

A Changing Global Gas Order

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Global energy markets are constantly evolving, sometimes making it difficult to identify when truly fundamental changes are underway. However, for natural gas markets—which are undergoing new shifts in global demand and supply, and face questions about conventional pricing, contracting and financing—there is no question that they are in the midst of a dramatic shake-up. The following commentary examines the causes and consequences of these transformational changes in global gas markets.

Historical Gas Market Dynamics

For decades, natural gas has been predominantly a regional commodity concentrated in areas with or near economically exploitable resources, due largely to the relatively high costs of transportation. The most efficient and preferred means of transporting gas over long distances has been through pipeline, which comes with geographical constraints. And even though the advent of technology to cool natural gas (into liquefied natural gas or LNG) in the 1960s now allows it to be shipped by tanker in a manner comparable to crude oil, the process of liquefaction, transport, and regasification is relatively costly, energy intensive and requires large up-front investments in massive LNG supply chains. Thus, global gas markets have largely remained regional, precipitating marked price differentials around the world, depending on regional supply and demand conditions.

Government energy policies have long influenced natural gas usage. For example, following the oil crises of the 1970s, the French government—reacting to an absence of domestic resources and the presence of major engineering capacity—began to develop a nuclear energy sector, which has crowded out gas and other feedstocks for electricity generation.

The construction and maintenance of high-pressure transmission pipeline systems have historically been carried out by state-owned companies, chiefly because these companies operate as natural monopolies. Yet in the United States, following significant market restructuring since the late 1970s, these companies have been mainly investor- and privately owned utilities. In most parts of the world, regulatory authorities help set tariffs for using infrastructure, or monitor fair access and competition, although specific country practices vary widely. Regulatory authorities are often not completely independent, and significant market reform is still required to enable competition.

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Furthermore, the close ties between the gas industry and national governments have historically played a role in the formation of strategic, social, infrastructure and budgeting policies. This has been true in major gas exporting countries like Russia, as well as in gas transit countries, such as Ukraine, Slovakia and Poland. The importance of natural gas in the day-to-day functioning of state governments has resulted in state interventions (including direct state control in many countries), or close connections between government and natural gas companies by way of direct ownership, indirectly via regulatory control, or through special voting rights for government representatives. In the case of international transactions, the gas industry has long played an instrumental role in geopolitical relationships between countries, such as those between the former Soviet Union and European countries like Germany, Italy, and France.

Transaction costs in gas markets have been extremely high due mostly to high specificity of assets,¹ and they have been reinforced by inflexible pipeline transport systems, which raises the probability of opportunistic behavior when one party uses the relationship to advance its position at the expense of the other. For example, after investing in the construction of a gas pipeline, should consumers demand lower prices for gas, suppliers face few choices but to comply, given few alternative uses of the pipeline.

In Central and Eastern Europe, concerns abound about arbitrary pricing, likely incentivized by the lack of regional competition due to limited pipeline infrastructure. The high capital intensity of the gas industry has increased the risk of opportunistic behavior here. Technological features have also created strong interdependencies between counterparts. Moreover, gas trade (both pipeline and LNG) always had a significant degree of uncertainty due to long investment cycles and long periods of subsequent operation of specific assets to recover costs. Economic theory suggests that high transaction costs favor vertical integration to reduce some of these costs, but when vertical integration is not practical, relatively inflexible long-term contracts have been used instead. In this case, the parties remain formally independent.

However, competition has been limited in many regional gas markets, precluding a viable price reference. Instead, there has been a preference to link the price of gas in contracts to the price of oil or oil products, an idea that was first developed in the Netherlands in the 1960s. But recently, with infrastructure developments, integration of previously fragmented networks, as well as the increasing penetration of LNG, the rate of asset specificity is diminishing, thus suggesting a transition away from vertical integration or long-term contracts and into classic market contracts that are used in other commodities.

¹ The asset which provides the maximal effect within the given contract. It is difficult to find replacement and alternative application for such an asset.



