

Fourth IEF-IGU

Ministerial Gas Forum

The role of Gas in Energy Security and Sustainability Economic Development

BACKGROUND PAPER ON THE GLOBAL GAS MARKET

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Prepared by IGU.

I. EXECUTIVE SUMMARY

Serious political and economic challenges need to be addressed if natural gas is to make a full contribution to energy security and sustainable economic development.

The backbone of the gas industry continues to be a long-term approach to business that has delivered a clear growth trend, but new shorter-term dynamics are becoming increasingly important. This applies not only to energy portfolio optimisation, but also to climate change mitigation. We need both longer-term research and development of emission reduction methods as well as supporting an immediate shift away from the more polluting fossil fuels by implementing efficient gas technology as the preferred partner for renewable energy.

International trade in natural gas has the ability to forge closer cooperation and mutually beneficial economic links between neighboring countries, but social unrest, terrorist attacks or even military action within countries along the gas chain can have serious consequences for investor confidence and longer term prosperity. Finding ways to ensure safety and stability along the routes where key natural gas infrastructure is located is an important political issue.

This 4th IEF-IGU Ministerial Gas Forum is a platform for Ministers and senior decision makers to investigate how energy policies, long-term partnership and enhanced cooperation can help to address these core challenges of energy security and sustainable economic development within a holistic energy framework.

Increasingly gas is traded as a commodity that is influenced by other markets through commercial and regulatory linkages. Just as trade, transit and investment in gas needs to be considered in a wider context, so should policies on issues like carbon allowances, technology transfer and energy services consider the effect on the gas industry.

Gas clearly plays an essential role in global economic development, but the maturity of the gas industry varies immensely across the world. We have the opportunity to learn lessons from the established gas markets and technology leaders to share knowledge and best practices that will help to achieve successful economic growth in the rapidly developing gas markets of Latin America and Asia.

Gas industry people often assume that, as a reliable, flexible and low-carbon fuel, gas must be the natural partner for renewable energy in a long-term sustainable energy solution. In this forum we will challenge ourselves about the wider perception of gas – what needs to be done if ‘Gas and Renewables’ is to be established as a Government-preferred sustainable partnership? We will also examine hard questions about the goals of eradicating energy poverty and achieving a successful transition to a low-carbon economy.

Globally there is an abundance of natural gas. The increasing ability to exploit unconventional gas reserves continues to add to the commercial world-wide potential. Large investments are needed both upstream to develop resources, midstream to transport the gas and downstream to establish robust markets that provide security of demand at the end of the gas chain. Political risk or regulatory instability can delay or prevent the necessary investments and lead to sub-optimal outcomes or even complete failure of the supply chain. Even in the most competitive energy markets, the major disruption of a nation’s gas supplies is a political issue. Governments need to be informed about gas industry activities, but that is only the first step in finding the right public/private balance to maintain security of energy supplies at the least cost. Sharing our perceptions and experiences from across the world should help us to build a more secure energy future based on efficient use of gas that is delivered both by pipeline and as LNG.

II. RECENT DEVELOPMENTS

The 2008/9 economic downturn caused global gas demand to fall by 2.3% in 2009 compared with 2008, followed by an acceleration of structural change and a return to growth. By the time of the 3rd IEF-IGU Ministerial Gas Forum in Paris on 29 November 2012, the global energy markets had already adjusted to fundamental changes in national energy policies. These ranged from changes in gas demand that resulted from the Fukushima nuclear disaster in 2011 to changes in gas supply as the implications of the US-led 'shale gas revolution' became clearer. At the end of 2011 the IEA had asked the question "Are we entering the Golden age of Gas?" There was however, little evidence for this at the last Ministerial Gas Forum, despite the global gas market being better connected physically than ever before; high spot prices for LNG and fierce competition with coal for power generation, despite the environmental advantages of gas, were dampening gas demand. The economics of new gas projects and even the viability of existing assets looked doubtful, at least in part because the contributions that gas could make to a cleaner world had not been properly recognized by policy makers.

