

Wholesale Gas Price Survey 2025 Edition

A Global Review of Price
Formation Mechanisms

2005 - 2024

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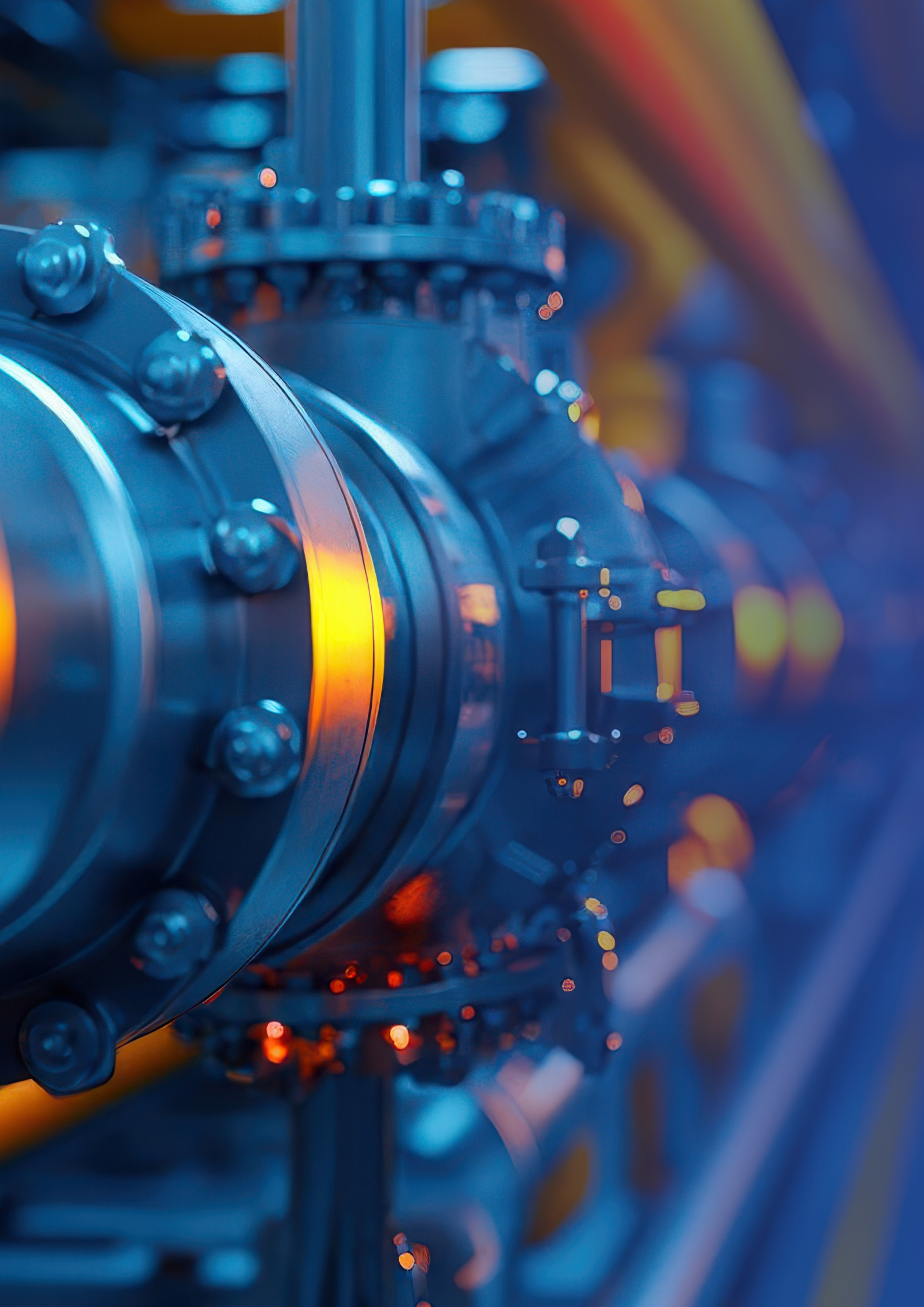
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ANDREA STEGHER
President, IGU

SECTION 1

Message from the President of the International Gas Union

Welcome to the 17th annual edition of the International Gas Union's Wholesale Gas Price Survey report. These flagship reports are a unique source of information on global wholesale natural gas price trends and illustrate the significant evolution of wholesale price formation mechanisms across the globe. The 2025 edition survey responses cover 96% of total world consumption.

The world continues to need more natural gas. Latest IEA figures indicate natural gas demand rising by 2.7% last year and meeting 28% of the total increase in global energy demand in 2024. Efficient global natural gas market functioning and liquidity therefore remains pivotal to energy security and the functioning of the global energy systems.

The world continues to face great uncertainty around market dynamics, economic growth, geopolitical conflict, trade and regulatory developments. In such an uncertain landscape, well-functioning, open natural gas markets permit the flexible adaptation of the global natural gas trade map, without interrupting the movement of molecules globally.

Following the record natural gas prices of 2022, this year's report sees prices continue to decline across all regions. The average world price for 2024, \$4.88 per MMBTU, is now only slightly above the average in the mid to late 2010s. As the global natural gas market continues to rebalance from 2022, the focus in multiple global regions remains on affordability, energy access and energy security. This also remains true in Europe, still dealing with the aftereffects of the significant reduction of Russian imports and a greater reliance on LNG.

The International Gas Union is the global voice of the gas industry, with more than 130 members in over 70 countries representing 90% of the global gas market across the full gas value chain. The IGU's global membership translates into one of the most extensive knowledge networks in the energy industry. Hundreds of professionals from member organisations work in the IGU Committees and Task Forces to produce insightful industry reports and help design the technical programmes of the IGU's flagship energy events; the World Gas Conference (held in Beijing last month); the upcoming International LNG Conference in Qatar in February next year and the International Gas Research Conference in Budapest in 2027.

I congratulate the IGU Strategy Committee on bringing this important work to life and I hope that you will find the 2025 report informative and helpful.

SECTION 2: EXECUTIVE SUMMARY

This is the seventeenth edition of the IGU Wholesale Gas Price Survey¹, which began in 2005. The survey was launched to assess global wholesale price formation mechanisms and track their evolution. It classifies global wholesale price formation mechanisms into nine distinct categories (see table below) and quantifies the share of each mechanism in wholesale² gas prices across the world.

1. The survey has been conducted by Mike Fulwood, Senior Research Fellow, Oxford Institute of Energy Studies, under the guidance of the IGU Secretariat and reviewed by the IGU Strategy Committee.
2. The wholesale price would typically be a hub price (e.g. Henry Hub or the NBP), but in markets where there is no hub price, it could typically be a border price, or could be approximated by wellhead prices or city-gate prices. Generally, the wholesale price is likely to be determined somewhere between the entry to the main high-pressure transmission system and the exit points to local distribution companies or very large end users.

PRICE FORMATION MECHANISMS

Oil Price Escalation (OPE)	The wholesale gas price is linked, usually through a base price and an escalation clause, to competing fuels, typically crude oil, gas oil and/or fuel oil. In some cases, coal prices can be used as can electricity prices.
Gas-on-Gas Competition (GOG)	The wholesale gas price is determined by the interplay of direct gas supply and demand – gas-on-gas competition – and is traded over a variety of different periods (daily, monthly, annually or other periods). This includes gas traded on a short-term hub-priced basis and longer-term contracts that use gas price indices to determine the monthly price.
Bilateral Monopoly (BIM)	The price is determined by bilateral discussions and agreements between a large seller and a large buyer, with the price being fixed for a period of time – typically one year. There may be a written contract in place but often the arrangement is at the Government or state-owned company level.
Netback from Final Product (NET)	The price received by the gas supplier is a function of the price received by the buyer for the final product the buyer produces. This may occur where the gas is used as a feedstock in chemical plants, such as ammonia or methanol, and is the major variable cost in producing the product.
Regulation: Cost of Service (RCS)	The price is determined, or approved, formally by a regulatory authority, or possibly a Ministry, but the level is set to cover the “cost of service”, including the recovery of investment and a reasonable rate of return.
Regulation: Social and Political (RSP)	The price is set, on an irregular basis on a political/social basis, in response to the need to cover increasing costs, or possibly as a revenue raising exercise – a hybrid between RCS and RBC.
Regulation: Below Cost (RBC)	The price is knowingly set below the average cost of producing and transporting the gas often as a form of state subsidy to the population.
No Price (NP)	The gas produced is either provided free to the population and industry, possibly as a feedstock for chemical and fertiliser plants, or in refinery processes and enhanced oil recovery. The gas produced maybe associated with oil and/or liquids and treated as a by-product.
Not Known (NK)	No data or evidence.

In the 2024 survey responses covered some 96% of total world consumption.³

3. Due to the ongoing Russia-Ukraine war, responses from the Former Soviet Union markets remained challenging to obtain, and some data was researched by the author.

KEY FINDINGS WHOLESALE GAS PRICE FORMATION

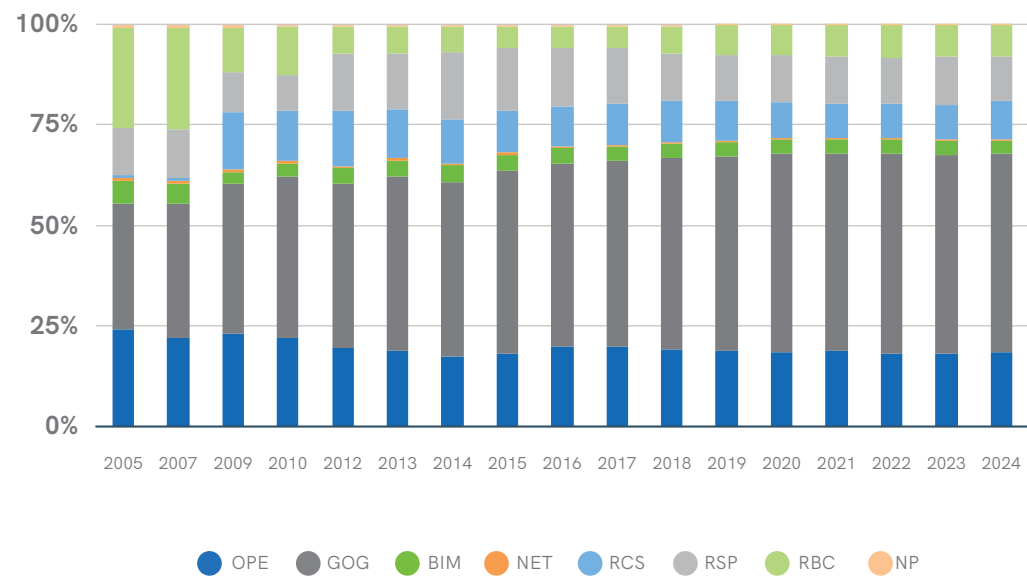
49% SHARE OF GAS-ON-GAS COMPETITION IN GLOBAL NATURAL GAS CONSUMPTION IN 2024

Since the start of the survey series, gas markets have been undergoing a significant transformation, with the most important trend being that of the growth of the share of competitively priced gas-on-gas (GOG) competition, largely at the expense of oil-price-escalation (OPE) pricing, and forms of regulated pricing. In recent years the GOG share of LNG imports has grown significantly, with the addition of Henry Hub linked long term contracts and the rise in spot LNG cargoes, such that in 2024 GOG pricing accounted for just over 50% of total LNG imports.

Between 2005 and 2024, the GOG share of global gas consumption rose from 31.5% to 49%, while the oil-price-escalation (OPE) indexed price mechanism share fell from 24% to 18.5%.

- Most of the rise in GOG, and decline in OPE, between 2005 and 2017 were driven by changes in pipeline imports in Europe, with OPE almost disappearing in Northwest Europe⁴ and Central Europe⁵, thanks in large part to the European energy market reform and liberalisation over that period. The volume of OPE, though, rose by some 100 bcm between 2005 and 2024, largely as a result of changes in Asian markets.
- The remaining enclaves of OPE in Europe are in Turkey, Southeast Europe (including Greece), which still receives some Russian pipeline gas, plus Spain and Portugal, with Algerian pipeline gas and older, traditional LNG contracts.
- Since 2016, the displacement of OPE by GOG, has largely been a result of the rise in GOG pricing share in LNG imports, especially via spot market LNG trade.
- Up until 2016, there was a switch away from regulated pricing mechanisms towards the more “market-based” pricing

Figure 1: World Price Formation 2005 to 2024 – Total Consumption



4. Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherlands, UK.
5. Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland

mechanisms such as GOG and OPE. Since then that move has paused, with the key change in pricing mechanisms being in the LNG market, between OPE and GOG.

- Within the regulated categories, the big changes occurred between 2005 and 2012, seen in a move away from subsidised pricing or regulated below cost (RBC) to higher, but still regulated, prices.

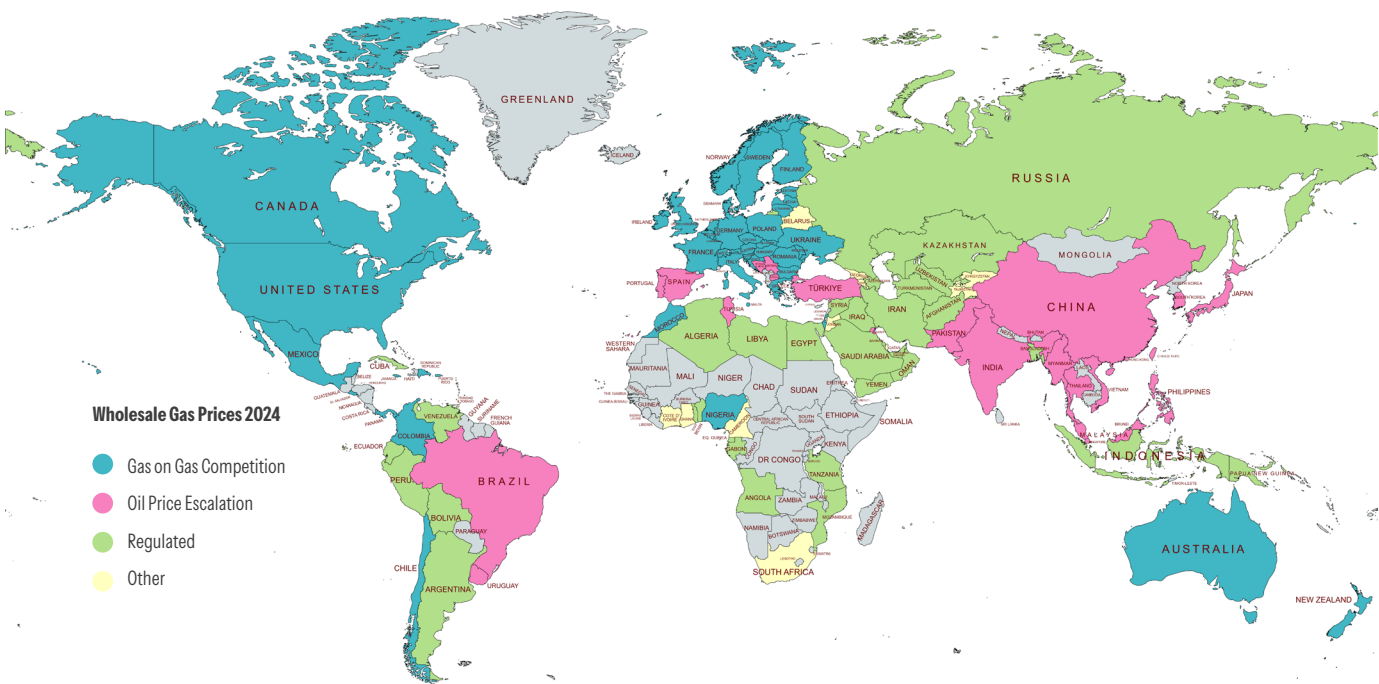
Following the shocks to prices in 2022, where the GOG share rose to over 50% of global gas consumption for the first time, the share has fallen back to just under 50%, as a result of a move in India's domestic pricing to OPE (which now dominates the market in India) and relatively weak European demand. The rise in spot LNG imports (GOG) into Europe and China offset some of this fall. Largely as a consequence of the change in India, the OPE share recovered slightly from its historic 2022 low. The map above shows the main price formation mechanism by market. For each market the highest share is used to categorise the dominant price formation mechanism for that market. OPE and GOG are self-explanatory, regulated covers the 3 categories RCS, RSP and RBC, while Other is predominantly BIM the bilateral monopoly category.

82% SHARE OF GAS-ON-GAS COMPETITION IN EUROPE IN 2024

Europe is now almost all GOG, which represents 82% of Europe's pricing, with almost all domestic production, 80% of pipeline imports, and 78% of LNG imports priced with GOG. By contrast, in 2005 – when the first IGU Wholesale Gas Price Survey was performed – only the UK, in Europe, had any significant levels of GOG.

OPE is still the largest category in most Asian countries, even in Malaysia, Vietnam, and the Philippines, where it is mostly domestic production, and also in India following the change in the domestic pricing mechanism, away from linkage to international hub prices to oil linked pricing. In a large area of the world covering the Former Soviet Union, the Middle East and North Africa prices remain largely regulated.

Figure 2: Wholesale Price Formation Mechanisms Map



KEY FINDINGS LNG MARKET

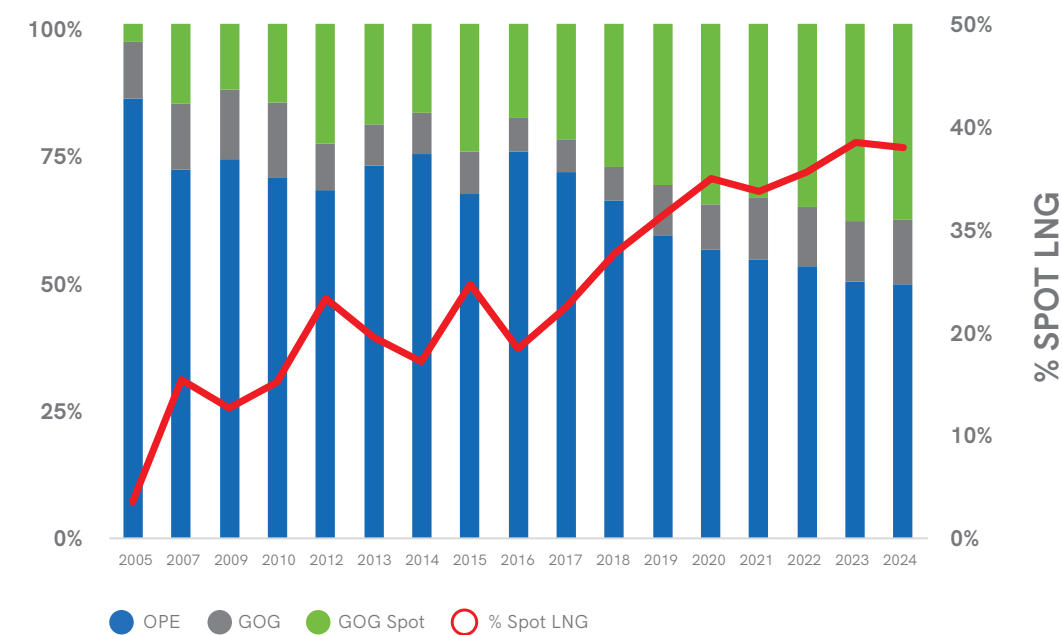
JUST OVER

50%

SHARE OF GAS-ON-GAS COMPETITION IN GLOBAL LNG TRADE IN 2024

The growth in the share of total GOG in LNG trade took off in 2017. The total GOG share of LNG imports nearly doubled between 2016, when it was 25%, and 2024, when it has risen to just over 50% of all LNG trade. Between 2016 and 2018, the rise was all driven by rapid growth in spot LNG trade, while in 2019 the increase was partly spot LNG imports and partly the significant rush of LNG to Europe's traded markets. In 2020 and in 2021 there was another notable increase, particularly in 2021 much more Henry Hub-priced US LNG entered the market. The share of spot LNG⁶ rose sharply in 2023, to 38%, from a 35% share in 2022, which was up on 2021 levels as well. The 2024 share of spot LNG was marginally down on the 2023 share. The rise in 2023 reflected a rebound in China from a weak showing in 2022 and further growth in spot LNG into Europe. In 2024, spot LNG cargoes moved away from Europe, as LNG imports fell, to Asia, as demand rose. In 2017 the volume of OPE in LNG imports was 272 bcm, with GOG at 110 bcm. In 2024, despite the 138 bcm growth in LNG trade since 2017, the volume of OPE had fallen to 257 bcm with GOG rising to 263 bcm.

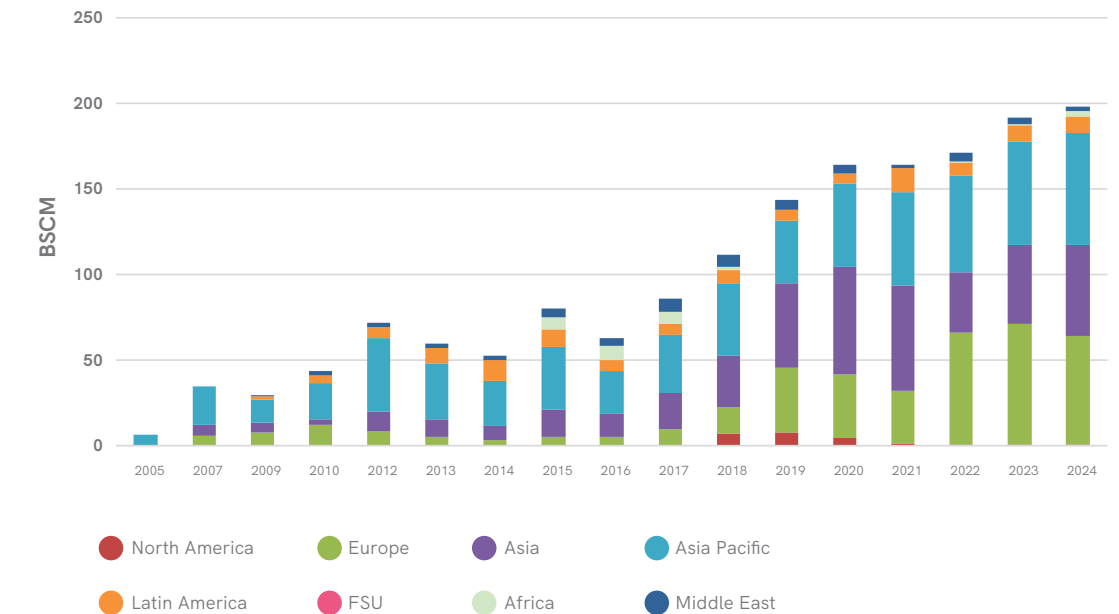
Figure 3: World Price Formation 2005 to 2024 – LNG Imports



It is notable that the growth of spot LNG imports prior to 2010, was predominantly in the Asia Pacific region, with the growth in Asia starting post-2010. The spot LNG volume in Europe was relatively low until 2018, with the GOG LNG imports being mainly into the traded Northwest Europe markets. The rise in spot LNG, from 2016, was largely a consequence of the surge in US LNG exports. Since 2016, there have been increasing volumes of spot LNG into the Asian markets of India and China, especially the latter, and into Japan and South Korea (Asia Pacific).

6. The definition of Spot LNG in this Survey includes spot cargoes and contracts under one year. This makes it distinct from the definition used by GIIGNL in their annual report, for spot and short-term trades, which included contracts up to four years. LNG being imported into the trading markets of North America and Northwest Europe, is now split between Spot and Traded volumes, to avoid the categorisation of some spot volumes as traded volumes. In addition, in some countries we have also attempted to categorise US cargoes, which are spot and those under contracts with Henry Hub linked pricing, which would be included in the "Traded" category.

Figure 4: Spot LNG Imports 2005 to 2024



Spot LNG into Europe began growing strongly in 2019, as rising LNG supplies found a home there. Spot LNG into China reached a record of almost 50 bcm in 2021, but this more than halved in 2022, with flat China gas demand, and the pull of Europe for spot cargoes – where spot volumes of 64 bcm were almost 40% of total LNG imports into Europe. Asia Pacific volumes in 2022 rose slightly with increases in South Korea, Chinese Taipei and Thailand, more than offsetting declines in Japan and elsewhere. The 2023 rise came from a recovery in China and more spot LNG into Europe. Asia Pacific volumes were little changed with higher volumes into Thailand and Korea, and lower volumes into Japan – due to weaker demand. 2024 saw a small rise in spot volumes, but was mainly a switch away from Europe towards Asia and Asia Pacific on the back of stronger demand in those regions. The volume of spot LNG cargoes have risen over three times in seven years, from 63 bcm in 2016 to 198 bcm in 2024.

KEY FINDINGS WHOLESALE GAS PRICE LEVELS

AVERAGE GLOBAL WHOLESALE GAS PRICES FELL TO \$4.88 PER MMBTU IN 2024 AGAINST A PEAK OF \$9.45 IN 2022

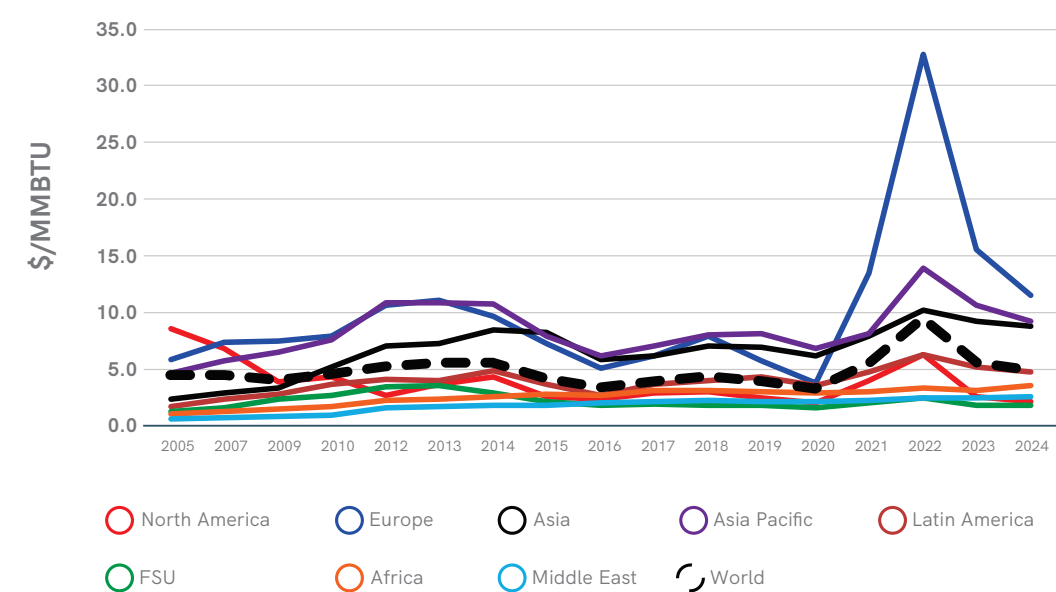
Following the record gas prices in 2022, 2023 and 2024 saw prices fall back somewhat. Gas prices continued to ease back, in 2024, in Europe, Asia Pacific and Asia, with North America also declining. The average World price fell further in 2024, down to \$4.88 per MMBTU, slightly above the average in the mid to late 2010s.

Globally, wholesale prices had generally risen between 2005 and 2014, apart from North America where the shale gas revolution contributed to a reduction in prices by unlocking ample new supply and turning the region from a net gas importer into one of the main exporters.

The regions which have had a lot of regulated pricing – Africa, the Middle East and FSU – generally experienced rising prices through 2015 before a levelling off, driven by the move away from more subsidised wholesale prices in many countries. This was also the case in the FSU, especially Russia, through 2013, but the decline in US dollar prices since then has largely reflected continued currency weakness, with rouble prices being maintained.

Since 2015, prices in Asia, Asia Pacific and Europe had broadly tracked each other, but this link was broken in 2019 as spot prices dropped significantly in a well-supplied market, which benefited the European market much more than Asia and Asia Pacific where prices barely changed from 2018 levels. These differences widened further in 2020 as spot prices collapsed further in the pandemic. However, in 2021, with the rapid post-pandemic demand recovery and growth driving a surge in hub prices, European prices leapt above Asia and Asia Pacific prices, where OPE prices only rose slightly. European average wholesale prices were over \$13 per MMBtu, while Asia and Asia Pacific prices were just over \$8 per MMBtu in 2021. These trends were exacerbated further in 2022, with European prices at \$32.50, Asia Pacific prices at \$14.50 and Asia prices at just over \$10 per MMBTU, with the average World price at \$9.45 per MMBTU. By 2024, European prices had fallen back to \$11.52 per MMBTU, with Asia Pacific prices at \$9.19 and Asia prices at \$8.76. North American prices fell again in 2024 to \$2.13 from \$6.29 in 2022, and were only slightly above the Covid19 2020 levels.

Figure 5: Wholesale Price Levels 2005 to 2024 by Region



There had been a trend of greater global gas price convergence from 2005 through to 2015, but this trend stalled somewhat with a period of lower prices. There was a sharp divergence in 2021 and 2022 especially, with the divergence doubling from 2015. In 2023 this divergence fell away somewhat but only back to 2021 levels, which were still well above the convergence levels seen between 2015 and 2020, before a further fall in divergence (more convergence) in 2024.

“Since 2015, prices in Asia, Asia Pacific and Europe had broadly tracked each other, but this link was broken in 2019 as spot prices dropped significantly in a well-supplied market...”

SECTION 3: INTRODUCTION

3.1 Background

The 2024 IGU Wholesale Gas Price survey is the seventeenth to be undertaken in a series which began at the start of the 2006 to 2009 IGU triennium culminating in the World Gas Conference in Buenos Aires. Previous surveys were undertaken for the years 2005, 2007, 2009, 2010, and then annually from 2012. The seventeen surveys have confirmed the significant changes in wholesale price formation mechanisms during a period of key developments and upheaval in the global gas market. In the 2024 survey, responses covered some 96% of total world consumption. As in the last three surveys, responses were difficult to get for some countries, especially in the Former Soviet Union, following the Russia war with Ukraine, but estimated data on the remaining markets, where responses were not received, was researched by the author of the report and/or based on past responses.



3.2 TYPES OF PRICE FORMATION MECHANISMS

In preparation for the initial 2005 survey, a series of discussions were held at the IGU group meetings, in 2006 and early 2007, on the definition of different types of price formation. It was decided to use for categorisation purposes the wholesale pricing mechanisms, summarised below.

PRICE FORMATION MECHANISMS	
Oil Price Escalation (OPE)	The wholesale gas price is linked, usually through a base price and an escalation clause, to competing fuels, typically crude oil, gas oil and/or fuel oil. In some cases, coal prices can be used as can electricity prices.
Gas-on-Gas Competition (GOG)	The wholesale gas price is determined by the interplay of direct gas supply and demand – gas-on-gas competition – and is traded over a variety of different periods (daily, monthly, annually or other periods). Trading takes place at physical hubs (e.g. Henry Hub) or notional hubs (e.g. NBP in the UK). There are likely to be developed futures markets (NY-MEX or ICE). Not all gas is bought and sold on a short-term fixed price basis and there will be longer term contracts, but these will use gas price indices to determine the monthly price, for example, rather than competing fuel indices. Also included in this category are spot LNG cargoes, any pricing which is linked to hub or spot prices and also bilateral agreements in markets where there are multiple buyers and sellers.
Bilateral Monopoly (BIM)	The wholesale gas price is determined by bilateral discussions and agreements between a large seller and a large buyer, with the price being fixed for a period of time – typically one year. There may be a written contract in place but often the arrangement is at the Government or state-owned company level. Usually there would be a single dominant buyer or seller on at least one side of the transaction, to distinguish this category from GOG, where there would be multiple buyers and sellers trading bilaterally.
Netback from Final Product (NET)	The wholesale gas price received by the gas supplier is a function of the price received by the buyer for the final product the buyer produces. This may occur where the gas is used as a feedstock in chemical plants, such as ammonia or methanol, and is the major variable cost in producing the product.
Regulation: Cost of Service (RCS)	The wholesale gas price is determined, or approved, formally by a regulatory authority, or possibly a Ministry, but the level is set to cover the “cost of service”, including the recovery of investment and a reasonable rate of return.
Regulation: Social and Political (RSP)	The wholesale gas price is set, on an irregular basis, probably by a Ministry, on a political/ social basis, in response to the need to cover increasing costs, or possibly as a revenue raising exercise – a hybrid between RCS and RBC.
Regulation: Below Cost (RBC)	The wholesale gas price is knowingly set below the average cost of producing and transporting the gas often as a form of state subsidy to the population.
No Price (NP)	The wholesale gas produced is either provided free to the population and industry, possibly as a feedstock for chemical and fertiliser plants, or in refinery processes and enhanced oil recovery. The gas produced maybe associated with oil and/or liquids and treated as a by-product.
Not Known (NK)	No data or evidence.

3.3 ANALYSING THE RESULTS

In the discussion of regions, the IGU regional definitions are used and there is a map in the Appendix which shows the regions. A key point to note is that the Asia region refers to China and the Indian sub-continent and Asia Pacific are the rest of what is often called Asia.

3.4 REPORT LAYOUT

Section 3 of the report covers the results at the World level of the 2024 survey, and a comparison of the results across all sixteen surveys, for the different categories – domestic production, pipeline imports, LNG imports, total imports and total consumption. The GOG and OPE categories are also analysed in more detail.

Section 4 of the report covers wholesale price levels including a discussion and analysis of the results of the 2024 survey, by region, price formation mechanism and country, and then provides comparisons over all surveys. A sub-section also analyses the impact of the pandemic and geopolitical conflict on spot prices.

Section 5 of the report contains an analysis of global gas price convergence over the seventeen surveys.

Appendix A of the report looks at the individual regions (IGU definitions) results for the 2024 survey and comparisons across all surveys for the price formation mechanisms.

Appendix B describes the survey methodology, including the data collection method, the IGU regional definitions, the definitions of the price formation mechanisms and the analytical framework.

The results for previous surveys may, in some cases, appear slightly different from what has been published in previous reports. This reflects mostly revisions to IEA data on consumption, production, imports and exports but can also reflect retrospective changes to price formation classification when survey respondents have a better appreciation of the classification definitions as they reflect upon the results from the surveys overall.