New Factors Driving Gas Market Shifts

While natural gas is still largely traded on a regional basis, several factors are conspiring to drive fundamental shifts in the market:

- High levels of infrastructure development and gas penetration throughout the world. In mature gas markets, such as those in North America and Northwestern Europe, much of the legacy infrastructure has already been amortized. Mature networks provide opportunities for pipeline competition, assuming third-party access is guaranteed. Thus, asset specificity is diminishing.
- New LNG technologies—notably floating storage and regasification technology (FSRUs)—will make the gas market more flexible on the demand side, further reducing specificity of its assets. A floating regasification and storage unit, for example, can be moved to different locations, or used as an LNG carrier or floating storage unit (FSU). Moreover, these options are relatively easy to finance and construct compared to their capital-intensive and large-scale peers.
- The number of gas-exporting countries (33 countries in 2015) and gas-importing countries has increased dramatically. A growing number of, and more diverse, market participants naturally reduces market concentration.
- Intensifying inter-fuel competition, especially in the electricity sector, has forced gas pricing to become more market-based, and it has weakened linkages between the price of imported natural gas and the price of oil. However, challenges still exist if the gas industry does not implement creative solutions in this increasingly competitive environment—some assets may become stranded. Hence, cost reduction and the identification of new markets will be key in the coming years.
- Substantial new gas supplies, combined with weaker-than-expected demand, are creating a gas glut, resulting in the release of some gas volumes into the free competitive market, which were previously locked in long-term contracts. Over the next four years, the start-up of several large-scale LNG projects—in particular in Australia and the United States—will grow the volume of gas available to trade on this market. Furthermore, a pending decision on the legality of long-term take-or-pay contracts by Japan’s Fair Trade Commission may further dismantle what has historically been a rigid sector.
- The global community has become more serious about reducing GHG emissions and addressing climate change in recent years. While the full impact of these efforts is unclear, one possible outcome could be higher demand for natural gas, which is considered a relatively clean fossil fuel. To be sure, this is not a guaranteed outcome. In various parts of the world, particularly Europe, it has become questionable whether natural gas will indeed play a bridge fuel role. In North America, there are concerns about the Trump administration’s commitment to mitigate carbon emissions and what the broader consequences of such a policy shift would be. Most modelling suggests that



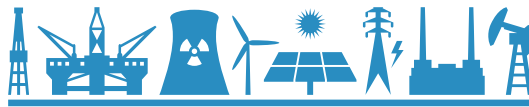
existing trends will likely be slowed down, but not reversed, even if drastic policy interventions like axing the Clean Power Plan take place.

- The advent of shale gas extraction in North America has shattered conventional wisdoms, for instance, about the relative scarcity of exploitable natural gas resources. To what extent and within what timeframe the shale gas phenomenon unfolds in other countries remains to be seen.
- Gas demand growth is decelerating. Several factors are important to consider here. First, with energy demand growth taking place almost exclusively in non-OECD countries, it is of utmost importance that data collecting and verification in those nations improves. Previous forecasts have too often proved false, undermining the assumptions on which research is carried out and investments are based. In OECD countries, natural gas demand in most projections seems roughly flat, due to factors including improved efficiency and the encroachment of renewable energy into traditional natural gas markets. This is a trend we expect to continue, and may lead to greater competition between fuel sources for a shrinking market. However, this could change if natural gas can make inroads in new markets, and the current low price environment should incentivize companies to search for such options.

While all of the aforementioned factors have contributed to a fundamental restructuring of natural gas markets, the explosion of shale gas production in the United States in the last decade, which was followed by the substantial yet underappreciated beginning of large-scale coal-bed methane development in Australia, began the process. The scale of this transformation is hard to overstate.

U.S. shale gas production has increased from about 5 Bcf/day in 2005 to nearly 40 Bcf/day today, accounting for about half of America's dry gas production. Furthermore, after completing a cumbersome—though not insurmountable—permitting procedure and mobilizing sufficient capital, U.S. companies now export natural gas not only to Mexico by pipeline, but increasingly to markets across the rest of the world in the form of LNG. To the surprise of many analysts, Latin America received the vast bulk of initial U.S. cargoes shipped in the first half of 2016 due to seasonal demand. Currently, one U.S. LNG liquefaction plant is operational, with another four due online in the coming years, which should make the United States the third largest exporter of LNG after Australia and Qatar.

It is no accident that the development of shale reserves has sky-rocketed in the United States. Underlying the boom in U.S. shale production is a unique set of factors, including a well-developed and large market, favorable geological conditions, access to infrastructure, public support (in key, energy producing regions and states), private ownership of mineral rights, access to capital, and a highly competitive, high-quality onshore service industry.



