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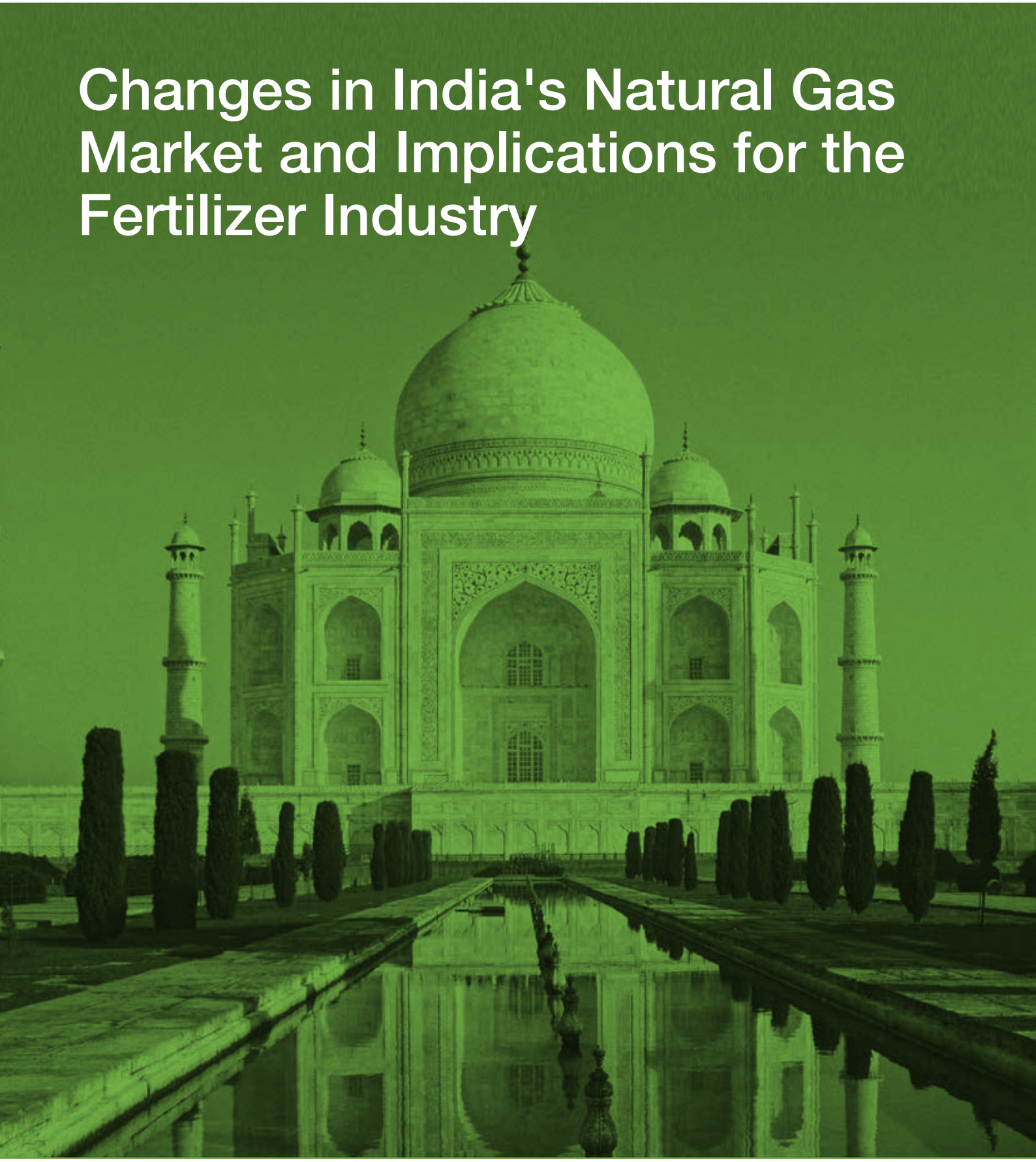
Changes in India's Natural Gas Market and Implications for the Fertilizer Industry



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1. Introduction

The ammonia and urea industries represent significant and vital components of the chemical economy. They serve as significant sources of revenue and employment, in particular within countries with large availability of feedstocks such as natural gas and coal. Furthermore, the principal application of ammonia and urea is within the fertilizer sector which is critical to agricultural production and the wider world economy.

Global ammonia demand is estimated to be 186 million tons, driven primarily by urea consumption, which in turn is mainly a function of fertilizer demand. In 2016, the consumption of urea globally was an estimated 179 million tons. Clearly, these are high volume commodity chemicals. Fertilizer demand growth has historically been linked to food consumption through GDP and population growth. This trend is expected to continue, although in recent years this dynamic has begun to change somewhat, due to the strong growth in biofuels production (mainly bioethanol) made from corn and wheat, and biodiesel made from soya, palm and rapeseed oil.

Given the high correlation between size of population and fertilizer consumption, India naturally is one of the most important fertilizer markets globally. With an estimated population of over 1.3 billion it is no surprise that India is one of the largest consumers of urea in the world, particularly as urea is an important fertilizer for rice crops which constitutes an important part of the Indian diet.

In terms of supply, feedstocks for ammonia production are principally natural gas and coal. The rising demand for urea and ammonia will be met by new investment with new capacity coming onstream. Coal is predominantly a feedstock used in China but interest in this feedstock can also be found elsewhere including in India. In most parts of the world, however, natural gas is still the main source of hydrogen for the production of ammonia and consequently urea. This is also the case in India. As with other primary energy sources, natural gas is also used to a large extent in power production, for heating and cooking purposes as well as in other industrial applications. Hence every country has to allocate its natural gas resources (domestic and imported) to various different industries. This can be done via government or through market forces.