SECTION 4: WORLD RESULTS

This section covers the full results and analysis at the World level for wholesale price formation mechanisms and comprises results for the 2024 survey and comparisons and analysis of the results of the surveys from 2005 to 2024 for the consumption allocated to the following categories:

- Domestic Production
- Pipeline Imports
- LNG Imports
- Total Imports
- Total Consumption

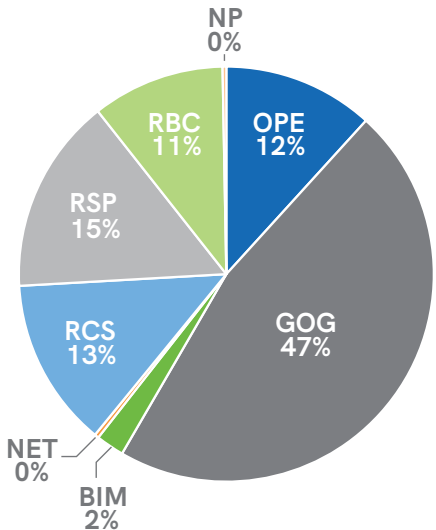
There is also a sub-section which analyses in more detail the GOG and OPE categories for all the surveys.

4.2 DOMESTIC PRODUCTION

4.2.1: 2024 Survey Results – Domestic Production

Domestic production in 2024 accounted for some 74% of total world consumption – some 3,112 bcm.

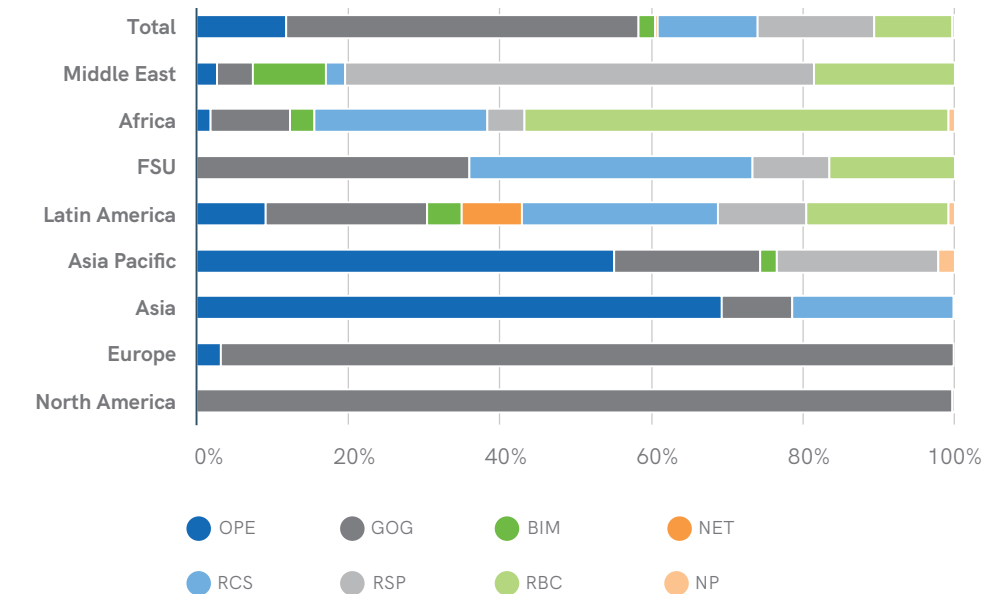
Figure 6: World Price Formation 2024 – Domestic Production



The percentage shares of the mechanisms for each region are shown in Figure 7.

GOG has the largest share in domestic production at 47%, totalling some 1,451 bcm, with North America accounting for 1,008 bcm – around 69% of the total. The next largest share is in the Former Soviet Union, where the sales of gas in Russia to the large eligible customers by either Gazprom or the independent producers is classified as GOG (see the section on Former Soviet Union in the regional analysis for further discussion), accounting for some 245 bcm. The balance is in Europe at 64 bcm – principally the UK plus the Netherlands and Romania, Asia Pacific at 34 bcm – Australia and New Zealand, Asia at 32 bcm – mainly China, and Latin America at 27 bcm – mainly Argentina and Colombia.

Figure 7: Regional Price Formation 2024 – Domestic Production



OPE has a relatively small share in domestic production at 12%, totalling some 367 bcm, with 238 bcm in Asia – China, India and Pakistan mainly, 96 bcm in Asia Pacific – Thailand, Indonesia, Vietnam, Philippines, Australia and Malaysia, the Middle East at 15 bcm in Kuwait and Israel, 12 bcm in Latin America – Brazil, and small amounts in Africa, mainly Tunisia, and Europe. The regulated categories – RCS, RSP and RBC – in total account for 39% of domestic production – some 1,207 bcm, with RCS principally in the Former Soviet Union, Asia and Asia Pacific, RSP principally in the Middle East, Former Soviet Union, Latin America and Asia Pacific and RBC in the Former Soviet Union, Africa, Latin America and the Middle East. A more detailed breakdown of the regulated categories is contained in the regional analysis sections.

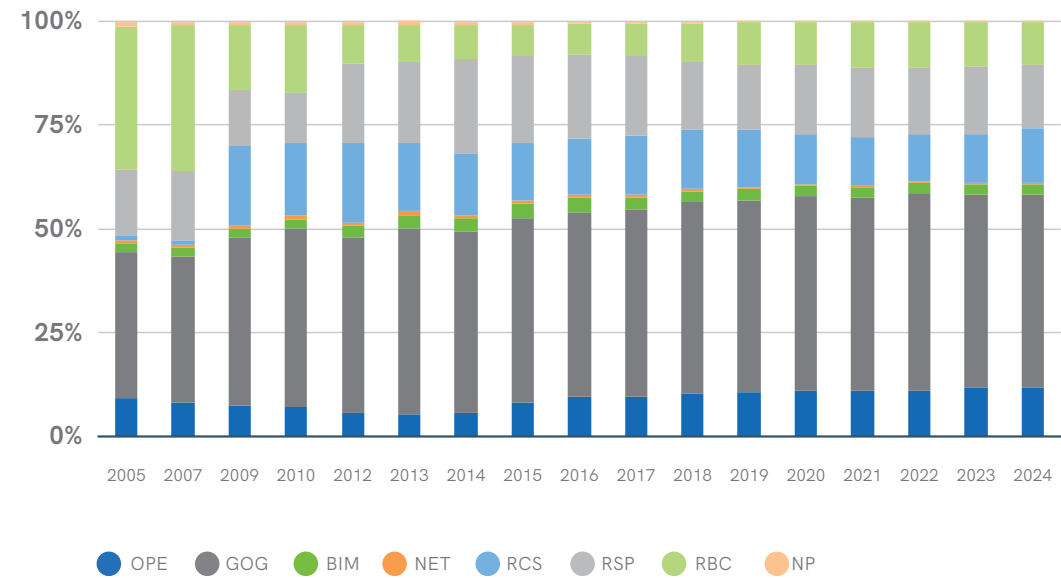
4.2.2: 2005 to 2024 Comparisons – Domestic Production

The main changes in price formation over the seventeen surveys have been the general rise in domestic GOG from 35% in 2005 to 47% in 2024. The share fell between 2022 and 2023, as a result of a change in the price formula in India, to incorporate linkage to oil prices rather than hub prices. As a result, the OPE category, which is not particularly large in terms of domestic production, has increased in the last two surveys.

Over the period as a whole, GOG in domestic production has gained share from the three regulated categories which in 2005 totalled some 52% compared to 39% in 2024. Half of this occurred in 2009 and 2010 when the GOG category increased in Russia at the expense of the regulated categories, as the market began to open up to independents more, and there was more effective competition between the independents and Gazprom for power sector and industrial customers. This was followed by the changes in India in 2015, as regulated pricing was replaced with a formula linked to international, predominantly hub, prices for key sectors. There has also been an increase in GOG in Latin America as well, principally in 2007 and 2009.

Within the regulated categories, there have been two main changes, in 2009 when Russia changed from RBC to RCS as prices were finally increased above the cost of production and transportation, and in 2012 when Iran increased prices sharply to move from RBC to RSP. RSP increased again in 2014 as prices to the domestic population in Russia switched away from RCS. In 2017, there was also a change in Malaysia, away from RSP to RCS. In 2020, there was a switch away from RCS as it declined in Russia, as the sector was hit by lower demand, and in Malaysia which moved away from RCS to OPE. In 2021, the RSP category gained share with more rapid demand growth in Middle East, Asia Pacific and FSU. The RSP share fell back in 2022, as domestic production in the Ukraine switched to GOG. In 2023 and 2024, the shares were broadly unchanged from 2022.

Figure 8: World Price Formation 2005 to 2024 – Domestic Production



4.3 PIPELINE IMPORTS

4.3.1: 2024 Survey Results – Pipeline Imports

Pipeline imports in 2024 accounted for some 14% of total world consumption – some 601 bcm⁷.

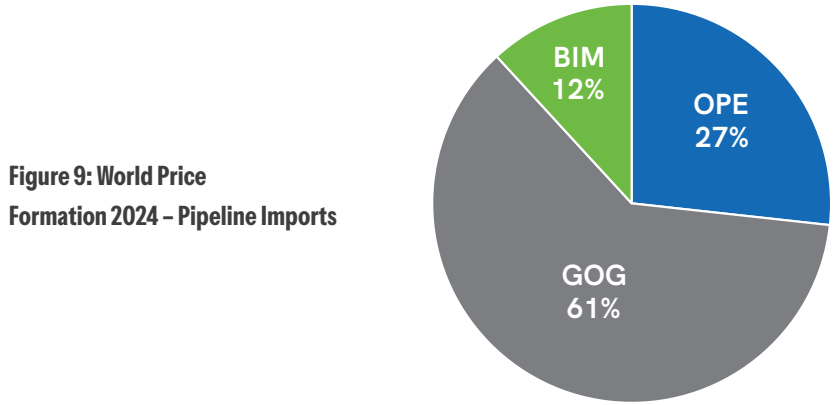


Figure 9: World Price Formation 2024 – Pipeline Imports

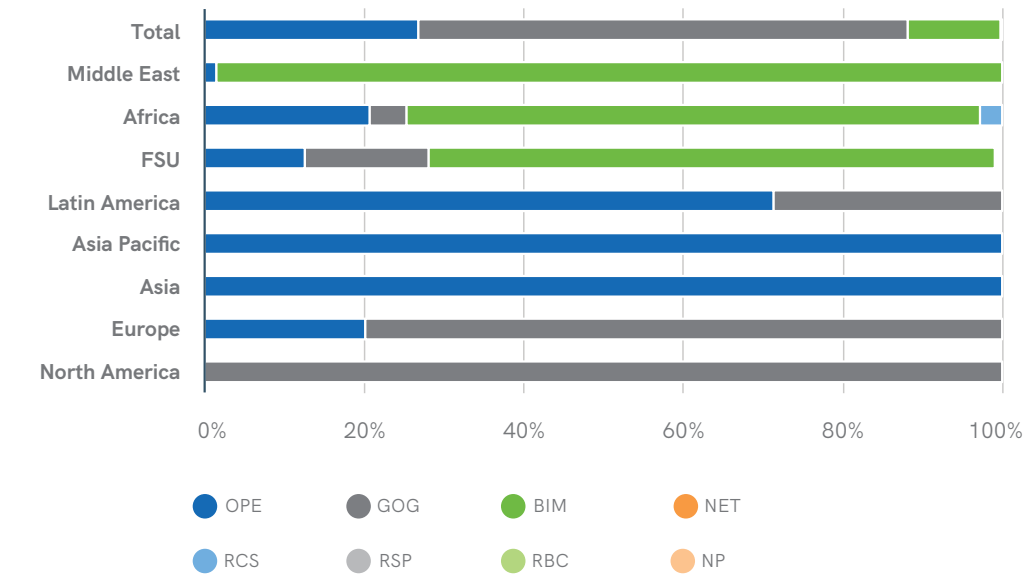
Pipeline imports are split between just three categories – OPE, GOG and BIM⁸. The regional breakdown is shown in figure 10.

GOG is 61% of all pipeline imports, totalling 368 bcm, with Europe at 226 bcm, North America 133 bcm and the Former Soviet Union 5 bcm (Ukraine imports from Europe). Most of the European gas importing countries, are now dominated by GOG pipeline imports with the top seven countries being Germany, Italy, UK, Turkey, France, Poland and the Netherlands.

OPE is around 27% of all pipeline imports, totalling some 133 bcm. Asia accounts for some 73 bcm – China, with Europe at some 57 bcm – Turkey being by far the largest contributor, followed by Italy and Spain, 16 bcm in Asia Pacific – Thailand, Singapore and Malaysia, 7 bcm in Latin America – mainly Brazil and Argentina, and 4 bcm in the Former Soviet Union – Russia. There are also small quantities in countries such as Iran and Tunisia.

BIM has the balance of 12%, totalling some 71 bcm. This is mainly in the Former Soviet Union and the Middle East, with a small amount in Africa.

Figure 10: Regional Price Formation 2024 – Pipeline Imports



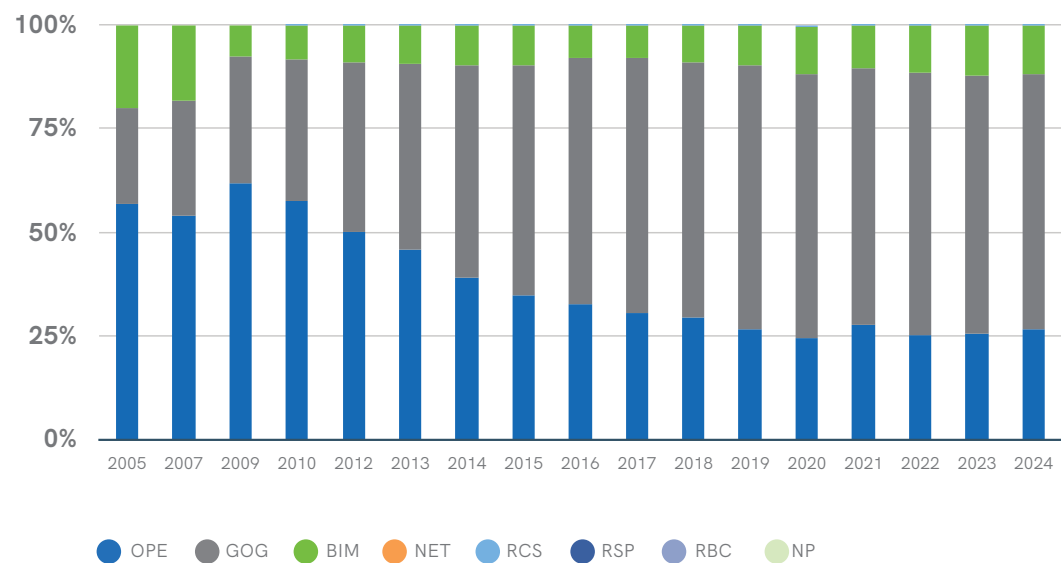
7. This figure represents the total effective net pipeline imports for all countries. Many countries will produce gas and import by pipeline and LNG and also export by pipeline from the "pool" of all sources of supply. Gross pipeline imports in total in 2024 were 663 bcm so effectively 62 bcm was "re-exported" by pipeline.
8. There is a very small amount of RCS in Africa reflecting the regulated transportation tariff element of pipeline gas from Nigeria to Ghana.

4.3.2: 2005 to 2024 Comparisons – Pipeline Imports

The main changes in the seventeen surveys from 2005 to 2024 are the continued rise in GOG from 23% in 2005 to 61% in 2024, which has been at the expense of the OPE category. The decline in OPE was partly offset by a switch from BIM to OPE in intra-FSU trade in 2009, and more recently the imports of pipeline gas from Turkmenistan to China, and in 2016, the change in one of the gas contracts from Russia to Turkey. In 2022, the GOG share recovered, having fallen back in 2021 (when the volume of OPE imports in Europe rose sharply in Turkey and Spain, reflecting a faster increase in demand than elsewhere in Europe). The 2022 recovery reflected a partial switch away from OPE in Turkey’s contracts with Gazprom. The total volume of pipeline imports declined sharply, as Russian flows to Europe declined – this impacted GOG volumes more but this was offset by the change in Turkey to leave OPE and GOG shares largely the same. In 2023, the GOG share fell back slightly, principally reflecting lower demand and lower pipe imports from Russia, and again in 2024, as OPE imports picked up in Spain and Turkey, in Europe and in China.

The rise in GOG at the expense of OPE has been entirely in the European market (at least until 2015 when the Ukraine began importing gas from Europe, rather than Russia – utilising reverse flow mechanism), as the Northwest Europe countries began switching to GOG and more recently the Central Europe countries and, in 2014 and 2017, Italy. In respect of pipeline imports into Europe, GOG in 2024 has an 80% share compared to 20% for OPE – in 2021 the GOG share in Europe was 75% and OPE 25%, with the change in 2022 reflecting the changes in Turkey, stabilising in 2023, with the volume decline hitting both categories. In 2024, as pipeline volumes rebounded in Europe, the OPE share rose marginally. This is in marked contrast to 2005, in Europe, when it was 91% OPE and only 7% GOG. OPE also rose in 2024 as China’s pipe imports from Russia continued to increase.

Figure 11: World Price Formation 2005 to 2024 – Pipeline Imports



4.4 LNG IMPORTS

GOG IN TOTAL WAS JUST OVER 50% OF GLOBAL LNG TRADE IN 2024, WITH SPOT LNG TRADE (WITHIN GOG) AT SOME 38%

4.4.1: 2024 Survey Results – LNG Imports

LNG imports in 2024 accounted for some 12% of total world consumption – some 520 bcm⁹.

LNG imports are split 50.5% GOG and 49.5% OPE. The regional breakdown is shown in Figure 13 below.

GOG totals some 263 bcm and can be divided into imports into traded markets in North America and countries such as the UK, Belgium, France and Netherlands, where the domestic market pricing mechanism is GOG (with contracts linked to hub prices), and all other markets which are mainly importing spot and short-term priced LNG cargoes, which is almost every other LNG importing country principally China, Japan, India, Korea, Chinese Taipei, Turkey, Spain, Argentina and Brazil, plus the uncontracted spot LNG into the traded markets noted above. In Europe, 78% of LNG imports are now GOG. OPE at some 257 bcm is mostly Asia Pacific – Japan, Korea and Chinese Taipei, followed by Asia – China, India and Pakistan – and Europe – mainly France, Spain, Turkey, Portugal, Italy and Poland.

Figure 12: World Price Formation 2024 – LNG Imports

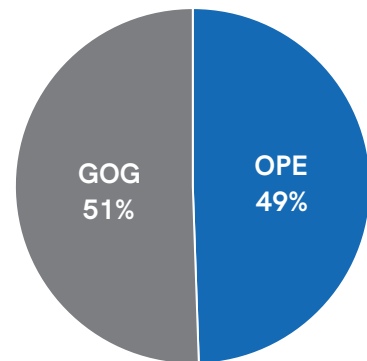
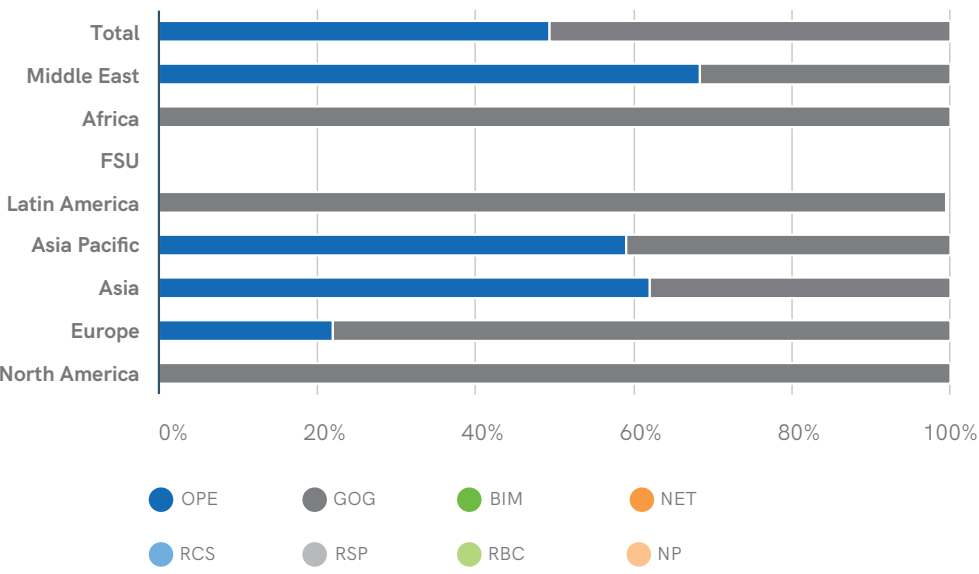


Figure 13: Regional Price Formation 2024 – LNG Imports



9. As for pipeline imports, the figure represents total effective net LNG imports for all countries. Gross LNG imports (net of re-exported LNG) were some 552 bcm in 2024, with around 32 bcm being regasified and re-exported as pipeline gas. A substantial amount of this was in Europe as LNG being imported was re-routed to markets which had lost Russian pipeline imports, over the last few years.

4.4.2: 2005 to 2024 Comparisons – LNG Imports

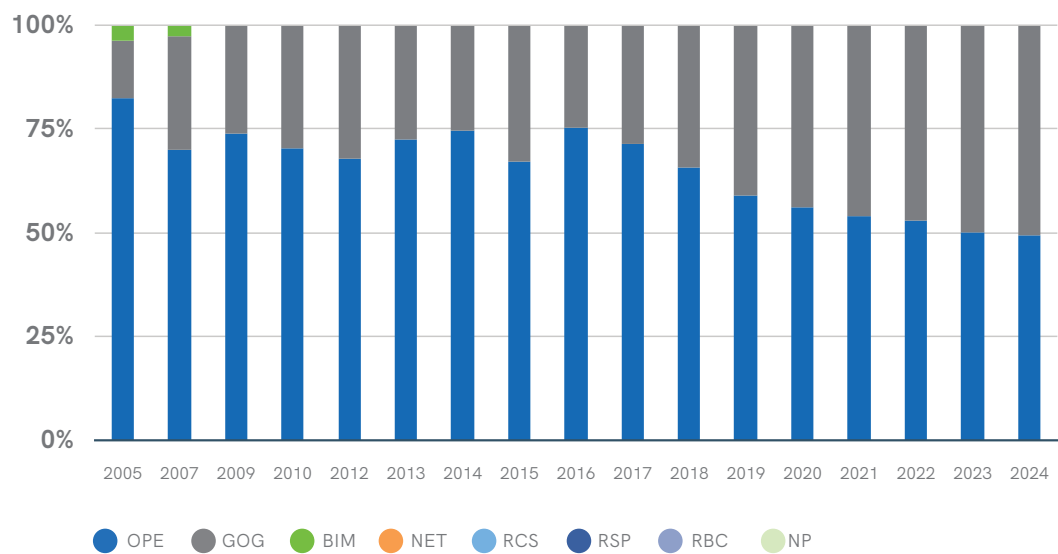
The main changes in the seventeen surveys from 2005 to 2024 are a rise in GOG from 14% in 2005 to 32% in 2012, which was largely at the expense of the OPE category, before it fell back in 2014 to 25%. In 2015 there was a recovery back to a 33% share, a fall in 2016 to 25%, before rising to 29% in 2017, 34% in 2018, 41% in 2019, 44% in 2020, 46% in 2021, 47% in 2022, to 50% in 2023, and just over 50% in 2024.

The GOG share is comprised of LNG going to the traded markets of North America and, in Europe, the UK, Belgium and Netherlands and any hub-indexed LNG contracts (such as Henry Hub), and spot LNG cargoes to the more “traditional” LNG markets in Asia Pacific, Asia and Europe (including uncontracted LNG into traded markets) and some of the newer markets. There was a significant increase in GOG between 2005 and 2007, which was principally due to a rise in spot LNG imports in Asia and Asia Pacific and a smaller rise in North American imports. Since 2007, there have been offsetting changes with North American LNG imports – which are all GOG – declining, European imports, principally to the UK increasing in 2009 and 2010 and relative stability in Asia and Asia Pacific spot LNG imports. In 2012, as Europe’s LNG imports declined, these were more than offset in the GOG category by rising spot LNG imports in Asia and Asia Pacific. The decline in 2013 reflected the fall in the share of spot LNG imports and a decline in LNG imports into the UK, the USA and Canada. The further small decline in 2014 was principally due to lower spot LNG cargoes in Asia and Asia Pacific, with correspondingly higher OPE under long term contracts. The rebound in 2015 was largely due to more spot LNG cargoes in all markets but especially Japan and the new markets, as the fall in spot LNG prices preceded the decline in oil-linked contract prices. In 2016, the decline in GOG was a consequence of LNG trade becoming more contracted, with fewer spot LNG cargoes, which benefitted OPE. In 2017 this was reversed as spot LNG cargoes increased, in part due to the rise in Henry Hub priced US LNG exports.

2018 saw a significant change in LNG imports of all the surveys, driven by the continued rise in Henry Hub priced US LNG exports but also by a general rise in spot LNG cargoes¹⁰. This change was just as large in 2019, rising to over 40% for the first time, with the volume of OPE LNG imports declining for the second year in a row. In 2020, the growth of GOG slowed but still rose to 44%. The rise in GOG was strongest in Asia and Asia Pacific, rising to 46% (up 5 percentage points) and 27% (up 6 percentage points) respectively. These rises offset a five percentage-point decline in Europe, largely due to a switch to more OPE volumes in Spain in 2020. In 2021, the two-point rise in GOG largely reflected a large increase in spot LNG cargoes to Latin America (Brazil mainly), Asia Pacific and China. There was also a switch away from OPE cargoes to GOG in Europe. 2022 saw some significant changes as LNG imports increased dramatically into Europe, replacing lost Russian pipeline imports. The GOG share in Europe rose to 76% in 2022 from 67% in 2021, with a large rise in spot LNG cargoes. Many of these spot LNG cargoes were diverted from China, where the GOG share fell to 27% in 2022 from 49% in 2021, and Pakistan, where the GOG share fell to 17% in 2022 from 41% in 2021. In 2023, the GOG share rose to 50% from 47% in 2022. GOG took all the growth in LNG imports together with a small switch away from OPE. The change was driven by more spot LNG into Europe and a recovery of spot LNG into China, as gas demand rebounded. In 2024, the volume of GOG rose again, largely in Asia and Asia Pacific, as spot cargoes were diverted from Europe, with the GOG share in Europe actually declining on the sharp fall in LNG imports leaving OPE with a larger share. In 2017 the volume of OPE in LNG imports was 272 bcm, with GOG at 110 bcm. In 2024, despite the 138 bcm growth in LNG trade since 2017, the volume of OPE had fallen to 257 bcm with GOG rising to 263 bcm.

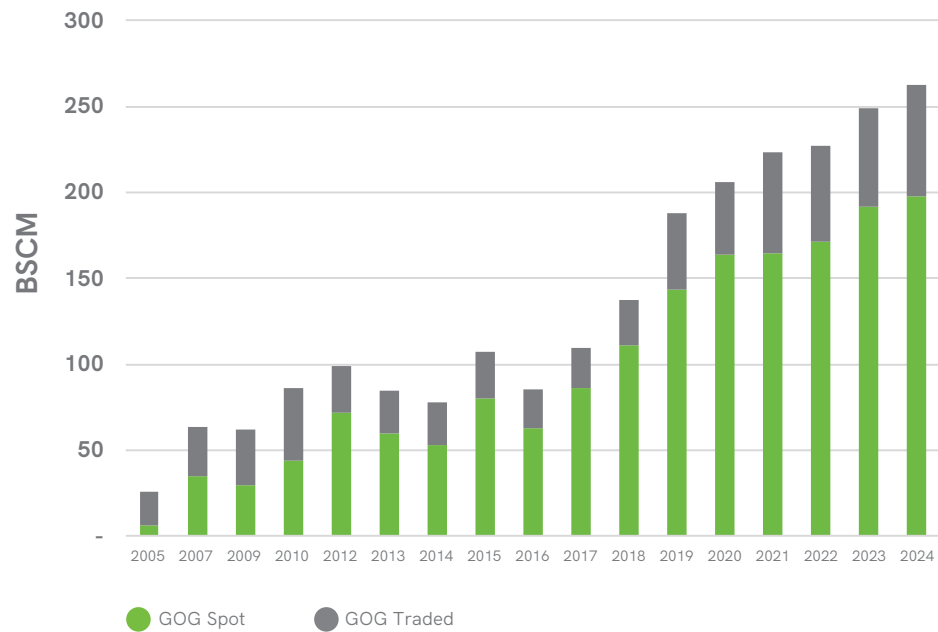
10. The definition of Spot LNG in this survey includes spot cargoes and contracts under one year. This makes it distinct from the definition used by GII&NL in their annual report, for spot and short-term trades, which included contracts up to four years. LNG being imported into the trading markets of North America and Northwest Europe, is now split between Spot and Traded volumes, to avoid the categorisation of some spot volumes as traded volumes. In addition, in some countries we have also attempted to categorise US cargoes, which are spot and those under contracts with Henry Hub linked pricing, which would be included in the “Traded” category.

Figure 14: World Price Formation 2005 to 2024 – LNG Imports



The volume of LNG going to the traded markets had been in decline since 2010, with the decline in US LNG imports, reaching a low point in 2018 as UK imports also declined. In contrast, spot LNG cargoes have increased, especially in 2017 and 2018 in Asia Pacific, Asia and parts of Europe plus the newer LNG importing markets. However, in 2019, the volume of LNG going to the traded markets of Northwest Europe increased markedly, as the abundant supply of LNG sought a home in the only market able to absorb the surplus, declining only slightly in 2020. In 2021, the traded share rose again on the back of contracted US LNG cargoes into Asian markets especially. In 2022 and 2023, spot LNG cargoes increased again as Europe outbid other regions and mopped up increasing uncontracted LNG supply, while in 2023 there was a rebound in China. In 2024, LNG imports in Europe fell back sharply, with spot LNG going to Asia and Asia Pacific. As Figure 15 shows, the volume of spot LNG cargoes have risen over three times in seven years, from 63 bcm in 2016 to 198 bcm in 2024.

Figure 15: GOG LNG Imports 2005 to 2024

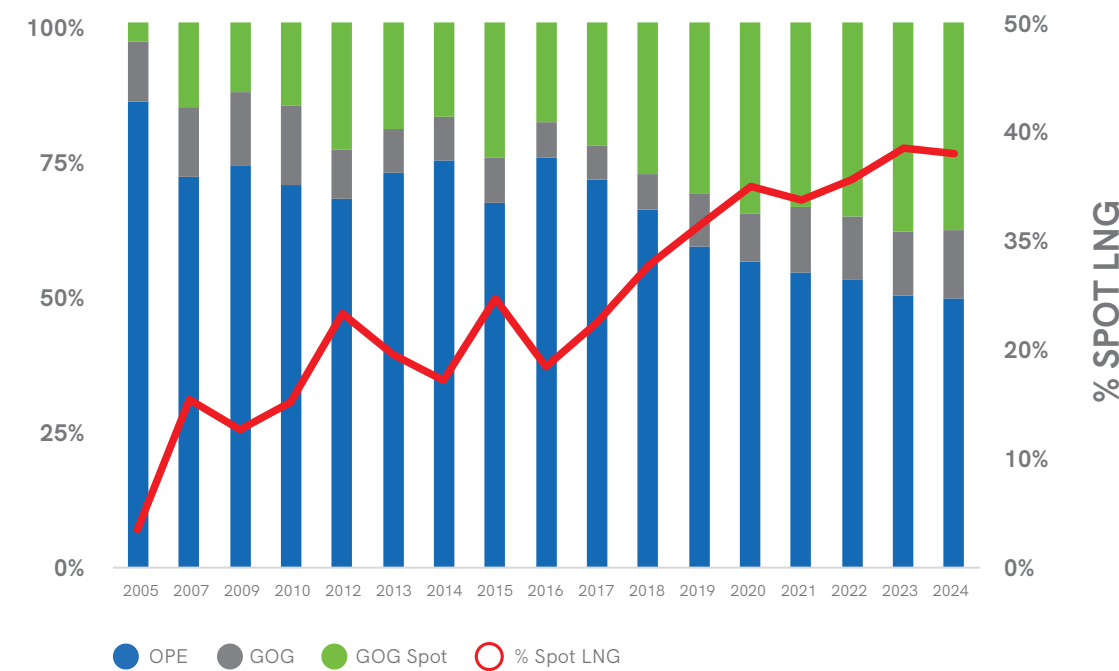


The division of GOG LNG imports into Traded and Spot can be a somewhat grey area. The survey respondents split LNG imports into either OPE or GOG. The division of GOG into Traded and Spot is then done centrally using other data, notably the latest GIIGNL report¹¹ which includes information on spot and short-term trade. It is becomingly more difficult to precisely allocate GOG LNG between Traded and Spot, with cargoes under long-term contracts being re-traded while at sea, equity liftings and additional sales, above contract levels, being based on GOG pricing. Deciding whether these are GOG Traded or GOG Spot can be subjective, especially in the Asian markets, while having confidence, from the survey, on what total GOG LNG imports are.

To further illustrate the growth of spot LNG, figure 16 breaks down the data from figure 15, showing Spot LNG separately and the percentage of Spot LNG in total LNG imports. In 2021, the spot LNG percentage declined, for the first time in 5 years, to 34% in 2021 from 35% in 2020, with the growth in LNG trade being largely accounted for by contracted LNG – both OPE and hub-indexed. In 2022 this was reversed as spot LNG headed to Europe, continuing into 2023, together with the China rebound. Spot LNG in 2024 rose again in volume terms to 198 bcm but the share declined slightly, as a little more GOG LNG imports were classified as traded.

For comparison the latest GIIGNL report has total spot and short-term volumes of LNG trade at some 197 bcm – almost the same as in this survey. However, the GIIGNL numbers include short-term volumes, in addition to spot, although these are thought to be only around some 12 to 15 bcm. In addition, the GIIGNL numbers do not factor in the re-export of LNG via pipeline, although this is largely in Europe and most of the re-exported volumes in Europe seem likely to have been in the GOG Traded category in, and around Northwest Europe. Having said that, this survey’s estimate of spot LNG may be some 3 or 4 percentage points higher than GIIGNL’s imputed estimate.

