White paper

Coal gasification for energy and chemical security

A strategic roadmap for India's industrial resilience

April 2026

The better the question.
The better the answer.
The better the world works.

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“

A landmark **INR8,500 crore** incentive framework has been introduced to transform India’s coal resources into high value chemicals and fuels, marking a decisive step toward national self reliance and industrial resilience.

– National Coal Gasification Mission – Ministry of Coal

”

A strategic step towards India's energy and chemical self-reliance

Release of the White paper

This report was formally released by

Hon'ble Chief Minister of Maharashtra,
Shri Devendra Fadnavis
and
Hon'ble Union Minister for Coal and Mines,
Shri G. Kishan Reddy

Their leadership and continued commitment to strengthening India's energy security and advancing coal gasification have been Instrumental in shaping the strategic direction outlined in this report.

In the presence of
Shri Balasaheb Darade, Founder and Managing Director
Shri Madhusudan Agrawal, Chairman
Shri Aayush Agrawal
Shri C.P. Gurnani, Board Member

Acknowledgement

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Their collective efforts have helped bring together the insights, analysis and strategic perspectives presented in this report.

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Executive summary

India imports approximately 85% to 90% of its crude oil, and the combined import value of energy-derived chemical feedstocks exceeds US$30 billion annually. Coal gasification offers a strategic pathway to domestic energy and industrial resilience.

India's energy security challenge extends far beyond its dependence on imported crude oil and natural gas. Beneath the visible layer of fuel vulnerability lies a deeper structural exposure: India's growing reliance on energy derived chemicals and petrochemical intermediates that form the backbone of modern industrial production. Recent geopolitical disruptions – including sustained tensions in West Asia and supply chain volatility triggered by the Russia-Ukraine conflict – have demonstrated how global fuel price shocks rapidly cascade across these downstream sectors, inflating input costs and amplifying fiscal stress on the national exchequer.

Against this backdrop, coal gasification stands out as India's most strategic near term pathway to simultaneously strengthen energy security, reduce dependence on imported chemical feedstocks, enable self reliant fertilizer production and catalyze a resilient domestic industrial base. Crucially, modern coal to chemicals pathways are also compatible with India's long term sustainability objectives when paired with integrated carbon capture, utilization and storage (CCUS).

To unlock this opportunity at scale, India should adopt a coherent, product specific and mission oriented policy framework. This white paper recommends the following interventions:

- Adopt a phased DME blending mandate –targeting 10% to 20% inclusion in LPG cylinders by 2027, –to create early demand and accelerate market adoption
- Direct the Department of Fertilizers to formulate a dedicated coal to urea investment and offtake policy, enabling coal based urea to compete on equitable terms with gas based production.
- Integrate a sub sectoral window for coal based urea under the upcoming VIKALP scheme and enhance the Viability Gap Funding (VGF) quantum.
- Classify coal gasification under the Harmonized List of Infrastructure Sub-Sectors, to enable access to long-tenor, low-cost financing, while providing customs duty and GST relief on critical capital equipment to mitigate the substantially higher capital intensity of coal-to-urea projects relative to gas-based facilities
- Extend targeted fiscal incentives, including accelerated depreciation and tax holidays, to improve project viability and attract large scale private investment.

Together, these interventions will position coal gasification as a national industrial strategy – one that transforms

India's abundant coal reserves into secure, domestic sources of urea, methanol, DME, ammonia and other critical intermediates, while reducing exposure to global energy volatility and advancing India's long term industrial and economic sovereignty.

~88% Crude oil import dependence	US$30B+ Chemical feedstock imports/yr
US$13-15B Annual LPG import bill	360 BT Coal reserves (geological)

Key findings

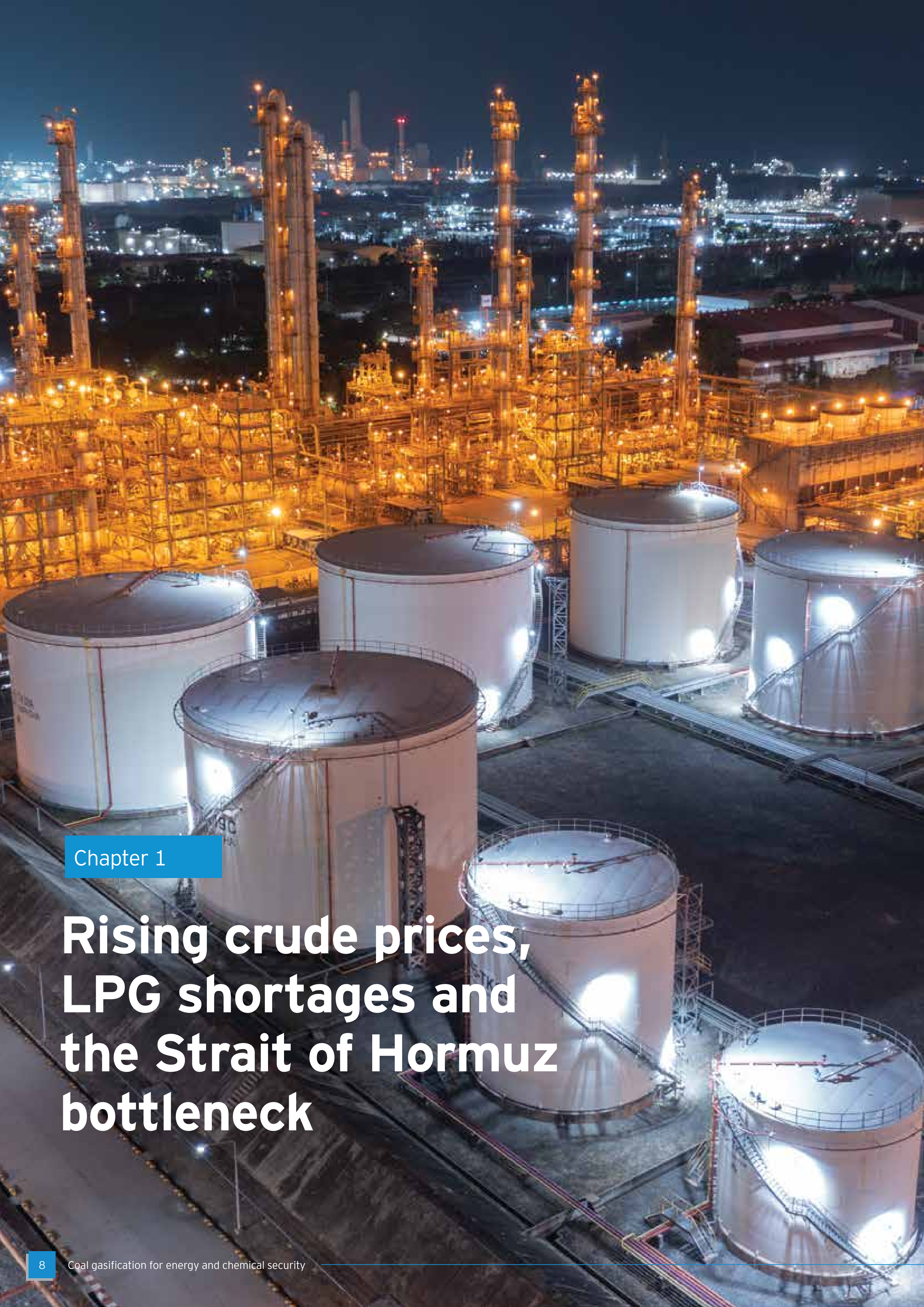
The Strait of Hormuz remains India's most critical energy chokepoint, with approximately 30% of global seaborne crude and 90% of India's LPG imports transiting through this corridor. Recent geopolitical escalations in West Asia have already produced supply disruptions, port delays and LPG price increases of up to INR144 per commercial cylinder.

India's crude oil import dependence has risen steadily from 83.8% in FY 2018-19 to approximately 88.2% in FY 2024-25, against the backdrop of stagnant domestic crude production at around 29 MMT annually. The import bill surged to US$158 billion in FY 2022-23 – the highest in recent history – driven by energy price shocks

Chemical feedstocks, including ammonia, urea, MEG, methanol and ammonium nitrate together represent an annual import bill exceeding US$30 billion. During the 2022 energy crisis, ammonia prices surged by 350%, urea by 150% and MEG by 95%, demonstrating the systemic risk embedded in India's industrial supply chains.

Dimethyl ether (DME), producible from coal gasification, can partially substitute LPG imports. An 8% national blending program could displace approximately 2.5 million tons of LPG imports annually. BIS has already notified standards permitting up to 20% DME-LPG blending in India.

New Era Cleantech Solution Pvt. Ltd. is translating these strategic imperatives into industrial reality through India's first greenfield private sector integrated coal gasification complex in Chandrapur, Maharashtra – with a product portfolio directly addressing the country's most critical chemical import dependencies.



Chapter 1

Rising crude prices, LPG shortages and the Strait of Hormuz bottleneck

1.1
Global energy markets under stress

Global energy markets are once again facing a period of significant disruption. A renewed wave of geopolitical tensions in West Asia has created instability in global maritime shipping routes, leading to rising crude oil prices and supply constraints in key fuels such as liquefied petroleum gas (LPG). For energy-importing economies such as India, these developments have immediate economic implications. Rising crude oil prices directly influence domestic fuel costs, inflation and the national import bill.

1.2
Strait of Hormuz: A strategic energy chokepoint

Strategic importance

At the center of the current disruption lies the Strait of Hormuz, one of the most critical maritime energy corridors in the world. This narrow waterway connects the Persian Gulf to global markets and serves as the primary export route for crude oil and petroleum products from major Gulf producers.

~30% Share of global seaborne crude	**14 MMBPD*** Crude oil transported daily
~90% India's LPG imports via Hormuz	

* million barrels/day

Recent disruptions

Recent attacks on oil tankers and escalating geopolitical tensions in the region have significantly affected tanker traffic and maritime logistics. Shipping insurers have raised risk premiums for vessels operating in the region, tanker movement has slowed creating delays in energy shipments and several cargo shipments have experienced significant logistical disruptions.

