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Wholesale Gas Price Survey - 2015 Edition

- A global review of price formation mechanisms 2005 - 2014



INTERNATIONAL GAS UNION
UNION INTERNATIONALE DU GAZ

Wholesale Gas Price Formation

PGCB STUDY GROUP 2



Gas: Sustaining Future Global Growth
International Gas Union

Foreword

I am pleased to once again announce a new edition of the report on “Wholesale Gas Price Formation”. The 2015 edition is the seventh in a row which started in 2006 and have been prepared by Study Group 2 of the IGU Strategy Committee, under the leadership of Fethi Arabi chair of PGC B. On behalf of IGU I would like to thank all those involved for their efforts.

The response to the survey behind the report is very comprehensive and now covers 94% of the total world consumption. Some of the previous reports of the global review of wholesale gas price levels and price formation mechanisms are available on the IGU website - www.igu.org.

Historically, gas prices have not been in the news to the same extent as oil prices. This is changing as the share of gas in global energy consumption continues to increase, volumes of internationally traded gas are greater than ever before and different price formation mechanisms have had serious commercial implications both for producing and consuming nations. When looking at future energy scenarios they all are positive about the long-term future of gas. Whether it is the International Energy Agency (IEA), the World Energy Council (WEC), Shell or ExxonMobil, they all forecast significant growth of gas demand in the decades ahead. Indeed, in most scenarios, gas will be the world’s biggest energy source in 2050.

This report sets out the large variations in wholesale gas prices across the world that result from the different prevailing price formation mechanisms.

Natural gas is an abundant resource, it is clean and cost-competitive, and should therefore play an important role in the mitigation of climate change in every region of the world. However, the way wholesale gas prices will be determined in the future will have a significant influence on sustainable market growth.

Promoting international understanding of natural gas pricing and wholesale gas price formation trends is important for the future success of the global gas industry by enabling participants in new and established gas regions to learn more about the different approaches that are being used. It is my hope that this publication can serve as an example of how we can all benefit when vital information is carefully gathered, analysed and shared.

Any questions on this report can be addressed to the Chair of Study Group 2, Mike Fulwood of Nexant at mfulwood@nexant.com



May 2015

Pål Rasmussen
Secretary General of IGU



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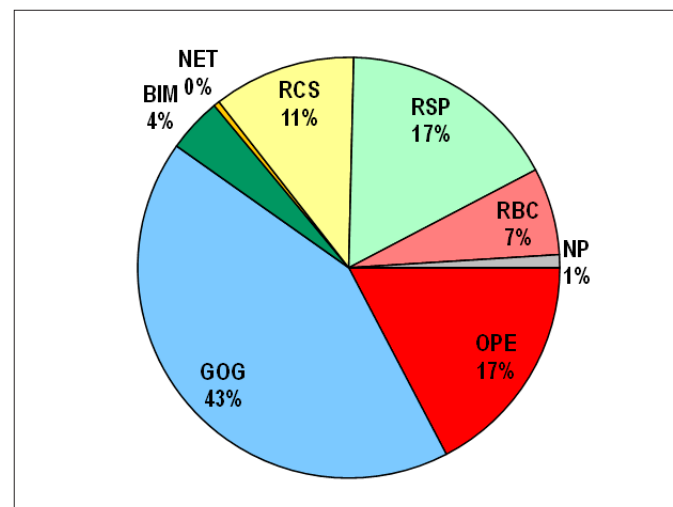
Section 1. Key Findings

The 2014 IGU Wholesale Gas Price survey is the seventh to be undertaken in a series which began at the start of the 2006 to 2009 triennium culminating in the World Gas Conference in Buenos Aires. Prior to the 2014 survey, previous surveys were undertaken for the years 2005, 2007, 2009, 2010, 2012 and 2013. The seven surveys are now indicating the changing trends in wholesale price formation mechanisms over a period of rapid and significant change in the global gas market. In the 2014 survey responses were received for some 71 out of 109 countries, but these responses covered 94% of total world consumption. Data on the remaining countries, where responses were not received, was researched by Nexant.

The share of gas on gas competition stands at 43% of total world gas consumption...

The 2014 survey showed again that gas on gas competition has the largest share in the world gas market. Out of total world consumption of some 3,520 bcm, gas on gas competition has a share of 43%, totalling around 1,495 bcm, dominated by North America at 936 bcm, followed by Europe at some 292 bcm and the Former Soviet Union at around 144 bcm (albeit a different type of GOG – see below). In all gas on gas competition can now be found in some 46 countries, in one form or another, and in all regions except Africa.

Figure 1.1 World Price Formation 2014



The different types of price formation mechanism are described in the box on the next page:

TYPES OF PRICE FORMATION MECHANISMS	
Oil Price Escalation (OPE)	The 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 price is determined by the interplay of 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 (NYMEX 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 is spot LNG, 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 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 this would be one year. There may be a written contract in place but often the arrangement is at the Government or state-owned company level. Typically 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.
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, 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, 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 price is <i>knowingly</i> 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 fertilizer 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.

The share of oil price escalation or oil indexation stands at some 17%, and totals around 610 bcm and is predominantly Asia Pacific (230 bcm), Europe (153 bcm) and Asia (130 bcm). Oil price escalation is widespread being found in some 60 countries, including virtually every country in Europe, and in all regions except North America.

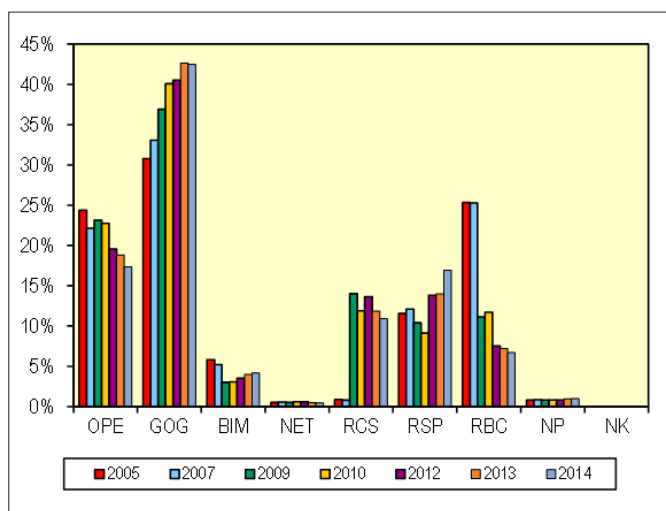
The three regulated categories – regulation cost of service, regulation social and political and regulation below cost – account in total for some 35%, or around 1,215 bcm; with regulation cost of service in 16 countries, mainly the Former Soviet Union (Russia) and Asia (China); regulation social and political in 26 countries, with the Middle East dominating –

Iran, Saudi Arabia and the UAE; and regulation below cost in 13 countries, mainly the Former Soviet Union – Kazakhstan, Turkmenistan and Uzbekistan, Africa – Egypt and Algeria, and Latin America – Venezuela.

...the share of gas on gas competition was unchanged between 2013 and 2014

The share of gas on gas competition was virtually unchanged between the 2013 and 2014 surveys, reflecting a rise in the share in Europe, rising consumption in North America, offset by a decline in the share in Russia. The level of spot LNG imports was slightly down. Oil price escalation declined again in 2014, largely in Europe, while the regulated categories increased share between 2013 and 2014 as a result of relatively faster consumption growth, rather than any change in price formation mechanisms.

Figure 1.2. World Price Formation 2005 to 2014



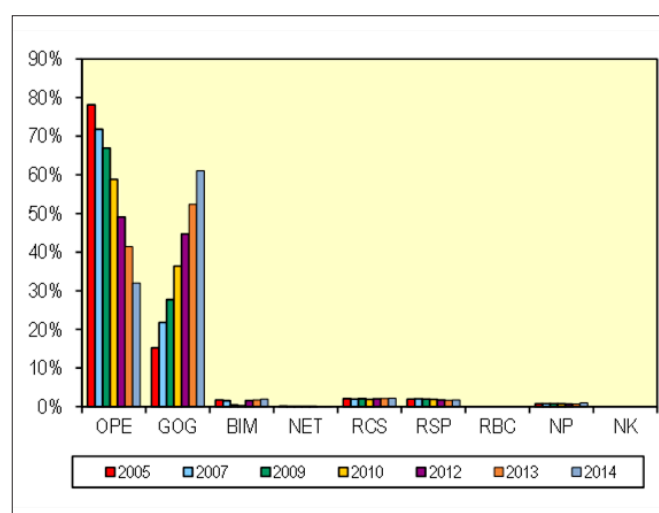
Overall over the 2005 to 2014 period, the share of gas on gas competition has risen by 12 percentage points, while oil price escalation has declined by 7 percentage points. Bilateral monopoly has declined by 1.5 percentage points, while in the regulated categories regulation cost of service has risen by over 10 percentage points, regulation social and political has risen by almost 5 percentage points and regulation below cost has declined by 18 percentage points.

In Europe gas on gas competition has risen to over 60% of total consumption, with oil price escalation at around half this level.....

The major overall changes, in the 2005 to 2014 period, have been the continuous move away from formal oil price escalation

to gas on gas competition in Europe, and also in Russia as the independents and Gazprom competed for sales to large eligible customers such as power plants. This is clearly a different kind of gas on gas competition from the liquid trading markets in North America and Europe but reflects the fact that there are multiple buyers and sellers, distinguishing it from the bilateral monopoly category, where there would be a single dominant buyer and/or seller.

Figure 1.3. Europe Price Formation 2005 to 2014



In Europe the move from formal oil price escalation to gas on gas competition, has seen the latter's share increasing from 15% in 2005 – when oil price escalation was 78% – to 61% in 2014 – when oil price escalation had declined to 32%. 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 have also seen the introduction of hybrid pricing formulas where oil indexation is partly maintained but within a price corridor set by hub prices.

The change in price formation mechanisms in Europe was not universal across the region. Northwest Europe¹ has seen the most dramatic change in price formation mechanisms, with a complete reversal from 72% oil price escalation and 28% gas on gas competition in 2005 to 12% oil price escalation and 88% gas on gas competition in 2014, as a result of increased hub trading and contract renegotiations, as noted above. Central Europe² has also, more recently, seen significant changes. Oil price escalation has declined from 85% in 2005 to 32% in 2014, while gas on gas competition has increased from almost zero in 2005 to over 50% in 2014, principally reflecting increased imports of spot gas, some re-exported from Germany, with some element of

contract renegotiation. There has been less change in other areas of Europe such as the Mediterranean³, where oil price escalation has declined from 100% in 2005 to around 64% in 2014 with gas on gas competition rising from nothing to 27%, largely reflecting spot LNG imports with significant changes in pipeline imports into Italy in the last year, as a result of contract renegotiation. In Southeast Europe⁴ there is only around 4% gas on gas competition.

...but oil price escalation has gained ground in Asia...

While oil price escalation has lost share in Europe and, to a much lesser extent, in Asia Pacific, there have been gains in share in Asia with a rise from 35% to 45% between 2005 and 2014 as China began importing more LNG, pipeline gas from Turkmenistan together with domestic pricing reform in two Chinese provinces, plus India's pricing for LNG from Qatar changing.

Figure 1.4. Asia Price Formation 2005 to 2014

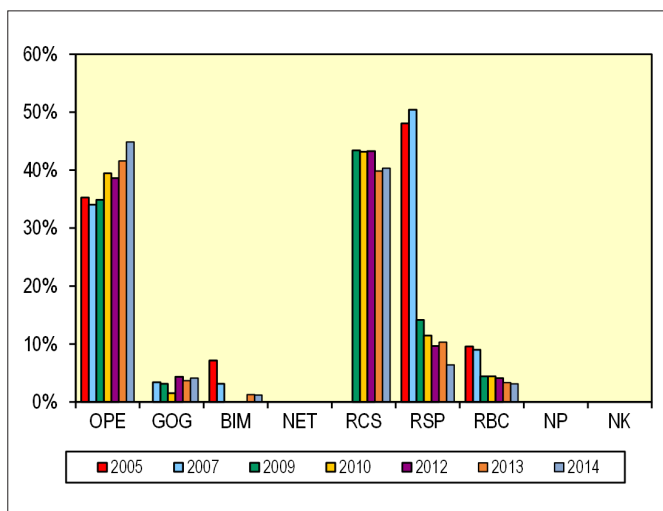
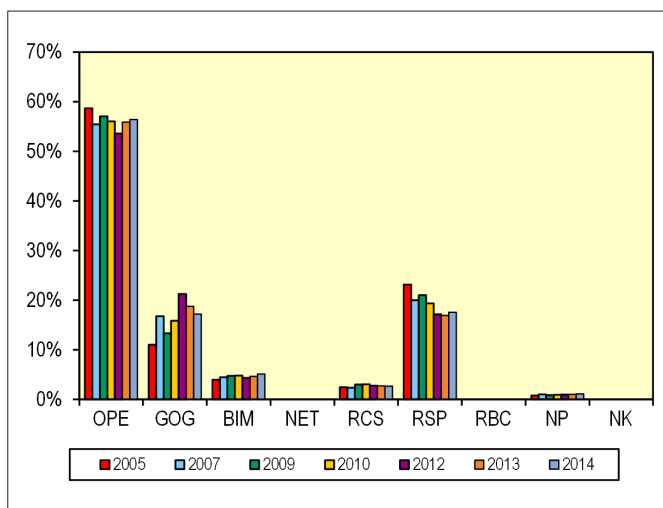
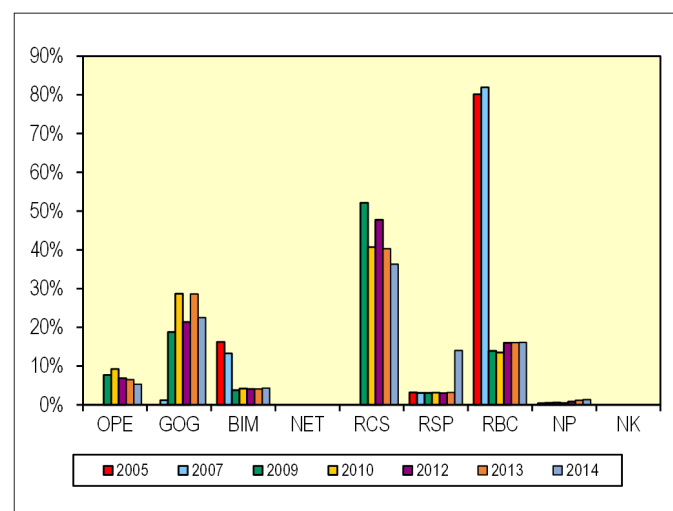


Figure 1.5. Asia Pacific Price Formation 2005 to 2014



In the Former Soviet Union intra-regional trade, pricing had mostly switched from bilateral monopoly – effectively annual fixed price arrangements – to oil price escalation around 2009. Finally in the Middle East there have been very small amounts of oil price escalation since 2009 when pricing under the Turkmenistan to Iran contract changed.

