

'Make in India'

A new window of opportunity for commodities

April 2017

Executive summary

Despite the challenges, the sun is rising over India

Foreword

B. Ashok, Chairman, Indian Oil Corporation

India's manufacturing gambit

Dharmakirti Joshi, Chief Economist, CRISIL

Commodities

Petroleum: Demand growth accelerates

Natural Gas: LNG to extend gas use to India's east and south

Thermal Coal: Focus turns to domestic output

Petrochemicals: Demand marches ahead at breakneck speed

Steel: Riding the infrastructure and manufacturing wave

Power: Debt problems remain as system surplus emerges

Contents

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Introduction.....	4
<i>India is entering a new phase in its economic history</i>	
Executive summary	7
<i>Despite the challenges, the sun is rising over India</i>	
Key forecasts.....	8
Foreword.....	10
<i>B. Ashok, Chairman, Indian Oil Corporation</i>	
India's manufacturing gambit	12
<i>Dharmakirti Joshi, Chief Economist, CRISIL</i>	
Commodities	18
<i>Petroleum.....</i>	<i>19</i>
<i>Natural Gas.....</i>	<i>22</i>
<i>Thermal Coal.....</i>	<i>26</i>
<i>Petrochemicals.....</i>	<i>30</i>
<i>Steel.....</i>	<i>32</i>
<i>Power.....</i>	<i>34</i>
Tables, maps and charts	
<i>Increment to workforce (2015-2025).....</i>	<i>12</i>
<i>Growing vs shrinking workforces.....</i>	<i>13</i>
<i>India achieves middle income status - GDP per capita.....</i>	<i>14</i>
<i>India becomes the fastest growing large economy - GDP growth.....</i>	<i>14</i>
<i>India's crude oil demand to 2020.....</i>	<i>19</i>
<i>India's oil products demand outlook.....</i>	<i>20</i>
<i>Indian oil demand rises as China's appetite cools.....</i>	<i>21</i>
<i>Natural gas production, sales and LNG imports.....</i>	<i>22</i>
<i>Expansion plans: India's gas transmission network.....</i>	<i>23</i>
<i>India's gas pipelines, operating and under construction.....</i>	<i>24</i>
<i>India's forecast domestic gas production and imports, 2016-2021</i>	<i>25</i>
<i>India's forecast coal production and imports, 2016-2021.....</i>	<i>26</i>
<i>Indian railway network.....</i>	<i>27</i>
<i>India: coal fields and coal-fired generation plants.....</i>	<i>28</i>
<i>Indian polypropylene market moves into deficit by 2019.....</i>	<i>30</i>
<i>India's HDPE import dependence to rise.....</i>	<i>30</i>
<i>Forecast polyethylene demand, 2016-2026.....</i>	<i>31</i>
<i>India's crude steel capacity and output</i>	<i>32</i>
<i>India's finished steel consumption</i>	<i>33</i>
<i>Rising steel consumption in India: forecast to 2020-21</i>	<i>33</i>
<i>India: robust growth in power demand.....</i>	<i>34</i>
<i>India's improving power balance.....</i>	<i>34</i>
<i>Forecast renewables capacity, excluding hydro</i>	<i>35</i>
<i>Indian installed generation capacity as of 31 March, 2016.....</i>	<i>37</i>
<i>Projected installed capacity by end 2021-22.....</i>	<i>37</i>
<i>Solar outperforms 2012-2017 12th year plan targets (MW).....</i>	<i>37</i>

Introduction



Sambit Mohanty
Lead Author
S&P Global Platts

India is entering a new phase in its economic history. By 2025, it will be the most populous country in the world. Its GDP growth, forecast at close to 8% this year and next, has overtaken that of China. It is a young country with a median age of just 27.6 years. According to CRISIL Research, a million people join the working-age population in India every month, more than in any other country in the world.

This is both an immense challenge and an immense opportunity.

While still predominantly rural, urbanization is progressing fast, from just over 30% in the 2011 census to a projected 40% by 2030 out of a population that will then total more than 1.5 billion. This will create millions of new urban households and huge demand for employment.

India combines extremes of both wealth and poverty, but overall has entered the middle income bracket among countries. GDP per capita of \$6,658 in 2016, on a purchasing power parity basis, is forecast by the IMF to rise to \$9,306 by 2020. For the first time, tens of millions of new consumers will be able to afford vehicles, white goods and other energy consuming devices.

Comparisons with India and China are as often misleading as illuminating, but in terms of demography, rising income levels and growing urbanization, India is at similar point to China in the second half of the 2000s, a period in which Chinese GDP growth and its huge appetite for commodities shook the world.

In India, the workforce is growing, while in China it is shrinking. India's ratio of economically-active people to dependents is rising. India has the opportunity to grasp its 'demographic dividend' at a time when growth in world trade has slowed, but when rising wages in China are diffusing its role as the manufacturing workshop of the world.

There is no question that the challenges are huge, and key to India's economic future and its push to become a global manufacturing hub — exemplified by the "Make in India" initiative — are to combine its competitive labor costs and strong information technology skills base with reliable power supplies and efficient transportation infrastructure. To build its manufacturing base from 16% to 25% of the economy, Indian manufacturing needs to be competitive, both internally and externally.

The country's demand for a variety of energy and non-energy commodities is forecast to outstrip strong GDP growth. There is little prospect that domestic production of many primary and secondary commodities will keep pace. Import gaps are a certainty. India will need partners, it will need reliable supply chains, and it will need foreign investment, if it is to grasp the opportunity that awaits...





Executive summary

Despite the challenges, the sun is rising over India

India is the world's fastest-growing, large economy. It is experiencing the 'demographic dividend', with millions of young people entering its workforce every year. Rising income levels, urbanization and changing lifestyles suggest strong growth in commodities demand over the next decade.

The "Make in India" campaign aims to replicate the export-led growth of the Asian tigers between 1965 and 1990 and then later China, by boosting manufacturing's share of the economy from 16% now to 25% by 2025. The tigers and then China were able to achieve this because their goods were competitive at a time of rapid expansion in international trade.

India is unlikely to emulate this in the same manner; it must find its own path. The external trade environment is no longer so conducive. India's position in terms of competitiveness has improved sharply over the past two years, but a lot still needs to be done to close the gap with countries like China.

A lack of infrastructure, inconsistent power supply, restrictive labor laws and burdensome bureaucracy are all

challenges to be overcome. To expand its manufacturing sector, Indian labor and capital must become more productive; strong GDP growth means little, if based on population growth alone.

As a result, India must look to its domestic market for dynamic growth as much as export markets.

As India invites multinationals to set up manufacturing units in the country, the government must continue to put in place policies and incentives that enable them to produce goods competitively. It must ensure that the planned multi-billion dollar improvements in infrastructure are delivered. Without the right conditions in place, overseas companies will be reluctant to dive in.

The government must also secure its long-term energy and resource needs. India is heavily dependent on many imported feedstocks and is vulnerable to external shocks and price fluctuations. The push to expand manufacturing will trigger a massive requirement for oil, gas and other resources. The government must make sure that policies and the right infrastructure are in place to

ensure that exports of finished products pick up as manufacturing activity rises.

The task is no doubt gigantic, but so is the prize. To achieve it, growth must be based on both the domestic market, which will require a broader distribution of income, and a more competitive economy that allows Indian manufacturers to expand their presence in foreign markets. Critically, India must raise the productivity of both its labor and capital.

There are many reasons to be optimistic about the Indian growth story, as well as good grounds for caution. It is likely that India will realize at least in part its ambitions for its manufacturing sector. It is likely that a combination of state and private capital will deliver the majority of the major infrastructural investments planned. But the level of success, and thus the upturn in demand for commodities, depends ultimately on the continuation of the strong government policy initiatives that have been launched and implemented over the past two years.



Key forecasts

Petroleum

India's crude oil demand is expected to rise by just over 7% in 2017 and at a Compound Average Annual Growth (CAGR) rate of 5% between 2015-2020 to 5.2 million b/d. Large gains in domestic production are not expected, increasing the country's already large dependence on crude oil imports. Oil products demand is expected to grow annually by 7-9% over the next 5-10 years. Security of energy supply will remain a critical issue.

Natural Gas

India's demand for gas has been held back by regulated domestic prices, both in the gas and electricity sectors, as well as by a lack of pipeline infrastructure. However, urea production, gas-for-power, industry and city-gas demand, including gas use in transport, are all expected to grow. Gas demand is forecast to rise at a CAGR of 4% to 183 MMcm/d by 2021. Utilization of LNG terminal capacity is expected to grow from around the current 16 million mt to 30 mt/year by 2022.

Thermal Coal

A rapid expansion in domestic production has seen Indian thermal coal imports peak. Targets for increased output remain ambitious, but are likely to be sufficiently successful to further reduce the country's dependence on imported coal. A switch in power sector policy suggests India's coal-for-power generation expansion may start to peter out after 2022, potentially leaving some assets stranded in a 10-15 year time frame.



Petrochemicals

India has a surplus of refined oil products, but the petrochemical industry is a major deficit center. Already the third-largest polymer market in the world, demand is growing at 10% a year, a growth rate expected to be sustained over the next decade. Combined polyethylene and polypropylene demand is expected to rise to 21.5 million mt by 2026 from the current 9.6 million mt. Polyolefins consumption is forecast to grow from around 6 kg/person per year to 15 kg/ person per year by 2026.

Steel

India is on the cusp of a transformation from a traditional 'brick-and-mortar' economy. Domestic consumption of steel per capita is just 65 kg, compared with a global average of 235 kg. Short-term steel demand is forecast to grow at 4.5-5.5%, accelerating to 6.0-6.5% CAGR through 2020-21, driven by the steel-intensive railway and urban infrastructure sectors. While India is already self-sufficient in commercial grade steel, deficits are expected in high value-added steel.

Power

Much progress has been made in adding new generating capacity, with private sector investment particularly evident. The national system is moving into surplus. The country is experiencing a boom in renewable energy. However, industrial consumers are paying high tariffs to subsidize rural constituents, while the financial position and lack of cost recovery of state-level distribution companies represents a major weakness affecting industrial competitiveness. Nonetheless, power demand is forecast to surge 44% from 2016 levels by 2020.

Foreword



B. Ashok
Chairman
Indian Oil Corporation

I am happy to note that S&P Global Platts is publishing a white paper on the potential of the government's "Make in India" initiative to transform the energy landscape of the country in the near future.

India today is at an inflexion point of high growth, with an enormous opportunity to achieve the requisite momentum for sustained economic growth. The oil and gas sector in India is gearing to fuel this unprecedented opportunity.

The 12th edition of PETROTECH International Oil and Gas Conference in December 2016 attracted 20 high-level ministerial delegations and over 7,000 delegates from around the world. India, with its burgeoning demand and high growth rate, was the focus of the global hydrocarbons sector at the event.

At the event, Hon'ble Prime Minister Narendra Modi outlined his comprehensive vision for the energy sector in India, with four main coordinates — Energy Access, Energy Efficiency, Energy Security and Energy Sustainability.

One of the recent successes of India's hydrocarbons sector has been the implementation of a targeted subsidy management system in LPG cooking gas distribution through innovative use of information technology tools. This not only ensured subsidy transfer directly into the bank accounts of over 170 million beneficiaries, a Guinness Record, but also checked leakages in the system.

Now, under Pradhan Mantri Ujjwala Yojana, 50 million deposit-free LPG connections are being released to the women folk from 'bottom of the pyramid' families. It is the world's largest empowerment scheme for social and energy inclusion. With India emerging as the world's fourth largest consumer of LPG, this sector alone has a huge space for "Make in India" initiatives in LPG-related ancillaries.

India is the second biggest refining hub in Asia. In view of the robust domestic demand projected for petroleum products, there is a need to further expand refining capacity via brownfield as well as green field routes.

A milestone in India's oil history has just been reached in this regard. Indian Oil Corp., Bharat Petroleum Corp Ltd and Hindustan Petroleum Corp Ltd — the three downstream national oil companies — have recently signed a memorandum of understanding to build a refinery-cum-petrochemicals complex on India's western coast, having an annual capacity of 60 million mt. This would be one of the largest projects in the world and would offer opportunities for national and international companies to invest and also support India's quest for energy security under the "Make in India" scheme.

The upstream sector policies too have been recast and the new investment-friendly Hydrocarbons Exploration and Licensing Policy — also called HELP — is expected to attract international players and give a boost to indigenous production of crude oil and gas. The 67 small discovered fields and the huge still-to-be-proven oil reserves are attracting investors to come and tap into India's considerable hydrocarbon potential.

Midstream is emerging as another sunrise segment of India's oil and gas sector, with increasing use of natural gas as a clean and efficient fuel. With large import terminals, extensive pipeline infrastructure and multiple city gas distribution networks under implementation, all user segments, especially industry-transport-households, will benefit.



India's manufacturing gambit

India is a bright spot in a global economy fraught with risks and fragility. It stands out as the fastest-growing large economy with strong prospects over the medium term.



Dharmakirti Joshi
Chief Economist,
CRISIL

The policy initiatives of the Narendra Modi-led National Democratic Alliance so far have largely focused on the repair and reform of dysfunctional systems and on improving India's macroeconomic fundamentals.

