Future of Chemicals Part VI
Global Feedstock Developments and Implications for GCC Players
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EXECUTIVE SUMMARY

Petrochemical producers in the Middle East are currently at the junction of several trends that will significantly affect their industry. After a two-decade period of significant growth, the industry is now experiencing a regional shortage of natural gas, due to supply–demand imbalances. This is leading GCC petrochemical players to use liquid feedstocks, which don’t offer the same cost advantages as natural gas. At the same time, feedstock supplies are undergoing major changes in other regions. Shale gas presents new opportunities for U.S. petrochemical players, although its potential is limited in Europe and has a high degree of uncertainty in China, especially in the short to medium term. China has ambitious plans to convert coal to olefins but faces technical, economic, and environmental challenges. Finally, a potentially renewed gas sector in Iraq could become a major petrochemical player, but there are supply uncertainties. Although it is still too early to determine the specific impact of each of these developments individually, together they can present a material threat to the GCC’s bulk petrochemical players.

GCC players need to formulate their response to these threats. They have three main options: remain upstream and participate in the shale gas ventures in North America; move downstream into performance or specialty chemicals; or become a consolidator of the industry within the GCC to build greater scale and derive benefits. GCC companies need to make clear choices on which growth opportunities to pursue, as each option requires companies to develop or enhance a distinct set of capabilities to succeed. An assessment of which capabilities a GCC company can realistically build or enhance should ultimately determine the company’s most promising-growth strategy.
Over the past two decades, the petrochemical industry in the Middle East has enjoyed a period of significant expansion, driven by an abundance of natural gas at advantaged prices. Thanks to that cost advantage, companies established a leading position in petrochemicals. They built world-scale plants that could efficiently turn local natural gas feedstocks into basic chemicals and polymers, and distributed these products through a network of international partners and their own marketing organizations to global customers, primarily in Asia and Europe. This combination of capabilities and plentiful supplies of advantaged gas feedstocks resulted in attractive growth rates.

However, recent shifts in both supply and demand have led to growing regional shortages in natural gas feedstocks. On the demand side, GDP and economic growth have led to an increase in power consumption throughout the Middle East, and natural gas—a relatively clean alternative to oil—is increasingly in demand for use in power plants, making it less available for petrochemical manufacturing. Moreover, the region has undergone a diversification effort to increase non-oil-related GDP. As part of that effort, Middle East countries have made major investments to boost local employment, including in industrial sectors such as steel and aluminum, both of which are energy-intensive and driven by low gas prices. As a result, the Gulf Cooperation Council (GCC) is projected to experience a sizable—and growing—shortfall in natural gas for the coming years. Consequently, ethane supply is not expected to grow significantly and most of the anticipated supply is already committed to existing and new projects (see Exhibit 1).

GCC GAS SHORTAGES CONSTRAINING PETROCHEMICALS’ GROWTH
Exhibit 1
The Gas Shortage in the GCC Region Is Constraining Ethane Supply

FORECASTED GAS SHORTAGE IN THE GCC
(IN BILLION CUBIC METERS)

SAUDI ARABIA ETHANE SUPPLY FORECAST
(IN MILLION TONS)

Source: BP Statistical Review of World Energy 2011; Jacobs Engineering; Booz & Company analysis
Middle East petrochemical companies have adapted to the shortage of natural gas by shifting to more liquid feedstocks. In Saudi Arabia, for example, ethane allocations to petrochemical producers effectively stopped in the middle of the last decade, and new projects such as the US$20 billion Saudi Aramco–Dow Chemical venture, Sadara, are expected to use mostly liquid feedstocks. In the United Arab Emirates, the Borouge 3 project has absorbed the last of the nation’s gas availability, and new projects on the drawing board such as Chemaweyaat are expected to use liquid feedstocks in an integrated refinery/petrochemicals complex. In Kuwait, the Equate II project absorbed the last of the country’s ethane production, and new projects in the pipeline will adopt a similar approach of integrated refinery/petrochemicals complex. The move to more liquid feedstocks will reduce profit margins and overall competitiveness for GCC players. Liquid feedstocks do not offer the same cost advantages as gas feedstocks.

