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The Next Cycle
Gas Markets
Beyond the Recession



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EXECUTIVE SUMMARY

Worldwide markets for natural gas have gone through unprecedented change over the past 18 to 24 months as a result of significantly reduced energy demand driven by the global recession, and an unexpected expansion in supplies of unconventional gas in the United States. As the world's largest economies emerge from the downturn, a scenario may play out in which the traditional supply/demand equilibrium and pricing structures gradually disappear, profoundly altering the structure of international gas markets.

These fundamental changes will compel players in the gas market to react in different ways. Producers should review their asset and development portfolios to assess whether investments are still advantageous given changing gas price dynamics. Integrated oil and gas companies may need to reconsider the way in which they allocate investment funding to oil and gas assets. As the market has tilted in the buyers' favor—a situation that may well hold steady for some time to come—producers will need to find ways to monetize the supply security they provide in a world that is more spot focused and, hence, more exposed to short-term supply shocks. Further

down the value chain, importers and large users such as utilities must reevaluate their optimal supply portfolios in terms of balancing contracts and open positions; they need to assess the value they place on gas supply security against the advantages of low-cost spot gas with its potential price and supply volatility. At the same time, wholesalers will need to find ways of creating value for their customers to justify their role in the value chain, which is increasingly being eroded by large users and producers connecting directly. Utilities, for their part, need to assess their power generation portfolios against the new relative price positions of gas and coal.

Key Highlights

- Reduced energy demand due to the global recession has roiled natural gas markets, as demand has plunged worldwide.
- Natural gas markets are likely to remain oversupplied for five to seven years, in part due to unconventional development in the U.S.
- This fundamental change in the traditional supply/demand equilibrium could be altered yet again by new demand from utilities switching from coal to gas, as well as shifts in long-term contracts that allow buyers to participate more in spot markets.
- Because of natural gas market shifts, upstream and downstream players must address fundamental questions on risks, and sourcing and supply portfolios.

AN OVERSUPPLIED MARKET

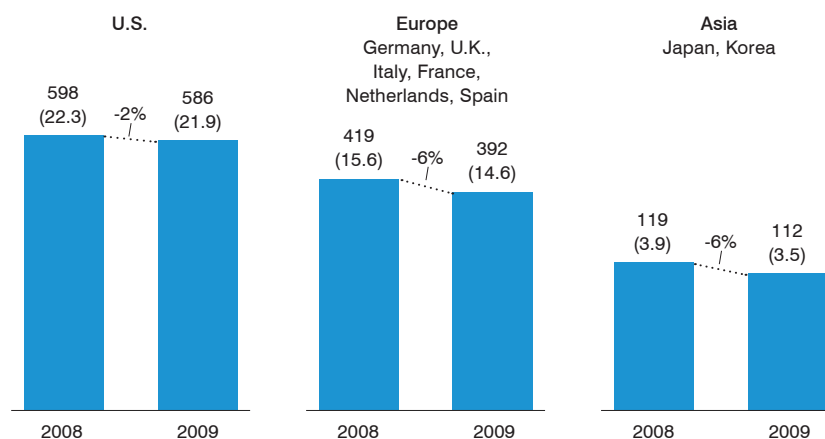
Since the recession of 2008–2009, global natural gas markets have been in turmoil. That may be an understatement: in 2009, demand

for natural gas actually dropped in all regions of the world simultaneously (see Exhibit 1) for the first time since the onset of international gas trade in the 1960s.

The resulting oversupply sent gas prices tumbling in spot markets. Still, in Europe and Asia, long-term contracts indexing gas prices to oil prices are prevalent. And with oil trading again in a range of US\$70 to \$90, a significant gap has opened up between depressed gas prices on the

Exhibit 1
World Gas Demand

CUMULATED CONSUMPTION IN bcm (tcf)



Source: IEA; EIA; Booz & Company analysis

spot market and the price of gas sold under long-term oil-indexed contracts (see Exhibit 2). This puts significant pressure on the buyers of long-term contracts because they may be facing competitors and customers with access to significantly cheaper supplies.

