APERC

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Foreword

In 2023, global gas demand grew modestly for the second consecutive year, increasing by 0.6% year-on-year. This limited growth was mainly due to reduced demand in Europe, as OECD Europe adjusted its energy consumption patterns and supply sources to reduce reliance on Russian natural gas, alongside high gas prices in the international market that impacted Europe's and the global gas consumption.

The APEC region, which includes the world's three largest gas consumers (the United States, Russia and China), accounted for 59% of global gas consumption in 2023. Despite relatively high gas prices, the region saw a 2.4% year-on-year increase in gas demand, driven mainly by renewed interest in LNG cargoes bound for China.

The global gas market dynamics of 2023 and 2024 highlighted the energy security challenges of the gas-importing economies in the APEC region as the relatively high LNG prices increased energy costs on those economies. With the growing interest in LNG regasification projects observed in 2023 in Southeast Asia and China, the region's exposure to future fluctuations in gas prices is likely to continue.

Natural gas production growth in the APEC region in 2023 continued to be largely concentrated in some of its largest producers: the United States, China and Canada. The observed decline in gas production in other APEC economies, mainly in Southeast Asia, highlight the need for additional upstream and midstream investment to enhance energy security and provide sufficient gas supplies to support their economic growth.

The 2024 edition of the APERC Gas Report reflects the ongoing developments and challenges in the global gas market with a focus on the APEC region. I hope this report will be one of the references to be considered by policymakers across the APEC region when developing energy security and energy transition plans and programs. I would also like to express my sincere gratitude to the authors and contributors for their time and effort in writing and publishing this report. I am also grateful to APEC member economies for providing updated data through the APEC Expert Group on Energy Data and Analysis (EGEDA).

Kazutomo IRIE

President
Asia Pacific Energy Research Centre
2025

Acknowledgements

We would like to take this opportunity to thank the APEC Expert Group on Energy Data and Analysis for supplying economy data, and researchers at APERC for providing the latest update on the gas development of each APEC economy. We also thank the administrative staff at APERC for their support.

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Abbreviation and acronyms

Abbreviation

bbl	barrel
bcf/d	billion cubic feet per day
bcm	billion cubic meter
GHG	greenhouse gas
GJ	giga joule
kWh	kilowatt hour
m^3	cubic meter
Mtpa	million tonnes per annum
MMBtu	million British thermal units
SPAs	sale and purchase agreements
y-o-y	year-on-year

Acronyms

APEC	Asia-Pacific Economic Cooperation
APERC	Asia Pacific Energy Research Centre
EIA	Energy Information Administration
FSRU	Floating Storage Regasification Unit
IEA	International Energy Agency
JKM	Japan-Korea Marker
LNG	Liquefied Natural Gas
NEA	Northeast Asia
NBP	National Balancing Point
SEA	Southeast Asia
TTF	Title Transfer Facility

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Key Highlights

Asia Pacific Economic Cooperation (APEC) economies accounted for 59% of the world's natural gas demand in 2023. Three APEC economies were the largest natural gas consumers in the world in 2023: The United States, Russia, and China. The United States remained the largest natural gas consumer in the world at 948 bcm, 23% of the world's natural gas consumption in 2023. In the same year, Russia consumed 472 bcm, while China consumed 387 bcm, accounting for 12% and 9% of the world's consumption, respectively.

APEC's natural gas demand had a growth of 2.4% year-on-year (y-o-y) in 2023. The United States, China, and Canada were the main drivers of consumption growth in the region. China saw the largest increase in natural gas demand, driven by its economic recovery from COVID-19 restrictions and renewed interest in LNG imports due to lower spot market prices.

The power sector was the main natural gas consumer in the APEC region, accounting for 40% of total gas demand in 2022. The power sector consumed 950 bcm of natural gas in 2022, registering a modest 0.4% year-on-year growth. This growth was driven by increased demand in China and the United States but was partially offset by declines in Russia, Northeast Asia, and Southeast Asia due to the expansion of nuclear power, renewable electricity, and price sensitivities.

Medium-and-long-term outlooks for natural gas demand project that China and SEA will drive demand growth in the region. Projections suggest that China and Southeast Asia will see continued natural gas demand growth beyond the 2030s and into 2050, driven by economic expansion, rising electricity demand, and decarbonization efforts. However, overall natural gas demand in APEC is expected to decline after the 2030s as advanced economies shift toward renewable energy and, to a lesser extent, nuclear power.

The APEC region continued to be a dominant natural gas producer in 2023. The region accounted for 60% of worldwide natural gas production. The region produced 2,476 bcm, a 1.8% y-o-y increase. Natural gas production in the United States experienced a 4.2% y-o-y increase, more than enough to offset the production drop in Russia (-5.3% y-o-y) resulting from the sharp decline in exports of Russian gas to Europe. Natural gas production growth in the United States was driven by growth in domestic demand and growth in exports.

Natural gas production in 2023 in the APEC region continued to be dominated by shale gas in the United States and conventional gas in Russia. Marketed gas production in the United States reached 1,071 bcm, while Russia's output stood at 600 bcm, down from 634 bcm the previous year. China and Canada, the next largest producers in the APEC region, saw significant production growth, with China recording the second-largest increase, reaching 230 bcm, driven by conventional gas production.

Natural gas production in Southeast Asia stabilized in 2023. Most natural gas producers in Southeast Asia saw declines in production, particularly Viet Nam, the Philippines, and Brunei Darussalam, due to technical challenges and maturing fields. However, this was offset by production growth in

Indonesia, which managed to reverse the downward trend of the past decade through efforts to revitalize its oil and gas sector.

Medium-and-long-term outlooks for natural gas production indicate that the United States, Russia, and China will continue to drive natural gas production growth in the region. Forecasts based on current global energy trends suggest that natural gas production in the United States and China will keep increasing throughout this decade. After the 2030s, the future of natural gas production in the United States and Russia will depend on how decarbonization efforts affect demand for their natural gas exports, both through pipelines and as LNG. In China, natural gas production growth will continue to be driven by energy security goals.

Total natural gas imports in the APEC region rebounded with a 1.5% y-o-y growth in 2023. The rebound of economic activities in China after the extended COVID-19-related lockdowns of 2022 combined with lower prices in the spot market incentivized China to have a rebound in imports. Natural gas imports in China saw a 10% y-o-y growth. This change in trend in overall natural gas imports in the APEC region underscores the impact of China's energy needs and strategies in the global gas markets.

LNG imports in the APEC region saw a 1.7% y-o-y increase in 2023. China and Thailand were the main drivers of LNG import growth in the region, with their imports increasing by 13% and 39% year-on-year, respectively. This growth more than compensated for the decline in LNG imports from Japan, Korea, and Chinese Taipei. Additionally, 2023 saw Viet Nam and the Philippines import LNG for the first time.

Natural gas imports by pipeline in the APEC region showed a 0.9% y-o-y growth in 2023. This modest growth was driven by increased pipeline imports to Mexico and China, which offset declines in imports to Thailand and Singapore. In Thailand, the decrease was due to production challenges in Myanmar, caused by technical issues and international sanctions targeting the oil and gas sector. In Singapore, imports declined as Indonesia prioritized domestic natural gas consumption over exports.

Total natural gas exports in the APEC region showed a 3.1% y-o-y decrease in 2023. The main factor behind the decline in gas exports was the significant reduction in Russian natural gas exports to Europe. Russia's annual exports fell by 19% year-on-year as Europe continued its efforts to reduce dependence on Russian natural gas.

LNG exports in the APEC region experienced a 3% y-o-y increase in 2023. The growth in LNG exports was led by the United States, which increased its exports by 9.5% year-on-year. U.S. LNG's share of the European market continued to rise as Europe worked to reduce its reliance on Russian natural gas.

Natural gas exports by pipeline in the APEC region showed a 9.6% y-o-y contraction in 2023. The decline in pipeline exports was mainly due to the reduction in Russian gas flowing into Europe. Russian natural gas exports by pipeline dropped by 24.5% year-on-year, largely because of a further decrease in gas deliveries to Germany and Italy.

Medium-and-long-term outlooks for natural gas trade project that China, Chinese Taipei, and Southeast Asia (SEA) will drive imports growth in the region. Projections based on current global energy trends suggest that China's natural gas imports will nearly double by 2030 and continue growing through 2050. In Southeast Asia, declining domestic production, rising energy demand, and decarbonization efforts are expected to drive rapid growth in the region's LNG market.

Medium-and-long-term outlooks for natural gas trade project that the United States will drive exports growth in the region. U.S. natural gas exports are projected to more than double by 2030 and continue growing through 2050, primarily driven by LNG shipments. This growth will be supported by substantial gas production capacity and an extensive liquefaction infrastructure. Meanwhile, Russian natural gas exports via pipeline are unlikely to return to pre-2022 levels, but Russia aims to expand its presence in the Asian market through increased LNG exports and new pipeline projects.

Natural gas prices remained volatile in 2023 and experienced continuous increases throughout 2024. Although natural gas prices didn't reach the record highs of 2022, they remained volatile in 2023 due to market tightness, geopolitical tensions, and technical challenges that impacted liquefaction capacity. In 2024, prices began the year at moderate levels but gradually rose as concerns over supply competition, higher import demand from China, geopolitical risks, and seasonal demand fluctuations pushed prices up.

Section 1: Gas Demand

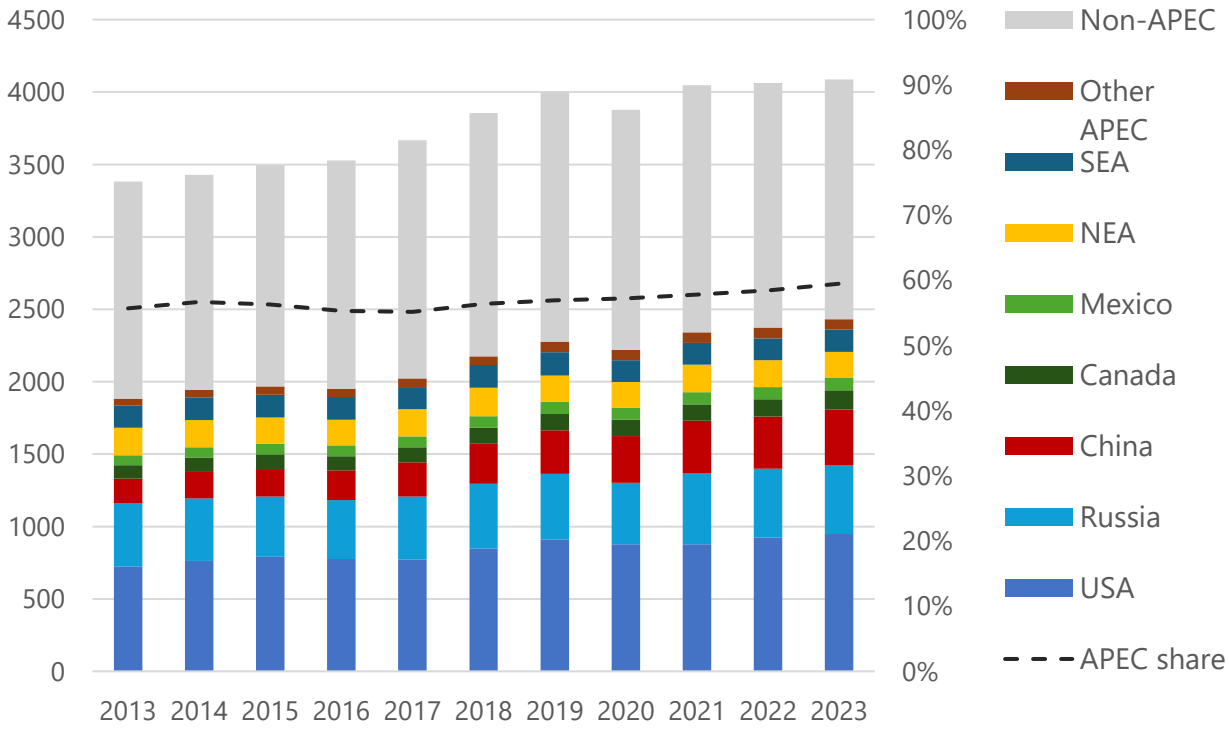
1-1 World and APEC natural gas demand

The global and APEC natural gas demand has been continuously on the rise almost every year since natural gas became part of our energy mix, with 2020 being a notable exception due to the COVID-19 pandemic. Over the past decade, APEC's natural gas demand grew by 29%, increasing from 1,883 bcm in 2013 to 2,430 bcm in 2023. This growth outpaced the global natural gas demand increase of 21%, raising APEC's share of global demand from 56% to 59% during the same period.

In 2023, global natural gas demand experienced modest growth, increasing by 0.6% year-on-year (y-o-y). In Europe, demand declined further, driven by energy efficiency measures aimed at reducing reliance on natural gas imports, mild winter weather, and high LNG prices, which led price-sensitive consumers to seek alternatives or reduce consumption altogether. In contrast, natural gas demand within APEC grew by 2.4% y-o-y, supported by significant increases in China, the United States, and Canada.

However, some traditional natural gas consumers in APEC saw a significant decline in demand in 2023. Japan and Korea experienced notable reductions of 8% and 5% y-o-y, respectively, attributed to higher nuclear power generation and higher penetration of renewable energy sources. Australia also saw an 8% y-o-y decrease in natural gas demand due to milder weather conditions, higher renewable energy penetration, and reduced industrial gas demand driven by elevated natural gas prices (IEEFA, 2024).

Figure 1-1: Natural gas demand in APEC and the world, 2013-2023 (bcm)



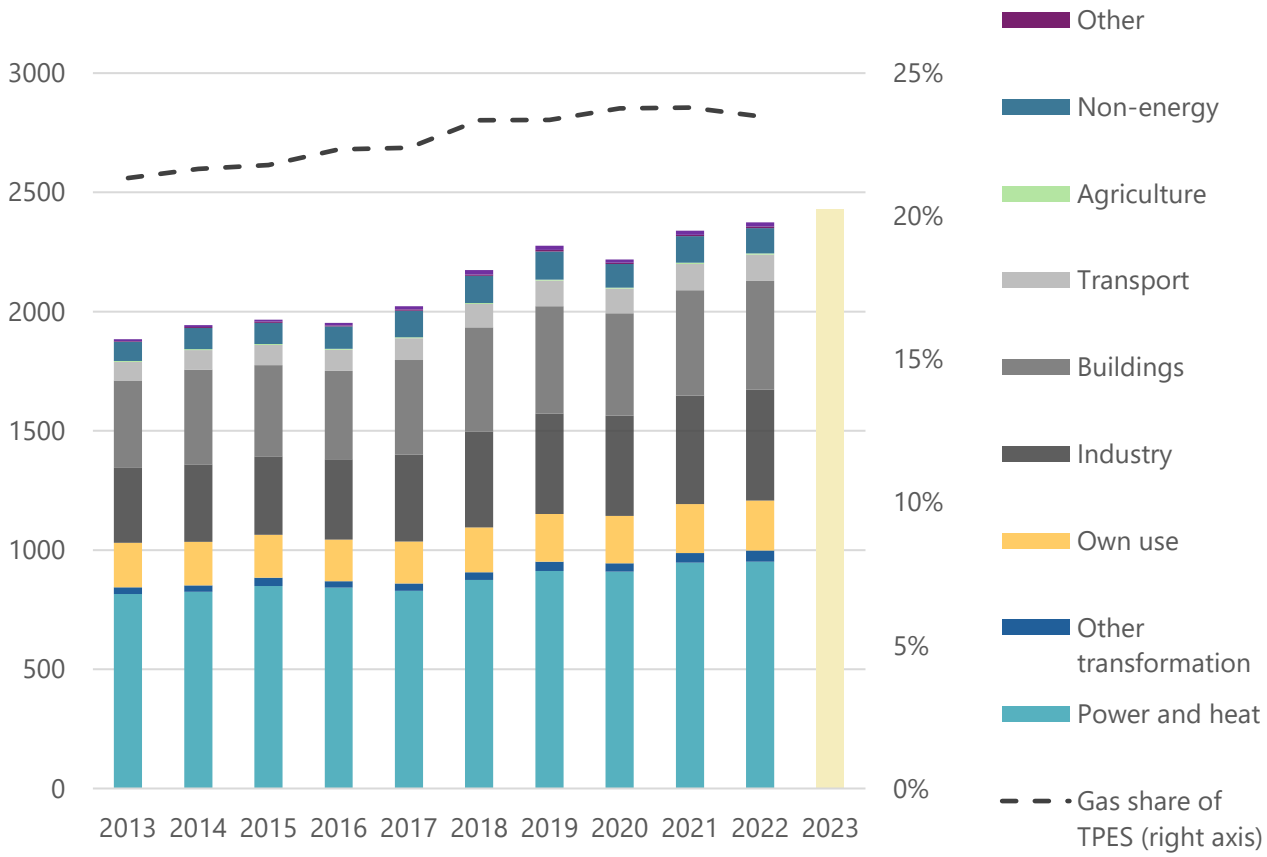
Source: CEDIGAZ

Natural gas demand in the APEC region is primarily driven by the power sector, with the building and industry sectors accounting for the second and third largest shares of consumption, respectively. Over the past decade, these two sectors have led the growth in natural gas demand, surpassing the expansion observed in the power sector.