Figure 1.6. Former Soviet Union Price Formation 2005 to 2014



...regulated pricing continues to move away from subsidies in many regions

Apart from the changes concerning gas on gas competition and oil price escalation in Europe and Asia Pacific, there have also been significant changes in the regulated pricing categories. The increases in regulated pricing and policy changes in Russia not only saw a switch towards gas on gas competition, but also a switch from the subsidised regulation below cost in 2009 to regulation cost of service as Gazprom finally stopped losing money on their domestic gas sales, although with the freeze in regulated prices in 2014, there was a partial switch back to regulation social and political.

There were also significant changes in China as pricing reforms, again around the 2009 period, saw domestic production prices being more formally regulated and the price formation mechanism changing from regulation social and political to regulation cost of service. Similarly, and more recently, in Iran prices were raised significantly with the category changing from regulation below cost to regulation social and political in 2012, and a similar change in Nigeria in 2014, as prices increased.

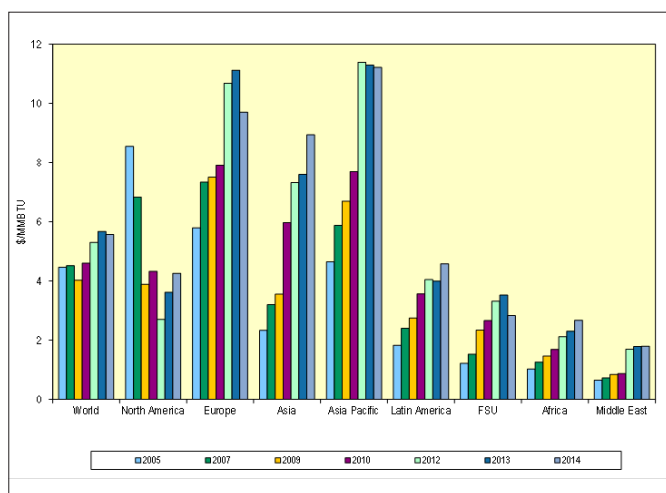
¹Belgium, Denmark, France, Germany, Ireland, Netherlands, UK
²Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland
³Greece, Italy, Portugal, Spain, Turkey
⁴Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia

The continuous rise in wholesale prices, outside North America, since 2005, was largely halted in 2014, except in Asia

The rise in wholesale prices in Europe and Asia Pacific, over the last few years, and the decline in US prices, has been well documented and studied, but prices have also risen in Asia, largely due to increases in prices in China, particularly, and India, both as more gas was imported and regulated domestic prices were increased. The rise in China was especially significant in 2014.

Less well documented, however, has been the general rise in prices in other regions, such as Latin America, where average prices have more than doubled and in the Former Soviet Union, where average prices have almost tripled, largely due to the rise in regulated prices in Russia, although in 2014 prices in US\$ terms declined again. In Africa, where over 70% of prices are effectively subsidised, there have also been price increases, with the largest consumer Egypt raising prices, although remaining with subsidies, and more recently Nigeria. Also in the Middle East prices have risen slowly, with a significant increase in 2012 over 2010, as a result of the regulatory changes in Iran, maintained since 2012

Figure 1.7 Wholesale Price Levels 2005 to 2014 by Region



The increase in gas on gas competition has not all been in the trading markets

Gas on gas competition is not one homogenous category, and while the dominant mechanism can be considered as trading, as in the North American and European markets, there are also markets where there is no hub trading but there are multiple buyers and sellers entering into bilateral agreements – Australia, Russia and Argentina, plus spot LNG imports. Out of the increase in gas on gas competition of 12 percentage points between 2005 and 2014, 5 percentage points has come from the bilateral category, 5.5 percentage points from trading – entirely in the European market – and 1.5 percentage points from spot LNG. The rise in the bilateral category in Russia and Argentina are the principal examples of changes in pricing mechanisms away from mechanisms which are considered to be regulated to more market-based mechanisms.

Section 2. Introduction

2.1 BACKGROUND

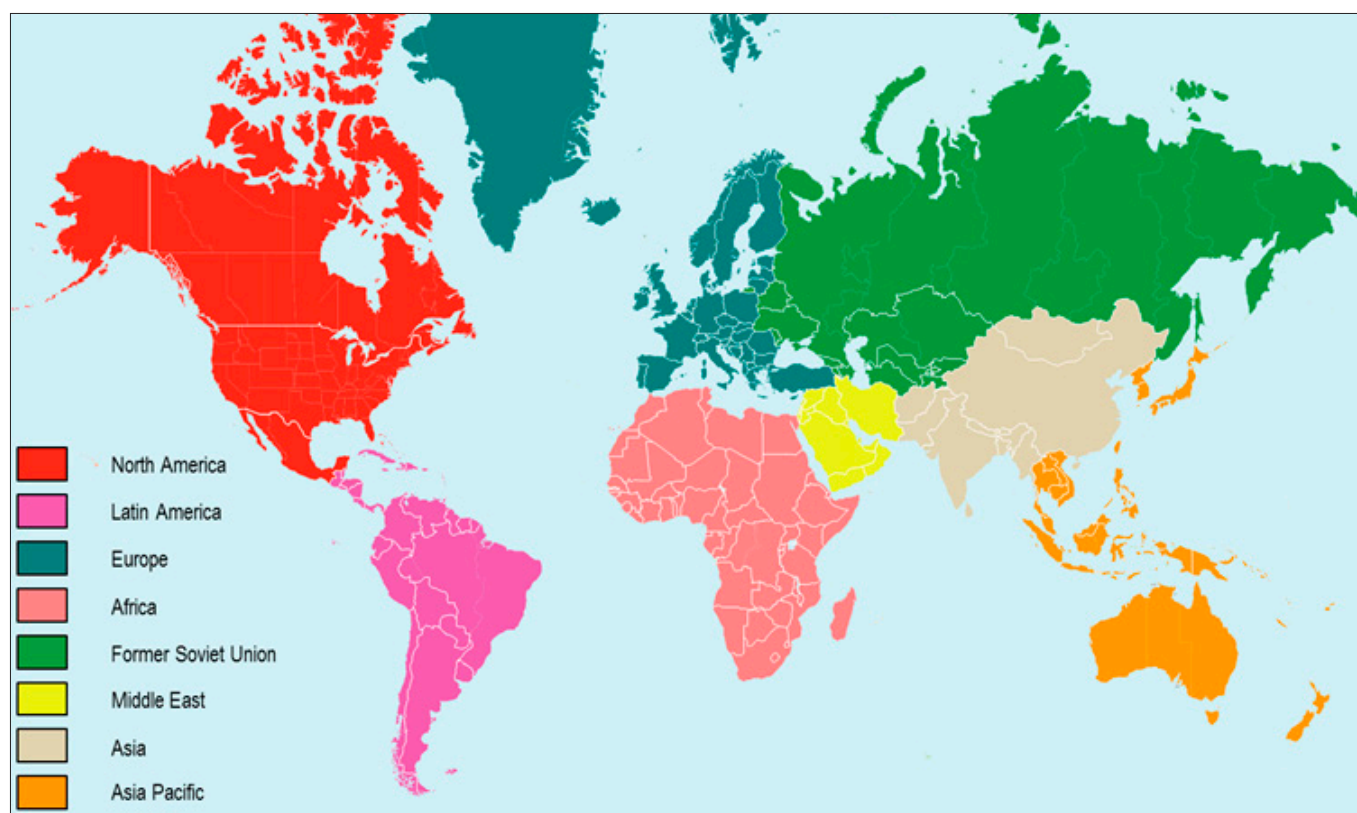
The idea for a survey of wholesale gas price formation mechanisms arose at the beginning of the triennium leading to the 2009 World Gas Conference. The Strategy, Economics and Regulation Programme Committee (PGCB) had set up a new sub-group to consider gas pricing, with a key remit to carry out a comprehensive 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 Nexant. 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. This 2014 survey is the third survey undertaken in preparation for the 2015 World Gas Conference in Paris⁵, following on from the 2012 and

2013 surveys, and is the seventh overall. In the 2014 survey responses were received for some 71 out of 109 countries. Data on the remaining countries, where responses were not received, was researched by Nexant. However, the 71 countries where responses were received covered 94% of total world consumption.

2.2 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.

Figure 2.1. IGU Regions



⁵ A separate report in Wholesale Gas Prices has been prepared by sub group 2 of PGCB and is being presented at the 2015 World Gas Conference in Paris.

The initial data collection was done on a country basis. The data were then collated to a regional level using the standard IGU regions shown in the figure above. Most of the regions are defined along the usual geographic lines, although the IGU includes Mexico 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.

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). 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 and the highest monthly average price and 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 data in the IGU study 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 2014 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 2.2 Data Collection Form

Country	United Kingdom					
Region	Europe					
Volumes 2014: BCM	Consumption	Production	Imports		Exports	
			Pipeline	LNG	Pipeline	LNG
	70.6	38.6	32.1	11.2	11.2	0.0
Wholesale Price Formation	Domestic Production		Imports			
			Pipeline		LNG	
Oil Price Escalation	14.1%					
Gas-on-Gas Competition	85.9%		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 2014 Wholesale Price Range (\$/MMBTU)	Average		High		Low	
	\$8.71		\$11.70		\$6.34	

2.3 TYPES OF PRICE FORMATION MECHANISMS

In preparation for the initial 2005 survey, a series of discussions were held at the PGCB meetings⁶ on the definition of different types of price formation. It was decided to use for categorisation purposes the wholesale pricing mechanisms described in Box 1.

BOX 1: TYPES OF PRICE FORMATION MECHANISMS	
Oil Price Escalation (OPE)	The 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 price is determined by the interplay of 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 (NYMEX 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 is spot LNG, 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 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 this would be one year. There may be a written contract in place but often the arrangement is at the Government or state-owned company level. Typically 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.
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, 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, 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 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 fertilizer 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.

⁶ The Wholesale Gas Pricing Group is 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 since 2009 by Mike Fulwood of Nexant.

2.4 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. Comparisons of wholesale price levels, however, need to be treated with caution. As noted above, 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.

2.5 REPORT LAYOUT

Section 3 of the report covers the results of the 2014 survey and looks at the World level for the different categories – domestic production, pipeline imports, LNG imports, total imports and total consumption. Results at the individual regional level are then analysed followed by a discussion and analysis of wholesale price levels by region, price formation mechanism and country.

Section 4 of the report provides a comparison of the results across all seven surveys to identify key trends and, similar to Section 3, covers the World level for the different categories, the individual regional level, changes in wholesale price levels, concluding with a special analysis of changes in the GOG category

Section 3. 2013 Survey Results

3.1 INTRODUCTION

This section covers the results of the 2014 survey and comprises three parts:

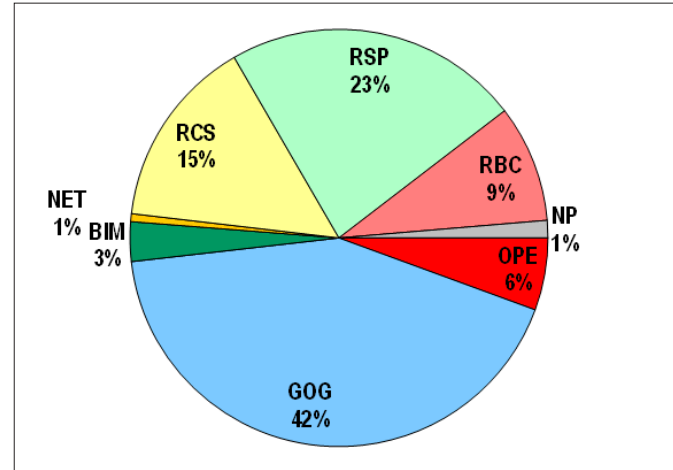
- Results at the World level for the different categories – domestic production, pipeline imports, LNG imports, total imports and total consumption;
- Results for each individual region for total consumption; and
- An analysis of wholesale price levels by region, price formation mechanism and country.

