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Gas Shortage in the GCC

How to Bridge the Gap



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EXECUTIVE SUMMARY

Bahrain, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates are facing a reversal of a decades-old status quo: an increasing gas shortage in the region amid a significant supply overhang in the rest of the world. Although the global economic slump has reduced the need for gas in most regions, demand in the Gulf Cooperation Council¹ for power generation from some industrial sectors has far outpaced the region's gas exploration and production. As a result, GCC countries find themselves in uncharted territory, an almost contradictory position of having to import gas, when they have exported gas for decades.

The GCC gas shortage will become more pronounced through at least 2015, as demand stays strong and supplies fail to keep pace. However, fundamental changes in the global gas market—the growth of unconventional domestic gas in North America in particular and a large increase in the number of liquefied natural gas (LNG) projects—have created a significant global supply overhang and provide GCC countries with a unique opportunity to address their gas shortage in the short term.

Over the long term, GCC countries can address the supply–demand imbalance by raising local gas prices gradually, improving energy efficiency through new regulation, increas-

ing penetration of alternative power sources in the energy mix, investing in alternative methods for enhanced oil recovery, and providing incentives for international oil companies (IOCs) to participate in the upstream gas sector. Such an approach would require national oil companies (NOCs), utilities, and regulators in the region to work together to develop a GCC-wide approach and even consider a regional gas grid. Timing is crucial; the failure to act now and take advantage of the unique opportunity in the global gas markets might force GCC countries to make poor economic decisions to serve consumers, such as burning more-valuable liquid fuels in power plants or redirecting gas required for enhanced oil recovery.

KEY HIGHLIGHTS

- A shortage of gas in the GCC has traditional gas exporters now importing product as a short-term solution.
- The gas shortage in the region is not temporary; it will become more severe whether growth returns or the recession persists. However, the problem can be solved.
- Current supply overhang in global gas markets—due to growth in North American gas production and a significant increase in LNG supply—provides a unique opportunity for GCC countries to solve the gas shortage.
- There is an opportunity for NOCs, regulators, and utilities in the region to develop an integrated, GCC-wide approach.
- The time to act is now: Waiting for solutions to materialize might mean that GCC countries will have to burn more-valuable liquid fuels or redirect gas from enhanced oil recovery to meet demand.

AN UNEXPECTED CONTRADICTION

In April 1977, the GCC began exporting gas as the United Arab Emirates (UAE) built the region's first LNG liquefaction terminal and began sending LNG to Japan.

A little more than 30 years later, in August 2009, the GCC began importing gas, as Kuwait received its first LNG cargo from Russia at its fast-track LNG receiving terminal at Mina Al-Ahmadi GasPort (MAAGP).

These examples illustrate the sea change that GCC countries have undergone in that time frame. Importing gas into the resource-rich countries of the GCC seems counterintuitive—the six member countries of the GCC collectively hold roughly 23 percent of global

gas reserves.² However, the extent of the gas supply–demand imbalance in the region has mandated that the countries of the GCC, with the exception of Qatar, at the very least consider importing gas to meet rapidly rising demand. Construction of Kuwait's MAAGP commenced in January 2008, and in April 2008, the Emirate of Dubai appointed Shell to advise it on building a fast-track LNG receiving terminal and expects to receive its first gas in 2010.

Five factors have combined to shift the gas supply–demand balance in the GCC to the point where the region now faces a growing gas shortage:

1. Increasing power consumption and the share of gas in power generation: From 1998 through 2008, GCC economies grew at a rate of about 7.6 percent per year. Demand for both gas and electricity has kept pace with regional GDP growth and economic diversification, posting annual gains of 5.5 percent and 6.1 percent, respectively. Going forward,