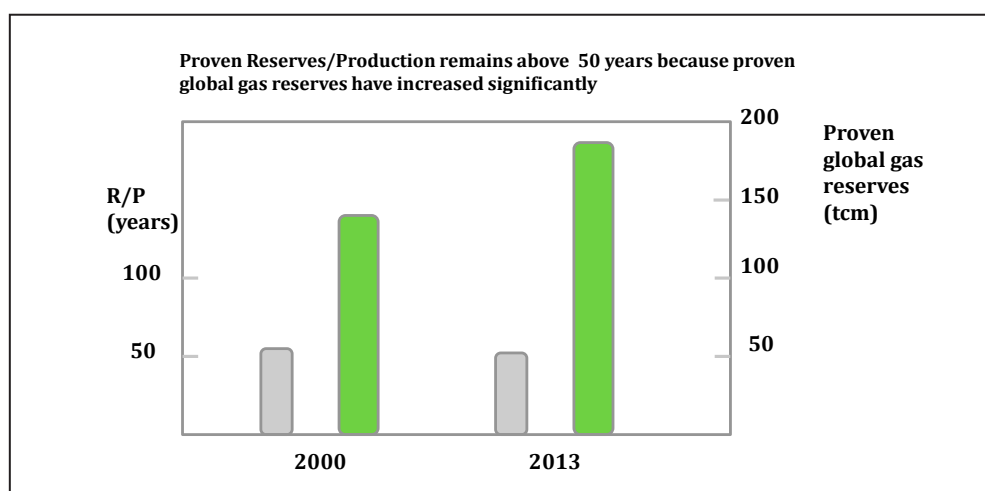
2013 saw a return to growth in global gas demand (+1.4%), but regional price differences were wider than ever. Probably the largest international gas deal announced during 2014 was the \$21billion Russia-China gas pipeline that is projected to build up to a supply of 38bcm/year some years after construction is completed in 2019 and will have huge effects on reductions of emissions. The 30-year deal reported to be worth \$400billion. This mega-project will connect the world's largest conventional natural gas producer with the world's most rapidly growing gas market. At the same time in Europe there is political uncertainty about the security of Russian gas supplies because of the tensions and turmoil in Ukraine. In other parts of the world, notably the Middle East and North Africa, investment in the gas industry and the optimal operation and usage of existing assets is constrained by social unrest, terrorist threats or civil war.

The remaining sections of this note set out some facts and figures, suggesting some key trends that relate to the topics being discussed in the panel sessions of the Forum,

III. THE DYNAMICS OF GLOBAL GAS SUPPLY

The world has sufficient gas to sustain annual increases in supply for decades to come, but geographic shifts in production and consumption are presenting new political and economic challenges for investors and developers in conventional and unconventional gas projects.

Since the year 2000, annual gas production world-wide has increased from 2410bcm to 3370bcm last year, an increase of 40% in 13 years. At the same time the quantity of remaining reserves has also increased, with 46,500bcm more gas now proven to be technically and economically viable for commercial production. Overall there has been a slight reduction in the global reserves/production (R/P) ratio, suggesting that proven reserves cover 55 years of global demand at current production rates compared with nearly 58 years of cover at the turn of the millennium.



The R/P ratio is a very high-level guide to the dynamic stability of future gas supply. Underlying the figures we can see an increasing proportion of unconventional gas and of gas from smaller reservoirs being added to the reserve base. The slight drift downward in R/P (which remains high in comparison with less than 20 years for oil) also reflects the changing structure of the gas market and arguably the improved efficiency of hydrocarbon exploitation: Whilst many of the initial giant gas discoveries are now well into decline, the vast range of discovered probable new gas reserves only need to be drilled and appraised (and hence proven) once there are good economic prospects for bringing that gas to market.

The world has vast conventional and unconventional gas resources, but expenditure to prove-up additional gas reserves rarely makes economic sense in regions where that is already abundant or even surplus gas production as well as proven but undeveloped gas reserves. On the other hand there are strong economic drivers for the application of new technology to discover, prove, develop and monetize indigenous gas resources close to consumer markets, or in new production frontiers where large discoveries hold out the prospect of economies of scale. Prime examples of these two dynamic drivers that continue to expand the gas resource base are the shale gas revolution that started in North America and could spread initially to Europe, China, Latin America and North Africa, and Gas Production (including new LNG export routes) from areas like the Arctic or offshore East Africa.

In recent years, the rise of shale gas in North America and projects to develop gas resources from new exploration and production plays has shifted the political and economic drivers of gas supply. The US has changed from being a consumer and importer of natural gas to achieve production level on a par with Russia, which holds the largest proportion of the world's proven gas reserves. The gas production from several well-established areas has now matured. In some countries like UK in Europe or Malaysia in Asia the longest established conventional

gas fields have now been depleted or are in rapid decline. At the same time gas production is increasing at many new locations throughout the world, for example from Latin America, China and in the coming years from Africa and Australia.

