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Navigating a fractured future

Insights into the future of the North American natural gas market

A report by the Deloitte Center for Energy Solutions and Deloitte MarketPoint

Contents

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Introduction

OVER exactly the past decade, the North American natural gas industry has transformed vast, previously uneconomical shale gas deposits into valuable energy resources. While the so-called "shale gas revolution" has dramatically revitalized natural gas exploration and production, increased supplies, combined with the slowdown in demand resulting from recent economic events, have resulted in a steep decline in North American gas prices.

North American gas producers are currently facing a great deal of uncertainty. To unlock the potential of shale gas resources, large investments are needed. However, these investment decisions require an understanding of the rapidly changing market dynamics related to new gas supplies and uncertain demand growth. The decisions are complicated by a plethora of interrelated domestic and international forces that influence the natural gas market in North America.

Producers are asking many important questions:

- How long will U.S. natural gas prices stay low? Will they ever achieve parity with other global markets?
- Will U.S. shale gas production continue with its rapid growth and eventually overtake conventional production?
- Will low natural gas prices stimulate significant additional demand in the U.S. for power generation and for other sectors of the economy?
- How do changes in shale gas costs impact U.S. production and prices?
- How will the anticipated increase in global liquefied natural gas (LNG) supply affect the U.S.?
- Will the U.S. ever import large volumes of LNG? How much of the existing regasification capacity will be utilized?
- Alternatively, will the U.S. become a long-term exporter of LNG?
- How will China's ravenous appetite for energy affect U.S. and world gas prices?
- How will the announced nuclear shutdown in Japan, Germany, and other countries affect worldwide gas demand? What are the implications for the U.S.?

North American gas producers are currently facing a great deal of uncertainty.

In order to address many of these questions, Deloitte used the analytical capabilities of Deloitte MarketPoint LLC ("Deloitte MarketPoint"). Deloitte MarketPoint applied its integrated North American and World Gas Models to analyze the future of North American gas markets under a range of assumptions. This paper summarizes the findings of several scenarios about the future of North American and global gas markets and offers related strategic insights.

Executive summary

FOR this report, Deloitte MarketPoint used its World Gas Model (WGM) to analyze North American gas markets over the next two decades. The model, based on sound economic theories and detailed representations of global gas demand, supply basins, and infrastructure, projects market clearing prices and quantities over a long time horizon on a monthly basis. The model also helps provide a better understanding of fundamental market drivers and their potential impacts.

Our Reference scenario assumes current market trajectories without any major regulatory intervention. In this scenario, worldwide economic growth rebounds fairly quickly from the recent downturn and resumes steady growth. World gas demand grows by 1.9% per annum through 2030. It assumes no U.S. regulatory policy restricting carbon dioxide (CO2) emissions, although there is a tightening of mercury, nitrogen oxides (NOx), and sulfur oxides (SOx) regulations. Even without carbon legislation, gas demand for power generation grows rapidly as gas becomes the fuel of choice for new domestic power plants. It also assumes no new regulations or restrictions on the application of the hydrofracking process to produce shale gas. This scenario does not include the potential effects of the announced shutdown of nuclear power plants in the aftermath of the Japanese nuclear disaster in March 2011.

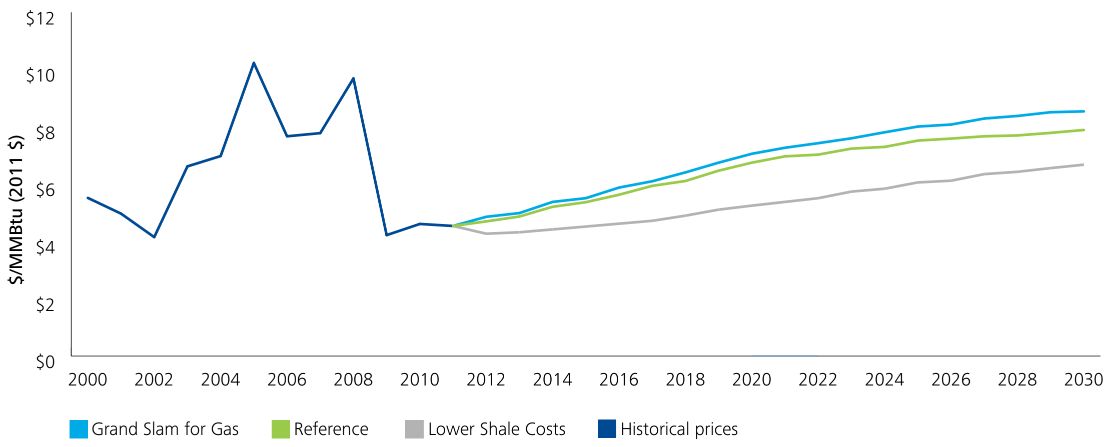
We also present two alternative scenarios, one altering demand and the other altering supply. The first, referred to here as the "Grand Slam for Gas," is roughly based on the high-demand scenario described by the International Energy Agency's World Energy Outlook 2011. Under this scenario, global demand escalates as Asian demand, primarily from China, continues to grow at a rapid rate. Gas demand in China is projected to equal that of Europe by 2035. Furthermore, some leading nuclear power countries, including Japan, Germany, and the U.S., are assumed to shut down or scale back their nuclear energy production or expansion plans, leading to increased demand for natural gas.

Under the second scenario, referred to here as "Lower Shale Costs," we assessed the impact of lower shale gas production costs. While large volumes of shale gas are projected in our Reference case, much of it requires a relatively high wellhead price [> $8 per million British thermal units (MMBtu]) to make production economically viable. What if the costs are dramatically lower as some have suggested? In the Lower Shale Costs scenario, we reduced the cost to produce shale gas by about 50% to assess the impact on domestic and global prices.

Figure 1 shows the various paths that benchmark Henry Hub prices follow under the Reference scenario and the two alternative scenarios. Prices in this and other charts are shown in real terms (i.e., 2011 dollars), unless otherwise stated. The projections of Henry Hub prices rise above current levels under all three scenarios. In an absolute sense, relative to the Reference scenario, the price impact of the lower shale gas cost scenario is much greater than the impact of the higher gas demand scenario.