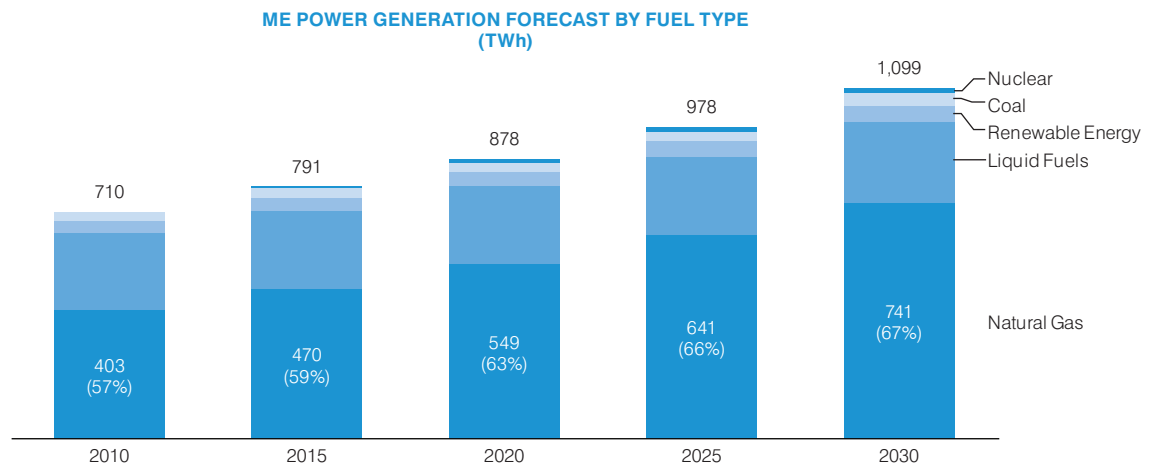
according to U.S. Energy Information Administration (EIA) forecasts, the region's power generation needs will grow by about 50 percent—from approximately 710 terawatt hours (TWh) in 2010 to around 1100 TWh in 2030. The EIA also predicts that more than 90 percent of this incremental power generation growth will be fulfilled by gas, significantly increasing the GCC power sector's reliance on gas. Other power-

sector alternatives, like liquid fuels, renewable fuels, coal, and nuclear energy will contribute, but only modestly compared with natural gas, according to the EIA's 2009 outlook (see Exhibit 1).

2. Depleting oil fields and the need for gas in enhanced oil recovery: Depleting oil fields, where natural gas is used for re-injection to maintain reservoir pressure and oil production

capacity, are another major source of gas consumption in the GCC. For example, in the UAE, gas demand for re-injection is expected to grow significantly—from around 18 billion cubic meters (bcm) in 2008 to approximately 45 bcm by 2020.³ To a lesser extent, Oman and Qatar also face an increase in gas demand for re-injection. GCC countries currently manage their gas shortage by reducing gas re-injection and directing gas

Exhibit 1
Natural Gas Will Continue to Be the Dominant Source of Power Generation in the Middle East



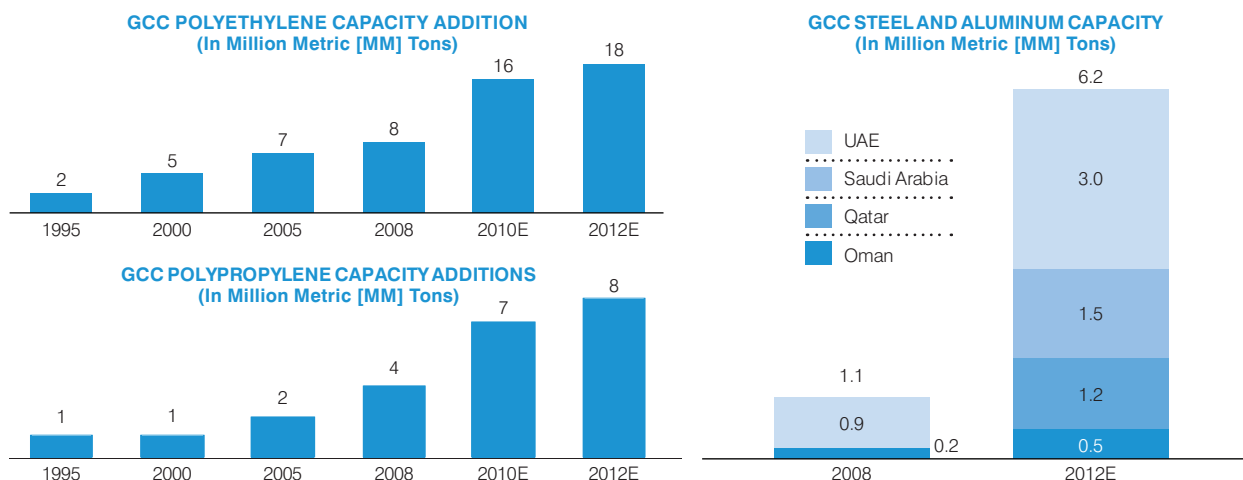
Source: Energy Information Administration, "International Energy Outlook 2009"; Booz & Company analysis

to end consumers. That strategy, however, is not sustainable over the long term, as prolonged reduction in gas re-injection will have an adverse impact on the oil reservoirs. Although groundbreaking alternative technologies such as nitrogen and CO₂ injection are currently being developed and deployed on a pilot basis, it is unlikely that they will significantly reduce the demand for gas, at least in the near future.

3. Increasing economic emphasis on the steel, aluminum, and petrochemicals sectors: The emergence of the gas-based petrochemical sector, especially in Saudi Arabia, has been one of the great GCC success stories over the last three decades. These industries likely will continue to grow and even accelerate over the next decade as other GCC countries continue their diversification efforts and invest in gas-intensive industries.

