's efforts to meet its climate goals. Countries such as Indonesia, Malaysia, the Philippines and Viet Nam are grappling with the reality that without affordable LNG options, they may need to continue relying heavily on coal-fired power plants, which are often more cost-effective in the short term but contribute significantly to GHG emissions and air pollution.

The financial constraints faced by emerging markets often mean that investments in LNG infrastructure, such as import terminals and regasification facilities, are limited. This lack of investment in critical infrastructure can exacerbate the reliance on traditional fossil fuels like coal. Governments may need to create more favourable regulatory environments and incentivise private sector participation to facilitate the development of LNG projects. This could include mechanisms such as subsidies for LNG imports, tax breaks for infrastructure investments, or financial support for research into alternative energy sources.

Integrated gas market

In the context of developing an integrated gas market in Southeast Asia, market-based pricing appears more feasible and likely to succeed compared to cost-based pricing for several reasons. Firstly, Southeast Asia comprises diverse economies with unique energy needs. Market-based pricing offers the flexibility to accommodate these regional

differences in supply and demand, facilitating better integration of national markets. Additionally, an integrated market can foster competition among the AMS, leading to more efficient pricing that reflects real-time market conditions rather than solely production costs.

Moreover, market-based pricing aligns prices with consumer demand, enabling adjustments that reflect current trends, such as shifts towards renewable energy or evolving consumption patterns. As gas transportation and trade infrastructure improve, market dynamics will become increasingly critical, with market-based pricing signalling profitable investment opportunities. Furthermore, the regional geopolitical landscape significantly influences gas supply and pricing, and a market-based approach allows for more agile responses to these external factors.

Despite these potential benefits, there are notable drawbacks to adopting market-based pricing in an integrated gas market. One significant concern is volatility; market-based pricing can lead to considerable price fluctuations, creating uncertainty for both consumers and producers, which complicates planning and budgeting efforts. Additionally, vulnerable populations may face disproportionate impacts from price spikes, resulting in affordability issues and potential social unrest.

Another risk involves market manipulation, where a less regulated environment may be susceptible to the influence of dominant players or cartels, leading to unfair pricing practices and undermining competition. The unpredictability of market prices could also deter investment in infrastructure and production, as investors may be cautious about volatile returns. Furthermore, market-based pricing can incentivise short-term strategies, potentially neglecting essential investments in renewable energy and energy efficiency.

Worth noting, establishing and maintaining effective regulatory frameworks to ensure fair competition and protect consumers is complex and resource-intensive. Regional prices may also become overly reliant on global market fluctuations, exposing local economies to external shocks and vulnerabilities. Therefore, while market-based pricing could provide a framework for a more integrated and efficient gas market in Southeast Asia, careful consideration of these dilemmas is essential to ensure a balanced approach that promotes both stability and equity.

Liquefied natural gas in the TAGP framework

The rapid surge in LNG imports has further complicated the ambitions for a TAGP. Since 2010, LNG imports in ASEAN have skyrocketed, reaching 57.76 Mtpa by 2023 [21]. Operations have been running in seven of the ten AMS, with only Brunei Darussalam, Cambodia and Lao PDR having zero activity. This trend allows nations to adapt their imports to changing demand, making it a competitive alternative to traditional pipeline infrastructure.

This growth in LNG imports raises critical questions about the necessity and feasibility of an extensive pipeline network like the TAGP. The volatility of the global gas market, driven by

geopolitical factors and fluctuating supply, complicates long-term planning and investment for such large-scale projects. However, it is important to note that while the TAGP faces issues in LNG transport, it is also designed to accommodate LNG regasification terminals within its framework, integrating them as part of its operational strategy.

Geopolitical related issues

Geopolitical tensions greatly hinder the development of natural gas reserves in areas such as East Natuna and the Spratly Islands [22]. Nations including Brunei Darussalam, China, Indonesia, Malaysia, the Philippines, Taiwan, Thailand and Viet Nam contest the ownership of the reserves. The complex geopolitical dynamics hinder the formation of a unified strategy for energy development and distribution across the region and lead instead to a fragmented approach to energy cooperation.

The situation is further complicated by varying perspectives among key stakeholders within ASEAN regarding the role of natural gas. There is an ongoing dialogue about whether gas should primarily support domestic consumption or be leveraged to attract foreign investment through global exports. This debate has resulted in difficulties in establishing a coherent pricing and distribution strategy. The lack of consensus not only complicates the development of the TAGP but also impacts the establishment of a common gas market, which could enhance regional energy security.

Additionally, the situation in the South China Sea adds another layer of complexity to the oil and gas sector in Southeast Asia. The maritime disputes in this vital area have implications for energy exploration and production, particularly as these waters are believed to contain significant hydrocarbon reserves. The relationship between Southeast Asian countries and China influences negotiations and partnerships within the energy sector. While some nations seek collaborative approaches to resource management and energy security, others may adopt more cautious stances in light of geopolitical considerations.

Image Source: Getty Images

Policy Recommendations

Considering the pressing challenges facing Southeast Asia's natural gas sector, it is imperative to adopt a comprehensive set of policy recommendations aimed at fostering resilience, collaboration and sustainability. These include:

1. Adopting a nuanced policy framework that positions natural gas as a transitional ally in the shift towards renewable energy. Policymakers should establish a comprehensive strategy that not only acknowledges the region's current reliance on natural gas but also emphasises its potential to facilitate the integration of renewable energy sources. This can be achieved through targeted investments in infrastructure that support both natural gas and renewable energy projects, including smart grids and storage solutions. Moreover, the ASEAN governments should engage with private investors by promoting public-private partnerships, provide incentives for investments in cleaner natural gas technologies, and ensure regulatory frameworks that foster innovation while maintaining environmental standards.

2. ASEAN must foster a spirit of collaboration and dialogue among member states. Establishing a framework that aligns with existing protocols on dispute settlement mechanisms could enhance good faith in natural gas operations throughout the region. By encouraging joint development of contested resources, this approach can mitigate disputes and foster a more cohesive natural gas strategy. Moreover, regular multilateral dialogues involving all stakeholders should be initiated to align interests and develop a unified approach to energy distribution.

3. A concerted effort should be made to align producer pricing with consumer affordability, potentially through the establishment of a regional pricing mechanism. This mechanism could involve setting a cap on prices or developing long-term contracts that provide price stability. Additionally, enhancing transparency in pricing structures will help build trust between producers and consumers, ensuring that energy remains accessible to all segments of society.

4. The differing perspectives on the role of natural gas among ASEAN stakeholders must be reconciled to create a coherent natural gas policy. Facilitating inclusive discussions that bring together government representatives, industry leaders and civil society can help identify a common vision for natural gas utilisation. This dialogue should aim to balance domestic consumption needs with the potential for foreign investment through exports, fostering a unified pricing and distribution strategy that supports the development of both the TAGP and a common gas market.

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