One of the most significant insights gleaned from modeling these scenarios is that prices will rise to higher levels than current market expectations, as reflected in recent NYMEX futures prices. Under the Reference scenario, natural gas prices in real terms (i.e., today's dollars) grow by about 50% between 2011 and 2020, or 4.0% per year. Prices escalate in real terms, reflecting demand growth, the rising cost of finding and developing domestic gas

Figure 1. Henry Hub price projection under the reference and alternative scenarios



resources, and the projected future costs of pipeline and LNG imports. However, despite burgeoning demand for gas-fired power generation in the U.S., natural gas prices are not projected to reach the peak achieved several years ago. In this scenario, with increased production from shale gas and the availability of other supplies, production costs will play a critical role in determining the value of individual gas resources. Cost is projected to be key to producer profitability.

Modeling these scenarios also shows that basis differentials are anticipated to diverge from historical relationships as new supply basins grow in prominence. Prices in different regions are projected to grow at different rates, altering pipeline flows and capacity values. The biggest change is in the eastern U.S., where increased production from the Marcellus Shale is expected to displace supplies from the Gulf and other regions—a displacement that is projected to reverse some regional pipeline flows. The western states, meanwhile, may experience rapidly rising supply costs due to the absence of significant shale gas resources, strong competition from other market regions for available supplies, and a regulatory environment that discourages LNG imports. As a result, prices are projected to escalate rapidly, which would leave California with some of the highest prices in North America. For midstream operators and investors, these basis shifts carry strong implications for the direction of flow and the value of existing and future pipeline capacity.

Another insight that may run counter to conventional wisdom is that in the Reference case, U.S. LNG imports will increase substantially over time, although filling existing LNG import capacity is highly unlikely. Exporting LNG from North America to Europe and Asia, while tempting now, may not be profitable over the long term, especially if future technological advances do not continue to significantly drive down the cost of shale gas production. The large current spread between domestic and international prices has motivated some to analyze whether they should invest in liquefaction facilities to export LNG from the U.S. However, it is anticipated that projected new supplies and pipelines over the next few decades will apply competitive pressure on Asian and European markets. Meanwhile, firming U.S. prices will narrow the spread with Europe and Asia. Based on the results of the modeling, global LNG production is set to nearly double between 2010 and 2030, which will make more gas available to the U.S. once higher-priced foreign markets are satisfied.

North American natural gas market scenario

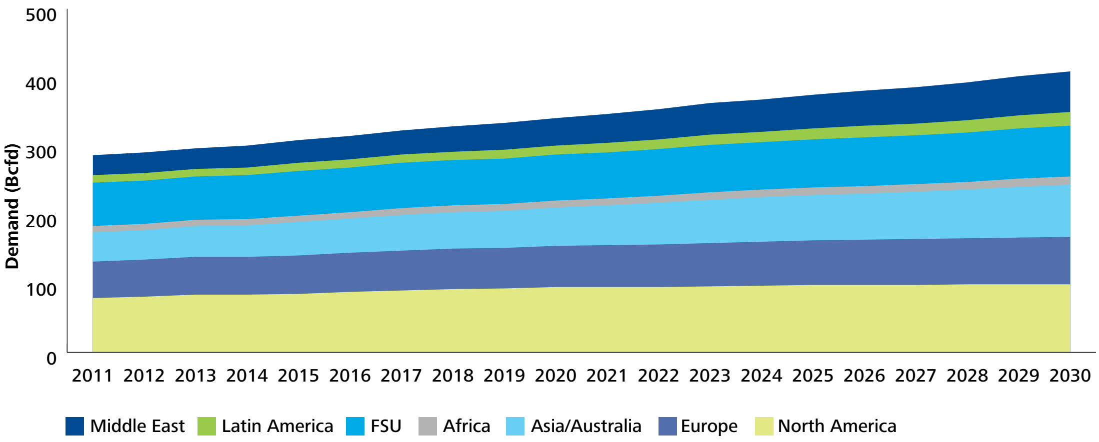
Scenario 1: Reference scenario

Under the Reference scenario, we assumed that continued economic recovery from the recent recession will spur steady growth in demand for natural gas in North America and worldwide, especially in non-OECD economies such as China and India. Projected world demand for natural gas, shown in Figure 2, grows at a yearly rate of 1.9% through 2030, with Asia and the Middle East registering the fastest growth of above 3% per year. Asian gas demand growth is led by China, whose demand is projected to continue to grow at a rapid pace, though not as much as in recent years. which is projected to continue its rapid growth, although not quite as fast as in recent years. During this period, we project an average annual demand growth rate of 4.6%, still quite high but much lower than China's 13.8% per year during the past decade. In this scenario, growth in U.S. natural gas demand will be driven almost entirely by the electricity sector, which will grow at a substantial rate. However, demand from other sectors is projected to be fairly flat; so the overall average annual demand growth will be only 1.3%.

Fortunately for consuming nations, the world has abundant resources to meet the robust projected growth in natural gas demand, though most resources are in remote regions. Countries with significant but stranded gas supplies may seek to exploit their resources by producing and shipping LNG. In addition, countries which have so far been unable to develop their own supplies due to political and social issues, such as Iran and Venezuela, are expected to move past the issues in coming decades.