Low gas prices provide a competitive edge for GCC businesses to increase investment and add significant new capacity within the next few years. As a result, production of polyethylene and polypropylene in the Middle East will more than double between 2008 and 2012, and steel and aluminum production may increase as much as sixfold in the same period⁴ (see Exhibit 2).

Exhibit 2
Capacity in Steel, Aluminum, and Petrochemicals Is Expected to Increase



Source: ChemSystems; Booz & Company analysis

4. Gas exploration and production challenges: The region faces extraordinary challenges in maintaining and increasing gas production at a level that would allow it to meet demand. Most of the region's gas production is in the form of associated gas that is closely tied to OPEC oil production quotas. As OPEC oil production has waned in line with the global economic recession, so has the region's gas production. This presents new challenges for managing the gas supply-demand balance. In addition, new sources of non-associated gas—gas produced on its own and not as part of oil production—are proving difficult to locate despite the optimism of regional gas producers. For example, Saudi Arabia has had limited success in exploring for and developing non-associated gas. In 2004, the Kingdom set up a consortium of Saudi Aramco,

Shell, and Total to explore in the Rub Al Khali area in the “Empty Quarter.”⁵ Despite high hopes and significant investment and drilling since 2006, no material amount of commercial natural gas has been discovered there. In 2008, Total pulled out of the consortium due to lack of commercial success. Similar challenges have plagued development activity in Kuwait. Even when gas has been discovered in significant quantities, production has been technically challenging as the gas is either sour (with sometimes about 25 percent sulfur content) or it is tight gas (gas trapped in unusually impermeable hard rock or in a sandstone or limestone formation). These technical challenges are stalling plans, increasing production costs, and adding to the risks of the projects. Moreover, as the GCC gas markets are highly subsidized, some countries are finding it difficult to attract and

retain IOCs for gas exploration and development activities.

5. Long-term gas export commitments limit local supply: Key gas-producing countries such as the UAE, Oman, and Qatar have committed significant portions of their current production to LNG exports through long-term contracts, mostly to Asia and Europe. Those commitments will exacerbate gas supply shortages while demand continues to increase. The International Energy Agency (IEA) even reports that Oman has been short of LNG for its Qalhat LNG plant. Export commitments extend at least through the end of the next decade and sometimes even longer.

The combination of these five factors is draining the gas supply in the GCC. What's more, there's no respite in sight.

THE BAD NEWS: THE CHALLENGE WILL INCREASE

Over the next five years, the shortage will become more acute—despite forecasts for slower economic growth due to the recession, as well as current investments in exploration and production intended to increase supply. The gas shortage will unfold according to either of the following scenarios—an enduring recession or the regional economies’ return to pre-recession growth levels.

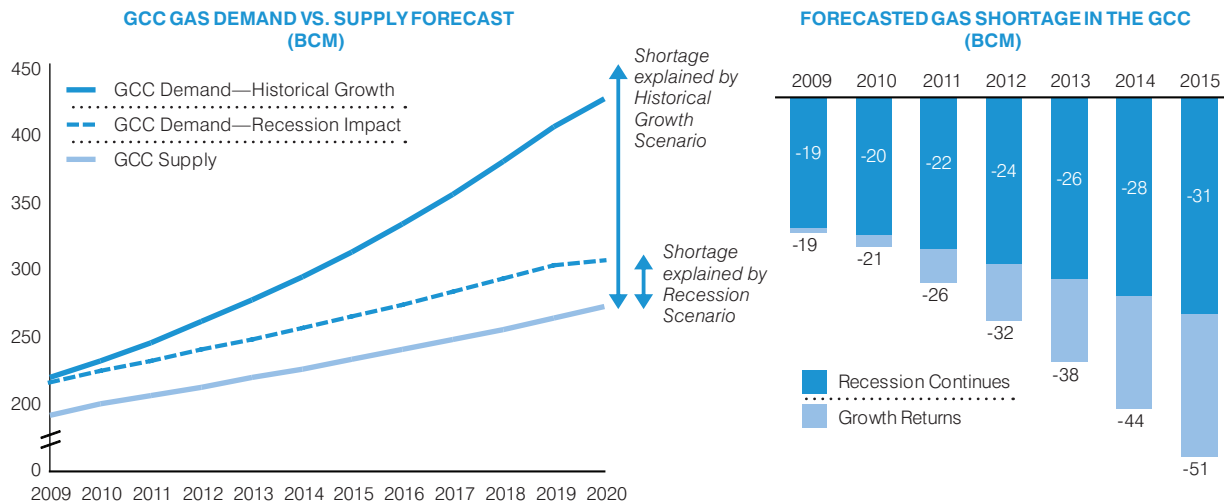
Scenario One: The Recession Continues
This scenario assumes that the recessionary environment in the GCC economies persists through 2015 or beyond. In this case, economic growth and consequently gas demand are based on forecasts developed by the IEA as part of the “Reference Scenario” in its annual “World Energy Outlook.” This scenario could materialize if oil prices slip back to early 2009 levels and the large number of residential and infrastructure development projects in the region are canceled or indefinitely postponed.