3.2 WORLD LEVEL RESULTS

3.2.1 Domestic Production

Domestic production in 2014 accounted for some 74% of total world consumption – around 2,600 bcm.

Figure 3.1. World Price Formation 2014 - Domestic Production



GOG has the largest share in domestic production at 42%, totalling some 1,106 bcm, with North America accounting for 822 bcm – almost three quarters 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 144 bcm. The balance is in Europe at 76 bcm – principally the Netherlands and UK, Asia Pacific at 42 bcm – Australia and New Zealand, and Latin America at 18 bcm – mainly Argentina.

OPE has a relatively small share in domestic production at 6%, totalling some 145 bcm, with 61 bcm in Asia – Pakistan, China

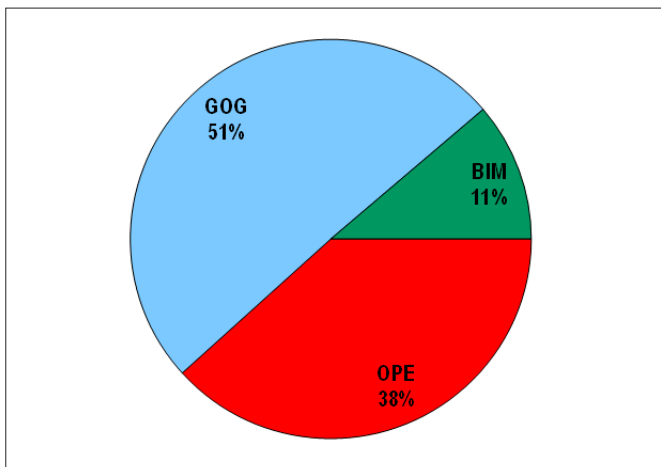
and India, 42 bcm in Asia Pacific – mainly Thailand, 27 bcm in Latin America – Brazil and Colombia, 8 bcm in Europe – mainly some residual contracts in the UK plus Germany and small amounts elsewhere, and under 4 bcm in Africa, mainly Tunisia.

The regulated categories – RCS, RSP and RBC – in total account for almost half of domestic production, with RCS principally in Asia and the Former Soviet Union, RSP principally in the Middle East, Former Soviet Union 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.

3.2.2 Pipeline Imports

Pipeline imports in 2014 accounted for some 17% of total world consumption – around 603 bcm.

Figure 3.2. World Price Formation 2014 - Pipeline Imports



Pipeline imports are split between just three categories – OPE, GOG and BIM.

GOG is now just over half of all pipeline import, totalling some 304 bcm, with Europe at 200 bcm and North America the rest. Most of the European gas importing countries, have some element of GOG pipeline imports with the top four countries being Germany, Italy, UK and France.

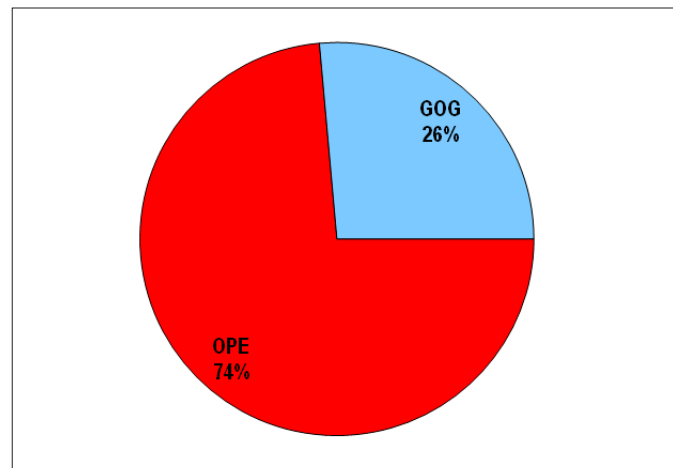
OPE is now under 40% of all pipeline imports, totalling some 231 bcm, mostly in Europe with some 117 bcm – Turkey, Italy, Spain and Germany being the main contributors. The Former Soviet Union accounts for some 34 bcm – principally Ukraine and Russia, with 34 bcm in Asia – China, 18 bcm in Asia Pacific – Singapore and Thailand, and 17 bcm in Latin America – mainly Brazil and Argentina. There are also small quantities in other regions, apart from North America, including countries such as Iran and Tunisia.

BIM has the balance of 11%, totalling some 68 bcm. This is mainly in the Former Soviet Union and the Middle East and is largely just two routes – Russia to Belarus and Qatar to the UAE – but also Russia to Turkey (part of the Botas gas release) in Europe and Indonesia to Malaysia in Asia Pacific.

3.2.3 LNG Imports

LNG imports in 2014 accounted for some 9% of total world consumption – around 318 bcm..

Figure 3.3. World Price Formation 2014 – LNG Imports



LNG imports are split 74% OPE and 26% GOG.

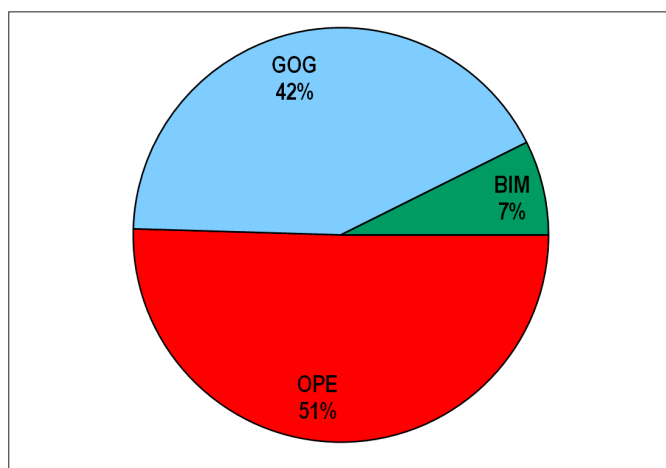
OPE at some 234 bcm is mostly Asia Pacific – Japan, Korea and Taiwan, followed by Asia – China and India – and Europe – mainly Spain, Turkey, France and Italy.

GOG totals some 84 bcm and can be divided into imports into countries such as the UK, USA, Canada and Mexico, where the domestic market pricing mechanism is GOG, and all other countries which are importing spot and short term priced LNG cargoes, which is almost every other LNG importing country – Japan and Korea taking the largest shares – but also includes Argentina and Brazil.

3.2.4 Total Imports

Total imports in 2014 accounted for some 26% of total world consumption – around 921 bcm.

Figure 3.4. World Price Formation 2014 – Total Imports



Total imports are the sum of pipeline and LNG imports and comprise the three categories of OPE (51%), GOG (42%) and BIM (7%). The table below shows the regional and category breakdown.

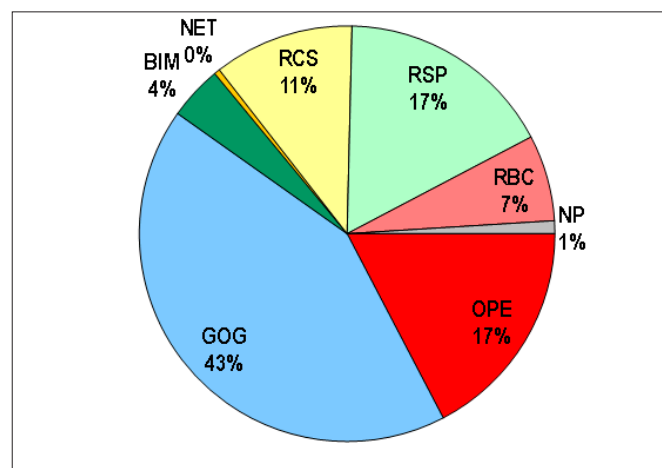
Table 3.1. World Price Formation 2014 – Total Imports

Region	Total Imports			
	OPE	GOG	BIM	TOT
North America	0.0	114.4	0.0	114.4
Europe	144.5	216.3	9.0	369.9
Asia	69.4	8.3	0.0	77.7
Asia Pacific	185.0	28.0	7.2	220.2
Latin America	17.5	18.3	1.2	37.0
FSU	34.2	0.0	27.8	61.9
Africa	4.9	0.0	4.0	9.3
Middle East	9.2	2.9	18.7	30.8
Total	464.7	388.2	67.8	921.1

3.2.5 Total Consumption

Total consumption in 2014 was around 3,518 bcm.

Figure 3.5. World Price Formation 2014 – Total Consumption



GOG has the largest share at 43%, totalling around 1,494 bcm, dominated by North America at 936 bcm, followed by Europe at some 292 bcm and the Former Soviet Union at 144 bcm. In all GOG can now be found in some 46 countries, in one form or another, and in all regions except Africa.

The OPE share at 17%, totals around 610 bcm and is predominantly Asia Pacific (231 bcm), Europe (153 bcm) and Asia (130 bcm). OPE is widespread being found in some 60 countries, including virtually every country in Europe, and in all regions except North America.

The regulated categories – RCS, RSP and RBC – account in total for some 35%, around 1,215 bcm:

- RCS totals some 384 bcm and is in 16 countries, mainly the Former Soviet Union (Russia) and Asia (China);
- RSP totals some 595 bcm and is in 26 countries, with the Middle East dominating – Iran, Saudi Arabia and the UAE – followed by the Former Soviet Union – Russia – and Asia Pacific – Indonesia and Malaysia;
- RBC totals some 236 bcm and is in 13 countries, mainly the Former Soviet Union – Kazakhstan, Turkmenistan and Uzbekistan, Africa – Egypt and Algeria – and Latin America – Venezuela

The BIM share at 4% totals some 148 bcm and is in 24 countries, predominantly Middle East – Qatar, UAE and Israel, Former Soviet Union – Belarus, Asia Pacific – Indonesia and Malaysia, and Europe – Turkey.

The NET share at less than 1% totals some 16 bcm in 3 countries – Trinidad, Norway and Equatorial Guinea.

The NP share at 1% totals some 35 bcm in 9 countries, largely Mexico, Norway, Kuwait, Yemen and Brunei, where it is used in the energy industry in refining processes or enhanced oil recovery.

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

Table 3.2. World Price Formation 2014 – Total Consumption

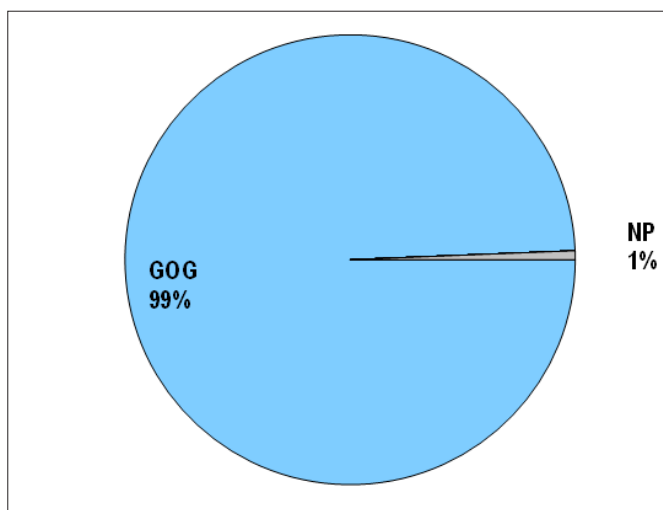
Region	Total Consumption								
	OPE	GOG	BIM	NET	RCS	RSP	RBC	NP	TOT
North America	0.0	936.0	0.0	0.0	0.0	0.0	0.0	6.0	942.1
Europe	152.9	292.1	9.5	0.4	10.6	8.3	0.0	4.4	478.2
Asia	130.4	12.0	3.4	0.0	117.3	18.6	9.1	0.0	290.9
Asia Pacific	230.7	70.3	20.9	0.0	10.9	71.8	0.0	4.5	409.1
Latin America	44.3	36.2	6.4	14.2	10.7	32.2	27.0	1.0	172.1
FSU	34.2	144.4	27.8	0.0	233.1	90.0	103.3	8.8	641.6
Africa	8.4	0.0	6.4	1.3	1.5	16.8	86.0	0.8	121.1
Middle East	9.2	2.9	73.1	0.0	0.0	357.6	10.3	9.5	462.6
Total	610.1	1 493.9	147.5	15.8	384.2	595.4	235.7	35.0	3 517.6

3.3 REGIONAL LEVEL RESULTS

3.3.1 North America

North America consumption in 2014 was some 27% of total world consumption – around 942 bcm.