Ammonia and urea production is of great importance in India and the country has a sizeable domestic production base. However, India also has strong requirements for increasing its power production capacity to support its growing economy. Given that India is an importer of natural gas, allocation of this resource and the attached pricing mechanisms are of great importance to the many industries that require it. Availability and affordability of natural gas will ultimately determine any future ammonia (and urea) capacity additions.

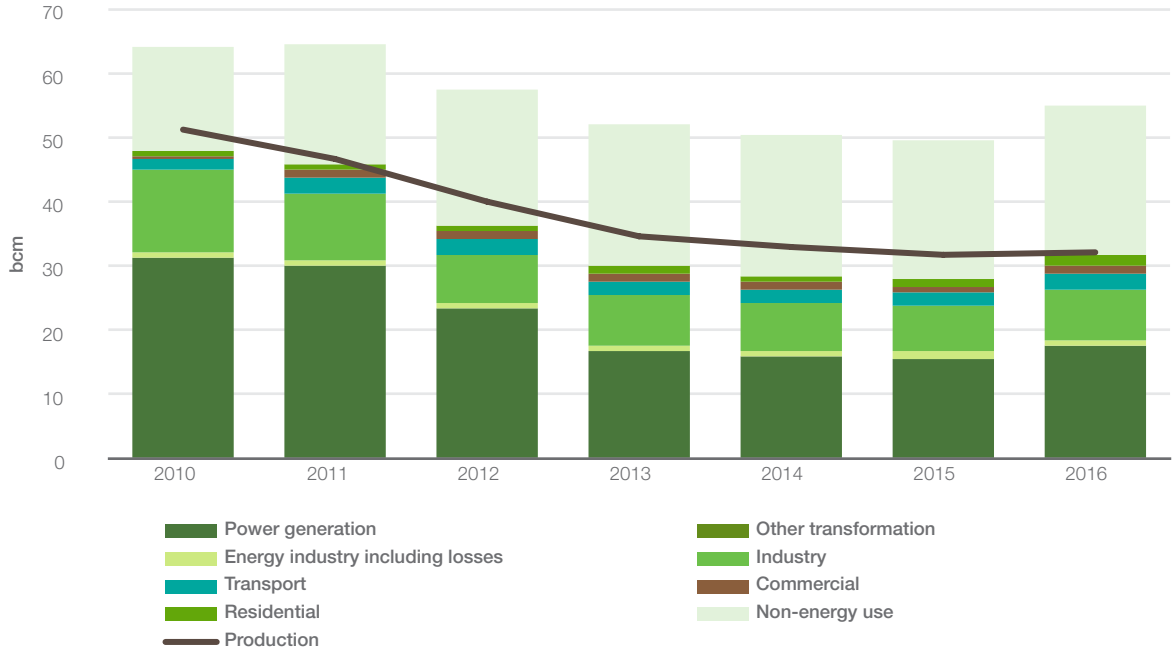
For the Middle East and the GCC in particular where large export oriented ammonia/urea plants are located, India is of course an important target market. As such, the development of domestic ammonia/urea capacity is of high importance to GCC producers.

2. Changes in India's natural gas market

India's gas industry is in a state of transition. The country faces a broadening gap between indigenous supply and demand. Thanks to India's immense population and the ongoing quest to provide a better standard of living for its rapidly expanding population, India's energy demand outlook is robust. The role of gas in the country's energy mix, however, is hard to determine. Today, gas occupies less than 7% of India's primary energy mix. The government has been a vocal proponent of increased gas use for many years, with plans to increase gas' share of the nation's primary energy mix to 15% "within three to five years". However, Indian end-users' ability to pay high prices for gas-fired power generation and/or gas as a fuel or feedstock is exceedingly limited. Consequently, the outlook for Indian gas consumption is contingent on several factors. These include, but are by no means limited to, government backing for indigenous gas production and equitable pricing for upstream producers; New Delhi's continued support for gas allocations to the fertilizer sector; and – in light of the country's growing import dependency – the price of India's broadening portfolio of imported liquefied natural gas (LNG).

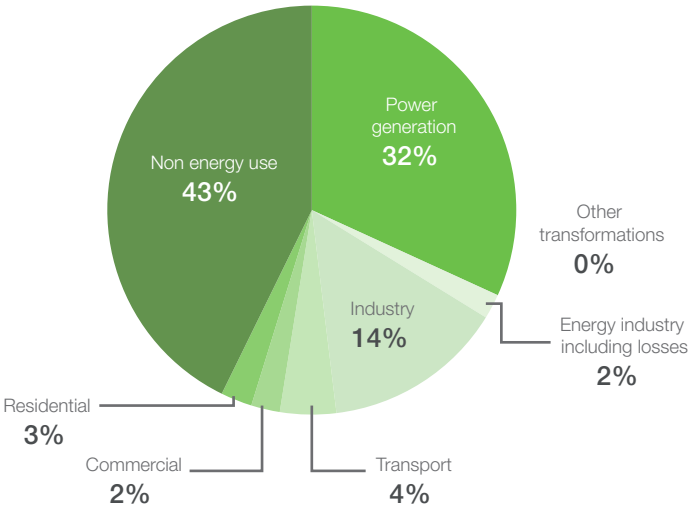
India's gas demand is dominated by the power, industrial, and non-energy use sectors, as shown in Figure 1. The latter covers gas used for 'non-energy purposes', namely the fertilizer and petrochemical sectors, where gas is used as a feedstock. In recent years, constrained supplies have affected the country's gas industry. Filling this gap, however, has not been easy. Indigenous production has been on the decline (Figure 1), thanks in no small part to dwindling output from mature fields and the hitherto disappointing performance of the Reliance-operated KG-D6 block. Although India has no less than four LNG import terminals serving the western and southern parts of the country, robust oil prices through 2014; a supply-tight global LNG market between much of 2011 and 2014; and the post-2009 switchover in the pricing terms of Petronet LNG's foundation 7.5 million tons per annum LNG supply contract with Qatar's RasGas combined to yield correspondingly high imported prices. The fertilizer and power sectors serve a large section of India's predominantly low income agricultural population, and cannot absorb high natural gas prices. This concomitant of factors resulted in a degree of gas demand destruction in India between 2012 and 2015.