Scenario Two: Growth Returns
This scenario assumes that the gas demand growth returns to 2008 levels, prior to the recession. The International Monetary Fund (IMF)

predicts that the GCC economies, after a contraction in 2009, should revert to pre-recession growth rates by 2012 with only a marginal decline. This implies that gas demand could return to 2008 growth rates by 2012.

Irrespective of which scenario plays out, the gas supply outlook for the GCC remains bleak. In the event that Scenario One prevails and a prolonged recession slows down the increase in gas demand, the gas shortage is expected to increase from about 19 bcm in 2009 to about 31 bcm in 2015. Worse yet, if Scenario Two materializes and growth returns to historical levels, the shortage is expected to increase to more than 50 bcm in 2015 (see Exhibit 3).

Exhibit 3
The Gas Shortage Will Intensify Regardless of Economic Conditions



Note: A shortage of 2.07 bcm was assumed for Oman based on a government-predicted shortage of 200 million standard cubic feet per day (mmscfd).
Source: Energy Information Administration (EIA); International Energy Agency, “World Energy Outlook 2005”; OPEC, “World Oil Outlook 2009”; “BP Statistical Review of World Energy, June 2009”; Booz & Company analysis

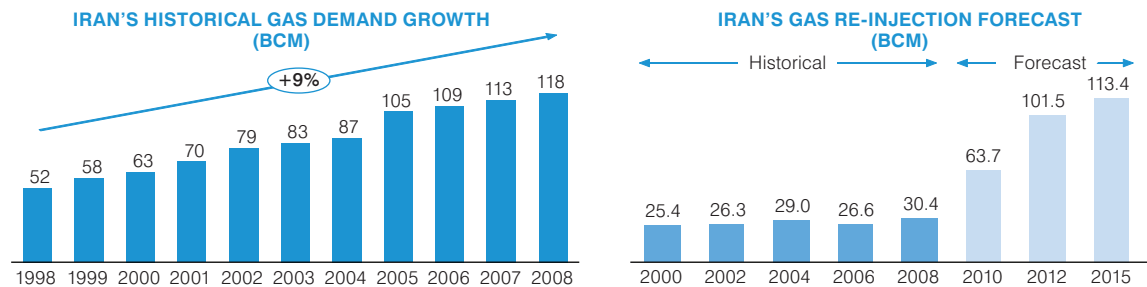
NO BAILOUT IN SIGHT

Will the biggest gas reserve holders in the Middle East—Iran and Qatar—come to GCC countries' rescue? Apparently not—at least not before 2015, during which time the GCC's gas shortage is expected to accelerate.

Iran: Despite holding the world's second-largest gas reserves, Iran currently imports almost 5 percent of its gas needs from Turkmenistan to satisfy local demand. Iran is the third-largest consumer of gas globally, and local gas demand will increase by around 7 percent per year over the next decade, according to the International Energy Agency's "World Energy Outlook 2009" (WEO). Currently the power sector consumes about one-third of Iranian gas, and Iran's aging oil reservoirs require about one-quarter of the country's gas for re-injection. According to the WEO, the demand for gas for re-injection will quadruple by 2015 (see *Exhibit A*). On the supply side, the most significant energy development project in Iran is the off-shore South Pars field (also known in Qatar as the North Field), which is estimated to contain about 50 percent of Iran's total natural gas reserves. However, the majority of natural gas development in South Pars is slated to be allocated to the domestic market for consumption and gas re-injection. In addition, Iran has contracted to import gas from Azerbaijan beginning in 2011 and has expanded its pipeline import capacity from Turkmenistan. Iran also has been negotiating with various countries in the region—Turkey, Armenia, Oman, Bahrain, and Kuwait, among them—to import gas, though price disputes and other uncertainties have held back agreements. Considering Iran's domestic gas needs and political uncertainty, it is unlikely that Iran will be able to export a significant amount of gas at least until the end of the next decade.