Figure 3.6. North America Price Formation 2014

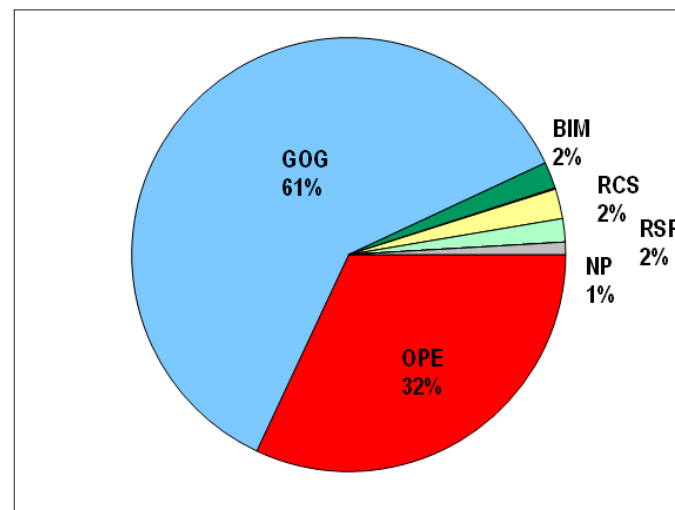


GOG clearly dominates the North American market with fully liquid trading markets in the USA and Canada and the wholesale price in Mexico being referenced to prices in the USA. The small amount of NP is in Mexico where Pemex uses the gas in refinery process and for enhanced oil recovery.

3.3.2 Europe

European consumption in 2014 was some 14% of total world consumption – around 478 bcm.

Figure 3.7. Europe Price Formation 2014



GOG remains the largest share in Europe, standing at 61%, totalling around 292 bcm. Some 76 bcm is domestic production, mainly Netherlands and UK, with some 201 bcm being pipeline imports, predominantly all the northwest European countries plus Italy in the Mediterranean area, but also increasingly the central European countries of Poland, Czech Republic, Slovakia, Austria and Hungary. LNG imports account for some 16 bcm, over half of which are into the UK, with the remaining quantities being largely spot cargoes into the more traditional LNG importing countries.

OPE is now down to 32%, totalling around 153 bcm, and is predominantly pipeline imports (117 bcm) into almost every European country, apart from the UK, Netherlands, Denmark, Croatia and Ireland, followed by LNG imports (28 bcm) into Spain, France, Italy, Turkey, Portugal and Greece, with domestic production (12 bcm) in a variety of countries principally Germany, Norway and the UK legacy contracts.

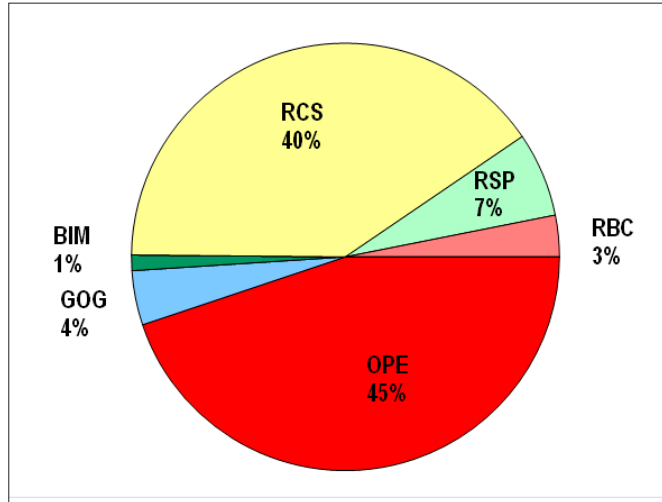
BIM is some 9.5 bcm and is almost all pipeline imports into Turkey.

RCS accounts for some 11 bcm and is domestic production in Romania, while RSP also accounts for some 8 bcm and is also domestic production in Poland, Hungary, Croatia and Bulgaria. NP is some 4.5 bcm and is gas used in enhanced oil recovery and refineries in Norway.

3.3.3 Asia

Asian consumption in 2014 was some 8% of total world consumption – around 290 bcm.

Figure 3.8. Asia Price Formation 2014



OPE at 45% totals some 130 bcm and is principally pipeline and LNG imports, together with some domestic production in China, LNG imports together with some domestic production in India, and domestic production in Pakistan where the regulator sets gas wellhead prices but linked to the oil price.

GOG at only 4%, some 12 bcm, reflects spot LNG imports into India and China, with some domestic production in India as the new pricing formula was introduced.

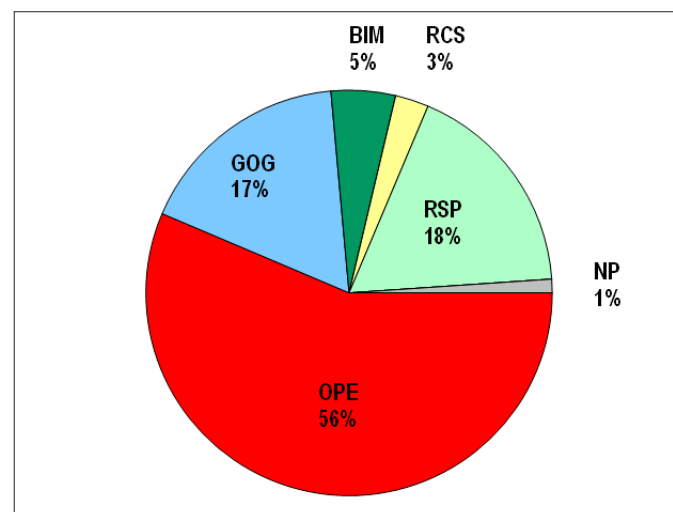
RCS accounts for some 40%, totalling around 117 bcm of domestic production, almost all in China with around 10 bcm in Bangladesh.

RSP at 7%, totals around 19 bcm and is domestic production almost all in India, while RBC at 3%, some 11 bcm, is Bangladesh domestic production.

3.3.4 Asia Pacific

Asia Pacific consumption in 2014 was some 12% of total world consumption – around 409 bcm.

Figure 3.9. Asia Pacific Price Formation 2014



OPE at 56% totals some 231 bcm, with LNG imports – in Japan, Korea and Taiwan – accounting for 167 bcm. Pipeline imports are some 18 bcm into Singapore and Thailand while domestic production is 46 bcm – almost all Thailand with a small amount in the Philippines.

GOG at 17% totals some 70 bcm, of which 28 bcm is spot LNG imports mainly in Japan, Korea and Taiwan, while the balance is domestic production in Australia and New Zealand.

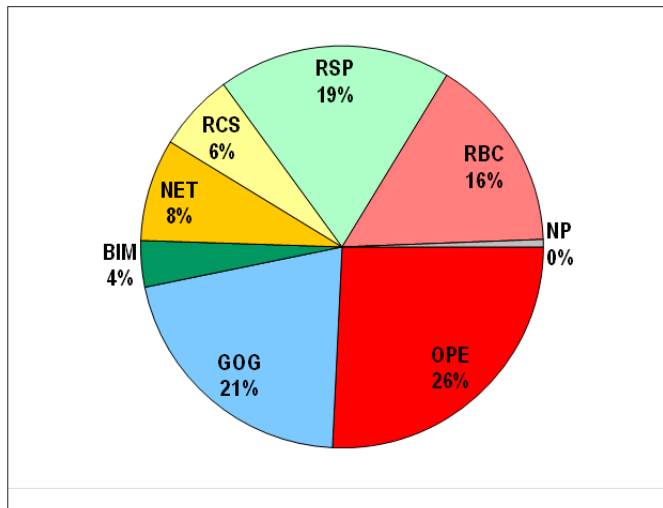
BIM at 5% totals some 21 bcm, comprising part of domestic production in Indonesia, domestic production in Japan and imports into Malaysia from Indonesia.

RSP at 18% totals some 72 bcm and is domestic production in Malaysia and Indonesia, while RCS at 3% or some 11 bcm, is mostly domestic production in Vietnam. NP at 1% or 4.5 bcm is domestic production in Brunei consumed in the energy industry.

3.3.5 Latin America

Latin America consumption in 2014 was some 5% of total world consumption – around 172 bcm.

Figure 3.10. Latin America Price Formation 2014



OPE at 26% totals some 44 bcm, mainly domestic production in Brazil and Colombia, pipeline imports into Brazil, Argentina and Venezuela and a proportion of LNG imports into Argentina.

GOG at 21% totals some 36 bcm, half of which is domestic production in Argentina, Colombia, Chile and Peru. The balance is LNG imports into Brazil, Argentina, Chile, Puerto Rico and Dominican Republic.

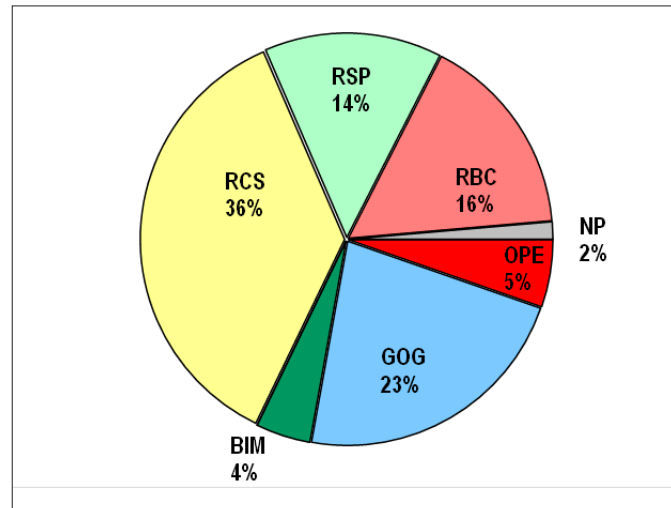
BIM at 4% totals some 6 bcm and is almost all domestic production to the power sector in Trinidad, plus the transportation element of the imports into Brazil from Bolivia. NET at 8% totals some 14 bcm and is the balance of domestic production in Trinidad used as a feedstock in petrochemicals.

RSP at 19% totals some 32 bcm and comprises domestic production in Argentina, Peru and Bolivia. RBC at 16% totals some 27 bcm and is domestic production in Venezuela, while RCS at 6% totals some 11 bcm and is domestic production in Argentina, Brazil and Colombia. NP at less than 1% or 1 bcm is Cuban domestic production.

3.3.6 Former Soviet Union

Former Soviet Union consumption in 2014 was some 18% of total world consumption – around 642 bcm.

Figure 3.11. Former Soviet Union Price Formation 2014



RCS at 36% is the largest share, totalling some 233 bcm and is almost all the major proportion of domestic production in Russia together with most of the domestic production in Azerbaijan. RBC at 16% or 103 bcm is domestic production in Kazakhstan, Turkmenistan, Uzbekistan and a small amount in Azerbaijan, while RSP at 14% or 90 bcm is a proportion of Russia domestic production (sold to the population) and Ukraine domestic production.

GOG at 23% totals some 144 bcm and is all domestic production to the eligible large customer market in Russia.

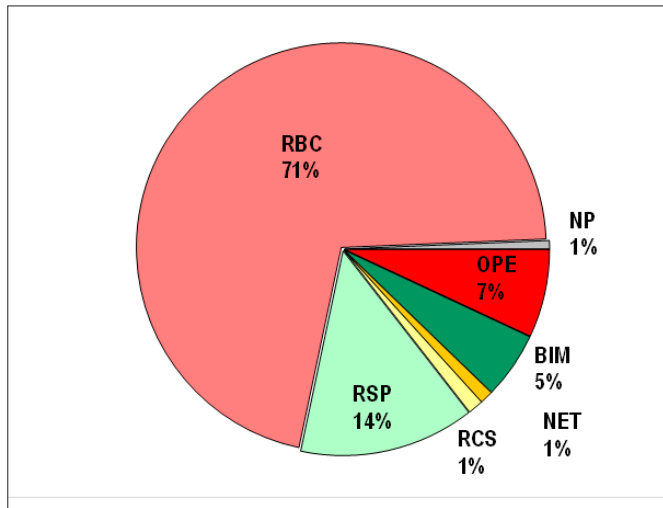
OPE at 5% or 34 bcm is all pipeline imports into Ukraine, Russia and Moldova, while BIM at 4% or 28 bcm represents other pipeline imports in the FSU region, principally from Russia to Belarus, but also Armenia, Georgia, Kazakhstan, Kyrgyzstan and Tajikistan.

NP at 2% or 9 bcm is part of domestic production in Turkmenistan.

3.3.7 Africa

African consumption in 2014 was some 3% of total world consumption – around 121 bcm.

Figure 3.12. Africa Price Formation 2014



RBC at 71% or some 86 bcm, dominates the region and is domestic production largely in Egypt, Algeria and Libya.

RSP at 14% or some 17 bcm is largely domestic production in Nigeria, with small amounts in Equatorial Guinea, Gabon and Tanzania.

OPE at 7% or 8 bcm comprises part of the pipeline imports into Tunisia and Morocco from Algeria, from Nigeria to Ghana, Benin and Togo, as well as domestic production in Tunisia and part of Ivory Coast and Tanzania.