If the momentum behind these changes continues to build, so too will India's growth potential.

There is a short-term headwind as a result of the government's withdrawal from circulation of large denomination bank notes in a dramatic fight against the black economy.

The resulting cash crunch will impact private consumption and is estimated

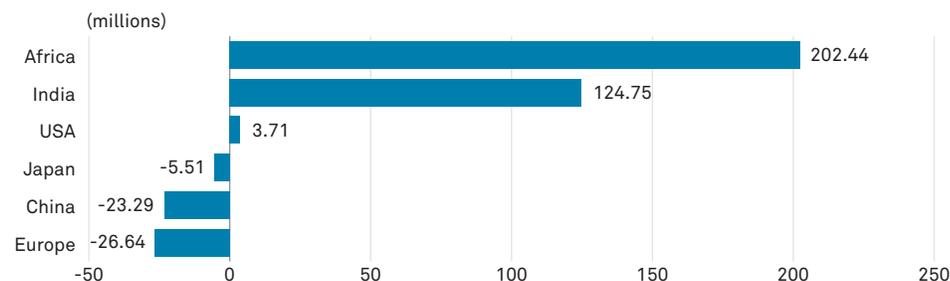
to have reduced GDP growth in the third and fourth quarters of the 2016/17 fiscal year, ending March 31, 2017. But thereafter, we expect growth to rebound to 7.4% by 2017/18 fiscal year.

Significantly, China is attempting to rebalance its economy, by focusing more on services and domestic consumption as opposed to industry and exports.

India is attempting the opposite. It is waking up to the idea of developing its industrial sector as an engine of growth and a means of creating employment for its fast-expanding workforce.

The Modi government has stepped up attempts to boost manufacturing through its flagship "Make in India"

INCREMENT TO WORKFORCE (2015-2025)



Source: CRISIL

program. But to make this a success, India will have to overcome both internal and external challenges.

The program draws inspiration from the high export-led growth achieved by the Asian tigers in 1965-1990, and by China later, but the reality today is that the external environment is far less conducive to trade.

Moreover, domestic challenges continue to constrain India's export competitiveness in many sectors.

We believe that India can nurture growth in its manufacturing sector only if it strikes a balance between export and domestic demand-led growth.

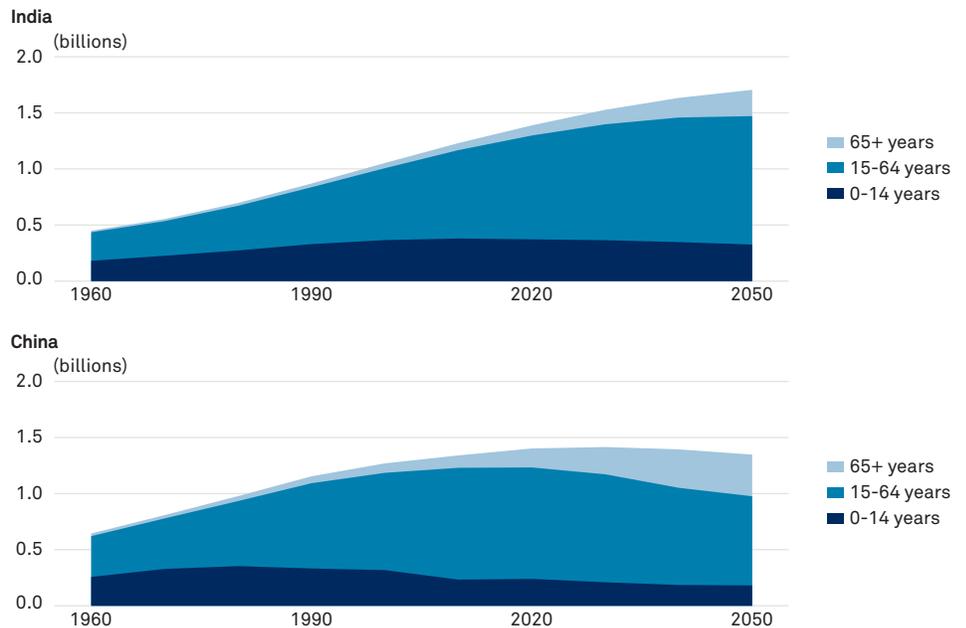
This will require relentless efforts to improve the competitiveness of our manufacturing sector.

Overseas companies will be looking to set up regional export hubs in the country only if they can produce goods that compete with other low-cost producers.

Without the right incentives in place, overseas companies will be reluctant to take the plunge.

“Unlike exports which are determined exogenously, components of domestic demand household consumption, investment, and government expenditure depend on domestic income. Hence, policy measures that ensure distribution of income growth across all sections will sustain domestic demand-led growth. — CRISIL”

GROWING vs SHRINKING WORKFORCES



Source: CRISIL

The post-financial crisis world is witnessing a sharp slowdown in trade and incipient protectionism. Since 2012, global trade has grown by only 3.1%, half the pace seen in the previous three decades.

Not only is trade slowing down, its intensity with respect to global growth has also come down — trade grew

faster than GDP before the crisis, but there has been a reversal of this trend since then.

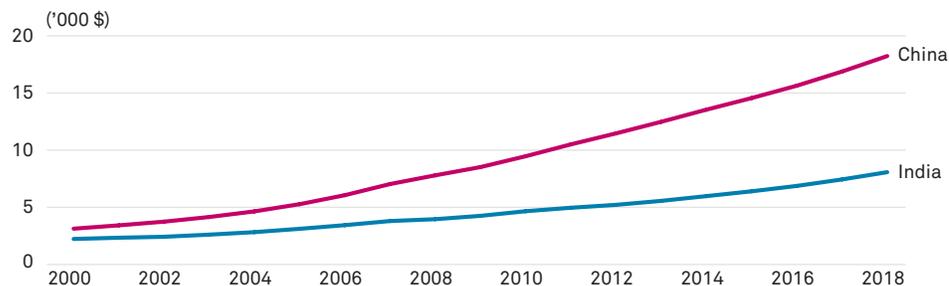
Then there are the adverse distributional aspects of trade. Not every advanced country has benefited from free trade, though at the aggregate level such trade has been gainful for both importing and exporting nations.

This is now breeding discontent in the segments that have been left out, leading to a backlash against free trade. Using exports to prop up manufacturing growth is, therefore, unlikely to be as easy for India as it was for the east Asian tiger economies.

Moreover, it is hard for Indian manufacturing firms to be competitive, given domestic constraints such as inadequate physical infrastructure, unreliable power and water supplies,

India's manufacturing gambit

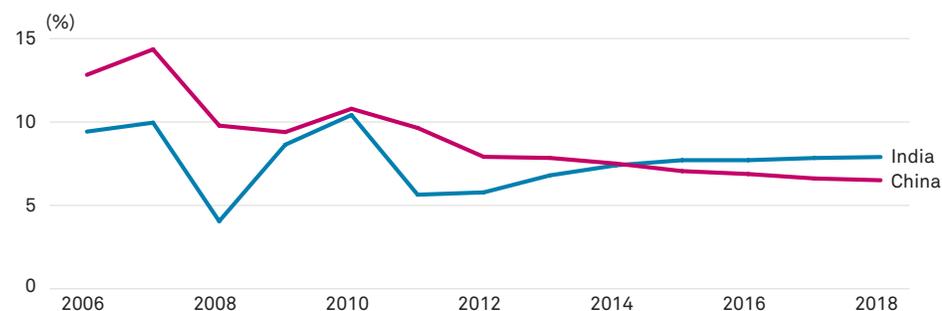
INDIA ACHIEVES MIDDLE INCOME STATUS - GDP PER CAPITA*



*Uses Purchasing Power Parity methodology

Source: IMF World Economic Outlook Database, October 2016

INDIA BECOMES THE FASTEST GROWING LARGE ECONOMY - GDP GROWTH (%)



Source: World Bank

inflexible labor laws and an opaque land acquisition system.

Once goods are produced, they face other systemic inefficiencies, in particular logistical bottlenecks. India thus has much work to achieve a level of competitiveness that will allow it to increase its share of international trade.

Nonetheless, India's domestic market offers significant opportunities. India has become the third-largest economy in purchasing power parity terms.

Empirical evidence suggests that when an economy is in the middle-income phase demand for manufactured goods accelerates. However, India must ensure a more

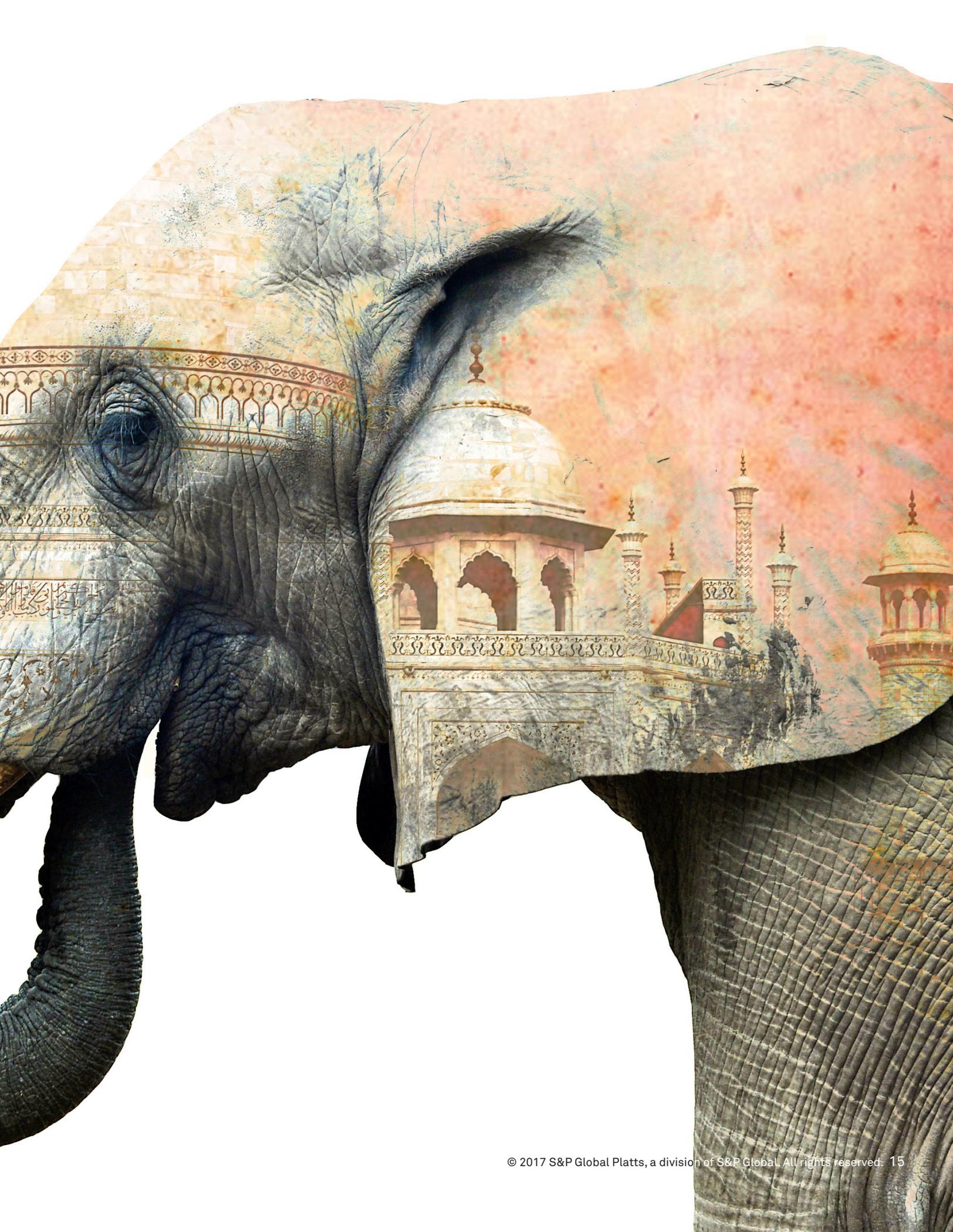
equitable distribution of income to sustain domestic demand growth.

But whether it is "Make in India", or "Make for India", improving competitiveness is the key.

India's position in terms of competitiveness has improved steadily over the past two years because of the initiatives of the present government, but much still needs to be done in terms of closing the gap with countries like China.

There is good news emerging on this front, as shown by India's improving rankings in the World Economic Forum's Global Competitiveness Index, the World Bank's Logistics Performance Index, and Transparency International's Corruption Index.







“*The whole world is looking for incremental energy demand, and the attraction to a lot of overseas investment and transparent policies through us to attract those companies in investment and set up their healthy competition between companies and ultimately, the benefits. — Indian Petroleum Pradhan in an exclusive interview with Global Power*



*s looking towards India
and growth. Our size is a big
s companies. Providing clear
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n these players and domestic
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um Minister Dharmendra
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Commodities

Robust GDP growth triggers unquenchable thirst

Launched in late 2014, the 'Make in India' campaign seeks to position the country as an investor-friendly international manufacturing hub, raising the sector's share of GDP to 25% by 2025 from 16% now. This will require manufacturing sector expansion above and beyond India's 8% GDP growth.

The sweeping reforms introduced by the National Democratic Alliance government since coming to power have infused India's manufacturing sector with new momentum.