Exhibit A

Demand for Gas Is Strong in the Power Sector and Could Quadruple for Re-injection



Source: EIA; "World Energy Outlook 2005"; "World Oil Outlook 2009"; "BP Statistical Review of World Energy 2009"; Booz & Company analysis

Qatar: Qatar holds the world's third-largest gas reserves and until recently has been one of the largest gas exporters. The country has built significant LNG export terminals and it exports pipeline gas to the United Arab Emirates via the Dolphin pipeline, which operates at a capacity of almost 2 billion cubic feet per day (equivalent to around 20.6 bcm per year). Plans are under way to increase this capacity even further to approximately 3.2 billion cubic feet per day (equivalent to almost 33 bcm per year) which would provide ample supply to the UAE. However, it is not clear that Qatar will supply gas to this pipeline and, even if it does, the terms and conditions it will impose are also unclear; Qatar's historical LNG exports to Asia have produced much higher returns and these oil-linked contracts are more profitable than short-term gas contracts. The issue is compounded by the moratorium Qatar placed on additional natural gas development projects at the North Field due to concerns that those reserves were being developed too quickly and threatened the field's long-term production outlook. The North Field assessment likely will not be completed until 2012, and it is doubtful that any new projects will be started before then.

THE GOOD NEWS: ALL IS NOT LOST

Despite the gloomy outlook, the GCC's gas shortage can be resolved. GCC countries now have a unique opportunity to address their gas shortage by taking advantage of the significant global supply overhang in the gas markets that is the result of three major developments.

Deep global economic recession: The recession has taken a substantial toll on developed countries' energy-intensive sectors such as automotive, chemicals, and steel. Industrial production in advanced as well as emerging economies has decreased as much as 30 percent on a month-to-month basis. Although the rate of decline has slowed, industrial production still is decreasing in some advanced economies. This has significantly reduced the demand for gas in industrial economies. The economies of Japan and South Korea, which together accounted for

almost 55 percent of the global LNG demand in 2008, are in decline with LNG demand down in the range of 10 percent to 13 percent in 2009, and expected to stay at depressed levels.

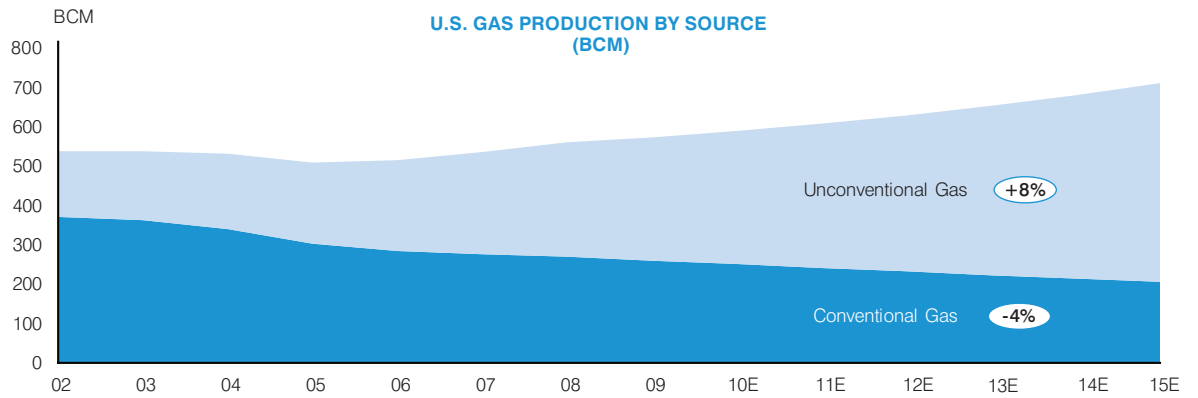
Growth from unconventional resources in North America: Research and investment into unconventional gas resources in North America has increased significantly in recent years. Since 2005, large amounts of unconventional gas have been discovered and therefore, North America has seen a sudden boom of gas production from tight gas, coal-bed methane, and in particular shale gas. Production from these unconventional gas sources is expected to grow by approximately 80 bcm through 2015, about an 8 percent cumulative growth rate per year. The increase in domestic gas production will put pressure on U.S. LNG imports of around 10 bcm annually (*see Exhibit 4*).

Large increase in LNG supply: Major LNG projects—including RasGas (Qatar), Sakhalin (Russia), Tanguh (Indonesia), and Yemen LNG—came on stream in the glut of 2009 and saw their first cargoes being delivered.

On a global basis, LNG liquefaction capacity also experienced its biggest ever increase from 2008 to 2009 with a 20 percent gain in capacity (*see Exhibit 5*). With more capacity slated to come on stream through 2015, Booz & Company estimates the global gas markets will realize a 5 percent to 15 percent surplus until at least 2015 and maybe even beyond then.