At the same time, feedstock developments in other parts of the world are making petrochemical players in those markets more competitive. The major feedstock developments affecting the petrochemical industry include new sources of shale gas in North America; promising production technologies such as coal-to-olefin initiatives in China; and conventional gas from the redeveloped sector in Iraq. Each development presents a significant potential discontinuity, but they all include uncertainties regarding precise production levels, the degree of competitive advantage for local petrochemical companies, and other factors. Still, in the aggregate they can lead to major changes in the industry.

As such, each development requires closer scrutiny.

*The move to more liquid feedstocks will reduce profit margins and overall competitiveness for GCC players.*
The petrochemical industry in North America is primarily driven by natural gas feedstocks. Although projections call for only a moderate increase in the production of conventional gas and heavy liquids through 2025, the real game changer could be shale gas, which has the potential to significantly boost overall gas production in the U.S., Mexico, and Canada (for an explanation of the different types of unconventional gas, please see “Unconventional Gas Sources,” page 6). Shale gas is already the largest source of unconventional gas in North America; current reserves of nearly 2,000 trillion cubic feet (Tcf) are much larger than coalbed methane and tight gas combined. Those reserves are geographically concentrated in basins around the continent. In the U.S., shale gas is found primarily in Pennsylvania, Texas, and Louisiana, with smaller basins in several other states (see Exhibit 2).

Exhibit 2
Shale Gas in the U.S. Is Plentiful and Concentrated in Key Basins

Source: International Energy Agency; U.S. Energy Information Administration; Booz & Company analysis
Unconventional Gas Sources

There are three major sources of unconventional gas:

- **Shale gas**: Natural gas derived from formations of shale, a fine-grained sedimentary rock composed of a mix of clay mineral flakes and tiny fragments of other minerals, especially quartz and calcite.

- **Tight gas**: Natural gas that is trapped in highly compressed formations underground, such as an unusually impermeable hard rock, or in a nonporous sandstone or limestone formation (known as “tight sand”).

- **Coalbed methane**: A form of natural gas that is extracted from coalbeds, where it has been absorbed into the solid matrix of coal and is in a near-liquid state lining the coal’s inside pores.

Although the U.S. has produced shale gas in small amounts dating back to the 1990s, production has increased steeply during the past five years and will likely grow at accelerated rates in the coming decade, for a number of reasons. Technological advances in hydraulic fracturing (or “fracking”) have led to better results and larger yields. At the same time, horizontal drilling techniques have improved, offering access to reserves that had previously been restricted due to surface obstacles. Pricing has driven production as well—the price spikes for natural gas in 2007 and 2008 created greater incentives for drilling. More recently, unconventional gas sources have helped gas prices fall, even as oil prices have risen over the past three years, increasing the relative cost advantage of natural gas as a feedstock. Finally, there are structural supports for shale gas as well—U.S. leasehold laws now require companies to establish and maintain production in order to retain mineral rights. This has led to the development of basins that might have sat untapped in prior years.
For these reasons, shale gas is currently projected to become the dominant source of natural gas in the U.S. by 2035, at 12 Tcf/year or 32 Bcf/day (see Exhibit 3). The shale gas market in the U.S. has shown so much potential thus far that a number of petrochemical players are building co-located infrastructure projects near shale basins. For example, Dow, Occidental Petroleum, and Chevron Phillips Chemical all recently announced plans to build new cracker capacity near the Barnett basin in Texas. Shell is developing capacity in the Appalachian region, near the massive Marcellus shale basin, and Dow announced plans to build a cracker in Louisiana. In addition to these plays by international oil companies, several master limited partnerships are making sizable investments in gas-to-market infrastructure for shale gas, including processing, treatment, fractionation, and transport functions.