Figure 1.1 India's historic sectoral das demand vs. production, 2010-2016



Source: Nexant

Figure 1.2 India's natural gas demand by sector, 2016



Source: Nexant

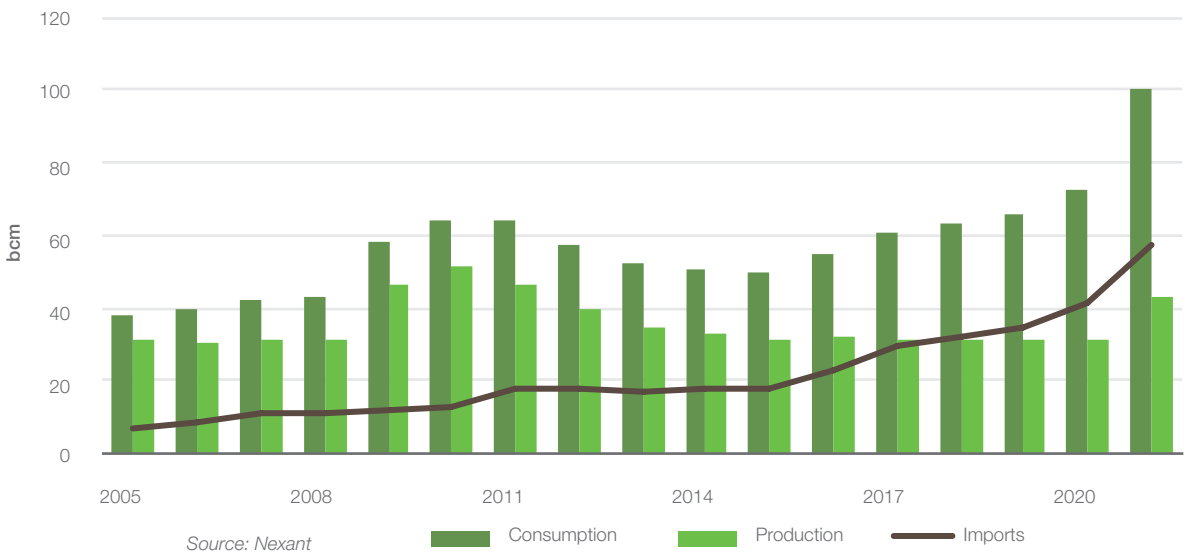
For the fertilizer industry, access to reasonably priced natural gas is a key concern. Given the conversion of the country's urea manufacturing plants from naphtha to natural gas, access to competitively priced feed gas is essential for fertilizer producers, especially since fertilizer production is an integral part of New Delhi's emphasis on food production security. This explains why the fertilizer sector receives priority access to domestically produced gas.

Following a few years of consecutive declines, India's natural gas supply and demand outlook is changing. This is attributable to several factors. One key factor is the promulgation of new upstream and domestic gas pricing policies, which is conducive to higher domestic gas production in the medium to long term. India's domestic gas pricing was reformed in late 2014, with the partial aim of boosting the price of gas paid to India's upstream producers. In the recent past, dwindling upstream production and a lack of investment in new petroleum fields was partially attributable to a lack of financial incentives for upstream producers. This initiative was followed up with a March 2016 initiative by the Indian Ministry of Petroleum and Natural Gas allowing producers in "challenging" areas to sell gas under a special pricing regime. The effects of these policies may take some time to materialize, but in the longer run they bode well for increased indigenous gas output. (Indeed, BP and Reliance announced in June 2017 plans to develop the 'R-Series' deep water gas fields in Block KGD6 off the east coast of India, in the hopes of producing up to 4.4 billion cubic meters of gas per annum in 2020.) Another factor is New Delhi's 2015 enactment of a so-called "gas pooling policy". This policy ensures the supply of gas at a uniform delivered price to all fertilizer plants on the gas grid for ammonia and urea production. The policy was enacted because of uneven gas procurement prices for urea producers, where prices were contingent on whether the gas was sourced from the domestic or import market, or varying combinations of both.

Further complicating the outlook for natural gas is India's milestone 2015 ratification of the Paris Accord, and the steps needed for India – the world's third largest emitter of greenhouse gases – to fulfil its obligations under the agreement. Key features of India's Paris targets include lowering the emissions intensity of gross domestic product by 33%–35% by 2030 below 2005 levels, and increasing the share of non-fossil based power generation capacity to 40% of installed electric power capacity by 2030. To help accomplish these goals, the Modi government announced an ambitious clean energy target of 175 gigawatts (GW) by 2022, with 100 GW for solar, 60 GW for wind, and 15 GW for other renewables. In addition to retiring mature coal-fired power generation plants, India's draft National Electricity Plan assumes that no new coal power plants will be required (beyond those already under construction) until at least 2027. The success – or failure – of these broader energy policies may have serious implications for natural gas use, and therefore constitute another wild card when determining India's long-term natural gas outlook.