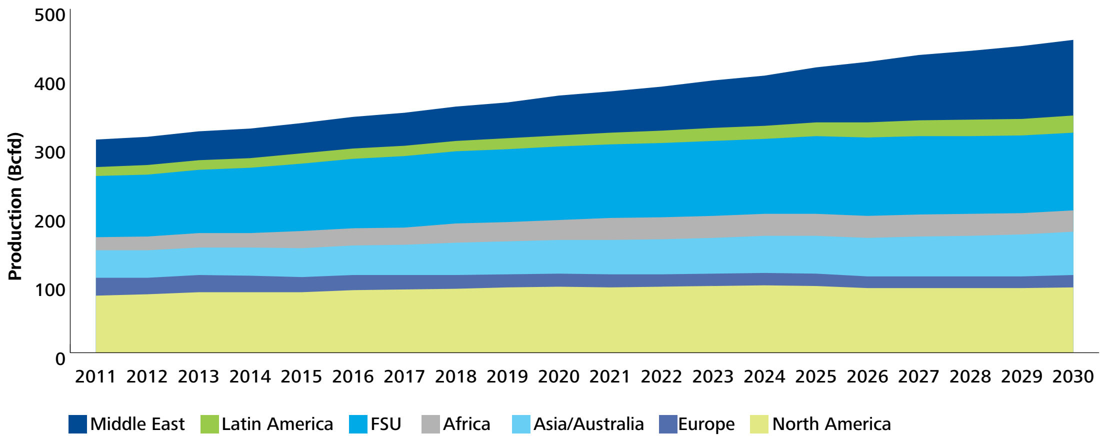
Figure 3 shows our projection of natural gas production by region.[1] Based on the assumptions in the Reference case, the Middle East is expected to provide much of the incremental supply, a direct consequence of the region's massive resources and the predicted increase

Figure 2. Projected world natural gas demand



[1] The total production shown in this chart is higher than the total demand shown in Figure 2 because production represents marketed production (i.e., gross withdrawals from reservoirs minus reinjections and losses), while demand just represents end use consumption. The difference is due to gas usage and loss all along the supply chain including pipeline transportation, gas liquefaction and regasification of LNG, and LNG shipping.

Figure 3. Projected world natural gas production



in export capacity. The production rate in the Middle East is projected to nearly triple over the next two decades. Some of that production is projected to serve rapidly growing domestic markets while the rest will go to other regions via LNG or international pipelines.

Asia/Australia is projected to be the next fast-growth region, but its volume growth is considerably lower than the Middle East's. The former Soviet Union (FSU), including Russia and the Caspian republics with their prolific supply basins, is the world's largest producer. FSU production is projected to hold fairly steady and then grow moderately due to increased production in Kazakhstan and Turkmenistan, both of which have significant resources and relatively small domestic markets.

Perhaps somewhat surprisingly, North American, production under this scenario, will remain fairly flat. The much-anticipated rise in shale gas production merely sustains current production. LNG imports become more competitive in the future, displacing some higher-cost domestic production.

Growing global gas demand and the resulting world gas prices may encourage countries with significant, stranded gas supplies to monetize their resources via LNG. In addition, political and social factors that have historically prevented the development of supplies from some countries, such as Iran and Venezuela, are assumed to eventually diminish over time, allowing these countries to develop supplies for export.

Key North American gas market findings

Deloitte MarketPoint's detailed market modeling and analysis suggest the following key trends in North American gas market fundamentals and prices:

1. U.S. natural gas prices rebound. Rising North American gas demand and the dissipation of short-term factors that mask the full cost of supply may cause prices to escalate. The Deloitte MarketPoint WGM projects monthly prices over a 30-year horizon by simultaneously considering short-term dynamics and long-term fundamentals. Natural gas prices are projected to rebound from current levels and continue to strengthen over the next two decades, although nominal prices will not return to the peak levels of the mid-to-late 2000s until after 2020. In real terms (i.e., constant 2011 dollars), benchmark U.S. Henry Hub spot prices will increase from an annual average of $4.53 per million British thermal units (MMBtu) in 2011 to $6.75 per MMBtu in 2020, before rising to $7.87 per MMBtu in 2030 in the Reference scenario.

Escalating real prices by an annual inflation rate (estimated at 2.0%) yields nominal prices that can be compared to NYMEX futures prices. The nominal price in 2022, the final year of NYMEX futures prices, is projected to be $8.67, substantially higher than the NYMEX futures price (June 23, 2011) average of $7.66 for the same year. Current depressed natural gas price levels will likely be insufficient to induce natural gas producers to make the capital investments required to meet the projected strong rise in demand. As production depletes the "sweet spots" of gas deposits with the lowest production costs, prices will ramp up to reflect the higher cost of production in new fields.

Our WGM projection of monthly Henry Hub prices for the Reference scenario is compared with NYMEX futures prices as of June 23, 2011 in Figure 4. Prices are shown in nominal terms (i.e., dollars of the day including inflation). Near-term projections are fairly consistent, but longer-term projected prices from the WGM will be significantly higher than the NYMEX futures prices. On an annual average, the projected prices are a dollar higher than the NYMEX futures prices in the longer term. Also notice the emergence of a summer mini-peak in price, reflecting growing gas demand for power generation during summer.

2. Gas demand for power generation grows strongly. Natural gas consumption for electricity generation is projected to drive up North American natural gas demand during the next two decades. In the U.S., the power sector, which accounts for nearly all of the projected future growth, will increase by about 50% [approximately 10 billion cubic feet per day (Bcfd)] over the next decade. Based on assumptions in the WGM, gas will become the fuel of choice for power generation for a variety of reasons, including tightening environmental regulations, expectations of ample domestic gas supply at competitive prices, and the need to back up intermittent renewable sources such as wind and solar to ensure reliability. As shown in Figure 5, projected gas demand for U.S. power generation is far greater than that predicted by the Energy Information Administration's (EIA) Annual Energy Outlook 2011, which forecasts essentially no change.

3. Shale gas becomes the dominant U.S. supply source. Under the Reference scenario, improving gas prices spur North American hydrocarbon producers to ramp up activity in the continent's gas patch over the next two decades. As shown in Figure 6, shale gas production, particularly in the Marcellus Shale in Appalachia and the Haynesville Shale in Texas and Louisiana, continues to grow, and is projected to eventually become the largest component of domestic gas supply. Increasing U.S. shale gas output bolsters domestic gas production, which will grow from about 66 Bcfd in 2011 to almost 79 Bcfd in 2018 before tapering off.