In 2022, natural gas demand trends varied across sectors and regions. In the power sector, demand increased modestly by 0.4% y-o-y, with most of the growth occurring in North America and China. However, natural gas demand for power generation declined in Northeast Asia, Russia, and Southeast Asia (except Thailand) flattening demand in the region. This decrease in natural gas demand observed was primarily driven by increase in nuclear power generation and greater renewable energy adoption in Northeast Asia and Russia, as well as declining domestic supplies and price sensitivities in Southeast Asia.

The building and industry sectors experienced stronger natural gas demand growth in 2022, with demand rising in these sectors by 2.9% and 2.4% year-on-year, respectively. Natural gas demand growth in the building sector was primarily driven by growing demand in North America and Northeast Asia. In the industry sector, natural gas demand increased across the region, except in China, where consumption in this sector declined slightly due to economic slowdown resulting from strict COVID-19 lockdowns and high LNG prices that hampered demand in price sensitive users (U.S. EIA, 2023).

Figure 1-2: Natural gas demand in APEC by sector, 2013-2023 (bcm)



Source: CEDIGAZ, EGEDA

Over the past decade, natural gas demand in the APEC region has increased across almost all economies, particularly in the United States and China where economic growth and abundance of natural gas supply (especially in the United States) have been the drivers of natural gas consumption growth. In the United States, natural gas demand growth was primarily driven by the power and heat sectors, while in China, the industry sector played a leading role. Natural gas demand growth in the buildings and transportation sectors also contributed significantly to overall demand growth in both economies.

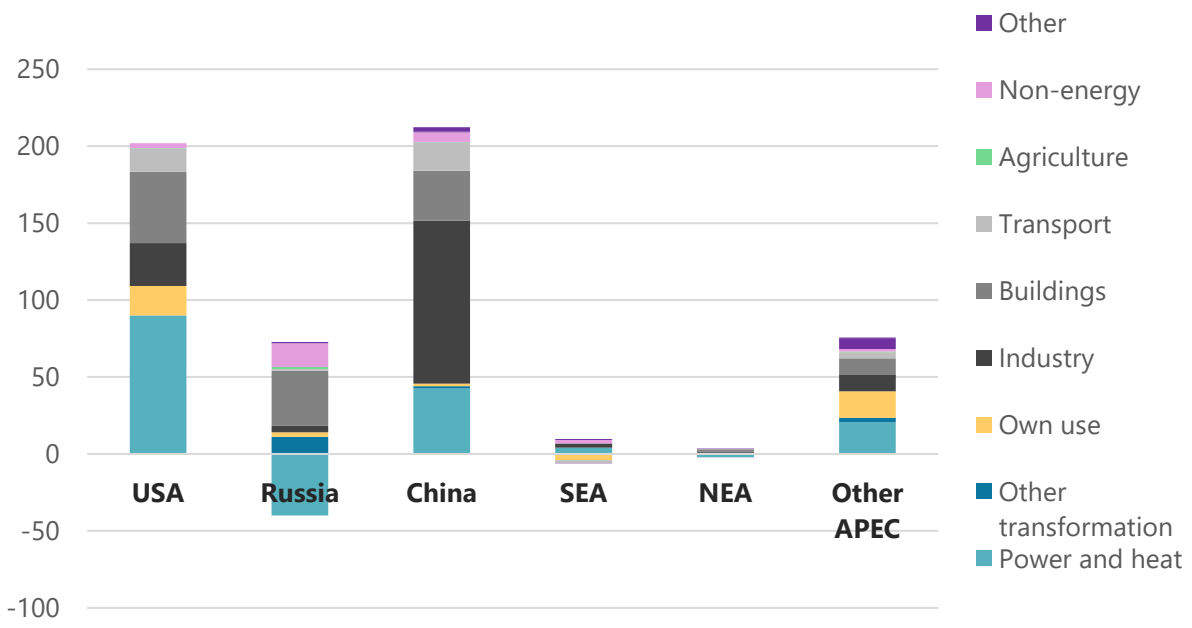
In contrast, Russia experienced a divergent trend in natural gas demand growth, especially in the power and heat sector. This was largely due to higher nuclear power generation as well as higher penetration of electricity generation from hydro and wind energy sources.

In Southeast Asia, the slight natural gas demand growth was driven by the power and heat and industry sectors. This sub-region saw a decline in the own use of natural gas, reflecting lower activity in the domestic oil and gas industries (a decline in the output of natural gas, crude oil, and refined products over the past decade). However, rapid expansion in natural gas demand is anticipated in Southeast Asia in the coming years, as growing electricity needs are expected to drive further demand.

In Northeast Asia, the natural gas demand contraction observed in the Japanese power and the slow demand growth observed in Korea almost completely offset the demand growth observed in Chinese Taipei.

In other APEC (non-U.S. Americas and Oceania), natural gas growth was driven by the power and heat sector and own use. Natural gas demand growth was also observed in the industry and building sectors but was secondary. Natural gas demand growth for power generation was driven by Mexico and Canada; demand growth in the fossil energy industry (own use) was driven by Canada and Australia.

Figure 1-3: Changes in natural gas demand in APEC by sector, 2012-2022 (bcm)



Source: CEDIGAZ, EGEDA

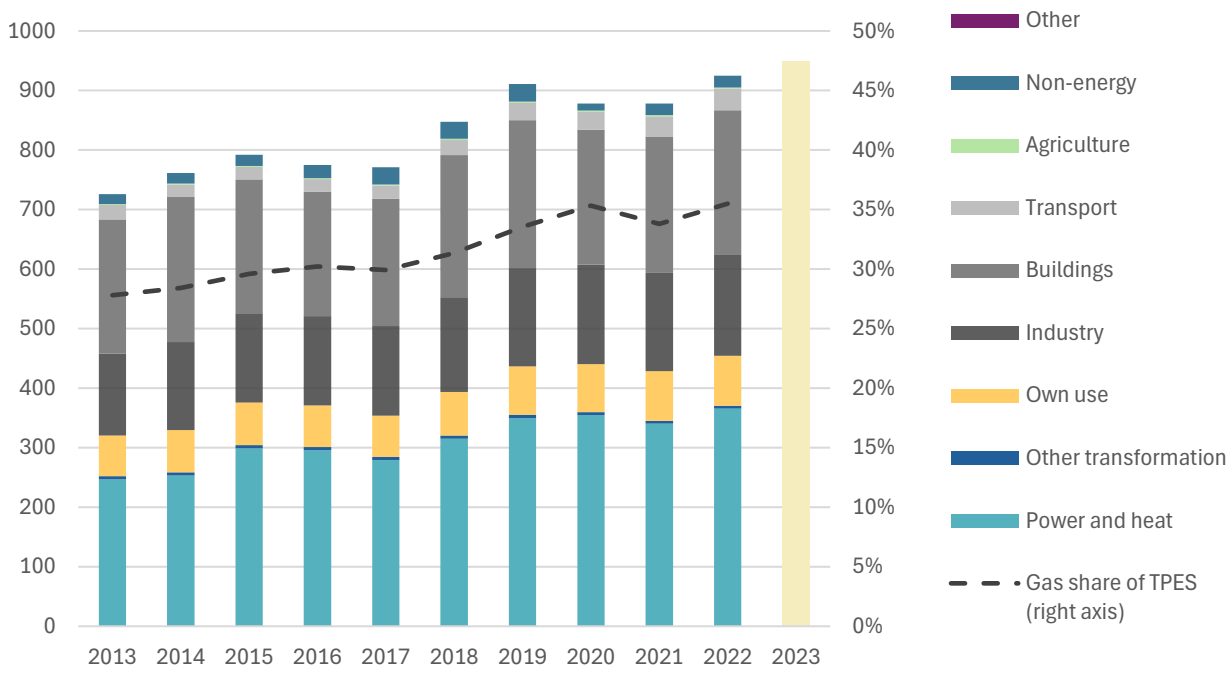
1-1-1 Gas demand in the United States

Over the past decade, the United States has remained the world's largest natural gas consumer, with natural gas demand increasing by 27% from 2013 to 2022. The abundant domestic natural gas supply has made this fossil fuel a key component of the U.S. energy mix. In 2022, natural gas accounted for over 35% of the total primary energy supply, with demand spread out across multiple sectors. The power and heat sector are the largest natural gas consumers, followed by the buildings and industry sectors.

During the decade between 2013 and 2022, natural gas demand in the power and heat sector saw the fastest growth, increasing by 48%. The industrial sector also experienced substantial natural gas demand growth with a 23% increase in demand, while the buildings sector grew more moderately (7% increase) in the same decade. In the same period, the transportation sector has shown consistent natural gas demand growth, with rising demand driven by the adoption of natural gas vehicles fueled by CNG and LNG.

In 2022, natural gas demand in the U.S. increased by 5.3% year-on-year (y-o-y), with growth across all sectors as economic activity continued to recover from the COVID-19 pandemic. The power and heat and buildings sectors contributed most to this rise, with y-o-y growth of 7.3% and 5.8%, respectively. This increase in natural gas demand was primarily due to higher electricity demand, the retirement of coal-fired power plants, and a colder-than-average winter season (EIA, 2022). The transportation sector also continued to expand its natural gas demand, with an 8% y-o-y increase as the number of natural gas-powered vehicles, particularly in high-mileage fleets, continued to grow (AFDC, 2019; GlobeNewswire, 2025).

Figure 1-4: Natural gas demand in the United States by sector, 2013-2023 (bcm)



Source: CEDIGAZ, EGEDA

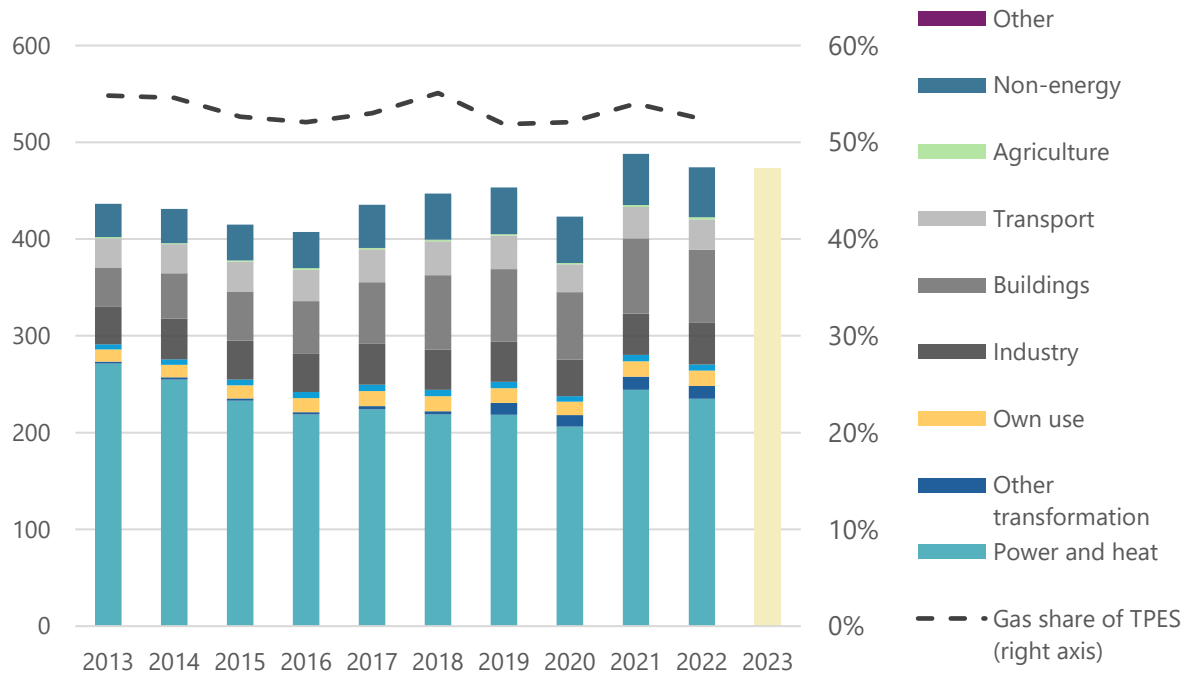
1-1-2 Gas demand in Russia

Russia has remained the world's second-largest natural gas consumer over the past decade, accounting for 12% of global consumption. With the world's largest proven natural gas reserves, this fossil fuel consistently contributes over 50% of Russia's primary energy supply. Over the last ten years, consumption trends have mirrored economic fluctuations, reflecting both downturns and recoveries.

In 2022, Russia's total natural gas demand declined by 2.8% year-on-year (y-o-y). The slight decrease in natural gas demand was spread out across most sectors, except for the agriculture and industry sectors. The contraction in natural gas demand was concentrated in the power and buildings sectors. This fall in natural gas demand is due to a combination of factors such as international sanctions impacting economic activities in Russia and the higher penetration of nuclear and wind power.

In 2022, natural gas demand in the power and heat sector decreased by 3.7% y-o-y. Electricity demand in Russia did not decrease; however, the economic sanctions slowed down electricity demand growth and constrained electricity export opportunities (EIA, 2023; IEA, 2023). In addition to this, the increase in nuclear power generation, high hydro power generation, and further penetration of renewables, particularly wind power, curbed natural gas demand for power generation.

Figure 1-5: Natural gas demand in Russia by sector, 2013-2023 (bcm)



Note: Sectorial data for the year 2023 was not available at the time of writing.

Source: CEDIGAZ, EGEDA

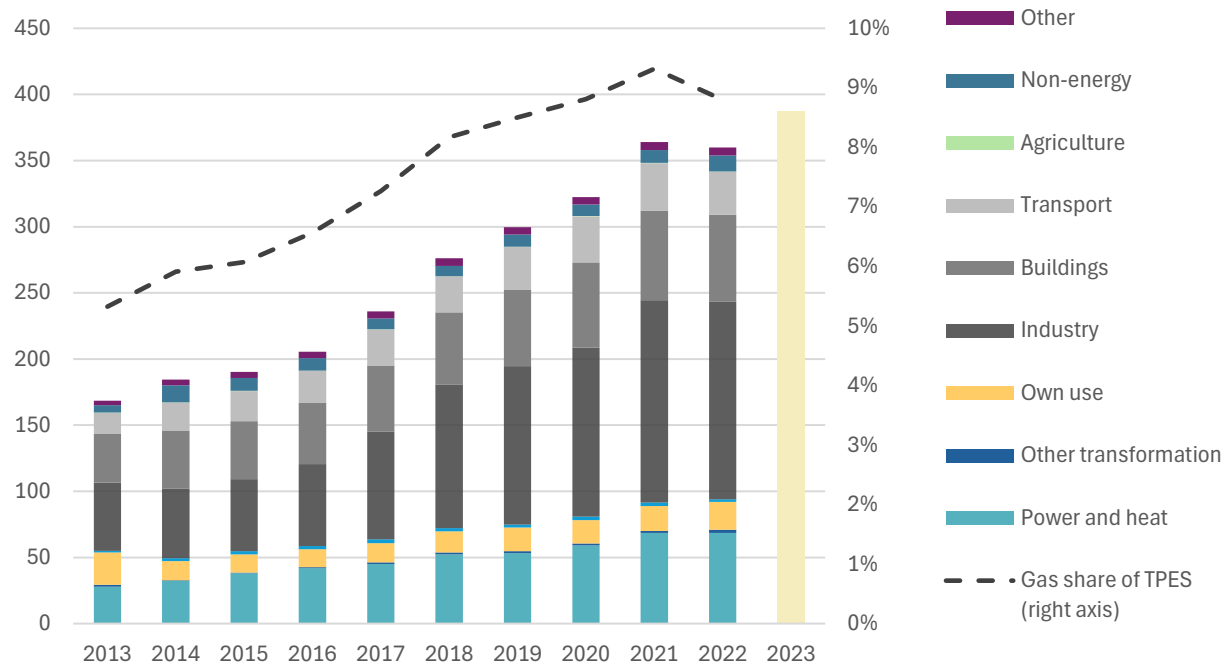
1-1-3 Gas demand in China

China is the third largest natural gas consumer in the world, currently accounting for 9% of global gas consumption. Natural gas demand in China has presented an upward trend the past decade, including during 2020 and 2021, the years where the negative economic effects of the COVID-19 pandemic were at their peak in economies around the world. It was not until 2022 that the economy showed a decrease in its demand levels due to high LNG prices and slower economic growth (S&P Global, 2022).