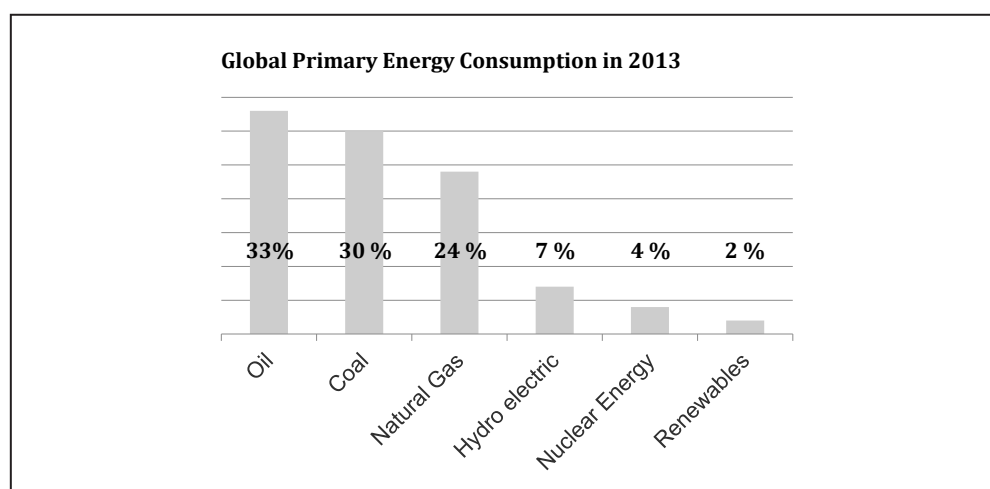
The interplay between traditional producing and consuming countries is changing, and the resulting political and commercial realities need to be shared and understood. Technology has the potential to expand the global gas market, but social and political acceptability relating to perceived environmental risks linked to fracking will affect the future gas supply outlook. Governments might also give a different emphasis to the development of indigenous resources; some having a clear objective of energy independence while others aim to attract investment and economic growth through enhanced trade. For developing nations it can be a difficult decision whether to develop a major discovery of gas as a new energy source for their own population or to improve the national budget by targeting export markets.

IV. THE DYNAMICS OF GLOBAL GAS DEMAND

Gas demand patterns have shifted significantly, but steady growth in North America and the double digit percentage rise in Chinese gas demand led to 1.4% expansion of the global gas market last year.

US, Canada and Mexico now account for 28% of global gas consumption, which in 2013 reached a record 3347.6 bcm. IGU longer term forecasts suggest that global gas demand will continue to trend upwards at about 1.4% pa, notably through economic development in Asia and Latin America. Among the key drivers are the needs of the population for cleaner fuel sources and more electricity supplies as the economies and population numbers grow. Choosing gas enables improvements in local air quality as well as mitigating climate change compared with coal. China is by far the most significant growth area within the Asian gas market. Indications are that policies are now reducing future investments in coal-fired power plant and this is leading to expansion of the gas-fired CCGT fleet (nearly 10GW added in first 6 months of 2014) and an even larger increase in the installed capacity for renewable energy.

Last year, natural gas accounted for just under a quarter of global energy demand, so it still takes a place well behind oil, which dominates the transport market and coal, which remains the market leader for power generation despite international concern about the effect on climate change. Wind, solar and other renewable energies are the most rapidly growing group of energy sources, but taken together these ‘renewables’ account for just over 2% of primary energy consumption world-wide.



The strongest determinant of energy demand, including the consumption of natural gas, is economic growth. The short-term effects were manifestly evident with the economic downturn and the beginning of recovery in the period 2008-2010. Energy demand in the industrial sector is particularly sensitive to economic changes. This is particularly true in the more globally competitive manufacturing industries, where there is also a clear energy and economy feedback loop. A reduction in economic growth leads to lower demand and pressure on industry to cut back, including a reduction in energy consumption. Whereas a reduction in energy costs or the use of more efficient energy sources like natural gas can increase productivity and boost economic growth as well as bringing additional environmental benefits. An example of this is the expansion of the gas market in the US going hand in hand with the exploitation shale gas and the continuing competitive advantage of low gas prices that have helped to fuel economic growth, create jobs and enhance GDP.

During the last decades, economic growth rates have been far higher in the developing economies rather than the mature ones. This trend is expected to continue but will require a wide range of energy sources to meet the needs of growing populations. The expansion of natural gas markets will be a critical success factor for the optimal economic growth and environmental improvement in many parts of Latin America, Africa, Asia and the Middle East.

Whilst the global economy and the effects on economic growth and energy demand is not something that an individual Government can control, the overall policy frameworks set by Governments do have a material effect on the energy mix within a country or region. Forecasting expected energy demand, let alone the gas demand, is therefore fraught with uncertainty and risk. Clear Government policy and a stable regulatory environment help to reduce that uncertainty and allow investors to better manage risk.

There is real growth potential for natural gas in every sector of the energy market throughout most areas of the world. The strongest growth, by volume, should be in the power sector, where replacing coal-fired power stations by high efficiency gas-fired CCGTs brings immediate efficiency gains and environmental benefits, both in terms of local air quality and reduced CO₂ emissions.

Gas is also a natural partner for renewable energy. The ability to store and to transport gas under high pressure provides enormous flexibility for this low-carbon fuel to work with intermittent solar or wind-based renewable energy sources. Further research and develop could undoubtedly lead to closer integration of high-efficiency gas technologies with a variety of renewable energy sources. Government policies that recognise this potential, support the necessary R&D and facilitate the investment that is required to bring about the perfect partnership between gas and renewable will help lay the foundation for a sustainable energy future.