Gas production in Canada is projected to decline over the next several years, reducing exports to the U.S., and then gradually

Figure 4. Comparison between projected Henry Hub and NYMEX futures prices

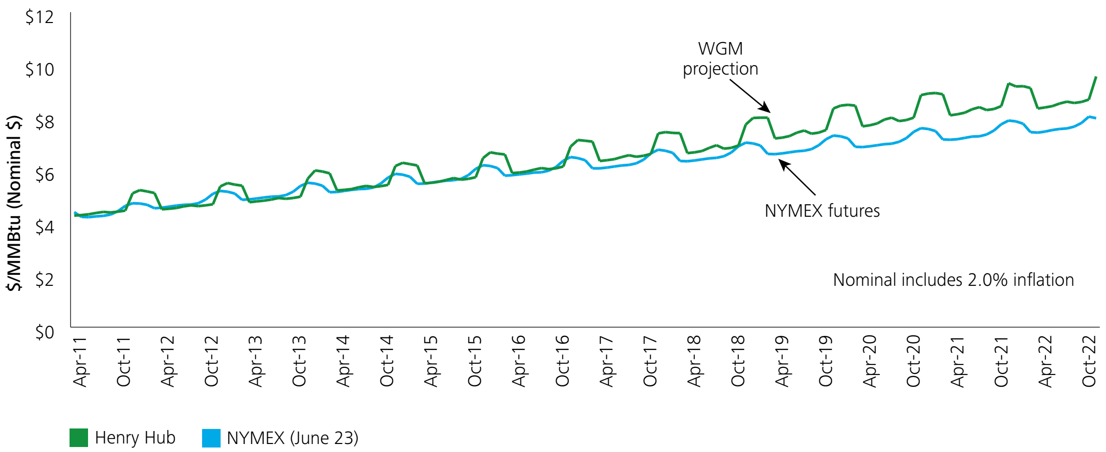


Figure 5. Diverse projections of U.S. gas demand for power generation

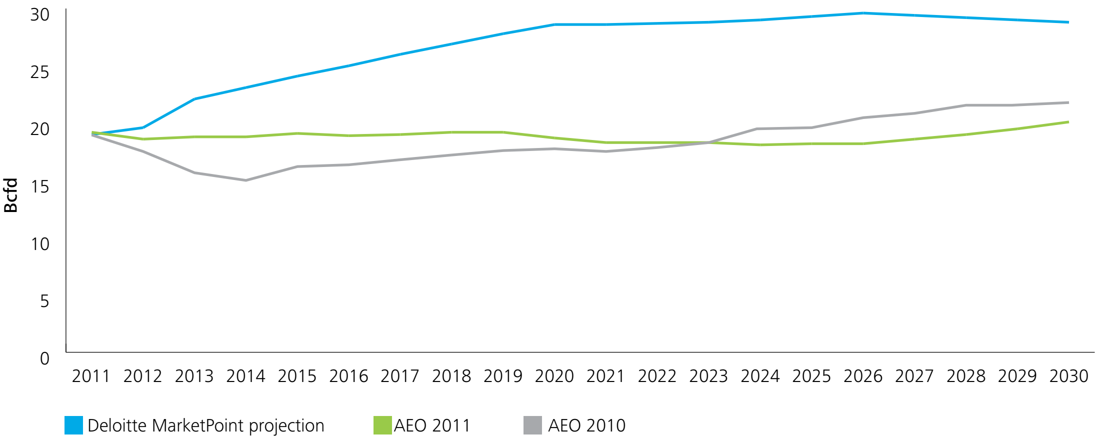
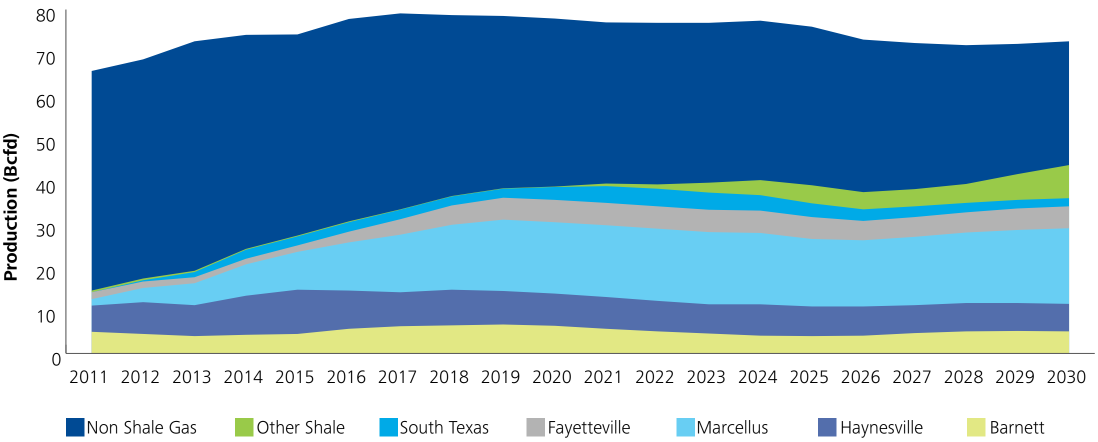


Figure 6. U.S. gas production by type



increase. The recent trend of production decline in the Western Canadian Sedimentary Basin is projected to continue until the end of the decade, when output will ramp up from the Horn River and Montney shale gas plays in Western Canada. Further into the future, the Mackenzie Delta pipeline may make available supplies from Northern Canada. Mexican production is projected to grow slightly but not enough to keep pace with its domestic demand growth.

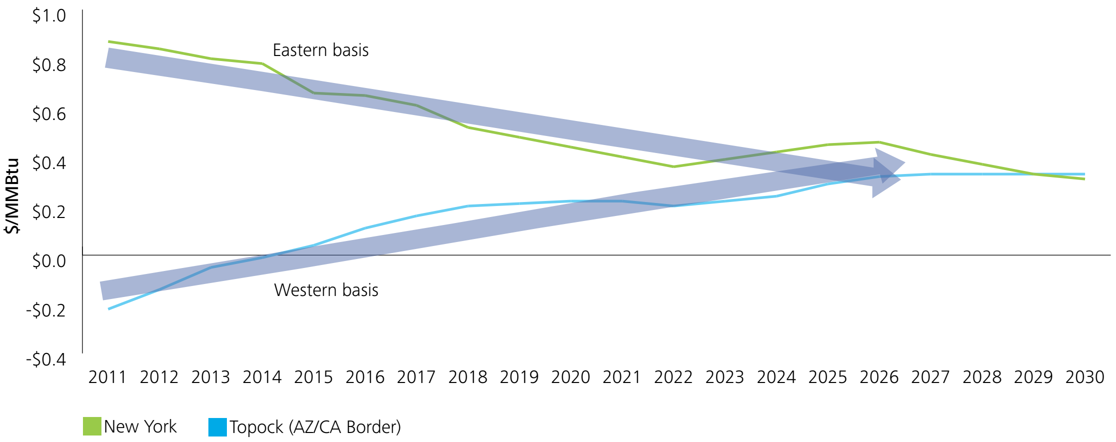
It is important to note that the projected tapering off of U.S. production reflects the increasing competition from LNG imports as well as resource depletion. Imports from outside North America, and eventually, from Canada are projected to displace some higher-cost domestic production. Rather than basing production projections solely on the physical decline of producing fields, the WGM considers economic displacement as new, lower-cost supplies force their way into the market.