**Exhibit 3**
**Shale Gas Is Projected to Be the Largest U.S. Natural Gas Source by 2035**

**U.S. NATURAL GAS PRODUCTION FORECAST**

Source: International Energy Agency; Booz & Company analysis
The growth in shale gas production has effectively decoupled natural gas prices and oil prices, which have historically moved in tandem. From their peak in mid-2008, oil prices have fallen roughly 35 percent through late 2011, while natural gas prices have fallen some 68 percent. Unconventional natural gas sources such as shale gas will cap gas prices over the long term at $6 to $7 per million metric BTUs (mmBTUs). This decoupling rewrites the economics of the petrochemical industry: The price of petrochemical end-user products is still correlated with oil prices, while cheaper natural gas gives suppliers a significant cost advantage, leading to more attractive margins.

A significant uncertainty regarding shale gas is the “richness” of the U.S. basins, or the relative levels of ethane and propane in the gas they generate. In both the Marcellus and Barnett shale basins, gas from wells on the eastern side is typically drier, while that from western wells has been rich in ethane, making it more attractive as a feedstock. If this propensity continues, it could lead to new feedstock sources for U.S. petrochemical players, increasing their competitive advantage.

Despite this promise, shale gas—particularly the current set of fracking production technologies—poses a number of environmental challenges, which will need to be overcome if the basins in North America are to be reliably developed. The fracking process requires large volumes of fresh water, mixed with sand and chemicals; after being recovered from wells, this water may contain naturally occurring radioactive materials and heavy metals that pose a risk of contamination if not treated or disposed of properly. In addition, the shale gas production process vents significantly higher amounts of methane (CH$_4$) into the atmosphere than conventional gas, which effectively undercuts the benefits of shale gas in reducing greenhouse gas emissions.

In addition to environmental factors, the U.S. shale gas industry has yet to overcome several key infrastructure challenges such as transportation. For example, several of the basins include regions with higher concentrations of natural gas liquids (NGL). In some cases, the amount of ethane exceeds the standard transportation threshold. (The amount of ethane that can be transported in the NGL stream for fractionation or transit by truck or rail is typically about 15 percent. Pipeline transit has a separate set of issues: Keeping ethane in the natural gas stream increases the energy content beyond pipeline specifications.) However, as with

The U.S. shale gas industry has yet to overcome several key infrastructure challenges such as transportation.
environmental issues, the industry is currently working to develop solutions to address the challenge of shale gas transportation.

The bottom line: Although questions remain around specific production amounts, unconventional natural gas—primarily shale gas—has the potential to transform the North American supply of feedstocks. Particularly if the gas from U.S. shale basins is rich, the U.S. market will see greater supplies of ethane feedstocks and ethylene production—a possible increase of 45 percent in supply by 2025 (see Exhibit 4). At a fundamental level, U.S. petrochemical producers are still positioned for a significant competitive advantage over those in other regions because of their access to a plentiful supply of natural gas feedstocks at affordable prices, which could last for several decades.

Exhibit 4
Unconventional Gas Could Add 45 Percent to Current U.S. Feedstock Sources

ETHYLENE VOLUMES BASED ON FEEDSTOCKS IN NORTH AMERICA
(2010–2025E; IN MILLION TONS PER YEAR, INCLUDING SHALE GAS)

Source: Nexant; Booz & Company analysis
In contrast to the strong potential of shale gas production in the U.S., Europe represents a much more limited opportunity. The European petrochemical industry is driven by naphtha feedstocks, with a smaller percentage of natural gas. Natural gas from conventional sources is declining rapidly, and although shale gas has been discovered in some regions, it is unlikely to replace that supply. Technically recoverable shale gas resources in western Europe amount to about 370 Tcf, primarily in basins located in France and Scandinavia, which have fairly dense populations, little service infrastructure, and vocal opposition to environmentally unfriendly techniques such as fracking.

Poland and eastern Europe (including Ukraine and Romania) also have reserves of more than 200 Tcf, with lower population density and fewer environmental constraints. However, as with the rest of Europe, the basins cross national borders and have a range of geologic factors that make the development of shale gas a greater logistical challenge than in the United States. Further complicating matters, landowners do not typically share in the wealth generated from mineral development, reducing the incentive for them to allow drilling. These factors all lead to greater production costs and higher breakeven prices. As a result, shale gas is unlikely to become a substantial factor in the petrochemical feedstock mix in Europe.