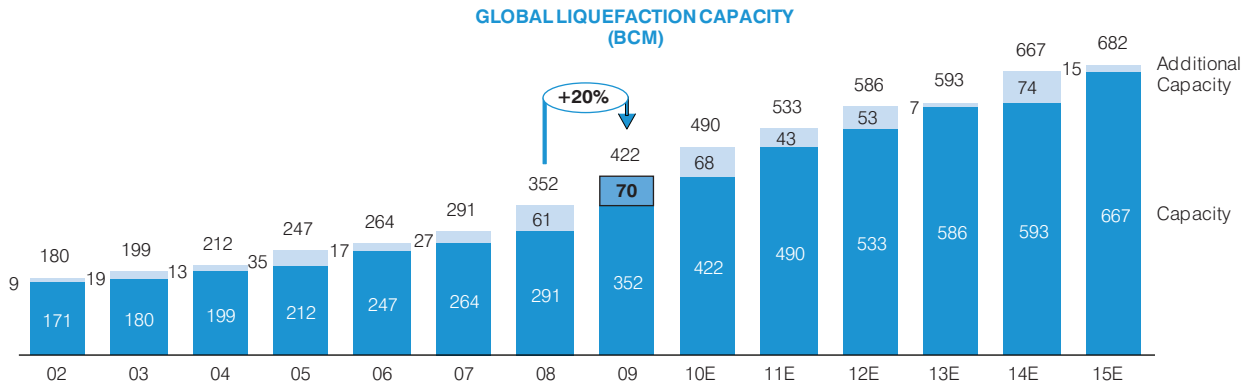
Considering this significant global oversupply, GCC countries have a unique opportunity. Countries such as Qatar, the UAE, and Oman could renegotiate some of their LNG export contracts, which typically include minimum off-take or take-or-pay conditions. That could help those countries free up export gas for domestic use. Because a large portion of the LNG exports are slated to go to the Asian markets of Japan and South Korea—both of which are severely affected by the recession—the timing could be mutually advantageous to propose flexible contract arrangements and create a win-win scenario for both parties. Once NOCs are successful at minimizing their LNG exposure to markets that currently are oversupplied, they can explore short-

Exhibit 4
Unconventional Gas Resources in the U.S. Are Seeing Strong Growth



Source: International Monetary Fund (IMF); EIA; Booz & Company analysis

Exhibit 5
Global Gas Markets Will See a Surplus through at Least 2015



Source: IMF; EIA; Booz & Company analysis

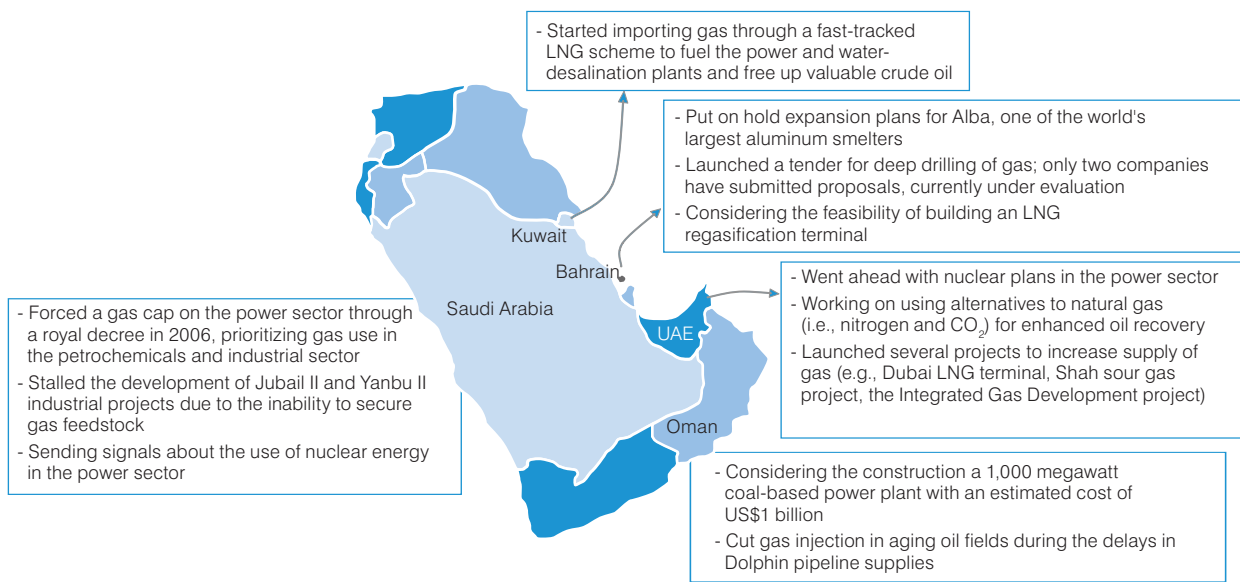
to mid-term gas import contracts because of the disparity between oil and gas prices, and employ fast-track LNG import terminals similar to those in Kuwait and Dubai to solve their gas shortage situation. Fast-track LNG import terminals can be set up within a year to 18 months—a short enough period to tackle short- to mid-term gas problems.