4. Basis relationships change drastically.

Increasing production from major shale gas plays, many of which are not located in traditional gas-producing areas, is projected to transform historical basis relationships during the next two decades. Varying rates of regional gas demand growth, the advent of new natural gas infrastructure, and evolving LNG imports may also contribute to changes in regional basis, though to a smaller degree.

Most notably, gas prices in the eastern U.S., historically the highest priced region in North America, could be dampened by incremental shale gas production within the region.

Figure 7. Dramatic shift in basis relationships



Mid-Atlantic and northeastern bases to Henry Hub are projected to be depressed under the weight of surging gas production from the Marcellus Shale. The Marcellus Shale is projected to dominate the Mid-Atlantic natural gas market, including New York, as it meets most of the regional demand and supplies gas to New England and even South Atlantic markets. Pipelines that transport gas supplies from distant producing regions—such as the Rockies and the Gulf Coast—to northeastern U.S. gas markets may face stiff challenges.

Meanwhile, western U.S. prices are projected to rise faster than those in other parts of the nation due to the region's comparatively small supply, the absence of LNG import terminals, and declining gas production in western Canada. Over the long term, Californian prices are projected to be higher than Mid-Atlantic prices, a reversal from historical relationships. As shown in Figure 7, eastern basis, represented by New York City, will fall and western basis, represented by Topock, AZ, will improve, relative to Henry Hub prices, under this scenario.

5. U.S. LNG imports rise in the longer term.

Although the immediate future may be rather bleak, U.S. LNG imports are projected to grow significantly in the middle of this decade and eventually comprise a fairly significant component of U.S. natural gas supply under this scenario. Average annual U.S. LNG imports will increase from less than 0.5 Bcfd in 2011 to almost 4.0 Bcfd by 2030 (see Figure 8). Although shale gas production will not completely dislodge LNG from the U.S. gas market, it will both delay and limit the extent of growth in LNG imports. Consequently, existing U.S. LNG regasification capacity will not be fully utilized during the next two decades. U.S. LNG imports are projected to remain modest in the near term as U.S. shale gas production burgeons and as higher gas prices in Europe and Asia draw flexible LNG cargoes to those markets and away from the U.S. However, even as U.S. gas demand rises and as global LNG supplies increase, LNG import volumes will be far lower than existing LNG import capacity. Hence, based on the WGM output, there is no projected need for the construction of additional LNG import terminals along the U.S. Gulf Coast.

The projected increase in LNG imports might call into question the long-term viability of plans to export domestically produced LNG, unless backed by long-term contracts with sufficiently high prices. As U.S. gas prices rise and European and Asian gas prices moderate, the economic incentive to export LNG from North America could dwindle. However, it should be mentioned that the Reference case assumes that shale gas production costs will not decline markedly from current levels. (An alternative scenario, presented below, demonstrates that if costs fall significantly, the need for LNG imports disappears.)

Selected WGM global gas market projections

1. Rapid growth of world LNG supply continues. Growth in global gas demand will continue to spur nations with stranded gas supplies to develop and monetize them through LNG exports. As a result, world LNG supply is projected to increase by about 50% over the next decade, rising from about 28 Bcfd (220 million tons per annum (MTPA)) in 2011 to about 41 Bcfd (320 MTPA) in 2020, and reach 54 Bcfd (425 MTPA) by 2030 (see Figure 9). Much of the incremental supply this decade comes from liquefaction projects that are either under construction or in the final investment decision stage, including many that are located in Australia. In the longer term, Qatar, with its vast, low-cost gas supply is assumed to be joined by new LNG entrants such as Iran and Venezuela in providing additional incremental growth.

2. European and Asian gas prices soften relative to U.S. prices, and oil indexation of gas contracts faces increased pressure. As more international pipelines and LNG supply trains enter service, increasing volumes of gas are expected to flow to Europe and Asia from prolific supply basins in North Africa, the Middle East, the Caspian region, and Russia. Suppliers to these regions may find it more difficult to insist on oil-price indexation in the face of growing competition among suppliers and mounting pressure on importers from customers who want competitively priced gas. As a result, European and Asian prices are projected to decline over time, while U.S. prices firm up. The likely outcome is a narrowing of the price differential to Henry Hub.