Given the absence of some of these important features in other parts of the world, we do not expect new “shale revolutions” going forward, even if geological conditions may be similar, or even better. Instead, companies, governments, and regulatory authorities around the world will have to slowly “crack the code” to access substantial, yet unconventional gas resources in places as diverse as China, Argentina, and Algeria, among others. Evolution, not revolution, will define future shale gas developments, but this does not change the overall point that, contrary to the conventional wisdom from a decade ago, the world is awash with natural gas and theories of peak supply seem relics of the past.

In 2011, the International Energy Agency hinted at the possible arrival of a “Golden Age of Gas,” but, contrary to expectations, demand for natural gas, though still the fastest-growing fossil fuel in most long-term forecasts, has recently been disappointing. This may change in the coming years, as additional supplies come to market, and oversupply may kick in. Assessments vary widely, but most analysts believe this overhang will last until the end of the decade and possibly several years into the next.

This oversupply will have significant implications for the future, some of which we can learn from the 2008-2009 supply glut, when U.S. shale gas production forced LNG cargoes—primarily from Qatar—to find a new home. In the more liquid parts of the European Union (where gas markets are well developed and sufficient infrastructure, pipelines, regasification capacity, and storage facilities exist to move various sources of supply), oversupply had a downward effect on spot market prices. It is important to keep in mind that historically most offtakers signed long-term take-or-pay (TOP) contracts that were indexed to oil (product) prices and tied to obligations to pay for a certain amount of natural gas per annum, whether buyers decided to physically ship the commodity or not. This in turn limited flexibility as well as the room for offtakers to shift suppliers if and when more competitive options became available in the market. We note this because it is the only part of demand not covered in long-term contracts for which plummeting spot market prices are relevant. In other cases, offtakers can find attractive alternatives.

Historically, every few years, most contracts allow for contractual arrangements to be evaluated. What we witnessed in Northwestern Europe during 2008-2009 was a pressure on incumbent suppliers to reconsider their contractual terms as the discrepancy between spot prices (based on excess supplies of natural gas in the market) and long-term TOP prices (tied to a high oil price) grew. The most prominent suppliers to Europe—namely Norwegian Statoil, Russian Gazprom, and Algerian Sonatrach—responded differently to these changing market conditions. For example, Statoil shifted its long-standing business practice and began to offer products based on gas (spot market) prices. The latter two suppliers were more conservative in their approach however, and they negotiated discounts and implemented a system of partial spot indexation with their clientele on an individual basis, without changing the fundamental contractual terms.



These developments in Northwestern Europe were significant and arguably the culmination of almost two decades of market development and liberalization. However, differences also exist today, in 2017. First, as a result of falling oil prices in 2014, some forecasts do not expect supply and demand to rebalance before late 2017. As prices for natural gas have plummeted, customers around the world are demanding better conditions for their offtake, whether that is realistic or not (in our view, when markets are not well developed and lack competition, it is somewhat futile to demand competitive prices). Second, as previously touched upon, with new projects entering the market, global liquefaction capacity will more than double in just five years' time.

What we see unfolding is what some have labeled as a reconfiguration of global LNG markets, which today constitutes about one third of global gas trade. Price mechanisms are changing, moving away from oil indexation and toward indexations based on various pricing points in the more liquid parts of the world (such as Henry Hub in the United States, NBP, or TTF in Europe). We believe it is only a matter of time before offtakers realize that spot market prices do not necessarily equate to low prices, as is sometimes erroneously assumed.

Furthermore, contract duration and flexibility will continue to change. Historically, projects have been financed through supply contracts with destination clauses which prohibited buyers from reselling cargos, regardless of whether they needed it. Today, U.S. projects entering the market increasingly use new pricing mechanisms and greater destination flexibility. New buyers often demand more flexibility as well, forcing producers to change traditional practices. These fundamental changes will have consequences for financial institutions that provide capital for what are often multibillion-dollar investments. They will also pose new challenges the market must grapple with in the coming years. For example, new financing schemes must be developed if financial institutions are to make a profit in this capital-intensive industry, and in turn, new questions arise: Could new gas projects become less vertically integrated and thus smaller in size? Does that mean overall entry barriers for the natural gas market will be lower?