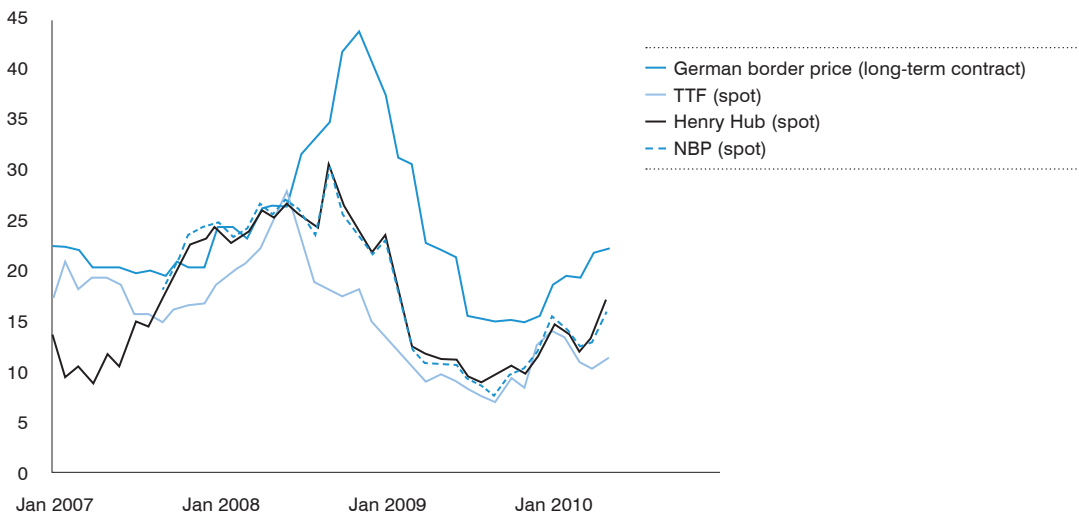
In our view, the demand reduction experienced in 2009 is structural. In

other words, as economies accelerate again, it's unlikely that natural gas markets will bounce back quickly and make up for lost ground with above-average growth. Two historical examples support this point of view. In the Asian economic crisis of the late 1990s, gas demand remained flat for some years. When the Asian economies emerged from the downturn, annual

demand growth returned to pre-crisis levels, but there was no acceleration of growth; as a result, volume lost during the crisis was never made up. Similarly, in the U.S., gas demand dropped significantly in the mid-1970s as the oil shortages of 1973 drove energy-intensive industries abroad. It took more than 20 years for gas demand to return to the levels of the early 1970s.

Exhibit 2
Regional Gas Prices, 2007-2010

MONTHLY AVERAGE (€/MWh)



Source: Bloomberg; Energy Intelligence Group; Booz & Company analysis

Given those precedents, with a demand destruction of 5 percent globally, worldwide markets would need two to three years to return to 2008 levels, assuming growth returns to pre-recession levels of 1 to 2 percent per year. And even as demand remains weak, natural gas supply infrastructure will continue to expand around the globe from large capital projects with long lead times that were already under way before the recession hit. Even if we exclude all projects that have not yet reached their final investment decision (FID), the world gas markets are expected to be in oversupply until at least the middle of this decade (*see Exhibit 3*).

Further supply pressure is looming in the form of gas production from unconventional sources. Since 2005, total U.S. natural gas reserves have almost doubled, to more than 50,000 bcm (billion cubic meters) because of improved technology for accessing unconventional supplies and better asset management. Some estimates indicate that up to 200 bcm per year in additional unconventional gas may be produced in the U.S., a market that

is expected to grow to approximately 850 bcm by 2020 (*see Exhibit 4*).

In effect, unconventional gas will compete with imported liquefied natural gas (LNG) in the United States. Under these conditions, traders are forecasting that gas price levels in the U.S. will remain at \$6 to \$7 per mmBtu (in 2010 dollars) for the remainder of the decade. But this may be a conservative estimate. Currently, production costs for unconvensionals are in the range of \$4 to \$5 per mmBtu for shale gas and \$6 to \$7 per mmBtu for coal bed methane (CBM). However, technical advances, such as lateral drilling over longer distances and increased knowledge of the geology of unconventional basins, should reduce production costs in the coming years. And that, in turn, will likely put further downward pressure on market prices.