Considering the government's evident support for natural gas, and the time needed for renewables to become more competitive with fossil fuel-based power generation (although from a global perspective, remarkable progress has been made on this front in recent years), the country's overall gas consumption is forecast to rise through 2025, but projected domestic production growth will be unable to keep abreast of consumption increases, as shown in Figure 2. This will result in growing LNG import dependency for India. Based on current global LNG market dynamics, however, spot LNG import prices are expected to be competitive over the next several years. This is the result of an oversupplied market stemming from the start-up of new projects in Australia and North America, and indifferent demand prospects in key consuming markets like Japan, Korea and (in the short-term), China. Access to competitively priced sources of imported gas likewise bodes well for increased Indian gas consumption going forward, especially for the nitrogen fertilizer/urea sector.

Figure 1.3 India's historic and projected natural gas balance, 2016-2025



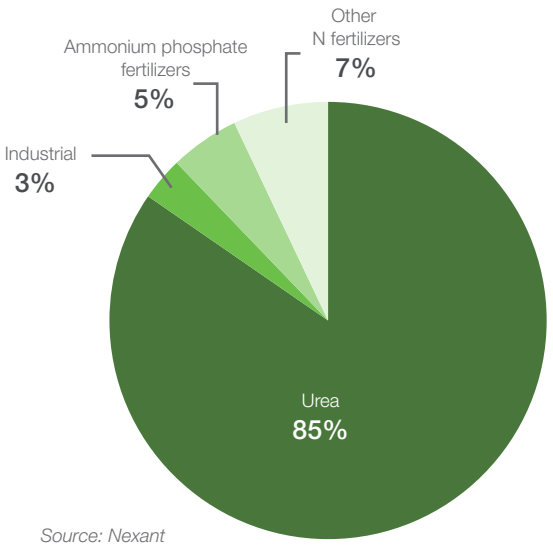
Source: Nexant

3. Implications on the fertilizer industry

3.1 The ammonia market

Behind China and the United States, India is the third largest ammonia consumer in the world, with an estimated demand of about 15.5 million tons in 2016. Over the past decade, ammonia demand growth in India averaged less than one percent per year, which is lower than the global average. Over 85% of ammonia consumption is used for urea production. Other nitrogenous fertilizers such as ammonium phosphates, nitrates, and NPKs account for about 12% of ammonia consumption. The potential for growth in ammonium phosphate end-uses is limited as India does not have any plans to add significant new capacity for phosphatic fertilizers. India meets about 90%of the domestic consumption for phosphates through imports. Reliance on imports is expected to increase as India does not have significant phosphate rock reserves. Technical Ammonium Nitrate (TAN) is a key ingredient in the mining, and explosives industry, and local consumption is expected to be met through domestic production and imports from Russia and Ukraine. Significant ammonium nitrate capacity additions are not expected in the forecast period as the current domestic capacity is sufficient to meet the local demand. Industrial applications comprise less than 4% of the ammonia demand but are the fastest growing segment, driven mainly by the use of ammonia in industrial refrigeration. More recently, ammonia refrigeration systems are being used for air conditioning in publicly accessed buildings and increasing output efficiencies for power generation facilities as ammonia is safe and environmentally benign compared to halocarbon refrigerants, and has favourable thermodynamic properties.

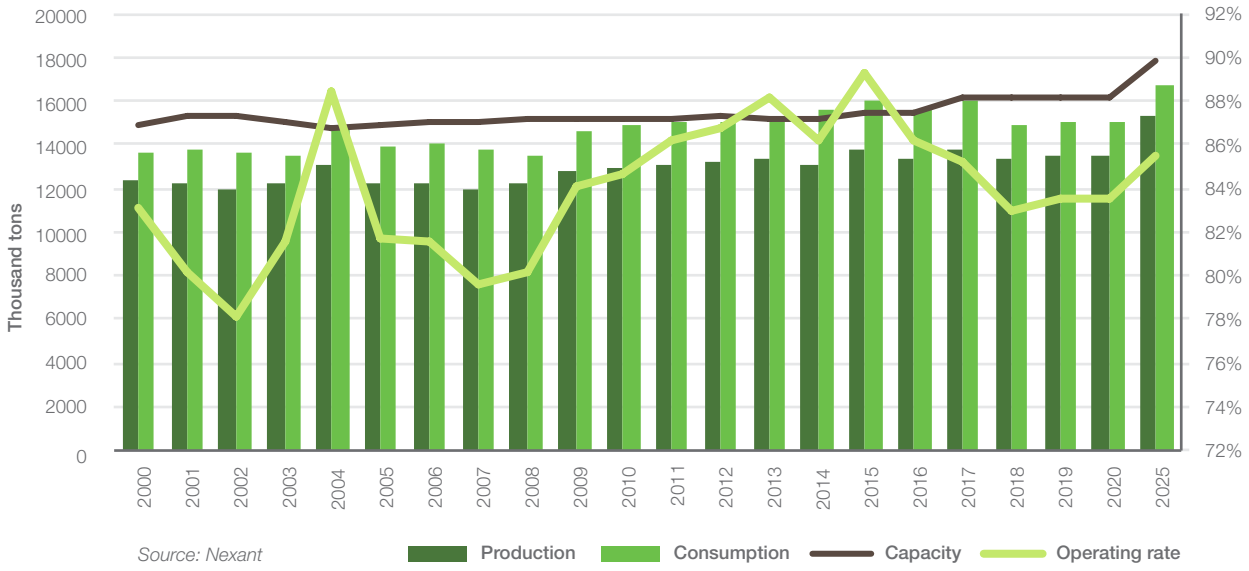
Figure 1.4 India's ammonia demand by end-use (2016 Estimate, demand = 15.5 million tons)