Figure 8. Projected volumes of U.S. LNG imports

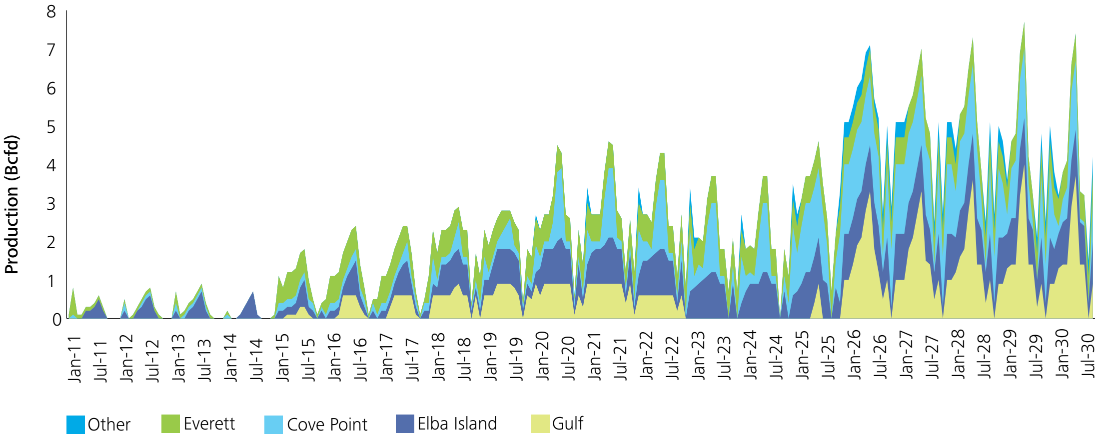
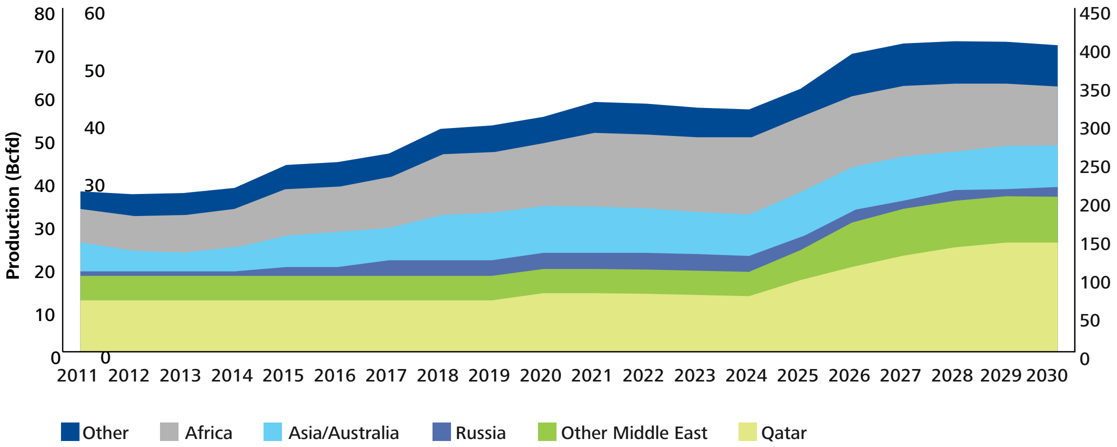


Figure 9. Projected world LNG production



Alternative scenarios

NORTH American gas executives are all too familiar with market risks and the pitfalls of conventional wisdom. In the middle of the last decade, many pundits declared that natural gas prices would remain high, as North American production had reached its peak and started on a protracted downward trend. In fact, the opposite occurred and the U.S. market entered a period of robust gas supply and low gas prices, ushered in by substantial shale gas production. Many point to massive technologically recoverable shale gas volumes in North America as a sign that low prices are here to stay. Will conventional wisdom once again prove to be wrong? The alternative market scenarios provide insights into future trends.

Scenario 2: Grand Slam for Gas

The Grand Slam for Gas scenario analyzes factors that may drive rapid growth in global demand in the coming decades. In this scenario, the largest catalyst is the escalation of natural gas demand from China, which has sustained a double digit annual growth rate over the past decade. We assumed that China's growth rate would be sustained at 7.5% per year through 2030, and demand will more than quadruple between 2011 and 2030. The Chinese demand in this scenario is 16 Bcfd greater in 2030 than in the Reference case.

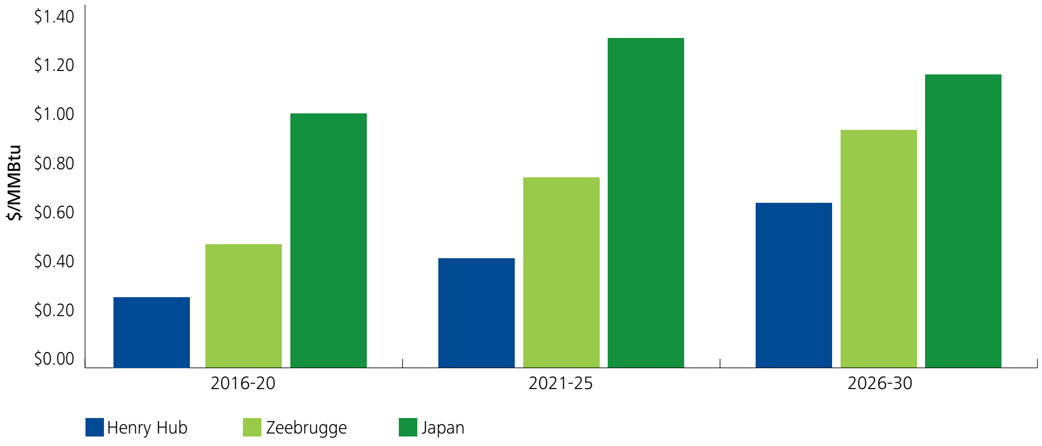
We also assumed that the nuclear disaster in Japan would permanently shut down some existing nuclear plants and curtail plans for future nuclear expansion in Japan. For this scenario, we assumed that Japan would eventually shut down 60% of its nuclear capability resulting in a reduction of 30.5 gigawatts (GW). We also assumed that all the displaced nuclear power will be replaced by gas-fired generation, leading to an over 6 Bcfd increase in gas demand from Japan by 2030.

The nuclear situation in Japan has also prompted other countries to review their nuclear programs. Germany has announced plans to shut down all its nuclear plants with a combined capacity of 20.3 GW by 2034. Even Switzerland has decided to shut down its three nuclear plants (3.2 GW). Under this scenario, we assume that generation capacity lost from the shutdown of the nuclear plants in Europe will be replaced by gas-fired generation, resulting in a 1.5 Bcfd rise in demand when the scheduled shutdowns are completed.

In the United States, the Japanese nuclear disaster is likely to make building new nuclear plants more difficult and expensive. Hence, we assumed no new nuclear plants would be built, but existing plants and those currently under development would not be affected. The lack of new nuclear plants will result in gas demand increasing by about 10 Bcfd in 2030 in this scenario, as most of the new nuclear power that was projected to be built is replaced by gas-fired generation.