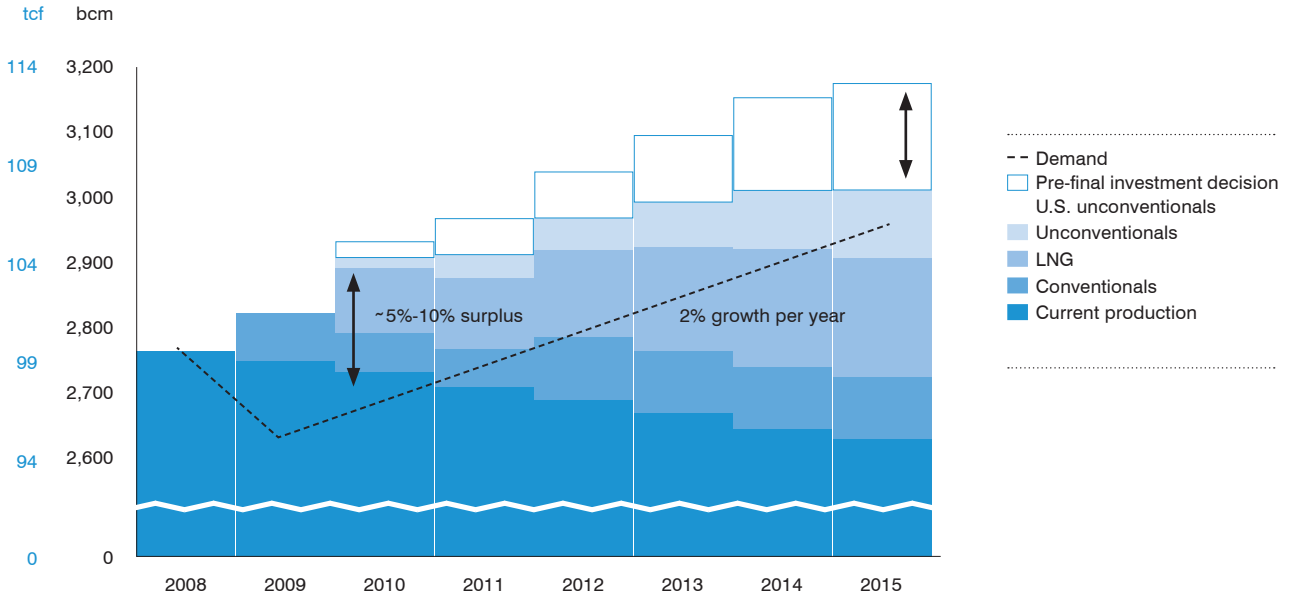
At these U.S. gas price levels, Asia and Europe will become the preferred destinations for supplies of LNG. Further development of LNG import infrastructure will then likely come to a halt in the U.S., limiting LNG import capacity to the current 200

bcm per year. This will put tremendous pressure on the global LNG market. In fact, U.S. price levels may start to spread to international spot markets. As gas spot prices in Europe rise above \$6 and U.S. prices lag behind because of the vast supply of unconvensionals, LNG originally destined for North America will be diverted to Europe. The resulting increased supply of LNG to Europe will drive down spot prices there. When these dip below \$6 or \$7 per mmBtu, the U.S. market could become more attractive again, draining the European market and forcing up prices there, initiating a new cycle.

Add to this scenario the possibility that China could become nearly self-sufficient in natural gas supplies as it develops new reserves from unconventional assets, which many industry observers believe is likely. At that point, unconventional gas has the potential to function as the marginal supply source in some of the major markets, and become the basis for prices globally. This would make it harder for global swing suppliers like Russia and Qatar to manage the market through supply-side actions.