In the residential and commercial sector a moderate growth is expected from almost 700 bcm now to nearly 900 bcm in 2030. The most significant rise is foreseen in Asia, mainly driven by the increased number of homes connected to the gas supply grid.

Gas demand in industry is expected to grow from 600 bcm in 2010 to 950 bcm in 2030 driven in a large part by developments in the Chinese and Indian economies. The overall trend is for forecasts of future industrial gas demand to be somewhat lower than in previous years as industrial output has been more constrained than expected in most OECD countries whilst on average better energy efficiency might be achieved globally.

The main driver behind the increase in total global gas demand in the past two decades has been the need for clean, efficient and competitively priced power generation. With billions of people needing electricity supplies, this sector should be set for continuing growth in the coming decades. The way gas is priced, however, can present some difficult challenges to the economics of power generation projects. In particular, if there were a return to some form of 'oil-parity' in Europe or a full continuation of oil indexation in Asia, then that would

reduce the demand for gas-fired power generation. Furthermore, if the gas price for power generation were held unduly low in North Africa and the Middle East, then that would reduce the likelihood of approval for investment in major renewable energy projects and may prevent their successful implementation. This would make global climate change goals more difficult to achieve despite the increased use of natural gas.

Overall, the IGU has forecast that the global power sector could grow to almost 1300 bcm in 2020 and around 1900 bcm by 2030. The outcome, however, is extremely dependent on the policies concerning renewable energy, which in turn are subject to economic and social pressures.

Gas consumption in the transport sector (mainly Natural Gas Vehicles - NGVs) is expected to become more important, growing from around 110 bcm now to 215 bcm in 2030. The main growth markets are likely to be onshore in the CIS, Middle-East and Asia, as well as in other coastal regions where LNG as a fuel for ships is required for environmental reasons.

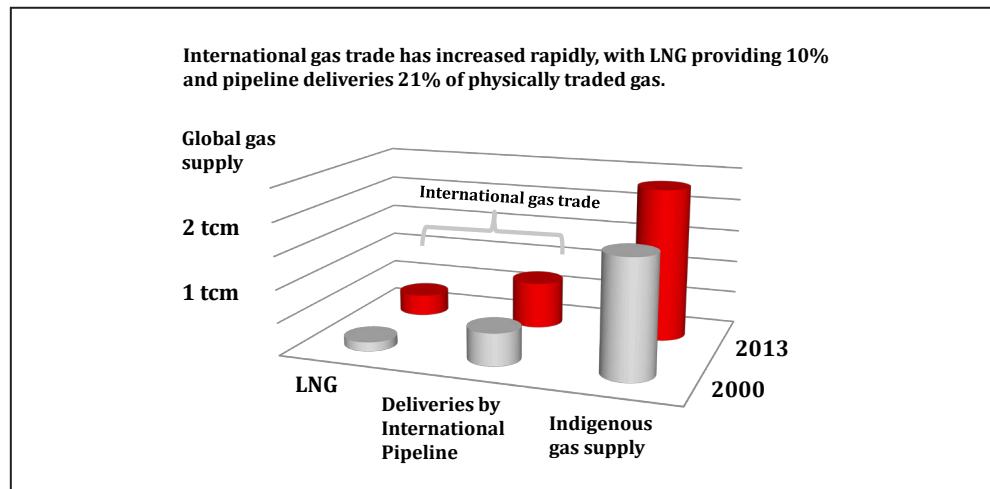
The transmission of gas through pipeline systems is far more efficient than the delivery of electricity through wires and cables. Not only is very little energy 'lost' in the gas system, the quantity of energy that can be transported through one under-ground high pressure pipeline typically dwarfs the energy delivered by a set of electricity pylons carrying several high voltage cables. Whilst electricity is needed for many modern appliances, the delivery of natural gas to cities, towns and villages provides an important economic option that will be the best solution in many circumstances and in many market sectors and different uses from district heating systems to use as a road transportation fuel.

How can Governments ensure that the best decisions on energy infrastructure are made? Establishing the right policy framework for longer-term economic growth and sustainable development is a particular challenge when there are large capital costs for the development of infrastructure, as is required for natural gas to be a beneficial 'game changer' for a nation or region.

V. THE DYNAMICS OF TRADE

Global trade patterns have changed, not only because of ongoing increased LNG imports by Japan since the Fukushima disaster and the essential self-sufficiency that shale gas has provided in the US, but also as seasonal patterns have emerged with arbitrage opportunities linked to the weather affecting regional demand. Looking forward, the investments already made mean that we can be confident that significant volumes of LNG will come on stream within the next five years. This includes from Australia, Africa, Russia and North America in addition to many other smaller or incremental projects from the increasing number of LNG exporters throughout the world. New supply routes are also emerging, with Yamal LNG expected to be delivered by the northern route eastwards to East Asian buyers during the Arctic summer, and the expansion of the Panama Canal allowing LNG cargoes from the Gulf of Mexico direct access to the Pacific. One forecaster suggests that the US will become the largest LNG supplier to Japan by 2023.