**EUROPE: LIMITED SHALE GAS POTENTIAL**

*In Europe, natural gas from conventional sources is declining rapidly.*
Asian feedstocks are currently experiencing two disruptive trends, both in China: the potential development of shale gas in China, and the country’s investment in leveraging coal as a feedstock, through coal-to-olefin (CTO) technology.

Regarding shale gas, China’s technically recoverable reserves are estimated at 1,275 Tcf, somewhat smaller than the 2,000 Tcf in North America. These resources are primarily in the Sichuan and Tarim basins, which feature the right geologic conditions. Other major basins in China, such as the Ordos, have the potential for coalbed methane and tight gas (see Exhibit 5).

The reserves in China are sufficiently large that several Chinese companies have partnered with international oil companies over the past four or five years to explore and eventually produce shale gas. Chinese national oil companies have less experience with techniques like fracking and horizontal drilling, but they have sought to acquire these needed skills through major M&A activity, primarily in the United States.

However, some constraints on the development of shale gas in China may be more difficult to address.

As discussed above, the fracking technologies that have succeeded in the U.S. require large amounts of fresh water, which is not present in sufficient quantities near the western shale gas reserves in China. Similarly, China’s basins are fairly deep (4 to 6 kilometers, compared to 2 to 4 kilometers in the U.S.) and located in hilly terrain, which makes production more expensive and complicated. China has less developed pipeline infrastructure, and a more consolidated energy industry, which tends to discourage entrepreneurial approaches. Regulation is a factor as well—gas prices are maintained at

Exhibit 5
China Has Large Shale Gas Reserves, Concentrated in a Few Major Basins

![CHINESE MAJOR SHALE GAS BASINS](image_url)

Technically Recoverable Resources: 1,275 Tcf

Source: U.S. Energy Information Administration; Booz & Company analysis
levels below those needed to make a typical shale gas project feasible. Finally, the ethane content of any shale gas that might be captured from these reserves remains largely unknown; as in other markets, large ethane quantities in the gas stream would pose logistical and transportation challenges.

Because of these factors, the probability that China will be able to replicate the success of U.S. shale gas developments remains low, at least in the short to medium term. The sheer size of the reserves, however, makes shale gas in China a long-term threat, and the industry is working to address the water issues and other factors that could prevent full tapping of that country’s shale basins. Still, production is not likely to increase substantially until 2020, and even then, the specific impact of the disruption is hard to quantify at this point.

A more immediate, and potentially larger, disruption could come from China’s significant recent investments in leveraging coal as a feedstock for petrochemicals. During the past decade, the country has become one of the most important coal producers in the world, with large reserves (roughly 15 billion tons, amounting to 93 percent of its total energy reserves) and local prices that are dramatically lower than in other markets. In 2010, China accounted for nearly half of the world’s total coal use, primarily for power generation, with consumption rising 50 percent between 2005 and 2010. However, many of China’s coal reserves are in geographically remote locations, primarily in the interior of the country. Given the difficulty and cost of transport over long distances—to the power plants in more concentrated population centers—much of this coal is effectively “stranded.”

In response, China has made significant new investments in CTO technology, which entails converting the coal into syngas and then methanol at facilities near the mines, so it can be more easily sent via pipeline or trucks to petrochemical plants. China has sizable CTO ambitions: A target of the country’s 12th five-year plan, for the period 2011 through 2015, is for 20 percent of the country’s olefin consumption to come from coal. The recently opened Shenhua demonstration plant is the first large-scale CTO plant in the world and thus far has proven the commercial-scale viability of the technology, and China’s attractive coal prices (about $10 a ton) make CTO a viable option. However, the country has to date fallen short of expectations on CTO development. Petrochemical companies in China have announced development projects that represent about 7 million metric tons per annum (mmtpa) of new ethylene capacity. However, the government approved only 1.6 mmtpa, and the overall industry has not achieved its goals. This disparity between ambitions and actual developments underscores critical questions regarding the long-term competitive threat from CTO technology. Key among these is the security of supply factors—there is legitimate debate regarding how much coal China is willing to devote to petrochemical feedstocks. While China has large domestic petrochemical demand, it has larger—and growing—energy needs, which could require more coal and thus constrain its use as a petrochemical feedstock.