Exhibit 3
Global Supply vs. Demand

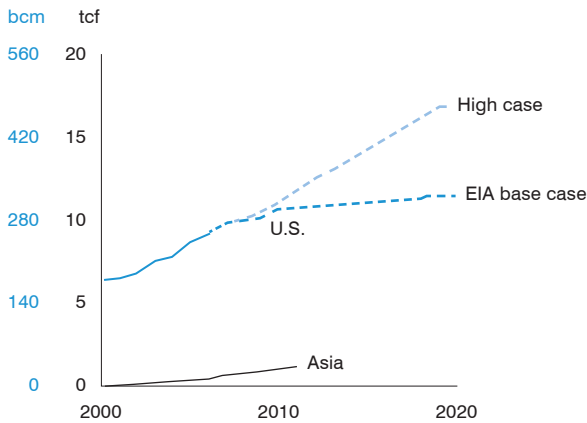
GLOBAL CAPACITY EXPANSION VS. DEMAND DEVELOPMENT



Source: Bloomberg; Energy Intelligence Group; Booz & Company analysis

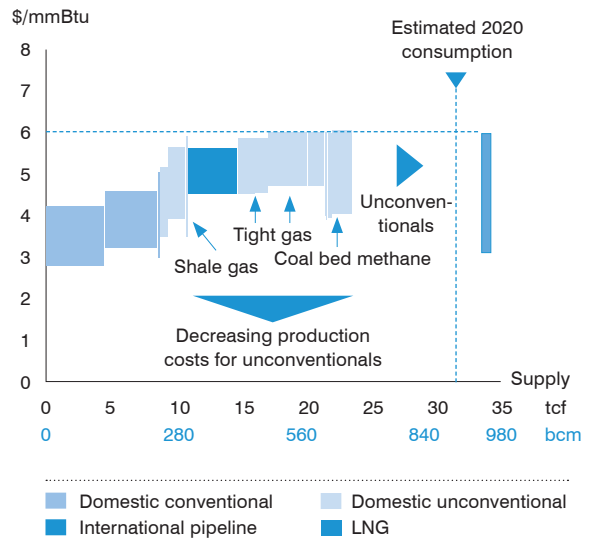
Exhibit 4
Gas Production from Unconventional Sources

UNCONVENTIONALS PRODUCTION IN U.S.



U.S. GAS SUPPLY CURVE
SCENARIO: "NEAR SELF-SUFFICIENCY 2020"

Illustrative



Source: Booz & Company analysis

A DEMAND-DRIVEN CYCLE

With so much oversupply in the offering and a historically bleak outlook for demand growth, the natural gas market appears to be headed for a long period of severe pressure on prices. But could relatively low price levels lead to another structural change—specifically, accelerated gas demand growth, triggered by unexpected demand elasticity.

The gas-to-power sector stands out as a possible avenue of demand growth, because the currently installed base is heavily underutilized. In Europe, the marginal cost of producing power

from gas purchased at current spot market prices of \$6 per mmBtu or €15 per MWh is very close to, or even lower than, the marginal cost of producing power from coal (*see Exhibit 5*). At those prices, gas becomes attractive where marginal trade-offs between gas and coal firing can be made. An increasing use of idle combined-cycle gas turbine (CCGT) capacity for baseload generation would have profound implications for power markets, changing the required generation mix for mid-merit production.

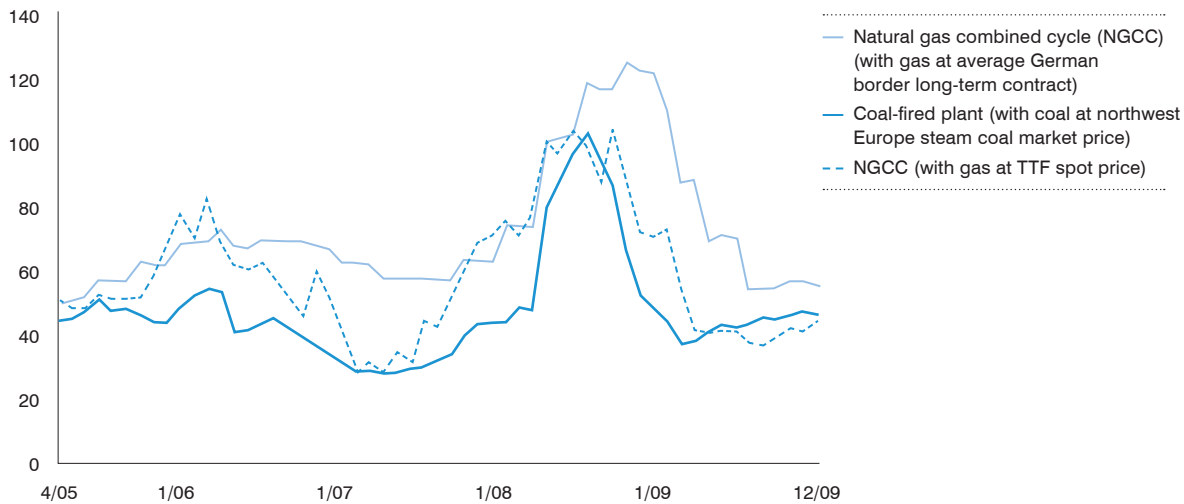
Moreover, if gas prices in the U.S. and Europe indeed stay at predicted U.S. levels, and coal prices and CO₂ costs remain close to current levels, an investment in new gas-fired capacity is clearly favored over an investment in a new coal-fired facility (*see Exhibit 6*).