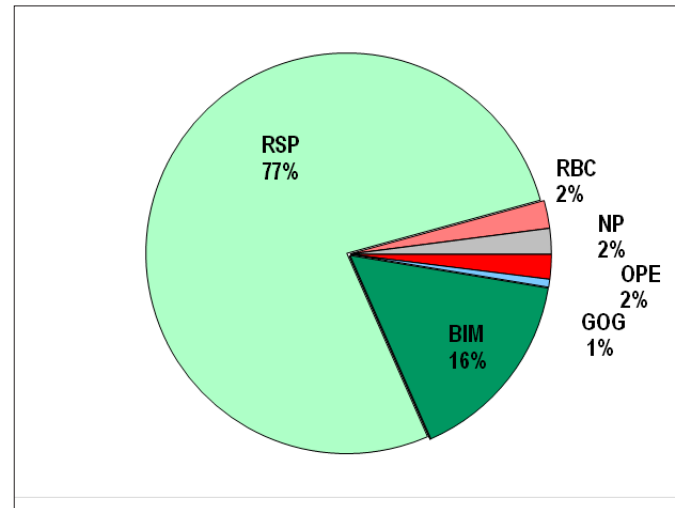
BIM at 5% or 6 bcm is pipeline imports into South Africa from Mozambique and the balance of domestic production in Ivory Coast, plus domestic production in Cameroon.

The remaining categories – all at 1% or 1 bcm – are RCS (largely South Africa plus part of pipeline imports from Nigeria to Ghana, Benin and Togo), NET (part Equatorial Guinea) and NP (largely Angola).

3.3.8 Middle East

Middle East consumption in 2014 was some 13% of total world consumption – around 463 bcm.

Figure 3.13. Middle East Price Formation 2014



RSP at 77% or 358 bcm dominates the region and is largely domestic production in Iran, Saudi Arabia and the UAE with smaller amounts in Oman, Bahrain and Kuwait.

RBC at 2% or 10 bcm is domestic production in Iraq and Syria.

BIM at 16% or 73 bcm is partly pipeline imports from Qatar to UAE and Oman and domestic production in Qatar and Israel.

OPE at 2% or 8 bcm is largely pipeline imports into Iran from Turkmenistan and the flows of gas from Egypt to Jordan, plus some LNG imports into UAE and Kuwait. There are also very small quantities of GOG as spot LNG imports into Kuwait, UAE and Israel.

NP at 2% or 10 bcm is largely gas used in enhanced oil recovery and refineries in Kuwait and Yemen.

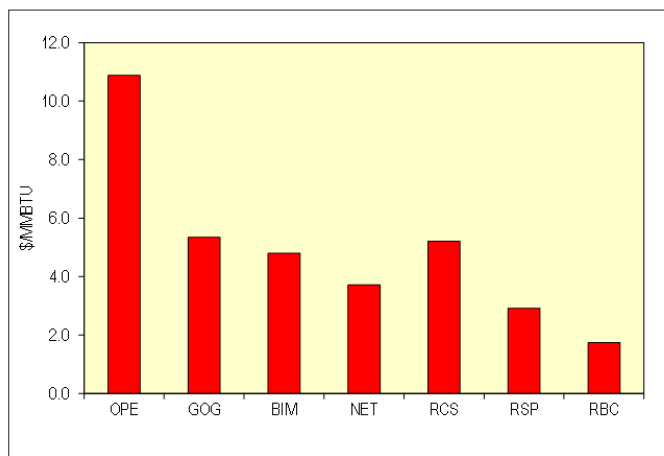
3.4 WHOLESFAE PRICE LEVELS

In considering wholesale price levels across regions, countries 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 caution and taken only as a broad indication.

3.4.1 Price Levels by Price Formation Mechanism

The figure below shows a snapshot of wholesale prices for 2014 by price formation mechanism⁷ – a comparison over the seven surveys is shown in section 4

Figure 3.14. Wholesale Prices in 2014 by Price Formation Mechanism



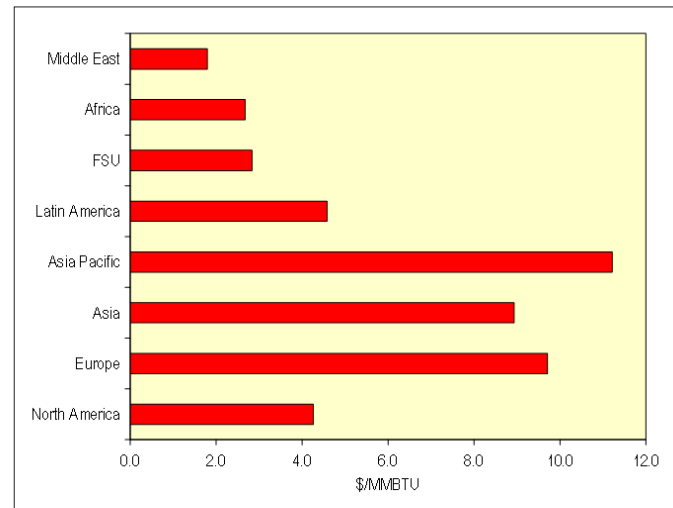
The highest prices, by some margin, are in the OPE category, at \$10.88 per MMBTU, compared to \$5.35 for the GOG category, which is only slightly above the RCS category. The price level in the GOG category is heavily influenced by the relatively low prices in 2014 in North America, although they were above both the 2012 and 2013 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 \$1.74 per MMBTU in 2014.

3.4.2 Price Levels by Region and Country

The figure below shows a snapshot of wholesale prices for 2014 by IGU region – a comparison over the six surveys is shown in section 4.

Figure 3.15. Wholesale Prices in 2014 by Region

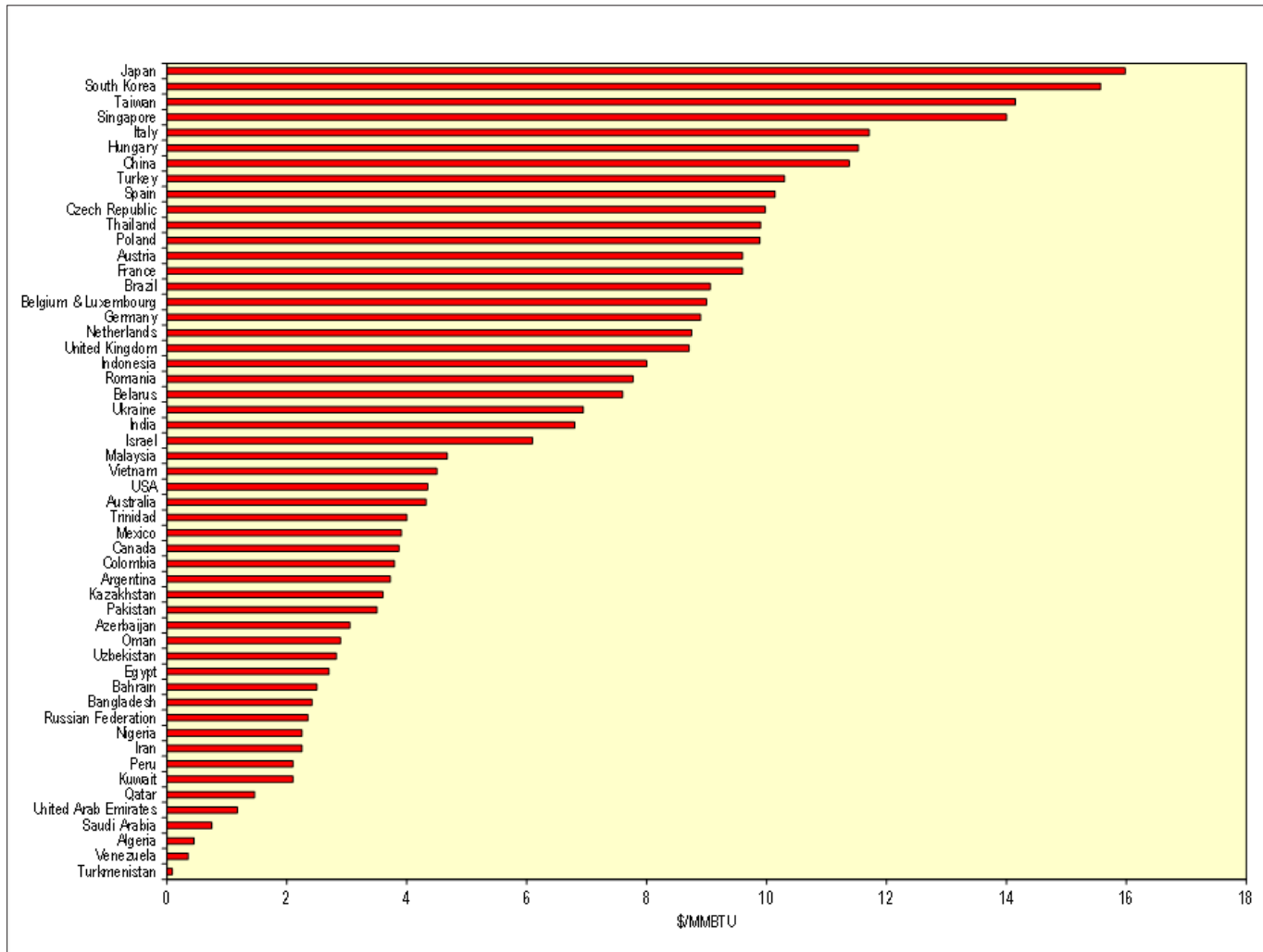


Wholesale prices can obviously vary significantly from year to year, but the top region is Asia Pacific where prices averaged over \$11.00. OPE remains the primary pricing mechanism in Asia Pacific. Prices in Europe, which are partly OPE are now only just above Asia prices, where China has increasing OPE prices. Despite increasing, prices in North America are still below those in Latin America in addition to the above regions. Prices have fallen back in the Former Soviet Union, in \$ terms in part due to the rouble depreciation. Middle East and Africa average prices, where prices are often held down to the cost of production or below as a subsidy, are the lowest.

These conclusions are further reinforced when wholesale prices are viewed at the country level. The figure below includes all countries with consumption greater than 7 bcm in 2014.

⁷ 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 3.16. Wholesale Prices in 2014 by Country



The highest wholesale prices in 2014 were found in the largely LNG dependent countries in Asia Pacific – South Korea, Japan and Taiwan – plus Singapore. These were followed by a few European countries including Italy, Hungary, Turkey, and Spain, where OPE still remains an important price mechanism. Prices in China have also gone up as well, having a higher proportion of OPE pricing. In Northwest Europe countries, where GOG dominates, prices are somewhat lower than the rest of Europe. Spot prices in the USA, Canada and Mexico remained lower than

in a whole range of countries, where prices had previously been well below North American prices. These included countries such as India, Indonesia and Malaysia. Prices in Russia have fallen well below other countries, which, in previous years, they had been above. At the bottom of the chart were generally countries where wholesale prices were subject to some form of regulation – largely Middle East and African countries – and often below the cost of production and transportation.

Section 4. Comparisons with Previous Surveys

4.1 INTRODUCTION

This section covers a comparison of the results of the seven surveys undertaken from 2005 to 2014 and comprises four parts:

- Results at the World level for the different categories – domestic production, pipeline imports, LNG imports, total imports and total consumption;
- Results for each individual region for total consumption;
- An analysis of wholesale price levels by region and price formation mechanism; and
- A special analysis of the changes in the GOG category.

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.

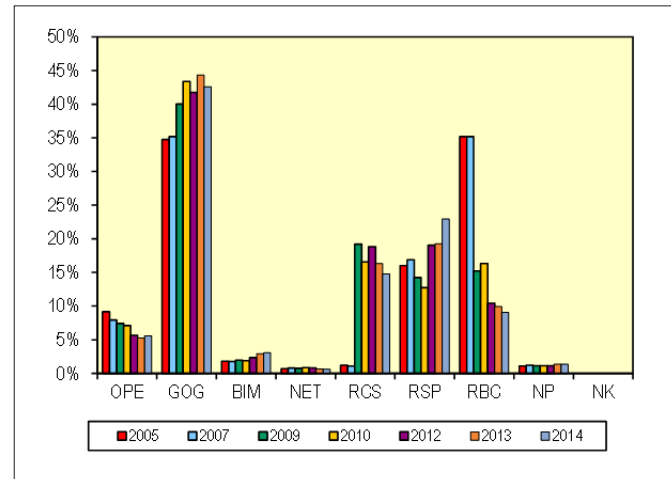
4.2 WORLD LEVEL COMPARISONS

4.2.1 Domestic Production

The main changes in price formation over the seven surveys have been the general rise in GOG from 35% in 2005 to 43% in 2014. This share was slightly lower than in 2013 as production was lower in Europe and also a lower GOG share in Russia. The OPE category is not particularly large in terms of domestic production, and was slightly higher in 2014 than 2013 as rising production in Asia Pacific and Asia offset a falling share in Europe. Apart from OPE, GOG has gained share from the three regulated categories which in 2005 totalled some 52% compared to 47% in 2014. A large part of this occurred in 2009 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. There has also been an increase in GOG in Latin America as well.