In addition, the CTO process entails several technical and economic issues. The plants required to convert methanol to olefins are capital-intensive, in part because the mines are relatively remote but also because the technology generates low olefin yields, requiring significant scale to become cost-competitive. Moreover, the quality of the coal is crucial, both to reduce potential fouling during the gasification process and to ensure sufficient efficiencies and yields (see Exhibit 6).

For these reasons, the economics of coal as a feedstock are not yet clear, making it difficult to predict the eventual scope of the market disruption from CTO technology. For petrochemical producers that export to China, the country’s rapidly growing demand for olefins, along with limited refinery capacity, ensures that current olefin imports are likely to remain stable for the foreseeable future.

Combining the potential impact of shale gas and CTO technology, China’s feedstock market represents both the greatest potential disruption to the global petrochemical industry and the most significant uncertainties. The most optimistic scenario suggests that these two developments could add approximately 30 percent to China’s feedstock capacity in the short to medium term (see Exhibit 7). However, this estimate remains highly uncertain.
Exhibit 6
China’s Attractive Coal Prices Make CTO Technology Appealing

COAL-TO-OLEFINS COST STRUCTURE AND ASSUMPTIONS
(2010; US$ PER TON)

<table>
<thead>
<tr>
<th>Coal-to-Methanol Costs</th>
<th>Methanol-to-Olefins (MTO) Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of Coal</td>
<td>10</td>
</tr>
<tr>
<td>Utilities, Catalyst, Chemicals</td>
<td>48</td>
</tr>
<tr>
<td>Non-Feed Operating Cost</td>
<td>133</td>
</tr>
<tr>
<td>By-Product Credit</td>
<td>8</td>
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<tr>
<td>Total Cost of Methanol</td>
<td>183</td>
</tr>
<tr>
<td>MTO Cost</td>
<td>550</td>
</tr>
<tr>
<td>Depreciation</td>
<td>36</td>
</tr>
<tr>
<td>Olefins Cash Cost</td>
<td>697</td>
</tr>
</tbody>
</table>

Capex Assumptions
- Capacity: 1.4 mmtpa
- Capital investment:
  - US$1,200/ton for coal-to-methanol
  - US$300/ton for methanol-to-olefins
- China coal price: ~$10/ton
- By-product credits included

Yield Assumptions (%)
- Methanol Used 100.0%
- Ethylene 19.9%
- Propylene 13.0%
- Butenes 4.2%
- Naphtha 2.4%
- Fuel Gas 2.5%
- Water 58%

Source: ICIS, China Daily, Chemical & Engineering News; Reuters; HSBC; Booz & Company analysis

Exhibit 7
The Most Optimistic Scenario Is That China’s Feedstock Supply Will Increase 30 Percent Through Shale Gas and CTO Plays

ETHYLENE VOLUMES BASED ON FEEDSTOCKS IN CHINA
(2010–2025E; IN MILLION TONS PER YEAR, INCLUDING COAL & SHALE GAS)

<table>
<thead>
<tr>
<th>2010</th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal: High-Ethane Scenario</td>
<td>13.7</td>
<td>12.2</td>
<td>26.4</td>
</tr>
<tr>
<td>Coal: Low-Ethane Scenario</td>
<td>1.5</td>
<td>17.3</td>
<td>22.0</td>
</tr>
<tr>
<td>Conventional</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy Liquids</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+31%

1 Numbers are much lower compared to other sources and hence not visible.
Source: Nexant; Booz & Company analysis
IRAQ: TAPPING OIL AND GAS RESERVES

Closer to home for Middle East petrochemical companies, Iraq has expressed significant ambitions in increasing its capacity and is emerging as a potential new source of feedstocks. The country’s oil and gas sector is undergoing a comprehensive redev elopment program, following decades of war and several years of political instability, and Iraq’s government is now seeking to tap its sizable reserves, which are smaller than those of world leaders like Russia, Iran, and Qatar but in line with those of large players such as Saudi Arabia and Venezuela.