1.3
Global oil prices surge amid supply disruptions

The disruption in Gulf shipping routes has rapidly translated into volatility in global crude oil markets. Brent crude prices have briefly reached US$100 per barrel, with energy market analysts warning that prices could rise to US$110 per barrel or higher if supply disruptions persist. Some Gulf producers have reduced output due to security concerns and logistical constraints.

> Every US$10 increase in crude oil prices raises India's annual import bill by approximately US$14-US$16 billion, underscoring the country's structural exposure to global oil market volatility

1.4
LPG supply chains under strain

While crude oil supply chains can sometimes adjust through diversification of suppliers, LPG supply chains are more concentrated and therefore more vulnerable to disruption. India imports a significant share of its LPG consumption, with most imports originating from producers in the Middle East.

55-60% Share of LPG demand imported	**Majority** LPG imports from the Middle East
~90% LPG via Hormuz	

1.5
Early signs of LPG shortages

Emerging supply stress

Early indicators of supply stress have already begun to appear in domestic LPG markets. LPG prices have increased by INR60 for domestic cylinders and up to INR144 for commercial cylinders. Delays in LPG tanker arrivals have been reported at several Indian ports. Commercial LPG cylinder shortages have been observed in multiple cities, with hotels, restaurants and small businesses reporting disruptions in fuel availability.

Government response measures

> To stabilize supply, the Government of India has invoked the Essential Commodities Act (ECA) 1955 (as of 10 March 2026) to address critical energy supply disruptions. Additional measures include prioritization of household LPG supply over commercial consumers, a 25% increase in domestic LPG production and enhanced monitoring of distribution networks to prevent hoarding and panic buying.

Chapter 2

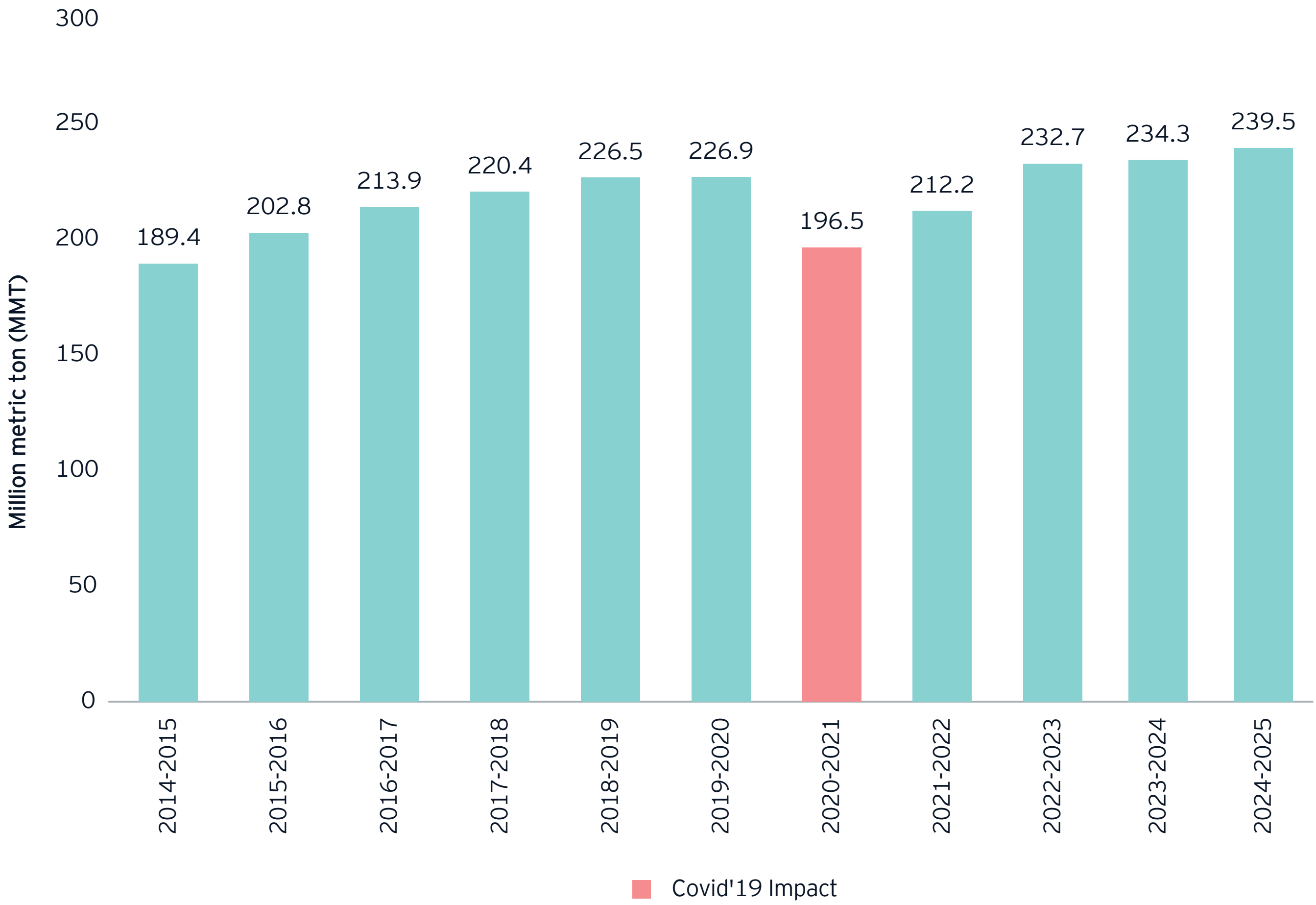
India's energy import dependence: The big picture

India is currently the third-largest oil importer in the world and one of the largest energy consumers globally. Despite its growing energy demand, the country remains heavily dependent on imported hydrocarbons, importing approximately 85% to 90% of its crude oil requirements.

2.1
Crude oil imports: Historical trends

Demand growth across transportation, petrochemicals, aviation and industrial sectors has steadily increased India's crude oil consumption over the past decade. The temporary decline in FY 2020–21 reflects the slowdown in economic activity during the COVID-19 pandemic; however, crude demand recovered sharply as economic activity resumed.

Figure 1: India crude oil imports volume trend (MMT)

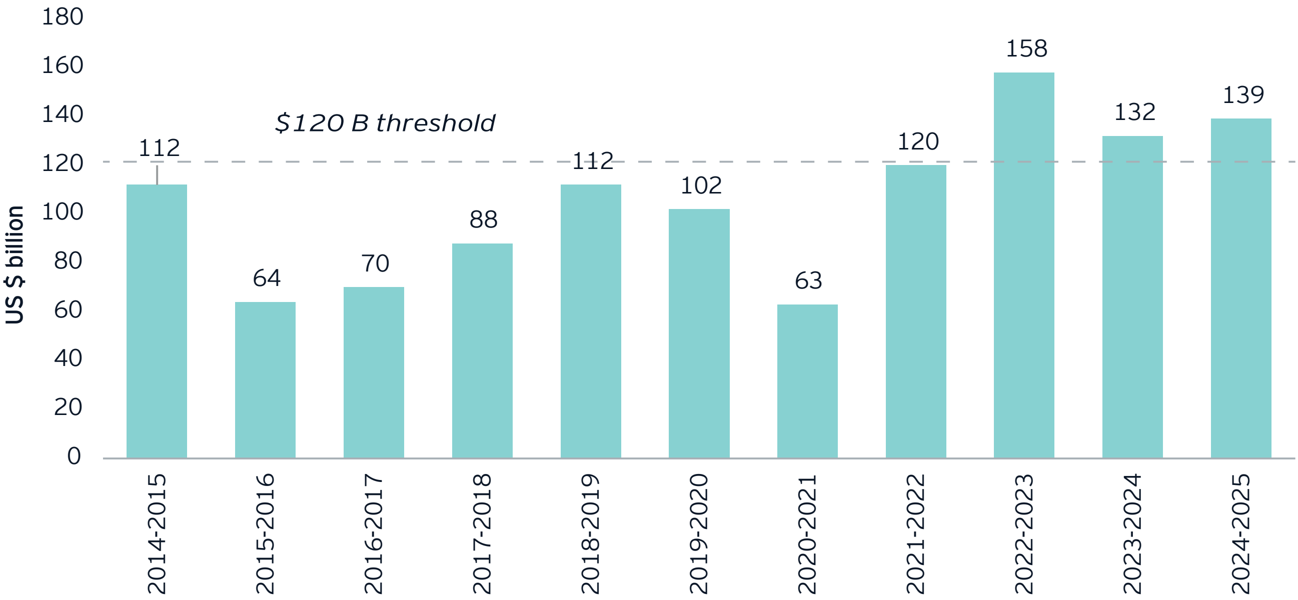


Source: PPAC, Ministry of Petroleum and Natural Gas

2.2
Crude oil import bill

Energy price shocks significantly influence India's foreign exchange outflows, making crude oil prices a critical macroeconomic variable. The sharp increase to US$158 billion in FY 2022-23 was primarily driven by elevated crude prices following geopolitical disruptions linked to the Russia-Ukraine conflict.