In 2022, China's natural gas demand declined by 1.2% year-on-year (y-o-y), primarily due to a reduction in demand in the industry, transport, and buildings sectors. The economic slowdown, compounded by the extension of COVID-19 restrictions and high LNG prices, led to lower industrial activity and energy consumption growth. However, natural gas demand in the power and heat sector remained stable. The decline was also driven by the shift toward alternative energy sources, including coal and renewables, which further reduced the need for natural gas (U.S. EIA, 2023: IEA 2023).

Natural gas demand in China data for 2023 does not yet include the breakdown per sector but it indicates that demand rebounded as China's economic activity rebounded and LNG prices remained lower compared to 2022 levels (Xinhua, 2024).

Figure 1-6: Natural gas demand in China by sector, 2013-2023 (bcm)



Note: Sectorial data for the year 2023 was not available at the time of writing.

Source: CEDIGAZ, EGEDA

1-1-4 Gas demand in Northeast Asia

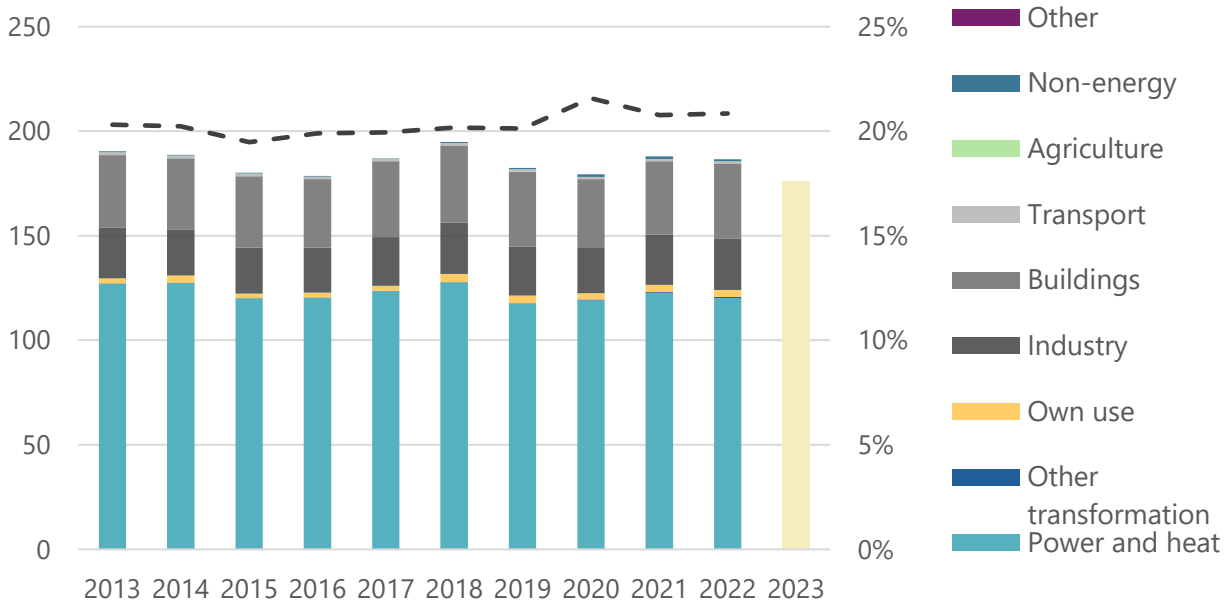
Natural gas demand in Northeast Asia peaked in 2017 (so far), driven by high demand in Japan and Korea and fast demand growth in Chinese Taipei. Since 2018, Japan's natural gas demand has been declining due to the reactivation of nuclear power plants, increased adoption of renewable energy, and a declining population (IEA, 2024).

Korea's natural gas demand trends are largely influenced by consumption in the power sector and fluctuate based on coal and nuclear power output. While Korea is actively reducing coal usage for electricity generation, the increasing share of nuclear power and renewables in its energy mix is expected to constrain future growth in natural gas demand, particularly within the power sector (IEA, 2024; Maguire, 2024).

Natural gas demand in Chinese Taipei has increased in cycles as LNG-to-power capacity is deployed. As a result, the power sector is the main driver for natural gas demand growth, with the industrial sector contributing to a lesser extent to this growth. Although Chinese Taipei remains the smallest natural gas consumer in Northeast Asia, natural gas demand is expected to continue growing as the country shifts away from nuclear energy. This shift is accelerated by the planned closure of its only nuclear plant, further increasing the reliance on natural gas for power generation (World Nuclear Association, n.d.).

Natural gas demand in Northeast Asia decreased in 2022 and 2023, primarily driven by lower consumption in the power sectors of Japan and Korea. In 2022, Japan's and Korea's power sectors saw year-on-year (y-o-y) decreases of 4% and 1.6%, respectively. Conversely, the power sector in Chinese Taipei reported a 7.3% y-o-y increase in natural gas consumption.

Figure 1-7: Natural gas demand in NEA by sector, 2013-2023 (bcm)



Note: Sectorial data for the year 2023 was not available at the time of writing.

Source: CEDIGAZ, EGEDA

1-1-5 Gas demand in Southeast Asia

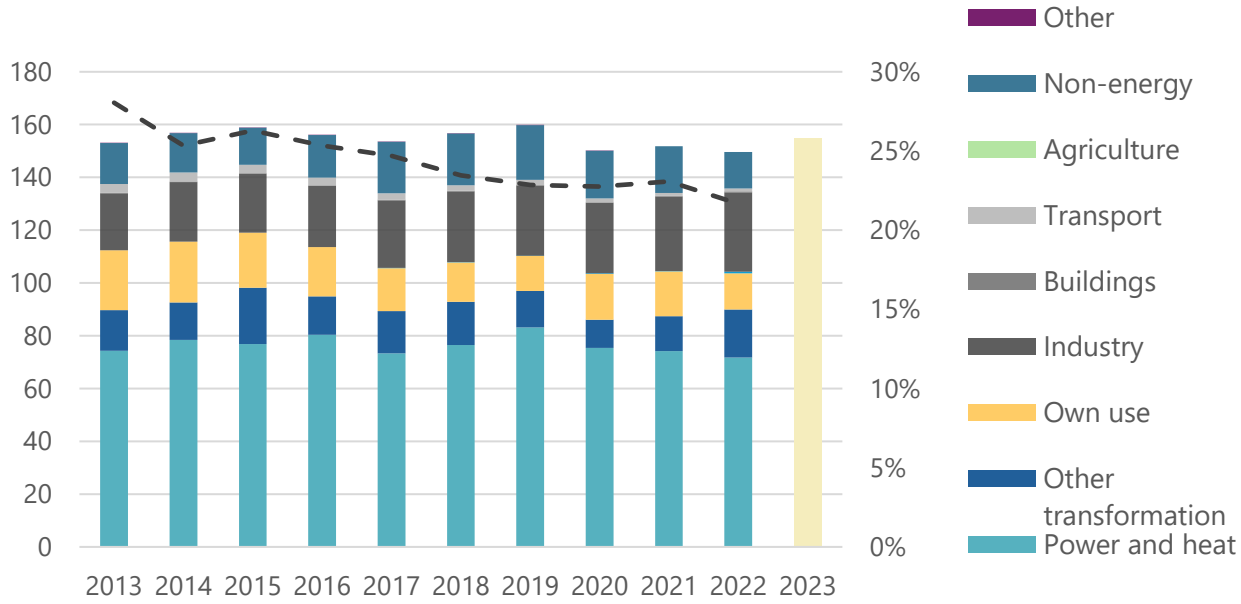
Natural gas demand in Southeast Asia (SEA) is driven primarily by Thailand, Indonesia, and Malaysia, with Thailand as the largest consumer in 2022 and 2023 mainly due to its reliance on natural gas for power generation. Smaller natural gas consumers like Singapore, Viet Nam and the Philippines also contribute to demand in the region, with Singapore leveraging LNG imports to meet domestic and re-export demands.

Rapid growth in natural gas demand is expected in Thailand, Viet Nam, and the Philippines driven by expanding power sectors and the shift from coal to cleaner energy sources. Southeast Asia is projected to be a key driver of global natural gas demand growth and LNG trade, supported by rising electrification and expanding regasification infrastructure (IEA,2024)

In 2022, natural gas demand in Southeast Asia declined by 1.4% year-on-year (y-o-y), primarily due to reduced consumption in the power, heat, and non-energy sectors across several SEA economies. This decline was largely driven by a sluggish economic recovery following the COVID-19 pandemic and record-high LNG prices in the international spot market. Thailand recorded the steepest drop in natural gas consumption in the sub-region (-7.7% y-o-y), as falling domestic gas production and soaring international prices constrained demand.

Data for 2023 indicates that natural gas demand in Southeast Asia rebounded, mainly due to higher consumption in Indonesia and Thailand. In Indonesia, the rise is most likely driven by higher electricity demand and demand growth in the industry. In Thailand, natural gas demand grew most likely supported by higher gas-fired power generation and lower reliance on thermal coal.

Figure 1-8: Natural gas demand in SEA (Southeast Asia) by sector, 2012-2022 (bcm)



Note: Sectorial data for the year 2023 was not available at the time of writing.

Source: CEDIGAZ, EGEDA

1-2 Gas demand outlook

The geopolitical crisis in Europe, that began in 2022, profoundly impacted the global natural gas market. After the EU (European Union) decided to limit Russia's pipeline gas imports, there was a higher demand for LNG, causing tightness in the global LNG market, which raised energy security concerns across the world.

The latest natural gas demand projection published by APERC (Asia Pacific Energy Research Centre) in the APEC Energy Demand and Supply 8th Outlook did not include analysis about the impact of the geopolitical crisis in Europe on the global energy market, so this edition of the APERC Gas Report utilizes other energy research organizations' projections (CEDIGAZ, and BP) to assist with future natural gas demand analysis.

Table 2-1: 2023 Medium-and-long-term natural gas demand outlooks from different energy research publications.

Organization	Publication	Scenarios	Description
CEDIGAZ	2023 Medium- and Long-Term Gas & LNG Outlook	CEDIGAZ Scenario	Projection based on the acceleration of energy transition and significant energy efficiency gains.
BP	BP Energy Outlook 2024	Current Trajectory	Projection based on the current trajectory of the energy system. It places weight on the recent global ambition for decarbonization. *Only presents disaggregated data for the United States, Russia and China.

The CEDIGAZ 2023 Medium- and Long-Term Gas Outlook provides a comprehensive projection for natural gas demand in the APEC region. It anticipates that natural gas demand will continue to rise into the 2030s, primarily driven by growth in China and Southeast Asia, with significant contributions from the power sector and the industry.

In contrast, mature natural gas markets in Northeast Asia (excluding Japan) and the Americas are expected to experience moderate demand growth into the 2030s. Factors such as slower population growth, reduced industrial output, and accelerated energy transition efforts are projected to limit natural gas demand growth in these regions.

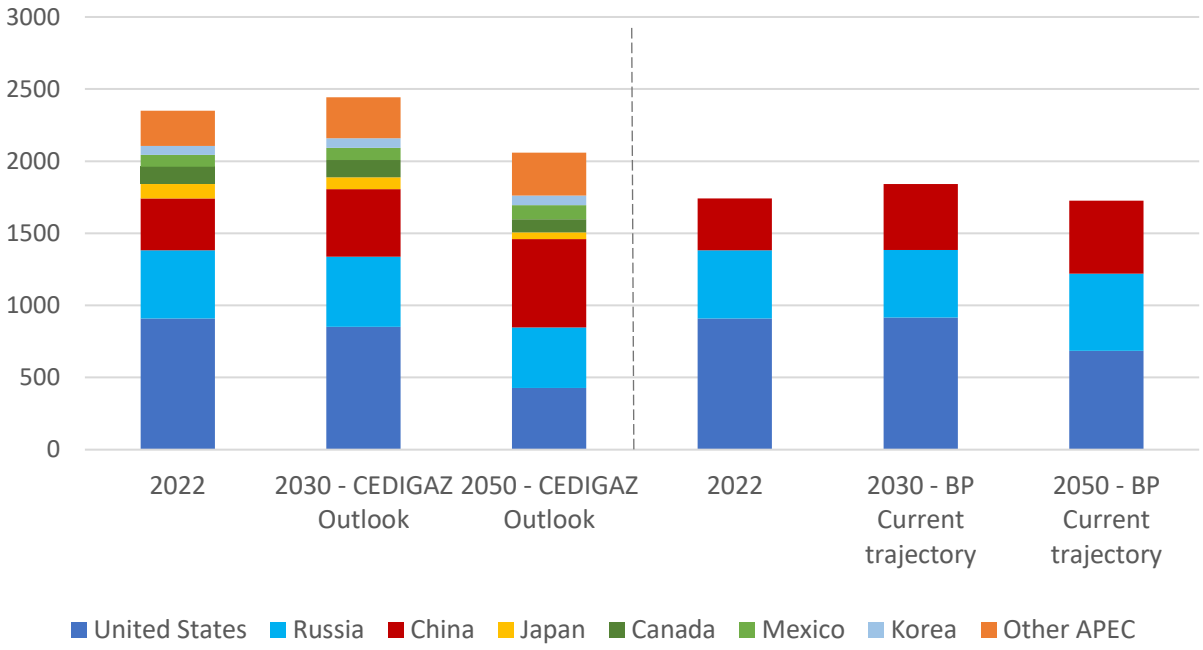
Beyond 2030, CEDIGAZ projects a decline in natural gas demand within the APEC region, falling below 2022 levels. This decrease is mainly attributed to energy transition initiatives in mature economies like the United States, Canada, and Australia where natural gas demand growth is not only slowed down but also reversed. However, in China, growing demand in the power and industrial sectors is expected to outpace the displacement of natural gas by renewables, leading to continued demand growth.

Similarly, Southeast Asia's expanding population, increasing electricity demand, and ongoing industrialization are projected to sustain natural gas demand growth, despite the implementation of renewable energy sources.

BP's Current trajectory scenario offers a different perspective. It projects a significant slowdown in China's natural gas demand growth after 2030, as further deployment of renewable electricity and the expansion of biogas production limit natural gas consumption.

Additionally, BP anticipates a less pronounced decrease in natural gas demand in the United States towards 2050, assuming that energy transition efforts do not accelerate significantly in this economy. BP's scenario also suggests that Russia's natural gas demand will rebound after the 2030s, following an economic recovery from the impacts of international sanctions.

Figure 1-9: Natural gas demand outlook in selected APEC economies, 2022-2050 (bcm)



Source: CEDIGAZ, BP

Section 2: Gas supply

2-1 World and APEC natural gas supply

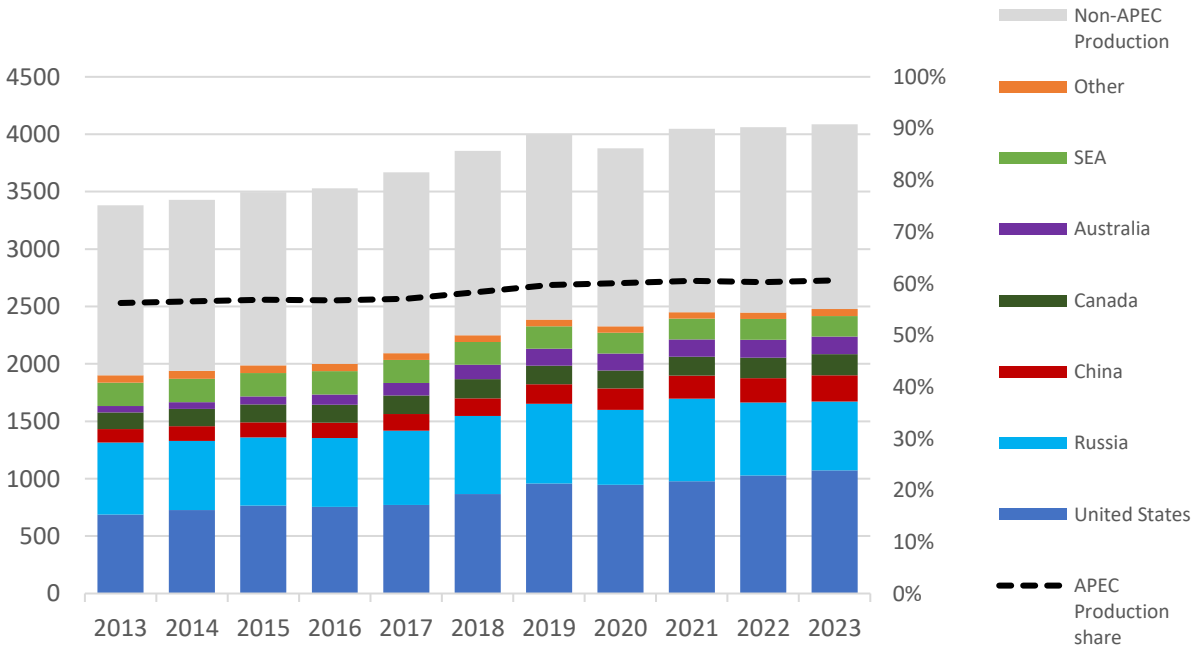
Over the last decade, natural gas producers in the APEC region have had a dominant role in supplying natural gas to the world. In 2023, natural gas production in the region accounted for 60% of total natural gas production in the world. The region produced 2,476 bcm in 2023, representing a 30% increment over the volume it produced in 2013. As a comparison, total world natural gas production in the world in 2023 was 4,086 bcm, a 21% increment over the 2013 value.