The same reasoning applies to replacements of retiring coal-fired capacity.

In this scenario, we anticipate an accelerated energy shift, with gas replacing coal in power production. Our calculations show that in Europe and the U.S., additional natural gas demand of up to 220 bcm per year could be unlocked under these circumstances: about 200 bcm of additional gas consumption due to increased utilisation of existing gas-fired power generation plants, which are currently operating only about 50 percent of the time, and about 20 bcm per year of additional gas consumption if all new fossil-fuel-burning power plants (including those replacing retiring coal-fired units) will be gas-fired. With this additional demand, the natural gas market would return to pre-recession growth forecasts in the second half of the decade (*see Exhibit 7*).

Exhibit 5
Marginal Cost of Producing One MWh of Power

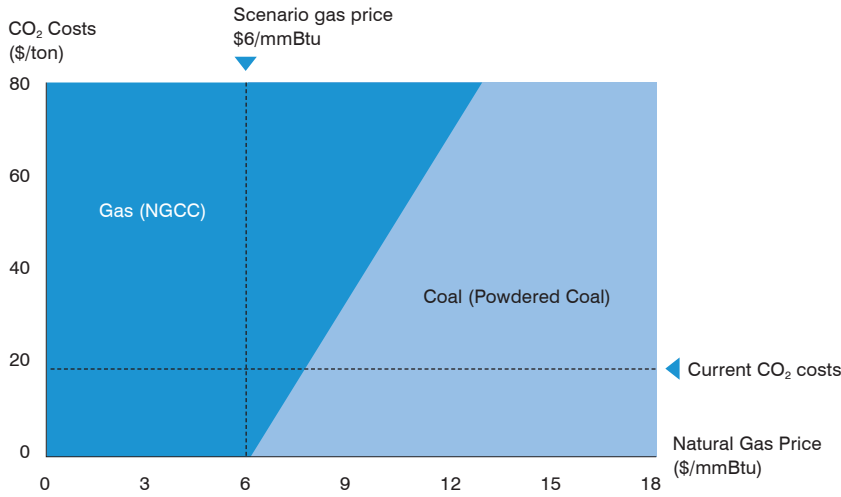
MARGINAL POWER GENERATION COSTS BY FUEL TYPE ESTIMATED (\$/MWh)