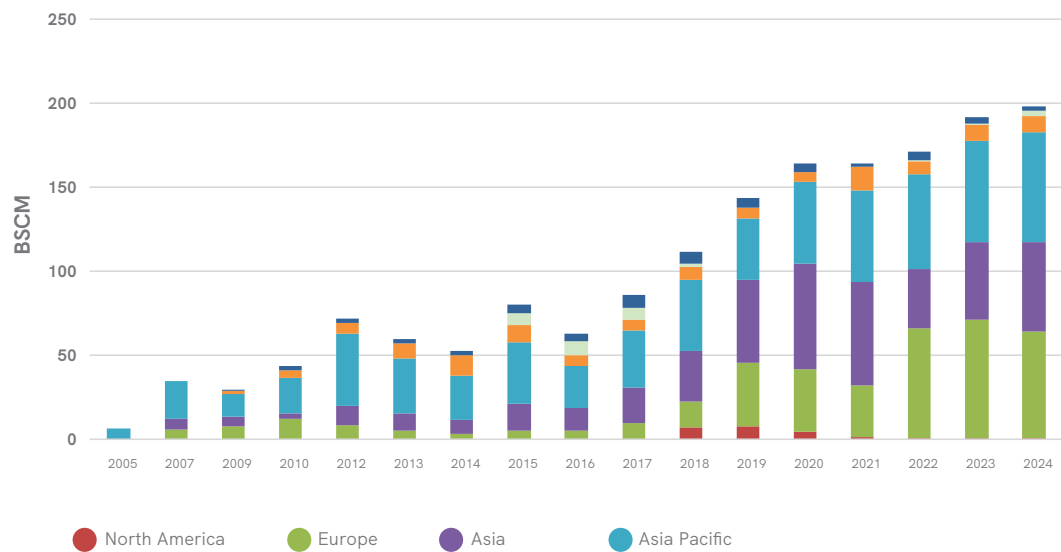
Figure 16: World LNG Price Formation 2005 to 2024 – Spot LNG Imports



11. <https://giignl.org/wp-content/uploads/2025/05/GIIGNL-2025-Annual-Report.pdf>. We would like to thank GIIGNL for providing us with early sight of their results, enabling us to calibrate the spot volumes.

Figure 17 shows the volume growth in spot LNG imports by region. The growth of spot LNG imports prior to 2010, was predominantly in the Asia Pacific region, with the growth in Asia starting post-2010. The volume in Europe was relatively low until 2018, with the GOG LNG imports being mainly into the traded Northwest Europe markets. The rise in spot LNG, from around 60 bcm in 2016 to over 150 bcm by 2020, was largely a consequence of the surge in US LNG exports, although not all the growth in spot LNG is from the USA. Since 2016, there have been increasing volumes of spot LNG into the Asian markets of India and China, especially the latter, and into Japan and South Korea (Asia Pacific). Spot LNG into Europe began growing strongly in 2019, as the rising LNG supplies found a market there. Spot LNG into China reached a record of almost 50 bcm in 2021, but this more than halved in 2022, with flat China gas demand, and the pull of Europe for spot cargoes – where spot volumes of 64 bcm were almost 40% of total LNG imports into Europe. Asia Pacific volumes in 2022 rose slightly with increases in South Korea, Chinese Taipei and Thailand, more than offsetting declines in Japan and elsewhere. In 2023, the rise in spot LNG imports was in Europe and China as noted above, while in 2024 it was all due to Asia and Asia Pacific as spot LNG moved away from Europe.

Figure 17: GOG Spot LNG Imports 2005 to 2024



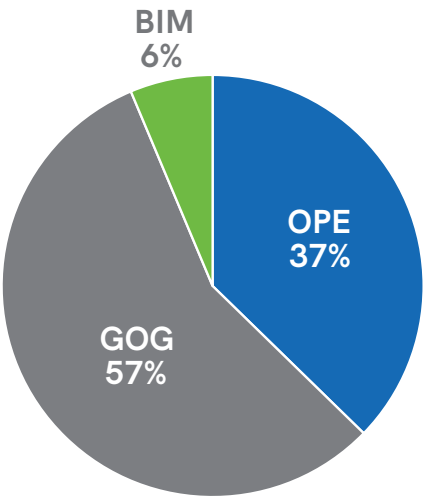
4.5 TOTAL IMPORTS

4.5.1: 2024 Survey Results – Total Imports

Total imports in 2024 accounted for some 27% of total world consumption – 1,120 bcm.

Total imports are the sum of pipeline and LNG imports and comprise the three categories of GOG (57%), OPE (37%) and BIM (6%).

Figure 18: World Price Formation 2024 – Total Imports



The table below shows the regional and category breakdown in volume terms.

Table 1: World Price Formation 2024 – Total Imports

REGION	TOTAL IMPORTS			
	OPE	GOG	BIM	TOT
North America	0.0	134.6	0.0	134.6
Europe	82.5	317.1	0.0	399.6
Asia	170.8	59.9	0.0	230.7
Asia Pacific	141.3	86.9	0.0	228.2
Latin America	6.1	19.6	0.0	25.7
FSU	4.4	5.5	25.2	35.1
Africa	3.8	4.0	13.3	21.7
Middle East	8.7	3.8	32.4	44.9
TOTAL	417.6	631.3	70.9	1,120.3

4.5.2: 2005 to 2024 Comparisons – Total Imports

Total imports have only comprised three categories – OPE, GOG and BIM – in all seventeen surveys from 2005 to 2024¹². As well as the table above, the figure below shows the volume breakdown. OPE declined from 63% in 2005 to 59% in 2007 as GOG rose from just over 21% to 28% and then in 2009, OPE gained share rising to 66% as BIM fell from 14% to 6%, with GOG rising to 29%. Since 2009 OPE has lost share by around 28 percentage points and GOG gained a similar share, in large part due to pipeline imports in Europe, but more recently the rising share of GOG in LNG imports. In volume terms, over the period 2005 to 2024, OPE pricing declined by 16% while GOG grew by 280%. It should be noted that total imports fell in volume terms in 2022 and 2023, as a result of the lower Russian pipeline imports into Europe, but recovered in 2024, with China pipe and LNG imports rising. Over the last three years there has been a further small move to GOG in total imports, driven by the

Figure 19: World Price Formation 2005 to 2024 – Total Imports

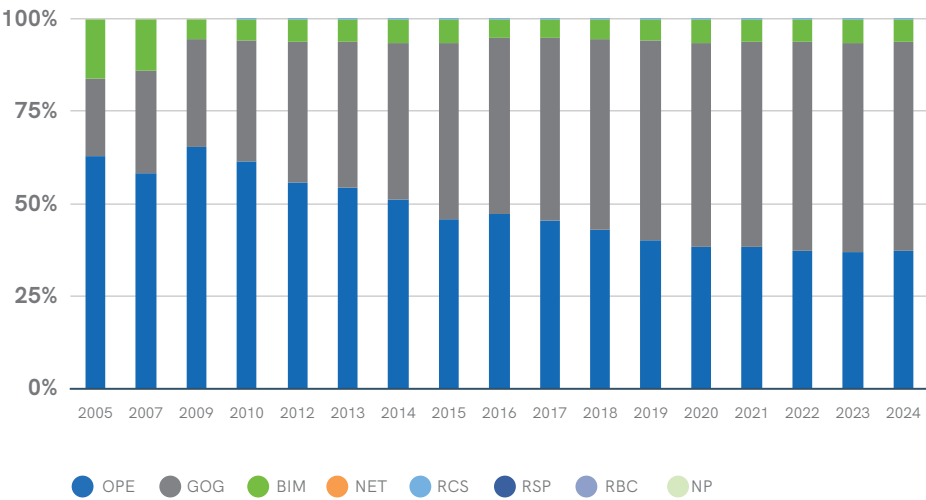


Table 2: World Price Formation 2005 to 2024 – Total Imports

WORLD	TOTAL IMPORTS			
	OPE	GOG	BIM	TOT
2005	498.1	165.9	128.6	792.7
2007	495.2	236.0	118.2	849.5
2009	532.3	237.4	44.7	814.4
2010	562.1	299.6	52.5	914.4
2012	526.6	357.6	58.3	942.7
2013	519.1	374.7	60.1	954.1
2014	464.3	386.1	59.2	910.0
2015	431.8	450.8	60.2	943.2
2016	469.8	472.9	51.3	994.1
2017	478.1	521.8	53.5	1053.6
2018	461.7	553.8	59.0	1075.0
2019	440.4	592.1	62.9	1095.8
2020	418.2	608.0	70.5	1097.3
2021	455.4	658.1	71.8	1185.7
2022	409.5	620.3	69.4	1099.7
2023	394.6	608.3	69.8	1073.1
2024	417.6	631.3	70.9	1120.3

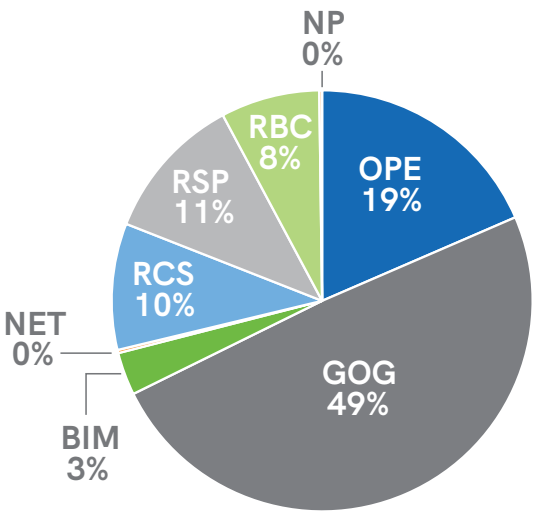
12. Apart from the very small RCS on the Nigeria to Ghana pipeline since 2010

4.6 TOTAL CONSUMPTION

4.6.1: 2024 Survey Results – Total Consumption

Total consumption in 2024 was some 4,233 bcm.

Figure 20: World Price Formation 2024 – Total Consumption



GOG has the largest share at 49%, totalling 2,083 bcm, dominated by North America at 1,142 bcm, followed by Europe at some 381 bcm, the Former Soviet Union at 251 bcm, and Asia Pacific and Asia at 121 and 92 bcm respectively. GOG can now be found in 70 markets, in one form or another, and in all regions.

The OPE share at 18.5%, totals 783 bcm and is predominantly Asia (409 bcm), Asia Pacific (283 bcm) and Europe (85 bcm). OPE is found in 42 markets, now less than half the countries in Europe (and mostly at very small percentages), and in all regions except North America.

The regulated categories – RCS, RSP and RBC – account in total for some 28.5%, around 1,208 bcm:

- RCS totals some 410 bcm and is in 16 countries, mainly the Former Soviet Union (Russia and Azerbaijan) and Asia (China and Bangladesh), followed by Africa (Egypt and Nigeria), Latin America (Argentina and Chile) and the Middle East (Iran);
- RSP totals some 475 bcm and is in 18 countries, with the Middle East dominating – Iran, Saudi Arabia, UAE and Oman – followed by the Former Soviet Union – Russia – and Latin America – Argentina, Bolivia and Peru with some in Asia Pacific – Indonesia;
- RBC totals some 322 bcm and is in 13 countries, mainly the Former Soviet Union – Kazakhstan, Turkmenistan and Uzbekistan, Africa – Egypt and Algeria – the Middle East (Iran and Iraq) and Latin America – Venezuela.

The BIM share at 3% totals some 139 bcm and is in 23 countries, predominantly Middle East – Qatar, UAE, Israel and Iraq, and the Former Soviet Union – in countries importing from Russia.

The NET share at less than 0.5% totals some 10 bcm in just a single country – Trinidad.

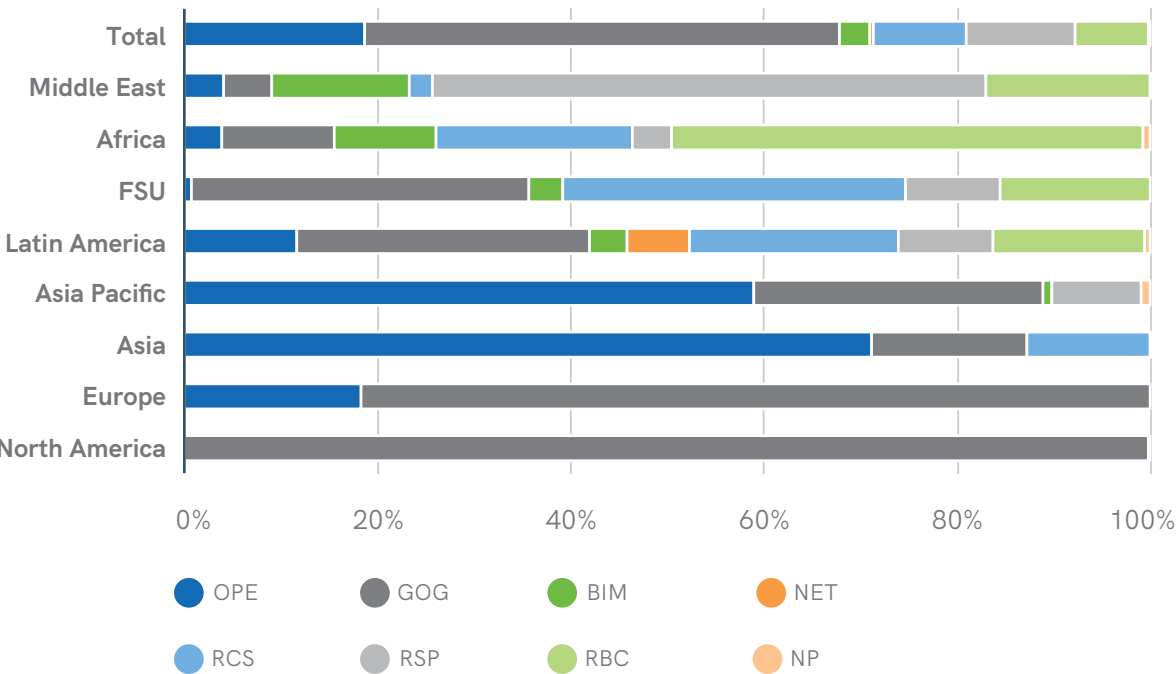
The NP share at less than 0.5% totals some 9 bcm in 7 countries, largely Mexico and Brunei, where it is used in the energy industry in refining processes or enhanced oil recovery.

The table shows the regional and category breakdown for total world consumption and figure 21 the regional breakdown.

Table 3: World Price Formation 2024 – Total Consumption

REGION	TOTAL CONSUMPTION							
	OPE	GOG	BIM	NET	RCS	RSP	RBC	NP
North America	0.0	1142.1	0.0	0.0	0.0	0.0	0.0	3.1
Europe	84.7	380.8	0.0	0.0	0.0	0.0	0.0	0.0
Asia	408.7	91.9	0.0	0.0	73.6	0.2	0.0	0.0
Asia Pacific	237.7	120.7	3.8	0.0	0.1	37.4	0.0	3.7
Latin America	18.0	47.0	6.0	10.3	33.4	15.1	24.4	1.0
FSU	4.4	250.6	25.2	0.0	255.1	70.3	112.2	0.0
Africa	6.4	19.5	17.9	0.0	34.2	7.0	82.1	1.3
Middle East	23.5	30.1	86.5	0.0	14.5	345.2	103.2	0.0
TOTAL	783.4	2,082.6	139.4	10.3	410.9	475.2	321.8	9.1

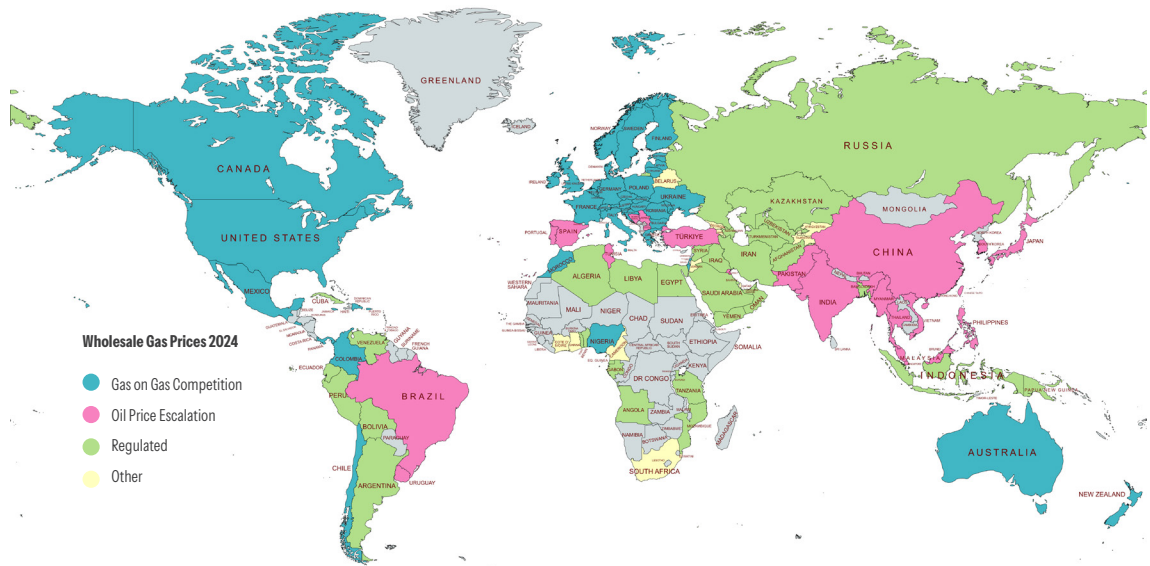
Figure 21: Regional Price Formation 2024 – Total Consumption



GOG DOMINATES IN NORTH AMERICA, EUROPE AND OCEANIA, WHILE OPE REMAINS PREVALENT IN ASIAN MARKETS

The map below shows the main price formation mechanism by market. For each market the highest share is used to categorise the dominant price formation mechanism for that market. OPE and GOG are self-explanatory, regulated covers the 3 categories RCS, RSP and RBC, while Other is predominantly BIM the bilateral monopoly category.

Figure 22: Wholesale Price Formation Mechanisms Map

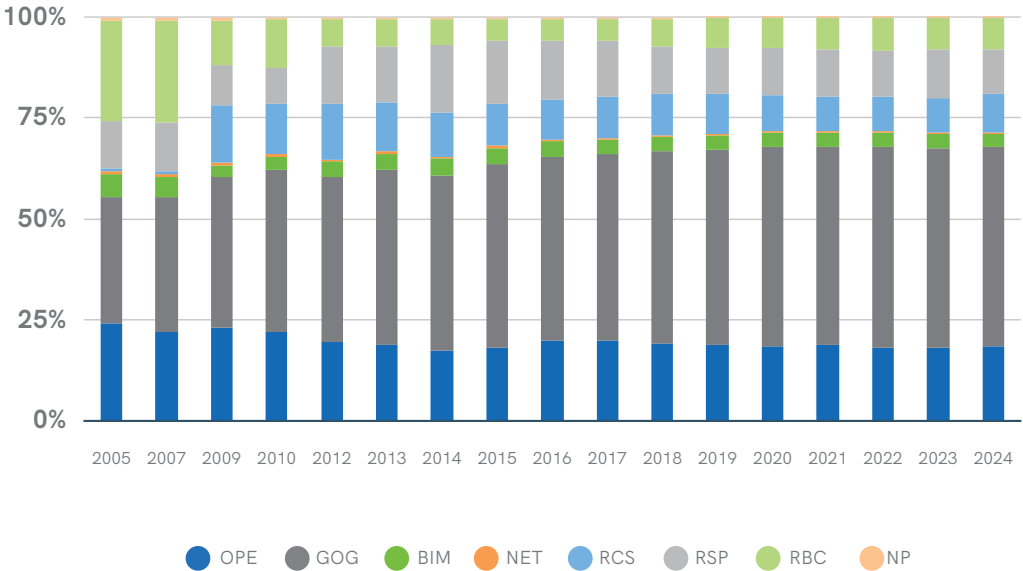


Europe is now almost all GOG, although there are remaining pockets of OPE in Iberia, Turkey and the Balkans. 82% of Europe is now GOG, almost all domestic production is, and 80% of pipeline imports and 78% of LNG imports are GOG. OPE is still the largest category in most Asian countries, even those such as Malaysia, Vietnam and the Philippines, where it is mostly domestic production. India now has more OPE than GOG, following the change in the price mechanism for most of domestic production in 2023. There is a large area of the world covering the Former Soviet Union, the Middle East and North Africa where prices remain largely regulated.

4.6.2: 2005 to 2024 Comparisons – Total Consumption

The figure below shows the changes in the price formation mechanisms over the seventeen surveys from 2005 to 2024.

Figure 23: World Price Formation 2005 to 2024 – Total Consumption



The changes between each survey can be summarised as follows:

- Between 2005 and 2007, GOG increased its share by some 2 percentage points and OPE decreased by 2 percentage points reflecting faster growth in consumption in North America than most other regions, a switch from OPE to GOG in Europe, and to a lesser extent in Asia Pacific and Asia, and a very small move from regulated pricing to GOG in Russia and Latin America. RSP also increased its share by half a percentage point reflecting more rapid growth in consumption in the RSP countries;
- Between 2007 and 2009, GOG increased its share by a further 4 percentage points, at a time when total world consumption showed little change, mainly because of the change in Russia from RBC to GOG but also because of the continuing switch from OPE to GOG in Europe. OPE actually gained 1 percentage point with the loss in share in Europe being more than offset by a switch from BIM, which lost 2 percentage points overall, to OPE in intra-FSU trade. The other major change was the decline of 14 percentage points in RBC and a similar gain in RCS, mainly in Russia, but RCS also gained at the expenses of RSP, which lost almost 2 percentage points, as China’s domestic production changed categories as prices increased as a consequence of regulatory change.
- Between 2009 and 2010, GOG increased its share by another 3 percentage points, with the continuing switch from OPE to GOG in Europe and further move in Russia away from RCS to GOG. OPE declined by just under one percentage point with losses in share in Europe being partly offset by gains in shares in Asia, as China began importing pipeline gas and more LNG under contract, and Asia Pacific on the back of rapid growth in demand in Korea, Chinese Taipei and Thailand.
- Between 2010 and 2012, GOG increased its share by almost one percentage point, rising to 41%, with the continuing increase in share in Europe away from OPE, and more spot LNG imports in Asia and Asia Pacific, being partly offset by a decline in share in Russia. OPE declined by 2.5 percentage points, based on the switch to GOG in Europe (and to BIM in Turkey, as a contract changed) coupled with declining European demand, only partly offset by a rising share in pipeline imports in China. RCS increased its share by 1 percentage point, principally in Russia but also as demand grew sharply in China. RSP increased its share by 5 percentage points, principally due to the change in pricing in Iran and rising demand in Saudi Arabia. RBC declined by a similar amount, reflecting the Iran pricing change.
- Between 2012 and 2013, GOG increased its share by over 2 percentage points, gaining from OPE as pricing mechanisms continued to switch in Europe, and from RCS in Russia as the independent producers recovered market share. OPE declined by another one percentage point reflecting the changes in Europe, partly offset by a small gain in the LNG import segment with spot LNG trade declining, and in China with the new pricing regime in two provinces. RCS declined by 1.5 percentage points, largely reflecting the change in Russia towards GOG and in China to OPE. The BIM category regained almost half a percentage point in share reflecting domestic production growth in Qatar.
- Between 2013 and 2014, the GOG share declined marginally as the continued switch away from OPE in Europe and more rapid consumption growth in North America was offset by a decline in the share of GOG in Russia towards regulated pricing, and fewer spot LNG cargoes. OPE was down just under 1 percentage point reflecting the changes in Europe, partly offset by an increase in China. RCS was down by 1 percentage point largely as a result of the switch to RSP in Russia and the RSP category was up by 2.5 percentage points, reflecting the Russia switch but also a change in Nigeria as well, away from RBC, coupled with more rapid consumption growth in RSP countries. RBC was unchanged, with the decline in Nigeria, being offset by rising consumption on Kazakhstan, Turkmenistan and Uzbekistan.
- Between 2014 and 2015, the GOG share increased by over 2 percentage points reflecting rising gas consumption in North America and Europe, together with the continuing move away from OPE in Europe, the change in pricing in India and more spot LNG, partly offset by a decline in Australia as OPE netback contracts began to be introduced, and the switch in Ukraine to imports of hub-priced gas from Europe. OPE’s share increased by just over half a percentage point, with the decline in Europe and lower share of LNG imports being more than offset by the change in the domestic pricing mechanism in China. The RCS share declined by one percentage point reflecting the changes in China, partly offset by moves to RCS in Egypt and Nigeria. RSP was down by one percentage point, principally reflecting the changes in pricing in India and Nigeria. RBC was lower by almost 1 percentage point, reflecting moves away in Bangladesh and partially in Egypt.

Table 4: World Price Formation 2005 to 2024 – Total Consumption

WORLD	TOTAL CONSUMPTION								
	OPE	GOG	BIM	NET	RCS	RSP	RBC	NP	TOT
2005	688.8	897.0	169.3	16.6	22.8	330.8	718.9	22.9	2867.2
2007	671.2	1017.4	160.1	18.9	22.3	368.3	775.5	21.5	3055.2
2009	697.9	1143.4	94.6	18.9	431.5	304.9	345.9	21.5	3058.7
2010	728.8	1342.5	103.7	22.5	419.0	293.7	394.6	22.2	3327.0
2012	665.2	1419.0	125.0	23.9	476.7	481.3	234.1	20.9	3446.1
2013	648.5	1517.0	144.1	20.0	419.4	493.6	230.3	20.7	3493.4
2014	609.2	1510.5	146.4	19.4	385.8	585.0	214.1	21.8	3492.2
2015	637.2	1609.9	149.5	18.8	361.1	553.4	192.7	20.5	3543.1
2016	718.2	1653.7	142.3	17.1	356.3	540.1	190.7	17.5	3636.0
2017	734.4	1737.2	129.4	13.0	385.1	517.8	210.5	14.5	3742.0
2018	748.2	1867.9	136.8	13.5	406.6	464.5	263.9	14.3	3915.6
2019	741.5	1941.7	139.3	13.8	402.5	450.3	297.4	8.8	3995.3
2020	726.4	1948.4	142.5	11.9	349.9	469.5	292.5	9.4	3950.5
2021	782.8	2044.9	145.6	12.5	349.9	494.0	322.2	9.4	4161.3
2022	732.4	2058.6	143.4	12.2	343.9	478.5	327.3	9.2	4105.6
2023	748.4	2030.7	142.0	12.5	353.5	500.5	320.3	9.4	4117.3
2024	783.4	2082.6	139.4	10.3	410.9	475.2	321.8	9.1	4232.7

2005	24.0%	31.3%	5.9%	0.6%	0.8%	11.5%	25.1%	0.8%	100.0%
2007	22.0%	33.3%	5.2%	0.6%	0.7%	12.1%	25.4%	0.7%	100.0%
2009	22.8%	37.4%	3.1%	0.6%	14.1%	10.0%	11.3%	0.7%	100.0%
2010	21.9%	40.4%	3.1%	0.7%	12.6%	8.8%	11.9%	0.7%	100.0%
2012	19.3%	41.2%	3.6%	0.7%	13.8%	14.0%	6.8%	0.6%	100.0%
2013	18.6%	43.4%	4.1%	0.6%	12.0%	14.1%	6.6%	0.6%	100.0%
2014	17.4%	43.3%	4.2%	0.6%	11.0%	16.8%	6.1%	0.6%	100.0%
2015	18.0%	45.4%	4.2%	0.5%	10.2%	15.6%	5.4%	0.6%	100.0%
2016	19.8%	45.5%	3.9%	0.5%	9.8%	14.9%	5.2%	0.5%	100.0%
2017	19.6%	46.4%	3.5%	0.3%	10.3%	13.8%	5.6%	0.4%	100.0%
2018	19.1%	47.7%	3.5%	0.3%	10.4%	11.9%	6.7%	0.4%	100.0%
2019	18.6%	48.6%	3.5%	0.3%	10.1%	11.3%	7.4%	0.2%	100.0%
2020	18.4%	49.3%	3.6%	0.3%	8.9%	11.9%	7.4%	0.2%	100.0%
2021	18.8%	49.1%	3.5%	0.3%	8.4%	11.9%	7.7%	0.2%	100.0%
2022	17.8%	50.1%	3.5%	0.3%	8.4%	11.7%	8.0%	0.2%	100.0%
2023	18.2%	49.3%	3.4%	0.3%	8.6%	12.2%	7.8%	0.2%	100.0%
2024	18.5%	49.2%	3.3%	0.2%	9.7%	11.2%	7.6%	0.2%	100.0%

- Between 2015 and 2016, the GOG share rose by marginally, with an increase in the share in Europe and the Former Soviet Union, together with growing consumption in North America, being partly offset by declines in Asia and Asia Pacific, reflecting fewer pure spot LNG cargoes. The OPE share increased by just under 2 percentage points, reflecting a small rise in Europe at the expense of BIM (in Turkey), but principally in Asia and Asia Pacific, as the share in LNG imports increased, but also reflecting a rise in domestic production in China, as the full year effect of the change in city-gate pricing came through, and changed domestic production pricing in Kuwait. The RCS share declined by half a percentage point, principally reflecting the changes in China, partly offset by a rise in Iran in gas as a feedstock to petrochemicals, and faster consumption growth in some countries with RCS pricing. The RSP share was down by just under one percentage point as

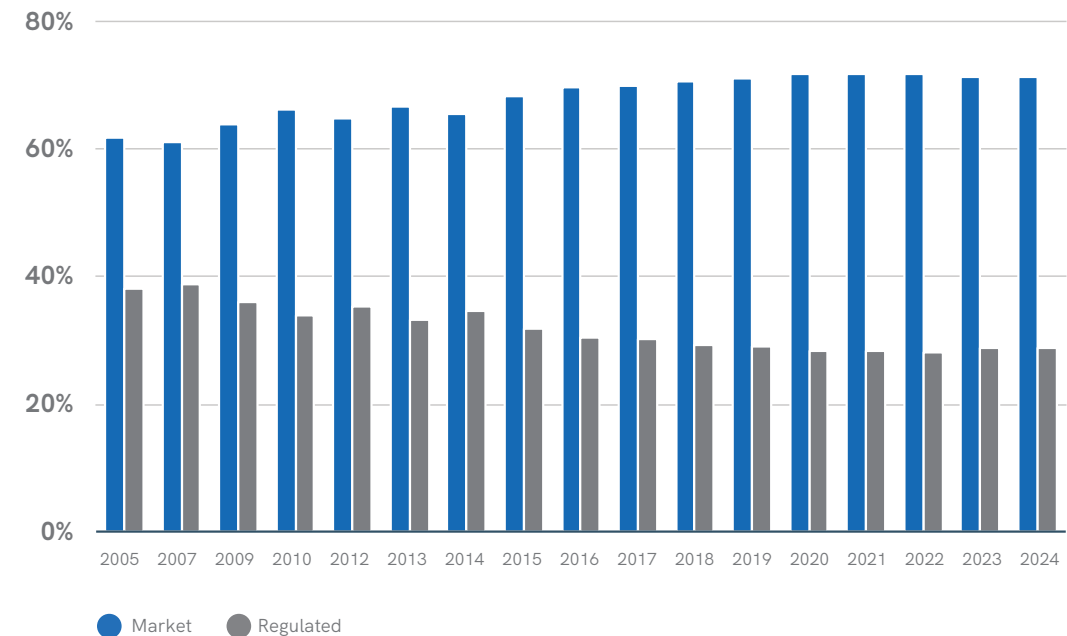
a result of declines in the Middle East – Iran and Kuwait – and the FSU, principally in Russia with switching to GOG and RCS. The RBC share was down very slightly on slower consumption growth.

- Between 2016 and 2017, the GOG share increased by 1 percentage point as a result of a continuing rise in Europe, at the expense of OPE, the rise in Asia as China introduced market pricing for direct sales from upstream producers to large users, the general recovery in spot LNG cargoes. The OPE share was almost unchanged, with the losses to GOG being partly offset by an increase in Asia Pacific, mainly in Malaysia and Indonesia. The BIM share was down almost half a percentage point reflecting the switch in Indonesia to OPE. The RCS share increased by over half a percentage point, largely as a result of the change in Malaysia away from RSP, which was down almost one percentage point. RBC was broadly unchanged.
- Between 2017 and 2018, the GOG share rose by one percentage point largely reflecting the increasing share of spot LNG cargoes in LNG imports and rapidly growing US consumption, more than offsetting the declining share in pipeline imports, as a result of reduced European pipeline imports and increased China pipeline imports. OPE share declined by half a percentage point, with the loss in LNG imports being partly offset by gains in pipeline imports and domestic production in China. RCS was largely unchanged but RSP declined by a quarter of a percentage point, reflecting slower consumption growth in countries with RSP and a switch away in Argentina to RCS. In turn RCS lost share in China to OPE.
- Between 2018 and 2019, the GOG share rose by one percentage point, at the expense of OPE, largely as a result of rising GOG in LNG imports – both traded markets and spot LNG cargoes – and a more rapid decline in OPE pipeline imports in Europe. RCS was down by half a percentage point, while RSP declined by a quarter of a percentage point, a decline in Russia and Ukraine. RBC rose marginally as Turkmenistan eliminated free gas but still maintained subsidies.
- Between 2019 and 2020, the GOG share rose by another one percentage point, largely driven by rising spot LNG imports, at the expense of OPE, together with rising shares in domestic production in Russia and Israel. OPE gained slightly in domestic production in China and Malaysia. RCS declined by one percentage point reflecting the changes in Malaysia. RSP gained slightly in Indonesia.
- Between 2020 and 2021, the GOG share was down marginally with a rising share in LNG (traded markets and hub-indexed contracts) and a decline in pipeline imports, largely reflecting rapid demand growth in Turkey and a switch more pipe imports into Spain, with lower LNG imports, plus more pipeline gas into China from Central Asia and Russia. As a consequence, the OPE share rose slightly. The RSP share also rose reflecting increasing demand growth in Indonesia and the Middle East.
- In the dramatically changed global market of 2022, the GOG share rose again by 1.5 percentage points, mostly at the expense of the OPE share, rising to over 50% of global gas consumption for the first time. There was a significant rise in the GOG share in Europe as spot LNG imports increased sharply and as some of Turkey’s contracted pipeline imports from Russia switched to hub pricing away from oil indexation. In addition, the pricing of pipe imports into Tunisia changed to GOG from OPE. Spot LNG imports also rose in South Korea and Chinese Taipei, and rising consumption in Russia added to GOG. Taken together, these more than offset the decline in GOG in Asia as China and Pakistan reduced spot LNG imports. The OPE share at 17.5% is now back equal to its lowest ever level previously reached in 2014, although the OPE volume increased by 100 bcm.
- The gas market in 2023 eased a little and the GOG share fell back slightly (by 0.5%) to just below 50%. This largely reflected the impact at the global level of a continued decline in gas demand in Europe (which is predominantly GOG) and the change in India domestic pricing to using oil price linkage from 2023 Q2 away from linkages to hubs in North America and Europe. The rise in spot LNG imports into Europe and China offset some of this fall. As a consequence of the change in India, the OPE share recovered slightly from its historic low in 2022.
- In 2024, gas demand rose principally in Asia, Asia Pacific and the FSU, but not in North America and Europe, where GOG is more dominant, so the GOG share remained unchanged, although the volume rose slightly. The OPE share rose slightly on more OPE pipeline imports in Europe and China and the RCS share on increasing China demand.