The accelerated growth in natural gas production in the region during the last decade was mainly driven by production growth in the United States, Russia (up to 2021), China, and Australia. The substantial natural gas production growth in the region was mainly supported by the shale gas revolution in the United States, development of conventional and unconventional reserves in China, and rapid growth of conventional natural gas production in Australia to feed its LNG exports growth.

During the last decade, some natural gas producers in Southeast Asia (SEA) and in the Americas had a diminishing role in natural gas volumes extracted. In SEA, Indonesia's and Thailand's production decreased by 13% and 34%, respectively, compared to the 2013 levels. In the Americas, Mexico had a gas production contraction of 39% for the same period.

In 2023, natural gas production in the region showed a 1.1% year-on year (y-o-y) increase. The flatness in natural gas production was the result of a decrease in Russian natural gas production (-5% y-o-y) which was offset by production growth in the United States (4.2% y-o-y), China (6.1% y-oy) and Canada (3.2% y-o-y). Other producers in the region like Indonesia, Thailand and Mexico saw slight increases in natural gas production in the same year.

Figure 2-1: Natural gas production in APEC, 2013-2023 (bcm)



Note: The figure shows marketed volumes.
Source: CEDIGAZ

2-1-1 Gas supply in the United States

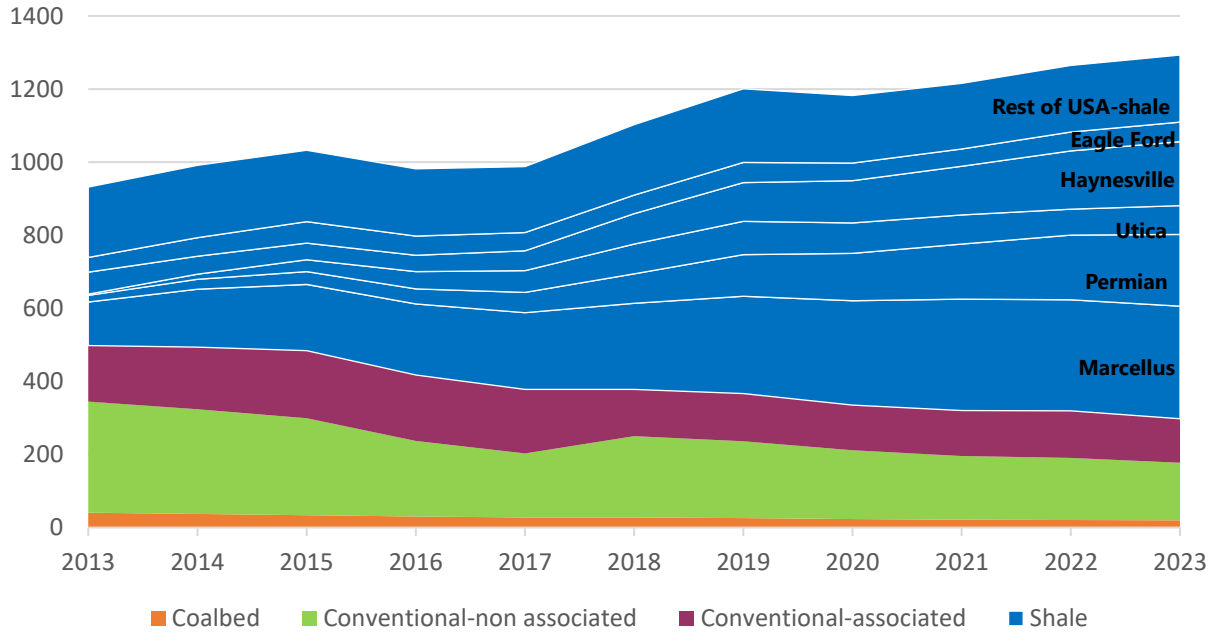
Over the last decade, shale gas has been the main driver of U.S. natural gas production growth, a trend stemming from the "shale revolution" that transformed the U.S. energy landscape. The shale revolution, driven by advancements in horizontal drilling and hydraulic fracturing (fracking), enabled the extraction of vast quantities of unconventional natural gas that were previously economically inaccessible. In 2023, shale gas accounted for 76% of total U.S. natural gas production, up from 46% in 2013.

The Marcellus formation, located beneath the Appalachian Basin in the eastern United States, remained the country's largest shale gas-producing region, generating 307 bcm of dry gas in 2023—30% of total shale gas output. The Permian play, spanning West Texas and Southeast New Mexico, was the second-largest contributor, producing 176 bcm, or 14% of total shale gas production.

In 2023, the United States continued to be the leading natural gas producer in the APEC region by a significant margin. Domestic gross natural gas production reached 1,293 bcm, marking a 2.2% increase compared to 2022. This growth was driven entirely by shale gas, as it was the only category of natural gas production to experience positive year-on-year growth.

The increase in shale gas production was primarily concentrated on the Permian and Haynesville plays. The Permian's growth was fueled by associated gas production from oil drilling activities, benefiting from robust crude oil output (U.S. EIA, 2024). Meanwhile, the Haynesville play, located in Louisiana and East Texas, saw rising production due to better economics increasing gas-directed rig activity and its proximity to liquefied natural gas (LNG) export facilities along the Gulf Coast, making it a key supplier for the expanding U.S. LNG sector (U.S. EIA, 2024). Advances in hydraulic fracturing and horizontal drilling, along with infrastructure expansions, further supported output growth in these regions.

Figure 2-2: Gross natural gas production in the United States, 2013-2023 (bcm)



Source: U.S. Energy Information Administration (EIA)

2-1-2 Gas supply in Russia

Russia holds the world's largest natural gas reserves and is the second-largest producer in the world after the United States (U.S. EIA, 2024). Its production is concentrated in Western and Eastern Siberia, with major pipeline infrastructure connecting it to Europe, Central Asia, and China.

Europe has been historically Russia's largest gas market, supplied via key pipelines such as Nord Stream 1, Yamal-Europe, the West-Siberian pipeline through Ukraine and the TurkStream through Türkiye. However, geopolitical crises and sanctions have sharply reduced natural gas flows, with TurkStream remaining the primary active route to Southern and Southeastern Europe (Brookings, 2023).

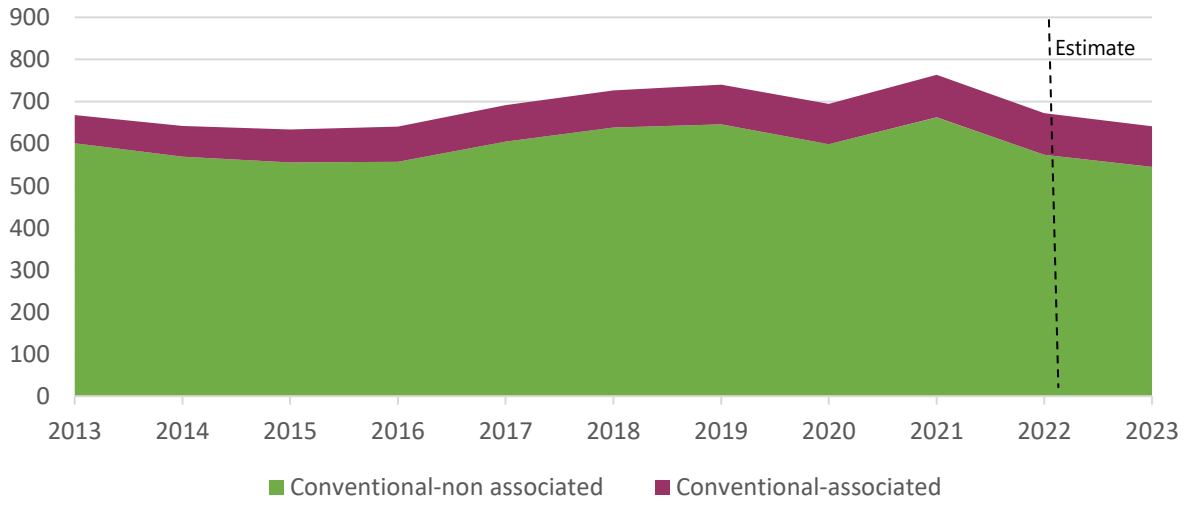
Russia also exports gas to Central Asia through the Central Asia–Center (CAC) pipeline system. Originally built to transport gas from Central Asia to Russia, the pipeline now enables Russian gas exports to Uzbekistan via Kazakhstan, with deliveries beginning in 2023 under a two-year agreement (OSW, 2023).

In Asia, Russia is expanding its gas trade with China. The Power of Siberia pipeline, which became operational in 2019, supplies gas from Eastern Siberia to Northeast China and is set to reach its full capacity of 38 bcm per year by 2025 (Reuters, 2024). Additionally, the proposed Power of Siberia-2 pipeline would transport up to 50 bcm annually from the Yamal Peninsula, traditionally supplying Europe, to China via Mongolia, further diversifying Russia's natural gas exports (CRS, 2024).

These developments highlight Russia's strategic shift away from European markets, reinforcing its role as a key energy supplier to Asia.

In 2023, Russia's gross natural gas production was estimated to decline by 4.7% year-on-year (CEDIGAZ, 2024). This decrease was probably driven by a drop in non-associated natural gas production, largely due to weakened natural gas demand from Europe, logistical challenges in rerouting exports, and limited infrastructure for expanding alternative markets, especially in Asia. Additionally, associated natural gas production saw a slight decline, influenced by OPEC+ production cuts on oil production and Western sanctions on Russian oil exports.

Figure 2-3: Gross natural gas production in Russia, 2013-2023 (bcm)



Source: ROSSTAT, CEDIGAZ

2-1-3 Gas supply in Canada

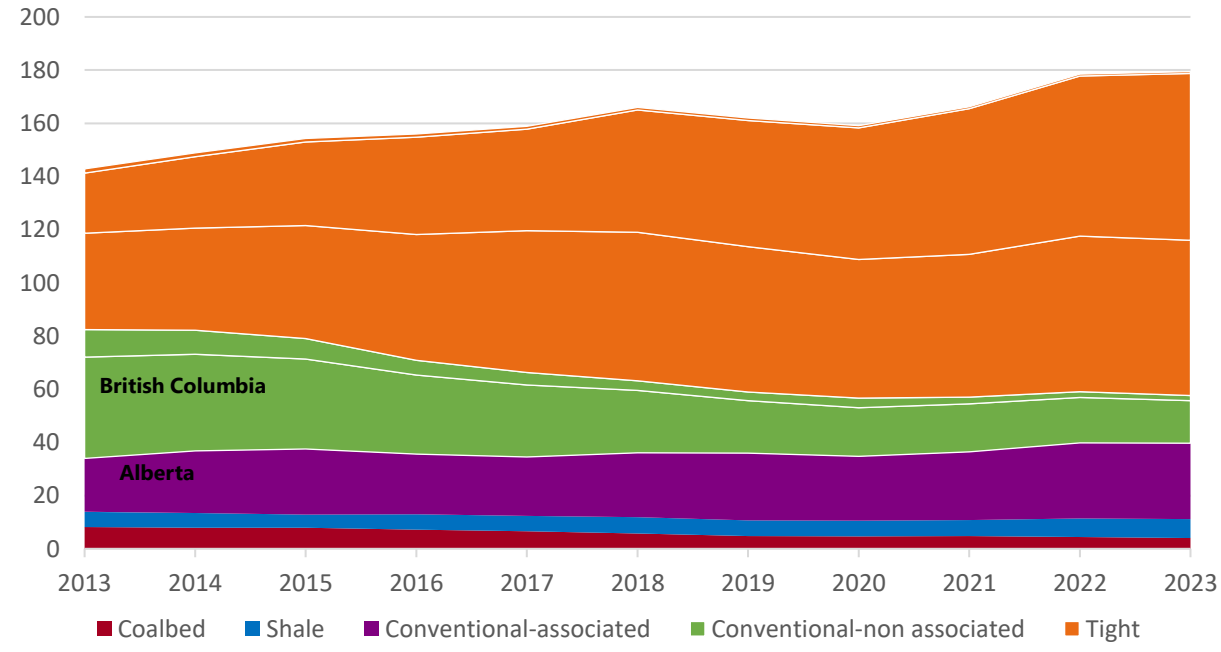
Canada's natural gas production is concentrated in the Western Canadian Sedimentary Basin (WCSB), primarily in the Alberta and British Columbia provinces. Canada holds proven natural gas reserves of approximately 2.4 trillion cubic meters, with the majority located in the WCSB. While Alberta has historically been the dominant natural gas producer, British Columbia's production share has grown to 37% of total production in 2023, reflecting shifts in regional production dynamics (CAPP, 2024).

The majority of Canada's natural gas output now comes from tight gas, which is extracted using advanced drilling techniques such as hydraulic fracturing (fracking). The development of tight gas resources, particularly in British Columbia and Alberta, has dramatically outpaced conventional gas production, leading to a sharp decline in conventional gas production share since 2015. Certain conventional gas regions have declined in production as they cannot compete with tight gas economics (CAPP, 2024).

Associated gas, produced alongside crude oil, has also increased in recent years due to higher oil production. In contrast, shale and coalbed methane still represent a small share of total natural gas production, with shale gas seeing some growth but remaining relatively minor (CAPP, 2024).

In 2023, Canada's natural gas production experienced a modest year-on-year growth of 0.8%. This overall increase was primarily driven by a 4.3% rise in tight gas production in British Columbia, particularly from the Montney formation. However, this growth was largely offset by a decline in conventional non-associated natural gas production in Alberta. The decrease in Alberta's conventional gas output is attributed to the natural decline of mature fields and the industry's shift towards more economically viable unconventional resources (CAPP, 2024).

Figure 2-4: Natural gas production in Canada, 2012-2022 (bcm)



Note: Shale gas refers to natural gas found in a type of sedimentary rock formed of very fine-grained particles, such as clay, that have been compacted to form a layered rock. Tight gas refers to natural gas found in low permeability reservoir rocks (DMP, 2023).
Source: Canada Energy Regulator, Canada's Energy Future 2024

2-1-4 Gas supply in China

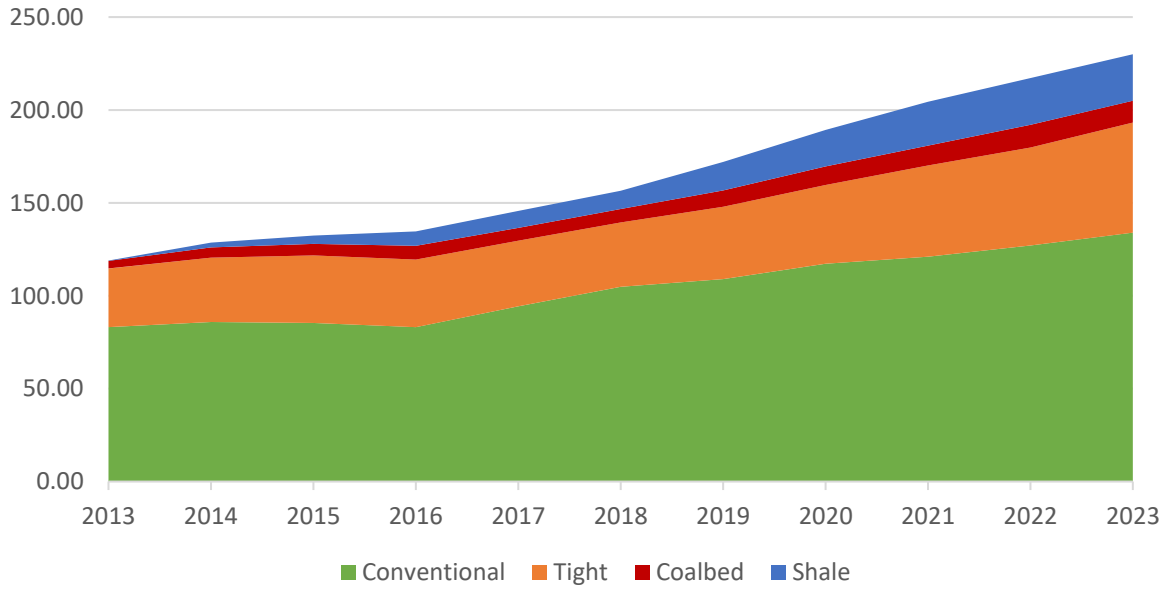
China's natural gas production has experienced continuous growth over the past decade, with conventional reservoirs remaining the primary contributors. In 2023, the country produced approximately 232.4 bcm of natural gas, with conventional reservoirs accounting for 58% of this output. Unconventional reservoirs, including tight gas, shale gas, and coalbed methane, have become increasingly significant, accounting now for 42% of total natural gas production.