Fundamentally, the magnitude and timing of gas production growth in Iraq is highly dependent on oil production growth. Field development rights have been awarded to international oil companies in three licensing rounds, in which the treatment of gas varies. In some cases, gas will be gathered, processed, and marketed by the Basrah Gas Company. In other cases, individual license holders are required to gather and process gas and deliver it to the Ministry of Oil. For nonassociated gas fields, the licensee will develop the fields in return for a fee. In all cases, current gas reserves of 112 Tcf will likely be expanded.

Iraqi oil production is subject to a wide range of uncertainty. Some believe that production will essentially remain flat, while others paint a far more optimistic picture in which production quadruples. Timing estimates are equally variable—Iraqis are seeking to increase capacity by 2017, but estimates vary. Ethane production and ethylene capacity in Iraq are subject to similar disparities regarding growth potential, since the level of ethane in the natural gas is not yet known within broad parameters. Despite this uncertainty, we believe that the country could potentially add significant ethylene capacity by 2025.

“The magnitude and timing of gas production growth in Iraq is highly dependent on oil production growth.”
LONG-TERM IMPLICATIONS OF NEW FEEDSTOCK DEVELOPMENTS

Regardless of their impact in the short term, these feedstock sources—North American ethane from shale gas, Chinese CTO, and Iraqi ethane—present both material threats to the profitability of GCC players and new growth opportunities to consider.

First, the shifts in the cost curve could lead to more competitively priced feedstocks and new petrochemical capacity in all three markets: the U.S., China, and Iraq. Capacity additions from these sources could ultimately result in excess supply, and new feedstocks will likely replace older sources such as subscale naphtha crackers in Europe and Asia, pushing traditional players out of the market (see Exhibit 8). At a time when gas prices within the GCC are likely to rise, given local supply–demand imbalances, the cost and margin advantages that Middle East petrochemical companies have enjoyed during the past few decades will likely decline marginally. Middle East producers may have an opportunity to set up projects in the U.S., China, and Iraq.

Second, while early signs indicate that China’s shale gas–based petrochemical ventures may not be cost-competitive, it is too soon for certainty. The country’s reserves are large enough to significantly impact the market if China’s energy industry figure out a more efficient means of extraction. In that context, Middle East producers must hedge their bets, by maintaining both a strong market position in China and sufficient flexibility to react as the situation changes.

Third, the structural feedstock shifts in the U.S. market, driven by shale gas, will distort the traditional pricing relationship between propylene and ethylene. Propylene margins may have a structural advantage, creating opportunities for on-purpose propylene or other ways to extend into the C3 value chain.

Exhibit 8
New Feedstocks Will Be Cost-Competitive with GCC Sources

Note: Natural gas prices (Iraq: $4/mmBTU; U.S.: $5/mmBTU).
Source: CMAI; Booz & Company analysis
The feedstock developments don’t present dramatic changes for the current capacity of Middle East petrochemical producers—the region’s capacity remains competitive. However, Middle East companies must now work harder to identify new sources of growth. Primarily, companies have many options that involve looking upstream within the value chain to more effectively leverage feedstock developments. They can also expand into performance or specialty products, or consolidate the industry and build scale. Each of these options entails building on existing capabilities—or implementing capabilities that are new to the enterprise (see Exhibit 9).