It has opened a window of opportunity to take advantage of both domestic demand and export-led growth.

A series of new projects have been announced and implemented, helping to drive up demand for resources such as oil, coal, petrochemicals and metals.

“India remains a top-tier macro story in the Asia-Pacific region. We remain comfortable with our 8% GDP growth forecast for the next few years.

— Paul Gruenwald, Chief Economist, Asia Pacific, S&P Global Ratings ”

This, the government hopes, will set the stage for sustainable long-term economic growth and create jobs for the millions of young people joining the workforce every year.

There are already signs of success. Flows of Foreign Direct Investment increased by 60% in the 24-month period following the launch of the initiative.

In the commodities sector, major international companies, such as Shell, BP, Rosneft, Trafigura and Saudi Aramco are expanding their presence in the country or considering joint ventures to explore production and trading opportunities.

Certain commodities, such as natural gas and new renewables technologies, appear set to benefit disproportionately from India's push simultaneously to increase indigenous production, become a global manufacturing hub and lower its greenhouse gas emissions.

Strong economic growth, urbanization, rising income levels and a rapid increase in the ratio of economically active

“Unlike the sharp recovery seen after the global financial crisis of 2008, the current one has not only been gradual, but more sustainable. That's because the growth we are seeing is not driven by monetary and fiscal steroids. — CRISIL ”

people to dependents – 'the demographic dividend' – will also drive demand for vehicles, petroleum products, high-grade steel and petrochemicals.

Growth is dependent on major improvements in transport infrastructure and power supply.

Huge investments in these areas are underway or planned, and infrastructure investment itself is a major demand driver for key commodities.

Petroleum

Demand growth accelerates

Between 2006 and 2015, world oil demand grew by 9.28 million b/d to 95.01 million b/d. China accounted for 48.9% of this growth, India 15.3%.

Demand proved resilient in both, growing even through 2008 and 2009 when world oil consumption fell by almost 1.4 million b/d as a result of the global financial crisis. Now, India appears to be entering a period of rapid demand growth as China's appetite cools.

CRISIL estimates that over 2015 to 2020, India's crude oil demand will increase at a CAGR of 5% to 5.2 million b/d, compared with a 4.6% CAGR in the 2010-2014 period.

Platts Analytics expects India's oil demand growth to outpace China's for the third year in a row in 2017, rising by 7% to 4.13 million b/d.

S&P Global Platts forecasts oil products demand growth of 7-9%

a year over the next five to ten years.

Multiple factors support the strong growth outlook for oil demand.

Population trends, rising employment and higher incomes will encourage car ownership and boost commercial vehicle use, impacting diesel and gasoline demand, as the economy grows by close to 8% a year. According to CRISIL, the passenger and commercial vehicle segments will see CAGRs of 9-10% and 10-11%, respectively, over the next five years.

The associated investments needed to support the "Make in India" initiative — road and rail networks and ports — are all expected to add momentum to oil demand.

India's refining capacity grew from 2.97 million b/d in 2006 to 4.66 million b/d in 2016, but is running significantly above

“India's crude oil binge is expected to continue up to 2020 as growth in industrial activity spurs the transportation sector. While India's thirst for fuel will continue unabated up to 2020, the energy mix will shift. Gas demand will be driven by the power and fertilizer sectors. — CRISIL **”**

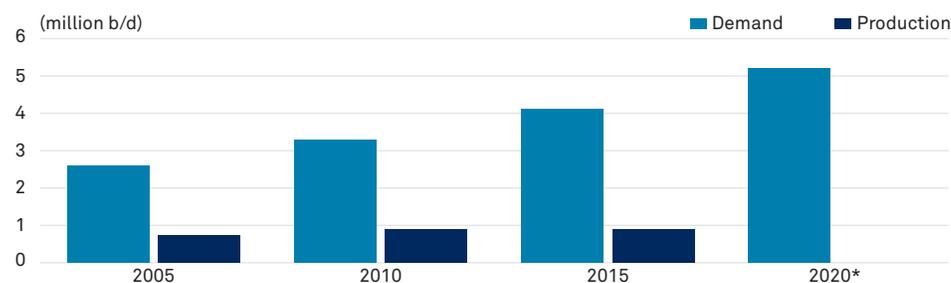
nameplate capacity. Oil ministry data showed throughput of 5.1 million b/d in December. Forecasts by the International Energy Agency and others suggest India's refining capacity will rise to 7.7 million b/d by 2030 and to 10.2 million b/d by 2040.

India has set up three Strategic Petroleum Reserves in southern India with combined capacity of 38.8 million barrels.

Plans have been finalized for two further reserves with capacity of 37 million barrels each, one in the eastern state of Odisha and one in the northwestern state of Rajasthan.

This is expected to take overall storage capacity to more than 15 million mt (111 million barrels) by 2020.

INDIA'S CRUDE OIL DEMAND TO 2020



Source: CRISIL

*Forecast

The country is chronically dependent on imports, which account for over 80% of demand. Despite new policies to boost domestic oil production, exploration activity is currently too low to result in a major increase in output. Domestic oil production fell from 916,000 b/d in 2011 to 876,000 b/d in 2015.

There was a small increase in output in fiscal 2015/2016, but in the first nine months of fiscal 2016/2017, domestic oil production dropped by nearly 2%.

Security of supply

The combination of stagnant domestic production and rising demand means India's already severe oil import dependency is likely to worsen.

It is by no means a barrier to success, as Japan and South Korea have shown, but the economy's vulnerability to external supply shocks will be a critical concern for the government.

Delhi is likely to pursue three main policies in this regard. It will encourage domestic production; diversify lines of supply and build strong relationships with key suppliers; and attempt to raise the share of Indian companies' overseas oil production.

“India’s GDP growth of about 7%-8% at a time when oil prices are low is very supportive for oil demand. The fundamentals in India are really strong, given how low their oil consumption is relative to their population. They are also building substantial inventories. — Gary N. Ross, Executive Chairman and Head of Global Oil at PIRA Energy Group”

In early 2016, the government unveiled its long-awaited Hydrocarbon Exploration Licensing Policy, which aims to attract more investment into the upstream sector. The policy moves away from cost-recovery to a revenue-sharing model and includes a uniform licensing system that covers conventional and unconventional hydrocarbons. It also features an ‘open acreage policy’ that allows companies to evaluate and define the areas they want to bid for.

The launch of HELP was followed by the award of 31 contract areas comprising 44 oil and gas fields under a revenue sharing model in February 2017. The government expects these contracts to monetize 293 million barrels of oil and 22 Bcm of gas over 15 years.

These are relatively small volumes, but at the least should indicate whether companies are sufficiently attracted by the new regime to commit funds to upstream development.

Externally, Oil Minister Dharmendra Pradhan has been actively courting India's top crude suppliers, offering them a range of quid pro quo deals, such as investment in refineries in Nigeria and a strategic crude storage deal with the UAE, in order to strengthen supply chain ties.

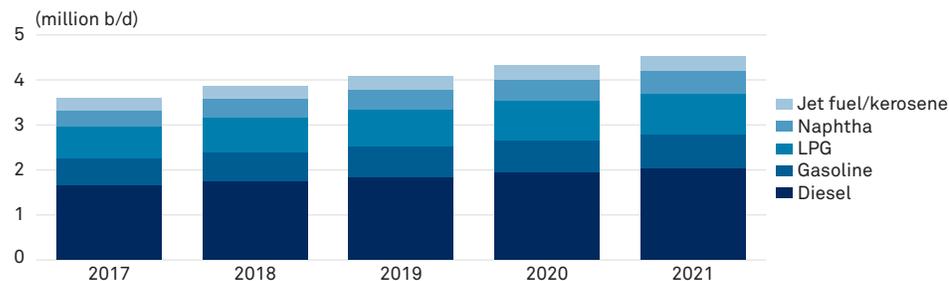
The government has also floated the idea of creating a few integrated state oil firms by consolidating some of the existing ones to help them compete better in the overseas market.

Oil products

The government's clean fuel drive, sharp anticipated growth in rail, road and air transport, alongside the country's insatiable demand for petrochemicals is expected to support consumption of gasoline, jet fuel, LPG and naphtha in 2017, with growth at or higher than in 2016.

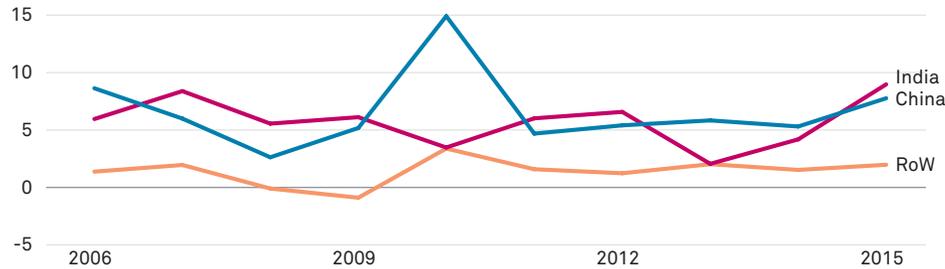
Gasoline demand grew by more than 12% in calendar 2016 to 23.66 million mt, while gasoil demand rose 5.6% to 76.71 million mt. LPG demand posted double-digit growth, rising by 11.3% to 21.17 million mt. Jet fuel demand rose close to 11%, reaching 6.73 million mt. Demand growth for naphtha was more modest at 3.4%, but the rate of

INDIA'S OIL PRODUCTS DEMAND OUTLOOK



Source: PIRA Energy Group, a unit of S&P Global

INDIAN OIL DEMAND RISES AS CHINA'S APPETITE COOLS - CHANGE IN OIL DEMAND (%)



Source: BP Statistical Review of World Energy

consumption is expected to pick up over the next few years.

The high rate of gasoline demand growth reflects the deregulation of diesel prices in late 2014, which prompted consumers to switch fuels.

Diesel may have lost out in the passenger vehicle segment, but this is more than likely to be offset by strong demand from the industrial sector.

In addition, the government, since coming to power in 2014, has undertaken a series of initiatives to help boost LPG penetration across the country. It has aggressively pushed to expand the national LPG dealership network, while it has urged more affluent consumers to give up LPG subsidies and pass those savings to economically-poorer sections of society. The extension of city-gas networks is an attempt to displace urban LPG use to allow increased rural use of the fuel.

The government is also discouraging the use of kerosene for domestic cooking, and last year allowed the state-run oil companies gradually to raise prices. This also serves to reduce government subsidies; kerosene has so far accounted for more than 40% of all state petroleum subsidies. As a result,

kerosene consumption fell nearly 14% year-on-year in 2016 to 5.93 million mt.

Kerosene and LPG are the only oil products still regulated by the government. The deregulation of diesel has created a more level-playing field for the country's private refiners. Essar Oil and Reliance, who were forced to shut their retail outlets after the short-lived deregulation of pump prices in 2004-2005, have stepped up efforts to get back into the retail fuel space.

Major foreign companies are also moving to take advantage of what is set to be one of the world's most dynamic centers of oil products demand growth.

UK oil major BP is investing in retail fuel outlets, becoming the second major international oil company after Royal Dutch Shell to venture into the Indian market.

Russia's Rosneft and a consortium led by trader Trafigura have jointly bought Essar Oil, expanding their footprint in the country's growing retail fuel sector. Saudi Aramco is in talks with the government to gain market entry.

With oil demand growth running near parallel with high GDP growth, India is set to absorb growing volumes of crude oil, but security of supply will remain a critical concern.



Natural Gas

LNG to extend gas use to India's east and south

Natural gas accounts for only 6.5% of India's energy mix, but the growth prospects are huge. The gas transmission network is expected to double in size in the next three years to 29,000 kilometers, bringing access to gas – primarily imported LNG – to the country's east and south, which currently account for only 20% of national use. Driven by both local air pollution and national emissions targets, the government aims to raise gas' share of the energy mix to 15% in the next three to four years.

India's gas consumption is split between the following sectors: fertilizer (37.2%), power (23.3%), city gas distribution (13.5%) and the refinery, petrochemical and industrial sectors (25.0%). All represent major areas of demand growth.

Reforms to pricing policies have so far been insufficient to boost domestic gas production, suggesting that India's gas import gap is going to increase rapidly.

“India's LNG terminal utilization will reach 30 million mt/year by 2022, almost double current throughput as terminal logistics are resolved and new import infrastructure completed. — Platts Analytics”

This will favor LNG as proposed international gas pipeline projects face major political and financial challenges. Subsidies, a system of 'price pooling', in which prices reflect a mix of cheap domestic gas and more expensive LNG, combined with new priorities in gas allocation are boosting consumption.

Urea production: Fertilizer producers are India's largest consumers of gas, using 43.83 MMcm/d in fiscal 2015/16,

out of total consumption of 130 MMcm/d, according to Ministry of Petroleum and Gas data. This included 18.73 MMcm/d of LNG imports, up 23% from the previous year.