Overall, over the 2005 to 2024 period, OPE has declined by 5.5 percentage points, GOG has risen by 18 percentage points, BIM has declined by 2.5 percentage points, RCS has risen by 9 percentage points, RSP share is flat and RBC declined by 17.5 percentage points. In terms of absolute volumes, OPE increased by some 95 bcm, and GOG by 1,186 bcm – a 132% increase. BIM and NET were also down slightly. The regulated categories in total saw their volume increase by some 135 bcm. Global gas consumption in 2005 was some 2,867 bcm and had risen to 4,233 bcm by 2024, an increase of some 1,366 bcm, slightly more than the rise in the volume of GOG over the same period. Effectively, most of the rise in global gas consumption between 2005 and 2024, has been matched by rising GOG consumption, although that hides the fact that consumption has risen strongly in many countries with heavily regulated markets, such as in the Middle East, and there have been significant changes towards GOG in other markets, notably in Europe, and in LNG markets in Asia and Asia Pacific.

While there have been a number of significant changes over the period of the surveys between the 8 categories, as described above, the changes have been almost wholly within larger groupings of categories, until very recently. The categories of OPE, GOG, BIM and NET can be broadly described as “market” pricing, while the categories of RCS, RSP, RBC and NP can be broadly described as “regulated” pricing. The figure below compares the changes in the “market” and “regulated” categories over the fourteen surveys.

Figure 24: Market and Regulated Pricing 2005 to 2024



The total of “market” pricing rose from 62% in 2005 to 71% in 2024, mirrored by a decline in “regulated” pricing, from 38% in 2005 to 29% in 2024. Changes in percentages between surveys can arise because of actual changes in price formation mechanism or because of more rapid growth in consumption in countries with a specific type of price formation mechanism. The switch to “market” pricing is down to the following:

- The move away from regulated pricing in the Russian market to GOG as the independent producers began to compete with each other and Gazprom to sell gas to the power sector and large industrials – this was partly reversed in 2014 with more “regulated” pricing.
- A similar move in Argentina, to GOG, as the eligible market opened up, and more recently in Nigeria.
- The changes, since 2013, in China where there was initially a move to OPE in 2 provinces away from RCS which in 2014 became nationwide for incremental production over 2012 levels and then in 2015 for all sectors except residential and

fertilisers – some of this OPE in 2017 switched to GOG – and halfway through 2018 the move to OPE for residential city-gate pricing. In 2020, Malaysia moved away from RCS to OPE in its domestic pricing.

- The pricing reforms in India, which began in late 2014, moving pricing away from RSP to GOG; and
- The rise in new LNG importers, importing at OPE and/or GOG, to enhance or replace domestic production which was regulated.

4.7 ANALYSIS OF GAS-ON-GAS COMPETITION AND OIL PRICE ESCALATION

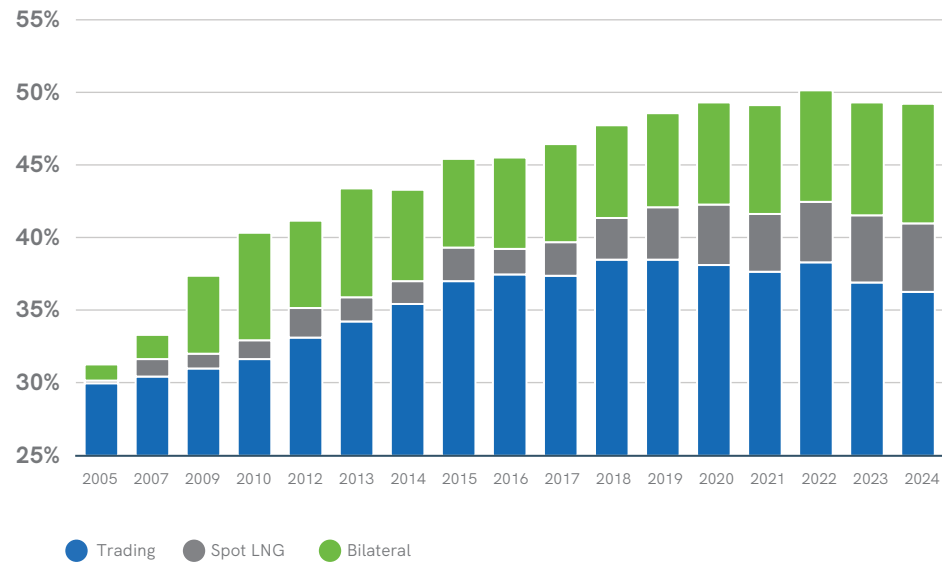
4.7.1: Gas-on-Gas Competition

The rise in GOG from 31% of total world consumption in 2005 to 49% in 2024 and in which regions, has been discussed in some detail above. It has been noted earlier that GOG is not one homogeneous category and can be considered to comprise of the following pricing mechanisms:

- Trading – what is generally thought of as GOG where the price is determined by the interplay of supply and demand and is traded over a variety of different periods (daily, monthly, annually or other periods). Trading takes place at physical hubs (e.g. Henry Hub) or notional hubs (e.g. NBP in the UK). This will also include longer term contracts into markets where there is little or no trading at hubs, but where the price is linked to hub prices in markets where there is liquid trading.
- Bilateral – there is no trading market or hub but there are multiple buyers and sellers – distinguishing this from BIM – providing the competitive element. This is largely in parts of Australia, Russia, Argentina and now China. In many of these markets, the GOG pricing will be influenced by significant regulated segments.
- Spot LNG – spot LNG cargoes where the price of the cargoes reflects the current supply-demand situation.

The figure below breaks down the GOG percentages over the seventeen surveys into these 3 categories. The Trading category is by far the largest – dominated by North America and increasingly Europe – and has increased from 30% of total world consumption in 2005 to 36% in 2024 – a rise of 6 percentage points. The Bilateral category has risen from 1% to 8% – a rise of 7 percentage points, while the Spot LNG category has risen from 0.2% to 4.7% – a rise of 4.5 percentage points. The total rise in GOG between 2005 and 2024 has been 18 percentage points.

Figure 25 Changes in GOG in Total Consumption by Type 2005 to 2024¹³

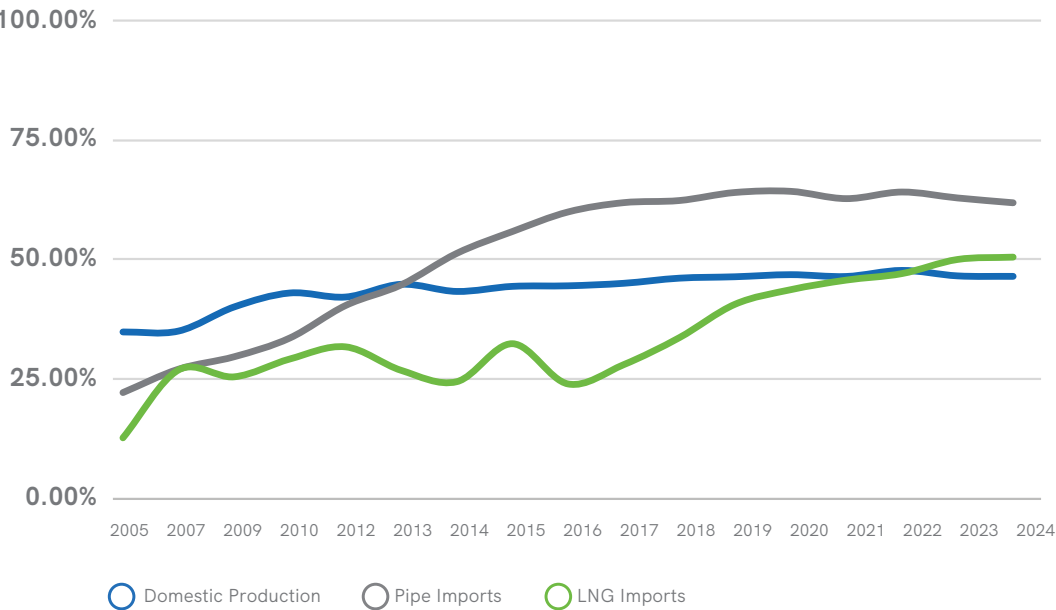


13. In order to emphasise changes the vertical axis starts at 25%

THE RISE IN GOG WAS LARGELY IN PIPELINE IMPORTS IN EUROPE THROUGH 2016 AND, SINCE THEN IN LNG IMPORTS

In terms of the three different categories of consumption – domestic production, pipeline imports and LNG imports, the figure below shows the changes in GOG over the seventeen surveys.

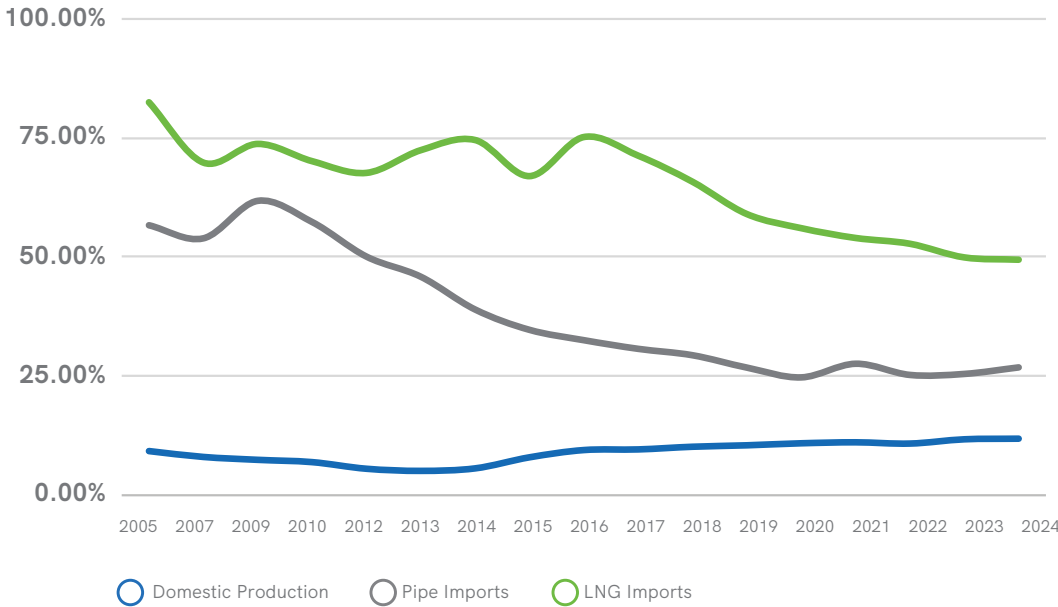
Figure 26: Changes in GOG by Consumption Category 2005 to 2024



Apart from the rise in domestic production share between 2007 and 2010, as a result of the changes in Russia and, to a lesser extent, in Europe, the share of GOG has been relatively stable, until the slight fall in 2023 reflecting the pricing change in India. Similarly, the share in LNG imports did not change much between 2007 and 2016, fluctuating largely in response to changes in spot LNG cargoes, until we saw the sharp increases in the last seven years. The big rise has been in pipeline imports, almost all in Europe, although that has levelled off since 2017, and even fell back a little in 2023, with the rise in LNG imports since 2017 driving the overall rise in GOG.

The similar chart for changes in OPE, is the mirror image of the GOG chart for LNG imports, and for pipeline imports. For domestic production, the share declined continuously from 2005 to 2013, principally down to the changes in Europe, before recovering by some 3.5 percentage points through to 2016, principally reflecting the pricing changes in China and, to a lesser extent in Australia and Vietnam. The domestic production OPE share rose slightly in 2023, reflecting the change in India. OPE pipeline imports picked up in 2021, reflecting the rapid demand growth in Turkey and Spain and increased pipe imports into China from Central Asia and Russia, but fell back again in 2022, as Turkey switched away from OPE in its Russian gas contracts. There was a slight pick-up in the OPE share in 2024 as China imported more Russian pipeline gas and Europe's pipe imports from Algeria to Spain and Italy rose and Turkey's imports from Russia rose as well.

Figure 27: Changes in OPE by Consumption Category 2005 to 2024



4.7.3: Where are the main OPE areas?

CHINA HAS THE LARGEST VOLUME OF OPE IN ALL CATEGORIES – DOMESTIC PRODUCTION, PIPELINE IMPORTS AND LNG IMPORTS

As noted earlier, the share of OPE had fallen to 18.5% of total world consumption in 2024, from 24% in 2005. In volume terms, however, there was an increase to 783 bcm from 689 bcm in 2005. Total world consumption grew by 48% over the same period – some 1,365 bcm.

Out of the 783 bcm in 2024, some 366 bcm was domestic production, 160 bcm was pipeline imports and 257 bcm LNG imports. Domestic production has grown in volume terms since 2005, but the share in 2024 was only 2.5 percentage points above the share in 2005 – see figure 27 above. Pipeline imports had fallen sharply in volume terms, as a result of the shift away from OPE in Europe, while LNG imports grew in volume terms, with the share declining as already discussed.

46% of OPE in 2024 was in domestic production, and, as shown in the figure below, of this 47% is in China and predominantly in the Asia and Asia Pacific regions. The categorisation, in some countries, as OPE is not necessarily as clear as the familiar oil indexation in both pipeline imports and LNG imports, and there is often an overlay of regulation involved. China is a good example of this, where city-gate prices from domestic production have been very broadly linked to liquid fuels prices for a number of years, but the decision to change these prices has been overseen by the state. If China continues with pricing reforms, then this element of domestic production could change to a different category – possibly GOG – but again this would be a very different GOG from that seen in the North American and European trading markets¹⁴.

14. Compared to Russia where the large GOG category is very different from European GOG.

Figure 28: OPE Domestic Production

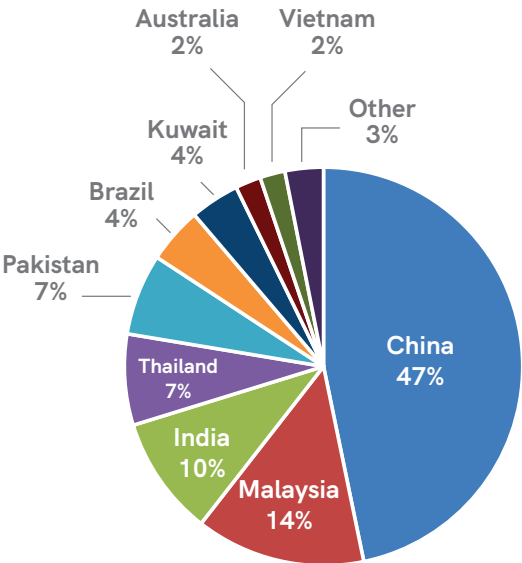
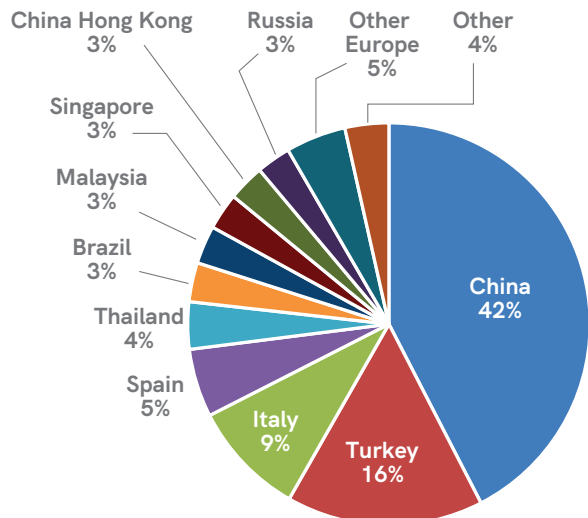


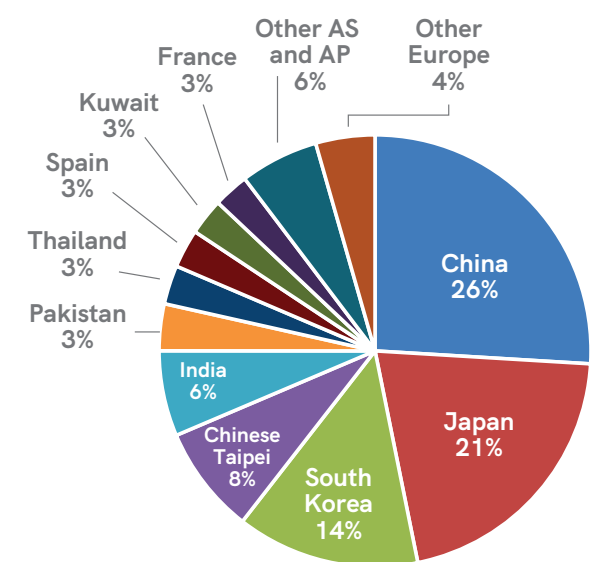
Figure 29: OPE Pipeline Imports



Pipeline imports are the more traditional type of oil indexation, seen initially in Europe but now mostly replaced there by GOG. China is the largest OPE pipe importer, with imports from Central Asia, Myanmar and, since the end of 2019, from Russia. In Asia Pacific, Thailand and Singapore imports are also OPE, while in Europe, Turkey, Italy and Spain are the largest OPE importers, with smaller volumes in Germany, while Other Europe is largely Southeast Europe, including Greece, and the Baltic countries.

While the share of OPE in LNG imports has fallen significantly since 2016, as GOG has risen, to just under 50% of LNG imports. Out of the 257 bcm in 2024, some 190 bcm (75%) was in the Big 5 Asian markets – Japan, China, South Korea, Chinese Taipei and India. The rest of the Asia and Asia Pacific regions added an additional 31 bcm (or some 12%) – half from Pakistan and Thailand. Spain, France and Turkey in Europe accounted for some 20 bcm. Kuwait, Portugal, Poland, Italy and Greece also have OPE LNG imports.

Figure 30: OPE LNG Imports



SECTION 5: WHOLESALE PRICE LEVELS

5.1 Introduction

This section covers the full results and analysis on wholesale price levels at the overall World level and comprises:

- The results for the 2024 survey; and
- Comparisons across the seventeen surveys.

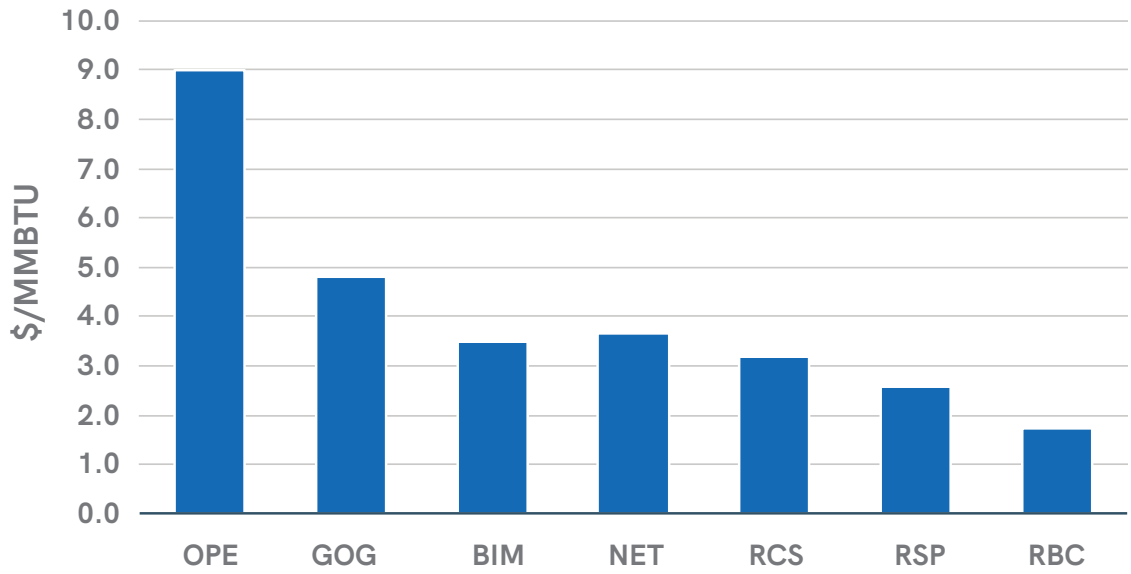
In considering wholesale price levels across regions, markets, or price formation mechanisms, it should be noted that the wholesale price can cover different points in the gas chain – wellhead price, border price, hub price, city-gate price – so the comparison of price levels is not always “like for like”. Comparisons, therefore, should be treated with utmost caution and taken only as a broad indication.

5.2 2024 SURVEY RESULTS

5.2.1: Price Levels by Price Formation Mechanism

The figure below shows a snapshot of wholesale prices for 2024 by price formation mechanism¹⁵.

Figure 31: Wholesale Prices in 2024 by Price Formation Mechanism



The highest prices in 2024 were in the OPE category at \$9.00 per MMBTU, despite the still relatively high spot prices around the world. Prices in the GOG category averaged \$4.80 per MMBTU. However, the price level in the GOG category is heavily influenced by the relatively low prices in North America and Russia. Spot prices did fall back from the very high 2022 and 2023 levels, following the start of the Russia war with Ukraine. If the lower priced markets of North America and Russia were excluded then the balance of GOG prices would be, on average, \$10.17, higher than the OPE levels.

In the regulated categories, it can be seen that the prices in the RCS category are higher than those in RSP and, in turn, RBC – which were the lowest at \$1.75 per MMBTU in 2024.

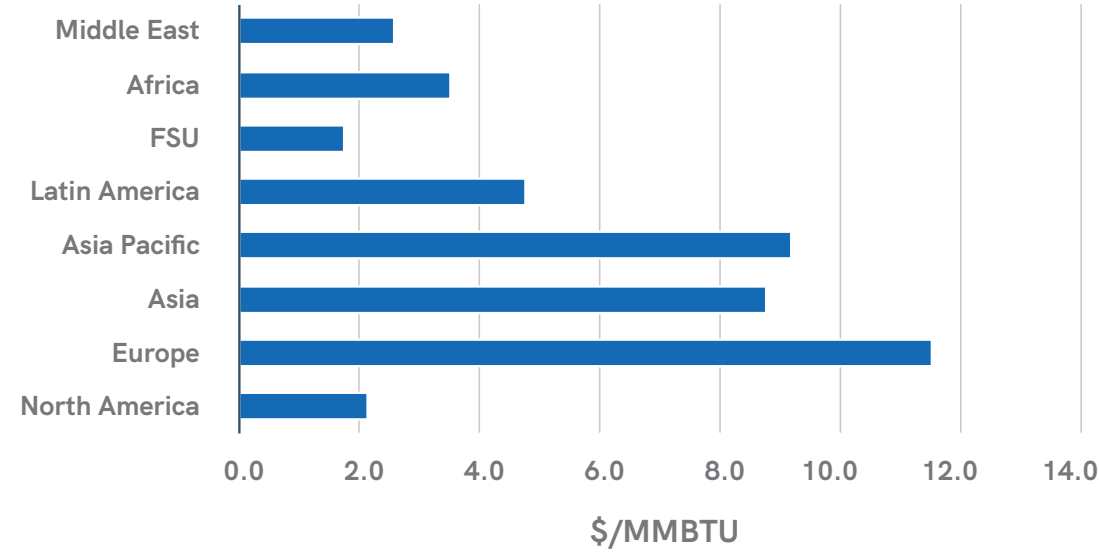
5.2.2 PRICE LEVELS BY REGION AND COUNTRY

THE HIGHEST WHOLESALE PRICES ARE IN EUROPE FOR THE 4TH CONSECUTIVE YEAR

The next figure shows a snapshot of wholesale prices for 2024 by region.

15. It should be noted that on an individual country basis no break down has been made of the price level for different price formation mechanisms within the country, so the same price level is applied to all mechanisms. This simplifying assumption is not considered to have any material influence on the conclusions.

Figure 32: Wholesale Prices in 2024 by Region



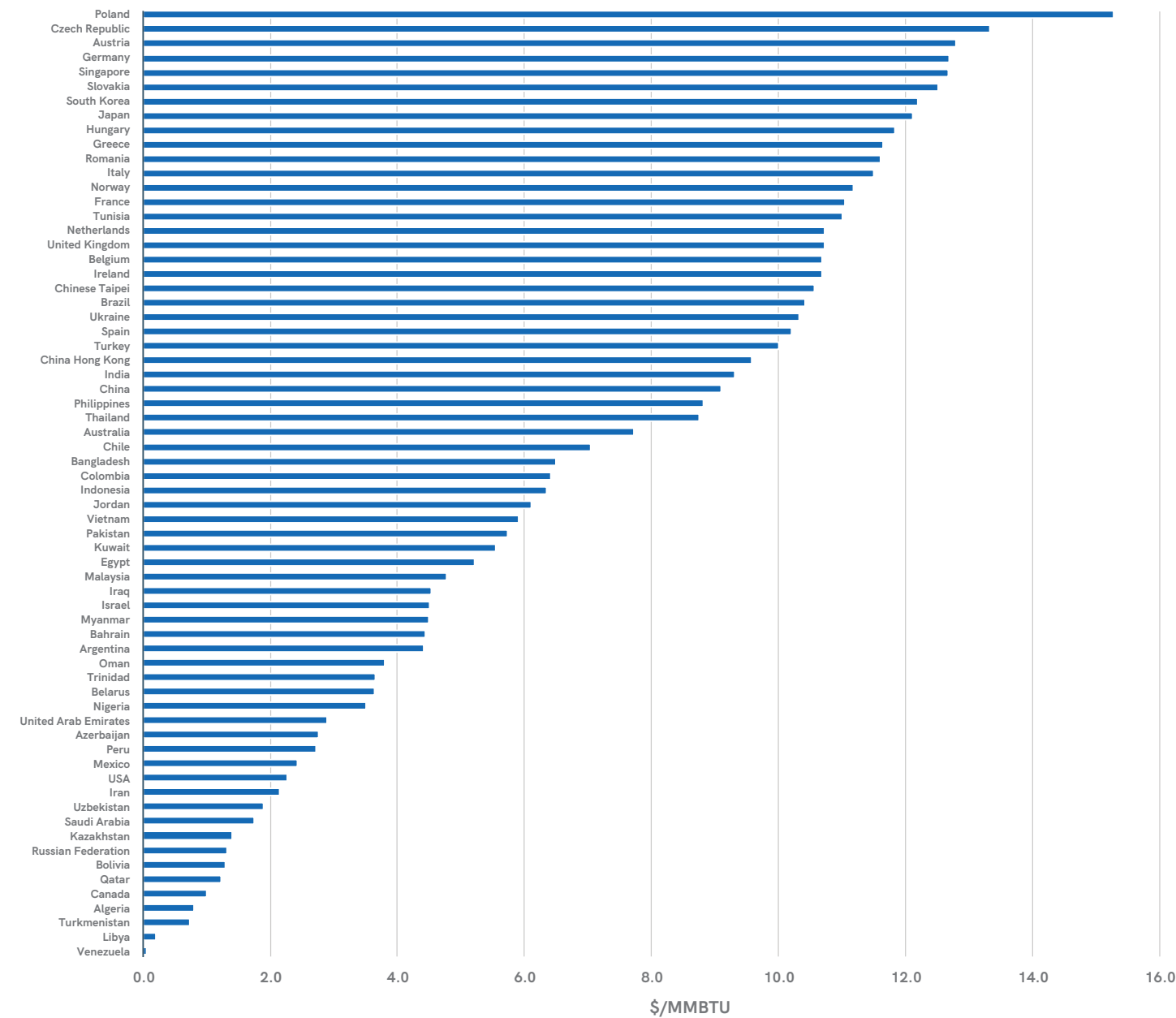
Wholesale prices can obviously vary significantly from year to year. In 2024, prices in Europe were the highest, reflecting the higher average spot prices, at \$11.52 per MMBTU. Asia Pacific had prices averaging \$9.19 and Asia had average prices at \$8.76. OPE is the primary pricing mechanism in both regions, so were much less impacted by spot prices. Prices in North America in 2024 were below the average for Latin America and even Africa and the Middle East. Prices in the Former Soviet Union, in \$ terms, were the lowest.

These conclusions are further reinforced when wholesale prices are viewed at the country level. The figure below includes all markets with consumption greater than 4 bcm in 2024. Comparisons between markets comes with the usual caveat that they may not be a like-for-like comparison, even for markets where hub prices are the measure. Are the respondents using day-ahead or month ahead prices or some blend of prices in the market.

The highest wholesale prices in 2024, as in the three previous years, were found in Europe and not the main LNG importing markets in Asia Pacific, although prices narrowed again in 2024. The top 5 highest prices were in Europe, but had dropped well below \$20 per MMBtu. Some of the key LNG importing markets – Japan, South Korea, Chinese Taipei and Singapore – are mixed in with European countries, as prices converged. Prices in Spain and Turkey were somewhat lower than other European countries, reflecting the higher share of OPE prices. Prices fell to much lower levels in the USA, below some FSU and Middle East countries. Saudi Arabia prices were raised to \$1.75 per MMBTU in 2024. Prices in Russia have continued to be well below other countries, which, a few years previously, they had been above, as a consequence of the large rouble depreciations. At the bottom of the chart are generally countries where wholesale prices were subject to some form of regulation and often below the cost of production and transportation – Turkmenistan, Algeria and Venezuela.

The figure below is a “heat” map of wholesale prices around the world, emphasising the lowest wholesale prices are found in the heavily regulated markets, but also in the resource-rich North American market. Prices above \$10 per MMBTU are generally found in Europe and the LNG dependent markets of Japan, Korea and Chinese Taipei, plus Brazil.

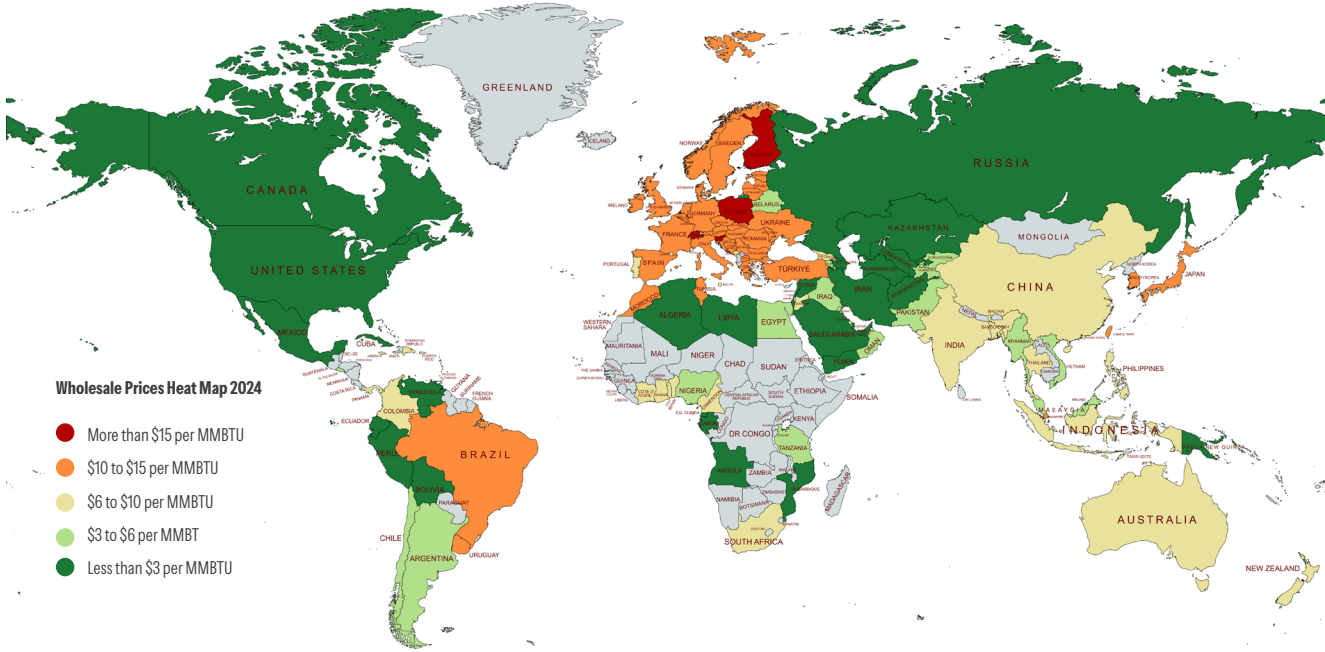
Figure 33: Wholesale Prices in 2024 by Market



The highest wholesale prices in 2024, as in the three previous years, were found in Europe and not the main LNG importing markets in Asia Pacific, although prices narrowed again in 2024. The top 5 highest prices were in Europe, but had dropped well below \$20 per MMBtu. Some of the key LNG importing markets – Japan, South Korea, Chinese Taipei and Singapore – are mixed in with European countries, as prices converged. Prices in Spain and Turkey were somewhat lower than other European countries, reflecting the higher share of OPE prices. Prices fell to much lower levels in the USA, below some FSU and Middle East countries. Saudi Arabia prices were raised to \$1.75 per MMBTU in 2024. Prices in Russia have continued to be well below other countries, which, a few years previously, they had been above, as a consequence of the large rouble depreciations. At the bottom of the chart are generally countries where wholesale prices were subject to some form of regulation and often below the cost of production and transportation – Turkmenistan, Algeria and Venezuela.