Global gas demand is projected to grow to 466 Bcfd by 2030, a 12% increase over the Reference case. The annual growth rate for this scenario is assumed to be 2.4% compared to 1.9% for the Reference case.

Figure 10. Impact of Grand Slam for Gas on global prices



Projected global impact

The projected price impact, shown in Figure 10, of the Grand Slam for Gas scenario is significant, grows over time, and varies by region. Clearly the hardest hit region is Japan, which we assumed would suffer the greatest loss of nuclear power. Japan has no domestic gas production to buffer an increase in gas demand, and, in our model, must rely entirely on LNG imports. The sharp price impact, about $1.00/MMBtu, will be felt even in the near term, as Japan has to bid LNG cargos away from other destinations to meet its increased needs. European markets are significantly affected in this scenario, as European gas demand increases due to nuclear shutdowns in Germany and Switzerland. Furthermore, Europe must compete with Asia for LNG imports, which are projected to increase over time, and must vie with China for Caspian supplies, which can flow to the country through a newly constructed pipeline from Turkmenistan to China. Europe's interconnection with Asian gas markets will cause European prices to rise above levels justified by an assumed increase in demand. The price impact at Zeebrugge, an established gas trading hub in Belgium, is projected to be about $0.40/MMBtu in the near term (2016-20) and grow over time to reach more than $0.90/MMBtu by 2026-30. Prices in the United States will be the least affected. However, as U.S. LNG imports grow and the impact of the decision to build no new nuclear power plants takes hold, the price impact at Henry Hub is projected to grow from more than $0.26/MMBtu to more than $0.63/MMBtu by 2025-30. Global markets will all be affected and the price impact grow as demand impact increases. Furthermore, impacts are more widely spread as linkages between global markets grows. LNG imports transmit more than just gas volumes; they also transmit price and volatility signals from connected markets.

The price impact from such a large increase in demand might appear to be a bit muted but over the long term, supply will rise to meet anticipated demand growth. Unlike short-term markets in which even small supply or demand changes during peak periods can result in huge price impacts, both supply and demand are far more elastic in the long term (Systematic shortages are not assumed to exist over the long term.)

So what are the incremental supplies that will help meet demand growth? The answer depends on the market, but even within a single major market (e.g., the United States) multiple marginal sources typically exist. LNG supply is expected to be an important marginal source in the long term. In the short term, little incremental LNG supply is available as LNG liquefaction trains typically operate at full capacity, and long lead times are required to bring new LNG trains on line. However, in the long term, there are vast supplies, especially in

Figure 11. Impact of Lower Shale Gas Cost on U.S. prices

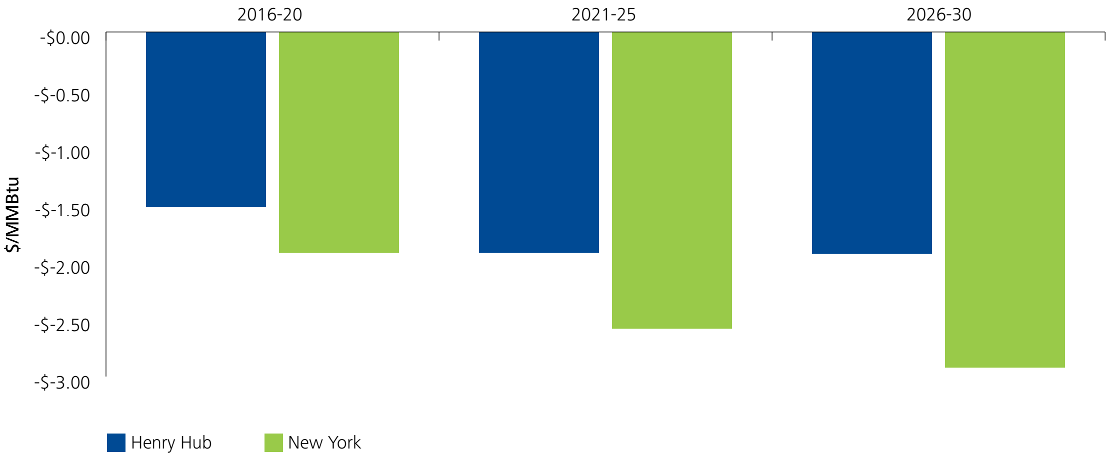
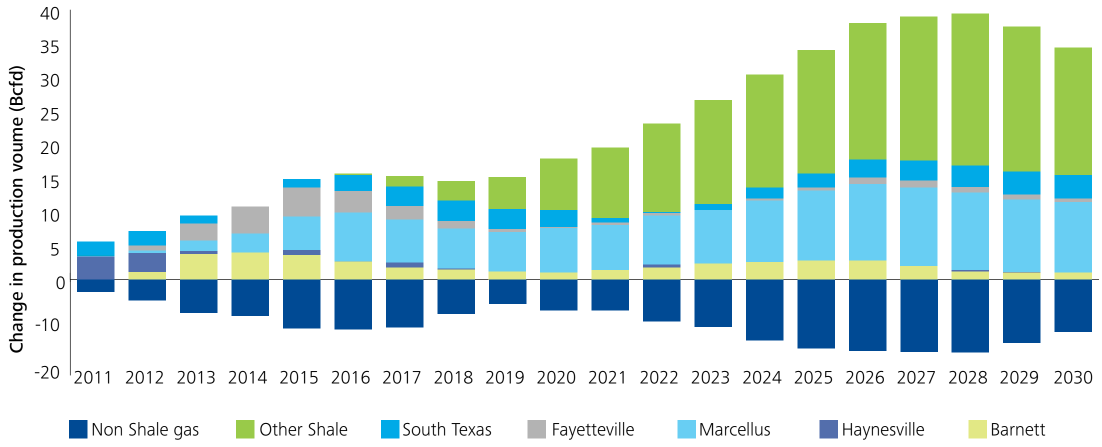


Figure 12. Impact of Lower Shale Gas Cost on projected volumes



the Middle East, that can be tapped if political and social issues are resolved.