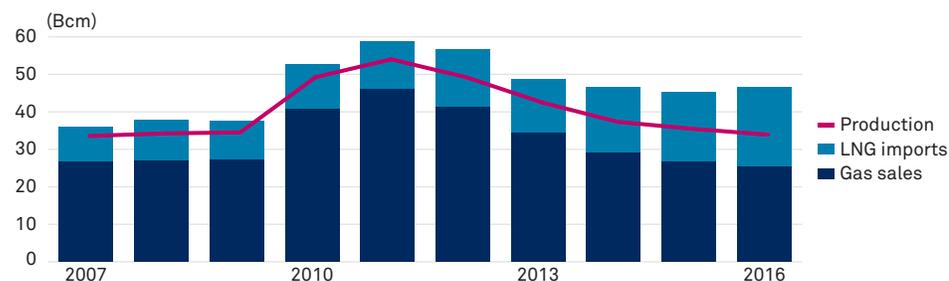
The pooled price system, introduced in 2015, has had a clear impact. After near stagnation, urea production rose by over 8% to 24.5 million mt in 2016. The government aims to close its existing urea import gap of 7.2 million mt. Additional fertilizer production capacity will play the role of anchor customers for east coast LNG import terminals.

Gas-for-power: India has about 25 GW of gas-fired generation plant, but 14 GW has been effectively stranded by a lack of gas, while the remaining 11 GW have been operating well below capacity. Gas turbine utilization averaged 23% in the nine months to December 2016.

Gas-fired power plants were allocated 87.4 MMcm/d last year, but only 22.9 MMcm/d was supplied from domestic sources. They consumed an additional 7.43 MMcm/d of LNG, more than double the 2.71 MMcm/d of the previous year. The increase in gas-for-power generation reflects subsidies from the Power System Development Fund that reduce the price of gas-generated power for the country's financially-stricken distribution utilities.

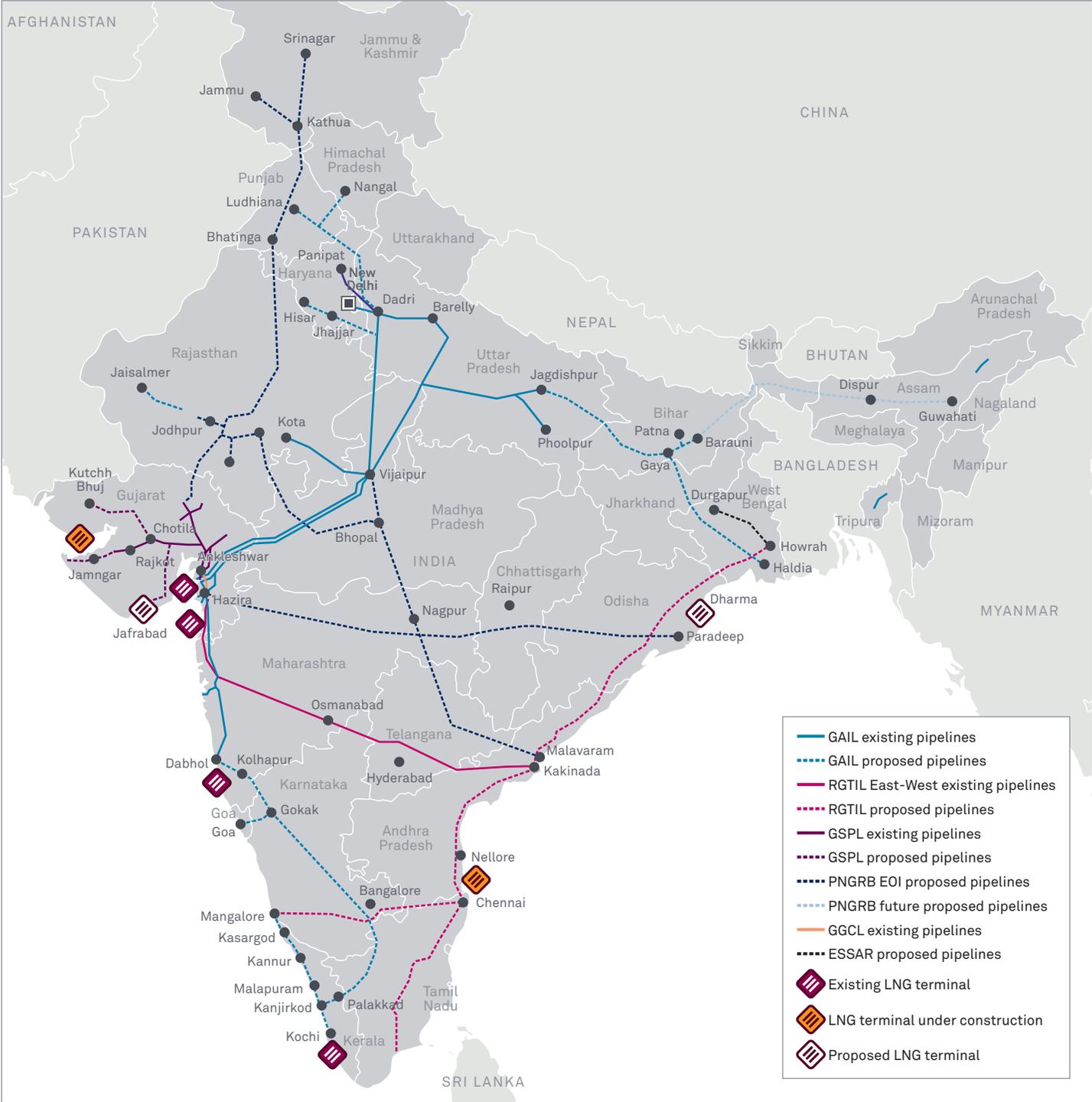
Industry: Refineries and petrochemicals production made up 14.9% of gas demand last year, with

NATURAL GAS PRODUCTION, SALES AND LNG IMPORTS



Source: Ministry of Petroleum and Gas

EXPANSION PLANS: INDIA'S GAS TRANSMISSION NETWORK



Source: Ministry of Petroleum and Gas

Commodities **Natural Gas**

other industry accounting for 11.1%. The “Make in India” campaign will be supportive of industrial gas demand, while refinery and petrochemical capacity is expected to more than double out to 2040. Gas demand from this sector will be contingent on the relative competitiveness of naphtha. Refineries and petrochemicals consumed 19.4 MMcm/d of gas in fiscal 2015/16, almost all of which was imported LNG, making the sector the largest consumer of imported gas.

City gas: In mid-2014, the government shifted its domestic gas allocation priorities from the fertilizer and power sectors to city gas supply, including for auto transport as Compressed Natural Gas. This was initially forced by a court order to fuel public transport by natural gas in the capital New Delhi and 22 districts in three adjoining states to reduce local air pollution caused in part by diesel and gasoline fumes. The government subsequently decided to make CNG available to other major cities.

City gas distribution projects have been established in 13 states. Over 3.3 million homes have been connected, and the availability of city gas means commercial and industrial consumers are also taking advantage. By October 2016, the number of CNG stations in India had grown to 1,167, supplying fuel to nearly 2.8 million vehicles. City gas is expected to reach 10 million households over the next three years, but the scope for expansion is even larger. 75 city gas networks have been authorized, suggesting that their number is on course to exceed Petroleum and

INDIA'S GAS PIPELINES, OPERATING AND UNDER CONSTRUCTION

Pipeline	Operator	Length (km)	Capacity (million cu m/d)
Operating pipelines			
Assam regional network	GAIL (India) Ltd	7.8	2.500
Cauvery Basin network	GAIL (India) Ltd	240.3	4.330
Hazira-Vijaipur-Jagdishpur-GREP (Gas Rehabilitation and Expansion Project)-Dahej-Vijaipur HVJ/VDPL	GAIL (India) Ltd	4,222.0	57.300
Dahej-Uran-Panvel-Dhabhol	GAIL (India) Ltd	815.0	19.900
K.G. Basin network (+RLNG+RIL)	GAIL (India) Ltd	877.9	16.000
Gujarat regional network (+RLNG+RIL)	GAIL (India) Ltd	608.8	8.310
Agartala regional network	GAIL (India) Ltd	55.4	2.000
Chhainsa-Jhajjar-Hissar	GAIL (India) Ltd	455.0	35.000
Dahej-Vijaipur (DVPL)-Vijaipur-Dadri (GREP) Upgradation DVPL 2 & VDPL	GAIL (India) Ltd	1,280.0	54.000
Dadri-Bawana-Nangal	GAIL (India) Ltd	886.0	31.000
Mumbai regional network	GAIL (India) Ltd	128.7	7.000
Kochi-Koottanad-Bangalore-Mangalore (Phase-I)	GAIL (India) Ltd	42.0	16.000
Dabhol-Bangalore	GAIL (India) Ltd	1,004.0	16.000
DukliMaharajanj (Earlier-Agartala)	GAIL (India) Ltd	5.2	0.260
Uran-Trombay	Oil and Natural Gas Corp.	24.0	6.000
EWPL (Kakinada-Hyderabad-Uran-Ahmedabad)	Reliance Gas Transportation Infrastructure Ltd	1,460.0	95.000
High Pressure Gujarat Gas Grid network	Gujarat State Petronet Ltd	2,239.0	31.000
Low Pressure Gujarat Gas grid network	Gujarat State Petronet Ltd	57.6	12.000
Hazira-Ankleshwar	Gujarat Gas Company Ltd	73.2	5.060
Dadri-Panipat	Indian Oil Corporation Ltd	132.0	9.500
Assam regional network	Assam Gas Company Ltd	104.7	2.428
Uran-Taloja	Deepak Fertilizer & Petrochemicals Corp. Ltd	42.0	0.700
Total		14,760.6	431.288
Under construction			
Jagdish-Haldia, including Bokaro-Talcher-Angul/Dhamra	GAIL (India) Ltd	2,539.0	16.000
Kochi-Koottanad-Bangalore-Mangalore (PH-II)	GAIL (India) Ltd	1,063.0	16.000
Surat Paradip	GAIL (India) Ltd	2,112.0	74.810
Shahdol-Phulpur	Reliance Gas Pipelines Ltd	312.0	3.500
Kakinanda-Vizag-Srikakulam	AP Gas Distribution Corp.	391.0	90.000
Mallavaram-Bhopal-Bhilwara via Vijaipur	GSPL India Transco Ltd	2,042.0	76.250
Mehsana-Bhatinda	GSPL India Gasnet Ltd	2,052.0	77.110
Bhatinda-Jammu-Srinagar	GSPL India Gasnet Ltd	725.0	42.420
Ennore-Nellore	Gas Transmission India Pvt Ltd	430.0	36.000
Tie-in connectivity to the proposed Jaigarh LNG Terminal	H-Energy Gateway Pvt. Ltd	60.0	29.000
Ennore-Thiruvallur-Bengaluru-Puducherry-Nagapatinam-Madurai-Tuticorin	Indian Oil Corporation Ltd	1,385.0	84.670
Total		13,111.0	545.760

Source: Ministry of Petroleum and Gas

Natural Gas Regulatory Board forecasts of 60 city gas projects by 2022 and 240 networks by 2030.

Domestic gas production outlook uncertain

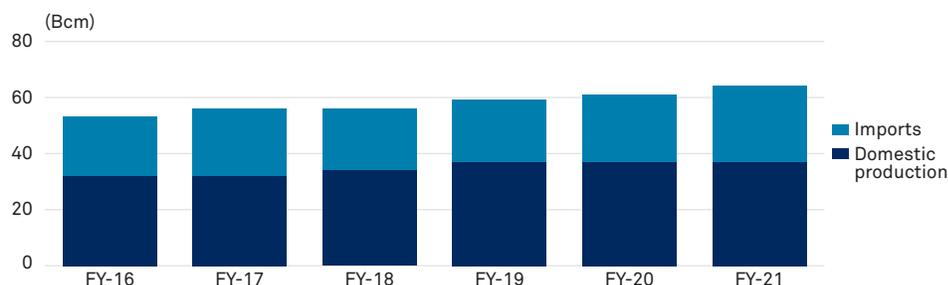
By controlling the price of gas, the government has been able to lower the cost of its urea subsidies which run into billions of dollars annually, but lower downstream gas prices have had a detrimental effect on upstream investment and LNG imports.

India's domestic gas production was 31.14 billion cubic meters (Bcm) in fiscal 2015/16, down 40% from its peak of 51.23 Bcm in 2010-11. The country's gas demand posted a modest 2.86% year-on-year rise to 46.62 Bcm in fiscal 2015/16, according to data from the government's Petroleum Planning and Analysis Cell, down 20% from its peak of 58.93 Bcm in 2010-11.

The declining trend in production is the result of insufficient levels of upstream investment, aging fields and the low level of regulated prices, which acts as major disincentive. Any upturn in exploration and production activity depends on the success of new policy measures instituted by the government, particularly with regard to pricing for deepwater and ultra-deepwater developments.

India has transitioned from controlled gas pricing to fully indexed pricing. Under the existing mechanism, the government sets the gas price every six months based on a formula linked to various global benchmarks from the US, UK, Canada and Russia. However, the current price of natural gas produced from existing fields is currently just \$2.5/MMBtu, while the ceiling price for

INDIA'S FORECAST DOMESTIC GAS PRODUCTION AND IMPORTS, 2016-2021



Source: CRISIL

development of gas from the offshore Krishna Godvari basin, which is also revised every six months, is \$5.3/MMBtu. The Federation of Indian Chambers of Commerce and Industry says \$6/MMBtu is required to stimulate development.