Figure 2: India crude oil imports import bill (US$ billion)

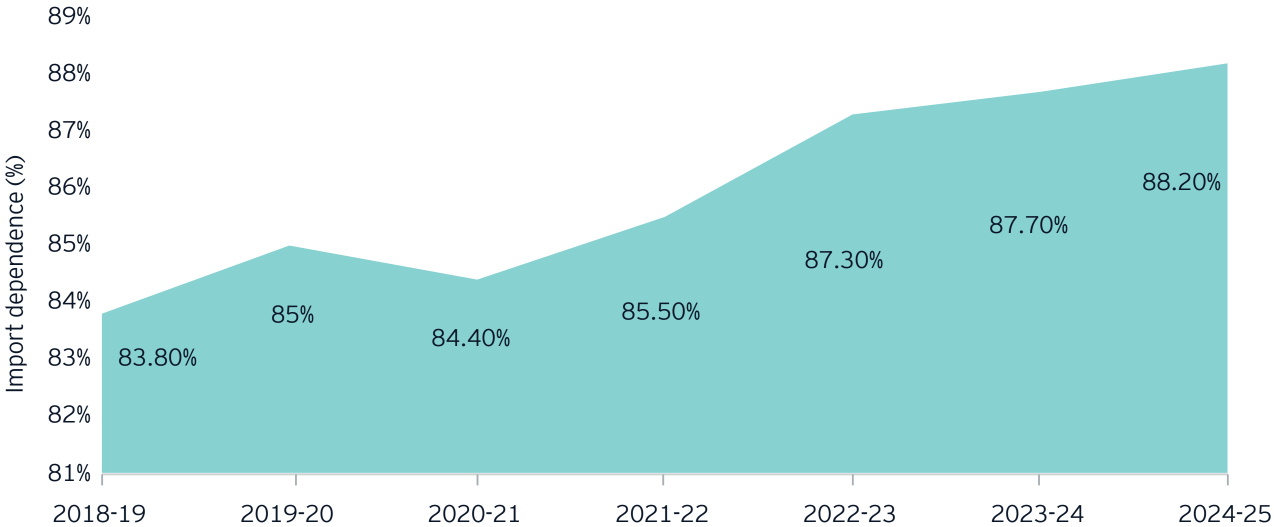


Source: PPAC, Ministry of Petroleum and Natural Gas

2.3
Crude oil import dependence

India's import dependence has gradually increased due to declining domestic crude production. Domestic crude oil production remains around 29 million tons annually, which is insufficient to meet the country's rapidly growing energy demand.

Figure 3: India's crude oil import dependence (%)

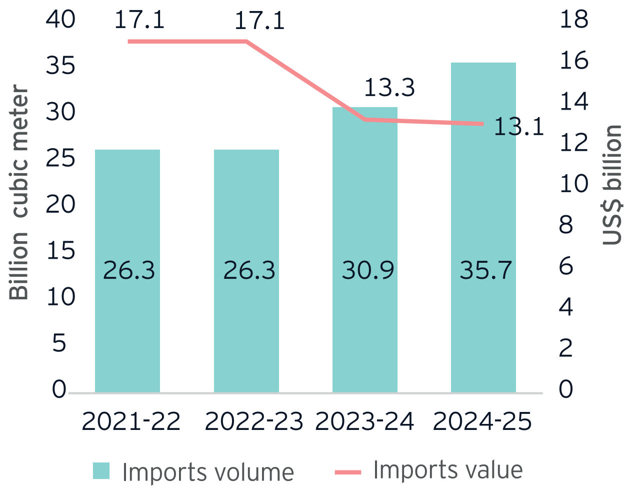


Source: Ministry of Petroleum and Natural Gas

2.4
LNG imports

Natural gas consumption in India has increased steadily due to the expansion of city gas distribution networks, fertilizer production and power generation. India aims to increase the share of natural gas in its energy mix from approximately 6% to 15%. Differences in import value largely reflect volatility in global LNG prices..

Figure 4: India's LNG imports volume (billion cubic meter) vs value (US$ billion)

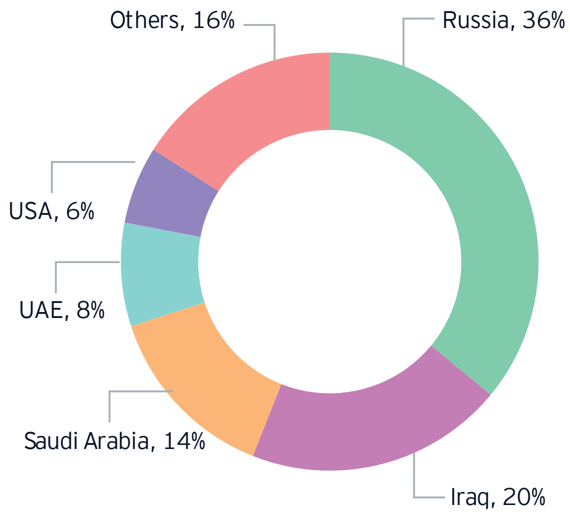


Source: PPAC

2.5
India's crude oil import basket

India has significantly diversified its crude oil suppliers in recent years. Russia emerged as India's largest crude supplier after 2022, primarily due to discounted crude flows. However, the Gulf region remains strategically critical for LNG imports, with Qatar alone supplying approximately 47% of India's LNG requirements.

Figure 5: India's crude oil import basket (FY 2024-25)

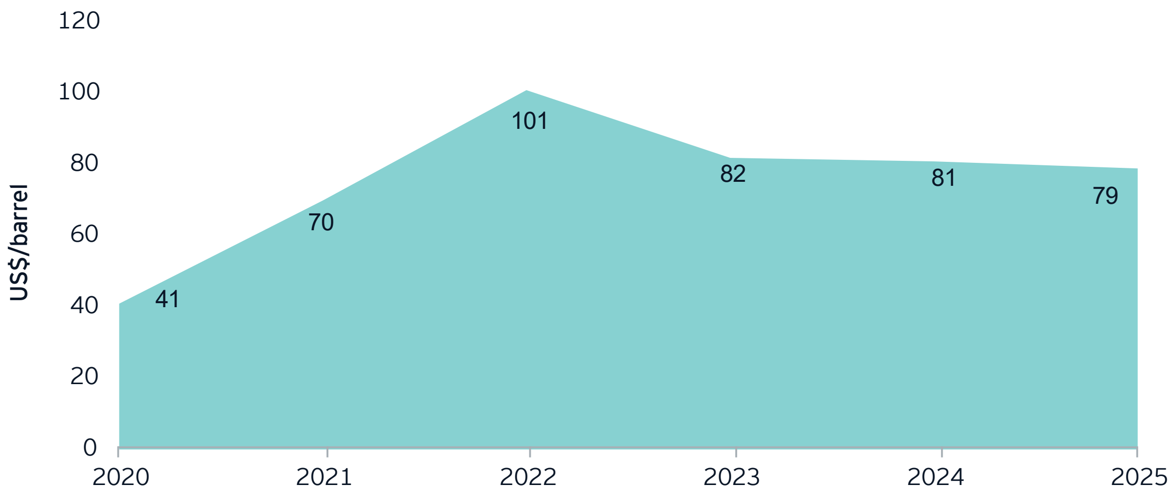


Source: PPAC

2.6
Oil price volatility and economic impact

Oil prices have historically demonstrated significant volatility. Higher oil prices affect several macroeconomic indicators including inflation levels, fertilizer subsidy expenditure, trade deficit, and currency stability – collectively influencing India's economic resilience and fiscal balance.

Figure 6: Average Brent crude oil prices (US$/barrel)



Source: World Bank Commodity Markets Outlook; IEA World Energy Outlook

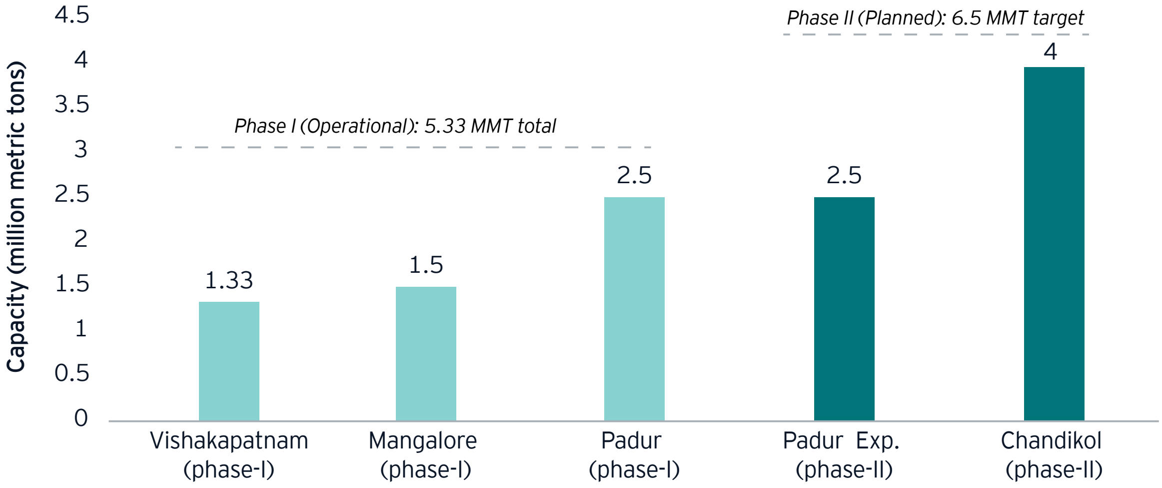
Chapter 3

Government of India's strategy to strengthen energy security

3.1
Strategic petroleum reserves

To safeguard against potential supply disruptions, India has developed strategic petroleum reserves (SPR) consisting of underground storage caverns. Under Phase I, three strategic crude oil storage facilities were established, providing approximately 9 to 10 days of national crude oil consumption during supply disruptions. Combined with commercial stocks (refineries/pipelines), India maintains a total energy buffer of approximately 74 to 87 days. Phase II targets expansion to cover up to 90 days of consumption, aligning India with IEA and OECD energy security standards.