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 population in Russia switched away from RCS. There was also a change in China in 2013 when OPE became the new pricing regime in two provinces, away from RCS, and in 2014 became nationwide but only for incremental production over 2012 levels.

Figure 4.1. World Price Formation 2005 to 2014 – Domestic Production

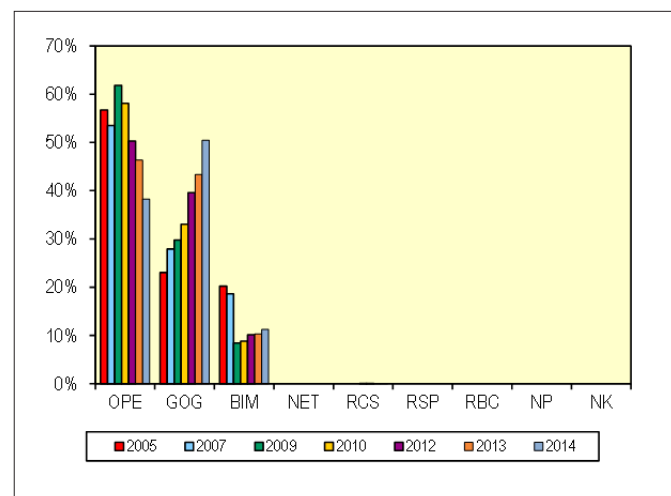


4.2.2 Pipeline Imports

The main changes in the seven surveys from 2005 to 2014 are the continued rise in GOG from just under 23% in 2005 to 51% in 2014, which has been at the expense of the OPE category. However, the decline in OPE has been 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.

The rise in GOG at the expense of OPE has been entirely in the European market as the Northwest Europe countries began switching to GOG and more recently the Central Europe countries and, in 2014, Italy. In respect of pipeline imports into Europe GOG in 2014 has a 62% share compared to 36% for OPE. This is in marked contrast to 2005 when it was 91% OPE and only 7% GOG.

Figure 4.2. World Price Formation 2005 to 2014 – Pipeline Imports



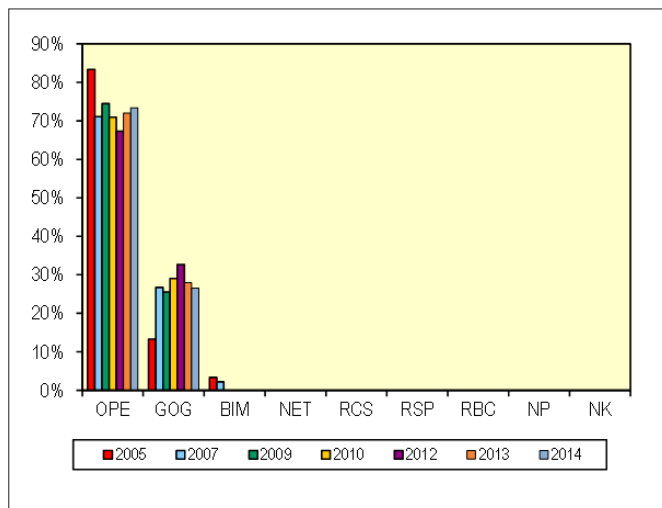
4.2.3 LNG Imports

The main changes in the seven surveys from 2005 to 2014 are a rise in GOG from just over 13% in 2005 to 33% in 2012, which has been largely at the expense of the OPE category, before it fell back in 2013 to 28% and in 2014 to 27%.

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 relatively 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 BIM category in 2005 and 2007 was the Qatar to India LNG contract which subsequently switched to OPE.

Figure 4.3. World Price Formation 2005 to 2014 – LNG Imports⁹



4.2.4 Total Imports

Total imports are the sum of pipeline imports and LNG imports and have only comprised three categories – OPE, GOG and BIM – in all seven surveys from 2005 to 2014. As well as the figure the table below shows the volume breakdown. OPE declined from 63% in 2005 to 58% in 2007 as GOG rose from just over 20% to 27% and then in 2009, OPE gained share rising to 66% as BIM fell from 14% to 6%, with GOG rising to 29%. Since then OPE has lost share by around 15 percentage points and GOG gained a similar share, in large part due to pipeline imports in Europe.

Figure 4.4. World Price Formation 2005 to 2014 – Total Imports

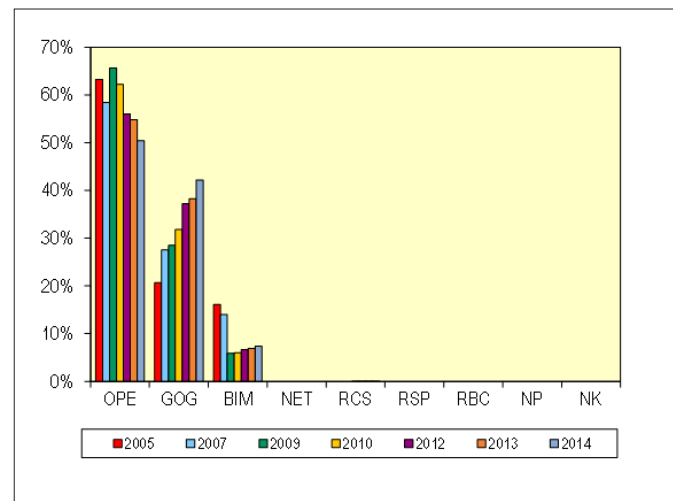


Table 4.1. World Price Formation 2005 to 2014 – Total Imports⁸
BCM

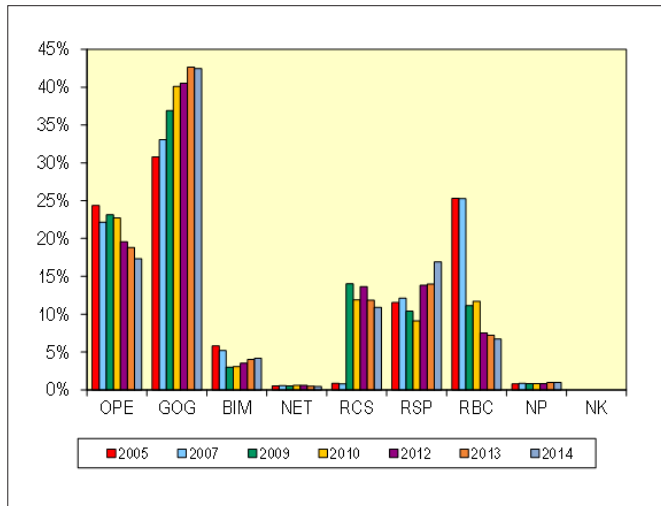
World	Total Imports			
	OPE	GOG	BIM	TOT
2005	505.7	165.2	128.7	799.6
2007	500.7	236.3	120.4	857.4
2009	542.5	235.5	48.7	826.6
2010	584.2	298.5	56.4	939.3
2012	533.6	354.7	63.8	952.3
2013	524.1	365.8	65.8	956.0
2014	464.2	388.6	67.8	921.0

⁸In 2010, 2012, 2013 and 2014 there were very small quantities of RCS reflecting the regulated transportation tariff element of pipeline gas from Nigeria to Ghana. The BIM category also includes a small element of transportation tariffs, principally Bolivia to Brazil.

4.2.5 Total Consumption

The figure below shows the changes in the price formation mechanisms over the seven surveys from 2005 to 2014.

Figure 4.5. World Price Formation 2005 to 2014 – 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 only half a 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, Taiwan and Thailand;

- Between 2010 and 2012, GOG increased its share by just under half a percentage point, rising to just under 40.5%, 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 almost 3 percentage points, based on the switch to GOG in Europe (and 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 1.5 percentage points, principally in Russia but also as demand grew sharply in China. RSP increased its share by almost 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 another 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 1 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 was virtually unchanged 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. OPE was down by another 0.5 percentage points 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 almost 3 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 down by 0.5 percentage points reflecting the change in Nigeria

Overall over the 2005 to 2014 period, OPE has declined by 7 percentage points, GOG has risen by 12 percentage points, BIM has declined by 1.5 percentage points, RCS has risen by 10 percentage points, RSP risen by 4.5 percentage points and RBC declined by 18.5 percentage points.

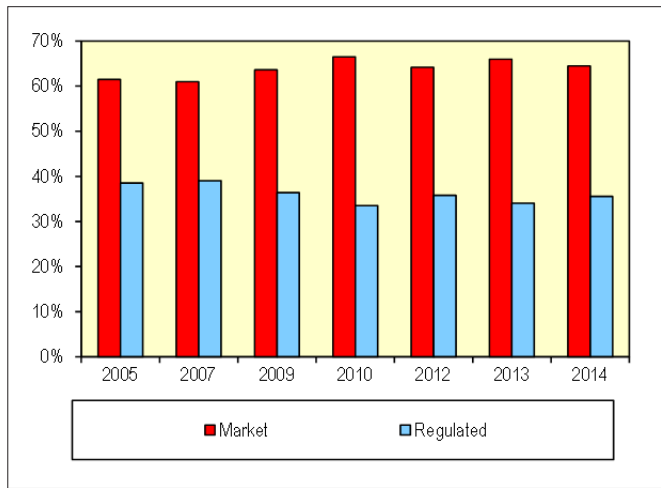
Table 4.2. World Price Formation 2005 to 2014 – Total Consumption

BCM and percentages

World	Total Consumption								TOT
	OPE	GOG	BIM	NET	RCS	RSP	RBC	NP	
2005	693.5	876.9	165.8	14.5	24.8	328.2	720.8	22.8	2847.3
2007	674.5	1007.1	158.8	17.1	24.0	369.4	770.3	26.0	3047.0
2009	708.3	1129.1	92.1	16.9	429.1	318.4	340.2	25.6	3059.7
2010	753.0	1327.9	101.8	20.1	393.2	302.2	387.9	27.0	3313.2
2012	675.3	1399.0	122.1	20.9	471.0	476.8	260.5	28.6	3454.2
2013	657.1	1488.2	140.4	16.9	414.1	487.8	251.7	34.0	3490.3
2014	610.1	1493.9	147.5	15.8	384.2	595.4	235.7	35.0	3517.6
2005	24.4%	30.8%	5.8%	0.5%	0.9%	11.5%	25.3%	0.8%	100.0%
2007	22.1%	33.1%	5.2%	0.6%	0.8%	12.1%	25.3%	0.9%	100.0%
2009	23.1%	36.9%	3.0%	0.6%	14.0%	10.4%	11.1%	0.8%	100.0%
2010	22.7%	40.1%	3.1%	0.6%	11.9%	9.1%	11.7%	0.8%	100.0%
2012	19.6%	40.5%	3.5%	0.6%	13.6%	13.8%	7.5%	0.8%	100.0%
2013	18.8%	42.6%	4.0%	0.5%	11.9%	14.0%	7.2%	1.0%	100.0%
2014	17.3%	42.5%	4.2%	0.4%	10.9%	16.9%	6.7%	1.0%	100.0%

The major overall changes, in the 2005 to 2014 period, have been the continuous move away from OPE to GOG in Europe, and also in Asia Pacific as spot LNG imports have risen, from RBC to RCS, RSP and GOG in Russia, from RSP to RCS and OPE in China and from RBC to RSP in Iran and Nigeria.

Figure 4.6. Market and Regulated Pricing 2005 to 2014



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. 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 seven surveys.

The total of “market” pricing rose from 61.5% in 2005 to just over 66% in 2013, mirrored by a decline in “regulated” pricing, from 38.5% in 2005 to 34% in 2013. This has been partly reversed in 2014, with a decline in “market” pricing to 64.5% and a rise in

“regulated” pricing to 35.5%. 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. Since 2005 consumption in countries with “regulated” pricing has generally grown faster than consumption in countries with “market” pricing, so the switch to “market” pricing is effectively understated. 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
- The recent change in 2013 in China where there was a move to OPE in 2 provinces away from RCS which in 2014 became nationwide but only for incremental production over 2012 levels.

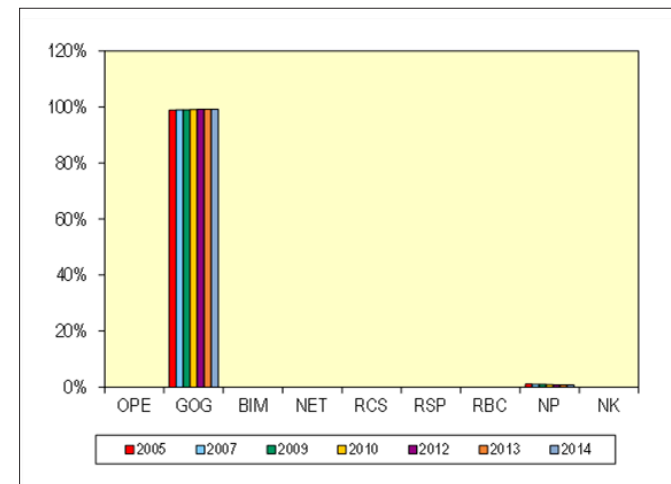
Apart from these changes between the “market” and “regulated” categories, there has been almost no change anywhere else in the world⁹.