The government has indicated that it is willing to consider a new pricing policy for deepwater and ultra-deepwater blocks, but this has still to be announced. Moreover, promised freedom in gas marketing and pricing from new production does not apply to existing fields mired in legal dispute with the government.

CRISIL estimates that with such pricing initiatives, domestic gas production could rebound and grow at 4% CAGR to 103 MMcm/d in 2020-21. Even in this relatively optimistic scenario, domestic gas production will remain well short of gas demand for the foreseeable future.

Rising import gap

The supply-demand gap looks likely to be met by LNG imports, but so far subsidies in downstream markets and delays in infrastructure construction have limited import volumes. Indian demand for LNG is highly price sensitive, with government-regulated power and fertilizer prices

limiting those segments from using relatively expensive imported LNG.

India has 22.5 million mt/year of LNG import capacity across four terminals, but only imported 16.08 million mt in fiscal 2015-16, owing to under-utilization at two of its terminals. The absence of breakwater facilities at the 2.5 million mt/year Dabhol terminal continues to halt imports during the monsoon season, from May to October, and the 5 million mt/year Kochi terminal is heavily underutilized because of delays in the construction of the connecting pipeline.

According to Platts Analytics, constraints at Dabhol are likely to be resolved before the 2018 monsoon, but the Kochi pipeline will not be completed before 2019. Two new LNG import terminals, with a combined capacity of 10 million mt/year, are under construction — Mundra, due to start up in 2017, and Ennore, in 2019. Three more terminals with combined capacity of 13.5 million mt/year are in the planning stage. Platts Analytics forecasts that terminal utilization will reach about 30 million mt/year, close to its full receiving capacity, by 2022.

The multiple drivers behind Indian gas demand suggest that, with further price reform, India will become one of the world's key LNG import destinations.

Thermal Coal

Focus turns to domestic output

India has abundant coal reserves — 56.1 billion tons of proved anthracite and bituminous coal at end-2015, as well as 4.5 billion tons of proved sub-bituminous coal and lignite. The total coal resource is estimated at some 300 billion mt. The country became the world’s second-largest consumer of coal in 2015, overtaking the United States for the first time.

Even with a strong push into renewable energy, coal is expected to account for over 50% of power generation by 2040. Under the Paris Agreement on Climate Change, India’s targets are to have 40% of installed electricity generating capacity from non-fossil fuel based sources by 2030, and to reduce the carbon intensity of GDP by 33-35% from 2005 levels by 2030. Both targets leave substantial room for increases in coal consumption.

However, India’s policy on coal has seen two major shifts since the Modi administration came to power in 2014.

The first was a concerted push to increase domestic coal production to reduce and potentially eradicate the country’s growing dependence on imported thermal coal.

The second emerged in the Central Electricity Authority’s Draft Electricity Plan published in December. The CEA said it sees no need for any more coal-fired plant in 2017-2022 beyond the 50 GW already expected to be completed in this period, adding to 186 GW of existing capacity.

This reflects expectations that renewable energy targets will be exceeded and implies a major change in India’s energy trajectory.

Coal backbone

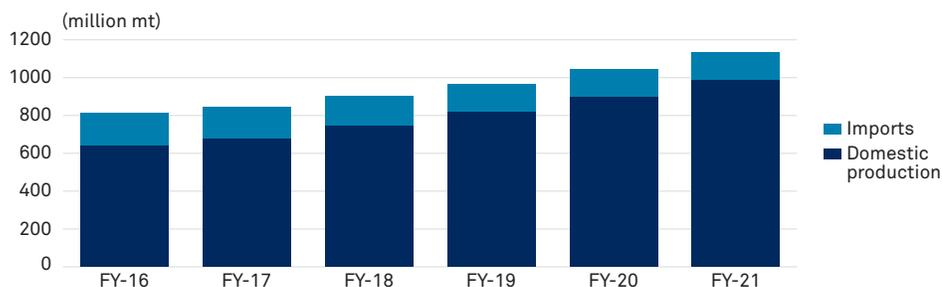
Thermal coal is the mainstay of the country’s power generation system, currently accounting for just over 60% of all generating capacity.

Domestic production has struggled to keep up with demand for more than a decade.

An acceleration in coal plant construction in the late 2000s, which continues today, combined with stagnant production growth, saw the country’s coal import gap widen alarmingly. Analysts and forecasters predicted huge future increases in Indian coal imports.

“Public sector power generation companies have virtually stopped buying imported coal as they are getting almost sufficient supplies of domestic coal.
— *mjunction CEO*
Vinaya Varma”

INDIA'S FORECAST COAL PRODUCTION AND IMPORTS, 2016-2021



Source: CRISIL

The International Energy Agency estimated that Indian coal consumption would nearly double by 2040 from 2012 levels and that the country would account for nearly one-half of the global increase in coal consumption over the same period.

These forecasts now look uncertain.

India is expected to consume 884.87 million mt of coal in 2016-17, of which 724.71 million mt is expected

to come from domestic sources, according to Piyush Goyal, minister for power, coal and renewables. This leaves a demand-supply gap of 160.16 million mt to be met via imports – still large, but smaller than in recent years.

India's monthly requirement for foreign coal fell 25% year-on-year to 14.31 million mt in December, down from 19.15 million mt a year earlier, according to data from mjunction, an online procurement and sales platform floated jointly by state-run Steel Authority of India Ltd. and Tata Steel.

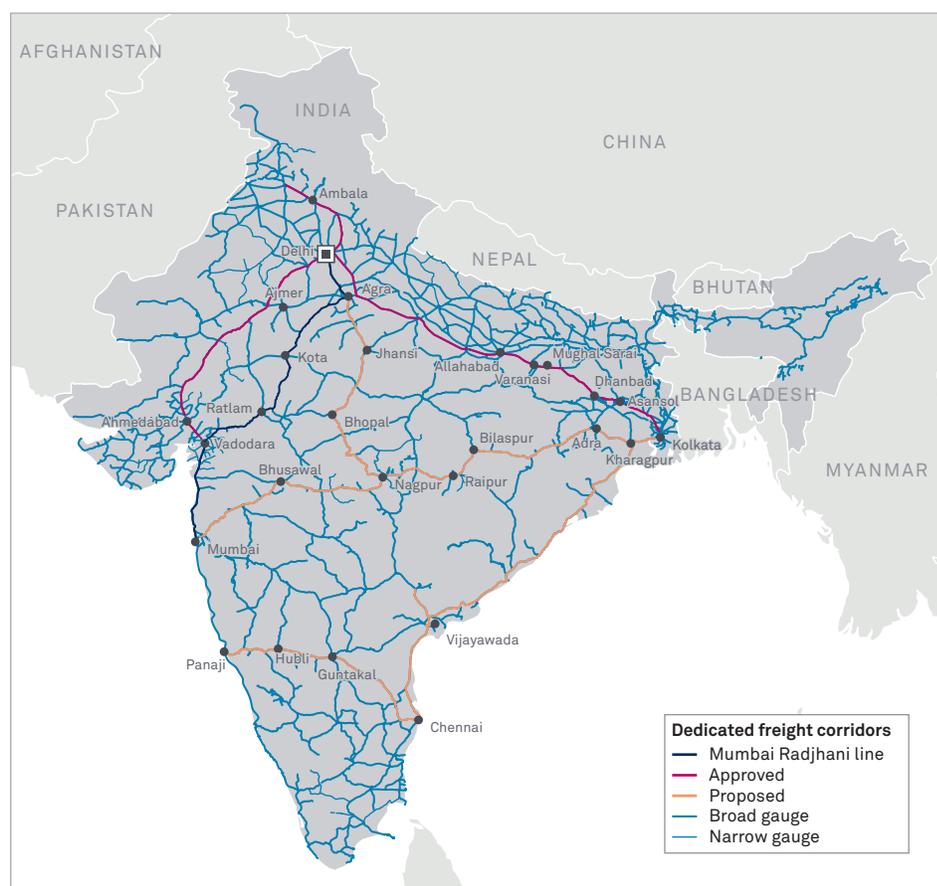
India's growth in coal import demand appears to have peaked.

Domestic production push

State-owned Coal India Ltd. accounts for almost 80% of the country's coal production and is the world's largest coal producer. It mined 536.51 million mt in fiscal 2015/16, up 8.5% year-on-year. This helped cut India's total coal imports by 8% to 199.88 million mt, according to coal ministry data. The government wants much larger gains in CIL's production, targeting 1 billion mt by fiscal 2019/2020, forming the majority of a total rise in coal output to 1.6 billion tons.

CIL is cash-rich and has the funds to carry out its plans, focusing primarily on mine expansions, but also adding 181.6 million mt of new mine production. Singareni Collieries Company Ltd, a joint venture between the central government and Telangana state, and the country's only other commercial coal miner, expects output to rise by 35% to 80 million mt by 2020, opening 17 new mines between 2015 and 2020.

INDIAN RAILWAY NETWORK



Source: Indian Railways

A further 0.5 billion tons is expected to come from captive coal miners, mining coal for their own use in power generation and steel production. The award of captive coal mines has been mired in controversy and development and production targets successively missed.

However, indicative of the domestic production push, India's largest electricity generator NTPC Ltd expects to mine 2 million mt of coal in the 2017-18 fiscal year from its first coal mine Pakri Barwadhi in the eastern state of Jharkhand. The government has allocated 10 mines to NTPC with an

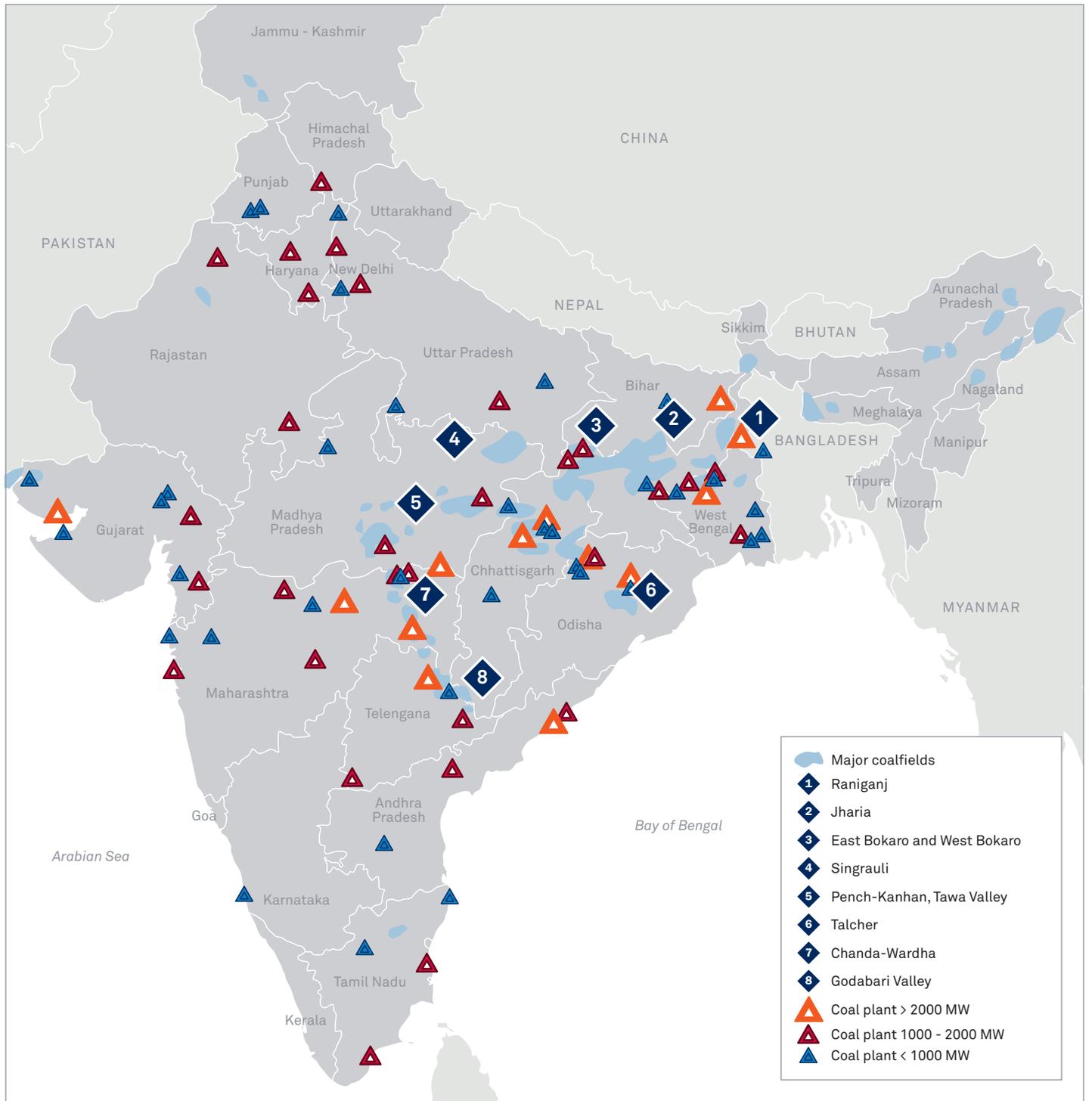
estimated total coal reserve of 7.3 billion mt and mining capacity of 107 million mt/year.