Source: Bloomberg; Booz & Company analysis

Exhibit 6
Decision Matrix for New-Build Power Capacity

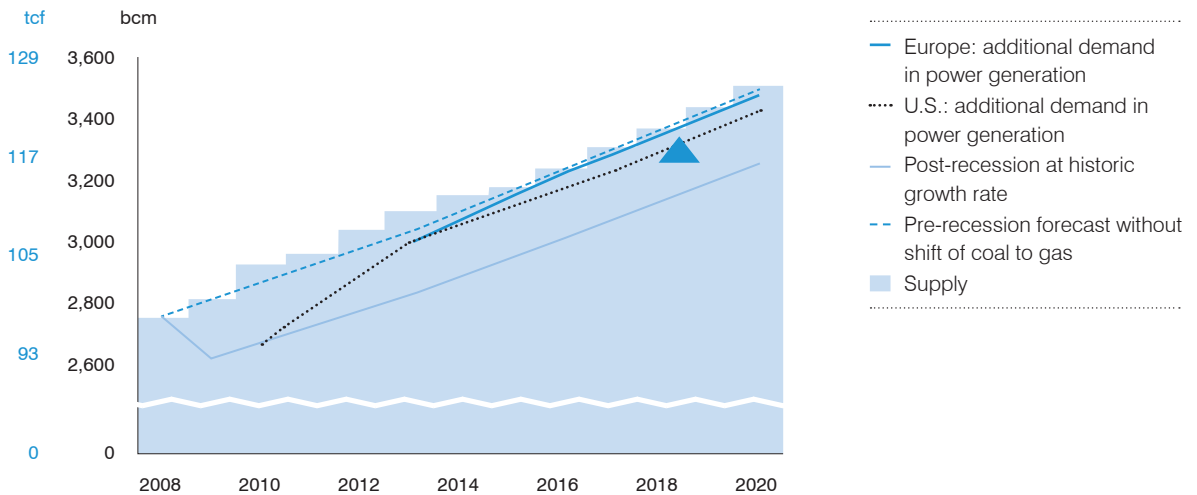
**NORTHWEST EUROPE LOWEST-COST NEW-BUILD TECHNOLOGY
 VARYING NATURAL GAS PRICE AND CO₂ COSTS**



Source: Booz & Company analysis

Exhibit 7
Worldwide Gas Demand Development if Gas Replaces Coal in Power Generation

**GAS DEMAND DEVELOPMENT
 PRE-RECESSION AND POST-RECESSION SCENARIOS**



Source: IEA; Oil & Gas Journal; Booz & Company Global Gas Model

A CHANGE IN EUROPEAN GAS PRICING?

Before the recession hit, conditions existed that challenged Europe's long-term, oil-indexed gas contract structures: Spot markets were gradually becoming more liquid, the first long-term contracts with prices partially indexed to spot gas or electricity prices were offered, new regulatory activity fostered competition and liquidity, and buyers were increasingly seeking to diversify their sourcing portfolios. However,

the European gas market changed very little as both producers and large gas importers could continue to apply pricing structures that linked the price of gas to oil, based on the notion of the value of gas as the best alternative fuel to oil.

Yet in a scenario of an oversupplied market with a more structural gap between spot and contract gas prices, customers may no longer be willing

In an oversupplied market, gas customers may no longer be willing to pay a premium for long-term oil-indexed contracts.

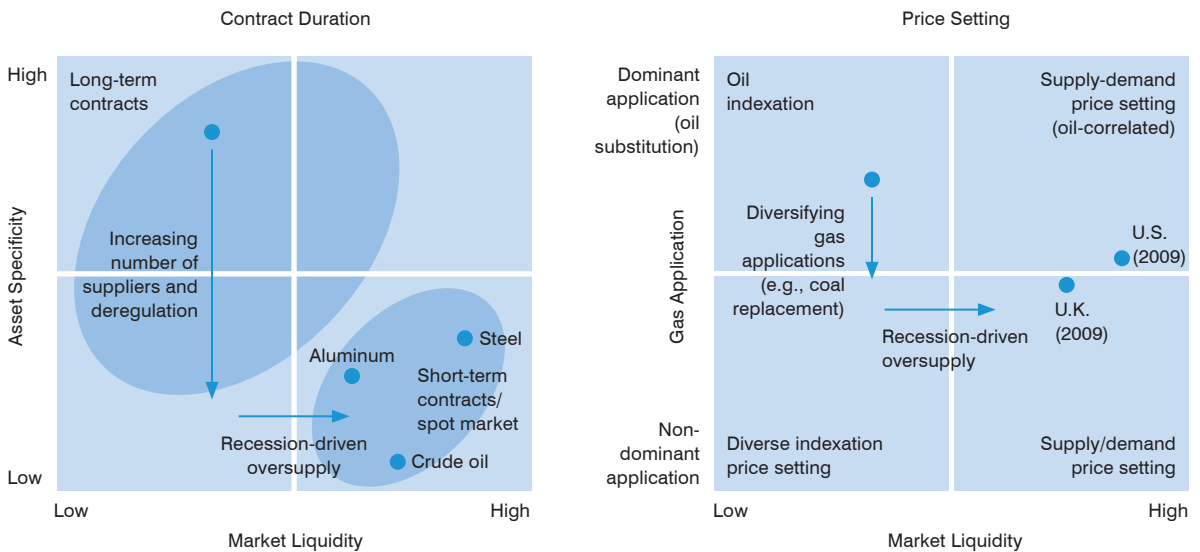
to pay the premium for long-term oil-indexed contracts. Under these circumstances, there could very well be a tipping point toward more short-term, less oil-linked pricing structures. There are some indications that several exporters have agreed to amend long-term