Figure 7: Strategic petroleum reserves - MMT (phase I and II[1])

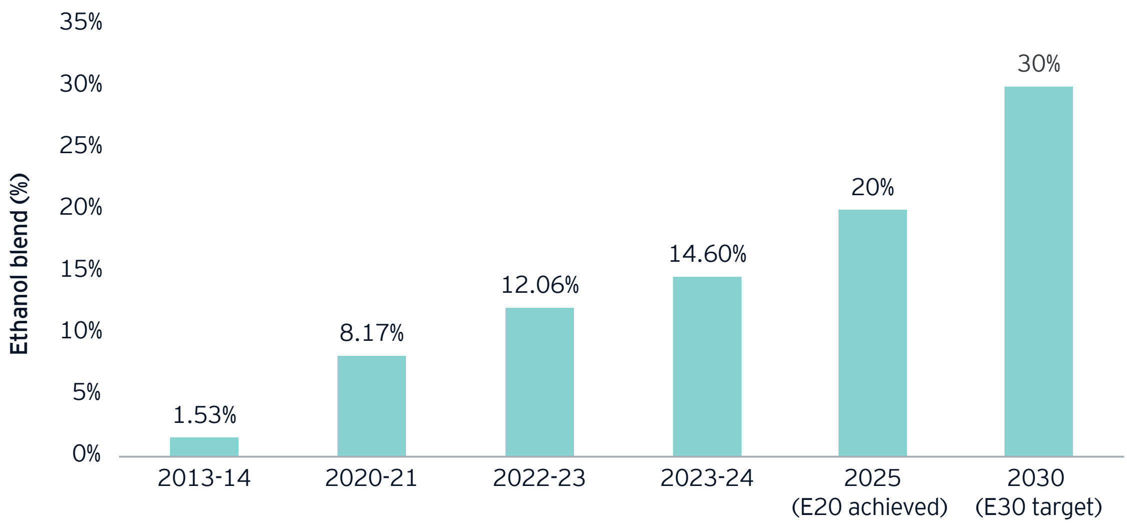


Source: ISPRL

3.2
Ethanol Blended Petrol (EBP) Programme

India has achieved significant progress in ethanol blending, successfully achieving E20 – 20% ethanol blending – nearly five years ahead of its original 2030 target. The government has now set a more ambitious goal of achieving E30 by 2030. Key outcomes of the program include: INR1.08 lakh crore in foreign exchange savings; 185 lakh tons of crude oil substituted; 557 lakh tons of CO emissions avoided; and INR92,000 crore in payments to farmers.

Figure 8: India's ethanol blending program progress[2]



Source: Ministry of Petroleum and Natural Gas; E20 achieved ahead of schedule

[1]Phase II capacities are planned/indicative
[2] E20 blending target was achieved ahead of schedule

3.3
Alternative fuels and bioenergy

The SATAT (Sustainable Alternative Towards Affordable Transportation) initiative promotes the production of Compressed Bio-Gas (CBG) from agricultural residue, organic waste and municipal waste streams. The government is also promoting biodiesel blending programs and encouraging automobile manufacturers to produce flex-fuel vehicles capable of operating on higher ethanol blends.

3.4
Diversification of crude oil supply

India has expanded its crude oil import sources to reduce geopolitical risk, with increased imports from Russia after 2022, continued purchases from Iraq, Saudi Arabia and the UAE, and rising imports from the United States and West Africa. India also aims to increase the share of natural gas in the country's energy mix from approximately 6% to 15% over the coming years.

3.5
Integrated energy security strategy

India's evolving energy policy framework is built around four major pillars: strategic petroleum reserves; biofuel blending programs; diversification of global energy supply sources; and expansion of domestic alternative fuels. Together, these measures aim to strengthen India's energy resilience, reduce exposure to global supply disruptions and support long-term economic growth and environmental sustainability.

3.6
Present policy scenario In India

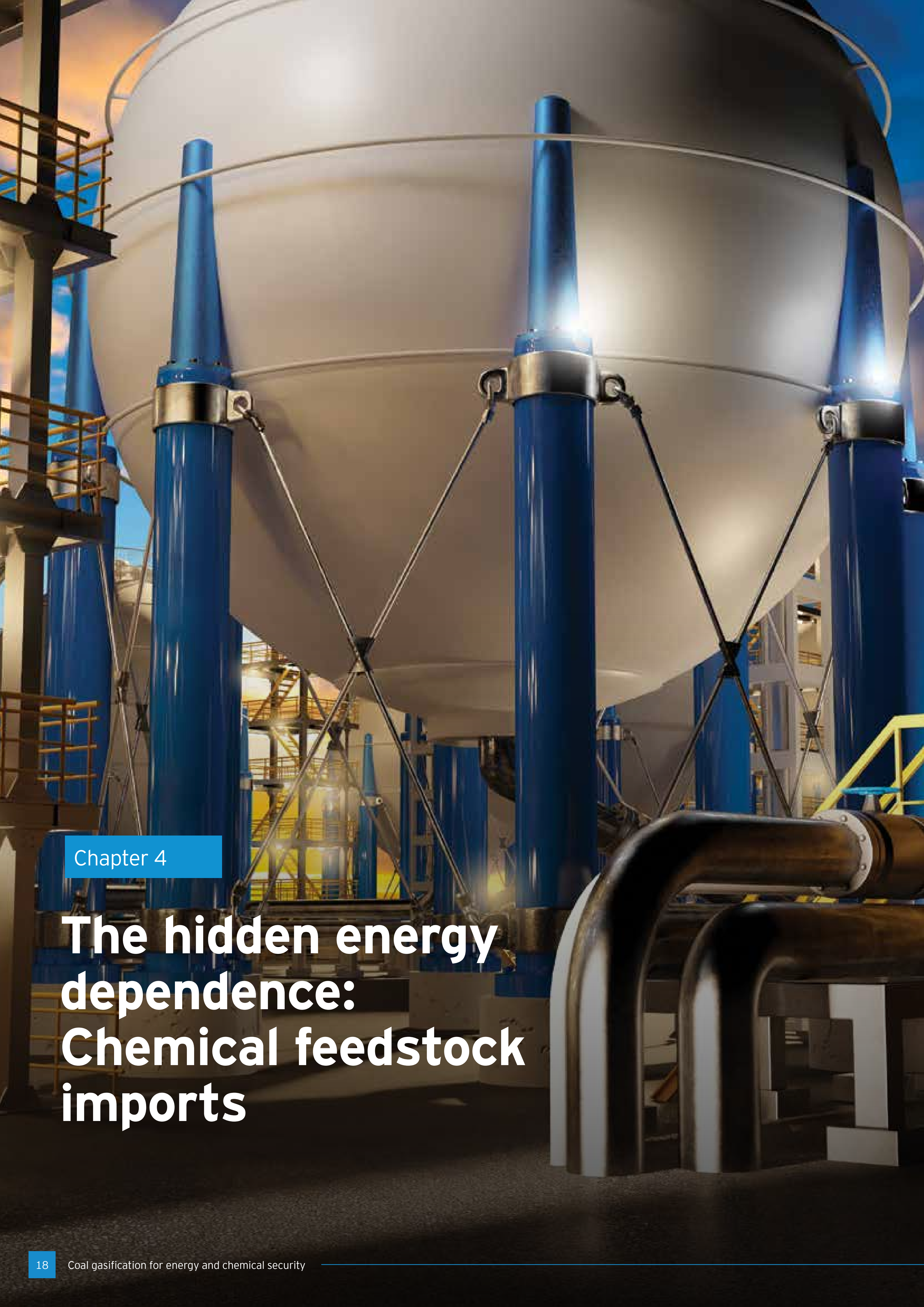
National Coal Gasification Mission

The Government of India launched this Initiative with the aim to reduce India's heavy dependence on imported fuels and promote cleaner utilization of the country's abundant coal reserves by converting coal into synthesis gas (syngas) and downstream products such as methanol, ammonia, hydrogen and synthetic natural gas. The mission's central target is to gasify 100 million tons of coal by 2030. By advancing coal gasification, India seeks to enhance energy security, conserve foreign exchange and build domestic value chains in chemicals, fertilizers and clean energy feedstocks.

Coal and lignite gasification initiative

The coal ministry has allocated INR8,500 crore to support gasification projects by both public sector enterprises and private developers. Additionally, they have authorized Coal India Limited (CIL) to invest in joint ventures with BHEL and GAIL for setting up large scale coal gasification facilities. To further strengthen the sector, a new sub sector titled "Production of syngas leading to coal gasification" was introduced under the NRS linkage auction policy in 2022, enabling auctions at regulated prices. As an added incentive, a 50% rebate in revenue share is offered for coal used in gasification during commercial coal block auctions, provided that at least 10% of the mined coal is dedicated to gasification applications.

[1]Phase II capacities are planned/indicative



Chapter 4

The hidden energy dependence: Chemical feedstock imports

India's combined annual import value of energy-derived chemical feedstocks already exceeds US$30 billion – a scale of vulnerability comparable to its crude oil exposure, yet far less visible in policy discussions.

4.1
Energy security beyond fuels

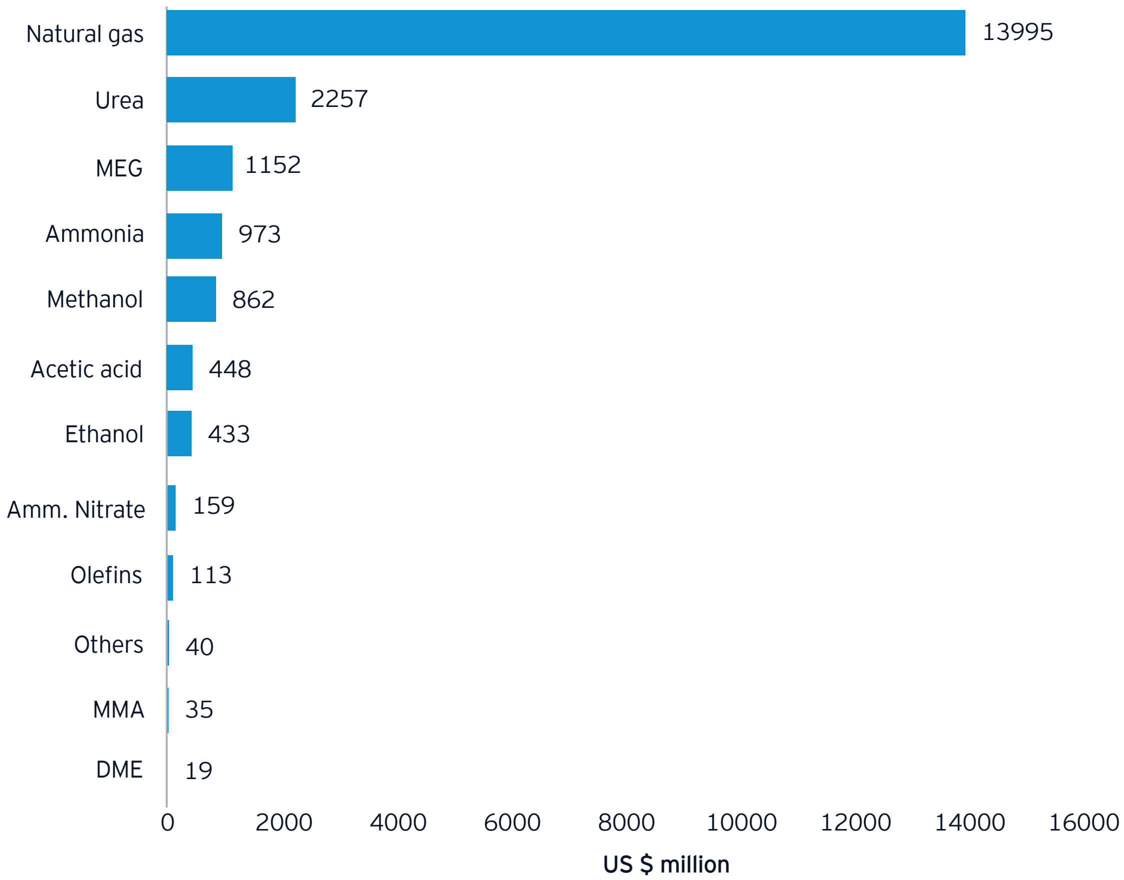
India's dependence on imported energy is often discussed primarily in terms of crude oil and natural gas. However, a deeper and less visible layer of vulnerability exists in the form of energy-derived chemicals and petrochemical intermediates that underpin modern industrial production. These chemicals serve as critical raw materials for fertilizers, plastics and polymers, textiles and synthetic fibers, packaging materials, pharmaceuticals, mining explosives and consumer goods manufacturing.