New contract configurations at a certain stage will also necessitate a new approach to transactions. They will likely be more frequent, less specific (more standardized), and involve more participants. This will not only encourage further hub development but also potentially lead to the "UBERization" of LNG trade with buyers dispatching LNG cargoes from a liquid global market whenever they need one. Overall, we expect the market will become much more efficient and liquid. In addition, the financial risk in these projects will increasingly shift toward the gas producer, and not, as historically has been the case, predominantly rest with the buyer.

As we enter several years of oversupply, suppliers must adapt to new market conditions as well as new demands from their offtakers. This process will inevitably hurt some of the global incumbents. For NOCs and IOCs active in both oil and gas markets, the process will be made more difficult if oil prices do not recover. But with an eventual recovery in oil prices, there is



expected upward effect on all gas contracts that are still oil-indexed (including virtually all contracts in Asia and most contracts in Europe). This, in combination with continued and relatively low spot LNG prices in the United States and Northwestern Europe, will likely incentivize offtakers to continue to put pressure on suppliers to revise existing terms of delivery.

Demand growth will also face headwinds from improving energy efficiency in buildings, industrial processes and electricity generation, ongoing electrification of our final energy use, and a structural shift of economic activity from industry towards the service sector.

However, despite abundant global supplies and relatively low prices, it remains to be seen whether we will witness the global breakthrough of natural gas that some anticipated several years ago. That belief was substantially based on the idea that policymakers around the world would implement increasingly progressive carbon reduction policies. In most parts of the world they have not, despite the adoption of a widely heralded agreement to address global warming in Paris. Combined with low global coal prices (although acknowledging their ability to fluctuate sharply, as witnessed in 2016) due to a set of structural economic changes and looming environmental policy, this has led to a situation in which natural gas struggles to compete, with exception to parts of the world where extraction costs are relatively low (such as North America, the Middle East, and Russia).

In large parts of Europe, natural gas has lost significant ground due to the economic crisis, increased efficiency, and subsidized renewables. In Central and Eastern Europe, the market has not been fully developed, and a lack of competition in this part of the continent further complicates the competitive position of natural gas. There are also questions around consumption in developed economies going forward as demand growth will come almost exclusively from non-OECD countries, fundamentally changing decades-old global trade patterns.

In large parts of Asia, market development is underway but still in the very early stages. It will take time to develop infrastructure, open the market to competition, deregulate gas prices and create independent regulatory authorities, among other measures. While new emerging markets in Africa, India, and South America face numerous challenges—the opportunities they offer for gas is critical. If the gas industry finds ways to provide energy supply solutions in cooperation with renewables for a competitive price in these regions, then a golden age may still lie ahead for natural gas.

Finally, one other critical question remains: What do consumers want? Consumers in developed countries increasingly are looking beyond gas to convenient and reliable supplies of relatively clean energy. Therefore, the answer to our question may lie in cheap, reliable, mixed solutions for electricity and heat supply, supported with proper schemes of financing and leasing. In some countries, such as India and Japan, governments choose to support clean energy technologies



with a more carbon intensive baseload, consisting of a sizeable share of coal. However, Germany's recent experience with a power mix dominated by coal and renewables suggests that this combination is not the quickest way to reduce carbon emissions in the power generation sector.

Ironically, the gas industry, which has long advocated for its own product due to its standing as a relatively clean fossil fuel and due to its alleged relatively flexible usage in electricity plants (making it a good fit with intermittent solar and wind power), might face increasing scrutiny about whether it has a future in a low-carbon economy. This is in part due to falling renewable energy and electricity storage costs.

The role of natural gas will be different across regions of the world as scenarios of deep decarbonization are considered. In the United States, the question of whether natural gas can be a bridge fuel has already been answered. With the advent of shale gas and the large-scale build-out of gas-fired electricity generation capacity, the bridge has already been built. The question going forward is how to reconcile the abundance of cheap gas with ambitions to significantly reduce carbon emissions. Elsewhere, energy transition scenarios will vary, but one certainty is that we will have to focus not only on the electricity sector, but also on natural gas usage in industry, transportation, heating and cooling.

It will take time to fully understand all the economic, environmental, and geopolitical implications of the new global natural gas order. Tectonic shifts in the energy sector tend not to occur overnight. But gas markets are on the move, and their evolution will profoundly shape our energy future.