Source: Nexant

About 15%of India's ammonia requirements – over 80%of which is used for urea production – are met via imports, mainly from the Middle East. In the past, India's ammonia/urea facilities have been forced to temporarily suspend operations due to gas shortages. However, the recent fall in natural gas prices and the introduction of India's gas pooling policy for the fertilizer sector has boosted ammonia and urea supply growth of late. In 2015, FACT re-opened a mothballed 0.2 mmtpa ammonia facility in Kochi, Kerala. The plant was shut down in January 2014, when delivered LNG prices reached USD 24 per MMBtu. However, a drop in crude oil prices; a fall in oil-indexed LNG prices to USD 10.9 per MMBtu (excluding value added tax); and the government of India's VAT waiver in the first half of 2015 all combined to help FACT restart its ammonia plant. Looking ahead, India's ammonia imports are expected to decline slightly as domestic output increases. Factors contributing to an improved trade balance for ammonia include new gas or coal based units entering service; the ongoing conversion of naphtha based units into gas-based feedstock; and improvements in operating efficiencies (resulting in higher operating rates).

Figure 1.5 India's ammonia supply demand outlook

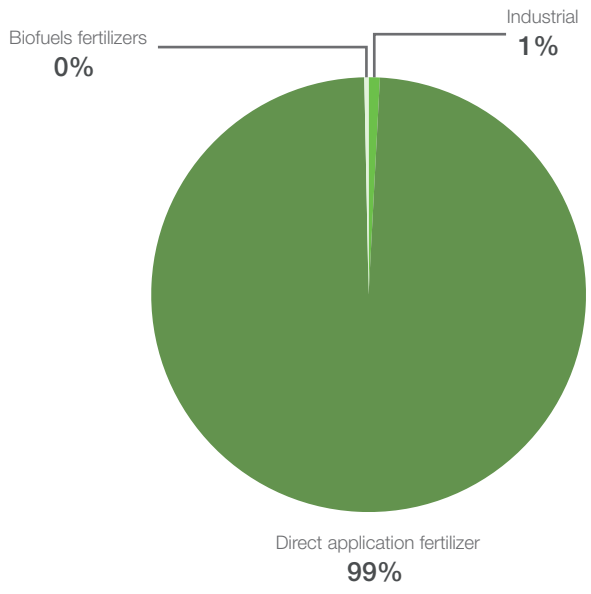


Source: Nexant

3.2 The urea market

In 2015-2016, India produced a record 24.5 million tons of urea, increasing output by 2 million tons from the previous year, and operating at close to 100%of nameplate capacity. This improved performance is attributable to the government's new urea policy and the National Democratic Alliance (NDA) government's reform-oriented action plan. Urea is strongly favoured over other nitrogenous, phosphatic and potassic fertilizers due to a subsidy scheme that promotes urea consumption. Farmers in India tend to heavily favour urea, as it is cheaper and highly subsidized compared to phosphorous and potassium fertilizers. Indeed, this has resulted in the overuse of urea, which in turn has adversely affected soil quality and crop yield in some regions. The government is planning to roll out subsidy reforms where the fertilizer subsidies would be transferred to manufacturers on the basis of actual sales, a move which will pave the way for implementation of the direct benefit transfer (DBT) system in this sector. However, this still has a long way to go before it gets implemented. Other non-fertilizer applications for urea are minimal.

Figure 1.6 India's urea demand by end-use (2016 Estimate, demand = 35.4 million tons)



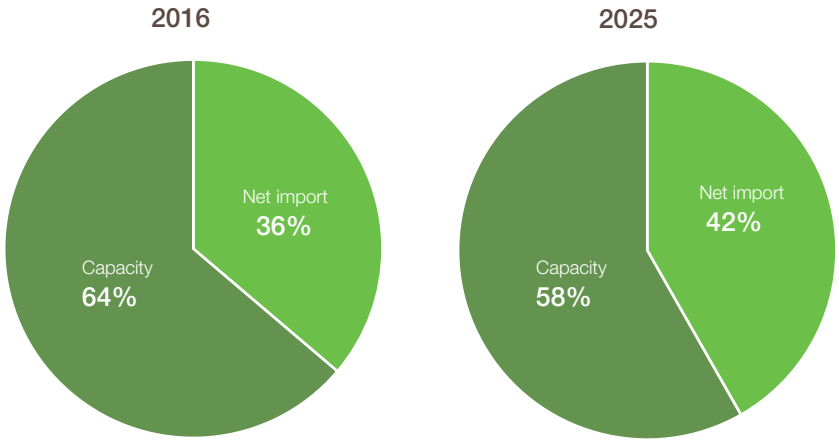
Source: Nexant

To address the environmental implications of urea overuse, and prevent the diversion of urea to the industrial sector, the government has mandated that at least 75%of the nation's urea production be coated with neem. Neem-coated urea offers the benefit of the slow release of nitrogen; consequently, smaller quantities for soil applications are required relative to uncoated urea. Despite the enactment of this policy, forecast population growth and India's ever growing agricultural requirements ultimately translate to rising urea demand, albeit at a slower rate relative to historic levels. Nexant believes that the nation's urea demand will increase by about 7.5 million tons between 2016 and 2025. India's anticipated urea demand growth has grabbed the government's support for new domestic urea manufacturing capacity, especially in light of the government's emphasis on agricultural self-sufficiency.