Official statistics compiled by the Department of Chemicals and Petrochemicals, along with trade data from DGCI&S and global industry datasets, indicate that several key industrial feedstocks remain heavily import-dependent, creating a hidden form of energy dependence embedded within India's industrial production systems.

4.2
Import dependence of energy-derived chemical feedstocks

The chart below illustrates India's dependence on major energy-derived chemical feedstocks and highlights the price volatility experienced during the 2022 global energy crisis.

Figure 9: Import value of key chemical feedstocks (FY 2024-25)



Source: DGCI&S, MoC&P, PPAC

4.3
The 2022 energy crisis: Industrial shockwaves

The global energy crisis of 2022 exposed the deep interconnections between energy markets and industrial supply chains. Several key feedstocks experienced dramatic price increases: methanol prices doubled; ammonia surged by over 300%; ammonium nitrate increased by nearly 200%; MEG rose by approximately 95%; and olefins and petrochemical intermediates increased by around 50%.

4.4
Sectoral impacts of chemical price shocks

Fertilizers and food security

India imports nearly 7 million tons of urea annually to supplement domestic production. During the 2022 crisis, global urea prices surged from approximately US$350 per ton to nearly US$900 per ton. India's fertilizer subsidy bill rose sharply from INR79,530 crore in FY21 to INR2.54 lakh crore in FY23, placing considerable pressure on the national budget.

Textile industry impact

Mono ethylene glycol (MEG), a key feedstock for polyester fibers and PET plastics, saw prices increase by nearly 95% during the crisis. India imports approximately 2.14 million tons of MEG annually, with nearly 70% consumed by the textile industry.

Mining and infrastructure costs

Ammonium nitrate, widely used as an industrial explosive in mining operations, experienced a price rise of nearly 200%. India extracts approximately 1 billion tons of coal and 275 million tons of iron ore annually, making ammonium nitrate price volatility a direct threat to mining sector's economics.

4.5
Strategic lessons for India

The 2022 energy crisis demonstrated that India's industrial ecosystem depends heavily on chemicals derived from global energy markets. Chemical feedstock imports should not be viewed merely as industrial inputs – they represent a strategic extension of India's broader energy security challenge. Strengthening resilience in these supply chains will require diversification of import sources, expansion of domestic production capacity and development of alternative feedstocks such as coal gasification, biomass and synthetic fuels.

Chapter 5

Major energy-derived chemical feedstocks in India

5.1
Methanol

Methanol is one of the most important industrial chemicals imported by India, functioning as a platform chemical supporting multiple downstream industries including plastics, resins, solvents and fuel additives. India's domestic methanol production remains limited, with domestic capacity of approximately 0.35-0.40 MMT against imports of 2.5-3.0 MMT annually – an import dependence of 65% to 70%. Top import sources are Oman, Saudi Arabia, Qatar, Iran and China. Middle Eastern producers dominate global methanol supply because production relies heavily on natural-gas-derived synthesis gas, giving gas-rich countries a substantial cost advantage.

5.2
Acetic acid

Acetic acid plays a crucial role in the production of polymers, synthetic fibers and pharmaceutical intermediates. India's domestic production stands at approximately 0.7-0.8 MMT against imports of 1.1-1.2 MMT, representing approximately 60% import dependence. Import value is approximately US$450-US$500 million. Because acetic acid production depends heavily on methanol feedstocks, its cost structure is indirectly linked to global natural gas markets. Principal uses include Vinyl Acetate Monomer (VAM), PTA and polyester intermediates, adhesives and industrial resins and pharmaceutical intermediates.

5.3
Mono ethylene glycol (MEG)

Mono ethylene glycol (MEG) is one of the most important petrochemical intermediates used in India's manufacturing sector, particularly in textiles and plastics. Domestic production stands at approximately 1.5-1.7 MMT against imports of 2.1-2.3 MMT (import value: approximately US$1.15 billion; import dependence: 55% to 60%). Principal suppliers are Saudi Arabia, Kuwait, UAE, China and South Korea. MEG is primarily used in polyester fiber production, PET bottle manufacturing, plastic packaging materials and automotive antifreeze.

5.4
Ammonia and urea

Fertilizer feedstocks represent one of the most strategically important chemical supply chains in India due to their direct link with agricultural productivity and food security. India's domestic ammonia production stands at 13-14 MMT annually; imports of 2.0-2.5 MMT account for 15% to 18% import dependence. India imports approximately 6-7 million tons of urea annually to supplement domestic fertilizer production. Ammonia is produced through the Haber-Bosch process, which requires hydrogen typically derived from natural gas – making it acutely sensitive to global gas price movements.

5.5
Ammonium nitrate

Ammonium nitrate is widely used as an industrial explosive in mining and infrastructure development. Domestic production stands at approximately 1.1-1.3 MMT with imports of about 0.4 MMT (import dependence: 25% to 30%; import value: approximately US$150-US$170 million). India extracts over one billion tons of coal annually, making ammonium nitrate a critical industrial input. Top import sources are Russia, Turkey, China, UAE and Kazakhstan.

5.6
Dimethyl ether (DME)

Dimethyl ether (DME) is emerging as a clean fuel alternative, particularly for LPG blending. India currently has limited pilot-scale domestic DME production, with imports of approximately 0.03 MMT (import value: about US$19 million). DME can be produced from coal gasification, natural gas reforming, biomass gasification or waste-derived syngas, making it uniquely positioned as a domestically producible LPG substitute.

5.7
Other key feedstocks

India also imports significant quantities of olefins (polyethylene, polypropylene feedstocks) at approximately US$100-US$120 million annually; formaldehyde at approximately US$70 million (largely domestically produced from methanol oxidation); and MMA (Methyl Methacrylate) at approximately US$35 million annually. Each of these chemicals is closely tied to global hydrocarbon prices, creating systemic sensitivity across India's industrial value chains.

Chapter 6

Sustainability and coal gasification

Coal gasification is often perceived primarily as an industrial technology used to convert coal into synthesis gas (syngas). However, when integrated with modern carbon management technologies and circular industrial processes, gasification can also contribute to long-term sustainability objectives and support India's pathway toward net zero emissions by 2070.

6.1 Why gasification is suited for carbon capture

Coal gasification offers technical advantages for carbon capture compared with traditional combustion processes. In conventional coal-fired power plants, carbon dioxide is diluted within large volumes of flue gas, making capture energy-intensive and costly. In contrast, gasification systems produce concentrated CO_2 streams during the syngas conditioning stage, particularly after the water–gas shift reaction, which can be captured more efficiently. Key capture points include shifted syngas streams, process purge gases, methanol synthesis tail gases and industrial off-gas streams.

6.2 Carbon utilization pathways

Captured carbon dioxide can be reused in several industrial processes rather than being released into the atmosphere. Major utilization pathways include methanol synthesis (CO_2 + hydrogen methanol); synthetic natural gas production through methanation; urea synthesis in fertilizer plants; and chemical intermediates for plastics and solvents. These pathways create circular carbon flows, where captured emissions become inputs for industrial production.

6.3 Industrial CCUS projects in India

Tata Steel - Jamshedpur

Tata Steel has commissioned a carbon capture plant at its Jamshedpur facility to capture CO from blast furnace gas streams. The captured CO is used for downstream industrial applications and research on carbon utilization technologies.

Jindal Steel & Power – Angul

The integrated steel complex at Angul incorporates gasification and industrial gas management systems capable of capturing significant volumes of CO from industrial gas streams, demonstrating how steel production and gasification technologies can integrate with carbon capture solutions.

6.4 Global CCUS projects

Several large scale carbon capture initiatives around the world demonstrate the viability of of carbon capture and storage. One such flagship project in Northern Europe enables the collection of CO from multiple industrial sources and its injection into offshore storage reservoirs. Another major initiative in Canada captures CO generated during hydrogen production and stores it securely within deep saline aquifers. A third project in the Asia Pacific region operates one of the world's largest CO injection facilities, channelling captured emissions into subterranean reservoirs for long term containment.

6.5 Clean fuels enabled by coal gasification

Coal gasification enables production of several alternative fuels: dimethyl ether (DME) for LPG blending and diesel substitution; methanol for marine fuels, chemical manufacturing and MTBE production; synthetic natural gas (SNG) injectable into existing natural gas pipelines; and ammonia for fertilizer production and emerging energy applications as a hydrogen carrier and marine fuel.