Importing gas or LNG is the most economically and environmentally sound solution to the GCC's problem, especially for the power sector. Furthermore, importing gas or LNG will enable GCC countries to continue their economic diversification efforts using local gas and allow them to continue to export crude oil, sending value-added refined products to foreign markets instead of burning

them as fuel for their own power needs.

Beyond addressing the short-term gas shortage, GCC countries will need to address their gas challenges by reducing demand in the long term and increasing supply (*see Exhibit 6*). The following are six areas in which NOCs, utilities, and regulators can focus their efforts (*see Exhibit 7*):

Exhibit 6
Several Countries Are Taking Steps to Rebalance Gas Supply and Demand



Source: MEED; Zawya; Booz & Company analysis

Exhibit 7
NOCs and Regulators Can Implement Several Measures to Rebalance Gas Supply and Demand

		POTENTIAL SOLUTIONS	ACTIONS
DEMAND	Gas Demand for Power Sector	Manage power demand through tariff and non-tariff mechanisms	<ul style="list-style-type: none"> - Review current gas/energy tariff structures, taking into account the cost of any contingency plan and bearable price by demand sectors - Bearable prices for the industrial sector bound by energy cost parity with (international) competitors - Residential and commercial bearable price set by affordability - Initiate non-tariff-related action plans, such as thermal storage
		Improve "energy efficiency" through regulatory changes	- Introduce energy-efficiency measures across demand sectors—efficiency standards, building codes, drip irrigation incentives, etc.
		Increase "renewable power" penetration in energy mix, e.g., nuclear power, solar power	<ul style="list-style-type: none"> - Rethink the role of nuclear energy in the power portfolio - Introduce renewable power penetration, e.g., solar
	Gas Demand for Enhanced Oil Recovery (EOR)	<ul style="list-style-type: none"> Invest in alternative technologies for EOR, e.g., nitrogen or CO₂ injection instead of gas Optimize usage of natural gas liquids for EOR 	<ul style="list-style-type: none"> - Adapt innovative technologies such as nitrogen and inert gas for re-injection in oil reservoirs instead of natural gas - Defer recovery of natural gas liquids during gas processing and introduce natural gas liquid spiking in natural gas re-injection
SUPPLY	Production Constraints	Increase IOC participation in upstream gas sector	- Design of competitive fiscal terms to attract upstream investments in technically challenging gas fields
	Commitment to Long-term Export Contracts	Diversify gas supply portfolio in case of imports	- Natural gas imports via pipeline or LNG terminals
		Assess export vs. domestic options for long-term gas production	- Renegotiation of existing export contracts

Source: Booz & Company analysis

- *Raise local gas prices gradually:* GCC governments heavily subsidize gas prices and, as a result, related power prices. As the regions' economies have grown and per capita wealth has increased in tandem, regional governments are likely to see an increased willingness to pay higher tariffs for power. Increasing power prices in a gradual manner over several years would lead to lower power (and consequently gas) demand. Governments' resistance to increased power prices stems from a fear of higher inflation: This argument, though partially valid, should not be an issue in the short term as GCC nations face a recessionary environment with a moderate inflation outlook. Moreover, even if governments issue a strong signal of higher power prices, con-

sumers likely would change their behavior to consume less power.

- *Improve energy efficiency through regulatory changes:* Establishing energy-efficiency standards and building codes in the construction industry would reduce power consumption, especially for the air-conditioning units in the peak summer months when the demand for gas is greatest.
- *Boost penetration of alternative power sources in the energy mix:* In the long term, the use of nuclear energy or renewable energy sources like solar will help reduce gas demand. The UAE has set an ambitious target of generating one-quarter of its power from nuclear sources over the next 15 to 20 years. To reach this target,

Abu Dhabi plans to construct at least six nuclear plants at a cost of more than US\$5 billion each. Given the challenges and hurdles to be overcome in constructing nuclear plants, it is unlikely that the first plant in the UAE will be operational before 2017. Despite the global political sensitivities of using nuclear power in the region, it is these types of bold actions that GCC nations will need to take to diversify the fuel sources for their power generation over the long term.

- *Invest in alternative methods for enhanced oil recovery:* Some of the regions' NOCs are pilot-testing groundbreaking new technology to produce and inject nitrogen or CO₂ instead of natural gas for enhanced oil recovery. The rapid deployment

and large-scale application of these types of state-of-the-art industry technologies across the GCC nations can help free up gas for end consumers.