More than a dozen ammonia/urea projects, based on gas as well as coal, are under consideration. For example, Coal India Limited (CIL) and National Thermal Power Corporation (NTPC) have entered into a joint venture to revive Fertilizer Corporation of India's fertilizer plants in Sindri and Gorakhpur. Feedgas will be sourced from GAIL's proposed Jagdishpur-Haldia pipeline. Meanwhile, Indian Oil has formed a joint venture with Coal India Limited and NTPC, called Hindustan Urvarak, to undertake the revival of closed fertilizer plant at Sindri in Jharkhand province. It is also considering investing in the ammonia-urea plant at Barauni and urea plant at Gorakhpur in Uttar Pradesh. In addition, ONGC and CFCL are planning to build a gas based ammonia/urea facility in Tripura. Further, Adani Group has signed a Memorandum of Understanding (MoU) with the government of Chhattisgarh, India to develop a coal to poly-generation (CTP) plant that will include an ammonia/urea and substitute natural gas (SNG) complex. This is just one of the 10 proposed coal based fertilizer plants which were announced by the government in 2015 as a step to make India self-sufficient in fertilizer production.

Though numerous projects and plans have been announced, securing capital investment is a major hurdle. The huge backlog of government subsidies, which stood close to USD 8 billion for urea fertilizer in fiscal year 2015, may deter private sector company investment in the fertilizer sector. The estimated unpaid fertilizer subsidy carried forward has been rising from less than USD 2 billion in fiscal year 2011 to USD 8 billion in fiscal year 2015. Some companies are also considering the possibility of manufacturing urea overseas, in low cost locations such as Iran, and importing into India. Of the more than dozen new projects under consideration, Nexant believes that only 3 or 4 new world scale urea plants will come onstream by 2025. Chambal Fertilizers and Chemicals' proposed gas based ammonia-urea complex in Kota, Rajasthan is in a fairly advanced stage (compared to other projects in India) and has a higher likelihood of materialization. The government has also announced plans to reopen the defunct urea facilities in Barauni (in Bihar), Sindri (in Jharkhand) and Gorakhpur (in Uttar Pradesh), with a capacity of 1.3 million tons per year. Nevertheless, the capacity growth rate is expected to be much slower than that of demand, thereby increasing the urea trade deficit in the country.

Figure 1.7 India's urea net imports vs. domestic production

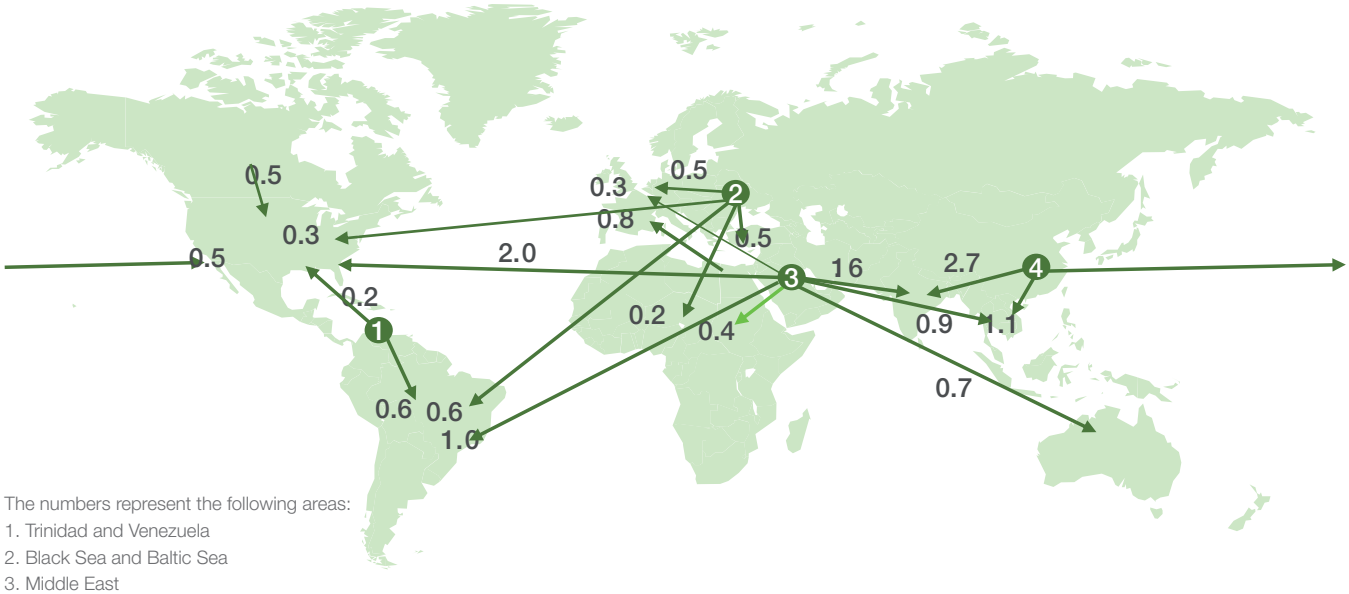


Source: Nexant

4. Implications for GCC fertilizer producers

The Middle East, with 27 million tons of urea capacity, accounted for about 12%of the global total in 2016. The GCC in particular constitutes a large part of this share with Qatar and Saudi Arabia being its largest producers. As the Middle East is an arid region, almost all of the domestically produced fertilizers are exported. This export oriented fertilizer capacity is based on the historic availability of low cost natural gas. Production of ammonia and urea is a means to add value to the natural gas resources and export these products to countries such as India which have comparatively smaller natural gas reserves and huge domestic requirements for fertilizers. This mechanism has propelled the Middle East to be one of the main export hubs for urea in the world.