6.6 Indian case studies on coal gasification

The government has also approved strategic investments by Coal India Limited (CIL) through joint ventures with BHEL and GAIL, enabling large scale coal to chemicals and coal to SNG projects. Further, a 50% rebate in revenue share for gasification dedicated coal has been incorporated into commercial coal block auctions, encouraging miners to allocate at least 10% of their production to gasification pathways. Together, these measures strengthen India's transition toward circular industrial processes and expanded value added utilization of domestic coal resources.

Joint ventures (JVs) by Coal India Limited (CIL)

BPCL and CIL

The JV will establish a large scale coal to SNG facility in the Majri Area of Western Coalfields Limited. This entails an investment of INR12,214 crore and is expected to produce 633.6 million Nm³ of SNG annually. The plant will generate SNG – a methane rich fuel (>95% CH) that closely matches the composition and performance of conventional natural gas – leveraging the proposed Bombay to Nagpur gas pipeline to integrate seamlessly into regional energy networks.

BHEL and CIL

The JV in Odisha, Bharat Coal Gasification & Chemicals Ltd (BCGCL), will convert coal into syngas to produce ammonia, nitric acid and ammonium nitrate. The facility is designed to deliver 2,000 tons of ammonium nitrate per day, requiring 1.3 MT of coal annually, with a total project cost of INR11,782 crore.

GAIL and CIL

Further east, Coal India and GAIL are collaborating on a coal to SNG plant in the Raniganj area of Eastern Coalfields Limited (ECL), West Bengal, employing surface gasification to produce 80,000 Nm³ of SNG per hour, or 633.6 million Nm³ annually, supported by around 1.9 MT of coal per year. With an estimated investment of INR13,052.81 crore, this project strengthens India's transition towards cleaner feedstocks and reduced gas import dependency through circular carbon pathways and advanced coal to energy technologies.

6.7
International climate finance and technology cooperation

Large-scale industrial decarbonization projects involving CCUS and synthetic fuels may qualify for blended finance structures supported by the Green Climate Fund (GCF). Institutions such as the Asian Development Bank (ADB), World Bank and International Finance Corporation (IFC) are actively exploring financing frameworks for industrial decarbonization projects through concessional financing, technical assistance and risk-sharing instruments. India and Japan are also expanding cooperation through the Joint Crediting Mechanism (JCM), which supports deployment of low-carbon technologies in developing countries.

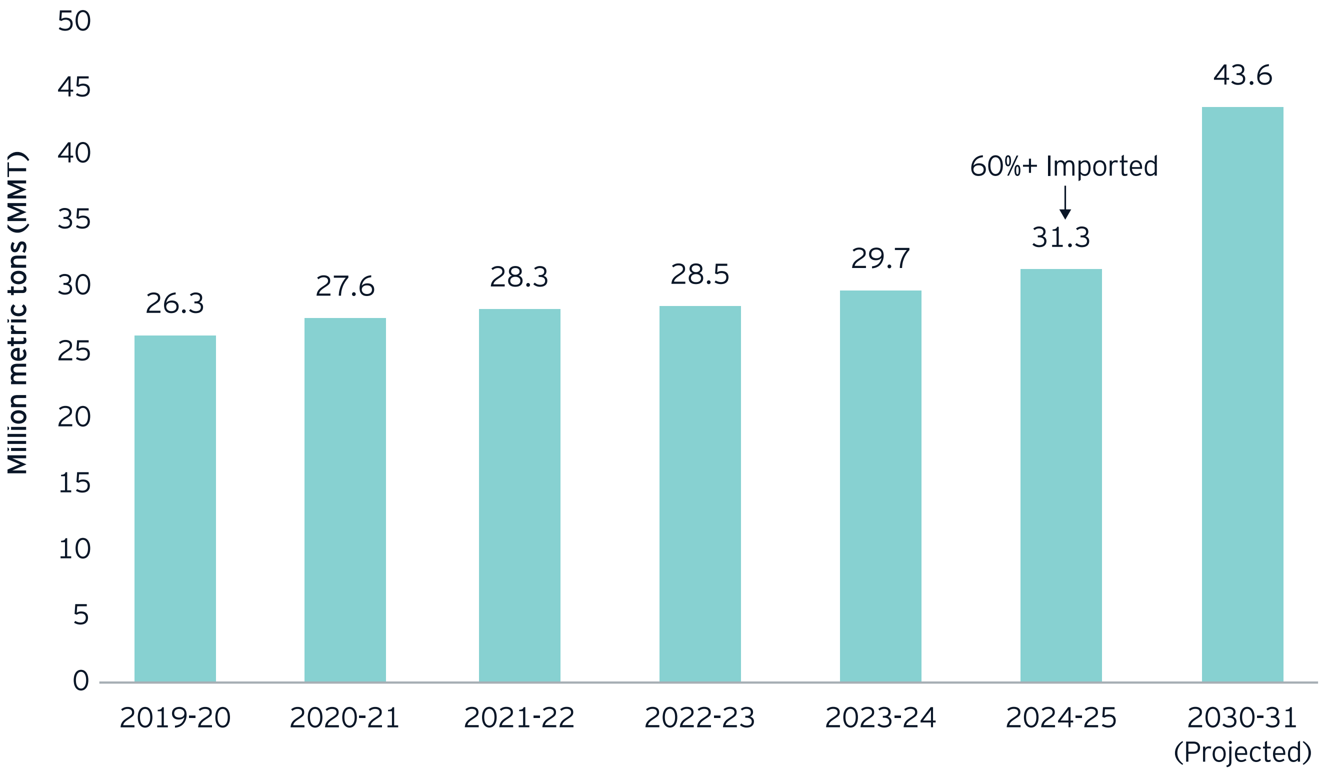
Chapter 7

Dimethyl ether (DME): A strategic solution to India's LPG import dependence

7.1
India's LPG challenge

Liquefied petroleum gas (LPG) has emerged as one of the most important household fuels in India. Over the past decade, LPG consumption has expanded rapidly as millions of households transitioned from traditional biomass fuels to cleaner cooking energy sources. India's LPG demand is projected to reach approximately 43.6 million tons by 2030–31, driven by expanding population, urbanization and improved access to clean cooking energy.

Figure 10: India's LPG consumption trend and projection (MMT)[3]



Source: PPAC

Despite rising demand, domestic LPG production remains significantly lower than consumption. In FY 2024–25, India consumed 31.3 MMT of LPG while producing only 12.8 MMT domestically, importing 20.7 MMT – meaning more than 60% of India's LPG requirement was met through imports. India's LPG import bill currently costs approximately US$13–US$15 billion annually.

7.2
DME: A potential substitute for LPG

Dimethyl ether (CH_3OCH_3) is a colorless gas that liquefies easily under moderate pressure, giving it physical characteristics similar to LPG. DME has physical properties similar to LPG, allowing it to be blended, transported and stored using existing LPG infrastructure with limited modifications. This compatibility significantly reduces the infrastructure investment required for large-scale adoption.

Feedstock flexibility

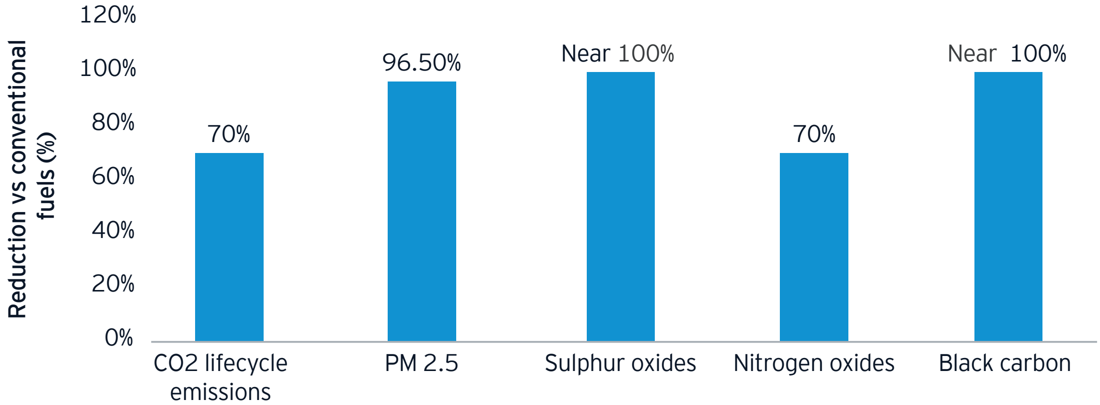
DME can be produced from coal gasification, natural gas reforming, biomass gasification or waste-derived syngas through two major production pathways: the indirect route (Syngas →Methanol →DME) and the direct route (Syngas→ DME via single-reactor catalytic process). Countries with large coal reserves can therefore produce DME domestically through coal gasification technologies.

[3] 2030-31 projected demand

7.3
Environmental advantages of DME

DME combustion produces significantly lower emissions compared with conventional hydrocarbon fuels. Because DME contains no carbon-carbon bonds, combustion occurs without producing soot or particulate emissions, making it suitable as a clean cooking fuel.