The flexibility that is developing in the LNG market is encouraging LNG deliveries to be seen as a useful source of supply diversification that allows supply security to be enhanced. Not only are LNG cargoes now frequently diverted to markets that offer a higher price, LNG reception terminals are increasingly used to re-export cargoes on other ships so that the contractual and logistic arrangements with the initial seller are not disrupted. As more and more LNG liquefaction and export plant is developed and additional capacity comes on stream the long-standing producer-consumer relationships will need to adapt to the new commercial realities.



International gas trade has grown even more rapidly than gas consumption and now supplies 31% of the global market demand, compared with 26% in 2000. Well over 1000 bcm of natural gas (that's slightly more than the annual natural gas consumption of the whole of Canada, USA and Mexico combined) crosses at least one international border every year. Nearly 70% of this internationally traded gas is delivered through high pressure pipelines and the rest is brought to market on LNG carriers.

Projected growth rates for international trade are expected to continue on current trends, with more and more gas crossing international borders and a larger proportion of traded gas carried on the sea. The long term investment cycle means that there is high confidence in this projection over the next 6-7 years, as the projects are already underway. Beyond 2020, however, there is considerable uncertainty as the investments have not yet been made.

The IEF Dialogue Insights paper on Unconventionals in the US and Beyond concluded that "the impact of a rise in gas production and available LNG exports on global markets will depend on the extent to which massive supply comes on stream, and on the extent to which demand will be able to absorb that incremental supply to maintain a price level that justifies continued investment in production and exports." The current decoupling of the gas price from the (higher) oil price has not, however, led to a downturn in global gas production. A large proportion of the gas fields that are now being exploited or planned for development will also produce high value NGLs (natural gas liquids) or are indeed associated gas fields in which the larger proportion of hydrocarbon value is in the oil that will be extracted.

Another factor that is impacting gas production linked to LNG export routes are the cost overruns of several projects, particularly in Australia. This leads companies to redouble their efforts to reduce costs, but also the larger players with world-wide portfolios reconsider where they are investing. When major companies sell parts of their production/liquefaction project assets that tends to set a global benchmark for the value that shareholders place on such projects. In the current environment this is placing additional pressure on developers to ensure that costs are minimized and that shareholder value will be realized.

Gas producers and LNG exporters continue to face difficult challenges to exploit the vast global reserve base, but there seems little doubt that overall global gas production and demand will continue to rise. The flexibility that LNG provides to link different sellers and buyers will make this an increasingly important international business. Not only have LNG ship sizes increased, the numbers of ships continues to rise; as recently as 1997 there were only 100 LNG carriers, now we have exceeded 400 and several hundred more are expected to be added to the global fleet during the coming years.

Analysed on the basis of eight regions, the IGU foresees changes in inter-regional gas trade, which will be reported by the IGU Strategy Committee (PGCB) at the June 2015 World Gas Conference in Paris.

The eight IGU regions



In terms of net importers, Europe and Asia/Asia Pacific stand out:

Even if demand is less than expected, Europe is, and will remain, by far the largest net importer; European net imports could exceed 460 bcm by 2035, an 80% increase compared to 2011 levels. Europe exports only small amounts of LNG from Snøhvit in Norway.

Continental Asia is set to become the second largest importing region, driven by the growing energy requirements of China and India. Imports of around 310 bcm will be needed by 2035, compared to around 35 bcm in 2011. IGU can envisage some exports by pipeline from Myanmar to Asia Pacific. Asia Pacific is a diverse area that will continue to be a net importer, but the rapidly increasing demand in Japan, Korea and the South-East Asian region is partially compensated by the surge in Australian LNG exports. Although internal regional trade will expand rapidly, net imports for the region as a whole are expected to decrease from 100bcm in 2011 to 85bcm by 2035.

There is now little doubt that USA will establish and retain significant LNG export potential, but the quantities exported will depend on whether or not price differentials exist with consumer markets. Overall supply and demand in the North American region may well establish a sustainable net export potential, but with net LNG exports occurring on a seasonal basis. Latin America and Caribbean is expected to export around 30 bcm of LNG. In terms of direct trade, the whole of the Americas will remain only physically linked to the rest of the global gas market through LNG imports and exports.

Africa is expected to see a considerable growth in terms of exports, reaching close to 200 bcm of net exports by 2030, whereas the Middle East will continue to expand production capacity with regional demand absorbing most of the additional supplies. The largest exporter will remain the CIS region, dominated by Russia, with a potential doubling of regional gas exports compared to 2010, reaching 370 bcm. These three regions will export both LNG and pipeline gas. Africa and CIS are not expected to import gas from the other regions, while some countries in the Middle East may continue to import LNG into the region.