Mining challenges

Access to resources is the main challenge for coal producers in India, followed by inadequate transportation infrastructure to move mined coal from the mine mouth to consumers and issues with coal quality.

Social consent: Delays have been persistent relating to environment and forestry approvals, land acquisition

INDIA: COAL FIELDS AND COAL-FIRED GENERATION PLANTS



Source: EIA

and agreeing relief and rehabilitation for people uprooted from mining sites. Many of India's large coal deposits are in forest areas, where open cast mining would have a severe environmental impact. Years of debate over forest zoning into 'violable' and 'inviolable' zones have held up development.

The previous government proved very reluctant to approve mining in forest areas, despite an obligation on miners to replace all damaged trees with replanting.

Under the current administration, environmental authorities are taking a more accommodating approach and appear willing to permit coal mining with what they call 'minimum damage' to the environment.

However, this does not overcome forest-related issues at the state and local level, where the registration of applications and then grants of no-objection certificates for the diversion of forest land to non-forest purpose can suffer lengthy delays.

Political setbacks for the ruling Bharatiya Janata Party at state and local level can sap its desire to push politically for mine developments opposed by local communities and state governments.

Transport: Poor transport infrastructure is a continual frustration, both for domestic production and imported coal. Most of the country's coal reserves are concentrated in the northeastern part of the country, and the government has been slow to improve transportation links either north-south or from ports into the hinterland.

The expansion of coal use is thus heavily dependent on the success of the government's port, rail and road building plans.

New Delhi is trying to expedite work on three major railway routes in the northeastern Indian states of Jharkhand, Odisha and Chhattisgarh to boost connectivity between the coal producing and consuming regions.

The administration is also trying to improve evacuation facilities at ports by investing in about 250 new railway wagons.

It is also investing \$700 million to develop 14,500 km of inland waterways, which are still underdeveloped for commodity transportation.

Coal quality: Domestic coal is mostly low-grade with an ash content as high as 35%, which makes it unsuitable for some power plant boilers.

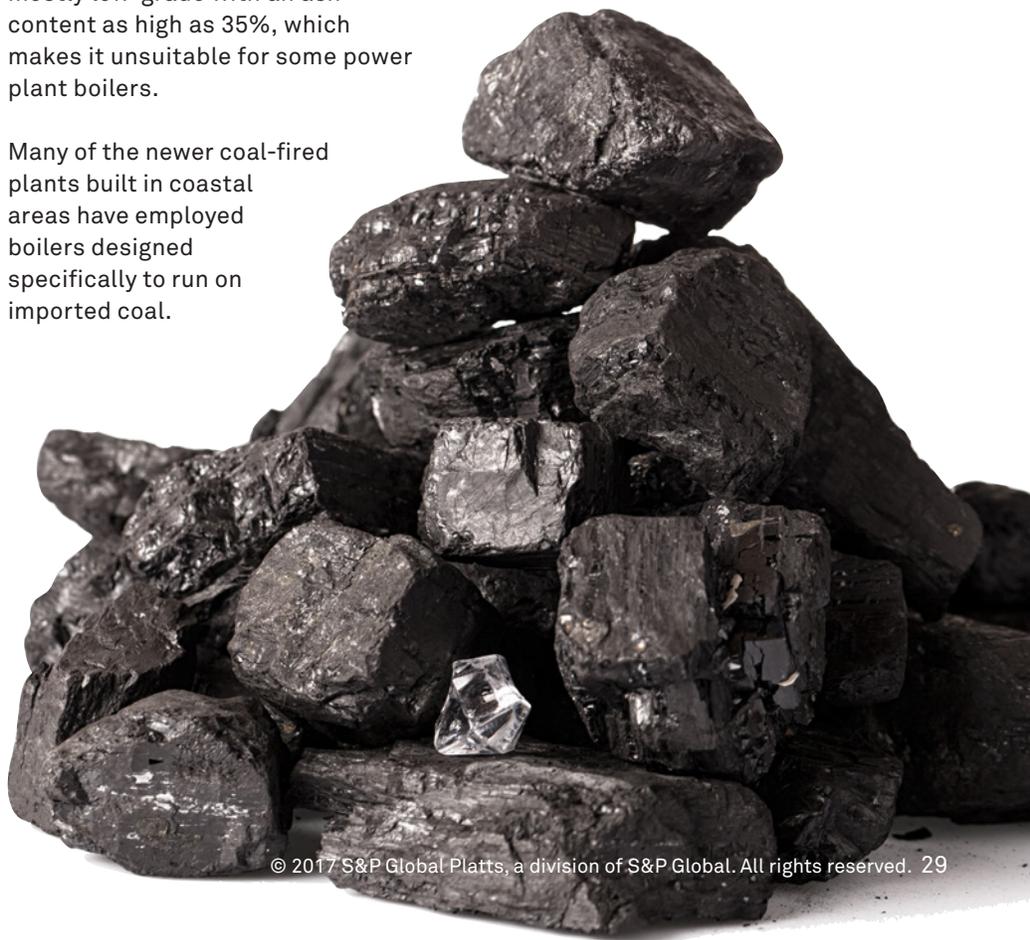
Many of the newer coal-fired plants built in coastal areas have employed boilers designed specifically to run on imported coal.

This, and inland transportation costs and bottlenecks, will sustain a proportion of thermal coal imports.

The government intends to invest in coal washeries to upgrade the heating value and reduce the ash content of low grade coal.

The country currently has washery capacity of 131 million mt at about 50 sites, according to government data. CIL plans to add another 17 washeries in the next three years.

India is no longer the dynamic coal import market of yesteryear. Domestic production will continue to expand, but India's energy trajectory is becoming less coal-based, raising a real risk of stranded assets.



Petrochemicals

Demand marches ahead at breakneck speed

India has a surplus of refined oil products, but the petrochemical industry is a massive deficit center. There is a major lack of integration between internal markets and production from coastal petrochemical plants built to take advantage of export margins that are higher than those provided by inland demand. The refined oil product surplus also means that India's petrochemical sector is heavily dependent on naphtha as a feedstock, creating the future risk of being undercut by imported petrochemicals derived from natural gas feedstocks.

Demand growth

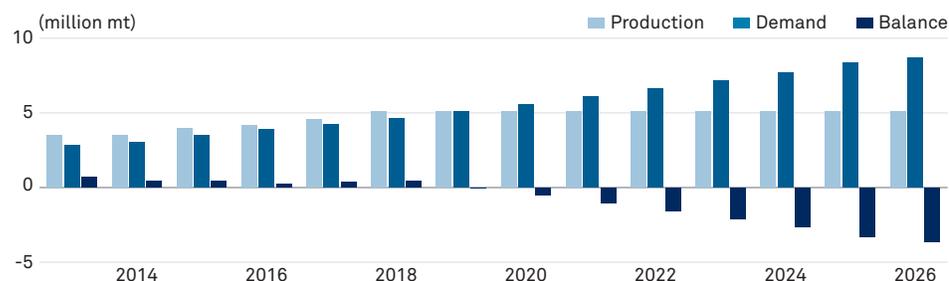
The "Make in India" initiative is expected to provide a major boost to industrial production, directly contributing to growth in demand for a wide array of petrochemical products, such as specialty grade polymers, chemicals and industrial solvents. New investment in the sector is not thought likely to keep pace with robust demand growth, creating opportunities for importers.

India is already the world's third-largest consumer of polymers at 12.5 million mt/

year, just behind the United States and China. Demand is currently growing at 10% per annum and this rate of expansion is expected to be sustained over the next decade, owing to continued urbanization and improved purchasing power. According to Platts Analytics, combined polyethylene and polypropylene demand in India is expected to rise to 21.5 million mt by 2026.

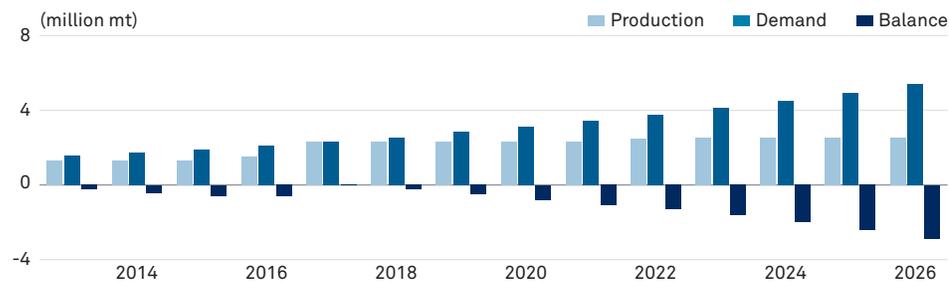
The outlook is equally robust for polyolefins. Demand is forecast to rise from 6 kg/person per year in 2015 to 15 kg/person per year by 2026. Even this would leave per capita levels of consumption at just a fourth of developed markets, such as the United States, where polyolefin consumption has more or less peaked at about 60 kg/person per year.

INDIAN POLYPROPYLENE MARKET MOVES INTO DEFICIT BY 2019



Source: Platts Analytics

INDIA'S HDPE* IMPORT DEPENDENCE TO RISE



*High-density polyethylene

Source: Platts Analytics

Integration challenge

Historically, the government has provided special zones for the petrochemical sector in coastal areas. Transportation bottlenecks and a complicated tax structure have created major barriers to the transport of finished products from coastal hubs to India's heavily-populated inland markets.

In some instances, the net cost of transporting key polymers from west coast India to the country's northern regions can be more than the freight cost to Chinese markets. As export margins have been higher, private investment in standalone petrochemical

plants designed to meet domestic demand has been minimal.

New investment is planned, but it will not keep pace with demand.

Reliance Industries is expected to have about 900,000 mt of polyethylene capacity online in early 2017. Public sector enterprises have stepped up efforts and are focusing on petrochemical investment in the recently assigned four petroleum, chemical and petrochemicals investment regions in the states of Andhra Pradesh, Gujarat, Odisha and Tamil Nadu.

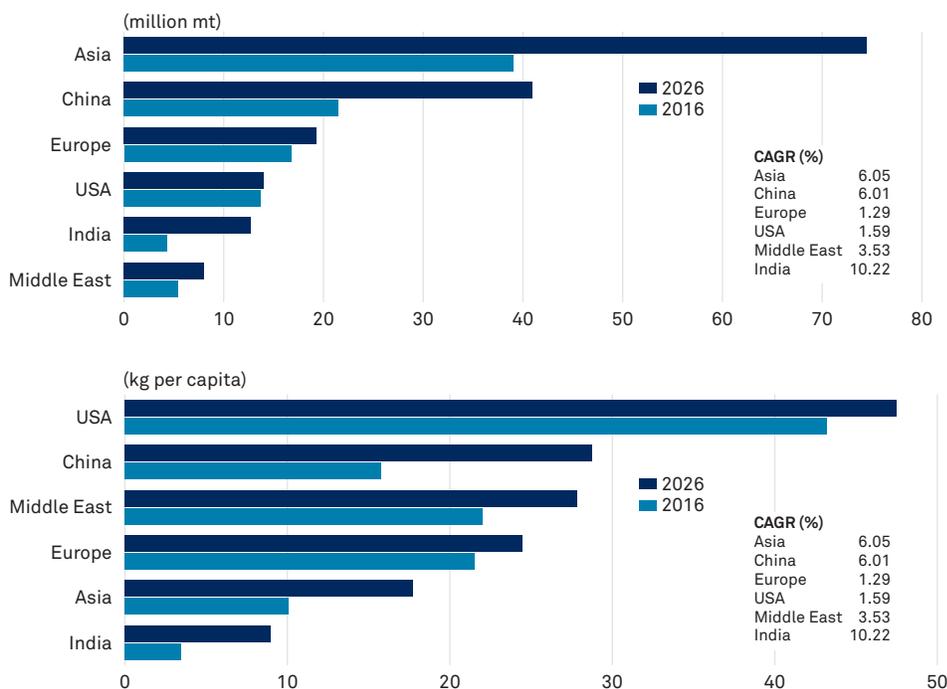
A total of 1.3 million mt of polyethylene capacity and 1.1 million mt of polypropylene capacity are expected to start up by 2020 as a direct result of these initiatives. New polypropylene expansions, from both greenfield and brownfield projects, would add annual capacity of about 1.35 million mt, and are expected to be operational between 2021 and 2026.

The investment pipeline suggests 4.65 million mt/year of new polymer capacity between 2017 and 2026. This is not enough to stem the rising import gap, which is expected to reach 10 million mt/year by 2026.

Naphtha vulnerability

India has a 7 million mt/year naphtha surplus, but a large deficit in both upstream and downstream petrochemical

FORECAST POLYETHYLENE DEMAND, 2016-2026



Source: Platts Analytics

products. The country is completely dependent on imports of styrene monomer and polymer polycarbonates, and relies on imports to meet 50% of its annual demand for monoethylene glycol, polyvinyl chloride and elastomers. At the same time, the petrochemicals sector exports downstream products such as benzene. It is also set to export paraxylene in the near future, when 2.2 million mt/year of new paraxylene capacity is brought on stream by Reliance Industries.