Figure 11: DME emission reduction potential vs conventional fuels[4]

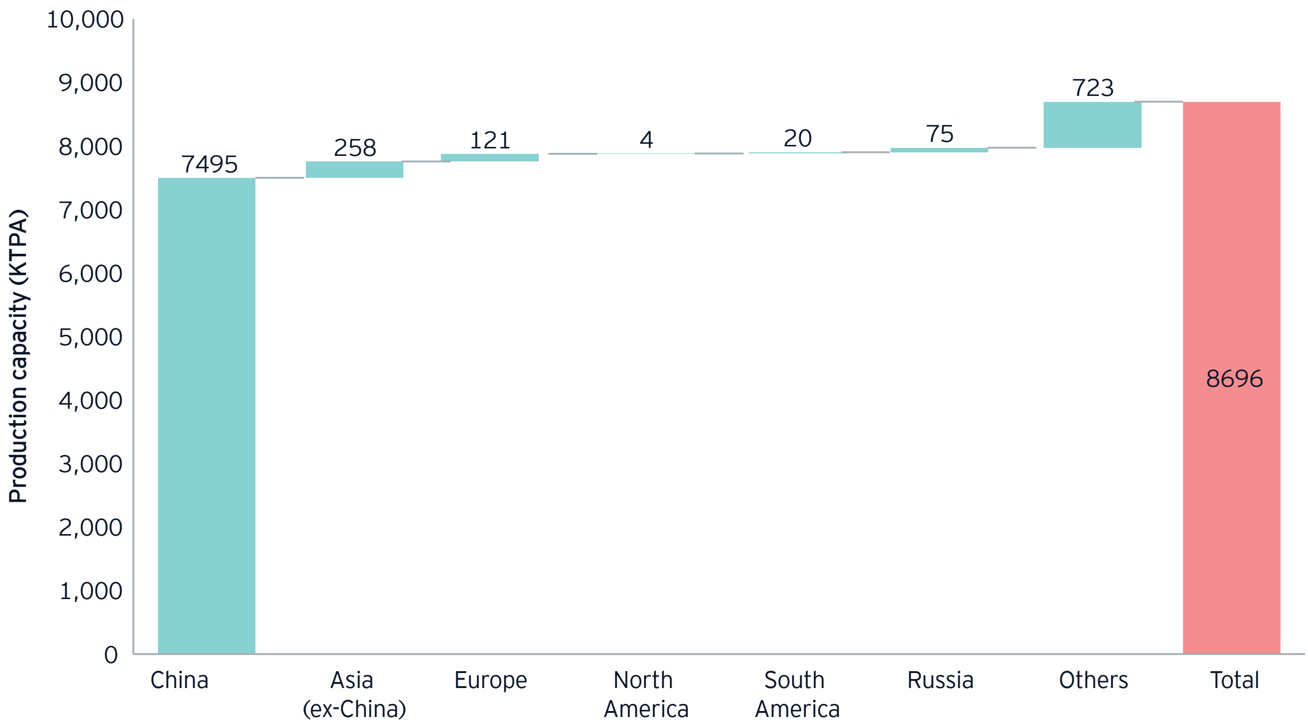


Source: IEA, DME Association; lifecycle comparison with conventional LPG/diesel

7.4
Global DME production landscape

Global installed production capacity for DME is estimated at approximately 8.7 million tons per year, distributed across roughly 32 operating plants worldwide. China accounts for nearly 90% of global DME production capacity, primarily due to its large-scale coal-to-chemicals industry.

Figure 12: Global DME production capacity by region

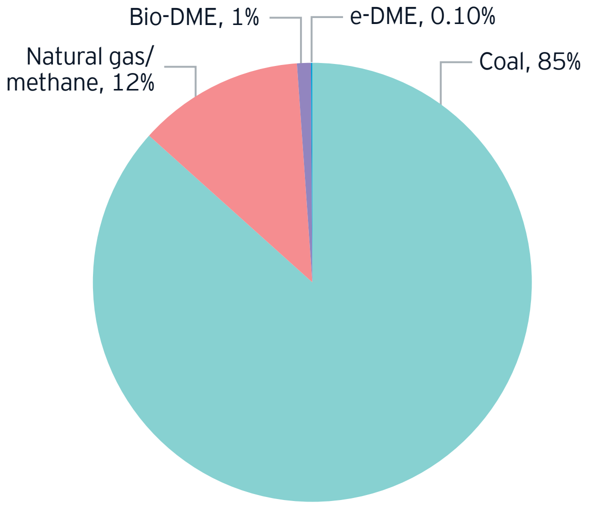


Source: DME Association; IEA World Energy Outlook

[4]Lifecycle comparison with conventional LPG/Diesel

Global DME production is dominated by coal based routes, which account for the overwhelming majority of output. A much smaller share comes from natural gas or methane based pathways, while bio DME contributes only a minimal fraction. This distribution highlights the sector's continued reliance on coal as the primary feedstock for DME manufacturing, with alternative and renewable pathways still in early stages of global adoption.

Figure 13: Global DME output across different pathways

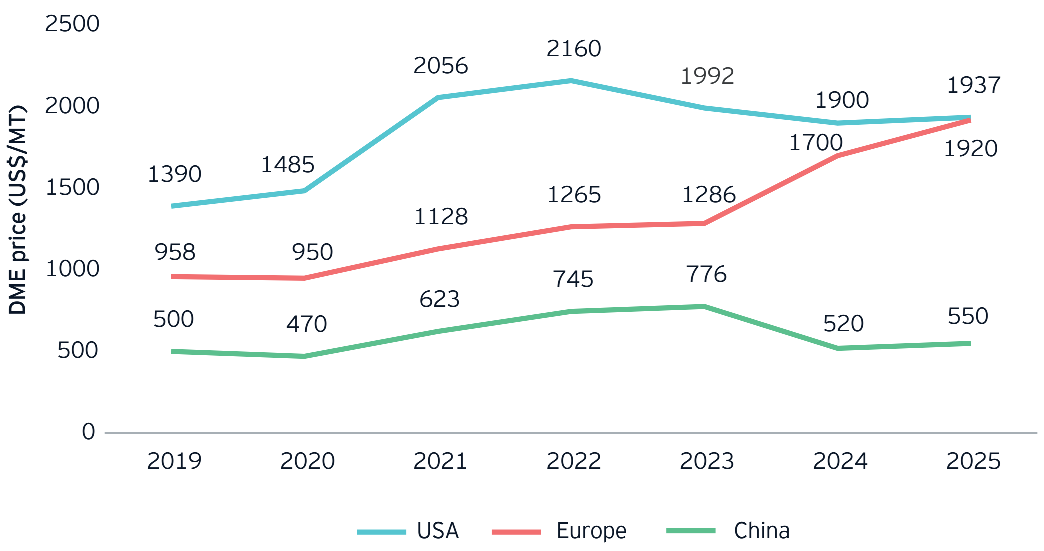


Source: EY analysis

7.5
Market trends in DME pricing

Since DME imports arrive irregularly, the CIF (cost, insurance and freight) India price has remained elevated, fluctuating between US$1,000–US$2,000 per ton over the past three to four years. This volatility, driven by inconsistent shipment volumes and dependence on external supply, continues to shape the cost dynamics of downstream industries relying on DME.

Figure 14: Global DME price trends (annual average US$/MT)

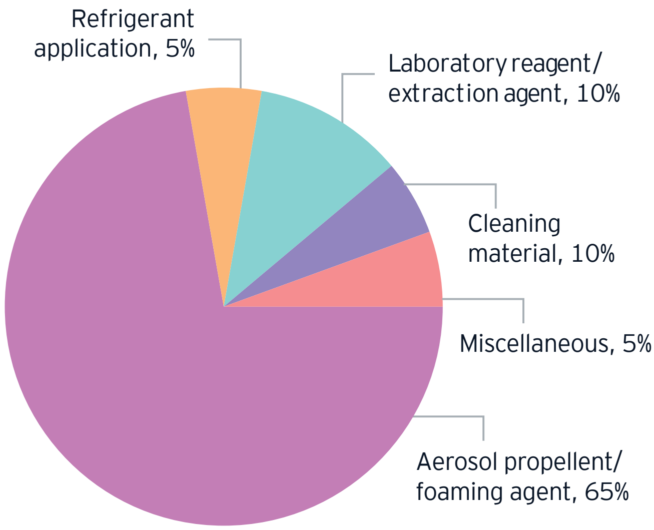


Source: EY analysis

7.6
Domestic landscape of DME

Domestic demand for DME remains modest, with consumption at around 1.2 KTPA in FY25, primarily driven by its use as an aerosol propellant, foaming agent and refrigerant. With nearly 60% of India's DME imports serving aerosol and foam applications and another 15% supporting refrigerant manufacturing, the country continues to rely heavily on external supply due to limited domestic production. In the absence of steady domestic availability, propane is frequently used as a substitute in aerosol formulations, underscoring a structural supply gap in the domestic market.

Figure 15: Domestic share of DME consumption (%)



Source: EY analysis

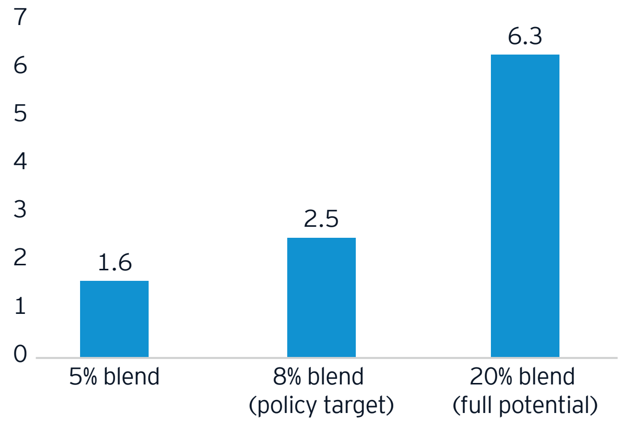
7.7
DME blending with LPG: Regulatory progress

The United Nations Economic Commission for Europe (UNECE) approved the use of up to 12% DME by mass in LPG for transportation and distribution in 2024. China has demonstrated 20% DME-LPG blends for domestic cooking applications. In India, the Bureau of Indian Standards (BIS) has notified standards permitting up to 20% DME blending with LPG, with initial policy discussions suggesting 8% blending in early deployment phases.

7.8
DME blending potential in India

Given India's LPG consumption of 31.3 million tons annually, even moderate blending levels could significantly reduce import dependence.

Figure 16: DME blending scenarios and estimated LPG import displacement (MMT)



Source: EY analysis

An 8% national blending program could therefore reduce LPG imports by approximately 2.5 million tons annually – a meaningful reduction in India's US$13-US$15 billion annual LPG import bill.

7.9
India's methanol market and DME production

DME production is closely linked to methanol production. India's domestic methanol capacity stands at approximately 660 KTPA against estimated demand of 3.2 MTPA, with import share exceeding 90%. Most methanol imports arrive through major ports such as Kandla and Mumbai, sourced from Middle Eastern and North African suppliers. Expanding coal-to-methanol production could therefore support both chemical demand and DME fuel production.