The figure below is a “heat” map of wholesale prices around the world, emphasising the lowest wholesale prices are found in the heavily regulated markets, but also in the resource-rich North American market. Prices above \$10 per MMBTU are generally found in Europe and the LNG dependent markets of Japan, Korea and Chinese Taipei, plus Brazil.

Figure 34: Wholesale Prices Heat Map 2024



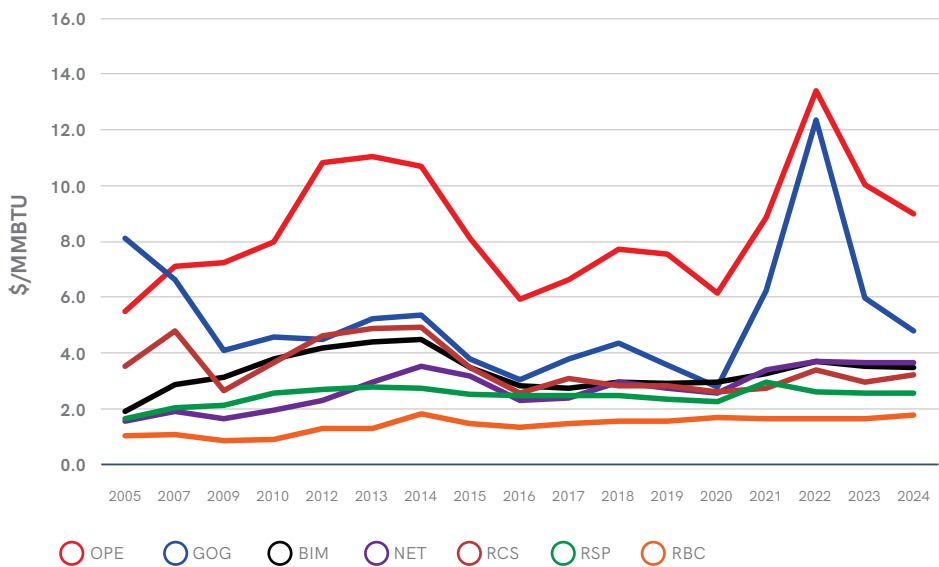
5.3 COMPARISONS 2005 TO 2024

5.3.1: Changes in Wholesale Prices by Price Formation Mechanisms

The figure below compares changes in wholesale price levels across the seventeen surveys by price formation mechanisms.

In 2005 the highest prices by price formation mechanism were for GOG at \$8.10 per MMBTU, but these declined between 2005 and 2009, before levelling off at around \$4.50, followed by small rise to the \$5.30 range in 2013 and 2014. This was followed by sharp declines in 2015 and 2016 reaching \$3.04. There was a rise in 2017 to \$3.78, with prices rising in all markets, and in 2018 to \$4.36, largely driven by rising European hub prices. GOG prices fell sharply in 2019 as spot prices collapsed to their lowest levels since 2016, followed by another – Covid-induced fall in 2020 to \$2.80 – the lowest level ever recorded. In contrast OPE prices rose significantly from \$5.47 per MMBTU in 2005 to just under \$11.00 in 2013, as oil prices increased, remaining around that level through 2014, before declining to around \$8.00 in 2015 and \$6.00 in 2016, following the oil price fall. OPE prices also rose back in 2017 to \$6.58, as oil prices recovered, and to \$7.59 in 2018, before declining slightly in 2019

Figure 35: Wholesale Price Levels 2005 to 2024 by Price Formation Mechanism



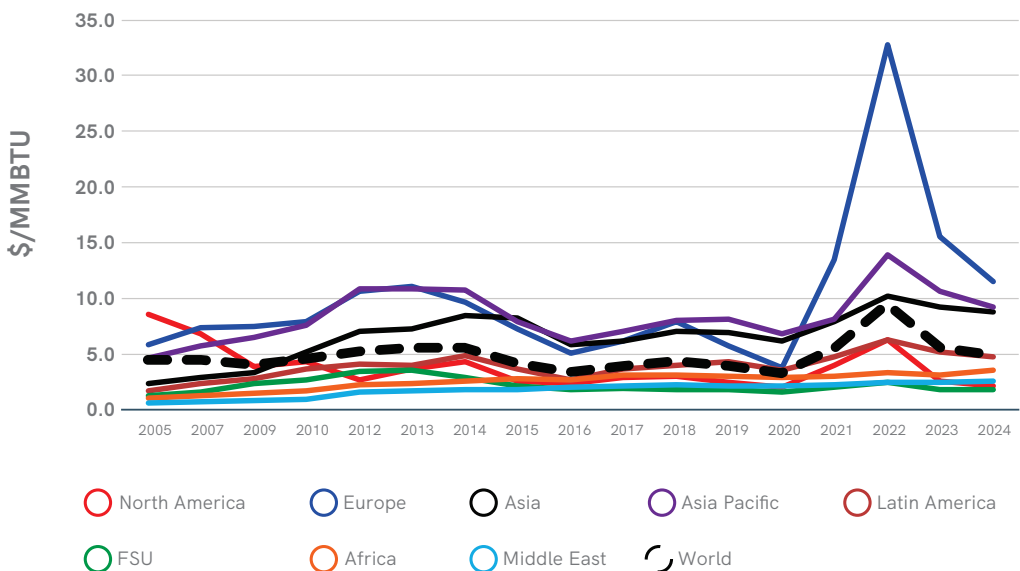
5.3.2: Changes in Wholesale Prices by Region

AVERAGE GLOBAL WHOLESALE GAS PRICES FELL TO \$4.88 PER MMBTU IN 2024 AGAINST A PEAK OF \$9.45 IN 2022

The figure below compares changes in wholesale price levels across the seventeen surveys by region.

At the world level, on average, wholesale prices have risen between 2005 and 2013 from around \$4.47 per MMBTU to \$5.57. This rise was across all regions apart from North America, where the dramatic increase in shale gas supply has led to a sharp drop in prices – with a small rebound in 2013. The rise in prices in Europe and Asia Pacific has been well documented and studied, but prices have also risen in Asia, largely due to increases in prices in China, both as more gas was imported and regulated domestic prices increased, and in India for similar reasons.

Figure 36: Wholesale Price Levels 2005 to 2024 by Region



In 2014, though, prices in Europe began to decline as the market weakened and, in the FSU especially, as the Rouble depreciated. This accelerated in 2015, and prices also fell back in North America and Asia Pacific on the back of weak demand, abundant supply and the impact of the sharp fall in oil prices. However, some regions did not see the sharp 2014 and 2015 fall in prices. These were Asia, as pricing reforms and inertia increased and kept prices up in China and India, the Middle East – as regulated prices were increased in Bahrain, Oman and Iran, with other prices staying stable – and Africa – where prices increased in Egypt, Nigeria and Algeria.

In 2016, prices declined further in all regions apart from Africa and the Middle East, with average world wholesale price falling to \$3.35 per MMBTU, the lowest level in all surveys, up until then.

In 2017, prices generally rose again in all regions as the global supply – demand situation tightened and oil prices rose. Price also increased, however, in the more regulated regions of the Former Soviet Union, Africa and the Middle East.

In 2018, prices increased in all regions, except for the Former Soviet Union, where Russian prices fell in \$ terms. The average world wholesale price in 2018 was \$4.38 per MMBTU – the highest average price since 2014.

These rises were reversed in 2019, the average price falling to \$3.88 per MMBTU, as global supply raced ahead. Prices across the world declined again in 2020, with the average price reaching its lowest ever level at \$3.24. Since 2015, prices in Asia, Asia Pacific and Europe broadly tracked each other, but this link was broken in 2019 as spot prices collapsed which impacted the European market much more than Asia and Asia Pacific where prices barely changed from 2018 levels. These differences widened further in 2020 as spot prices collapsed again. European prices are now much closer to the World average than they have ever been, breaking decisively from Asia and Asia Pacific prices.

2021 saw a very sharp increase in average European prices to some \$13.38 per MMBTU from \$3.75 in 2020. This took European prices above Asia Pacific prices for the first time since 2013. Average world wholesale prices rose to \$5.54 per MMBTU from \$3.24 in 2020, just below the highest ever global average of \$5.58 in 2013. Prices in North America still remained relatively low but doubled in 2021, reaching their highest level since 2014.

2022 saw prices rise sharply again and, with Europe prices over \$30 per MMBTU, this dragged up the average World price to \$9.48 per MMBTU – its highest price ever. The highest prices ever were also recorded in all other regions apart from North America and the Former Soviet Union.

In 2023, prices eased back in Europe, Asia Pacific and Asia, with North America also declining sharply. The average World price, while down to \$5.70 per MMBTU, was still the second highest average price recorded by the surveys since 2005.

2024 saw a further easing of prices with the World average coming down to \$4.88 per MMBTU, as a result of lower prices in Europe and Asia Pacific, principally reflecting lower spot and hub prices. The World average in 2024 was around half the World level in 2022.

5.4 IMPACT OF PANDEMIC AND GEOPOLITICAL CONFLICT ON GAS PRICES

COVID19 AND THE RUSSIAN INVASION OF UKRAINE HAVE RESULTED IN UNPRECEDENTED PRICE VOLATILITY

This sub-section focuses on the impact of the pandemic in 2020 and then the Russian invasion of Ukraine in 2022, on spot or hub prices. While the focus is on these events, as a starting point it is useful to go a little further back, to 2016 when US LNG began to enter the market. The period under discussion can be split into two period – 2016 to mid-2021, covering the advent of US LNG, the Covid19 period and the initial recovery from Covid, and from mid-2021 to date, encompassing the Russian invasion of Ukraine and the rebalancing of the global gas market.

5.4.1: 2016 to mid-2021

In 2016 spot prices in Europe and Asia had come down from the 2013 to 2015 levels. While gas demand was rising, there was increasing LNG supply from Australia and the start-up of new US LNG, plus more availability of LNG from Algeria. In addition, Europe was able to make use of increasing pipeline supply from Russia and Algeria, further easing the market. TTF prices averaged around \$4.50/MMBTU in 2016 and Japan spot at \$5.75 was lower than the previous lows in 2009.

While demand continued to grow through 2017 and 2018, LNG supply was increasing rapidly from the US, Australia and then the start-up of Yamal LNG in 2018. In 2018, however, there was a relatively cold winter and Europe drew down heavily on its storage stocks. Gas in storage in Europe declined by some 73 bcm between November 1 2017 and March 31 2018 – the largest ever withdrawal. This led to a need to refill a similar amount by the end of October 2018, which put upward pressure on TTF prices, especially with pipeline supplies to Europe not growing as much.

In 2019, there was a huge 75 bcm increase in available LNG export capacity, as a lot more US and Australian LNG came on line and Yamal in Russia ramped up to full capacity. This rise in LNG supply outweighed increasing demand, with the excess LNG finding a home in European storage, putting downward pressure on prices, with TTF reaching a low of \$3.56/MMBTU in July 2019. Japan spot was well below \$5 in the third quarter of 2019, reflecting the increasing globalisation of the gas market, with European and Asian prices increasingly moving together.

In 2020, Covid-19 hit demand, with LNG export capacity projects continuing to ramp up. As a result, prices fell even further, with TTF falling below \$3/MMBTU for the March 2020 contract and not going back above \$3 until October 2020. A low of \$1.55/MMBTU was reached in June 2020. Japan spot prices also went below \$3/MMBTU between May and August 2020. TTF actually fell below \$3 before Covid-19 hit demand so the fundamentals were already sending the price down further. The Oxford Institute for Energy Studies wrote a paper in October 2019¹⁶ arguing that the TTF price was heading below \$3 in 2020, followed by further papers on the subject in 2020¹⁷ With the very low prices for much of 2020, one market response was for offtakers of US LNG to not lift – and shut-in – their contracted cargoes, since the price they would receive in the European and Asian markets would not even have covered their variable costs. It is estimated that maybe some 15 bcm of US LNG was shut in during 2020, representing some 18 percent of total available US LNG export capacity.

As the economies began to reopen in late 2020 and into 2021, gas demand began to rise, especially in Asian markets. This was compounded by a cold northern hemisphere winter, hence the sharp rise in Japan spot prices in February 2021 to over \$18/MMBTU. European prices were rising because of the tightening market, but did not spike like Asian prices as Europe could access its abundant storage. TTF prices began rising more rapidly in the summer because of the need to refill storage. The movements in gas storage in Europe are often heavily correlated with movements in spot TTF prices. Both in 2018 and 2021, the need to refill storage, following large winter withdrawals, led to rising prices. In summer 2019, Europe was able to accept the extra supply of LNG by filling up storage.

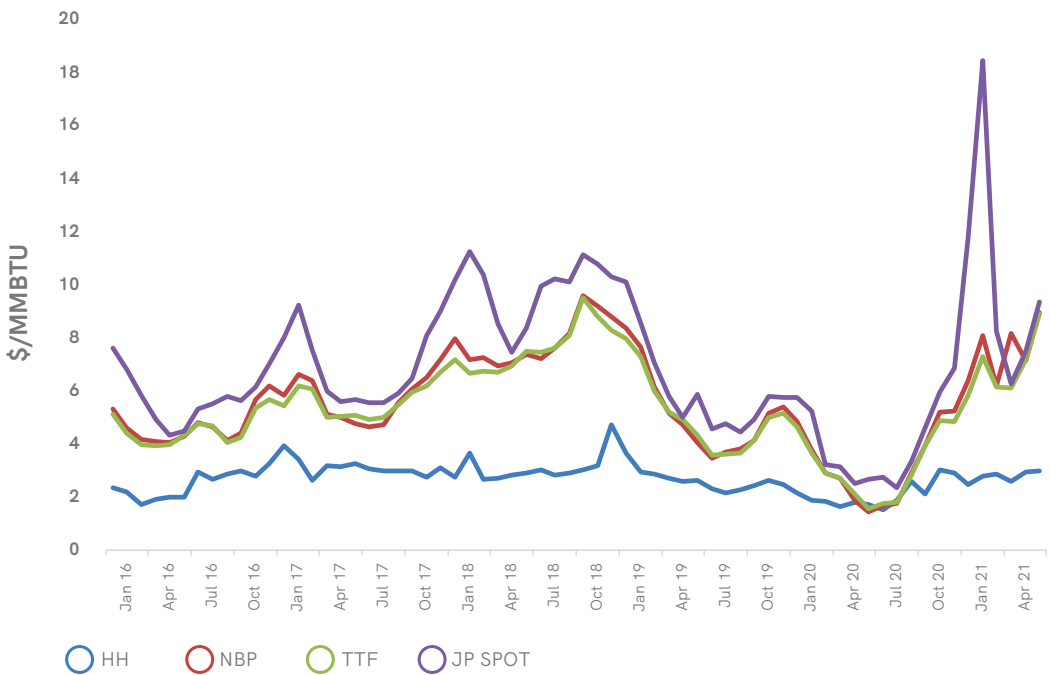
Compared to TTF and Japan spot, Henry Hub prices were relatively stable over the period. Henry Hub had largely decoupled from the rest of the global gas market but increasing LNG exports began to recouple the US to the rest of the global gas market.



16. Fulwood, M. (2019), Could we see \$2 gas in Europe in 2020, OIES Oxford Energy Comment.

17. Fulwood, M. (2020), \$2 gas in Europe is here: who will blink first? OIES Oxford Energy Comment Fulwood, M. and Sharples, J. (2020), \$2 gas in Europe (Part III): Down, Down, Deeper and Down OIES Oxford Energy Comment

Figure 37: Spot Prices – 2016 to Mid-2021



Source: Argus Media, S&P Global

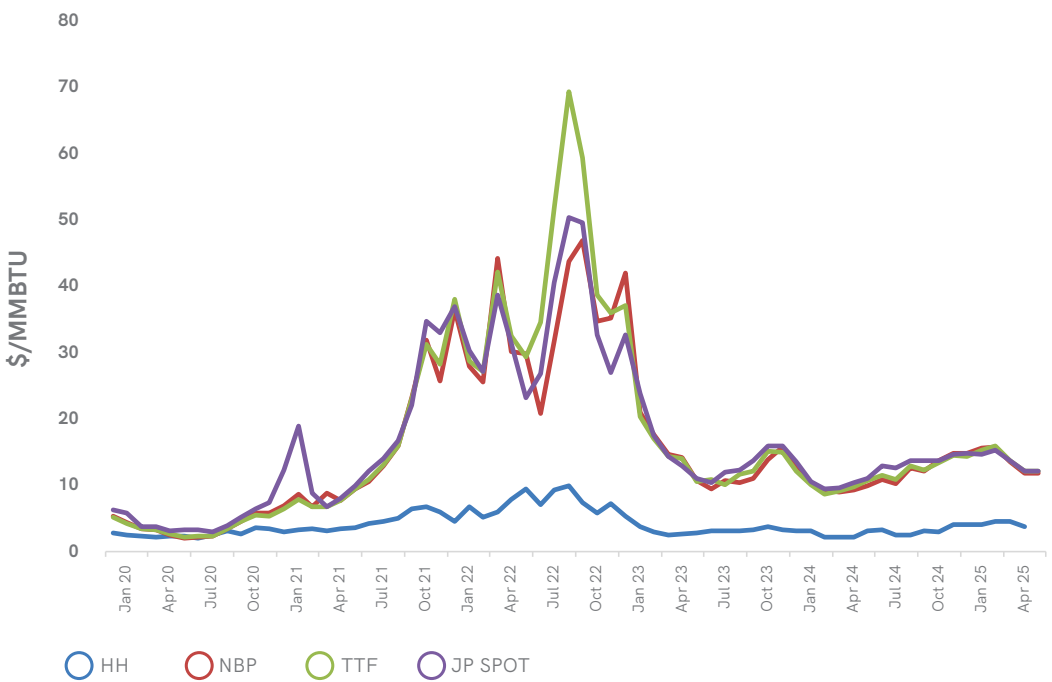
5.4.2: Mid-2021 to Date

The sharp decline in prices in 2020 as a result of Covid-19 was outlined in the previous sub-section. As the various lockdowns were lifted, economic activity began to pick up, especially in the Asian markets. Added to this was a widespread cold northern hemisphere winter in Q1 2021, which led to LNG being diverted away from Europe to the Asian markets. Spot prices in Europe did not initially rise with Asian prices, since Europe drew down on storage to meet demand. However, Europe's need to replenish storage stocks began to push up TTF and Asian prices. With demand in Asia, especially China, continuing to rise, the situation was compounded by a fall in available LNG export capacity, as many plants scheduled catch-up maintenance, delayed from 2020, and a fire at the Hammerfest plant in Norway took it offline until the middle of 2022. The situation was further exacerbated towards the end of the year, as Gazprom suspended sales of spot gas on the St Petersburg exchange. This tightening of the market was reflected in an increase in the utilisation of the capacity of available LNG export plants from 89 percent in 2020 to 96 percent in 2021. Even before the Russian invasion of Ukraine, TTF and Japan spot prices had risen to over \$35/MMBTU (January 2022), so tight was the market.

The sharp rise in prices from an already high level, followed the Russian invasion of Ukraine. Europe and the US responded by putting sanctions on all kinds of activities, although not on the purchase of Russian gas. However, a number of events resulted in a gradual decline in imports of Russian gas by pipeline to Europe, starting with the Presidential Decree from Putin that unfriendly countries must henceforth pay for their Russian gas supplies in Roubles, rather than Dollars or Euros. When some European buyers refused to comply, their supplies were halted. Then the Yamal-Europe line was effectively closed when, on May 11, the Russia government placed sanctions on EuRoPol Gaz, which operated the Polish section, although Poland had already stopped taking Russian gas. In June 2022 Gazprom announced it was reducing the flow from 167 mmcm/d to 100 mmcm/d and on 16 June further down to 67 mmcm/d, justifying its actions by technical problems at Portovaya¹⁸ – a giant compressor station feeding Nord Stream with gas. Nord Stream then entered its annual maintenance period in July 2022, to emerge briefly in August until flows stopped completely at the end of the month, before the pipeline (and one string of Nord Stream 2 as well) was blown up in September.

18. This has been described in detail in Fulwood, M, Sharples, J, Stern, J and Yafimava, K. (2022), The Curious Incident of the Nord Stream Gas Turbine OIES Oxford Energy Comment

Figure 38: Spot Prices – Mid-2021 to Date



Source: Argus Media, S&P Global

From an average of 240 mmcmd in January 2022, Russian pipeline flows to Europe fell to 160 mmcmd in June 2022 and to 74 mmcmd in September – with flows only on Turkstream and via Ukraine. Europe dealt with the loss of Russian pipeline supplies in two ways. Firstly, there was a sharp reduction in demand in industry and buildings. Industry began to switch to oil, enacted efficiency improvements and even some industrial closures. In the buildings sectors, there were behavioural changes, as thermostats were turned down. Secondly, Europe imported a lot more LNG, with imports rising over 60 bcm – or 60 percent – in 2022 over 2021. This was aided by a return to rising available LNG export capacity – in spite of the fire at Freeport in the US, which closed the terminal until well into 2023 – and reduced demand for LNG in China, as China locked down again. In addition, demand was lower than might have been expected because of a mild winter. In effect, Europe got lucky, to such an extent that storage was relatively easily filled up to, and, above the EU’s newly imposed targets.

The TTF price was also very high because of “fear”. There was a fear, following the Russian invasion of Ukraine, that Russian flows would decline rapidly and even stop abruptly. The flows did decline rapidly and, almost at the same time as the Nord Stream pipeline was blown up, prices began falling back quite sharply. TTF prices (month-ahead) peaked at just under \$70/MMBTU in September but were back to \$35 by December 2022. Russian flows stabilised at their much-reduced levels of September, and despite the big loss of Russian pipeline gas, the market had readjusted to the “new normal” – the “fear” of losing Russian gas had gone away, because the Russian gas had already gone away and the “sky hadn’t fallen in”.

The other noticeable price movement in 2022 was in Henry Hub prices, which had only rarely gone above \$4/MMBTU since 2010. However, in the final quarter of 2021, prices went above \$5 and then in 2022 to \$6, then \$7 and \$8 and even over \$9/MMBTU in September 2022. The average for 2022 was some \$6.64/MMBTU, compared to \$3.84 in 2021 and \$2.74 in 2023. Analysis by the US Energy Information Administration¹⁹, suggested this was due to high first quarter demand on cold weather and freeze-offs affecting gas production, together with growing demand for US LNG. In the summer there was also higher demand for gas because of the need for cooling and to refill storage, which had been depleted in the cold winter. In the middle of 2022, a large gap opened up between TTF, on the one hand, and NBP and Japan Spot prices on the other

19. <https://www.eia.gov/todayinenergy/detail.php?id=55119>

hand. This was not because, as was claimed by European politicians and some commentators, that the TTF market was broken, not fit for purpose or unrepresentative. This was a fallacy²⁰. The relatively high level of TTF compared to NBP was because there was congestion on the pipelines between the UK and Belgium and the Netherlands. The UK imported large quantities of LNG to effectively re-export to the EU. This filled up the two pipelines to capacity and a congestion differential opened up between TTF and NBP. This congestion premium for TTF was also seen relative to the Northwest Europe LNG price – which was very similar to Asian LNG spot prices – as the three regasification terminals into Northwest Europe – Dunkerque, Zeebrugge and Gate – were operating at or above nameplate capacity. As soon as the congestion was relieved, in the final quarter of 2022, on the UK to EU pipelines and in the regasification terminals, the differentials disappeared completely. Prices fell further in 2023 as the market rebalanced and almost returned to levels similar to the mid-2010s. The average TTF price for the 12-month period from July 2023 to June 2024, was just over \$10/MMBTU, similar to the average for 2014. In the second half of 2024, spot prices – now converged between Europe and Asia – began to rise again as the market tightened on rising demand and only a slow rise in LNG supply, combines with some cold weather spells in Europe. In the second quarter of 2025, prices began to ease back on weak Asia demand and rising LNG supply from the US.



20. For a more complete analysis see Fulwood, M. (2024), What Drives International Gas Prices in Competitive Markets? Four Fallacies and a Hypothesis, OIES Research Paper

SECTION 6: GLOBAL GAS PRICE CONVERGENCE

PRICES HAVE BEGUN CONVERGING AGAIN FOLLOWING THE SHARP DIVERGENCE IN 2022

6.1 Introduction²¹

In the period since the surveys began in 2005, it is generally recognised that the global natural gas markets have become more integrated through increased LNG trade, increased market related pricing and gas trading hub development. It might be expected, therefore, that global gas prices would converge, as markets became more integrated. However, the conventional wisdom is that of global gas price divergence, based on a few regional gas price markers such as Henry Hub, NBP and Japanese import prices, especially until 2015. A casual look at Figure 36 on wholesale price levels by region would appear to confirm the conventional wisdom, as the differentials between Asia, Asia Pacific and Europe prices, on the one hand, widened compared to most other regions through 2015.

This section contains an analysis of whether gas prices have been converging on a global basis over the years of the survey, using the wholesale price data from the seventeen surveys.

21. The analysis of global gas price convergence was undertaken by Floris Merison of Gasterra

6.2: Measuring Price Convergence

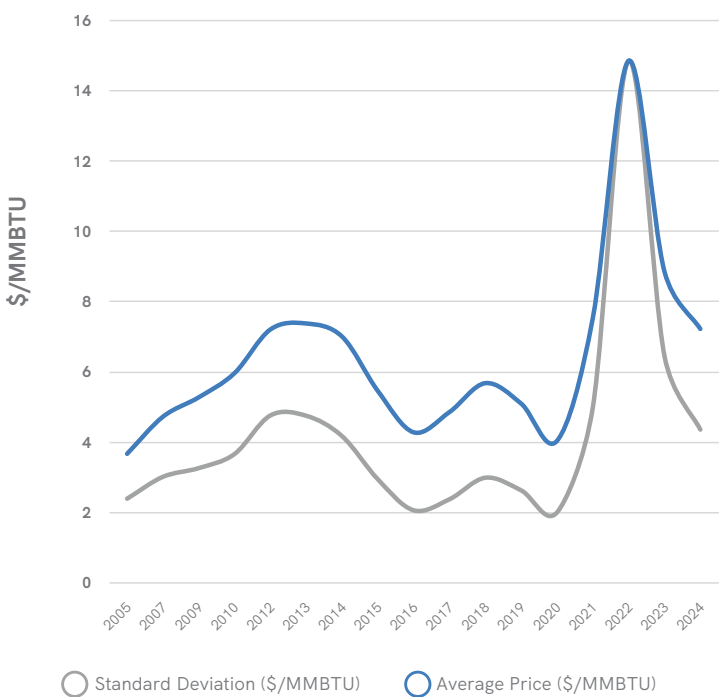
The wholesale price surveys have resulted in a unique database with data on gas price formation mechanisms, gas volumes, and annual average gas prices of well over 100 markets. The database enables analysis of different subsets of countries, categorised by properties such as price formation mechanism, region, and shares of imports. This has been used to shed more light on the apparent contradiction between the expectation of price convergence based on economic theory²² and market developments and the conventional market view of gas price divergence. The large number of countries available in the database, as well as the use of the coefficient of variation as a measure for price convergence can provide new insights.

The coefficient of variation of prices of a dataset in a certain year is determined by the standard deviation divided by the mean value of these prices. The amount of absolute price variation (standard deviation) is thus measured relative to the average price in a certain year. A low coefficient of variation indicates a higher level of price convergence and vice-versa. This measure is particularly suitable for datasets with a limited number of data points (in our database 17 years), for a large number of price lines (in our database more than 100 markets), and the ability to subdivide into subsets of countries with different mean gas prices.

6.3: Price Convergence Using The Survey Data

As a background to the methodology used, the graphs of the (unweighted) average price and the standard deviation are included below. The pattern of change over the years of the average price and standard deviation are similar. The level of standard deviation is firstly related to price level. When a correction is made for the price level (standard deviation divided by average price), the resulting coefficient of variation shows the relative variance of prices. This can be used as an indication of the level price convergence.

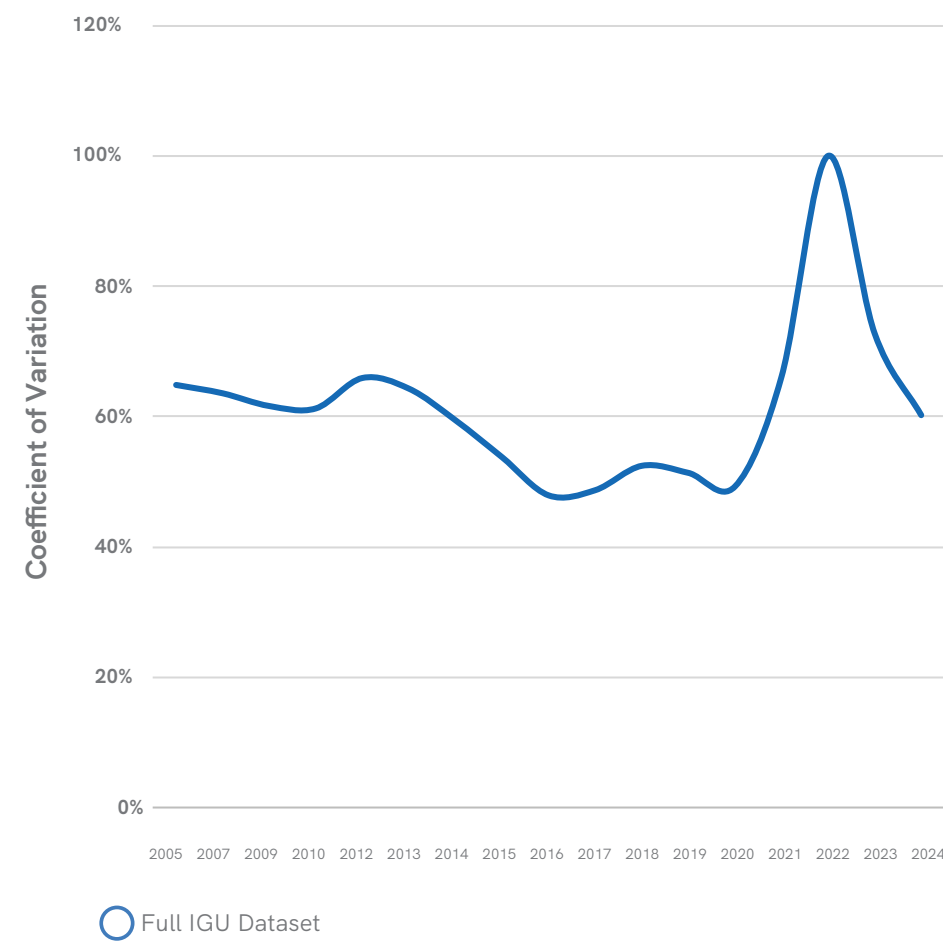
Figure 39: Average Price and Standard Deviation of the Full Dataset



22. The economic theory of the Law of One Price states that, in a perfect market, potential arbitrage opportunities between countries are immediately exploited by market participants, leading to convergence to one single price. With growing LNG trade and more markets involved, it might be expected that global gas prices should have converged, due to increasing arbitrage possibilities and further market integration.

In the period 2005 to 2020 the coefficient of variation of gas prices of this full dataset declined by 15 percentage points, with the sharpest drop between 2012 and 2017, indicating global gas price convergence. There was a small rise in 2018, suggesting a slight divergence, marginally reversed in 2019 and 2020. This trend of a decreasing coefficient of variation is consistent with our expectations based on the economic theory of the Law of One Price and can be seen as an indicator that the global gas markets were converging. However, in 2021 the coefficient of variation rose back to just below 2005 levels, and in 2022 the coefficient soared on the back of sharply rising prices in the main importing regions, to almost 100%. In 2023 there was a sharp decrease again in average price and (even more in) standard deviation, but not back to previous values. Coefficient of variation was much lower than 2022, but still higher than before 2022. In 2024, there was a further decline in the coefficient of variation, but still above the late 2010s level.

Figure 40: Global Gas Price Variation Trend



In order to be able to trade to exploit arbitrage opportunities (leading to gas price convergence), countries should be connected to the global gas market. Connectedness to the global gas market could be realised through physical gas imports or through market related pricing. We therefore looked at a subset of countries with a minimum level of gas imports (10%) and a subset of countries with market related prices. The result is as expected, with the coefficient of variation being much lower in a group of countries connected to the global gas market through physical imports and/or market related prices. Importing countries and market related pricing countries had very similar levels of convergence, with a large overlap in terms of data. As would be expected, the group of countries with both gas imports and market related prices has the lowest coefficient of variation.