In addition, initial plans for the recently announced 60 million mt/year mega refinery, planned jointly by IOC, Bharat Petroleum Corp. Ltd. and Hindustan Petroleum Corp. Ltd., indicate two major downstream petrochemical investments, one involving direct integration of refinery-based naphtha and the other involving procurement of surplus domestic naphtha.

Externally, it will be challenging for naphtha-based investments to compete with cheaper ethane-based production in the US and Middle East, as well as with China's coal-based olefins. Current crude oil prices indicate an advantage for naphtha-based investment, but the cost advantage of cheaper alternatives will widen with a \$15-\$20/barrel rise in crude oil prices.

“Polymer and elastomer demand is expected to see a CAGR of 9.5-10.5% between 2015-16 and 2020-21. This is because of an expected recovery in major consuming segments, such as packaging, automobiles, irrigation, construction and consumer durables. — CRISIL”

Steel

Riding the infrastructure and manufacturing wave

Both the “Make in India” initiative and expected investment in infrastructure has created expectations of a substantial increase in domestic steel demand. CRISIL forecasts that Indian steel consumption will rise 5.3% year-on-year to 85.8 million mt in fiscal 2016-17, compared with subdued average annual growth of about 3.9% over the last five years. Short-term steel demand is forecast to grow at 4.5-5.5%, accelerating to 6.0-6.5% CAGR up to 2020-21.

India is on the cusp of a transformation from a traditional ‘brick-and-mortar’ economy. Domestic consumption of steel per capita is just 65 kg, compared with a global average of 235 kg, indicating the scope for long-term demand growth.

India is already self-sufficient in commercial grade steel -- the grade used in infrastructure construction projects. Recent facility expansions raised India’s overall steel production capacity in 2015/16 to 118 million mt, up from about 110 million mt the previous year. These

“Steel demand is projected to gather momentum, with short-term growth forecast at 4.5-5.5%, accelerating to 6.0-6.5% CAGR through 2020-21. This will be driven by traction in construction activities, especially in the steel intensive railways and urban infrastructure sectors. Further robust growth in consumer durables, automobiles and capital goods will also support long-run steel consumption. — CRISIL”

include expansions of 6-7 million mt/year from the Steel Authority of India Ltd., 4 million mt/year from JSW Steel, and 3 million mt/year from Tata Steel at various green and brownfield sites.

Infrastructure investment

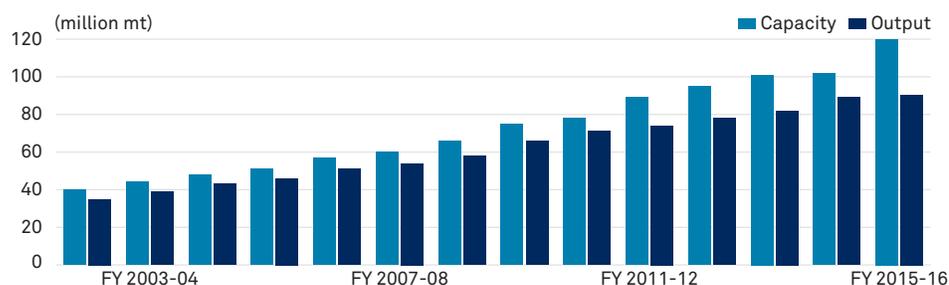
The government plans a major program of new infrastructure investments, including major additions to the road and rail networks, and the construction of new airports and shipping container terminals. Public work projects, such as plans to

provide low-cost housing for people living below the poverty line, are also expected to boost demand for products such as hot-rolled coils and rebars.

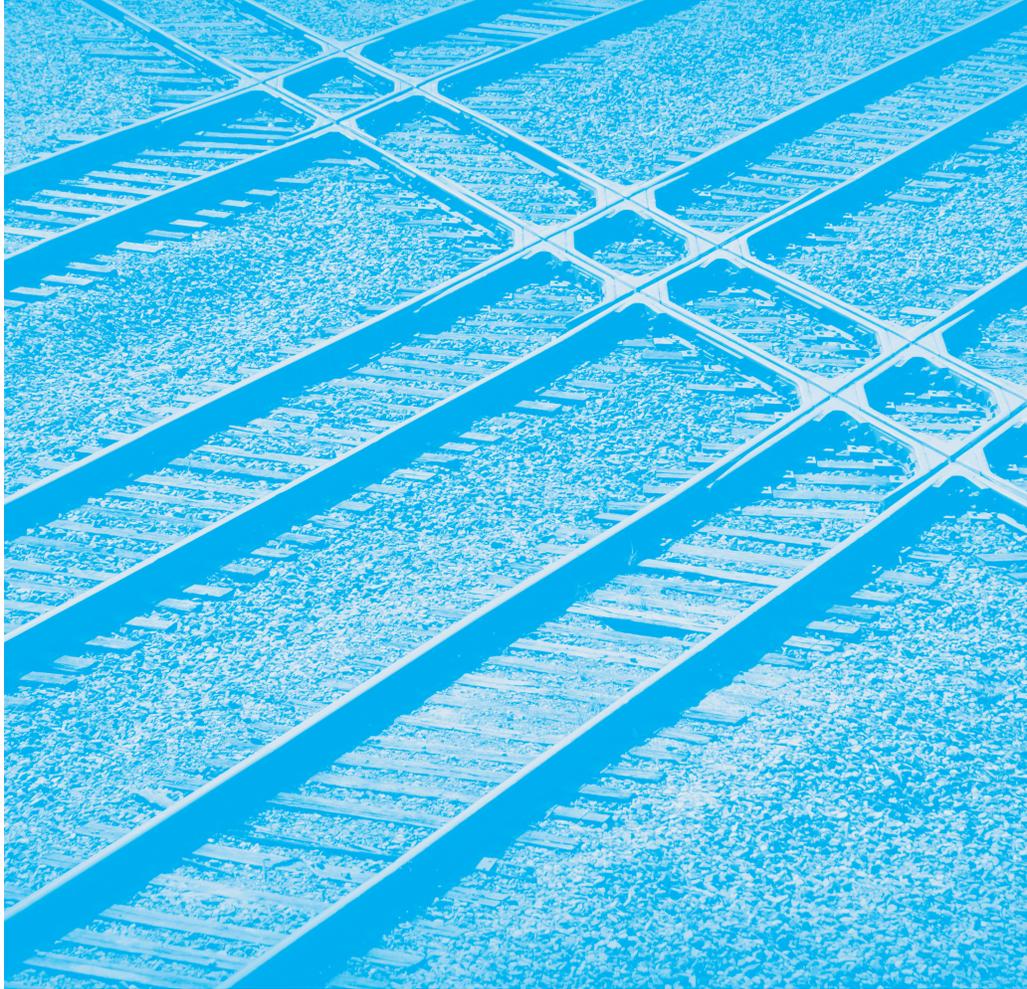
India has a road network of 4.9 million km, handling 60% of freight and 90% of passenger traffic. The government plans to build roads spanning an additional 66,000 km in seven phases over the next few years. Roads in rural areas are currently being constructed at a rate of 139 km per day, almost double the rate at which they were built in the 2011-14 period. Demand for rebar and wire rods has been growing at about 5% for most of fiscal 2016/17 as a result.

The government also plans to pick up the pace of new railway line construction from an estimated 7 km/day in fiscal 2016/17 to 13 km/day in fiscal 2017/18 and 19 km/day in fiscal 2018/19. New Delhi has announced plans to invest \$17.6 billion in the railway network, including the construction of dedicated freight corridors, in the current financial year, more than double the annual average of \$7 billion during the 2009-2014 period.

INDIA'S CRUDE STEEL CAPACITY AND OUTPUT



Source: Ministry of Steel



This is raising demand for rebars for platforms and foot bridges, galvanized sheets for roofing, and corrosion-resistant hot-rolled and cold-rolled sheets for wagons.

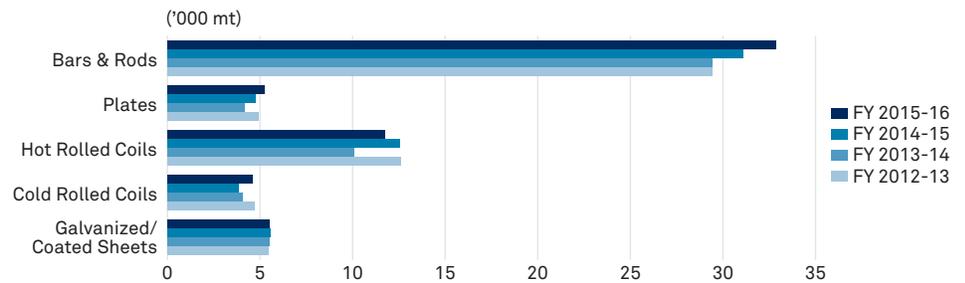
Shipping transport infrastructure is being expanded with plans afoot to build new berths and container terminals at ports around the country. As many as 33 air transport infrastructure projects worth \$3.8 billion are scheduled for completion during 2015-18. The government is also liberalizing foreign direct investment rules in the realty and construction sectors, providing additional investment opportunities that are expected to benefit steel demand.

However, a key imbalance in the Indian steel sector is a lack of high value-added steel production capacity. This imbalance is expected to widen as a result of the government's "Make in India" campaign, and the expansion of India's passenger vehicle market. The latter is expected to reach 9.4 million units per year by 2026, up from 3.41 million passenger vehicles during fiscal 2015/16.

The government is keen to see global auto makers set up manufacturing facilities within the country to supply both domestic and export markets. A similar desire to expand domestic production in the defense, ship-building and renewable energy industries will also drive demand for high value-added steel, suggesting this will become a key focus of new investment for domestic steelmakers.

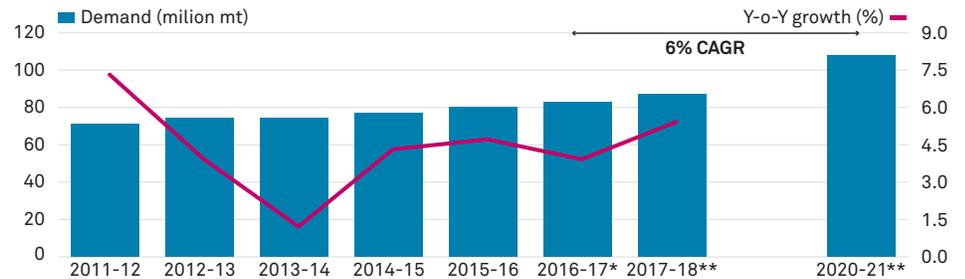
Spending on infrastructure will underpin domestic steel consumption, but demand would be broadened, and India's transformation from a 'brick-and-mortar' economy deepened, by a more equitable distribution of income.

INDIA'S FINISHED STEEL CONSUMPTION



Source: Ministry of Steel

RISING STEEL CONSUMPTION IN INDIA: FORECAST TO 2020-21



Source: CRISIL

*Estimate **Forecast

Power

Debt problems remain as system surplus emerges

The availability of reliable power supplies is a critical factor in the success of the “Make in India” campaign. The country already suffers from widespread electricity shortages, and power demand is forecast to surge 44% from 2016 levels by 2020, according to Platts Analytics.

India’s per capita annual electricity consumption, at around 1,100 kWh, is one of the lowest in the world. It is about one-third of the world average and about one-fourth that of China. There is also

considerable regional variation. Per capita electricity use in Bihar state is about one sixth the national average.

The sale of electricity below cost, particularly to farmers, is politically popular, but disastrous for the country’s energy industry. The resulting financial weakness of the state-level distribution companies creates bad debts, impoverishes their ability to invest in transmission and distribution infrastructure and skews their fuel acquisitions. Many often choose load

shedding over the distribution of electricity generated from expensive imported fuels.

This has significant consequences for the “Make in India” campaign. Industrial and commercial customers are forced to pay higher tariffs to cover the cost of subsidized prices to rural constituents.

Nonetheless, on a national scale, generation is expected to pass a landmark in the current fiscal year. Forecasts made by the Central Electricity Authority suggest generation will exceed demand by just over 1%. Peak hour availability, when blackouts are most likely, is forecast to show a surplus of over 2.5%, although only half of India’s states will be in balance or surplus.

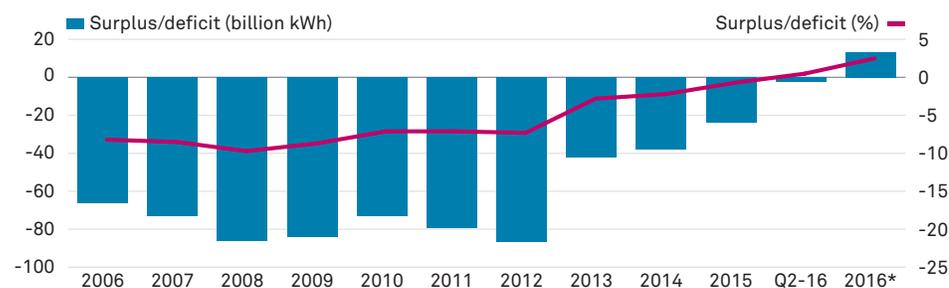
In the past four years there has been a rapid increase in generating capacity, and a welcome rise in private-sector involvement, bringing total installed generating capacity to around 310 GW.