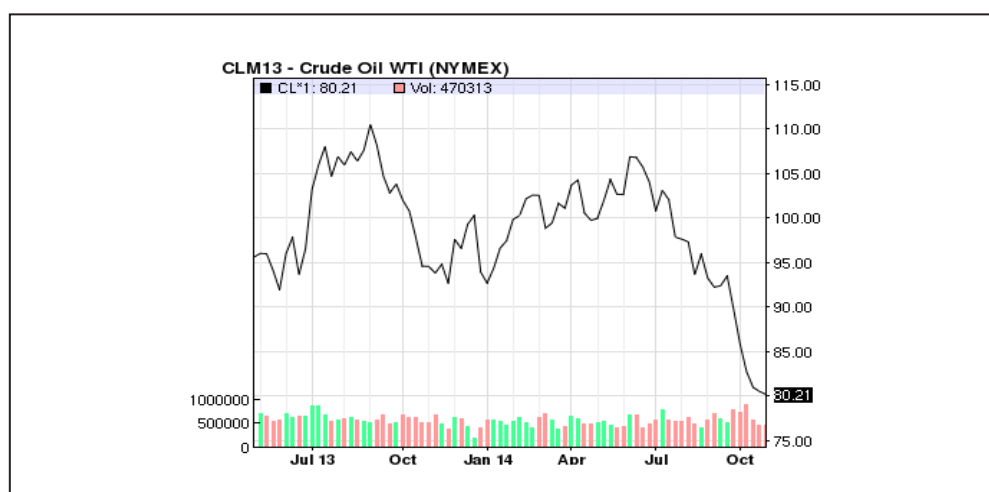
VI. GAS PRICING

Regional gas markets are now better connected than ever before and yet since 2008 globally gas prices have diverged; now there are signs that market forces are leading to a new form of global gas price convergence.

In 2007, for example the US, EU and Asian gas prices had all been typically in the range \$6-8/MMBtu. Average wholesale natural gas prices last year (2013) at Henry Hub were under \$4/MMBtu, Europe was around \$10-\$11/MMBtu and Japanese LNG averaged over \$16/MMBtu. These large arbitrage opportunities have led to structural change in the energy business, with new LNG flow patterns emerging and new trading relationships being established.

During 2014 there has been a seasonal variation in gas price across most of the globe. In particular since April 2014 the Asian LNG price fell sharply towards \$10/MMBtu by August, thus removing the economic arbitrage that had encouraged diversion of LNG cargoes away from Europe. During September, Asian and European prices started to rise as more information about potential supply constraints in the coming winter months started to emerge. There is no doubt that price awareness is stronger than ever before among producers, consumers and other participants and interested parties throughout the gas market. Interestingly, the summer-autumn 2014 fall in oil prices, down some 25% since a high in late June, has reduced the differentials between the main traded gas market prices and oil-indexed contract gas prices.

WTI oil price graph, 18 months to 3rd November 2014 (\$/bbl)



The local or regional balance between supply and demand, the aspirations for price levels and the actual form of gas price formation will all have an influence on international trade patterns in the future. Government decisions on allowing the export, or re-export, of LNG cargoes clearly influence market behavior and the attractiveness of various destinations for the delivery of LNG.

The latest figures from the IGU (ref. www.igu.org 2014 wholesale gas pricing report) show a continuing increase in the proportion of global gas that is priced using traded gas market prices (resulting from gas-to-gas competition and the formation of traded gas hubs). Whilst trading on downstream gas markets continues to develop and the proportion of spot cargoes of LNG continues to rise, 48% of gas imported by pipeline and 71% of LNG is still priced by reference to oil or a combination of oil product indices.

Gas-on-gas competition, with ‘hub-based’ pricing, continues to have the largest share of the world gas market and now totals some 43% of global gas consumption, spreading to 42 countries and can be found in all regions of the world apart from Africa. In Europe, gas-on-gas competition is now used for pricing over 50% of wholesale gas, displacing oil-price escalation as the dominant pricing mechanism. Globally, oil-price escalation is used for 19% of wholesale gas pricing. Oil-indexation gained some ground in Asia last year, with larger quantities of LNG and pipeline gas imported by China and India under oil-linked long-term agreements.

There has been ongoing speculation about the development of new LNG pricing hubs, particularly in Asia. Price reporting has advanced rapidly, and there are now financial instruments that use the reported prices of Asian LNG. A true LNG traded market, however, is not yet established but may well emerge in the coming years. The advent of LNG cargoes from the US later this decade, purchased on a ‘Henry Hub plus’ basis, might be the catalyst for liquidity in one or more emerging Asian LNG hubs.