Since 2013, tight gas production in China has increased by 78%. The Chinese administration is actively promoting the development of unconventional gas sources to decrease reliance on natural gas imports. National oil companies, including CNPC, Sinopec, and CNOOC, have integrated tight gas, shale gas, and coalbed methane into their long-term strategies (Rigzone, 2023).

Shale gas production in China commenced in 2012 and has experienced notable growth, accounting for approximately 11% of China's total natural gas output in 2023. In 2023, production reached 25.7 bcm, still short of the government's 2020 target of 30 bcm per year. The slower-than-anticipated development is attributed to challenges such as complex geological conditions and high development costs (Wood Mackenzie, 2021).

In 2023, China's natural gas production increased by 6% year-over-year, primarily driven by growth in conventional and tight gas output. In contrast, coalbed methane and shale gas production remained relatively flat during the same period.

Figure 2-5: Natural gas production in China, 2013-2023 (bcm)



Source: S&P Global Commodity Insights, National Bureau of Statistics of China, China National Development and Reform Commission

2-1-5 Gas supply in Australia

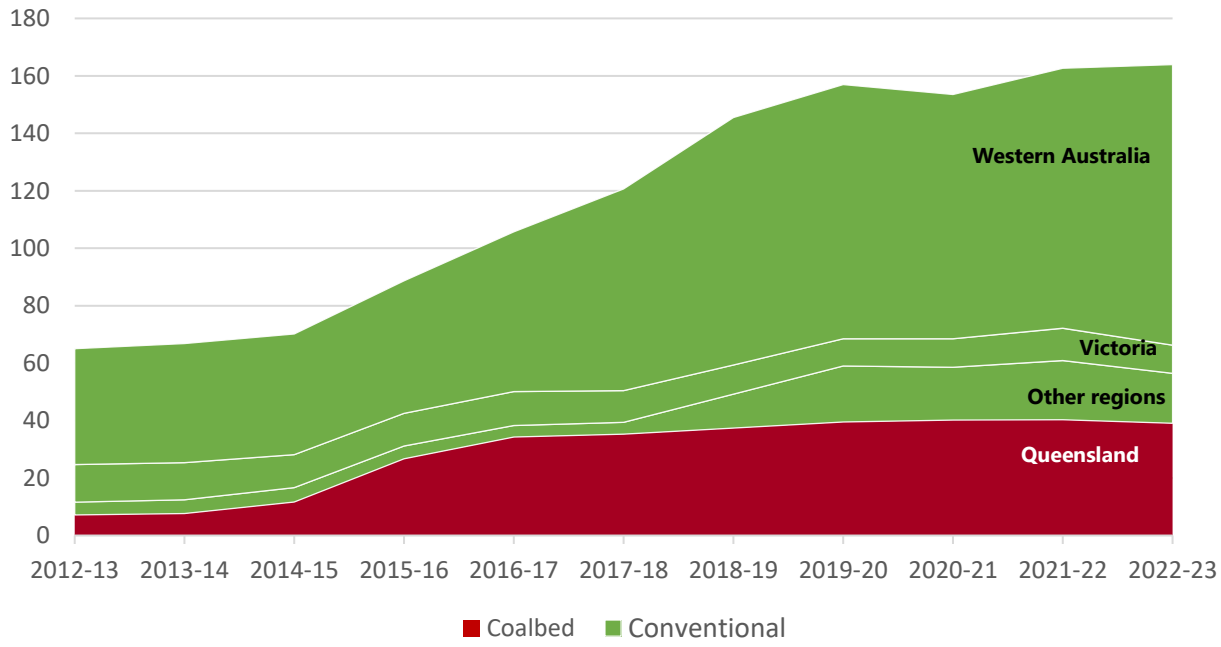
Australia's natural gas production grew roughly 150% between 2012 and 2022. This growth is primarily attributed to conventional reservoirs, especially those in Western Australia. Australia's natural gas industry has been significantly driven by liquefied natural gas (LNG) exports, with liquefaction capacity and gas output experiencing substantial growth since 2015.

In the 2022, Australia exported approximately 81 million tons of LNG, positioning it alongside the United States and Qatar as one of the world's leading LNG exporters. This robust export capacity underscores Australia's significance as a global LNG supplier, particularly to Asian markets. Notably, Japan, China, and Korea have been the primary destinations for Australian LNG exports

In the 2022–23 financial year, Australia's natural gas production experienced a modest year-on-year increase of 1.2%, reaching 163 billion cubic meters (bcm). Conventional natural gas production in Western Australia accounted for approximately 60% of this total output, while conventional sources in Victoria and other regions contributed an additional 16% of the total output.

Coalbed methane (CBM) production from the Queensland region constituted about 24% of Australia's gas production in the 2022–23 financial year. Mirroring the trend in conventional production, CBM volumes have doubled since 2015, coinciding with the commissioning of the first CBM-to-LNG export terminals in Queensland.

Figure 2-6: Natural gas production in Australia, 2012-2023 (bcm)



Source: Department of Climate Change, Energy, the Environment and Water, Australian Energy Statistics

2-1-6 Gas supply in Southeast Asia

Natural gas production in Southeast Asia (SEA) decreased by 12% between 2013 and 2023. The most significant decline occurred in Thailand and Indonesia. However, Viet Nam, the Philippines, and Brunei Darussalam also experienced decreases in their natural gas production.

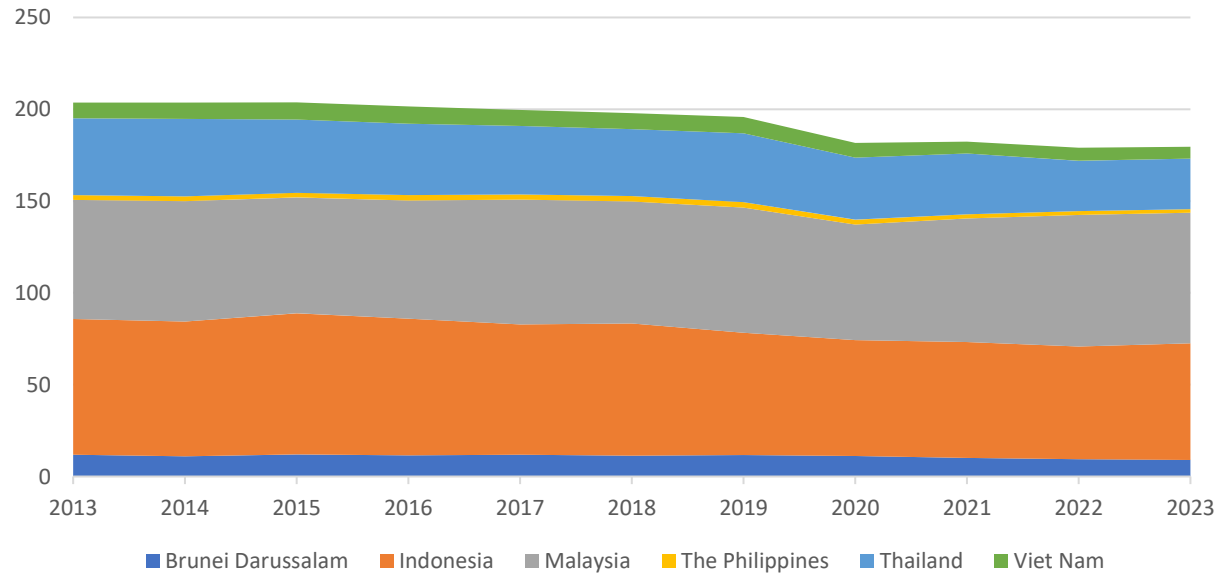
In Thailand, the decline was primarily due to the depletion of domestic natural gas reserves, especially in mature fields such as Erawan and Bongkot. Starting in 2023, PTTEP initiated efforts to revitalize production in these fields, focusing on increasing output at the Erawan field (Argus Media, 2024).

Indonesia's decrease in natural gas production resulted from aging fields that have been operational for extended periods, leading to natural declines in output. Insufficient investment and an uncertain regulatory environment exacerbated this decline. In response, Indonesia is implementing reforms to revitalize its oil and gas sector, including plans to reduce regulations and enhance output at existing assets (Nangoy, 2024).

Other economies, such as Brunei Darussalam, Viet Nam, and the Philippines, also experienced declining natural gas production. This trend is mainly due to maturing gas fields, operational challenges, maintenance activities, and, in the cases of Viet Nam and the Philippines, difficulties in developing new domestic natural gas reserves.

In 2023, Southeast Asia's natural gas production remained largely unchanged, experiencing a modest 0.3% year-on-year increase. This overall stability resulted from divergent trends within the region: while economies like Indonesia and Thailand reported production gains due to revitalization efforts in their oil and gas sectors, these increases were nearly offset by declines in other Southeast Asian economies.

Figure 2-7: Natural gas production in Southeast Asia, 2013-2023 (bcm)



Source: CEDIGAZ

2-2 Gas production outlook

The geopolitical crisis in Europe, that began in 2022, profoundly impacted the global natural gas market. After the EU (European Union) decided to limit Russia's pipeline gas imports, there was a higher demand for LNG, causing tightness in the global LNG market, which raised energy security concerns across the world.

The latest natural gas demand projection published by APERC (Asia Pacific Energy Research Centre) in the APEC Energy Demand and Supply 8th Outlook did not include analysis about the impact of the geopolitical crisis in Europe on the global energy market, so this edition of the APERC Gas Report utilizes other energy research organizations' projections (CEDIGAZ and BP) to assist with future natural gas production analysis.

Table 3-1: 2023 Medium-and-long-term natural gas production outlooks from different publications.

Organization	Publication	Scenarios	Description
CEDIGAZ	2023 Medium- and Long-Term Gas & LNG Outlook	CEDIGAZ Scenario	Projection based on the acceleration of energy transition and significant energy efficiency gains.
BP	BP Energy Outlook 2024	Current Trajectory	Projection based on the current trajectory of the energy system. It places weight on the recent global ambition for decarbonization. *Only presents disaggregated data for the United States, Russia and China.

CEDIGAZ projects a 2% increase in natural gas production within the APEC region by 2030, using 2022 as the baseline. This growth is anticipated to be driven primarily by the United States, China, and Papua New Guinea (PNG). In the United States, the expansion is expected to result from increased LNG exports, as domestic natural gas demand is projected to decline slightly. Similarly, PNG's production growth is linked to rising LNG exports, while China's efforts are focused on enhancing energy security and self-sufficiency.

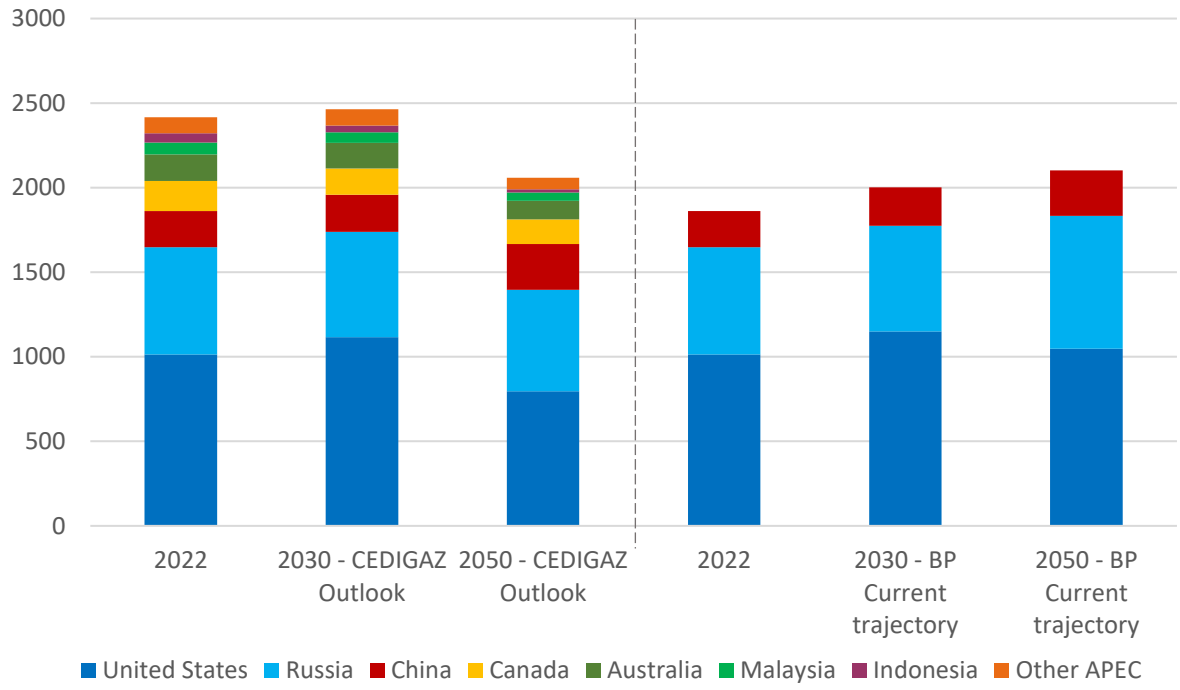
Beyond 2030, CEDIGAZ forecasts a 15% decrease in natural gas production in the APEC region compared to 2022 levels. This decline is mainly attributed to reduced outputs from the United States, Australia, and Russia, among others, as global demand for LNG diminishes, despite sustained natural gas demand in Southeast Asia and China. Nonetheless, energy security will continue to drive natural gas production growth in China.

BP's current trajectory scenario offers a slightly different perspective for the main natural gas producers in the APEC region. BP also projects that natural gas production in the United States will peak in the

2030s and then slowly decrease towards 2050, maintaining a higher level of production than forecasted by CEDIGAZ, as BP assumes a slower implementation of low-carbon technologies across the world. BP estimates a similar natural gas production trajectory for China as CEDIGAZ. On the other hand, BP has a more optimistic outlook for natural gas production in Russia, driven by a stronger natural gas market for Russian natural gas exports.

These varying projections highlight the uncertainties in global energy markets and the differing assumptions about technological advancements and policy implementations affecting natural gas production in the APEC region.