Figure 41: Price Convergence for Gas Importing Markets

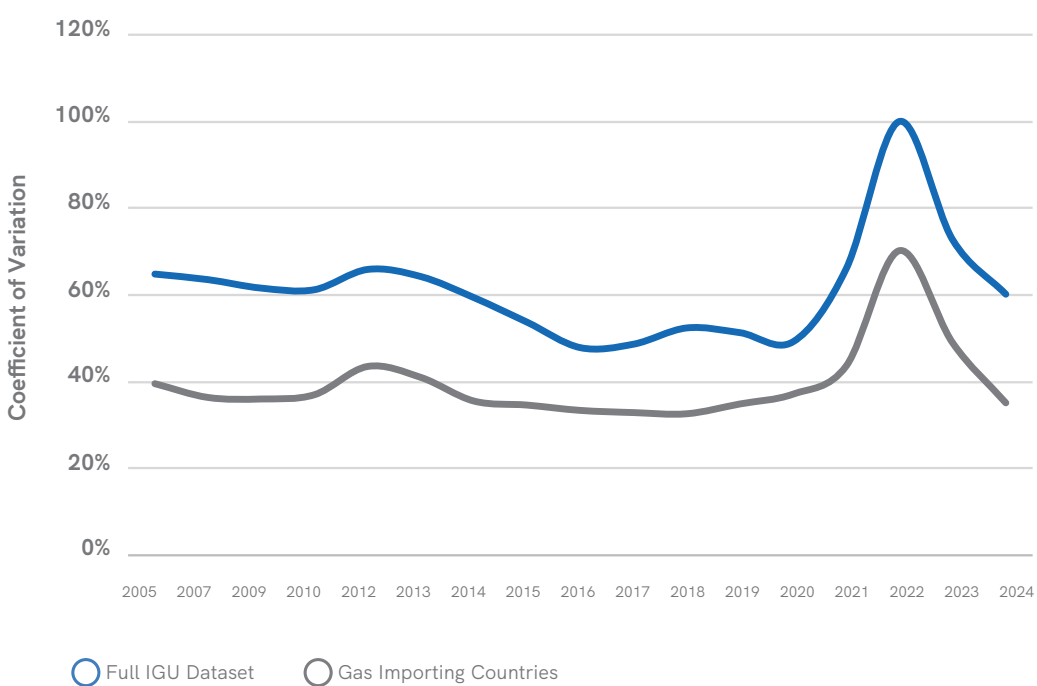
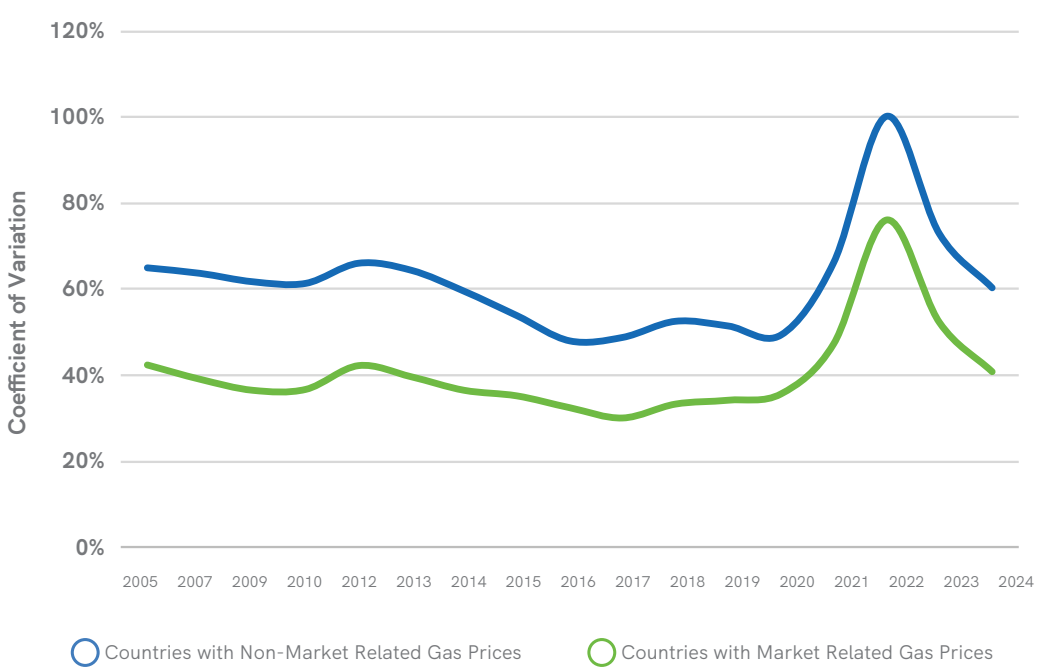
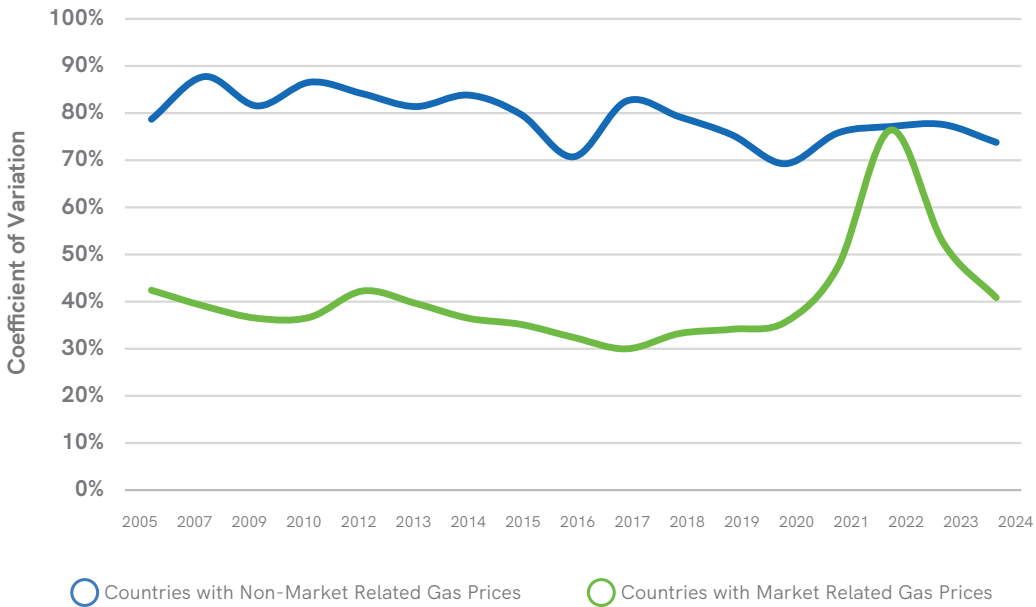


Figure 42: Price Convergence for Market Related Prices



We have defined countries with market related prices as countries where the majority of gas is priced through market related price formation mechanisms – OPE, GOG, BIM and NET – with OPE and GOG having by far the larger share. Non-market related prices mainly include the regulated price formation categories: RCS, RSP and RBC. In the figure below, the relative stability of the countries with non-market related prices, contrasts with the market-related prices, with the coefficient in the latter now approaching the former. In 2024 market related prices again lead to more price convergence (as would be expected).

Figure 43: Price Convergence Dynamic for Non-Market and Market Related Prices



When we look within the group of countries with market related pricing, we see that a subset of countries with OPE as the main price formation mechanism shows more price convergence i.e. a lower coefficient of variation. This is not surprising, since these prices are largely all indexed to crude oil, gasoil and/or fuel oil prices. The relative stability of coefficient of variation of the subset of countries with OPE is interesting to note, at least up until 2022. This rise in 2022 is likely to reflect that these markets also were impacted by the very high and rising spot prices for part of their gas supply. In 2024, countries with OPE convergence had gone back to the “normal” 30% level.

Figure 44: Price Convergence for OPE Prices

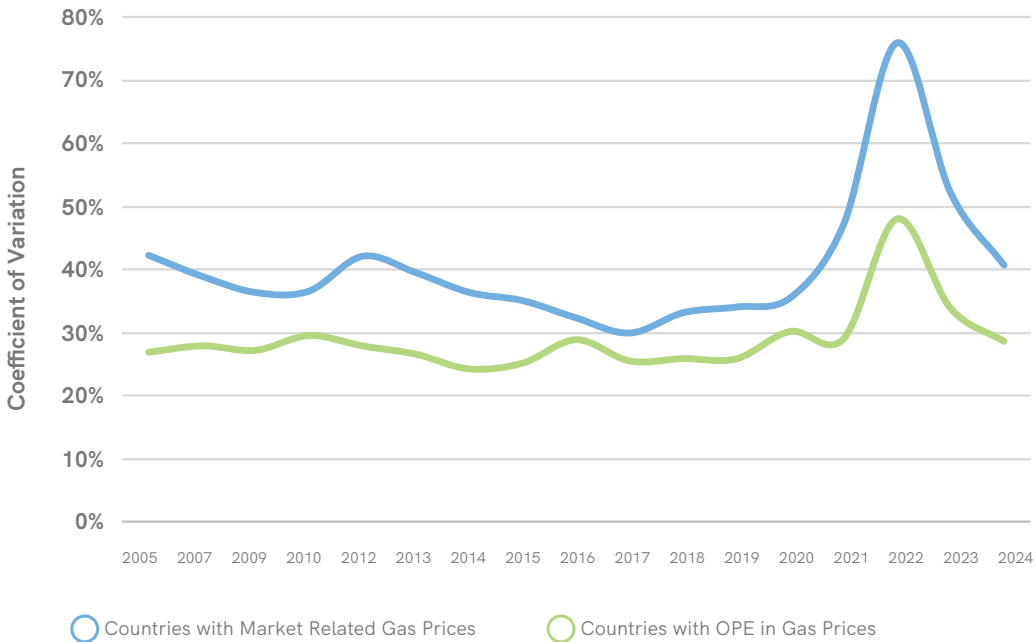
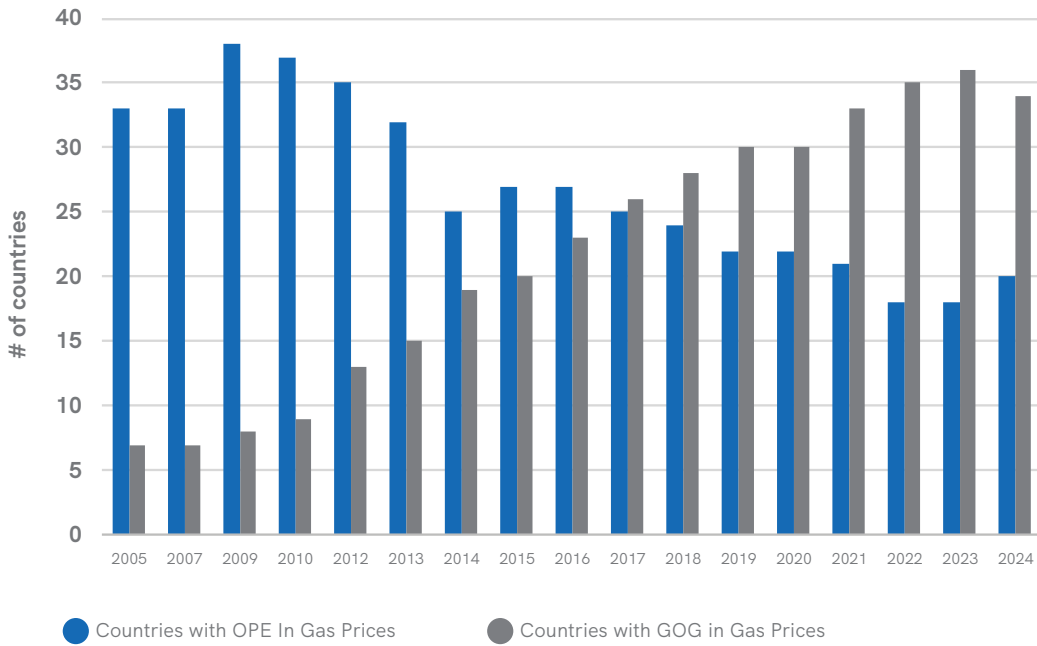


Figure 45: Number of Markets where OPE or GOG is the Majority Mechanism



As can be seen in the above figure the number of markets with a majority of gas consumed priced against GOG has increased considerably. In the first years, the number was too small and dynamic to calculate a meaningful coefficient of variation, but from 2013 the population became large enough to result in a more stable coefficient of variation, at a level lower than the total group of countries with market related gas prices and approaching the level of price convergence of the group of countries with OPE until 2020. In 2021 and 2022, the gap in price convergence between the groups of countries with GOG and OPE widened again, with the spike in GOG prices in Europe as the major driver. The gap didn't narrow in 2023 as spot prices remained high, but did narrow in 2024 as spot prices fell.

Figure 46: Price Convergence for Market Related and GOG Prices

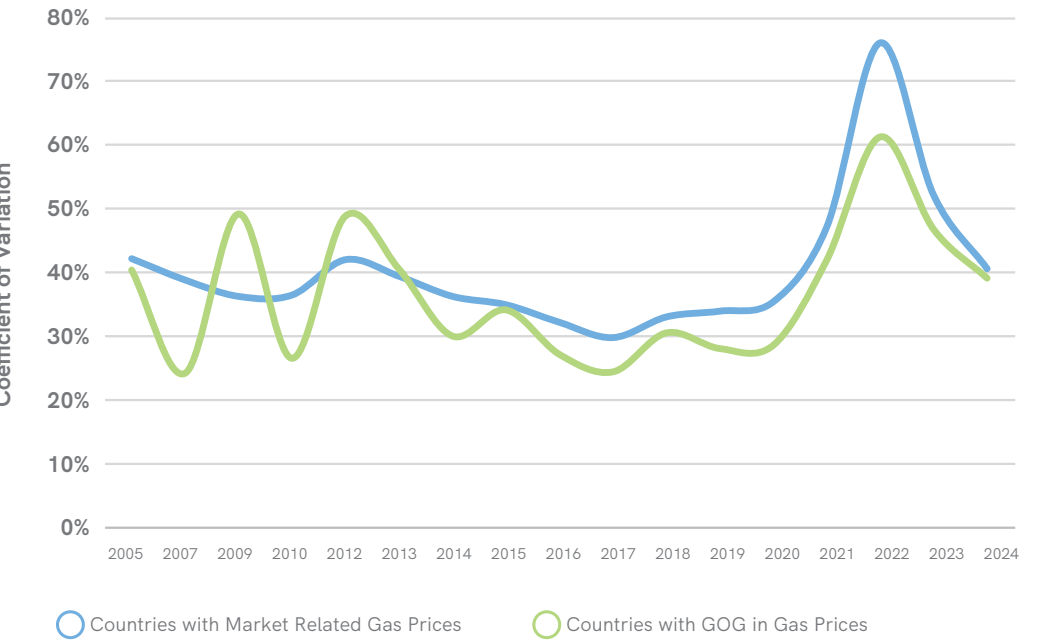
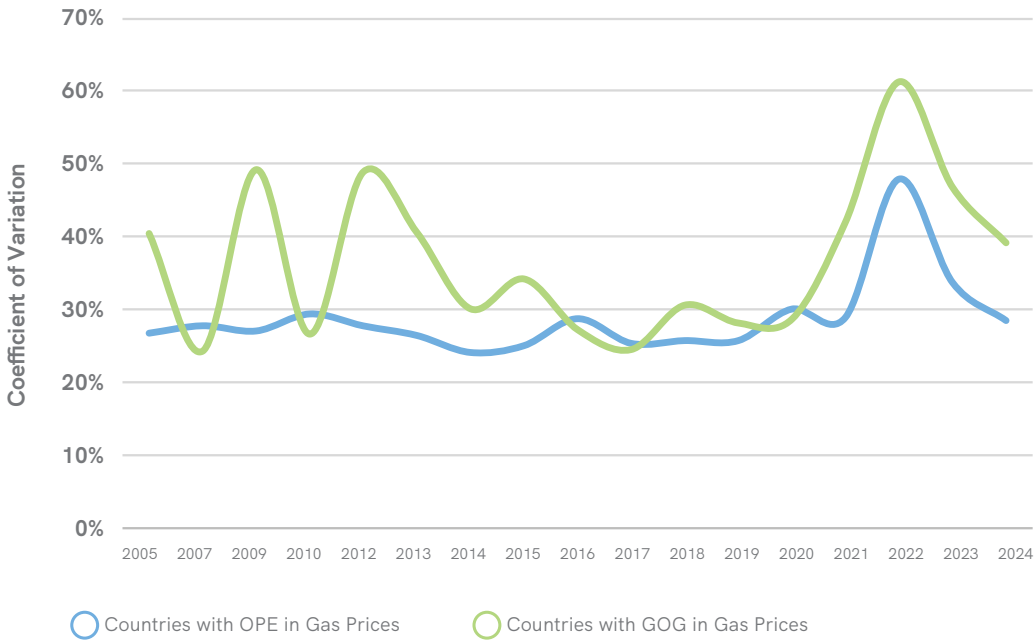


Figure 47: Price Convergence for OPE and GOG Prices



When we look at the different regions, Europe is the only region with sufficient countries to make meaningful convergence calculations. Here we can conclude that there is more price convergence amongst gas importing countries with market related prices within Europe than on a global level, since the decline in the coefficient of variation had been greater than in all importing countries with market-based gas prices. The rise in the coefficient of variation in 2022 in Europe, was also less than for the global total. This, again, is not surprising since intraregional trade of natural gas is usually easier and less costly than interregional trade. In 2024, the convergence in Europe was back close to historic levels.

Figure 48: Price Convergence for Europe

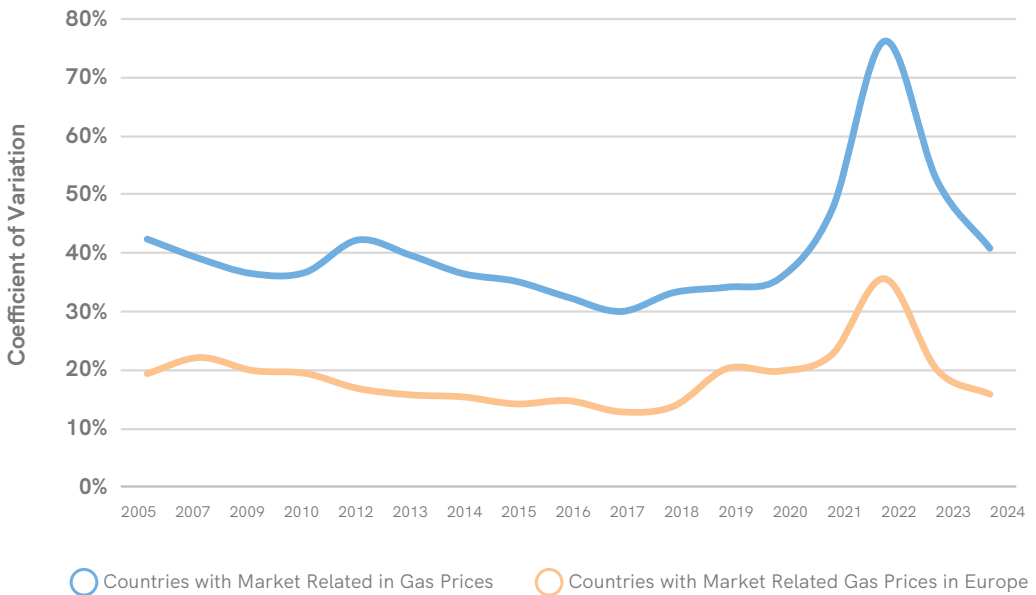
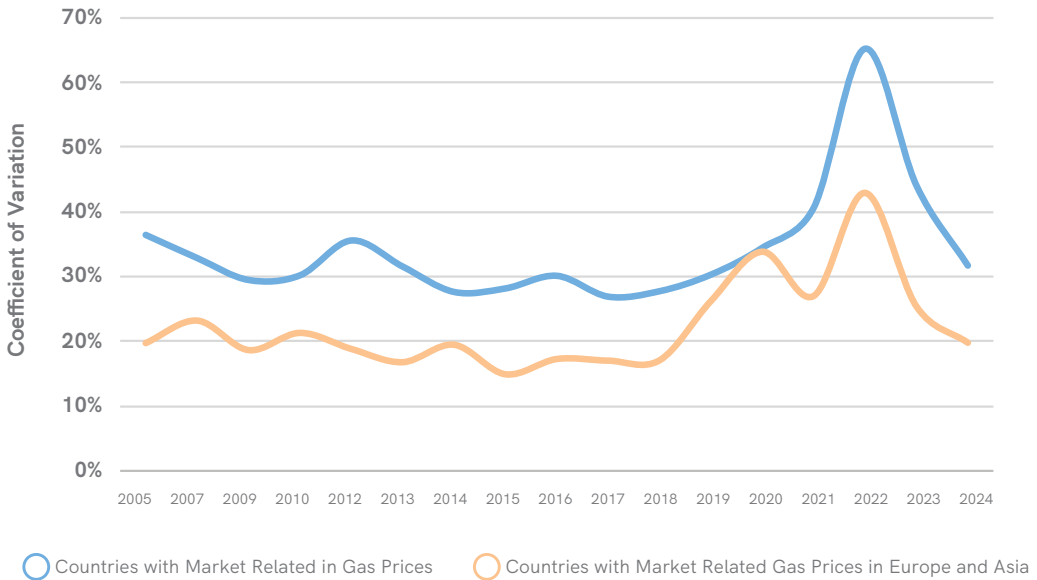


Figure 49: Price Convergence for Europe and Asia Pacific

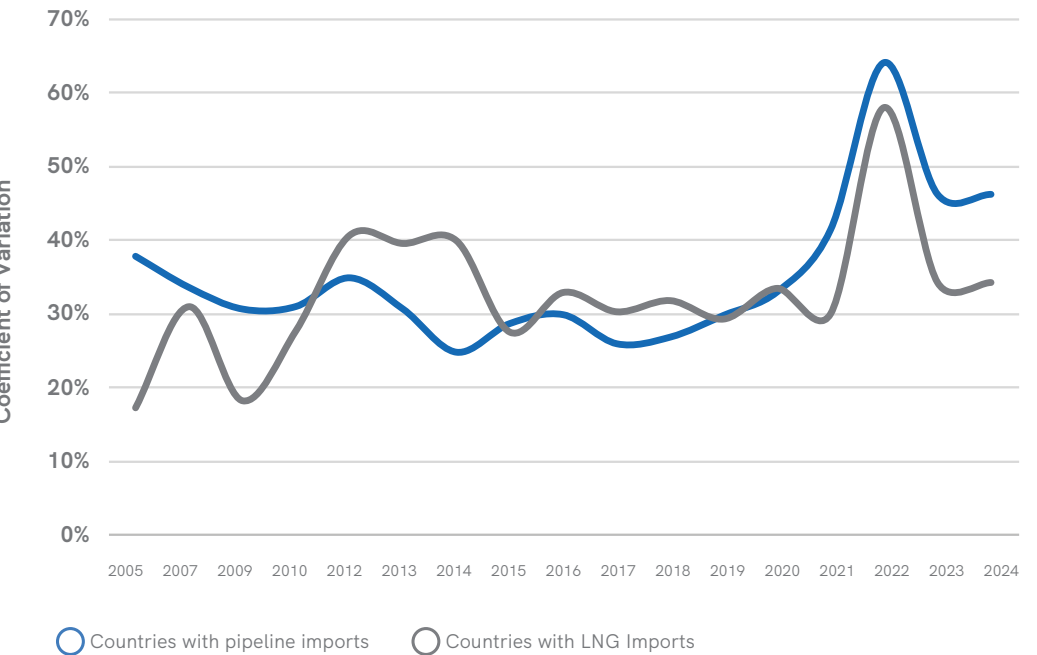


There is also closer convergence if Europe and Asia Pacific are combined, with some of the key LNG importing countries being in Asia Pacific, relative to all importing countries with market-related prices. The mixture of OPE and GOG prices in Asia Pacific, however, did mean that the convergence wasn't as great as for Europe alone.

In contrast to the general trend of price divergence in 2021 as compared with earlier years, prices within the group of LNG importing countries in 2021 actually did not diverge. However, this changed in 2022, with increasing divergence as spot prices jumped. The rise in prices in 2022 has overwhelmed the previous stability in the global LNG market. In 2023 and 2024, LNG importing countries convergence returned closer to historic levels

The large and stable group of countries with pipeline imports followed the general trend of price divergence in 2021 and 2022, but converged again in 2023 and 2024, although not back to pre-2021 levels

Figure 50: Price Convergence for Pipeline and LNG Importing Countries



6.4: Conclusions

This analysis shows that global gas prices had been converging continuously since 2005, indicating further globalisation of the gas markets, up until 2017. The increasing convergence then stalled and in 2021 and 2022, not surprisingly, prices diverged again, more than eliminating the convergence since 2005. 2023 saw somewhat of a return to more convergence, with 2024 continuing this trend. The trend of price convergence, through 2015, is against the conventional market wisdom of gas price divergence in the years up to 2015, but in line with developments such as the growth of LNG trade and increased market-related gas pricing.

It is also concluded that there is more gas price convergence amongst countries (1) with market related pricing, (2) which are connected with the global gas market through gas imports, (3) with oil-indexed gas prices, and since 2014 with gas-indexed prices, and (4) within Europe. Countries with non-market related prices have shown relative stability in terms of the coefficient of variation, albeit at a high level.

Since 2017, however, there was relative stability in the coefficient of variation, other than for 2018, suggesting that the trend of more price convergence had stalled or come to an end. 2021, however, undid all the convergence since 2005 as spot prices rose sharply, and even further in 2022. The extraordinary price developments in the global gas markets in 2021 and, especially, in 2022, clearly have had widely diverging impacts in individual countries and subsets of countries. Importing countries reliant on spot imports and contracts linked to hub prices saw their prices diverge sharply from countries with oil-linked prices, with 2023 undoing some of this divergence, which continued in 2024.



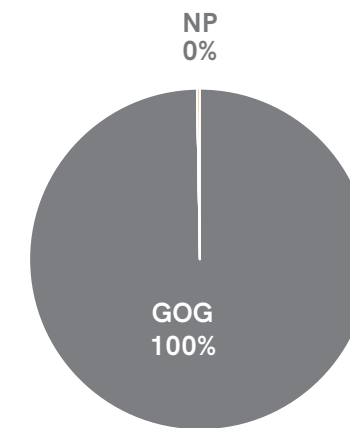
APPENDIX A

A.1 NORTH AMERICA

A.1.1: North America 2024 Survey Results

North America consumption in 2024 was some 27% of total world consumption – around 1,145 bcm.

Figure 51: North America Price Formation 2024

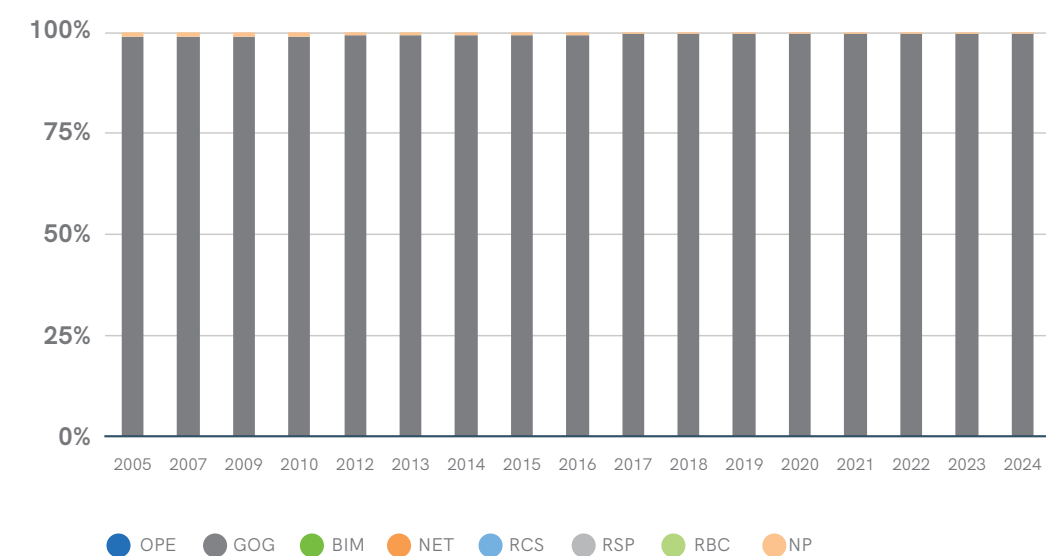


GOG clearly dominates the North American market with fully liquid trading markets in the USA and Canada. The wholesale price in Mexico used to be referenced to prices in the USA, but there are now reference prices based on trades in Mexico. The small amount of NP is in Mexico where Pemex uses the gas in the refinery process and for enhanced oil recovery.

A.1.2: North America Comparison 2005 to 2024

Price formation mechanisms have not changed at all, in effect, in North America over the seventeen surveys. Apart from the small amount – under 1% – of NP which, as noted earlier, is gas used by Pemex in refinery processes and enhanced oil recovery, North America was all GOG in 2005 and has remained so ever since. In fact, if the surveys had gone back even further, it is likely that the USA at least would have been GOG since the early 1990s.

Figure 52: North America Price Formation 2005 to 2024

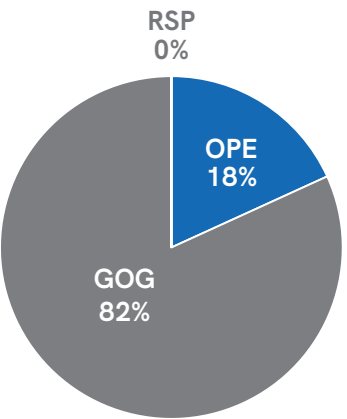


A.2 EUROPE

A.2.1: Europe 2024 Survey Results

European consumption in 2024 was some 11% of total world consumption – around 465 bcm.

Figure 53: Europe Price Formation 2024



GOG remains the largest share in Europe, standing at 82%, totalling around 381 bcm. Some 64 bcm is domestic production, mainly Netherlands and UK, with around 226 bcm being pipeline imports, being the overwhelming price formation mechanism in all European countries outside Italy, Turkey, Spain and the non-EU Balkan countries. LNG imports accounted for 91 bcm, of which around forty percent is deemed as being in the traded category in the trading markets of the UK, France, Italy, Belgium and Netherlands, with the remaining quantities being spot cargoes into those markets and the more traditional LNG importing countries.

OPE is now at 18%, totalling around 85 bcm, and is predominantly pipeline imports (57 bcm) only into one-third of the European countries, followed by LNG imports (26 bcm) into Spain, France, Italy, Turkey, Portugal, Poland and Greece, with domestic production (2 bcm) in a handful of countries.

A.2.2: Europe Comparison 2005 to 2024

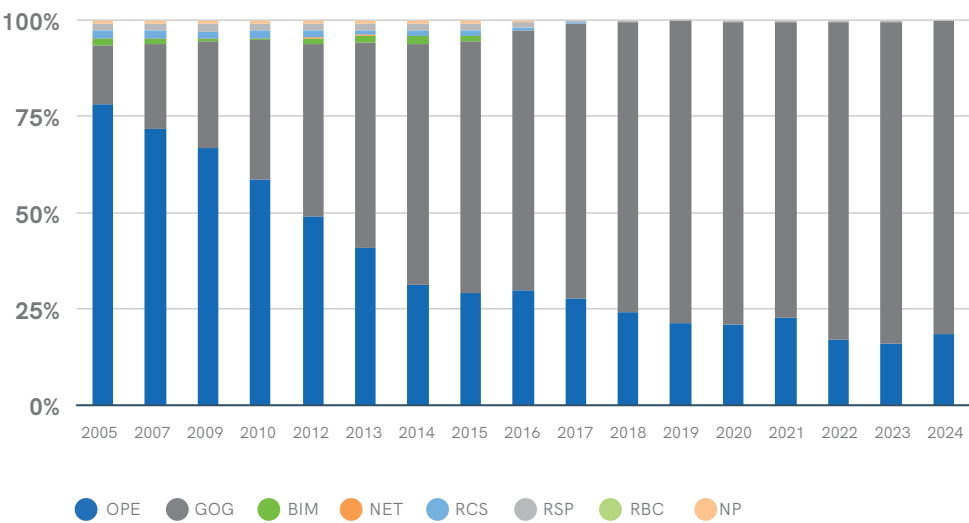
Europe is one of the regions where the most significant changes in price formation mechanisms have taken place. There has been a broadly continuous move from OPE to GOG since 2005, with GOG's share increasing from 15% in 2005 – when OPE was 78% – to 82% in 2024, with OPE at some 18%. In 2024, there was a fallback in the GOG share as spot LNG imports declined, with cargoes heading to Asia. The RCS category – domestic production in Romania – has steadily declined to zero, while RSP declined in 2017 as it disappeared in the Polish market, and to almost zero in 2024.

The changes have reflected a number of factors over the years; initially a decline in the volume of gas imported under the traditional oil indexed contracts, being replaced by imports of spot gas and increasing volumes traded at hubs, followed by the ending of contracts or the renegotiation of the terms to include a proportion of hub/spot price indexation in the pricing terms, or even a move to 100% hub price indexation, and in some cases, a reduction in the take-or-pay levels. The renegotiations saw the introduction of hybrid contracts²³, although it is thought in the last few years even some of these hybrid contracts are now purely hub/spot indexation.

23. Under the pricing formulas, oil indexation was partly maintained but within a price corridor set by hub prices. Such contracts are sometimes called quasi-oil indexed but could equally be referred to as quasi-hub indexed. It is suggested to the respondents to the wholesale price survey that such hybrid contracts are split between GOG and OPE, with the proportion dependent on how narrow the price corridor is. For example, if the price corridor is very narrow, the contract is effectively only notionally linked to oil prices and therefore would be allocated more towards GOG. In contrast if the band is relatively wide then more would be allocated to OPE.

The trend towards GOG and away from OPE, was reinforced by the continued decline in domestic production in the UK in the old legacy contracts, which were in the OPE category, to be replaced by pipeline and LNG imports, all at GOG. In 2019, there was a further rise in GOG as LNG imports surged with rising spot LNG cargoes in many traditional LNG importing markets. In 2020 there was a small fall back in GOG LNG imports as Spain switched more to OPE LNG. In 2021, OPE recovered some ground as demand rose sharply in Turkey, Italy and Spain met by rising OPE pipeline imports. In 2022, there was a sharp rise in GOG LNG imports, largely spot LNG cargoes, together with a change in Turkey's pipeline contracts with Russia to partly GOG. This trend continued in 2023, with the share of GOG in Europe's LNG imports rising to 82%, before falling back in 2024 to 79% as spot LNG imports declined.

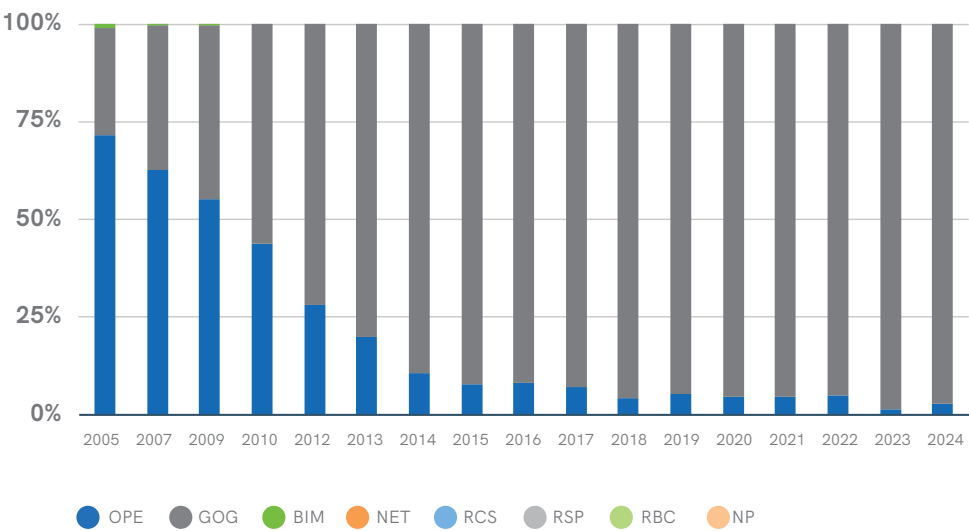
Figure 54: Europe Price Formation 2005 to 2024



The change in price formation mechanisms in Europe was not universal across the region. The figures below summarise the changes in the key sub-regions.