An alternative approach, that is also topical in the discussions of security of supply, is the concept of joint buying. In its most extreme form a single purchasing agency would negotiate all gas or LNG purchases required by a country or region, thus providing a single buyer with maximum buying power to counterbalance the perceived power of a large or monopoly gas seller. This idea has been discussed as an approach for Japan and has been raised in the EU as one possible way forward for some countries in the eastern half of Europe.

The competitive pricing hub, in which there are many buyers and sellers and in which the price of gas responds to their perceptions of the current and future balance of supply and demand, is however not compatible with the ‘single-buyer’ approach. Governments and gas companies need to be clear whether they are committed to fair and open competition and the market-based gas prices that result, or alternatively whether the conditions for a competitive gas market cannot yet be established locally and a single-buyer approach must continue or be set up to ensure the best deal for the local population. There does not appear to be a viable mid-point between these two fundamentally different approaches. There are also difficult challenges in managing the transition from one situation to the other.

The global gas market is becoming increasingly competitive and better interconnected. Consumers have ever stronger incentives and opportunities for seeking the lowest or ‘best value’ gas deal available whilst gas producers are increasingly faced with high costs, often as a result of regulatory intervention or tightening fiscal regimes. Gas pricing needs to be allowed to respond to market forces to ensure sustainable growth through the right investment decisions and the delivery of policy objectives.

VII. INVESTMENT AND POLICY

The underlying economics of gas projects need to make sense for shareholders but frequently it is Government policy or regulation that makes or breaks an investment decision.

The individual gas projects with greatest expenditure and the largest individual impact on the market command greatest attention from politicians, the media and market participants. Such large, ground-breaking projects continue to come forward, particularly in areas of the world like Russia where very large conventional accumulations of gas are known to exist. Having a large resource means that there is likely to be large capital expenditure, but size allows savings through economies of scale. Greater reliability can also be achieved to deliver long term production profiles that allow the gas to be monetized profitably. Examples of producer investment of this type include Yamal LNG, opening a new production frontier and Arctic delivery route, and the ‘Power of Siberia’ pipeline to export Russian gas to China.

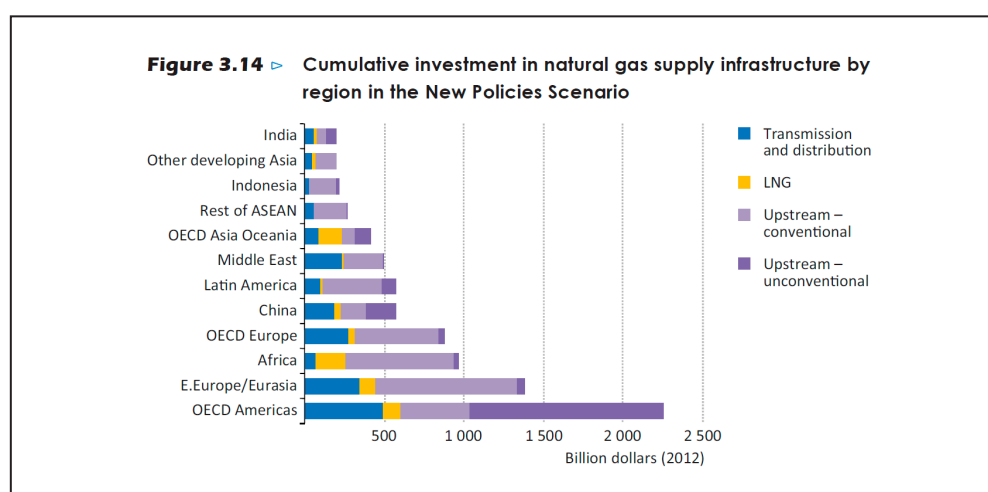
There are many other projects, however, of much smaller scale or much smaller duration, and it is these small

projects across the world that in aggregate could account for larger overall changes in the gas market, and indeed in the whole energy supply chain. Specific examples of these include the vast number of shale gas operations initially in the US and Canada, the increasing exploitation of tight-gas reservoirs in many other parts of the world, improvements in reservoir analysis and production technology that enhance recovery factors. These all increase the potential supply of natural gas. The gas market is also expanding through the use or blending of bio-gas or synthetic gas into mainstream natural gas markets, the development of small-scale LNG (not only FLNG and other liquefaction schemes but also for a wide variety of downstream uses including road and sea transportation fuel), localized power generation or CHP schemes based on gas, grid expansions to bring natural gas to new towns and cities or to established cities to improve air quality, refueling networks for CNG vehicles etc.

On a global basis there is no difficulty in finding capital for major investments that can be shown to make economic sense, or which a government is prepared to back for strategic reasons. Even some large projects, for example LNG developments, are now sometimes funded primarily by Government equity or from the balance sheet of a large private shareholder. Small or medium-sized companies involved in significant gas projects are still likely to require a long-term sale/purchase agreement to get funding from a bank. The investment bank will always be concerned about how Government policies and regulatory risk will affect the project.