MIDDLE EAST PRODUCERS NEED NEW CAPABILITIES

Middle East companies must now work harder to identify new sources of growth.
**Exhibit 9**

*All Strategic Options Will Require New or Enhanced Capabilities*

<table>
<thead>
<tr>
<th>Capabilities Required</th>
<th>1 Participate in Petrochemical Projects in U.S.</th>
<th>2 Extend Downstream Into Performance and Specialties</th>
<th>3 Consolidate Industry, Build Scale, Verbund Effects, Diversify Business Models</th>
<th>Current Capability of Middle East Players</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial strength</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Efficienctly bulk produce basic chemicals</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Efficiently run Verbund sites in customer markets</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Quickly erect capex optimal assets</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Strong innovation capability</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Understand customer/supplier business models</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>Efficient supply chain and distribution network</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Partnering capability</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Integration capability</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

1 Some Middle East players have this capability.

Source: Booz & Company
The strategic responses for Middle East companies include the following:

*Invest in petrochemical projects in North America driven by shale gas developments.* Not only would this give companies strategic information regarding developments in fracking and access to low-cost feedstocks, but it would also diversify their geographic markets. Currently, these players focus primarily on Europe and Asia, but North America represents a complementary region, with correspondingly complementary opportunities. This option requires enhancing several core capabilities that GCC petrochemical players already possess: financial strength, the ability to bulk produce basic chemicals in an efficient and cost-effective manner, strong partnerships with other enterprises, and a supply chain and distribution network that can be leveraged to source from vendors and deliver to customers in various regions. In addition, GCC players will need to refine their capabilities in terms of establishing large, capital-intensive projects in a cost-effective and timely manner.

*Extend downstream into performance and specialty chemicals.* This option entails expanding the current product portfolio away from basic chemicals toward end segments. This option potentially allows GCC companies to leverage heavier feedstocks within the region and maximize integration synergies. To succeed, petrochemical players will need to diversify their business models in order to reflect different market positions and different value propositions for each customer segment. GCC players already have some of the capabilities required for this option—though they will need to be enhanced—including financial strength, the ability to partner with outside firms, integration
competencies, and a strong supply chain and distribution network. In addition, any company seeking to expand into performance or specialty chemicals will need to build up an innovation capability to protect margins on its more specialized products, along with a better understanding of the business models to serve end-use customers.

*Consolidate the industry within the GCC and build scale.* GCC companies can acquire and integrate the basic chemical industry in the region, driving synergies and making more efficient use of scant local resources (including human capital). Regional players could also drive consolidation on a global level, through acquisition of basic chemical producers, along with companies that sell performance or specialty chemicals. This is the most complex strategic option and will involve the full complement of institutional capabilities: financial strength, partnering and integration, efficient bulk processing of basic chemicals, a strong supply chain and distribution network, and the ability to establish capital-intensive projects efficiently and in a timely manner, as well as strong innovation and a solid understanding of suppliers' and customers' business models and needs. Most important, these companies will need to be able to efficiently run Verbund sites in customers’ markets in order to effectively capture synergies.

**GCC companies can acquire and integrate the basic chemical industry in the region, driving synergies and making more efficient use of scant local resources.**
CONCLUSION

The Middle East petrochemical industry has enjoyed a period of stability and strong growth over the past two decades, but that period is now ending. Gas feedstock shortages in the region, combined with feedstock developments in other parts of the world, will reduce the sourcing and cost advantage of the region’s petrochemical players, introducing new competition and cutting into margins. The current feedstock developments—including shale gas in North America, CTO technology in China, and a renewed gas industry in Iraq—still have significant uncertainties regarding their long-term growth and potential to disrupt the petrochemical market. However, they will clearly present at least a moderate challenge in the medium term, and could change the industry in profound ways over the long term.

GCC petrochemical players have some clear choices in how to respond to this competitive threat, through a number of strategic options both upstream and downstream in the value chain. However, each option requires a specific set of underlying capabilities. Though many companies have some of these capabilities currently in their operational arsenal, they will need to be strengthened. Others may not exist within the enterprise at all, requiring that companies implement them entirely from scratch. Given those needed changes, it’s crucial that companies identify the best match between their current strengths and the future capability requirements of each strategic option. Companies cannot fight this battle on every front; instead, they must conduct an honest assessment of where their current strengths lie, along with areas in which they can make the most immediate and dramatic improvements, and then select the strategic response that provides the best match.
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Endnotes
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