Figure 1.8 Urea net trade flow pattern (2015, Million tons)



The numbers represent the following areas:
1. Trinidad and Venezuela
2. Black Sea and Baltic Sea
3. Middle East
4. China

Source: Nexant

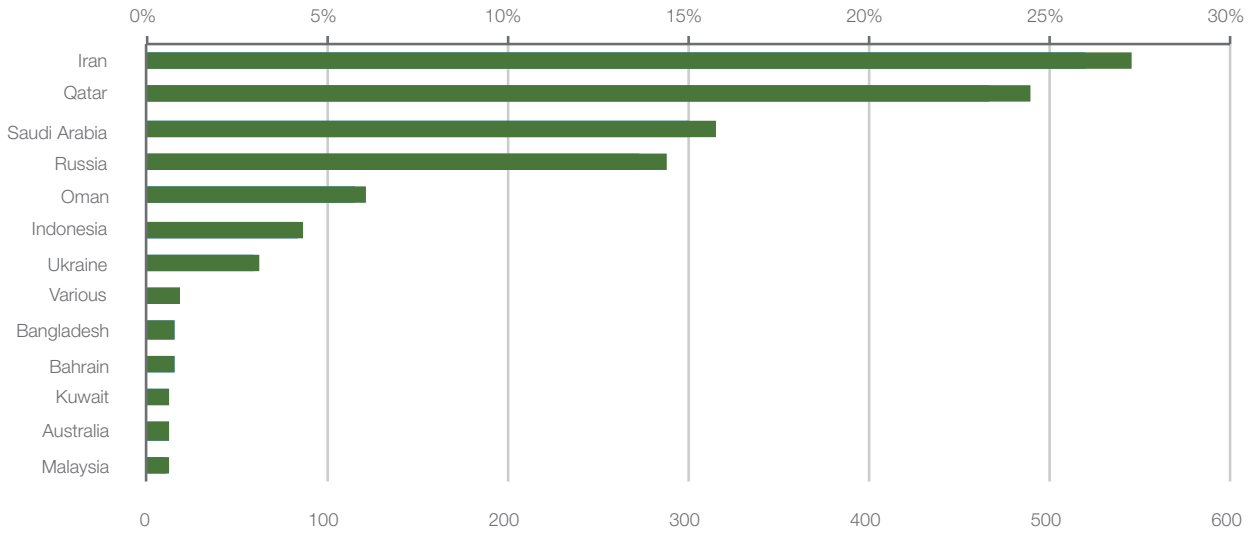
As the Middle East will continue to have some of the world's largest hydrocarbon reserves, it is one of the regions forecast for relatively large ammonia and urea capacity expansions over the long term. The key driver for this is the continued availability of extremely low cost gas feedstock. The price of natural gas in Saudi Arabia has increased to USD 1.25 per MMBtu in 2016 from USD 0.75 per MMBtu, but is still below the gas price in many other regions. Even after this increase in gas costs, Saudi Arabian ammonia producers maintain extremely low production costs relative to other producers globally. However, Saudi Arabia is currently facing challenging gas allocation problems due to the rapid development of its economy and high demand for gas in the power and chemicals sector.

Although the region has very substantial gas reserves the situation in each individual country varies. As mentioned earlier, gas allocations for new ammonia projects are currently highly unlikely in Saudi Arabia. Kuwait is already an LNG importer and hence does not have a competitive supply to support ammonia capacity additions. In fact, PIC recently announced plans to shut down its ammonia and urea facilities in Shuaiba, Kuwait by the second half of 2017 to focus on its core olefins and aromatics businesses. Iran is developing new ammonia/urea projects and has announced further capacity additions. Although Iraq is expected to have great potential in the future and is currently flaring significant volumes of associated gas, the country is currently still struggling with internal political unrest and security issues. In other parts of the region such as Oman, upstream gas developments are underway but it remains unclear if and when parts of these reserves are going to be processed into fertilizers. The noticeable exception in the Middle East currently is Qatar where large gas reserves can be found and the general investment climate is favourable. However, further capacity expansion may be limited in the near term by the gas moratorium in Qatar and the competing LNG and GTL sectors.

Despite these short-term developments, Nexant expects that the Middle East will remain a major exporting region in the long term. The expected increase in capacity in the region, as described above will be unevenly spread, and may result in fluctuating operating rates in individual countries. Demand for ammonia was 14.4 million tons in the Middle East in 2016 and is forecast to grow above global averages fuelled mainly by the production of urea.