4.3 REGIONAL LEVEL COMPARISONS

4.3.1 North America

Price formation mechanisms have not changed at all, in effect, in North America over the seven surveys. Apart from the small amount – around 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 4.7. North America Price Formation 2005 to 2014



⁹ In Peru there have been changes to some wellhead pricing linking the price to Henry Hub away from regulated pricing but for very small volumes. In addition, in India at the

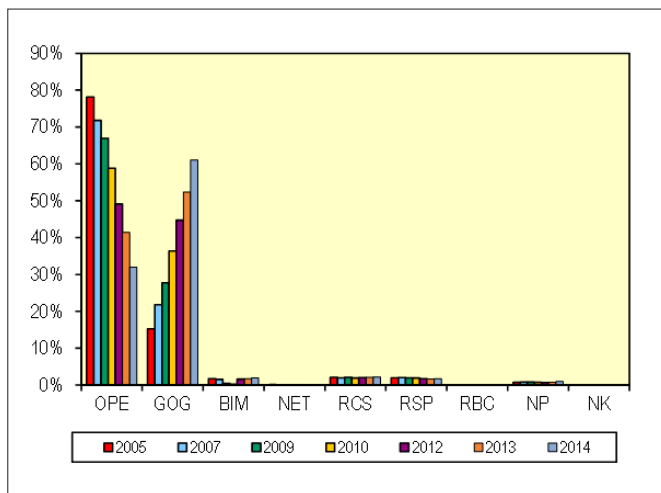
end of 2014, domestic prices were linked to a basket of hub prices.

4.3.2 Europe

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 61% in 2014 – when OPE had declined to 32%. The other largely regulated categories – domestic production in Poland, Hungary and Romania – remained at similar levels.

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 have also seen the introduction of hybrid pricing formulas where oil indexation is partly maintained but within a price corridor set by hub prices. 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 are in the OPE category, to be replaced by pipeline and LNG imports, all at GOG.

Figure 4.8. Europe Price Formation 2005 to 2014



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 Europe¹⁰ has seen the most dramatic change in price formation mechanisms, with a complete reversal in the ratio of OPE to GOG from 72% OPE and 27% GOG in 2005 to 12% OPE and 88% GOG in 2014, as a result of increased hub trading and contract renegotiations, as noted above.

¹⁰ Belgium, Denmark, France, Germany, Ireland, Netherlands, UK.

¹¹ Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland

¹² Greece, Italy, Portugal, Spain, Turkey

Figure 4.9. Northwest Europe Price Formation 2005 to 2014

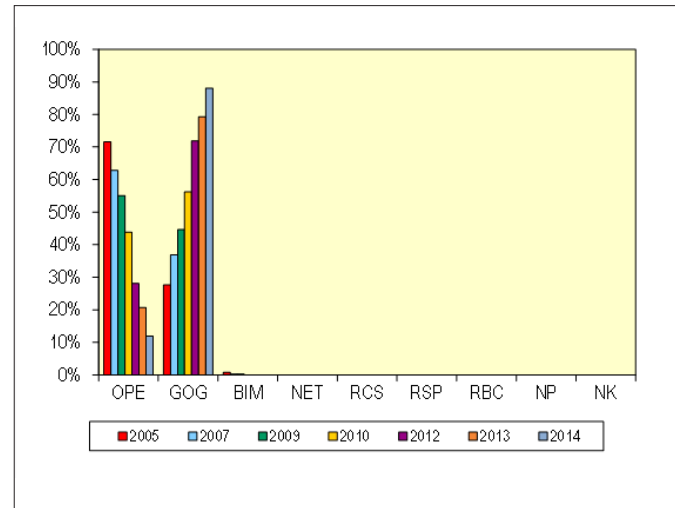
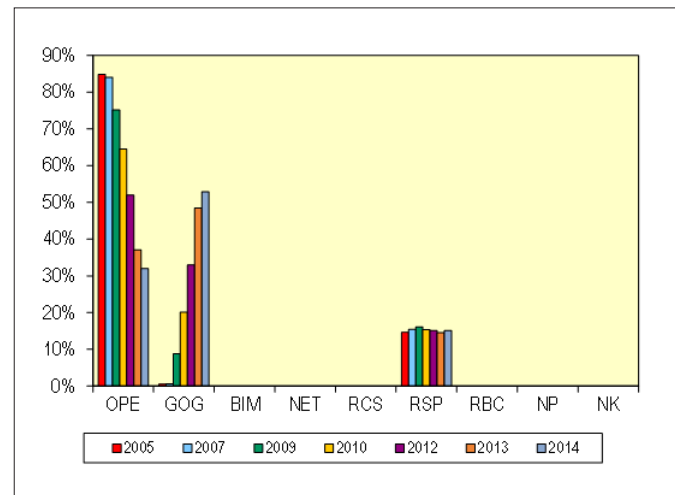


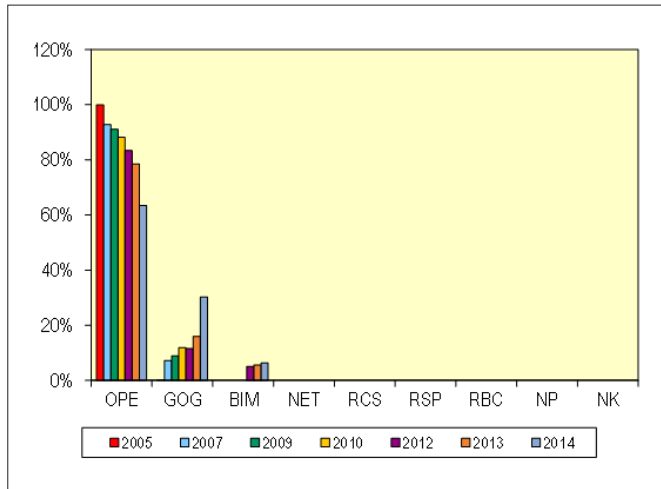
Figure 4.10. Central Europe Price Formation 2005 to 2014



Central Europe¹¹ has also, more recently, seen significant changes. Apart from the 15% or so of RSP, in Hungary and Poland, OPE has declined from 85% in 2005 to 32% in 2014, while GOG has increased from almost zero in 2005 to 53% in 2014, principally reflecting increased imports of spot gas, often from Germany, with contract renegotiations.

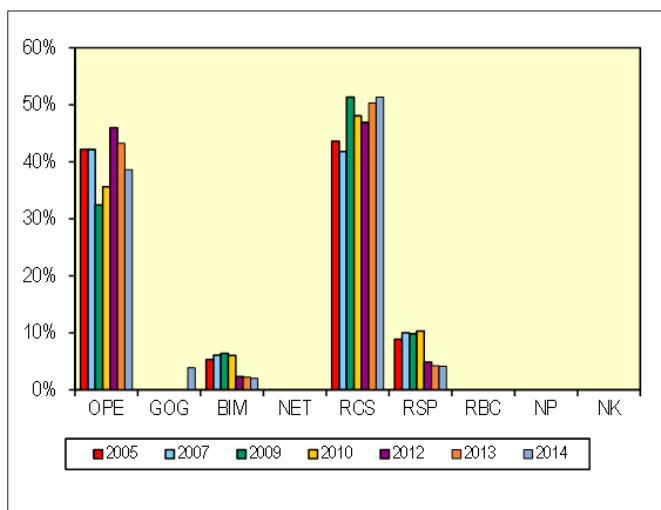
There has been much less change in other areas of Europe such as the Mediterranean¹², where OPE has only declined from 100% in 2005 to around 64% in 2014 and GOG rising from nothing to around 30%. This initially reflected spot LNG imports in the sub-region and some spot pipeline imports into Italy, as 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.

Figure 4.11. Mediterranean Price Formation 2005 to 2014



In Southeast Europe¹³ a very small amount of GOG is shown for 2014 in Croatia but in no other country. There is a large element of RCS in Romania, with the lower level of OPE in 2009 and 2010 a consequence of lower demand for imports in Romania and the rise in 2012 reflecting 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.

Figure 4.12. Southeast Europe Price Formation 2005 to 2014



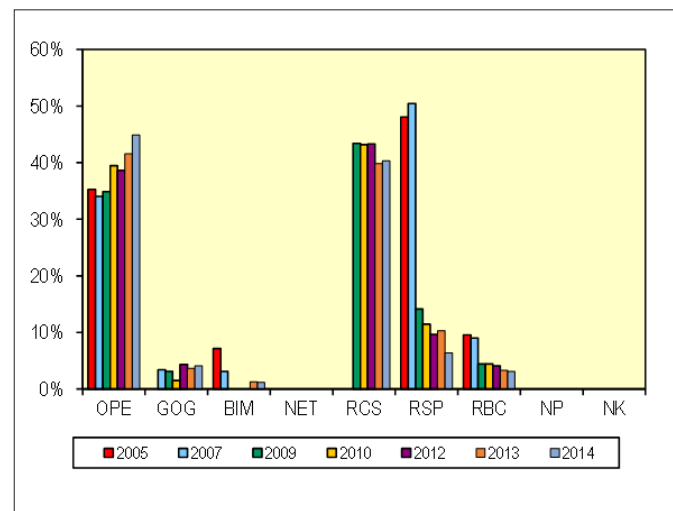
4.3.3 Asia

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 45% over the seven 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, and a change in domestic production pricing in two provinces in China.

The changes in RSP – down from 48% in 2005 to some 6% in 2014 – and the corresponding rise in RCS from 0% to 41% – was almost all due to the change in price formation in China as regulated prices were increased to economic levels. However, part of the fall in RSP also reflected the introduction, in the last quarter of 2014, of indexation of domestic production in India to hub prices. The decline in RBC from 11% in 2005 to 3% in 2014, largely reflected a change in some pricing in Bangladesh in 2009 to RCS and thereafter declining consumption in Myanmar. GOG, which has been variable, is all spot LNG imports, apart from the recent change in pricing in India.

Figure 4.13. Asia Price Formation 2005 to 2014

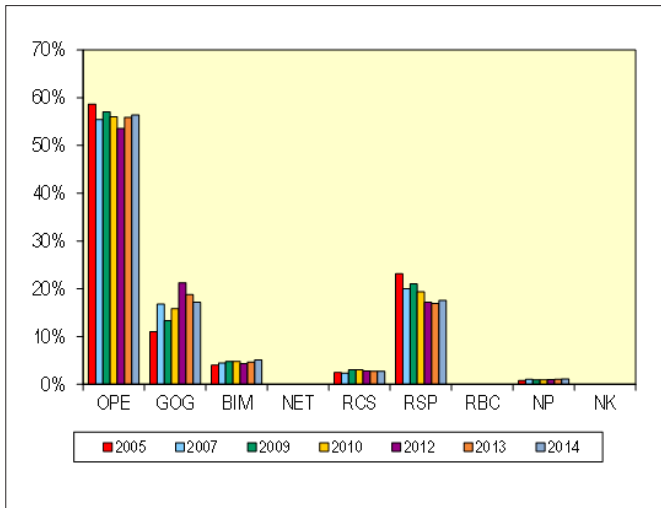


4.3.4 Asia Pacific

There have been only minor changes in price formation mechanisms in Asia Pacific since 2005. GOG has risen from 11% to 17%, with OPE declining from 59% to 56% and RSP down from 23% to 18%. Changes have not been consistent over time, but the rise in GOG has largely been the rise in spot LNG imports, mostly in Japan plus a smaller rise in Korea, with the variability reflecting the requirements for spot LNG. The fall in the RSP share reflects the relatively sluggish growth in consumption in Indonesia and particularly Malaysia.

¹³ Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia

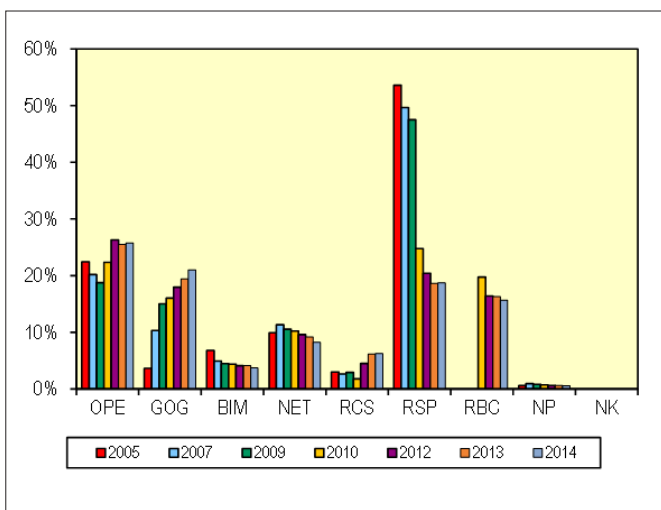
Figure 4.14. Asia Pacific Price Formation 2005 to 2014



4.3.5 Latin America

The changes in price formation mechanisms in Latin America have seen a rise in GOG from 4% to 21%, a decline in RSP from 54% to 19% and a rise in RBC from 0% to 16% - the latter all in Venezuela. The rise in GOG in part is due to rising spot LNG imports in Argentina, Brazil and Chile, and a switch away from RSP to GOG in Argentina, and to a lesser extent 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.