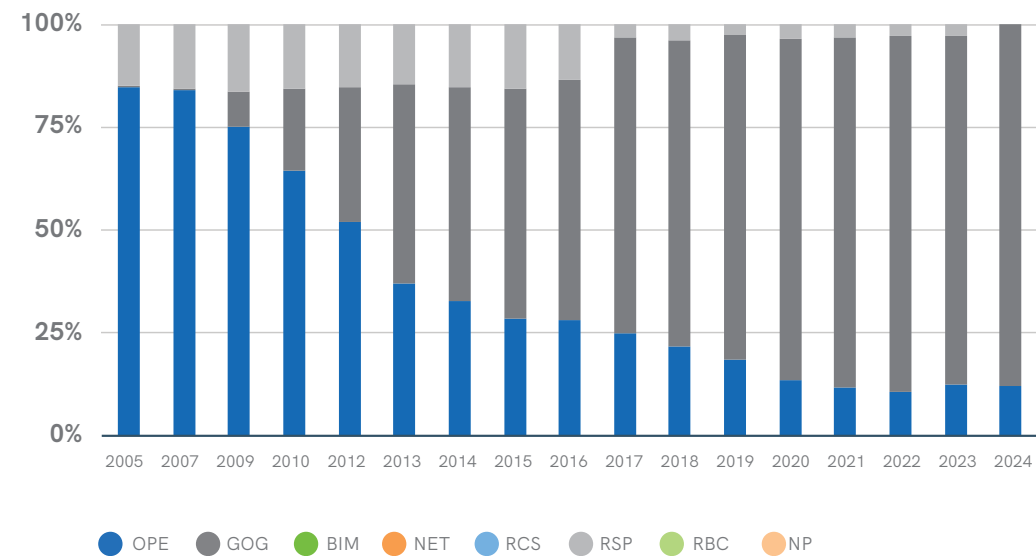
Northwest Europe²⁴ has seen the most dramatic change in price formation mechanisms, with a complete reversal in the ratio of OPE to GOG from 63% OPE and 37% GOG in 2005 to 3% OPE and 97% GOG in 2024.

Figure 55: Northwest Europe Price Formation 2005 to 2024



24. Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherlands, UK

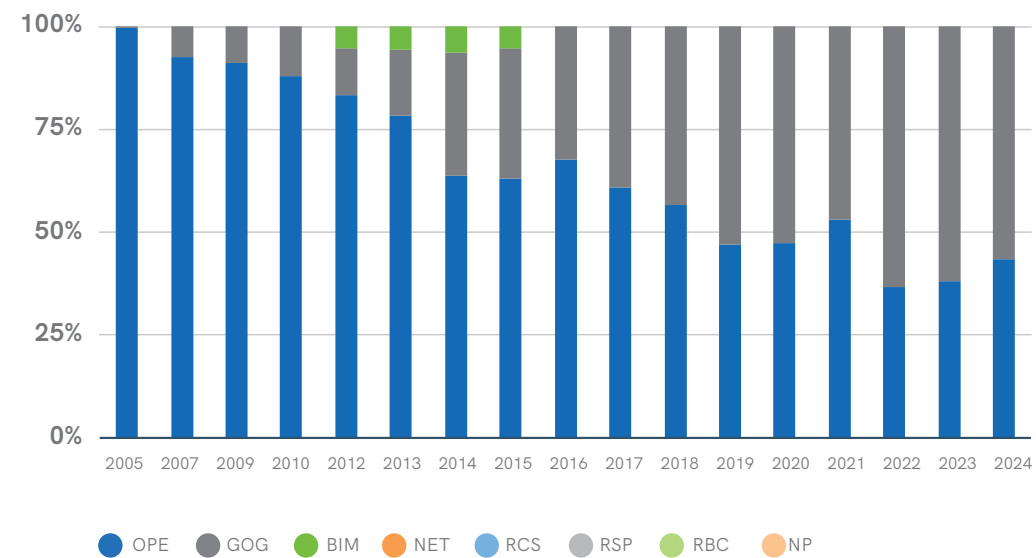
Figure 56: Central Europe Price Formation 2005 to 2024



Central Europe²⁵ has also, more recently, seen significant changes. OPE has declined from 85% in 2005 to 12% in 2024, while GOG has increased from almost zero in 2005 to 88% in 2024, principally reflecting increased imports of spot gas, often from Germany, and contract renegotiations. However, in 2017 the GOG increase – 59% to 73% – was mostly down to the switch from RSP in Poland as a result of regulatory reform.

There has been less change in other areas of Europe such as the Mediterranean²⁶, where OPE has only declined from 100% in 2005 to a low of 47% in 2020, and GOG rising from nothing to 53%. This initially reflected spot LNG imports in the sub-region and some spot pipeline imports into Italy, as well as changes in the pricing of domestic production in Italy. However, in 2014 this was further enhanced by the renegotiation of the main Russian contract into Italy, and in 2017, the change in the Algerian contract into Italy. In 2019 spot LNG imports increased but fell back in 2020 as Spain increased the share of OPE LNG imports. In 2021, with rising OPE in Turkey, Italy and Spain pipeline imports, the OPE share jumped back to 54% and GOG down to 46%. In 2022, the GOG share jumped back to 63% with the rise in spot LNG cargoes and the change in pipeline gas contracts in Turkey. There was little change through 2023, but a decline to 56% in 2024 as spot LNG cargoes declined.

Figure 57: Mediterranean Price Formation 2005 to 2024



25. Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland.
26. Greece, Italy, Portugal, Spain, Turkey

In Southeast Europe²⁷ GOG began in 2013 as Romania began liberalising domestic production pricing, moving away from RCS – a process which was completed in 2018. There is also a small amount of GOG in Croatia and Slovenia. The rise in OPE in 2012 reflected a switch from BIM in Bulgaria, where until 2010 there was payment in kind for transit (BIM) which then became a cash payment with the gas being purchased under the same OPE terms as the other imported gas. OPE fell back again in 2013 and 2014 as imports declined in Romania, before stabilising in 2015. 2017 and 2018 saw more declines for OPE, as Romanian imports fell. The OPE share rose again slightly in 2019 as consumption fell in the now predominantly GOG market of Romania, but has fallen back again in 2020, as imports into Romania from Russia declined, and there was little change in 2021. In 2022, 2023 and 2024, the OPE share fell, reflecting continuing falls in pipeline imports from Russia, with GOG rising correspondingly, aided by rising LNG imports into Croatia.

Figure 58: Southeast Europe Price Formation 2005 to 2024

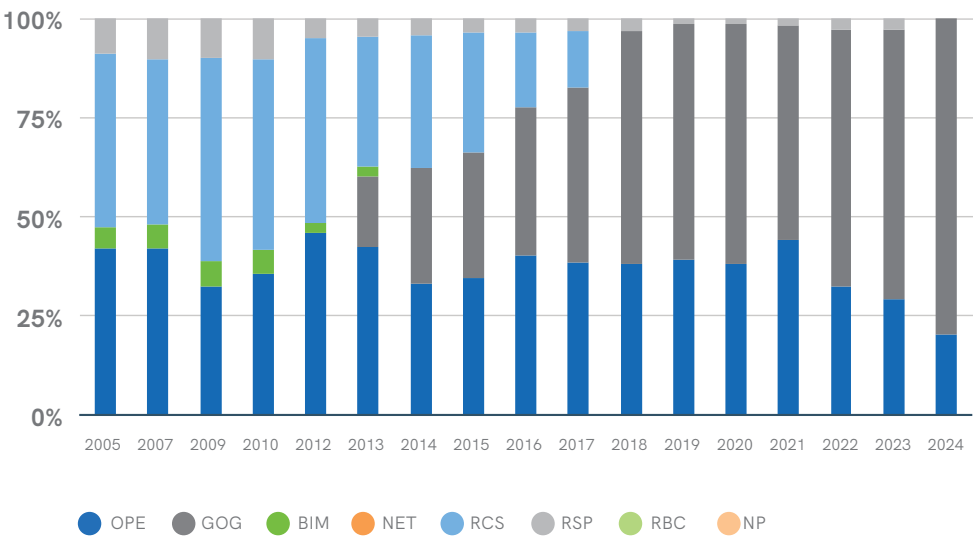
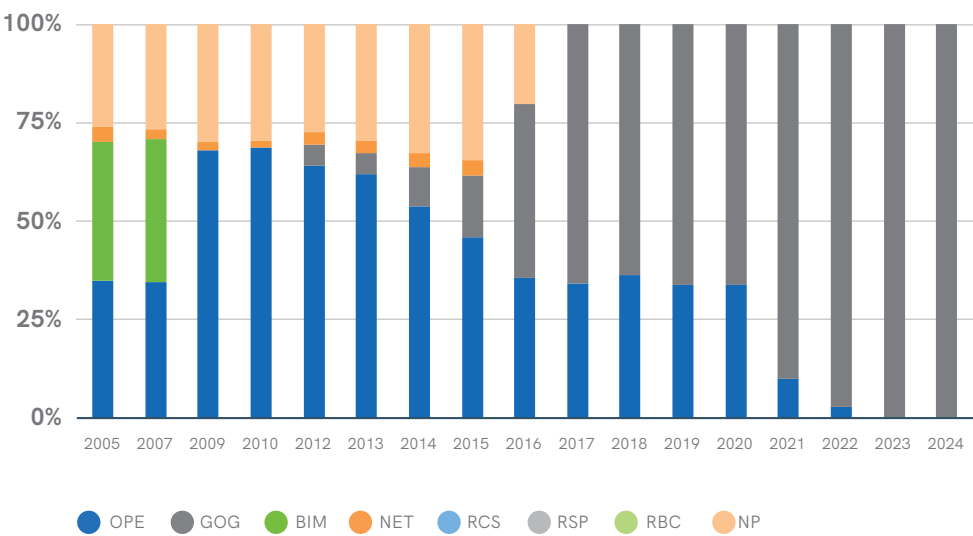


Figure 59: Scandinavia and Baltics Price Formation 2005 to 2024



27. Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia

In Scandinavia and Baltics²⁸, GOG has gained ground in recent years in Sweden, Norway and more recently in LNG imports into Lithuania and had risen to 60% in 2016, almost all at the expense of OPE, which is now down to 10%. The early switch in 2009 from BIM to OPE was in the contiguous Baltic States. The large gain in GOG in 2016 reflected, in part, the switch from NET and to GOG in Norway, but largely the LNG imports into Lithuania linked to NBP prices. In 2017 GOG increased further to 60% with the move away from NP in Norway, as all domestic production was priced at European hub levels²⁹. GOG is now at 100%, having risen sharply in 2021, as Finland moved to GOG from OPE, and again in 2022, as OPE pipeline imports from Russia fell away. In 2023, as pipeline imports from Russia stopped, the sub-region became 100% GOG.



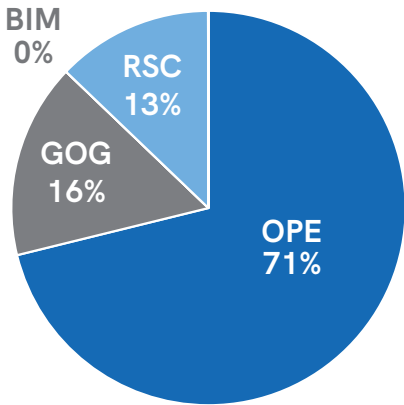
28. Estonia, Finland, Latvia, Lithuania, Norway, Sweden.
29. Previously gas used in refineries and gas processing was thought not to be priced, so it was allocated to NP.

A.3 ASIA

A.3.1: Asia 2024 Survey Results

Asian consumption in 2024 was some 13.5% of total world consumption – 574 bcm.

Figure 60: Asia Price Formation 2024



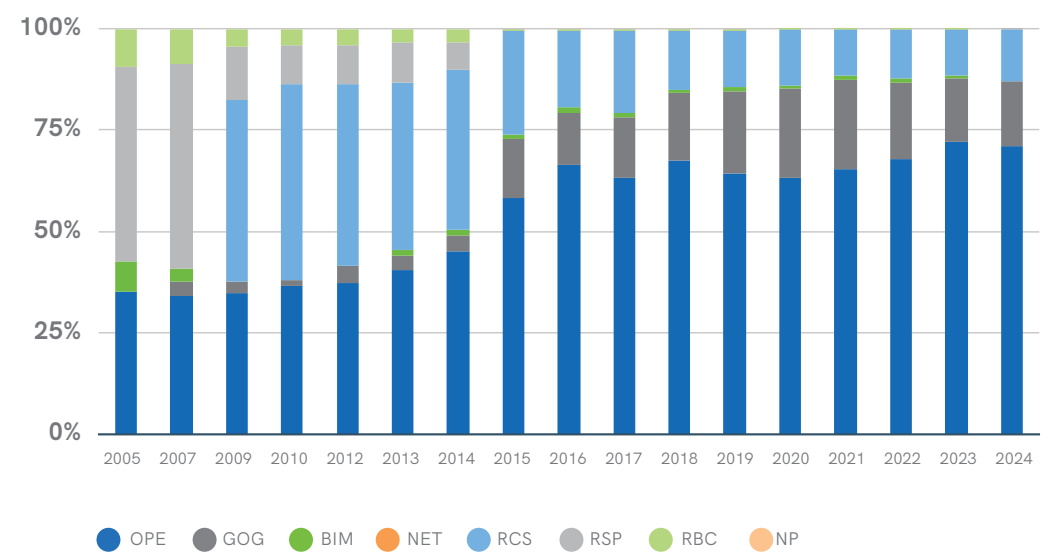
OPE at 71% totals some 409 bcm and is principally domestic production, pipeline and LNG imports in China, LNG imports together with domestic production in India, and LNG imports and domestic production in Pakistan where the regulator sets natural gas wellhead prices but linked to the oil price.

GOG at 16%, some 92 bcm, is largely spot LNG imports into India, China and Pakistan and domestic production in China, reflecting the direct sales of coalbed methane at market prices from upstream producers to large users in power and industry. RCS accounts for some 13%, totalling around 52 bcm of domestic production in China with around 21 bcm in Bangladesh.

A.3.2: Asia Comparison 2005 to 2024

The changes in price formation mechanisms in Asia have been dominated by China and India. Firstly, there has been an increase in OPE from around 35% to 71% over the seventeen surveys, largely at the expense of the regulated categories and BIM. The move from BIM to OPE reflected the change in the pricing of the Qatar LNG contract to India between 2007 and 2009, while the more recent rise in 2010 and 2012 was due to the start of pipeline imports into China from Turkmenistan, which are oil indexed under the contract. The change from RSP to RCS in China in 2009 came as the regulator increased prices to economic levels. Finally, there was the further change in domestic production pricing, initially in two provinces in China, before extending nationwide to all sectors except residential and fertiliser, again increasing OPE to 67% in 2016. In 2018, OPE was 68% rising from 64% in 2017, as China extended the pricing reforms to city-gate pricing to residential customers. The rise in GOG in 2015 to some 13.5% reflected the pricing reform in India, linking domestic prices to a basket of market hub prices. GOG increased further in 2017 to 14% and to 17% in 2018, partly as spot LNG imports increased in India and China. GOG share rose in 2019 and 2020, at the expense of OPE, reflecting a further increase in spot LNG imports across the region. OPE and GOG rose again in 2021 at the expense of RCS in China. In 2022 the GOG share declined from 22% in 2021 to 19% as a result of a drop in spot LNG cargoes into China and Pakistan. A further fall in the GOG share to 15.5% in 2023 was as a result of the switch to OPE in India domestic production, which was only partly offset by a rebound in spot LNG cargoes to China. There was a small decline in the OPE share between 2023 and 2024, and a corresponding rise in GOG as more spot LNG came to Asia.

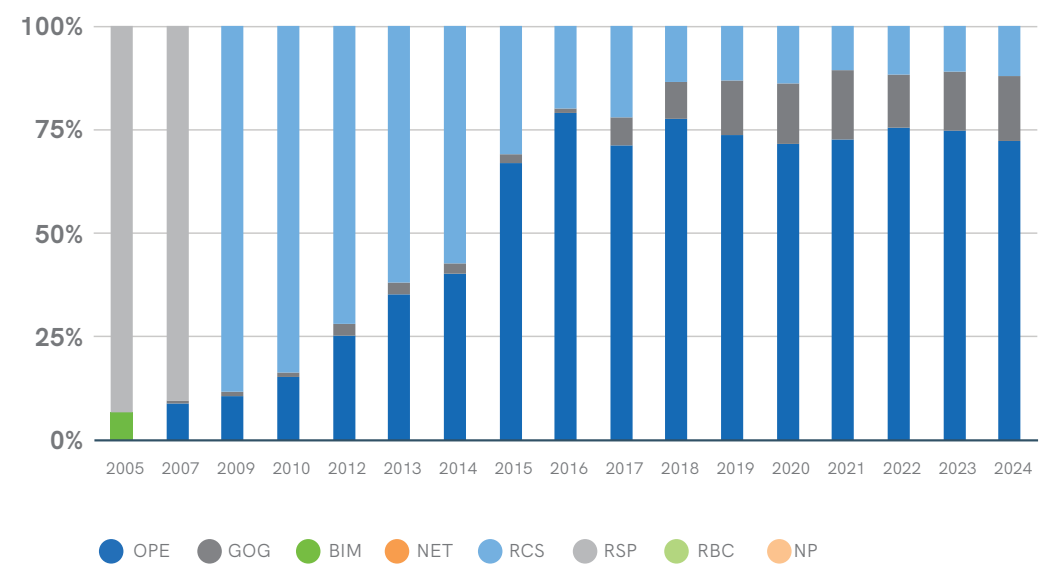
Figure 61: Asia Price Formation 2005 to 2024



The changes in RSP – down from 48% in 2005 to almost zero in 2015 was almost all due to the change in price formation in China as regulated prices were increased to economic levels, and the more recent change in India. Initially, RCS was the beneficiary, rising to 44% by 2012, but this has since declined with the pricing changes in China, partly offset by the move to more RCS in Bangladesh. The decline in RBC, from 10% in 2005 to zero in 2016, largely reflected changes in pricing in Bangladesh in 2009 and 2015 to RCS via RSP. There was a further increase in RCS in 2024 as RSP and BIM disappeared.

The wider Asia region can be broken into smaller sub-regions and these are China (including Hong Kong) and South Asia (India, Pakistan and Bangladesh). Back in 2005, China relied totally on domestic production to supply consumption and the prices were all heavily regulated by the government and classified as RSP. China exported small volumes to Hong Kong at a fixed price (BIM) in 2005 before switching to an OPE contract. China began importing both pipeline gas (from Central Asia, initially Turkmenistan) and LNG in 2007, with volumes growing rapidly to meet rising gas demand, adding pipeline imports from Uzbekistan, Kazakhstan, Myanmar and in 2019 from the Russia Far East. All the pipeline imports were, and still are OPE, while the LNG contracts were all OPE, with a very small volume of spot LNG (GOG).

Figure 62: China Price Formation 2005 to 2024

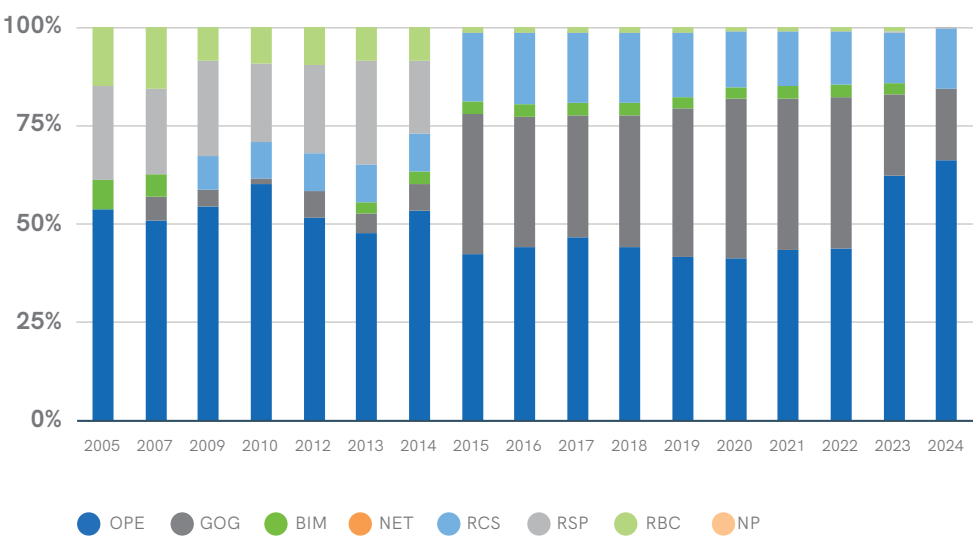


The exposure to more market-related import prices prompted changes in the regulation of domestic production, with a more formal RCS regime being introduced in 2009. In the mid-2010s, China began to introduce more market-related pricing into the sales of domestic gas, initially on a OPE basis and then GOG into the larger consuming sectors. By the 2020s, the RCS sectors were just for residential and fertilisers. While pipeline imports have continued to be all OPE, the composition of LNG imports has been changing, with increasing volumes of spot LNG cargoes and, since 2017, long term contracts of US LNG priced on a Henry Hub basis. Further pricing reforms in China are expected, possibly introducing a greater degree of competition. GOG increased in 2024 as more spot LNG was imported.

For South Asia, in 2005 the sub-region was dominated by domestic production, with a large share of OPE (Pakistan and part of India production), RSP (India) and RBC (Bangladesh). India also imported a small volume of LNG under a fixed price (BIM) contract. Pricing in Bangladesh moved away from RBC to RCS over the 2010s as prices increased to become more economic (other than wholesale prices for the smaller household consumers). Pakistan domestic production has remained OPE but in India, in 2015, much of domestic production pricing was linked to international spot prices in North America and Europe, plus also the Russian wholesale price. However, in 2023 Q2, the Indian regulator changed this formula to oil price linkage (OPE), since the sharp rise in 2022 in spot prices in North America and Europe had led to a large rise in the Indian domestic production price. Rather ironically, the old spot price formula would now be delivering lower prices than the new OPE formula. 2024 was the first full year of the changed formula hence the gain in OPE share again.

All three countries are now importing LNG with a mixture of OPE under long term contracts and GOG (US LNG imports and spot cargoes). In 2023, LNG imports were split 62% OPE and 38% GOG, but the shares have been volatile over time depending on the need for LNG in the sub-region. More rapid LNG volume growth has generally resulted in a higher GOG share and vice-versa.

Figure 63: South Asia Price Formation 2005 to 2024

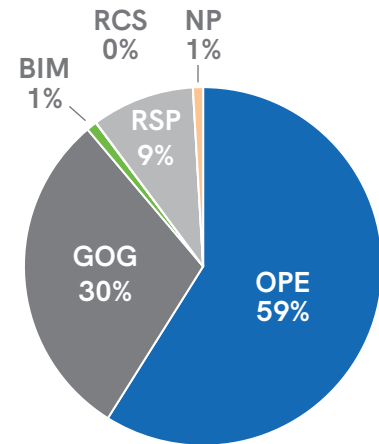


A.4 ASIA PACIFIC

A.4.1: Asia Pacific 2024 Survey Results

Asia Pacific consumption in 2024 was some 9.5% of total world consumption – 403 bcm.

Figure 64: Asia Pacific Price Formation 2024



OPE at 59% totals some 238 bcm, with LNG imports – predominantly in Japan, Korea and Chinese Taipei, but also now including Indonesia, Singapore, Thailand and Malaysia – accounting for 126 bcm. Pipeline imports are some 16 bcm into Singapore, Thailand and Malaysia, while domestic production is 96 bcm – mostly Thailand but also Vietnam, Malaysia, Australia (in part) and the Philippines.

GOG at 30% totals some 121 bcm, of which 87 bcm is LNG imports mainly in Japan, Korea and Chinese Taipei – but also some in Singapore and Malaysia, while the balance is domestic production in Australia and New Zealand.

BIM at less than 1% totals some 4 bcm, comprising domestic production in Japan.

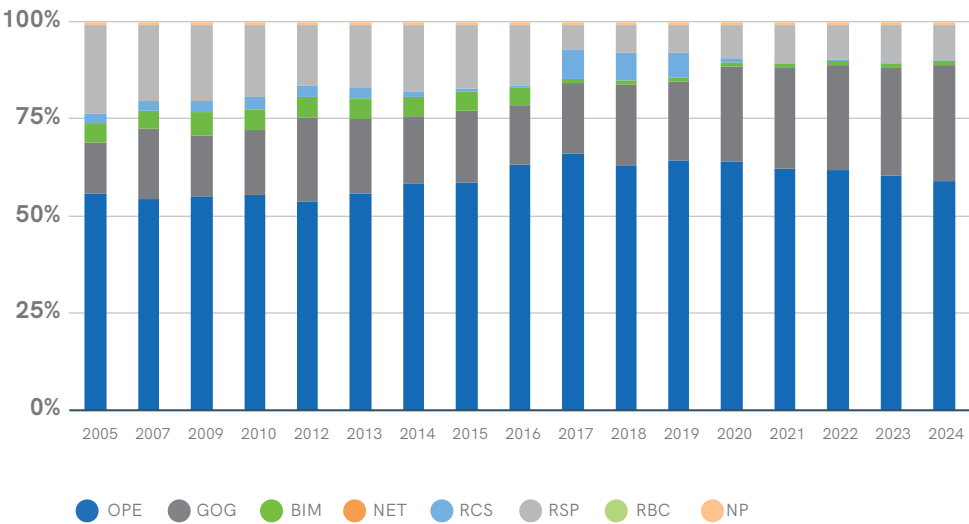
RSP at 9% totals some 37 bcm and is domestic production in Indonesia, while RCS has almost disappeared and is domestic production in South Korea and Chinese Taipei. NP at 1% or 3 bcm is domestic production in Brunei and PNG consumed in the energy industry.

A.4.2: Asia Pacific Comparison 2005 to 2024

Until 2017, there were only minor changes in price formation mechanisms in Asia Pacific since 2005. GOG had risen from 13% in 2005 to as high as 22% in 2012, while OPE was broadly unchanged, with RSP down from 22% to 15%. After 2012, GOG declined through 2016 as spot LNG imports fell. This has since been reversed by the sharp rises in spot LNG imports in the last four years. The gradual decline in RCS to 2016 reflected the changing pricing in Vietnam towards OPE.

In 2017, however, there were significant changes in Malaysia, with pricing moving to RCS and OPE in domestic production away from RSP, which has fallen from 16% in 2012 to 9% in 2020. In 2020 there was a further significant change in Malaysia which changed almost all its domestic production pricing to OPE, with prices being linked to a netback price from LNG exports, and completely in 2021. GOG and RSP rose in 2021, with rising LNG (mostly the traded element) for GOG and increased Indonesia domestic production. The OPE share declined in 2022, as pipeline imports to Thailand and Singapore declined, while GOG increased with more spot LNG into South Korea and Chinese Taipei. There was very little change in the shares in 2023, but in 2024 GOG rose at the expense of OPE, as spot LNG cargoes into the region increased.

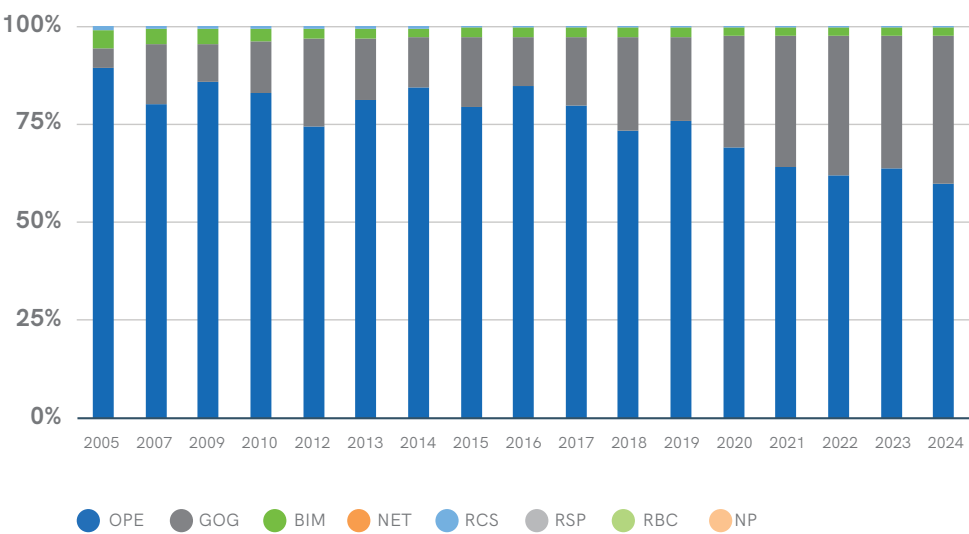
Figure 65: Asia Pacific Price Formation 2005 to 2024



The wider Asia Pacific region can be broken into smaller sub-regions and these are Japan, Korea and Chinese Taipei (as the LNG import dependent markets), the ASEAN³⁰ grouping and Oceania (Australia, New Zealand and PNG).

Japan, Korea and Chinese Taipei, as almost totally dependent on LNG imports, have seen the least change in price formation mechanisms since 2005, with a gradual increase in GOG, especially since 2016 as US LNG entered the market and spot cargoes grew. In 2024, the GOG share of LNG imports was 38%, having risen from a low of 13% in 2016. The small BIM share is Japan domestic production.

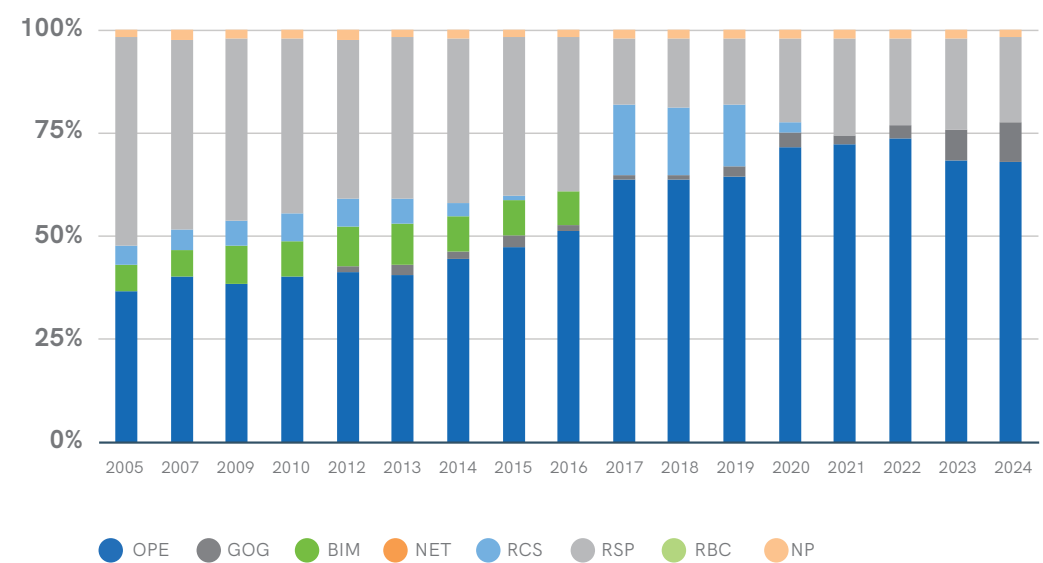
Figure 66: Japan, Korea and Chinese Taipei Price Formation 2005 to 2024



The ASEAN sub-region has been more reliant on domestic production and also trade between the countries. There has consistently been core level of OPE in domestic production, mainly in Thailand, Myanmar and Philippines initially followed by changes in the 2010s in Malaysia, Vietnam and, for a time, in Indonesia, away from regulated pricing – principally RSP.

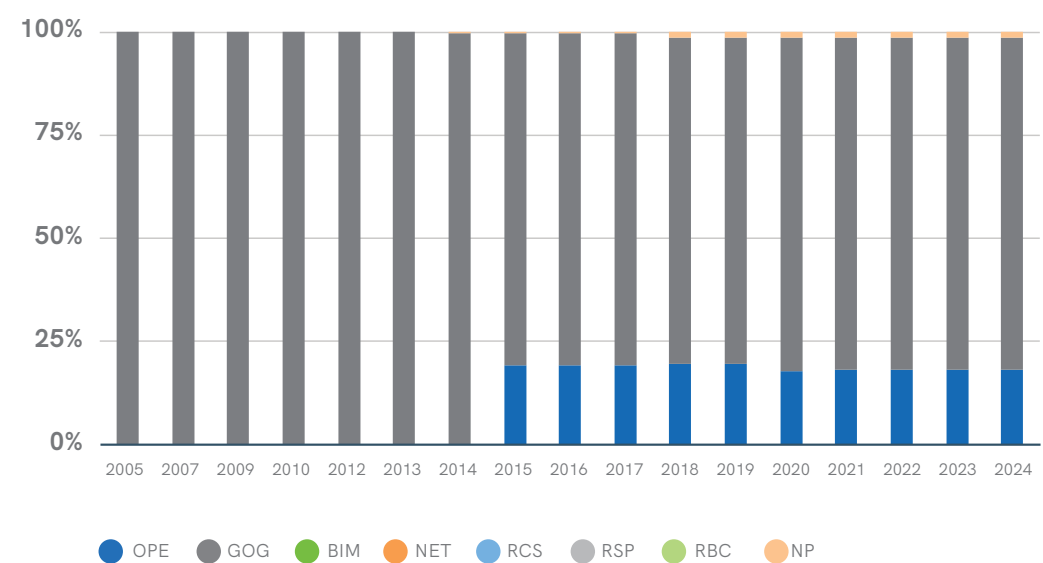
30. Myanmar, Brunei, Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam

Figure 67: ASEAN Price Formation 2005 to 2024



BIM through 2016 was in Indonesia before a switch to OPE, which then changed to RSP in 2020. The pipeline imports have all been OPE since 2005 and cover Thailand's imports from Myanmar, Singapore's imports from Malaysia and Indonesia and Malaysia imports from Indonesia. LNG imports have been predominantly OPE, after 2016, with a high level of long-term contracts, although pre-2016 volumes were very low and largely spot cargoes to Thailand. LNG demand has risen strongly in the sub-region since 2018, growing by some 21 bcm or 170%. GOG LNG imports have grown more in volume terms since 2018, with the GOG share at 53% in 2024.