Figure 2-8: Natural gas production outlooks in APEC economies, 2022-2030 (bcm)



Source: CEDIGAZ, BP

Section 3: Gas trade

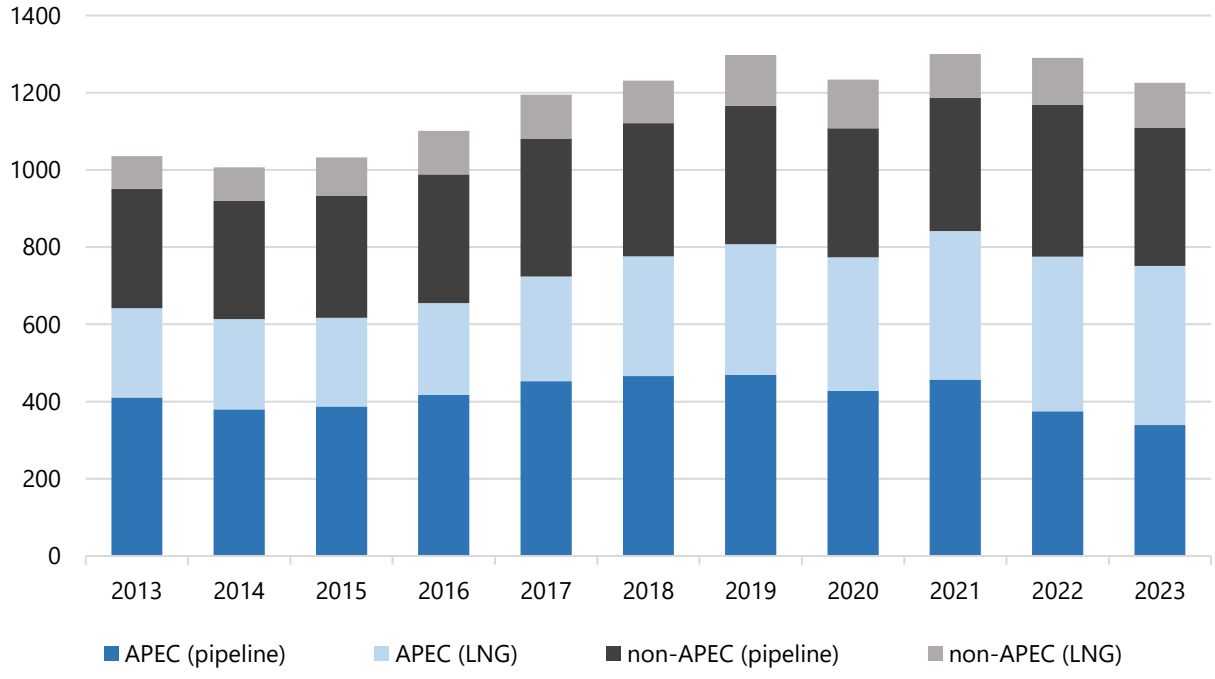
3-1 World and APEC gas trade

Global natural gas trade totaled 1,225 bcm in 2022, marking a 5% decline from the previous year. This drop was driven by the geopolitical crisis in Europe and its impact on energy markets. The primary factor was a sharp reduction in Russian pipeline gas exports to Europe. Although global LNG trade increased, it was not enough to fully compensate for the loss of Russian supply.

In 2023, total natural gas trade involving APEC member economies contracted by 3%, largely due to the continued decline in Russian pipeline exports to Europe. This reduction led to a 9.6% decrease in the APEC pipeline trade. At the same time, APEC LNG trade rose by 3.1%, supported by a growing share of American LNG in Europe's supply mix.

Europe's largest consumers significantly reduced natural gas consumption for a second consecutive year in 2023, negatively affecting non-APEC natural gas trade. This decline was driven by a combination of mild winter weather and coordinated demand-reduction measures across European economies (U.S. EIA, 2023). Non-APEC pipeline trade saw a 9.4% year-on-year decline, mainly due to reduced flows in Belgian and British pipelines. Meanwhile, non-APEC LNG trade fell by 3.5%, as Europe slightly decreased LNG imports from various suppliers while increasing volumes from the United States.

Figure 3-1: Natural gas trade, 2013-2023 (bcm)



Note: The figure shows the gross amount of gas traded.
Source: CEDIGAZ

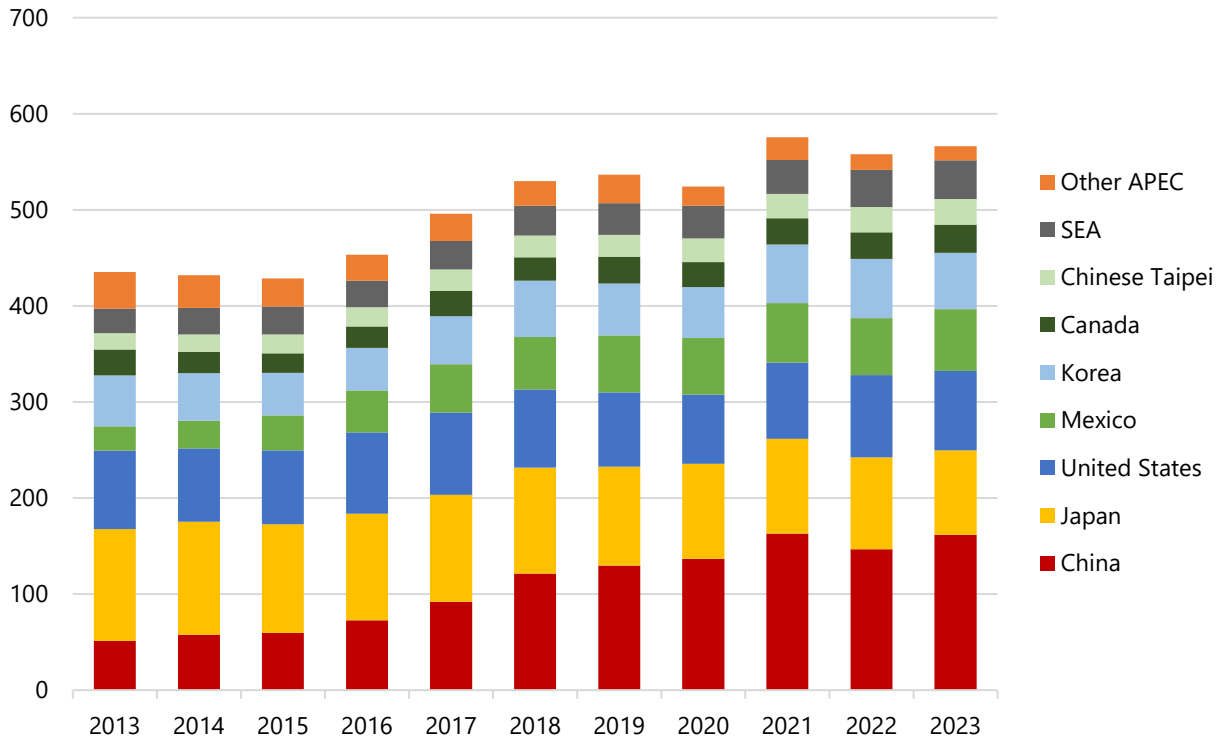
3-2 Gas imports in the APEC region

Natural gas imports in the APEC region grew by 30% between 2013 and 2023, driven primarily by China and Mexico, with Korea, Chinese Taipei, and Thailand also contributing significant volumes. China's rising imports over the past decade were fueled by rapid economic growth and decarbonization efforts, while Mexico's increasing reliance on natural gas stemmed from declining domestic production and growing demand in the power and industrial sectors.

In Northeast Asia, economies such as Korea and Chinese Taipei, lacking domestic natural gas reserves and facing rising demand across the power, building, and industrial sectors, became increasingly dependent on imports. In Southeast Asia, Thailand steadily increased its natural gas imports over the past decade as domestic production declined.

In 2023, the global natural gas market remained tight, with prices lower than in 2022 but still above historical averages due to the ongoing geopolitical and energy crisis in Europe, which reshaped global LNG trade flows. APEC natural gas imports rose by 1.5% year-on-year, reflecting mixed trade dynamics across the region. Imports grew substantially in a rebounding Chinese economy and, to a lesser extent, in Mexico. Meanwhile, Japan, Korea, and the United States saw declines, and Southeast Asia experienced only modest growth.

Figure 3-2: Total natural gas imports by APEC economies, 2013-2023 (bcm)



Source: CEDIGAZ

3-2-1 LNG imports in the APEC region

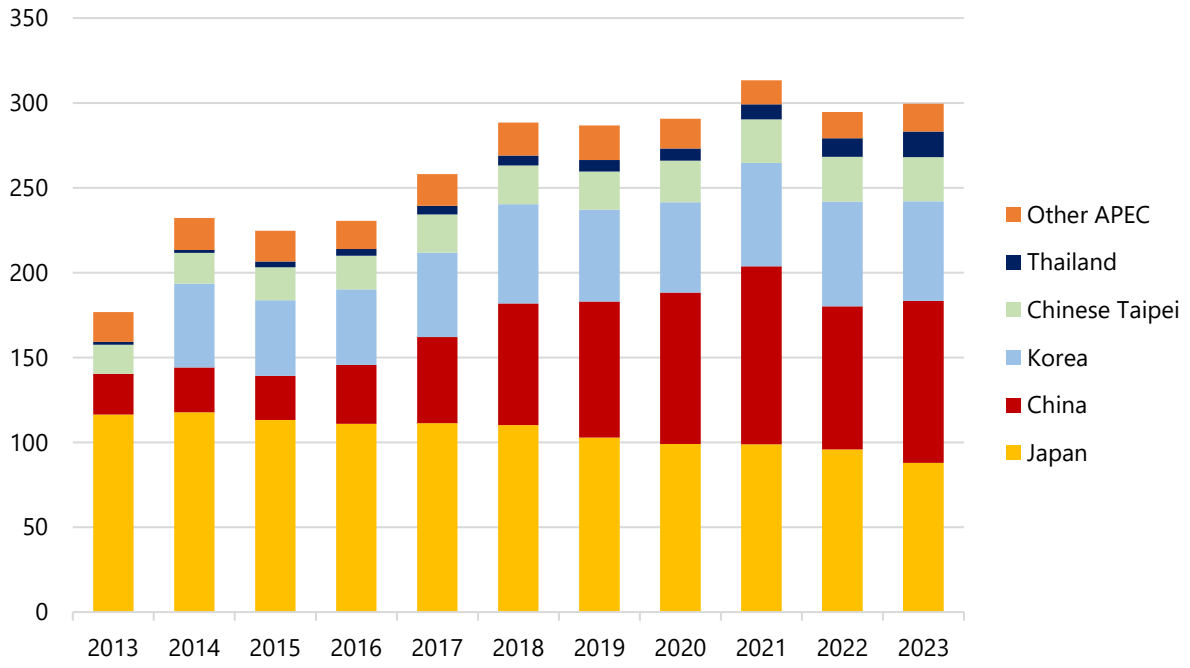
LNG imports in the APEC region grew by 30% between 2013 and 2023, driven primarily by China, with South Korea, Chinese Taipei, and Thailand also seeing significant increases. Over the same period, Japan recorded the largest decline in LNG imports in the region, falling by 24%. This decrease reflects higher solar and nuclear power generation, milder weather, and overall lower energy demand, which reduced natural gas consumption.

In 2023, APEC LNG imports rose by 2.1% year-on-year (y-o-y), primarily due to China's strong import growth. China's LNG imports increased by 13% y-o-y, driven by lower LNG prices and the rebound of economic activity following the loosening of COVID-19 policies. As a result, China regained its position as the world's largest LNG importer, surpassing Japan once again.

Traditional LNG markets, such as Japan and Korea, saw declines in LNG imports in 2023, with y-o-y decreases of 8.3% and 5.8%, respectively. In both economies, natural gas demand fell due to increased nuclear power generation and mild temperatures during the heating season (U.S. EIA, 2023). Meanwhile, Chinese Taipei's LNG imports remained stable.

In Southeast Asia, Thailand—the sub-region's largest natural gas consumer and importer—saw LNG imports grow by 6.2% y-o-y to meet rising natural gas demand in the power sector. Additionally, 2023 marked the entry of new LNG importers in the region, with the Philippines and Viet Nam importing LNG for the first time, at 0.8 bcm and 0.1 bcm (gasified), respectively.

Figure 3-3: LNG imports by APEC economies, 2013-2023 (bcm)



Source: CEDIGAZ

3-2-2 Gas imports by pipeline in the APEC region

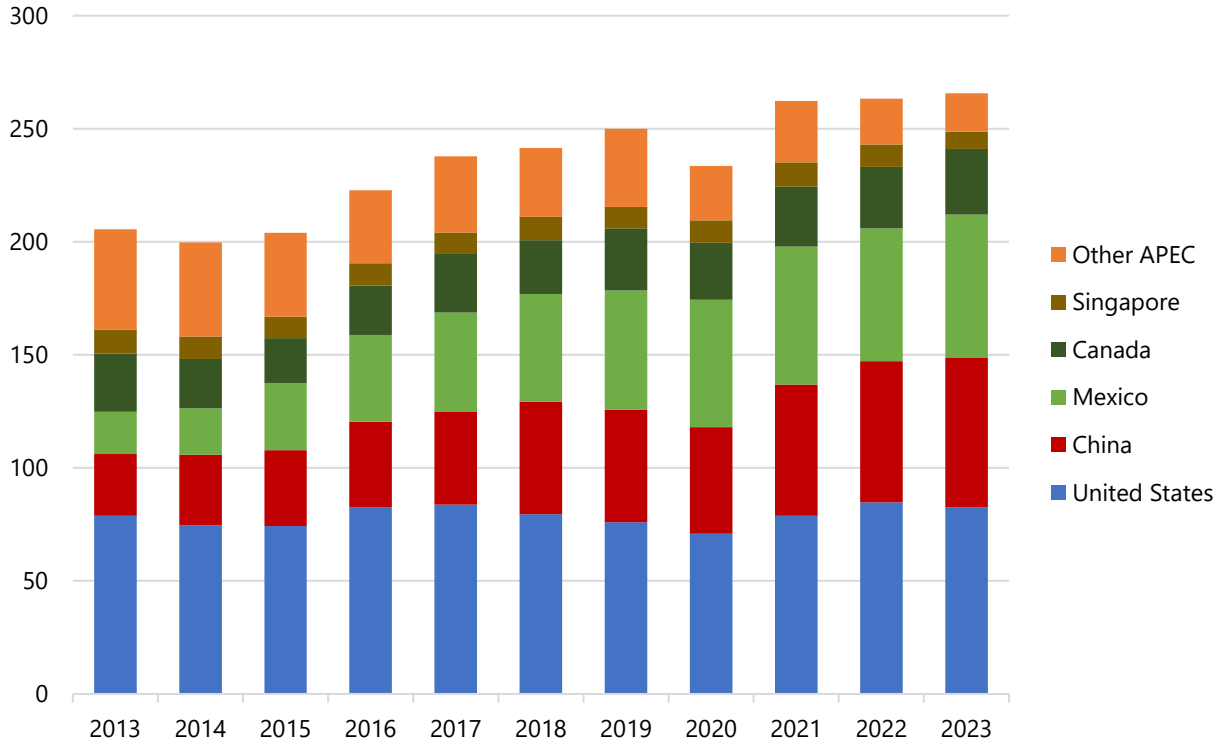
Natural gas imports by pipeline in the APEC region grew by 29% between 2013 and 2023, driven primarily by China and Mexico. In China, rising pipeline imports were fueled by accelerating energy demand and fuel switching in the power and industrial sectors. In Mexico, growing energy demand and declining domestic natural gas production led to a significant increase in imports from the United States.

In 2023, natural gas imports by pipeline in the APEC region grew modestly by 0.9% year-on-year (y-o-y), reflecting mixed trends across the region. Growth in pipeline imports to China (6.1% y-o-y) and Mexico (7.9% y-o-y) was largely offset by declines in the United States, Singapore, and Australia.

U.S. natural gas imports by pipeline fell by 2.8% y-o-y due to mild winter conditions and production disruptions in Canada (U.S. EIA, 2024). Singapore's pipeline imports dropped by 22% as Indonesia redirected gas from the Suban Field for domestic use. In Australia, imports by pipeline declined due to falling production at the nearly depleted Bayu-Undan gas field in East Timor.

Additionally, Thailand's natural gas imports by pipeline fell by 20% y-o-y, as Myanmar prioritized domestic consumption amid operational challenges in oil and gas production and international sanctions that exacerbated energy shortages (Hellenic Shipping News, 2024).