The rest of the incremental supply is projected to come from supply basins in Europe, Asia, and North America in reaction to higher prices that propel exploration and production activity. The U.S. is projected to increase production by about 11 Bcfd, mostly from incremental shale gas basins, which hold anundant gas but at a fairly high cost. Recall that projected U.S. gas demand increased by about 10 Bcfd, which is less than the projected production increase. The reason that U.S. production increases by more than the demand increase is that under this scenario, greater competition exists for world LNG supplies, so less LNG, about 1 Bcfd, is imported to the U.S. This again points to the importance of having a global perspective, to truly understand and quantify the impacts of major market changes.

Scenario 3: Lower Shale Costs

Given the vast potential—and wide ranging opinions about it—shale gas is perhaps the greatest source of uncertainty for the North American natural gas market. Some say shale gas, given the existing advanced technologies, is now cheaper to produce than conventional supplies. Others term these claims wildly optimistic. Our Reference case portrayed shale gas as a diverse resource, with overall costs ranging from under $5 to more than $8/MMBtu. Some speculate that continued technological advances will make shale gas available for under $5/MMBtu well into the future. Hence, we tested a scenario, which we call "Lower Shale Costs," in which the costs of finding and producing the gas are reduced by almost 50%. The resulting projections are quite informative and even surprising.

Figure 11 shows the price impact of the Lower Shale Costs scenario. Prices at the Henry Hub are projected to fall by almost $2/MMBtu from 2016 to 2030. The impact will be felt more acutely New York where prices will fall by almost $3/MMBtu. The Mid-Atlantic market, including New York, is projected to become heavily dependent on shale gas production, especially from the Marcellus, and therefore benefits more from lower shale gas production costs.

This finding raises the question of why the impact is not greater. If we have a massive reduction in the cost of a major supply, shouldn't there be a corresponding reduction in price, assuming all else is equal? The answer is that all else is not equal. Markets react to change. If the cost of a marginal supply drops dramatically, then it will no longer be the marginal source and something else moves to the margin and sets the price. Hence, the price impact is determined by the difference between marginal costs rather than the decrease in the price of the formerly marginal supply. Figure 12 shows the anticipated impact of the decrease in shale gas production costs on domestic production. Shale gas production surges as expected, but non-shale gas production decreases as it increasingly becomes the marginal source that sets the price. Notice also that in the long term, the other shales, which includes shale gas plays in the Rockies and midwest areas, are affected most by the cost reduction because these were projected to be the marginal shale gas resources.

Furthermore, the increase in shale gas production volumes is greater than the reduction in non-shale gas production, implying a net increase in U.S. production. In fact, under this scenario, the projected net increase in U.S. production reaches about 20 Bcfd by 2025. About half this increase serves a projected increase in gas consumption for power generation. Lower natural gas prices are a boon to gas-fired electricity generation and result in more gas being burned in the electricity sector. Under this scenario, gas demand for power generation doubles from current levels by 2030, compared with the little less than 50% increase in the Reference case. Lower U.S. gas prices also essentially drive out U.S. LNG imports. With huge, low-cost shale gas maintaining downward pressure on domestic prices, LNG supplies find other higher-priced markets and LNG imports to the U.S. fail to significantly ramp up despite the projected increase in world LNG supplies.

Summary

OUR analysis indicates that North American prices may soon begin to firm up and more closely reflect the long-term marginal cost of domestic supplies. Our models indicate that current market expectations, represented by the NYMEX futures prices, are too low to support the investment required to bring the online the supplies necessary to meet projected demand. U.S. natural gas demand, led by the power sector, is projected to grow rapidly, far exceeding the volume projected by the U.S. EIA's Annual Energy Outlook 2011. Shale gas production is forecast to increase until it becomes the dominant domestic supply. However, this requires heavy investment, which must be supported by sufficiently high prices. Furthermore, there are significant cost differences across shale gas fields, and prices typically reflect the costs of marginal fields. LNG import facilities may continue to experience low rates of utilization in the near term, but the future could be far brighter, as global supplies are projected to almost double between 2011 and 2030, and more LNG is expected to reach U.S. terminals once the higher-price Asian and European markets are satisfied.

The two alternative scenarios demonstrate the importance of considering a wide range of market scenarios to provide a more thorough understanding of how markets are interconnected and how changes in variables affect the broader market. Under the rapid global gas demand growth assumed in the Grand Slam for Gas scenario, prices increase significantly, especially in Asia and Europe, where LNG plays an important role in the supply portfolio. However, prices do not rise as much as many would expect from such a large increase in demand. As our results imply, even large increases in global demand could be met without a huge increase in price as long as the demand growth can be anticipated by the market. The world has abundant resources, although most of them are in remote and difficult locations; this should buffer the price impacts of demand growth in the long run as gas producers and transporters respond to the rising demand and make decisions accordingly.

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Under the Lower Shale Costs scenario, North American shale gas costs are assumed to be almost 50% lower than those in the Reference case. U.S. prices fall sharply, but not as much as shale gas costs. Again, markets are interconnected and strong feedback dampens price impacts. Shale gas production, projected to grow to comprise the majority of U.S. supply under this scenario, displaces some non-shale gas supplies and almost completely drives out U.S. LNG imports. Importantly, U.S. gas demand is projected to grow sharply in this scenario as lower gas prices increase gas demand for power generation. The supply-demand dynamics must be properly considered to accurately forecast future markets.

The highly volatile and dynamic natural gas market always presents new challenges and opportunities to those who can best anticipate the future.

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About Deloitte MarketPoint

Deloitte MarketPoint is a decision support solutions company focused on fundamental market analysis and price forecasting. We provide software and models with consulting services to help energy companies make informed decisions. Our solutions are comprised of our software applications, such as MarketBuilder, our models, our market data, and consulting services.

Deloitte MarketPoint LLC, the result of Deloitte's acquisition of substantially all the assets of MarketPoint Incorporated and Altos Management Partners (MarketPoint/Altos) in 2011, combines the global strength and quantitative experience of Deloitte and the member firm network of Deloitte Touche Tohmatsu Limited with the market-leading software and time-tested energy market success of MarketPoint/Altos. Deloitte MarketPoint is located within the Deloitte Center for Energy Solutions. www.Deloitte.com/us/talent.

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