- *Provide incentives for IOCs to participate in the upstream gas sector:* Although GCC countries slowly have opened up the upstream gas sector to IOC participation, the subsidized price environment renders the terms and conditions for IOC investment unattractive. Moreover, future non-associated gas resources in the region are likely to be rife with significant technical challenges like sour gas and tight gas. Bringing technically challenging gas on stream not only takes more time, it also carries additional risk and requires greater

investment. As a result, IOCs will require a higher financial incentive to justify their investments. Balancing the risk and reward for IOCs in joint venture contracts would increase their interest and commitment to the region to explore for non-associated gas.

- *Evaluate the export versus the domestic option for gas reserves:* Qatar, the UAE, and Oman are locked into LNG exports until at least the end of the next decade. However, questions remain about the longer-term export possibilities for the UAE and Oman. These countries can benefit now by undertaking a critical analysis of their domestic requirements and contingencies before they consider extending their export possibilities.

If GCC countries do not act now to address the gas shortage issue they will be forced to implement solutions such as switching gas-fired power plants to alternative liquid fuels like crude oil or diesel. Saudi Arabia took this approach through a royal decree in 2006, when it didn't have enough gas to fire up its plants. Essentially, Saudi Arabia was forced into placing a gas cap on the power sector and requiring all new power plants to use liquid fuels such as crude oil, which is much more expensive to use than gas. Kuwait has done exactly the reverse—importing LNG to free up valuable crude oil fired in the power plants for export. Especially in the current market, with gas prices depressed and oil prices climbing up again, burning crude oil, fuel oil, or diesel is far more costly than importing gas or LNG.

NOW IS THE TIME TO ACT

Although the gas shortage appears grim for the GCC, there are both short- and long-term opportunities that GCC countries can consider to ensure that they have ample gas supply for their own domestic needs as they fulfill export arrangements. To do so, stakeholders need to analyze the combination of solutions discussed above and prioritize based on four key considerations.

- *Economic and social benefits.* A cost-benefit analysis of importing

gas as opposed to burning liquid fuels will help reveal the best options and take into account a variety of factors, including the capital expenditure requirements and the impact on GDP, employment, and inflation.

- *Environmental impact.* All decisions on future gas needs must consider the country's environmental policy and vision and the "environmental cost" of implementing alternative options.

GCC countries have a unique opportunity to address the gas shortage by exploiting the global gas supply overhang.

- *Security of supply.* A dependence on external supply sources needs to address security issues, ensuring that a country's system has redundancies and back-ups in place to avoid blackouts.
- *Infrastructure requirements.* Stakeholders need to consider the amount of time required to set up the infrastructure to ensure that alternative solutions can be implemented efficiently.

Various stakeholders in the GCC—NOCs, regulators, and utilities—have a unique opportunity to work together and develop an integrated, GCC-wide approach, and even consider the development of a GCC gas grid. These stakeholders will have different roles to play in this process.

NOCs should:

- Conduct an economic assessment of the provision of imported gas or LNG to utilities, as opposed to crude oil or diesel
- Determine the technical and economic feasibility of importing LNG and negotiate supply contracts
- Invest in alternative technologies for enhanced oil recovery
- Design competitive fiscal terms to attract upstream investments from IOCs
- Work collaboratively with other NOCs to explore the development of a GCC-wide gas grid to manage supply–demand imbalances on a regional basis.

Regulators and national utilities should:

- Review current gas and power tariff structures and set up a structured mechanism to increase prices steadily
- Introduce energy-efficiency measures, such as efficiency standards and building codes
- Evaluate the role of nuclear energy and increase penetration of renewable power sources, such as solar energy, in the power portfolio.

CONCLUSION

The GCC gas shortage is real and likely will worsen—but there is opportunity to face the challenge both in the short and long term. For GCC nations there is a silver lining to the global economic slowdown: reduced demand for gas on a worldwide basis. Reduced demand coupled with growth from unconventional sources in North America and a large increase in the number of LNG projects have resulted in a significant global surplus of gas. That supply overhang provides the GCC with a prized short-term opportunity to ease what has become a major energy issue: a shortage of gas. The GCC, which holds almost one-fourth of the world’s gas reserves, faces a gas shortage that likely will

persist for years. Demand in the GCC for gas continues as regional economies diversify and grow in sectors reliant on gas. And the region has large commitments to export some of its gas production.

Opportunity also presents itself in the long term—which is important because the GCC wants to ensure it has an ample supply of gas and avoid reverting to more-expensive fuel to provide power. Through analysis, planning, and implementation, GCC countries and energy producers can take measured steps to ensure that they are able to keep the lights on in the most economically viable way for decades to come.

Endnotes

¹ The Gulf Cooperation Council, established in 1981, consists of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

² “BP Statistical Review of World Energy, June 2009.”

³ FACTS Global Energy.

⁴ ChemSystems.

⁵ Refers to the border region between Saudi Arabia and the UAE.

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