Figure 3-4: Natural gas imports by pipeline by APEC economies, 2013-2023 (bcm)



Source: CEDIGAZ

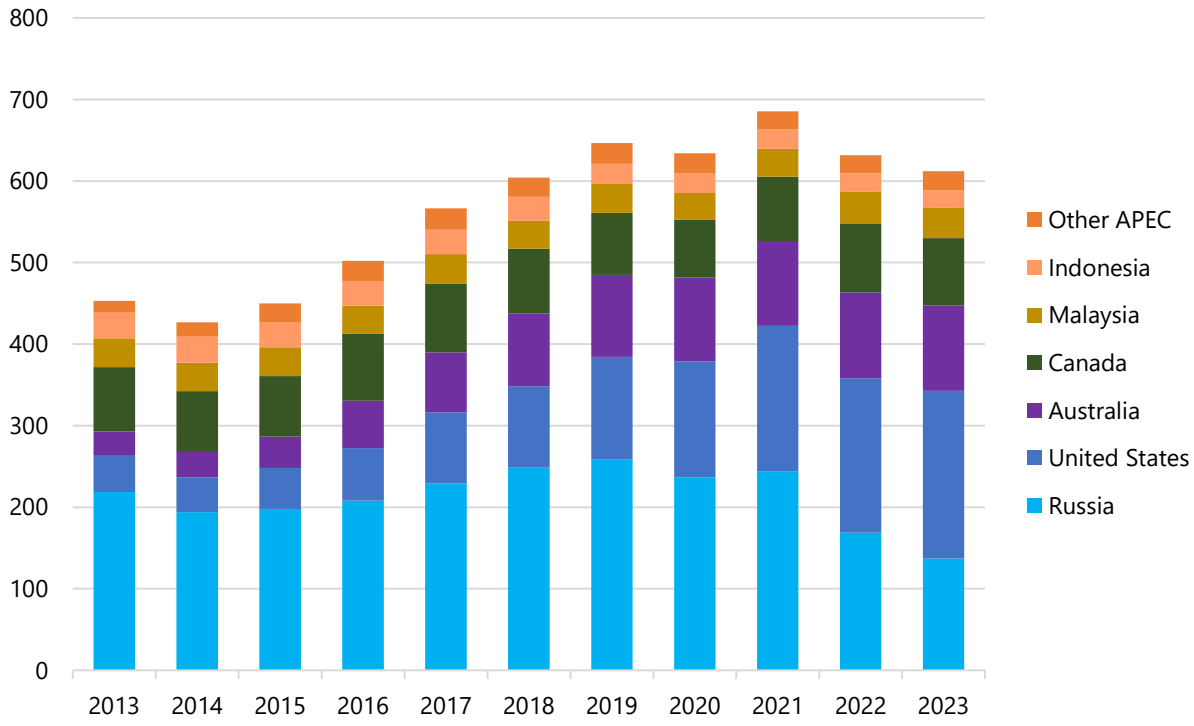
3-3 Gas exports in the APEC region

Natural gas exports in the APEC region grew by 25% between 2013 and 2023, driven primarily by the United States and Australia. Over the same period, Russia and Indonesia recorded the largest declines in exports. Russia's drop was a result of the sharp reduction in natural gas exports to Europe following the geopolitical crisis that began in 2022. In contrast, Indonesia's decline stemmed from a gradual decrease in natural gas production over the past decade.

In 2023, natural gas exports in the APEC region fell by 3.1% year-on-year (y-o-y), primarily due to reduced Russian exports to Europe. Russia's annual exports declined for the second consecutive year, dropping by 19% y-o-y as its share of the European market continued to shrink and the economy lacked the infrastructure to redirect its natural gas elsewhere. Indonesia and Malaysia also saw export contractions of 4.1% and 7.1% y-o-y, respectively, as domestic consumption took priority.

The United States recorded the highest export growth in the region, with an 8.6% y-o-y increase. The country further expanded its role in the European natural gas market by significantly increasing LNG exports as Europe sought alternative suppliers to replace Russian gas. These U.S. exports were primarily directed to the Netherlands, France, Spain, the United Kingdom, and Italy.

Figure 3-5: Natural gas exports by APEC economies, 2013-2023 (bcm)



Source: CEDIGAZ

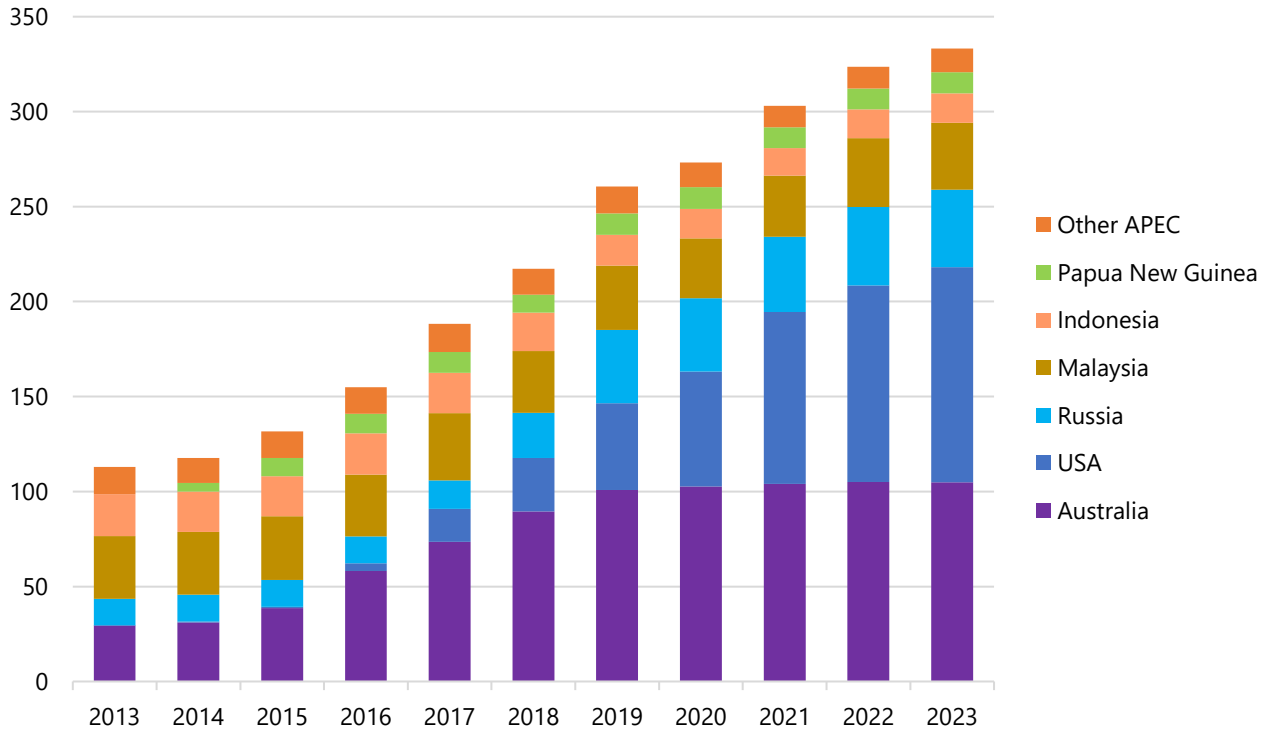
3-3-1 LNG exports in the APEC region

LNG exports in the APEC region nearly tripled between 2013 and 2023, driven primarily by the United States, Australia, and Russia, with Papua New Guinea also contributing substantial export volumes since 2014. In Southeast Asia, Malaysia remained a key LNG exporter, increasing its LNG exports by 6.2% over the decade. In contrast, Indonesia's outbound LNG volumes declined by 29% due to falling domestic production.

In 2023, LNG exports in the region grew by 3% year-on-year (y-o-y), largely driven by the United States, which saw a 9.5% y-o-y increase in LNG exports. As previously noted, European efforts to reduce dependence on Russian natural gas fueled this expansion. The Netherlands and France emerged as the largest buyers of U.S. LNG, with exports to these economies quadrupling between 2021 and 2023. Australia, the region's second-largest LNG exporter, maintained steady export levels in 2023 despite a slight decline in natural gas production.

Malaysia recorded the largest drop in LNG exports among APEC economies in 2023, falling by 3.3% y-o-y due to operational challenges in the Sabah-Sarawak gas pipeline, which reduced effective LNG capacity (Reuters, 2024). Russia's LNG exports also declined slightly (-0.9% y-o-y) as shipments to France decreased. Despite restrictions on Russian fossil fuels, Europe continues to import approximately 50% of all Russian LNG traded.

Figure 3-6: LNG exports by APEC economies, 2013-2023 (bcm)



Source: CEDIGAZ

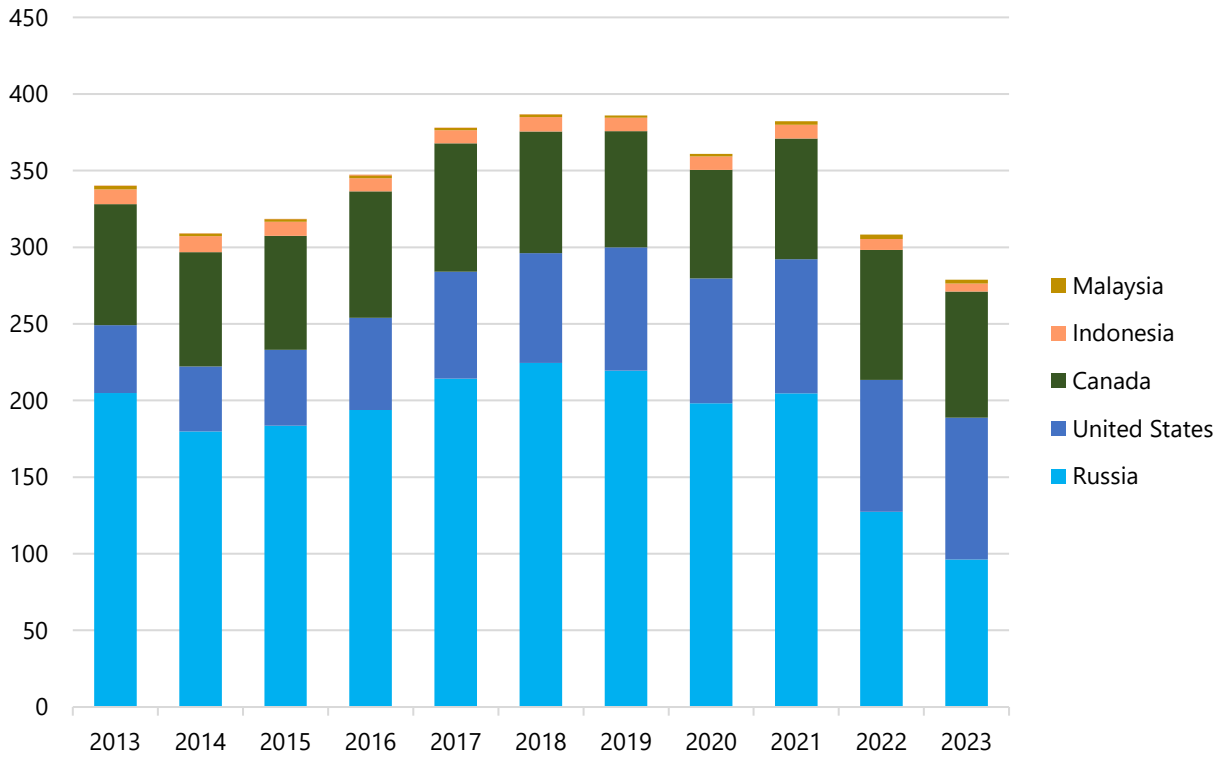
3-3-2 Gas exports by pipeline in the APEC region

Natural gas exports by pipeline in the APEC region decreased by 18% between 2013 and 2023. Russia's sharp reduction in pipeline exports to Europe reversed the upward trend seen in previous years. Indonesia's decline in exports, driven by falling domestic gas production, also contributed to the overall decrease in pipeline exports in the region over the last decade. In contrast, U.S. natural gas exports by pipeline grew by 108% during this period, largely due to Mexico's increasing reliance on American natural gas.

In 2023, natural gas pipeline exports in the APEC region dropped by 9.6% year-on-year (y-o-y), primarily due to a further decline in Russian exports to Europe. Russian pipeline exports fell by 24% y-o-y, mainly driven by reductions in shipments to Germany and Italy. To a lesser extent, Canada and Indonesia also experienced declines in pipeline exports in 2023: Canadian exports decreased by 2.8% y-o-y due to a mild winter in North America, and Indonesia's exports contracted by 28% y-o-y as the country shifted its focus to prioritizing domestic consumption of natural gas.

On the other hand, the United States saw a 7.5% y-o-y increase in pipeline exports in 2023, driven by ample supply of cheap natural gas in the United States and higher demand in Mexico and eastern Canada (Natural Resources Canada, 2023).

Figure 3-7: Pipeline exports by APEC economy, 2013-2023 (bcm)



Source: CEDIGAZ

3-4 Gas trade outlook in the APEC region

The geopolitical crisis in Europe, that began in 2022, profoundly impacted the global natural gas market. After the EU (European Union) decided to limit Russia's pipeline gas imports, there was a higher demand for LNG, causing tightness in the global LNG market, which raised energy security concerns across the world.

The latest natural gas demand projection published by APERC (Asia Pacific Energy Research Centre) in the APEC Energy Demand and Supply 8th Outlook did not include analysis about the impact of the geopolitical crisis in Europe on the global energy market, so this edition of the APERC Gas Report utilizes other energy research organizations' projections (CEDIGAZ) to assist with future natural gas production analysis.

Table 3-1: 2023 Medium-and-Long-term natural gas production outlook by CEDIGAZ

Organization	Publication	Scenarios	Description
CEDIGAZ	2023 Medium- and Long-Term Gas & LNG Outlook	CEDIGAZ Scenario	Projection based on the acceleration of energy transition and significant energy efficiency gains.

3-4-1 Net gas imports outlook in the APEC region

CEDIGAZ forecasts that growth in natural gas imports within the APEC region will be primarily driven by China and Southeast Asia (SEA). Thailand is expected to remain the largest natural gas importer in SEA until 2030. However, by 2050, new importers such as Indonesia, Viet Nam, and the Philippines (to a lesser extent) are projected to gain prominence. Indonesia's transition to a net importer of natural gas marks a significant shift, as it has traditionally been an exporter. This change is driven by increasing natural gas demand in the power and industrial sectors, which domestic production will no longer be able to meet.

A significant portion of China's additional natural gas demand will be supplied through LNG. Similarly, the new natural gas importers in SEA will primarily rely on LNG, making the sub-region a key driver in the expansion of the global LNG market.

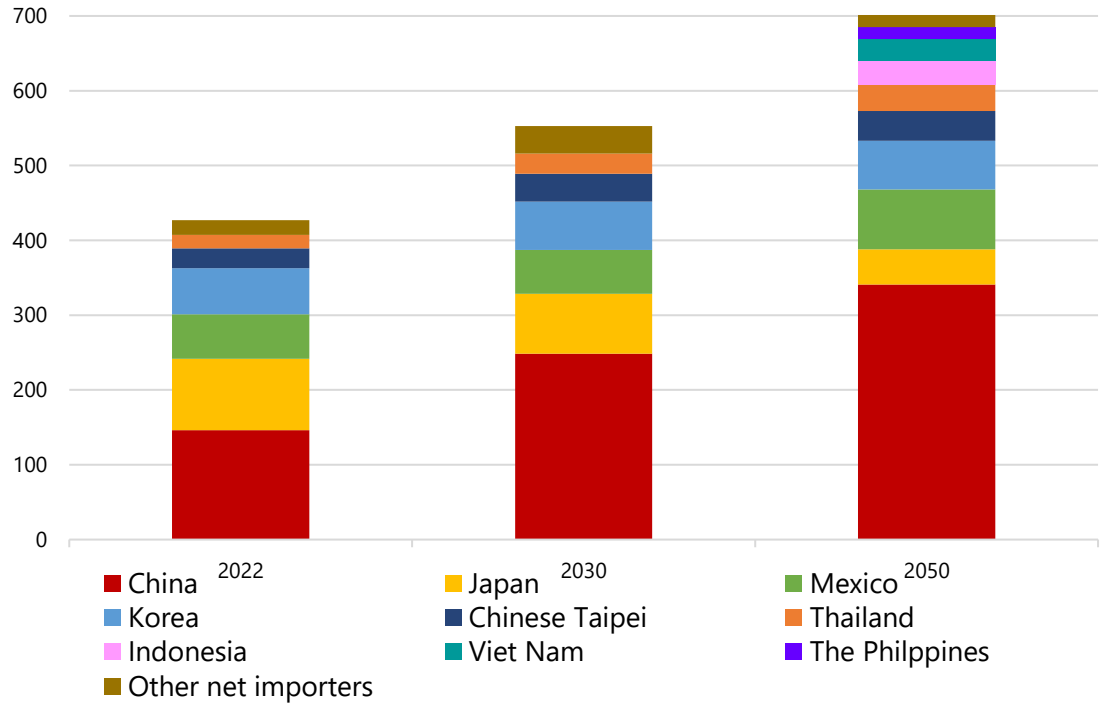
China is set to increase its LNG imports over the coming decade, supported by substantial expansions in regasification capacity. As of now, China's annual regasification capacity stands at 161 bcm, with an additional 155 bcm under construction, expected to come online by the end of 2026. Among the largest projects under development, Phase 3 of the Tianjin PipeChina LNG regasification terminal and the Sinopec Longkou LNG regasification terminal will add a combined 17 bcm of capacity by the end of 2025 (EIA, 2023).