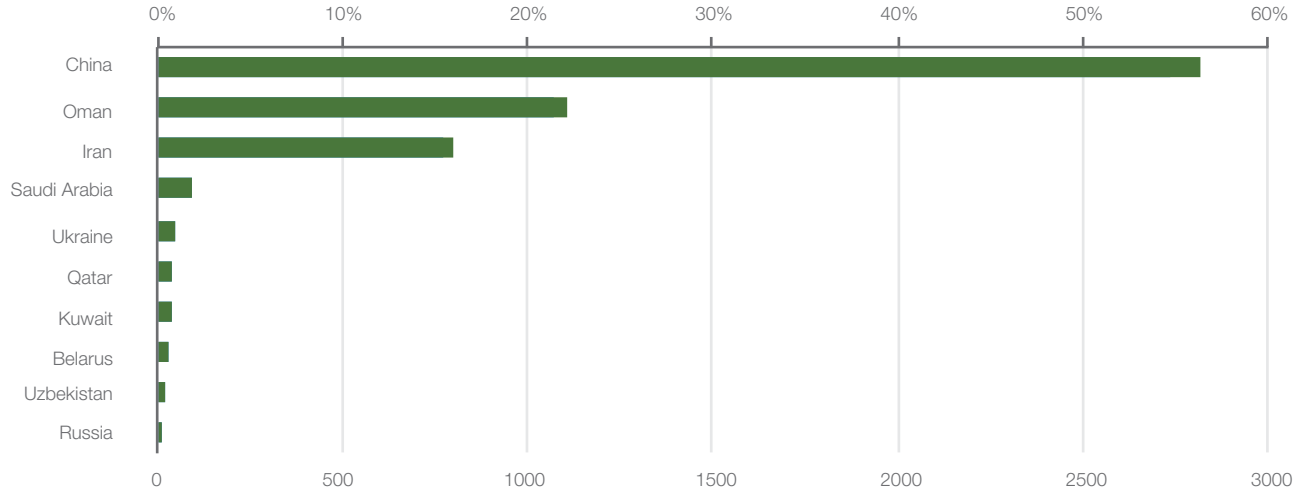
India, as the second most populous nation in the world and located in close proximity to the Middle East, is certainly one of the most important target markets for some of the GCC producers' ammonia and urea exports. There are, generally speaking, two different kinds of trade relationships. On one side, Indian fertilizer importers purchase ammonia and urea from individual Arabian Gulf producers through the open market. In other instances, Indian fertilizer companies and cooperatives jointly invest in fertilizer manufacturing companies in the Middle East. Such is the case for example with Oman India Fertiliser Company (OMIFCO) which has been established as the result of an initiative by the governments of Oman and India. This plant at the Sur Industrial Estate in Oman is owned 50% by Oman Oil Company (OOC), 25% by Indian Farmers Fertiliser Cooperative (IFFCO) and 25% by Krishak Bharati Cooperative (KRIBHCO). These types of joint ventures are based on the Middle Eastern countries' ability to supply cheap feedstock and the Indian investment partners' ability to secure offtake for the products through their marketing channels in India. A change in the natural gas market in India with consequences on India's ammonia and urea net trade balance will have less of an impact on these JV initiatives as offtake and feedstock supply are more secure. However, a change in the net trade balance due to an increase of domestic supply will have more of an impact on Middle Eastern exporters that sell urea to India on the open market.

Figure 1.9 India's ammonia imports, 2015



Source: Nexant

Figure 1.10 India's urea imports, 2015



Source: Nexant

As such, the projected slight contraction in ammonia import requirements in India could have a direct effect on Middle Eastern producers which currently sell ammonia to India on the open market. The expected widening urea trade deficit in India on the other hand will provide Middle Eastern producers with opportunities to increase its exports to the subcontinent. The extent of opportunities will be directly linked to the amount of new capacity coming onstream in India. Naturally, the opportunities decline with the number of new (or old) plants being commissioned or recommissioned in India. The other question is what kind of corporate structure any new plants in the Middle East will have. It remains to be seen if new ammonia or urea projects in the Middle East and the GCC in particular will be "independent" producers or if they will be JVs between Middle Eastern companies and "offtakers" in India (or other major importing countries).

5. Conclusions

The outlook for growing gas use in India across the board is promising, but a key determining factor is price. This point is especially crucial in light of India's growing dependency on imported gas. Pricing and ongoing government support in the form of volume allocation and sectoral subsidies are both vital for the expansion of India's nitrogen fertilizer sector. New Delhi appears optimistic that the country will be self-sufficient in the production of nitrogen fertilizers, but given India's gas price sensitivity, the slow pace of new project development, a convoluted bureaucracy, and a large outstanding subsidy balance, Nexant believes that current government projections are optimistic. While the Indian trade deficit for ammonia is expected to improve slightly, demand for urea is expected to outpace new capacity additions thus resulting in higher net-imports for urea going forward.

The Arabian Gulf as one of the largest export hubs in the world is naturally a key supplier of ammonia and urea to India. Low natural gas feedstock costs have historically fuelled the Middle Eastern ammonia/urea capacity expansion. Although natural gas prices for most parts of the Middle East are still relatively low compared to regions elsewhere, capacity additions have recently stalled somewhat and are expected to be modest in the short term (with the exception of Iran). The slight contraction in ammonia net import requirements in India might have an effect on Middle Eastern exporters that supply ammonia to India through the open market. Producers that are owned by an Indian or a Middle Eastern JV will be less affected by changes in the domestic supply base in India as the Indian equity investors typically sell the products through its own marketing channels often based on agricultural cooperatives. The urea net trade deficit in India is expected to grow as demand increases for this fertilizer is projected to outpace capacity additions. This will result in additional opportunities for Middle Eastern producers to extend sales to the subcontinent. It remains to be seen if new ammonia or urea projects in the Middle East and the GCC in particular will be "independent" producers or if they will be JVs between Middle Eastern companies and "offtakers" in India (or other major importing countries).

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The association supports the region's petrochemical and chemical industry through advocacy, networking and thought leadership initiatives that help member companies to connect, to share and advance knowledge, to contribute to international dialogue, and to become prime influencers in shaping the future of the global petrochemicals industry.

Committed to providing a regional platform for stakeholders from across the industry, the GPCA manages six working committees - Plastics, Supply Chain, Fertilizers, International Trade, Research and Innovation, and Responsible Care - and organizes five world-class events each year. The association also publishes an annual report, regular newsletters and reports.

For more information, please visit **www.gpca.org.ae**

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