Figure 4.15. Latin America Price Formation 2005 to 2014

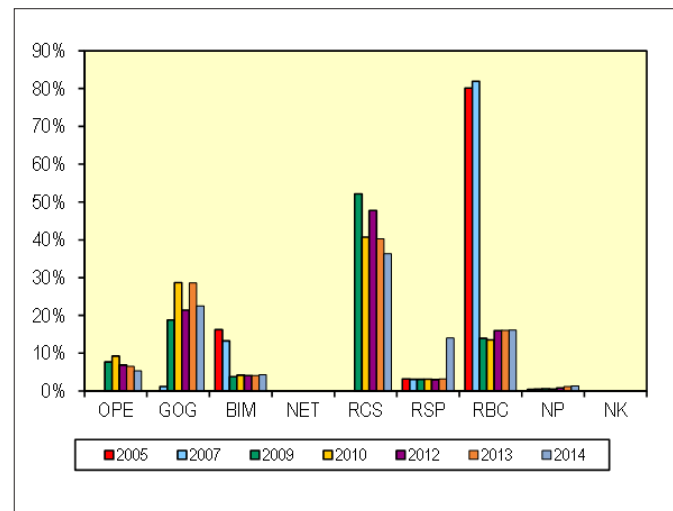


4.3.6 Former Soviet Union

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. The other change was in intra-FSU trade where pricing switched from BIM to OPE, particularly in the Russia to Ukraine trade.

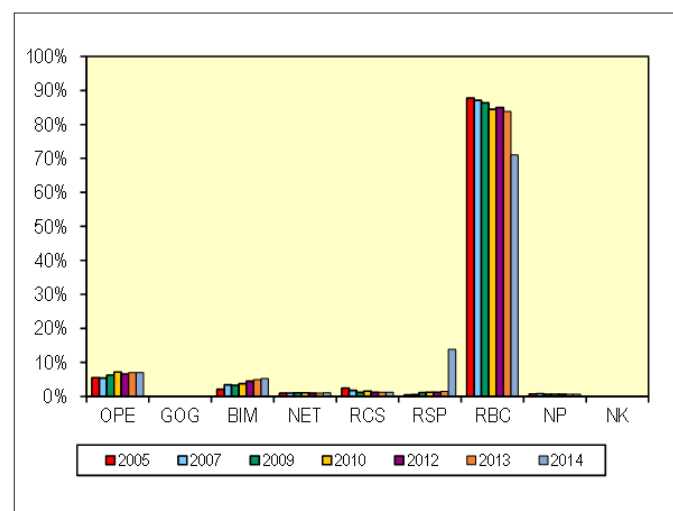
Figure 4.16. Former Soviet Union Price Formation 2005 to 2014



4.3.7 Africa

There were almost no material changes in price formation mechanisms in Africa between 2005 and 2013, but in 2014, Nigerian domestic production moved from RBC to RSP as prices were increased. The region remains dominated, however, by RBC, with gas prices largely subsidised.

Figure 4.17. Africa Price Formation 2005 to 2014

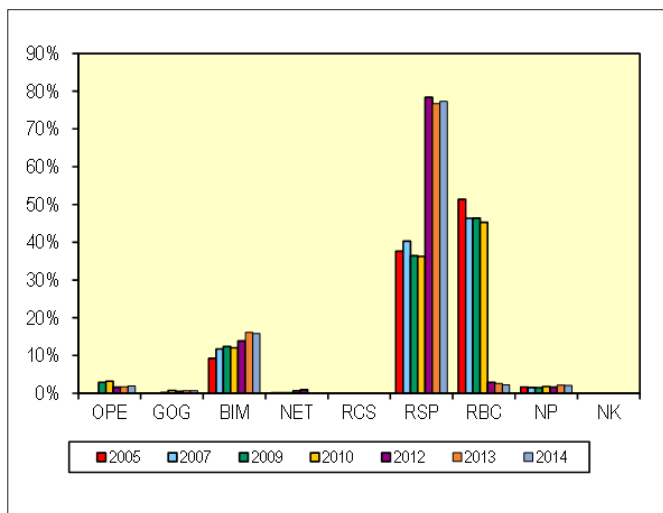


4.3.8 Middle East

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 and UAE. The rise in BIM in 2013 reflected the rapid consumption growth in Qatar.

Figure 4.18. Middle East Price Formation 2005 to 2014



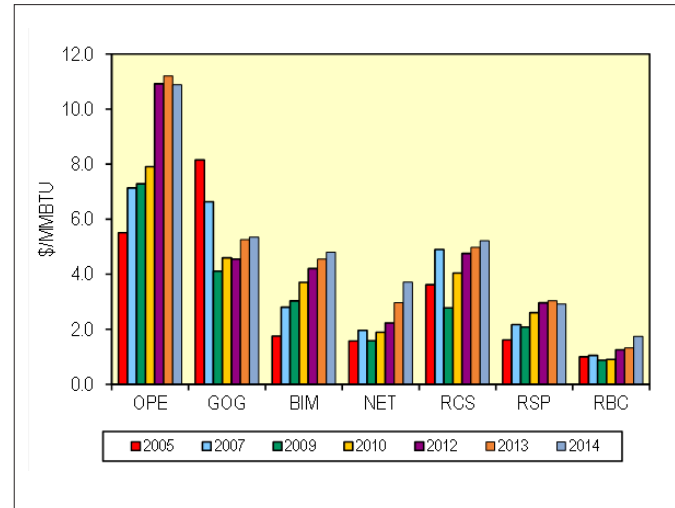
4.4 WHOLESALE PRICES COMPARISON

In considering wholesale price levels across regions, countries 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 caution and taken only as a broad indication.

4.4.1 Changes in Wholesale Prices by Price Formation Mechanism

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

Figure 4.19. Wholesale Price Levels 2005 to 2014 by Price Formation Mechanism

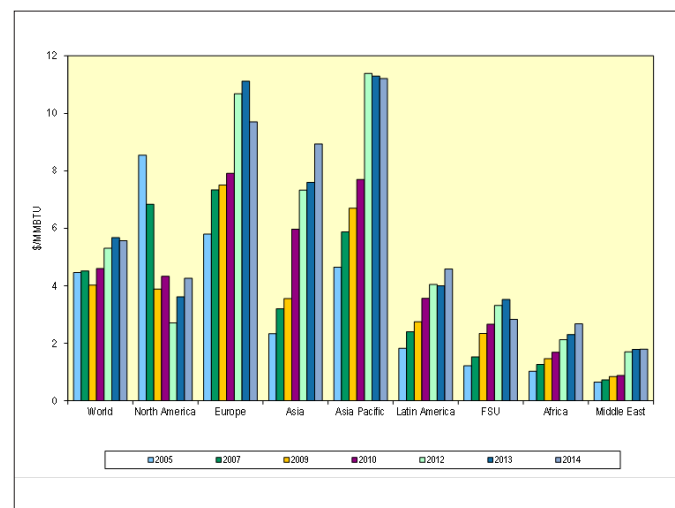


In 2005 the highest prices by price formation mechanism were for GOG at \$8.15 per MMBTU, but these declined between 2005 and 2009, before levelling off at around \$4.50, followed by small rise to \$5.25 in 2013 and \$5.35 in 2014. These changes were largely due to pricing changes in North America. In contrast OPE prices rose significantly from \$5.50 per MMBTU in 2005 to \$11.20 in 2013, as oil prices increased, before falling back slightly in 2014. There were also general increases in prices over time in the regulated price categories as well. The rise in prices in the BIM category reflected largely the loss of low priced intra-FSU trade to the OPE category as prices were raised in line with oil prices.

4.4.2 Changes in Wholesale Prices by Region

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

Figure 4.20. Wholesale Price Levels 2005 to 2014 by Region



At the world level, on average, wholesale prices have risen between 2005 and 2014 from around \$4.46 per MMBTU to \$5.57. This rise has been across all regions apart from North America, where the dramatic increase in shale gas supply has led to sharp falls in prices – with small rebounds in 2013 and 2014. The rise in prices in Europe and Asia Pacific have been well documented and studied, but prices have also risen in Asia, largely due to increases in prices in China, both as more gas is imported and regulated domestic prices are increased, and in India for similar reasons. The rise in prices in China was especially strong in 2014, putting China on a par with higher-priced European countries – see section 3.4. Less well documented, however, has been the general rise in prices in other regions, such as Latin America, where average prices have more than doubled and in the Former Soviet Union, where average prices have almost tripled, largely due to the rise in regulated prices in Russia, although prices fell back in 2014 as rouble prices were frozen and the rouble depreciated against the US dollar. In Africa, where over 85% of prices are effectively subsidised (RBC), there have also been price increases, with the largest consumer Egypt raising prices, although remaining with RBC, and more recently Nigeria. Also in the Middle East prices have risen slowly, with a significant increase in 2012 over 2010, as a result of the regulatory changes in Iran.

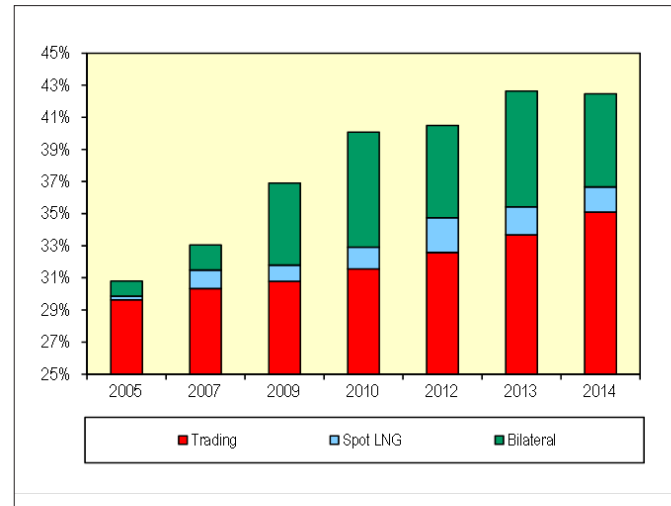
4.5 ANALYSIS OF CHANGES IN GAS-ON-GAS COMPETITION

The rise in GOG from 31% of total world consumption in 2005 to 43% in 2014 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 the following types of 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 where the price is linked to hub prices in markets where there is hub 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 Australia, Russia and Argentina.
- Spot LNG – simply spot LNG cargoes into markets where there are no trading hubs, but the price of the cargoes reflects the current supply-demand situation.

The figure below breaks down the GOG percentages over the seven surveys into these 3 categories.

Figure 4.21. Changes in GOG 2005 to 2014¹⁴



The Trading category is by far the largest – dominated by North America and increasingly Europe – and has increased from 29.6% of total world consumption in 2005 to 35.1% in 2014 – a rise of 5.5 percentage points. The Bilateral category has risen from 0.9% to 5.8% - a rise of 4.9 percentage points, while the Spot LNG category has risen from 0.2% to 1.6% - a rise of 1.4 percentage points. The total rise in GOG between 2005 and 2013 has been 11.7 percentage points.

Half the rise in GOG, therefore, has come from the Bilateral category and is largely in Russia together with a much smaller change, in volume terms, in Argentina. The rise in the Trading category is almost entirely due to changes in the European market, both in terms of increased trading volumes and contract renegotiations, although at the end of 2014 indexation to hub prices in India, away from RSP for domestic production, also increased the Trading category. The changes in the Spot LNG category have been variable over time reaching a peak of 2.3% in 2012 before falling back in 2013 and 2014 as the number of spot LNG cargoes declined¹⁵.

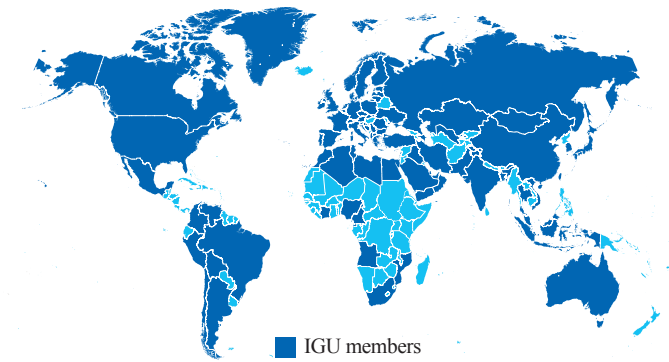
In respect of the earlier discussion on the changes from “regulated” pricing to “market” pricing, the major change in these categories over time have been in a move from “regulated” pricing to the Bilateral category of GOG, largely in Russia and, to a lesser extent, in Argentina, and “regulated” to the Trading category of GOG in India.

¹⁴ In order to emphasise the changes the vertical axis starts at 25%

¹⁵ The definition of Spot LNG in this survey is not the same as the GIIGNL definition of spot and short term contracts. This survey would not include the short term contracts element i.e. contracts over one year but less than four years.

IGU

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