contract conditions, allowing for greater volume flexibility and lower minimum take obligations, and for pricing mechanisms linked more closely to spot prices. Such a shift in contract conditions driven by the increased liquidity of gas markets is made possible by reduc-

ing specificity of gas assets included in the contract and by the gradual replacement of oil as the dominant alternative application to gas. Under this scenario, European natural gas markets would become similar to other commodity markets (*see Exhibit 8*).

Exhibit 8
Moving from Long-Term Oil Indexed Contracts to Spot Market Transactions and Pricing

MOVEMENTS IN CONTRACT DURATION AND PRICE SETTING MECHANISM



Source: Booz & Company analysis

POSITIONING AGAINST MARKET CHANGES

With so many potential changes in the global supply/demand balance and pricing levels and mechanisms, natural gas players of all stripes must explore how to manage the substantial changes they surely will face if this scenario plays out. Here's an analysis of what each type of company in the gas value chain needs to consider:

Producers

The main challenge for producers is to maintain the profitability of their gas activities by defending against the threats and seeking opportunities for creating value in the changing market conditions. They should review their hydrocarbon asset and development portfolios to assess which investments are still profitable under specific gas price forecasts. Integrated oil and gas players may need to reassess the balance between investment in oil and in gas production assets. A further challenge is to adapt to a world in which buyers have more options and power at the negotiating table.

The key advantage producers have is the ability to provide long-term security of supply. Indeed, the balance of power may very well swing back in favor of the producers in the second half of the decade under scenarios

that assume accelerated gas demand growth as offered earlier in this article. In short, producers need to find ways to monetize the supply stability they can deliver in a world that is becoming more spot focused, and therefore more exposed to short-term supply shocks.

Key Questions for Producers:

- Is increasing cooperation with other producers to manage supply the answer to optimizing value-chain economics?
- What is the optimal oil/gas split in the portfolio given the outlook of challenged returns from gas activities? How critical a success factor is access to unconventional sources in the asset portfolio?
- Can the asset portfolio be strengthened via the purchase of distressed assets from other players?
- Are increased flexibility in offtake obligations and new pricing mechanisms in contracts inevitable, and which customers should be given this flexibility?
- What is the best way to monetize the ability to provide long-term security of supply in a spot-focused environment?
- What innovative contractual conditions will stimulate a “dash for gas”?

Importers and Utilities

In today's market we see many established importers and wholesalers with long-term import contracts squeezed between their contractual commitments at oil-indexed prices and competitors and customers that can access part of their requirements in the spot market at advantaged spot prices. Clearly they will need to try to renegotiate their long-term contracts and seek more flexibility to deal with "stranded" contracts. As large users and producers more frequently connect directly, importing wholesalers need to find ways of creating value for their customers to justify their role in the market, which is increasingly at risk of being eroded. These players should determine whether they can create value with added services such as seasonal and short-cycle flexibility and risk management.

Large users such as utilities need to assess how to take advantage of their

newfound market power and reassess their supply portfolios, striking the right balance between contracted and open positions, determining the optimal mix of contracts in terms of maturity and pricing mechanisms, and understanding the optimal mix of suppliers. More exposure to structurally advantaged spot prices is attractive, but it also brings increased vulnerability to supply shocks and short-term price volatility. Therefore, utilities should analyze the value they put on supply security against the advantages of spot gas with more associated risk. Furthermore, utilities need to assess their power generation portfolios, both the installed base and projects, against the changed relative price positions of gas and coal. Finally, they need to thoroughly understand what the impact on coal prices may be in the situation of a new *dash for gas* caused by electric utilities' turning away from coal as preferred fuel.