Figure 68: Oceania Price Formation 2005 to 2024



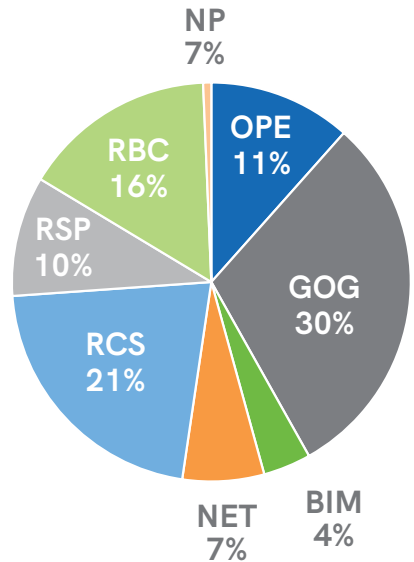
Oceania is essentially Australia and New Zealand and was one of the early areas of the world to fully adopt deregulation and GOG pricing. A small element of OPE came in in 2015 as the supply of gas from domestic production was from fields and basins which were also exporting LNG and netback pricing from the realised LNG price (which was OPE) was introduced.

A.5 LATIN AMERICA

A.5.1: Latin America 2024 Survey Results

Latin America consumption in 2024 was some 3.5% of total world consumption – around 155 bcm.

Figure 69: Latin America Price Formation 2024



OPE at 11.5% totals some 18 bcm, mainly domestic production in Brazil, pipeline imports into Brazil and Argentina.

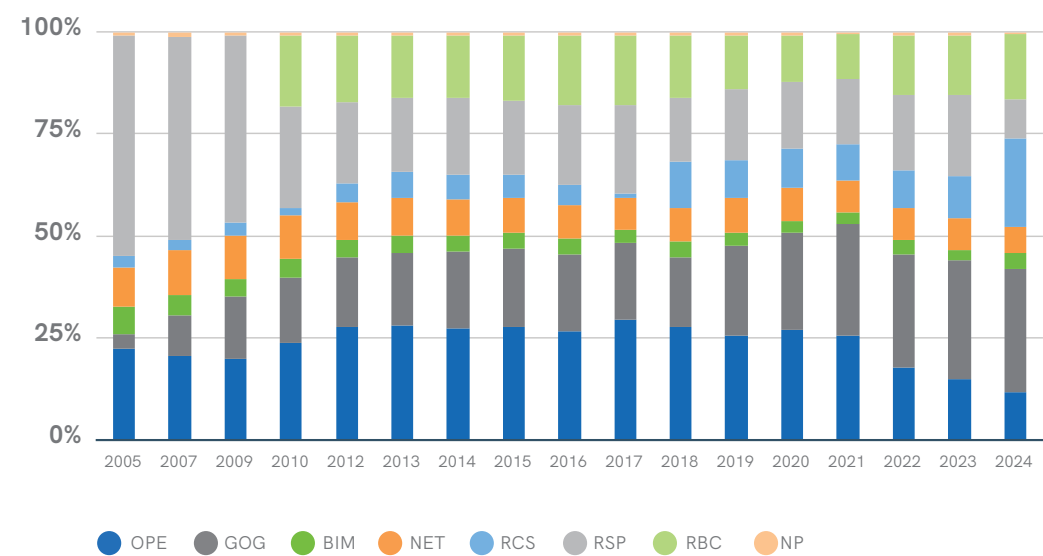
GOG at 30% totals some 47 bcm, of which 27 bcm is domestic production in Argentina, Colombia and Peru. The balance is LNG imports into Brazil, Argentina, Chile, Colombia, Puerto Rico, Jamaica, Panama, El Salvador and Dominican Republic. BIM at 4% totals some 6 bcm and is all domestic production to the power sector in Trinidad. NET at 7% totals some 10 bcm and is the balance of domestic production in Trinidad used as a feedstock in petrochemicals.

RCS at 21% totals some 33 bcm and is largely domestic production in Argentina. RBC at 16% totals some 24 bcm and is domestic production in Venezuela. RSP at 10% totals some 15 bcm and comprises domestic production in Peru, Ecuador and Bolivia, plus a small amount in Brazil. NP at 1% or 1 bcm is Cuban domestic production.

A.5.2: Latin America Comparison 2005 to 2024

The changes in price formation mechanisms in Latin America, between 2005 and 2024, have seen a rise in GOG from 4% to 30%, a decline in RSP from 54% to 10% and a rise in RBC from 0% to 16% - the latter almost all in Venezuela. RCS has also risen from 3% to 21%. The rise in GOG in part is due to rising spot LNG imports in Argentina and Brazil, and a switch away from RSP to GOG in Argentina, and, eventually, a complete switch from RCS to GOG in Colombia. In Argentina, this reflected producers and marketing entities, being allowed to sell gas at unregulated prices to large eligible customers, such as power plants. The decline in OPE in 2022 reflected lower pipe and LNG imports, in part due to lower consumption with the regulated domestic production increasing share. In 2023 and 2024, the GOG and regulated shares grew at the expense of the OPE share, largely as a result of the decline in gas demand and production (which is mostly OPE) in Brazil, and rising LNG imports. In 2024 there was a big switch away from RSP to RCS in Argentina.

Figure 70: Latin America Price Formation 2005 to 2024

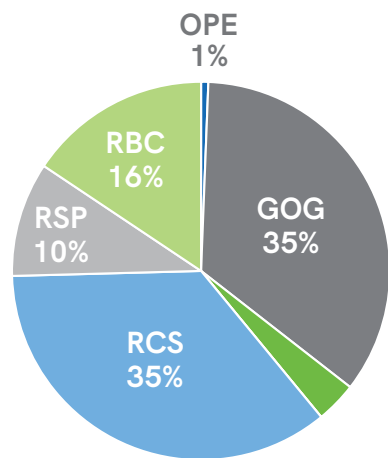


A.6 FORMER SOVIET UNION

A.6.1: Former Soviet Union 2024 Survey Results

Former Soviet Union consumption in 2024 was some 17% of total world consumption – around 718 bcm.

Figure 71: Former Soviet Union Price Formation 2024



RCS at 35% is the largest share, totalling some 255 bcm and is almost all the major proportion of domestic production in Russia together with most of the domestic production in Azerbaijan.

GOG is the next largest share at 35% totals some 251 bcm and is largely domestic production to the eligible large customer market in Russia, but also pipeline imports into Ukraine and Moldova at hub prices from Europe.

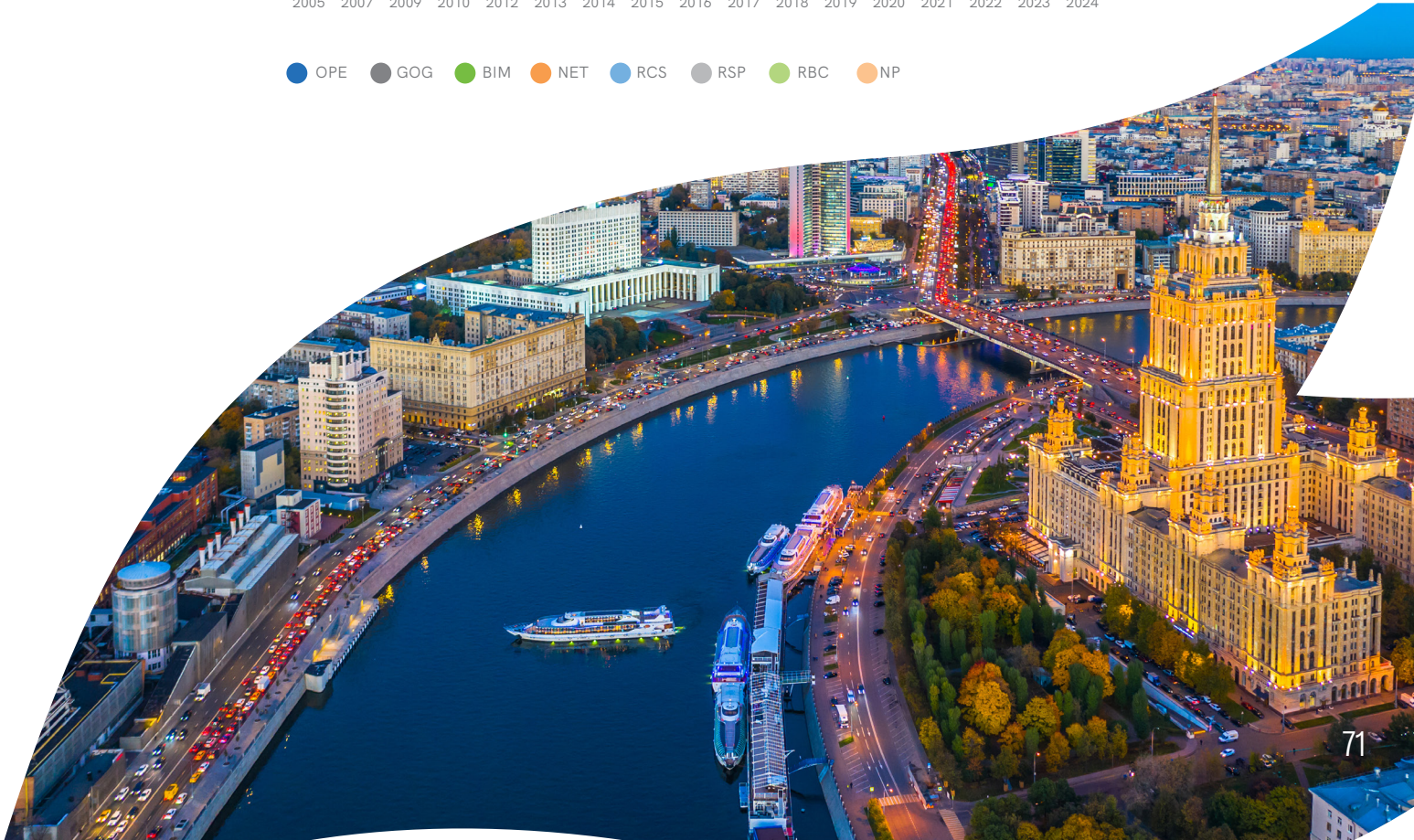
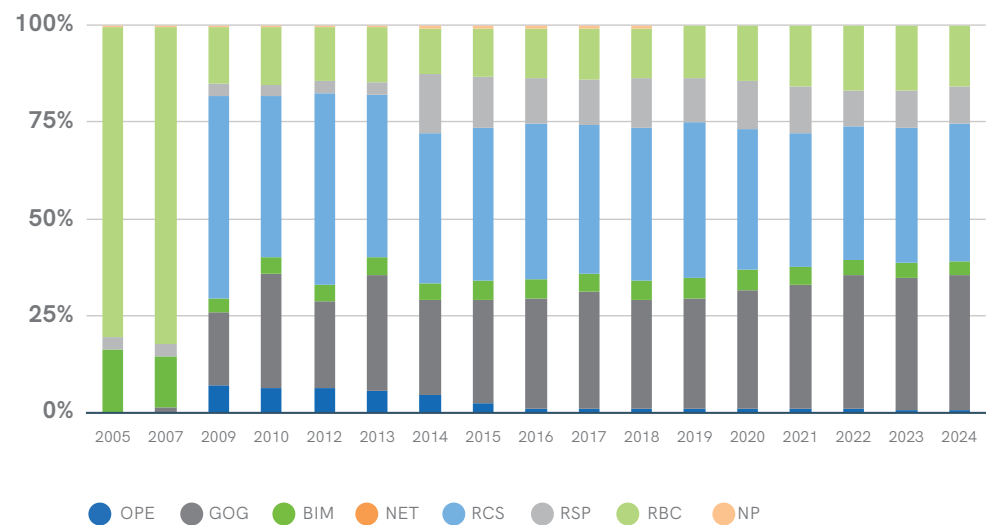
RBC at 16% or 112 bcm is domestic production in Kazakhstan, Turkmenistan, Uzbekistan and a small amount in Azerbaijan, while RSP at 10% or 70 bcm is a proportion of Russia domestic production (sold to the population).

OPE at 1% or 4 bcm is all pipeline imports into Russia, while BIM at 3% or 25 bcm represents other pipeline imports in the FSU region, principally from Russia to Belarus, but also Armenia, Georgia, Kazakhstan, Kyrgyzstan and Tajikistan.

A.6.2: Former Soviet Union Comparison 2005 to 2024

The Former Soviet Union is another region, like Europe, where there have been significant changes in price formation mechanisms, largely based around Russia. From having domestic production completely in the RBC category in 2005, there was a switch to GOG as the independent producers began to compete with each other and Gazprom to sell gas to the power sector and large industrials, and the rising Gazprom regulated prices saw a switch from RBC to RCS, although in 2014 the regulated pricing to the population saw a move from RCS to RSP, maintained in 2015 and 2016. The other change was in intra-FSU trade where pricing switched from BIM to OPE, particularly in the Russia to Ukraine trade, and then during 2015 when Ukraine began importing from Europe at hub prices, so switched to GOG from OPE. RSP lost share in 2019, with Russia and Ukraine volumes lower, while NP disappeared from Turkmenistan which moved wholly to RBC. In 2020, there was a further switch from RCS to GOG in Russia, and in 2021 and 2022 GOG rose further reflecting rising gas demand in Russia. 2023 and 2024 saw little overall change although there was more GOG domestic production in Russia as demand rose.

Figure 72: Former Soviet Union Price Formation 2005 to 2024

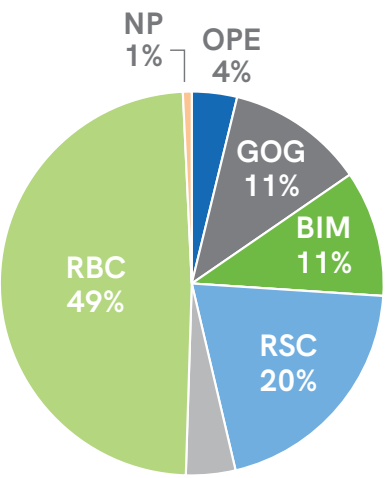


A.7 AFRICA

A.7.1: Africa 2024 Survey Results

African consumption in 2024 was some 4% of total world consumption – around 168 bcm.

Figure 73: Africa Price Formation 2024



RBC at 49% or some 82 bcm, has the largest share and is domestic production in Egypt, Algeria and Libya.

RCS at 20% or some 34 bcm is domestic production in Egypt and Nigeria plus part of pipeline imports from Nigeria to Ghana, Benin and Togo.

RSP at 7% or some 6 bcm is domestic production in Equatorial Guinea, Gabon, Ghana, Morocco, Mozambique and Tanzania. OPE at 4% or some 6 bcm comprises a proportion of the pipeline imports from Nigeria to Ghana, Benin and Togo, as well as domestic production in Tunisia, South Africa and part of Ivory Coast and Tanzania.

GOG at 11.5% or some 19 bcm is part of domestic production in Nigeria (sales to the non-power sector) and LNG imports into Egypt, plus pipeline imports into Morocco.

BIM at 10.5% or some 18 bcm is pipeline imports into South Africa from Mozambique and the balance of domestic production in Ivory Coast, part of domestic production in Ghana, plus domestic production in Cameroon.

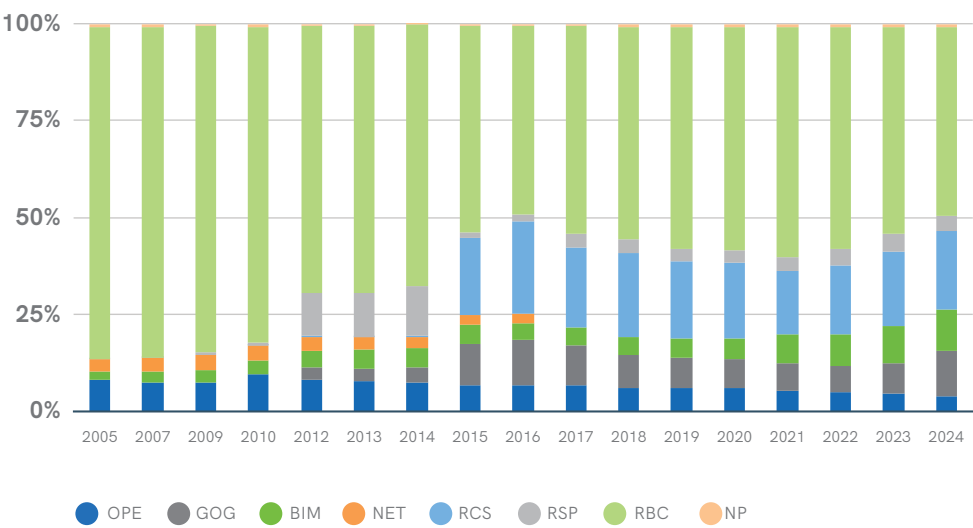
NP at 1% is Angola.

A.7.2: Africa Comparison 2005 to 2024

There was very little change in price formation mechanisms in Africa between 2005 and 2014, apart from the switch to RSP from RBC in 2012 in Nigeria, with some GOG as non-power markets were freed up. However, in 2015, Nigerian domestic production moved again from RSP to RCS as prices to power plants were increased, and also in Egypt there was a similar partial move away from RBC to RCS in some sectors, plus the start-up of spot LNG imports. In 2017, RBC gained at the expense of RCS and NET in Egypt as prices to the power sector were kept down and regulated to fertiliser plants. The main changes in 2018 were a decline in GOG as spot LNG imports into Egypt fell sharply and an increase in RCS in Egypt with more consumption met by domestic production. In 2019 and 2020, OPE and GOG declined as there was less trade, with RCS rising in

2019 as Egyptian production increased. The region remains dominated, however, by RBC, with gas prices largely subsidised. In 2021, GOG increased as South Africa switched in domestic production to prices based on international hub prices and Nigeria demand increased, with OPE declining. In 2022, GOG gained at the expense of OPE with a change in pipeline import pricing into Tunisia and the cessation of pipeline imports into Morocco from Algeria, partly replaced by spot imports from Spain. In 2023, RBC gained at the expense of RCS in Egypt as the composition of demand changed. In 2024, GOG rose as LNG imports returned to Egypt.

Figure 74: Africa Price Formation 2005 to 2024

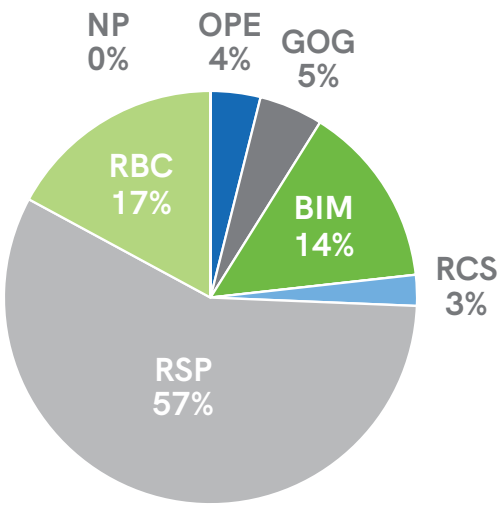


A.8 MIDDLE EAST

A.8.1: Middle East 2024 Survey Results

Middle East consumption in 2024 was some 14% of total world consumption – around 603 bcm.

Figure 75: Middle East Price Formation 2024



RSP at 57% or 345 bcm dominates the region and is domestic production in Iran, Saudi Arabia and the UAE with smaller amounts in Oman and Bahrain.

RBC at 17% or 103 bcm is domestic production in Iran, Iraq and Syria.

RCS at 2% or 14 bcm is part of Iran domestic production.

BIM at 14% or 87 bcm is partly pipeline imports from Qatar to UAE and Oman and domestic production in Qatar and part of Israel domestic production.

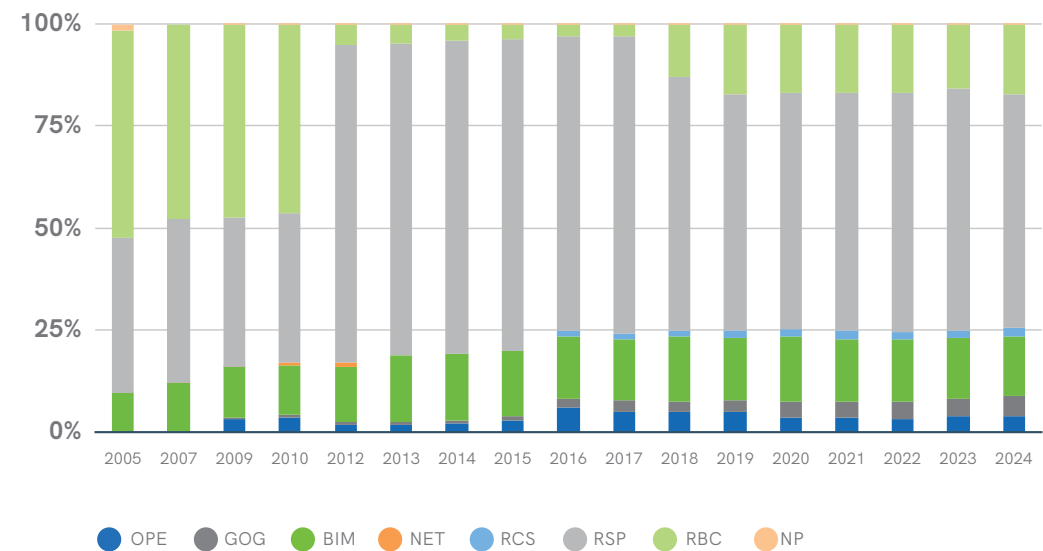
OPE at 4% or 23 bcm is largely pipeline imports into Iran from Turkmenistan, some LNG imports into Kuwait, and most of domestic production in Kuwait.

GOG at 4% or 23.5 bcm includes spot LNG imports into Kuwait, Jordan, UAE and Israel, domestic production delivered to petrochemical plants in Iran, where prices are partly linked to international hub prices, and domestic production in Israel. NP is almost zero and is gas consumed in Yemen.

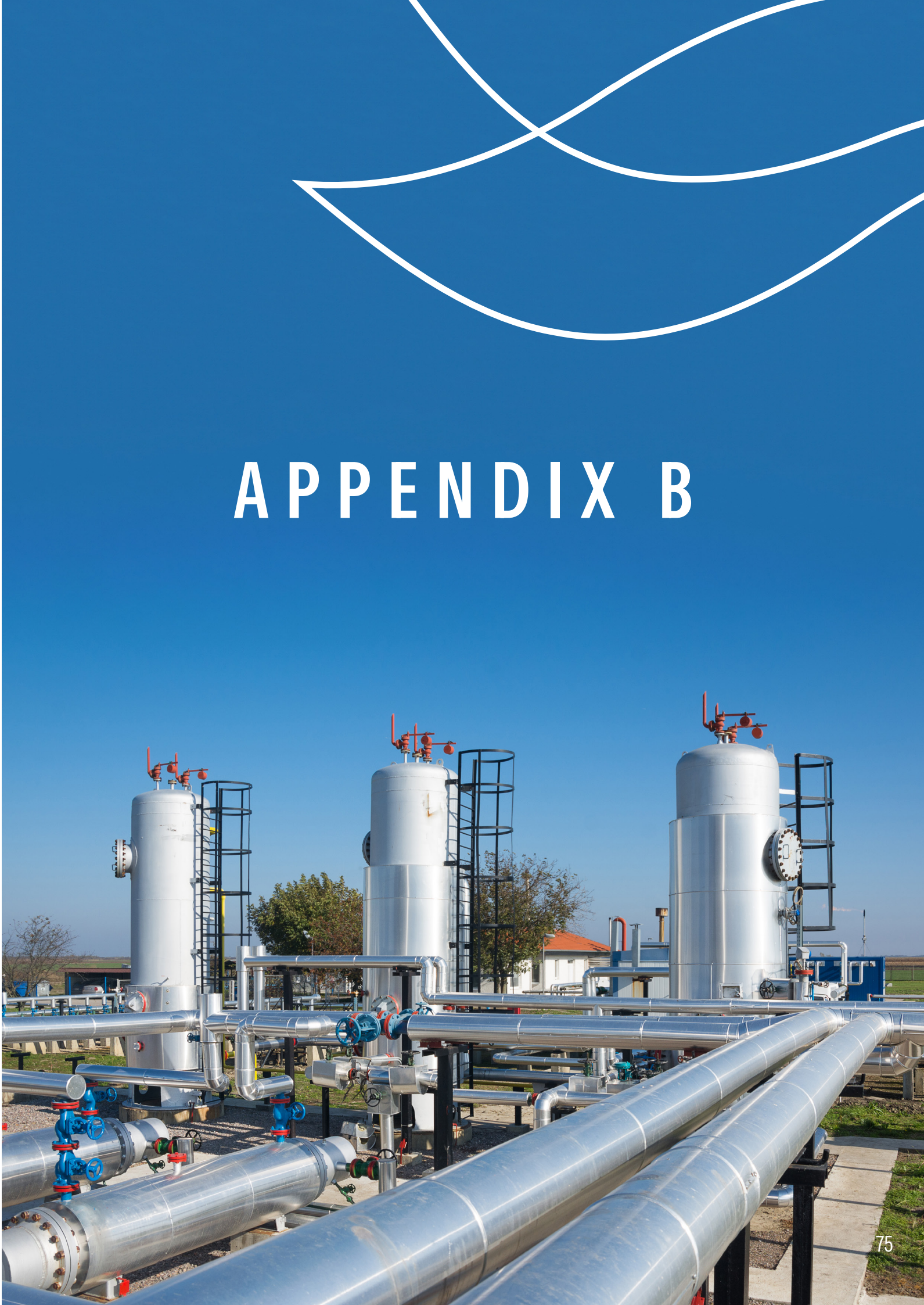
A.8.2: Middle East Comparison 2005 to 2024

The changes in price formation mechanisms in the Middle East have almost totally taken place between 2010 and 2012, when prices were increased significantly in Iran, moving from the RBC category to the RSP category. The other change was in small quantities of OPE and GOG as LNG began to be imported into Kuwait, UAE and, in 2015, into Jordan, plus the change in gas pricing to petrochemical plants in Iran. Kuwait also moved domestic production more towards OPE in 2016. LNG imports are, however, slowly increasing in the region which is introducing more market related pricing in the form of both OPE and GOG. In 2020, GOG increased as a result of changes in domestic pricing in Israel. There only change between 2021 and 2024, has been the continuing rise in GOG with rising Israel and Iran domestic production.

Figure 76: Middle East Price Formation 2005 to 2024



APPENDIX B



SURVEY METHODOLOGY

B.1: BACKGROUND

The idea for a survey of wholesale gas price formation mechanisms arose at the beginning of the triennium leading to the 2009 World Gas Conference. The Strategy, Economics and Regulation Programme Committee (PGCB)³¹ of the International Gas Union (IGU) had set up a new sub-group to consider gas pricing, with a key remit to carry out a comprehensive analysis of gas price formation mechanisms. The sub-group decided to carry out a survey of current pricing mechanisms around the world, not only for gas traded internationally, but also for gas produced and consumed within countries. IGU members were surveyed and provided the data and the survey responses were collated and analysed by the sub-group. The 2009 World Gas Conference in Buenos Aires presented the results of the surveys for the years 2005 and 2007. Two further surveys for the years 2009 and 2010 were undertaken and presented at the 2012 World Gas Conference in Kuala Lumpur. Three surveys were undertaken and presented at the 2015 World Gas Conference in Paris, covering the years 2012, 2013 and 2014. The 2015 was the first in the triennium for the 2018 World Gas Conference in Washington DC, 2016 was the second and 2017 the third. The 2018, 2019 and 2020 surveys were meant to be the three leading up to the 2021 World Gas Conference in Daegu, South Korea, but this was postponed until 2022, so the 2021 survey was published after the World Gas Conference. The 2022, 2023 and 2024 surveys were conducted in the triennium to the 2025 World Gas Conference to be held in Beijing. In the 2024 survey responses covered some 96% of total world consumption. As in last two surveys, responses were difficult to get for some countries, especially in the Former Soviet Union, following the Russia war with Ukraine, but estimated data on the remaining markets, where responses were not received, was researched independently by Mike Fulwood.

B.2: DATA COLLECTION

The focus of the gas pricing sub-group, and the surveys, was very much on wholesale prices, which can cover a wide range. In fully liberalised traded markets, such as the USA and the UK, the wholesale price would typically be a hub price (e.g. Henry Hub or the NBP). In many other countries, where gas is imported, it could typically be a border price. The more difficult cases are countries where all gas consumed is supplied from domestic production, with no international trade (either imports or exports) and the concept of a wholesale price is not recognised. In such cases the wholesale price could be approximated by wellhead prices or city-gate prices. Generally, the wholesale price is likely to be determined somewhere between the entry to the main high-pressure transmission system and the exit points to local distribution companies or very large end users. The initial data collection was done on a country basis. The data were then collated to a regional level using the regions shown in the figure below. Most of the regions are defined along the usual geographic lines, although Mexico is in North America, and divides Asia into a region including the Indian sub-continent plus China, called Asia, and another region including the rest of Asia plus Australasia which is called Asia Pacific.

In terms of the allocation between different price formation mechanisms in any country, the general rule is that the wholesale price at the “point of first sale” in the country should be considered. For example, if gas enters a country under an oil-indexed contract and is then re-traded at a hub it is still considered to be in the oil price escalation (OPE) category.

IGU members were surveyed and provided the data and the survey responses were collated and analysed by the sub-group.

31. The Wholesale Gas Pricing Group began life as Sub Group 2 of PGCB and was chaired in the period leading up to the 2009 World Gas Conference by Runar Tjersland of Statoil and between 2009 and 2018 by Mike Fulwood, formerly of Nexant, but now a Senior Research Fellow at the Oxford Institute for Energy Studies. It is now part of the IGU's Strategy Committee and has been re-titled as the Gas Pricing Group. The 2018 through 2024 surveys were organised by Mike Fulwood, under the guidance of the IGU Secretariat and the Strategy Committee.

Figure 77: Regions



Data for each country were collected in a standard format. As an example, a data collection form for the UK is shown in the figure below. Individual country gas demand may be supplied from a combination of three sources – domestic production, pipeline imports and LNG imports (storage is ignored for the purpose of this analysis). The demand is allocated pro rata to domestic production and imports (price formation of gas exported is not collected, this is collected at the country of import). The volume figures on domestic production and imports allocated to the different price formation mechanisms in this report exclude the gas which is re-exported.

For each of these three sources data was collected separately on what percentage of the wholesale price for that category is determined by each mechanism. In some countries, one single mechanism was found to cover all transactions and that mechanism, therefore, was allocated 100%. In many cases, however, several mechanisms were found to be operating, in which cases estimates were made of the percentages for each price mechanism. The only constraint is that the total for each source of gas – domestic production, pipeline imports and LNG imports – must add up to 100%.

Information was also collected on wholesale price levels. This covered the annual average price, highest monthly average price and the lowest monthly average price. All prices were converted to \$ per MMBTU. A comments section was included to identify and acknowledge the source of the information and any other useful information.

All the data, in this report, on gas volumes for consumption, production, imports and exports is taken from the IEA database, supplemented where necessary by any specific country and/or regional knowledge. It should be noted that 2024 volume data is still preliminary and may be adjusted once the final estimates are published later this year by the IEA. In addition, previous years may also be revised. These revisions may lead to small changes in the percentages for each price category when country data is aggregated at both the regional and world level.

Figure 78: Data Collection Form

Country	United Kingdom					
Region	Europe					
Volumes 2024: BCM	Consumption	Production	Imports		Exports	
			Pipeline	LNG	Pipeline	LNG
	62.3	30.1	31.2	10.4	10.8	0.0
Wholesale Price Formation	Domestic Production		Imports			
			Pipeline	LNG		
Oil Price Escalation						
Gas-on-Gas Competition	100.0%		100.0%		100.0%	
Bilateral Monopoly						
Netback from Final Product						
Regulation: Cost of Service						
Regulation: Social and Political						
Regulation: Below Cost						
No Price						
Not Known						
Total	100.0%		100.0%		100.0%	
Estimated 2024 Wholesale Price Range (\$/MMBTU)	Average		High		Low	
	\$10.72		\$14.30		\$8.44	

B.3: ANALYSING THE RESULTS

In looking at the different price formation mechanisms, the results have generally been analysed from the perspective of the consuming country. Within each country gas consumption can come from one of three sources, ignoring withdrawals from (and injections into) storage – domestic production, imported by pipeline and imported by LNG. In many instances, as will be shown below, domestic production, which is not exported, is priced differently from gas available for export and also from imported gas whether by pipeline or LNG. Information was collected for these three categories separately for each country and, in addition, pipeline and LNG imports were aggregated to give total imports and adding total imports to domestic production gives total consumption. For each country, therefore, price formation could be considered in 5 different categories:

- Domestic production (consumed within the country, i.e. not exported)
- Pipeline imports
- LNG imports
- Total imports (pipeline plus LNG)
- Total consumption (domestic production plus total imports)

Each country was then considered to be part of one of the IGU regions, as described above, and the 5 categories reviewed for each region. Finally, the IGU regions were aggregated to give the results for the World as a whole.

As well as collecting information on price formation mechanisms by country, information was also collected on wholesale price levels in each country – an annual average price and a range of high and low prices within the year. Comparisons of wholesale price levels, however, need to be treated with caution. The wholesale price can cover different points in the gas chain – wellhead price, border price, hub price, city-gate price – so the comparison of price levels is not always a like for like comparison.

APPENDIX C

GLOSSARY

BCM: Billions of standard cubic metres of natural gas

MMBTU: Millions of British Thermal Units – measurement of the energy content of natural gas
Price Formation Mechanisms: Categorisation of different methods of how wholesale prices are determined.

Spot LNG: Single LNG cargoes or multiple tenders or contracts under one year duration.
Trading or Traded Markets: Price is determined by the interplay of supply and demand and is traded over a variety of different periods (daily, monthly, annually or other periods). Trading takes place at physical hubs (e.g. Henry Hub) or notional hubs (e.g. NBP in the UK). This will also include longer term contracts into markets where there is little or no trading at hubs, but where the price is linked to hub prices in markets where there is liquid trading.

Wholesale Price: Typically, a hub price such as Henry Hub, but could be a border price or in some countries a wellhead or city-gate price. Generally, the wholesale price is likely to be determined somewhere between the entry to the main high-pressure transmission system and the exit points to local distribution companies or very large end users.





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