Globally the average wholesale gas price in 2013 was \$5.65/MMBtu. Given the size of the global gas market, this would suggest a total value of \$670billion at a wholesale level. With the additional costs of distribution, marketing and taxation associated with final retail, the global gas market is probably worth in excess of \$1trillion annually. To maintain, let alone expand, this business requires considerable capital expenditure throughout the gas chain. The investment trajectory is likely to follow the patterns of supply demand and trade indicated earlier in this note, with considerable expenditure in distribution systems required downstream to expand the gas market in addition to a new wave of exploitation, appraisal and development of new gas supplies. The bulk of global gas supplies will continue to be consumed within the countries in which they are produced, but international trade will require further investment to keep the world in a secure balance. Probably there will be about twice as much investment in LNG projects in comparison with international pipelines.

The IEA's 2013 assessment of gas industry infrastructure expenditure showed a predominance of upstream costs, with the highest costs associated with the development of both conventional and unconventional gas resources at the beginning of the gas chain.



Increasingly, however, the idea of a gas ‘chain’ is less useful when considering future policy and investment needs. Many national markets are now reshaping with gas flows reversing or being linked to new sources, while others have developed LNG export or import facilities with the intention of accessing buyers or sellers at many different locations in the world. We now have, in different stages of development, the beginnings of a world-wide gas mesh in which regional markets exist with potentially different prices but a range of options enable buyers and sellers to optimize their portfolios internationally. The changes required in business models, contracts, regulation and financing arrangements to make best use of this new world have yet to work their way through.

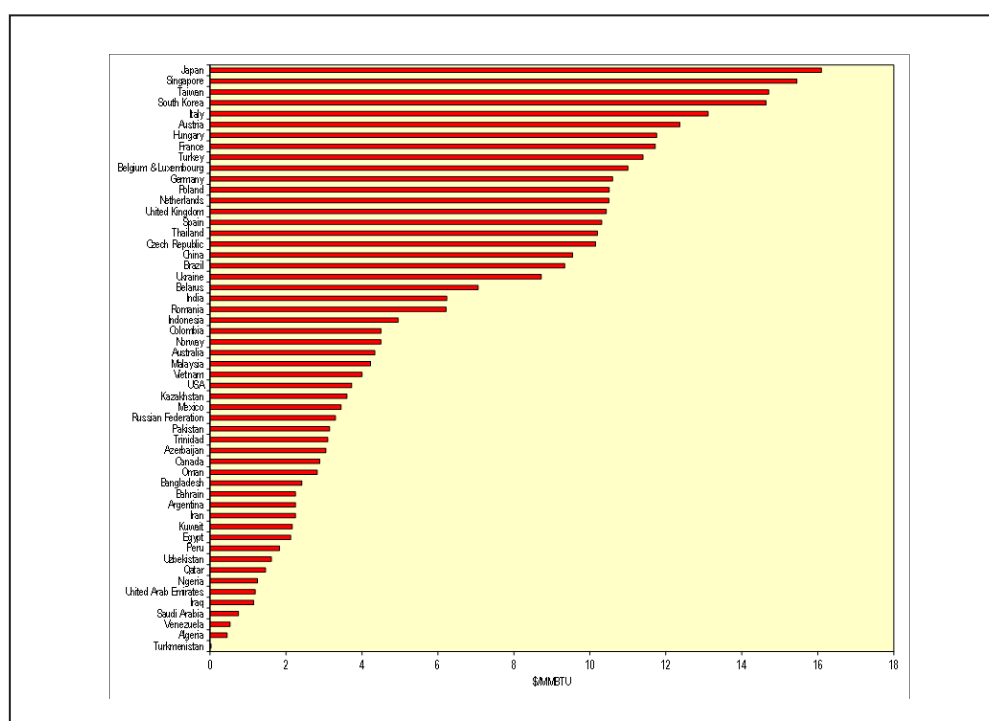
Governments have a central role to set the clear policy agenda and it is important to establish and maintain a dialogue on the needs of industry. An important aim would be for good international cooperation to avoid new barriers to gas trade or investment, for example by aiming for consistent approaches to gas regulation.

VIII. CONCLUSION

The digital age with social network now connects and informs the people of the world better than ever before. Energy, and in particular natural gas, has risen to be one of the main items on the political and social agenda. This brief note has illustrated how the global gas market is already bigger and more complex and yet it is still in a transition.

There is a wealth of information to be shared through this Ministerial Gas Forum and dialogue to deepen understanding. Although we cannot expect to find all the answers, the sessions will certainly aim to do something more important – they will seek to ask the right questions!

Annex: Average wholesale gas prices for individual countries in 2013



This chart is reproduced from the IGU 2014 gas price survey report, which is available on www.IGU.org



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