INDIA: ROBUST GROWTH IN POWER DEMAND



Source: Platts Analytics

INDIA'S IMPROVING POWER BALANCE



*Estimate
Source: Central Electricity Authority

PPA security

India is experiencing a boom in renewable energy. According to the Ministry of New and Renewable Energy (MNRE), 14.3 GW of on-grid renewable energy generating capacity was added over the 30 months between mid-2014 and end-2016. Renewables accounted for 7.3% of all power produced over April-October 2016 based on 14.2% of installed generating capacity (44 GW out of a national total of 310 GW).

The enthusiasm for renewables, in contrast to the slowdown in conventional generation technologies, reflects the availability of long-term Power Purchase Agreements (PPAs). Two central government enterprises, NTPC Vidyut Vayapar Nigam and the Solar Energy Corporation of India, have offered to buy renewable electricity under 25-year PPAs.

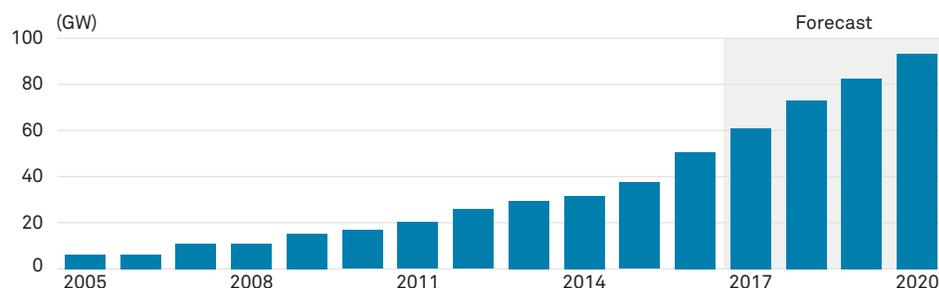
For the conventional power generators, the situation is much more difficult. State-owned utilities are the primary market for these projects. This has forced generators into the open market, where wholesale prices have fallen by about 30% over the past two years. Distribution companies are falling short not just on PPAs, but on their renewable energy purchase obligations. Returning them to financial health is thus imperative for both the conventional and renewable energy sectors.

Persistent debt problems

State utilities have for years been forced to provide electricity below cost. Moreover, state governments have failed to pay for the electricity supplied. As a result, chronic levels of debt have built up. Industrial users complain that their high cost of electricity, along with other inputs, is a major factor in their loss of competitiveness in export markets.

Overall, at the end of fiscal 2013/2014 — the last year for which audited accounts are available — the utilities were losing Rupee 0.73 on each kWh generated at an average cost of Rs5.15/kWh, resulting in combined losses of over Rs643 billion during 2014. These losses have starved the utilities of capital for investment in their power distribution networks. The collapse of old transmission lines and transformers is not uncommon and represents a major source of outages.

FORECAST RENEWABLES CAPACITY, EXCLUDING HYDRO



Source: Platts Analytics

The rising debt burden has pushed the state utilities to such a financial abyss that their interest costs alone now comprise a major portion of their annual losses. The government has implemented a major plan to provide the state distribution utilities with more financial stability, but not for the first time. The problem will not ultimately be resolved until the distribution companies recover costs on the electricity they distribute.

Renewables shift

Delhi now expects to beat its Paris Agreement target of achieving 40% of all power production from non-fossil fuels by 2030 by a long way; 56.5% by 2027 is the new goal. The ambitious forecast was set out in the CEA's draft ten-year energy blueprint. Its optimism is based on higher-than-anticipated levels of private sector investment, which in turn are the result of lower costs.

By 2022, the CEA sees 175 GW of installed renewable capacity, not including large hydro; 100 GW solar, 60 GW wind, 10 GW biomass and 5 GW small hydro. The government estimates that \$250 billion in new investment will be required between now and 2022 to attain its targets. By 2027, the forecast is 275 GW of installed renewable energy generating capacity, plus 72 GW of large hydro and 15 GW of nuclear, while energy efficiency measures will avoid the need for another 40 GW.

One of the most striking findings is the CEA's forecast for anticipated capacity additions covering the period 2022-27: 100 GW renewables, 12 GW large hydro and 4.8 GW nuclear, with no new coal. Although not stated in the report, it seems possible that some coal-fired capacity could be stranded within 10-15 years.

“The substantial higher capacity target of renewables will ensure greater energy security, improved energy access and enhanced employment opportunities. With the accomplishment of these ambitious targets, India will become one of the largest green energy producers in the world, surpassing several developed countries. — Central Electricity Authority, Draft Electricity Plan, December 2016”



The plan forecasts that power demand will continue to grow at the current rate of 6% a year for the foreseeable future. The draft plan will form the basis of the 13th National Electricity Plan, which commences in fiscal 2017/18.

Solar storm

The rise of the solar photovoltaic sector in India has been particularly remarkable. A paltry 6 MW of new solar PV capacity was added in 2009, but fiscal 2016/17 is expected to be the first in which more solar PV than wind power generating capacity is installed.

There is now 10 GW of installed solar PV capacity in the country, of which 4.9 GW was commissioned last year. Solar energy accounted for 16.7% of new power generating capacity added in 2016. Almost 21 GW of solar generating capacity was offered in government tenders in financial year 2015-16, of which 11.2 GW has already been awarded.

India has benefitted from rapidly falling manufacturing costs, higher solar energy conversion rates and spare manufacturing capacity in other parts of the world. Total solar PV costs have fallen by 80% over the past five years and the average selling price of Chinese solar modules in India fell by 30% in 2016 alone.

Solar power in India is being driven largely by fierce competition in auctions for long-term PPAs. According to the results of these auctions, solar power is coming in cheaper than some coal-fired power projects. Low returns on investments in solar projects won at below Rs5/kWh are a major concern among lenders who question whether cash flow will be sufficient to service the debts.

There is still scope for PV investment to be spread more evenly across the

“Frankly, I don't see any strength of challenge to getting finance for these programs.

Gone are the days when governments had to grapple with subsidies. You don't need to convince investors anymore – it is really in their own interests.

It makes good economic sense to invest in energy efficiency and clean energy. – Mines and

*Renewables Minister
Piyush Goyal ”*

country. A total of 89% of all installed solar PV capacity is located in just ten of India's 29 states.

However, the solar supply chain highlights a major problem with, and an opportunity for, the “Make in India” campaign. Most of the modules are imported as domestic manufacturers are not competitive. The US won a WTO case in 2016 that limits how much local content the government can mandate in its tenders to below 20% of the total 100 GW planned. The Indian import market for solar panels thus looks likely to thrive. Domestic solar panel manufacturers have annual production capacity of 1.2 GW of solar cells and 5.6 GW of modules, but they are operating at very low capacity.

Wind power

Wind power remains the mainstay of renewable generating capacity in the country. India had 28.2 GW of installed wind power capacity at end-October, the fourth highest national figure in the world,

after China, the US and Germany. A total of 3,423 MW was added in financial year 2015-16, 43% above the government's target. As with solar PV, Tamil Nadu in the southeast of the country has more wind power generating capacity than any other state, with 7.6 GW in October 2016.

Another 4.5 GW of wind capacity is expected to be added in 2017. In addition, India's first commercial offshore wind power project could be developed following the conclusion of a memorandum of understanding between Samiran Udaipur Windfarms and Gujarat state government in early January. The 500 MW project will be developed in the Gulf of Kutch near Jakhau.

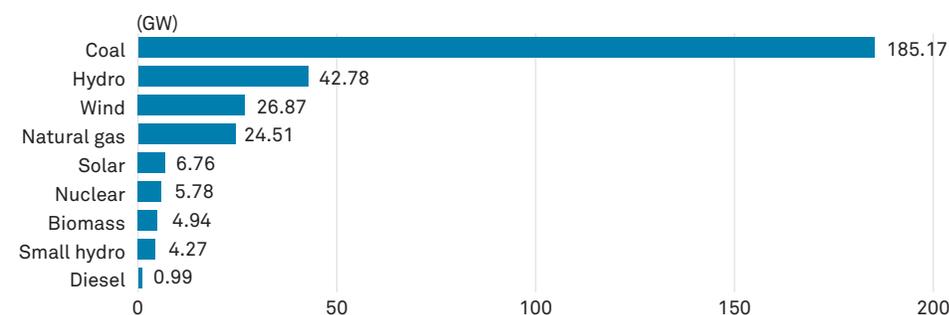
No target has been set for offshore wind, but MNRE has been authorized to carry out an allocation of offshore wind power blocks to "pave the way for offshore wind energy development including setting up offshore wind power projects". Spanish firm Gamesa is now the biggest turbine supplier in India, having overtaken India's own Suzlon Energy.

Grid stability and investment

Despite the positivity around the renewable energy sector's prospects, there are still significant problems. The government is increasingly concerned with how to integrate renewables to stabilize the grid, a situation which is starting to push India towards electricity storage projects.

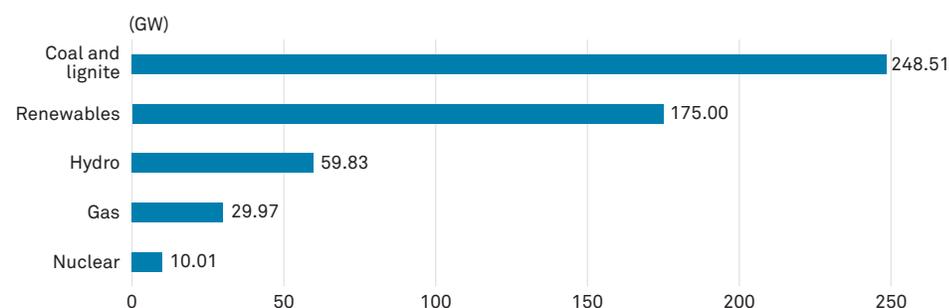
The centerpiece of the government's response is the Green Energy Corridor, which comprises a series of new transmission lines that will connect renewable energy rich states with those with limited renewable energy potential. In particular, the new transmission lines will connect 34 solar parks located in 21 states.

INDIAN INSTALLED GENERATING CAPACITY AS OF 31 MARCH, 2016



Source: CEA, Draft National Electricity Plan

PROJECTED INSTALLED CAPACITY BY END 2021-22



Source: CEA, Draft National Electricity Plan

SOLAR OUTPERFORMS 2012-2017 12th YEAR PLAN TARGETS (MW)

	Target	As of 31 March, 2016	Expected by end of plan
Solar	10,000	5,823	17,823
Wind	15,000	9,509	13,609
Bio-power and waste	5,000	1,719	2,219
Small hydro		879	1,104
Total	30,000	17,930	34,755

Source: CEA, Draft National Electricity Plan

The new transmission capacity is needed as the lion's share of the new solar PV capacity will be provided by large, utility-scale projects. The Power Grid Corporation of India, which aims to complete the GEC by 2020, estimates development costs at R380 billion.

The government is putting the expansion of renewables and energy efficiency at the heart of an industrial strategy designed to reduce unemployment and provide new income streams for poor farmers, who form a key electoral

grouping. This has been shown by the roll out of more energy efficient pumps, LED lighting and increased electrification (about 30% of the population still lacks access to electricity).

The increase in private-sector capital in the electricity sector is a very positive development. But, while major gains are being made, particularly regarding falling costs and energy efficiency, regulated electricity prices remain a substantial barrier to competition, while subsidies create unwelcome market distortions.

'Make in India'

A government initiative to transform India into a manufacturing hub

25 focus sectors

Automobile



Automobile components



Aviation



Biotechnology



Chemicals



Construction



Defense manufacturing



Electrical machinery



Electronic systems



Food processing



IT and BPM



Leather



Media and entertainment



Mining



Oil and gas



Pharmaceuticals



Ports and shipping



Railways



Renewable energy



Roads and highways



Space



Textiles and garments



Thermal power



Tourism and hospitality



Wellness



Summing it up...

Key forecasts

India's crude oil demand is expected to grow at a Compound Average Annual Growth rate of 5% until 2020.

Oil products demand is expected to grow annually by 7-9% over the next 5-10 years.

Gas demand is forecast to rise at a CAGR of 4% to 183 MMcm/d by 2021. Utilization of LNG terminal capacity is expected to grow from around the current 16 million mt to 30 mt/yr by 2022.

A switch in power sector policy suggests India's coal-for-power generation expansion may start to peter out after 2022, potentially leaving some assets stranded in a 10-15 year time frame.

Already the third-largest polymer market in the world, demand is growing at 10% a year, a growth rate expected to be sustained over the next decade.

Short-term steel demand is forecast to grow at 4.5-5.5%, accelerating to 6.0-6.5% CAGR through 2020-21, driven by the steel-intensive railway and urban infrastructure sectors.

Power demand is forecast to surge 44% from 2016 levels by 2020.

Key challenges

To expand its manufacturing sector, Indian labor and capital must become more productive; strong GDP growth means little, if based on population growth alone.

India is heavily dependent on many imported feedstocks and is vulnerable to external shocks and price fluctuations. Ensuring stable long-term energy and resource supplies will be critical to expand manufacturing.

India's position in terms of competitiveness has improved sharply over the past two years, but a lot still needs to be done to close the gap with countries like China.

To transform the manufacturing sector, growth must be based on both the domestic market, which will require a broader distribution of income, and a more competitive economy that allows Indian manufacturers to expand their presence in foreign markets.

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