Other Asian economies are also expanding their regasification capacity. In Chinese Taipei, the Taichung and Yung-an LNG regasification terminals have been operating above capacity to meet growing demand. The Yung-an expansion is currently under construction and is expected to be completed by 2027. Additionally, plans are in place to build a new LNG regasification terminal in Taoyuan by 2025 (CPC, 2023; JFE, 2023).

Thailand's recent regasification capacity expansions further reinforce its commitment to increasing LNG imports in the coming years. The completion of the Map Ta Phut 2 and Nong Fab LNG regasification terminals in 2022 added 15 Mtpa to the country's capacity, which previously stood at 11.5 Mtpa (CEDIGAZ, 2023; S&P Global, 2022).

Viet Nam has also made significant strides in LNG infrastructure. The country's largest regasification terminal, Thi Vai LNG, began operations in the last quarter of 2023 with a designed capacity of 1 Mtpa. This facility was developed to ensure gas supply amid declining domestic resources and rising demand for power generation. Viet Nam aims to use LNG imports to displace coal-fired generation as part of its commitment to achieving net-zero emissions by 2050 (Vietnamplus, 2023). Currently, an additional 8.1 Mtpa of regasification capacity is under construction in Viet Nam.

Figure 3-8: Net natural gas imports outlook in the APEC region, 2022-2050 (bcm)



Source: CEDIGAZ

3-4-2 Net gas exports outlook in the APEC region

Regarding natural gas export growth in the APEC region, CEDIGAZ projects that it will be driven by the United States and its ongoing expansion in liquefaction capacity. LNG exports from the United States are expected to keep growing in the 2030's to then stabilize in the 2040's as the demand growth for LNG in the world starts deaccelerating.

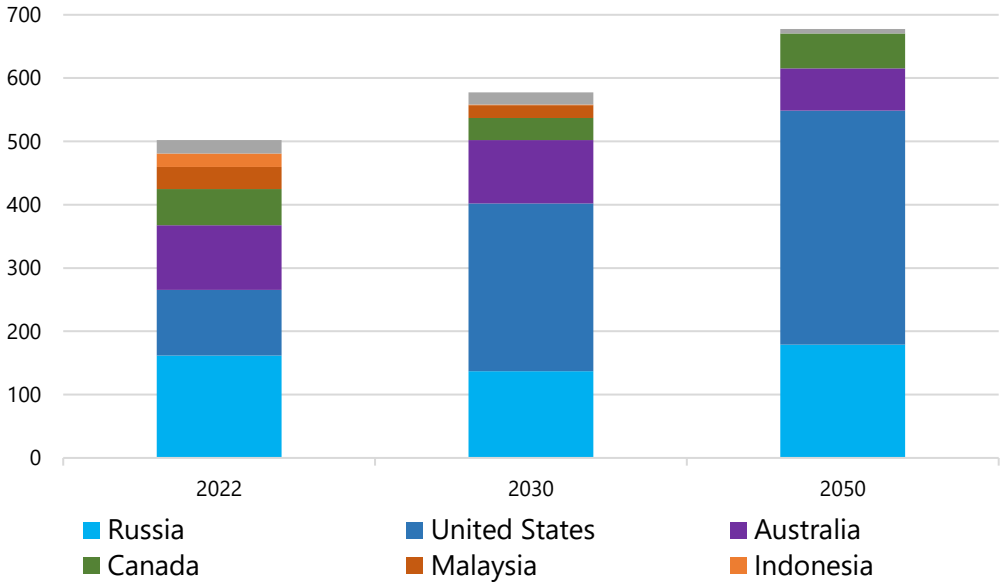
The United States is positioned to overtake Russia as the largest net gas exporter in the world. U.S. net exports are expected to grow by 155% between 2022 and 2030, reaching 265 bcm at the end of this decade. Most of U.S. gas export growth is expected to come from LNG, driven by the latest liquefaction capacity additions: Corpus Christi LNG III (11.4 Mtpa) and Plaquemines LNG (21.4 Mtpa) which started operations in December 2024 and Golden Pass LNG (18 Mtpa) which is expected to be completed by 2029. Additionally, two projects under construction, Port Arthur LNG (11 Mtpa) and Rio Grande LNG (31,5 Mtpa), will substantially increase liquefaction capacity by 2027 (CEDIGAZ, 2023).

CEDIGAZ forecasts that Russian natural gas exports by pipeline to Europe will not return to 2022 levels, with net exports expected to remain low until at least 2030. However, after 2030, Russian exports are projected to recover due to increased pipeline deliveries to China and expanded LNG capacity.

Russia is currently working to redirect a significant portion of its pipeline gas exports to China. The proposed Power of Siberia-2 pipeline is intended to supply China with gas from the Yamal Peninsula, which previously served the European market. Gazprom expects deliveries to China to begin by 2030, but key issues, including pricing negotiations, remain unresolved (Reuters, 2024).

Alongside its shift toward pipeline exports to Asia, Russia is expanding its LNG production capacity to diversify its export markets. The economy is currently building 44.7 bcm of additional annual liquefaction capacity, with 27 bcm expected to come from the Arctic LNG 2 project, originally planned to start operations in 2024. However, international sanctions have created uncertainty about when the project will reach full commercial operation (CGEP, 2024).

Figure 3-9: Net natural gas exports outlook in the APEC region, 2022-2050 (bcm)



Source: CEDIGAZ

Section 4: Gas prices

4-1 Gas prices in 2023

Natural gas monthly spot prices in Asia and Europe were volatile in 2023 but remained well under the previous year's prices at under $20 per MMBtu throughout the year. The JKM benchmark had an average price of $13.68 per MMBtu; in Europe, TTF had an average price of $12.72 per MMBtu.

At the beginning of 2023, natural gas monthly spot prices in Northeast Asia and Europe continued the downward trend observed during the final months of 2022. Mild winter temperatures, relatively weak demand, and abundant storage levels in Europe kept prices low in January and February. In addition, the expected production restart at Freeport LNG in the United States also contributed to low prices. However, in March, prices rose due to malfunctions at French nuclear plants and strikes at French LNG terminals. Prices though started to decrease again in April.

In May 2023, spot prices in Asia and Europe dipped below $10 per MMBtu, the lowest since May 2021, with JKM at $9.28 per MMBtu, and TTF $8.41 per MMBtu, due to abundant supplies, weak demand, and mild weather. However, prices increased in June 2023 due to increased buying interest from China and India, and maintenance at Norwegian gas processing plants.

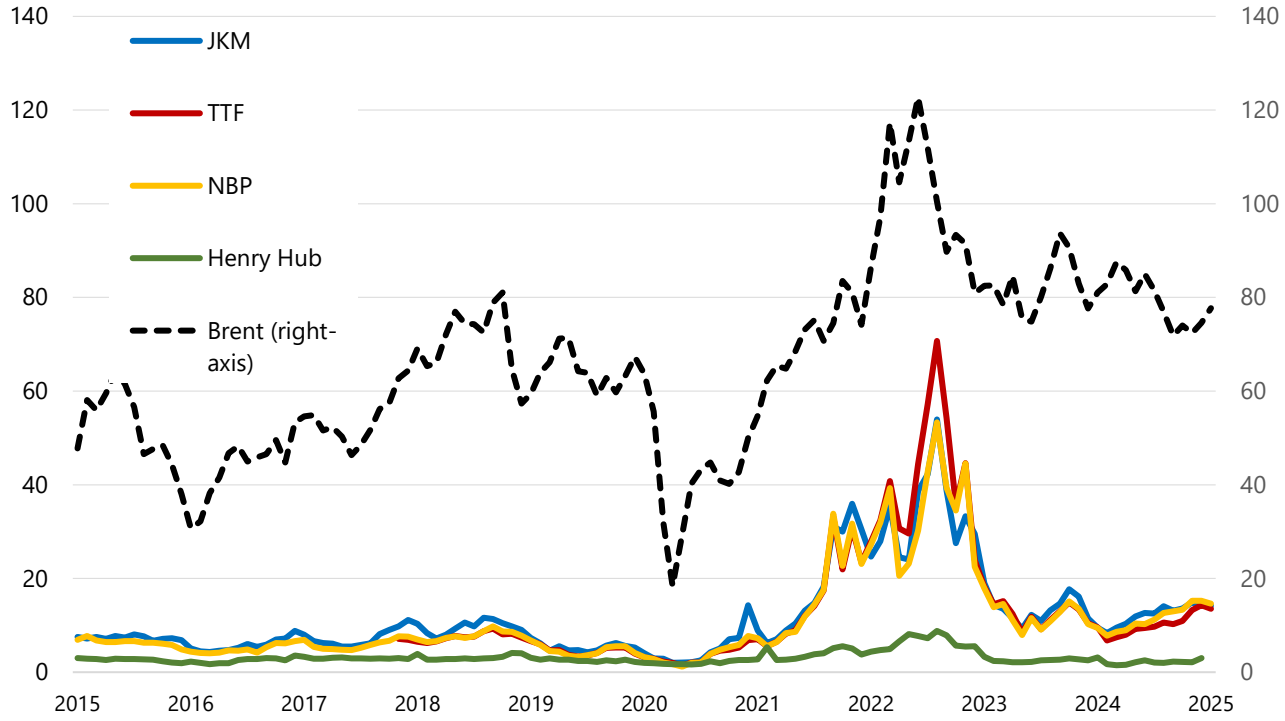
Prices decreased once again in July 2023. Short-lived heatwaves in Europe caused relatively lower demand and thus the fall of the TTF price. Prices in Northeast Asia declined, even amid a heatwave and maintenance on regional LNG export facilities; however, the JKM benchmark regained its premium over European prices.

Prices in August and September 2023 were impacted by strikes at major Australian LNG facilities, maintenance in Norwegian gas fields, and rising temperatures in Northeast Asia and Europe. In October 2023, additional supply disruption concerns emerged from the Israel-Hamas conflict and the Balticconnector shutdown in Europe, resulting in the year's highest spot prices. In October, JKM reached $17.72 per MMBtu, while the TTF reached $14.88 per MMBtu.

After peaking in October 2023, spot prices decreased in November 2023 as unions in Australia agreed to endorse deals on pay and conditions at Chevron's LNG facilities (Reuters, 2023). The observed further decrease in price in December was a consequence of ample supply and weak demand in Northeast Asia. This lower spot price temporarily increased buying interest from China. Relatively low demand, ample supplies, and mild temperatures in Europe also contributed to the fall in prices. The JKM spot price closed in 2023 with a monthly average price of $11.52 per MMBtu; TTF closed at $10.46 per MMBtu.

Henry Hub in the United States averaged $2.53 per MMBtu in 2023. The price reduction in the HH resulted from record-high production, slow growth in consumption, and rising natural gas inventories. Record-high natural gas production was the main driver for the fall in 2023 prices. Improved well-level productivity and high crude oil prices in 2023 benefited production in the Permian, Haynesville, and Appalachia regions. Additionally, the warm temperatures in January and February 2023 led to a fall in consumption in the building sector. The mild winter also decreased withdrawals from underground storage.

Figure 4-1: benchmark gas prices ($/MMBtu) and oil price ($/bbl)



Source: Investing.com; EIA

4-2 Gas prices in 2024

From January to December 2024, monthly spot prices for natural gas in Asia, Europe, and the United States trended upward, driven by weather conditions, supply-demand dynamics, increased interest from price-sensitive buyers, and geopolitical events. In Asia, average monthly JKM prices ranged from $8.40 to $14.90 per MMBtu. In Europe, TTF prices fluctuated between $7.87 and $14.83 per MMBtu. In the United States, average monthly Henry Hub prices ranged from $1.72 to $3.18 per MMBtu.

At the start of 2024, natural gas prices were lower than in 2022 and 2023 but remained well above historical averages. In January, JKM prices averaged $9.53 per MMBtu, and TTF prices averaged $9.58 per MMBtu. Toward the end of the month, cold weather across Northeast Asia and Europe put upward pressure on prices. In the United States, Henry Hub averaged $3.18 per MMBtu in January, also driven upward by cold weather.

By February, prices in all regions began to decline due to weak demand and ample supply. JKM dropped to $8.37 per MMBtu, while TTF fell to $7.87 per MMBtu, driven by low demand and strong underground gas storage levels in Europe. In the United States, Henry Hub prices averaged $1.72 per MMBtu, influenced by high production and mild weather.

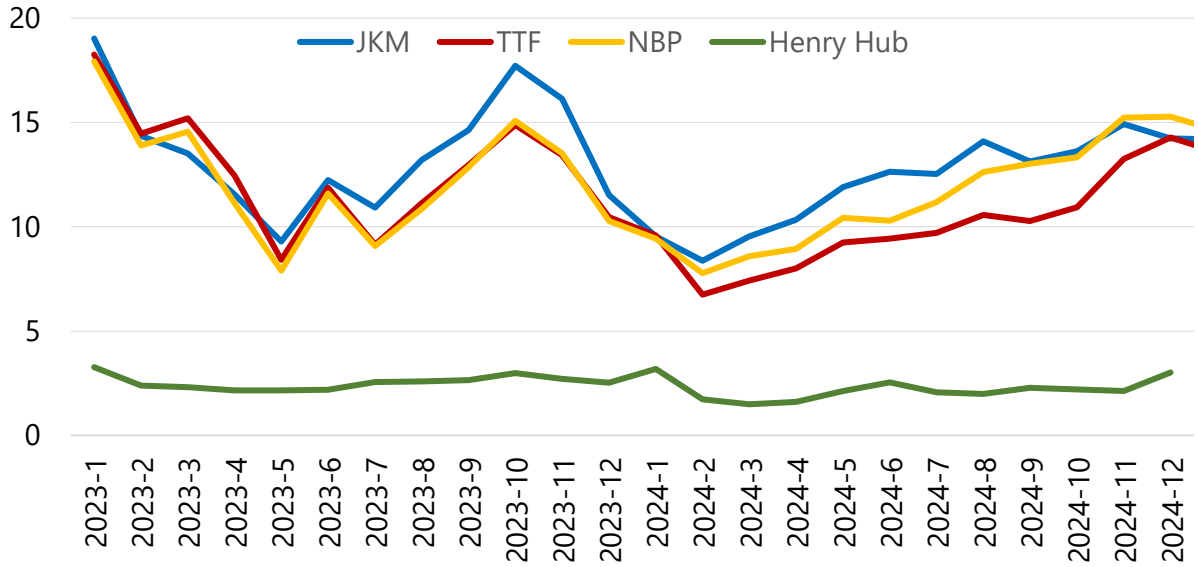
From March to May 2024, prices rose moderately, driven by increased LNG buying interest, geopolitical tensions, and higher temperatures in Asia toward the end of spring. In May, JKM reached $11.90 per MMBtu, supported by competition for supplies with Europe. TTF in Europe followed a similar trend, with TTF reaching $10.87 per MMBtu. In the United States, Henry Hub prices reached $2.12 per MMBtu in the same month.

With the arrival of summer, natural gas prices rose again, driven by increased cooling demand and supply constraints. JKM climbed to $12.63 per MMBtu, while TTF reached $10.82 by July. In the United States, Henry Hub rose to around $2.54 per MMBtu. Along with high temperatures, maintenance-related disruptions at Norwegian gas fields and Australia's Wheatstone LNG facility further supported price increases.

In the second half of 2024, natural gas prices rose more sharply in August and September, mainly due to geopolitical tensions in Europe. By September, JKM surged to $13.12 per MMBtu, while TTF reached $12.74 per MMBtu. In the United States, Henry Hub rose to $2.28 per MMBtu, driven largely by concerns over potential supply disruptions from Hurricane Helene. Prices remained elevated through October, with JKM holding at $13.62 per MMBtu and TTF at $12.94, supported by the start of the stockpiling season and ongoing geopolitical pressures. Henry Hub edged down slightly to $2.20 per MMBtu, reflecting a balanced supply-demand outlook in the U.S. market.

As the year came to a close, natural gas prices continued to rise. JKM averaged $14.92 per MMBtu in November 2025, driven by the onset of colder temperatures marking the start of the heating season. In Europe, TTF reached an average of $14.81 per MMBtu in November, influenced by reduced wind energy output, lower temperatures, and uncertainty around Russian gas supplies. Meanwhile, Henry Hub prices remained steady at around $2.12 per MMBtu. At the beginning of December, prices in both Asia and Europe stayed relatively stable, supported by forecasts of a mild winter. However, by the end of the month, upward pressure emerged as expectations grew that Russian gas flows through Ukraine would decrease in 2025. Colder weather in the United States also led to a rise in Henry Hub prices.

Figure 4-2: Monthly natural gas spot prices, January 2023- December 2024 (USD/MMBtu)



Source: Investing.com; EIA

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