Key Questions for Importers and Wholesalers:

- How should stranded contracts be dealt with, and what is the best way to reduce exposure to the gap between oil-indexed gas and spot gas?
- How can added value be offered to users to avoid attrition to the spot market and to reduce the risk of customers dealing directly with gas producers?

Key Questions for Utilities:

- What is the optimal sourcing portfolio under new market conditions in terms of exposure to the spot market, the optimal mix of contract durations, and the optimal portfolio of suppliers of both LNG and pipe gas?
- What is the value of supply security in a structurally oversupplied market that could be subject to short-term supply shocks?
- What is the impact on the optimal composition of the installed power generation base?

Utilities should analyze the value they place on supply security compared to the advantages of spot gas with more associated risk.

- What is the best way of dealing with the increased need for flexibility when gas becomes more important in the generation portfolio?
- What is the potential impact on coal prices if electric utilities strongly increase the use of gas at the expense of coal?

Infrastructure Providers

In the current world with lower-than-forecasted demand and reduced prices, infrastructure providers are already considering the need and the economics of the projects in their portfolio. Yet in the medium term, opportunities may arise under the scenario of accelerated demand growth, especially in LNG regasification. Having a portfolio of regasification capacity in different locations may enable companies to capture some price arbitrage potential by adjusting regasification fees. Also, structurally lower-than-forecasted gas prices may increase gasification of regions where previously it was uneconomical to rely on natural gas, potentially providing opportunities for LNG regasification capacity projects. Increased gasifica-

tion and connectivity between regions may also benefit parties building and operating pipelines. Storage providers need to carefully assess potentially opposing drivers of demand for storage capacity under this scenario. Ready availability of LNG on a spot basis may reduce the level of storage capacity that market players feel they need to keep in their books. Also, if the utilization rate of gas-fired power plants increases as described in this Perspective, the need for storage flexibility may be reduced in power generation. On the other hand, players may wish to keep storage capacity to be able to purchase gas opportunistically when price conditions are favorable, and to exploit short-term arbitrage opportunities.

Key Questions for LNG

Regasification Providers:

- What is the optimum way to deal with projects in the portfolio that have become problematic in the short run: delay, sell, or cancel?
- Is a business model based on capturing geographic price arbitrage feasible in the medium term?

- Can structurally low gas prices lead to gasification of regions and countries, and can this lead to profitable LNG regasification capacity projects?

Key Questions for Storage Providers:

- How will opposing drivers of demand for flexibility affect the need for storage capacity in different regions?
- What is the impact of the market changes on current revenue and business models for storage capacity? Are there opportunities for innovative business models?

Key Questions for Pipeline Providers:

- What opportunities for pipeline expansion projects potentially arise owing to the increased attractiveness of gas—for example, if power producers turn to gas firing on a large scale, if regions and countries increase gasification, or if connectivity between regions increases?
- How can these opportunities be captured in this typically heavily regulated segment?



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CONCLUSION

If a scenario of relatively quick return to balance in the global supply and demand of gas is feasible, it will only occur with different pricing dynamics in Europe and possibly Asia. Today's pricing dynamics seem to be ill suited for facilitating demand acceleration. This acceleration would only be possible if power producers can access sufficient quantities of gas at current spot price levels. Yet if the pressure on long-term contract conditions remains in a scenario of continuous oversupply,

producers and buyers will likely agree upon new ways to fashion key aspects of these contracts—in such areas as minimum take volumes and flexibility in pricing mechanisms. Under these conditions a larger part of the market would see price levels set by supply and demand dynamics than today, turning European gas markets into a more common commodity market, resembling for example the oil market. This scenario, we believe, gives rise to the need for market players to address fundamental questions on risks, and sourcing and sales portfolios. Because energy markets are cyclical in nature, it is vital for the gas industry not to miss the next upswing.



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