7.10
Additional applications of DME

DME has a high cetane number (55-60), making it suitable for use in diesel engines with relatively minor modifications. More than 15 countries have conducted pilot DME bus fleet trials, with over 300 buses converted to DME operation. DME can also be used as industrial heating fuel, gas turbine fuel and distributed power generation fuel, increasing its attractiveness as an alternative energy carrier.

Chapter 8

The urea imperative: Decoupling food security from gas volatility

8.1
Framing the fertilizer-energy linkage

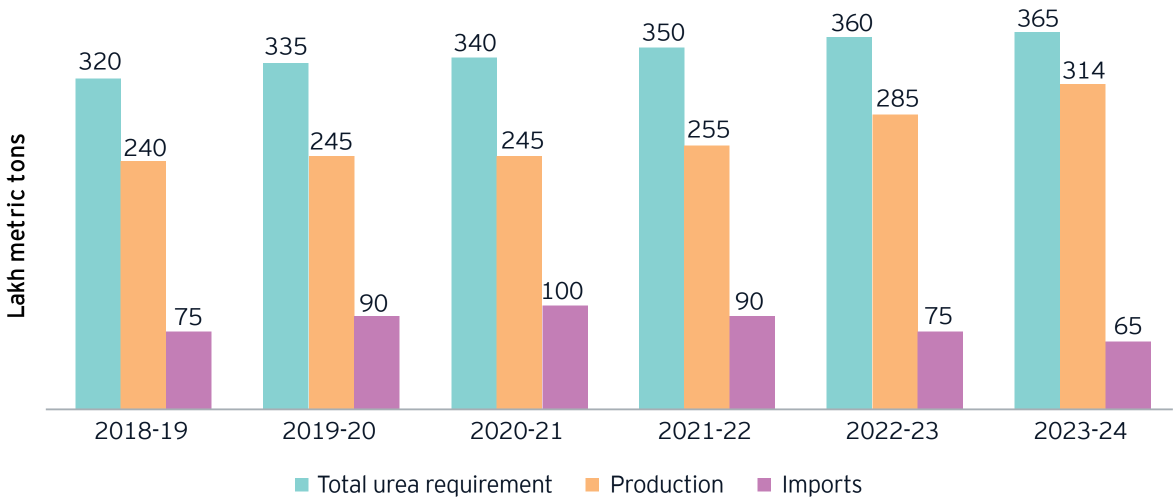
Urea sits at the center of India's fertilizer economy, forming the most critical nitrogen input for national food production systems. As one of the world's largest producers and consumers of urea, India relies on a tightly regulated framework for pricing, distribution and subsidies to enable uninterrupted access for farmers. Over the past decade, domestic production has expanded significantly, narrowing – but not fully closing – the gap between demand and import dependence. At the heart of urea production lies ammonia, synthesized using hydrogen derived primarily from natural gas. With nearly half of the country's natural gas consumption absorbed by the urea industry, the fertilizer food chain is inseparable from India's broader energy security landscape. The production pathway itself underscores this interdependence of urea on natural gas, making fertilizer availability deeply contingent on a stable and affordable energy supply.

8.2
India's domestic production profile

India's urea landscape shows a persistent gap between rising demand and relatively stagnant domestic production. From 2018-19 to 2023-24, total urea requirement increased from 320 LMT to 365 LMT, while domestic production rose only modestly from 240 LMT to 314 LMT. Imports have therefore remained necessary – ranging between 65-100 LMT annually – leaving India exposed to global price shocks.

This vulnerability was evident during 2021-2023, when international urea prices surged from US$280/MT to as high as US$800/MT, pushing India's fertilizer subsidy burden from INR1.5 lakh crore to INR2.5 lakh crore in 2022-23. The root of this fragility lies in India's heavy dependence on natural gas: 95% of domestic urea is produced using gas, a fuel that is largely imported.

Figure 17: Urea demand-supply trends In India (2018-24)



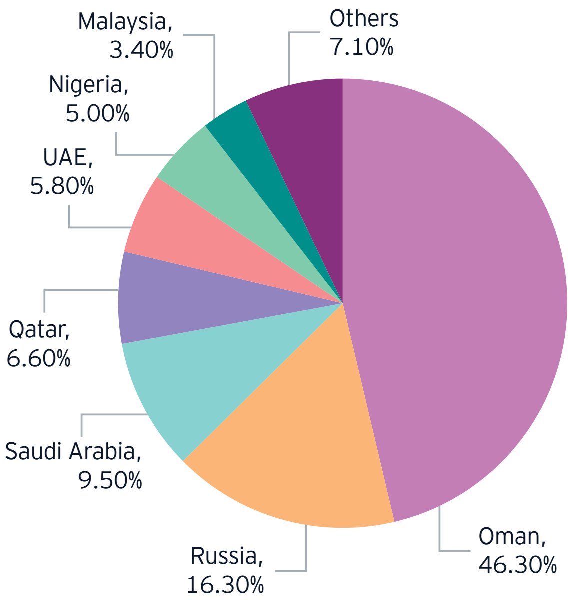
Source: Press Information Bureau, EY Analysis

This dependence has significant macroeconomic consequences. In 2024-25, India's total LNG import bill was roughly INR1.25 lakh crore, of which an estimated 85% was consumed by the fertilizer sector alone, underscoring how deeply fertilizer security is tied to energy security. As urea demand continues to outpace domestic production, the country remains vulnerable to volatility in global LNG and fertilizer markets – highlighting the need for alternative domestic pathways such as coal-based gasification to strengthen long-term resilience.

8.3
Strengthening supply resilience amid energy and trade volatility

India's urea sector continues to face deep structural vulnerabilities despite capacity additions, largely due to its dependence on natural gas, where LNG supply disruptions – triggered by geopolitical tensions in West Asia – have forced several gas based plants to operate at nearly half of their rated capacity, creating periodic shortfalls and reinforcing reliance on imports. During April-October 2025, India imported 58.62 lakh tons of urea – more than double the 24.76 lakh tons imported during the same period the previous year – highlighting the scale of emergency procurement required to maintain supply stability. A significant portion of this increase came from China, which supplied 21.24 lakh tons following the relaxation of its export restrictions, while imports from Russia also rose to 13.99 lakh tons. These trends underscore India's growing dependence on external suppliers and the challenges of maintaining fertilizer security under tightening global conditions.

Figure 18: Urea imports by India (2024-25)



Source: India's fertilizer Import Landscape (2024-25), EY Analysis

Urea consumption is projected to reach approximately 459 LMT by 2034-35. The gap between demand and supply would widen sharply due to stagnant domestic production and an aging, low efficiency plant fleet, with most units being 30 to 60 years old. With limited scope for capacity expansion under the current gas based infrastructure – a commodity India heavily imports – such a surge in demand would inevitably push urea imports even higher, increasing India's exposure to global price volatility and substantially burdening the national exchequer through elevated subsidy outlays.

8.4
Coal gasification to urea: The technology pathway

Coal gasification based urea production begins by converting coal into a usable synthesis gas (syngas). In this process, coal is heated with a small amount of oxygen and steam, which turns it into a mixture of useful gases instead of smoke. From this gas, hydrogen is separated and cleaned. At the same time, nitrogen is taken from the air. These two – hydrogen and nitrogen – are then combined using the Haber-Bosch process to make ammonia, a key ingredient for urea. Finally, ammonia is reacted with carbon dioxide (also produced during the earlier steps) to form urea, which is then solidified for agricultural use. Coal gasification offers a viable domestic alternative, especially in central and eastern India, where coal availability is assured and pipeline gas infrastructure is limited.

8.5
Strategic advantages of coal gasification to India

Expanding India's coal-to-urea capacity is not just an industrial shift; it is a geopolitical safeguard

a) **Shielding the Union Budget**: India's fertilizer subsidy is one of the largest fiscal outflows (net budgetary allocation for the Department of Fertilizers is INR1.71 lakh crore in FY 2026-27). By using domestic coal, the government replaces a volatile, US$-indexed cost (imported LNG) with a stable, INR-indexed cost. This "de-risks" the national budget from global energy shocks.

b) **Decoupling food security from gas markets**: India currently imports nearly 50% of its natural gas. As seen in recent years, conflict in the Middle East or Eastern Europe can instantly choke LNG supplies. Coal to urea safeguards the "Nutrient Security" of the Indian farmer against becoming a casualty of foreign wars.

c) **Foreign exchange conservation**: Transitioning to domestic coal-based urea is estimated to save India billions of dollars annually in import bills for urea and natural gas.

d) **Industrial clustering**: The high-pressure syngas produced for urea can act as a "parent feedstock." A single gasification hub can simultaneously feed urea, methanol and DME plants, creating a high-value industrial ecosystem in coal-rich eastern India - regions such as Odisha and Jharkhand.

8.6
The Talcher fertilizer project

The Talcher Project in Odisha – a JV project between Gas Authority of India Limited (GAIL), Coal India Limited (CIL), Rashtriya Chemicals & Fertilizers (RCF) and Fertilizer Corporation of India Limited (FCIL) – is the "lighthouse project" for India's coal-to-chemicals sector. Projected for completion in late 2027, the plant has a designed capacity of 2,200 TPD of ammonia and 3,850 TPD of urea. It is the first large-scale venture to prove that Indian high-ash coal can be gasified reliably. The plant will use Surface Coal Gasification (SCG), converting a blend of high-ash coal (75%) and pet-coke (25%) (sourced from IOCL Paradip) into syngas for ammonia synthesis, which will then be converted to urea. The project will serve as a benchmark for reducing dependence on imported LNG for urea production.

8.7
Challenges and mitigation of making ammonia through coal gasification

Producing ammonia (NH3) from coal is significantly more carbon- and capital-intensive than using natural gas

a) Technical: The high ash hurdle

Indian coal has 30% to 45% ash with a high ash fusion temperature (AFT). If the ash doesn't melt properly, it clogs the gasifier. If it melts too much, it erodes the reactor lining. This can be mitigated by adding limestone or iron ore to the coal feed to lower the melting point of the ash, allowing it to flow out as liquid "slag." Consideration may also be given to moving from fixed beds to fluidized beds and entrained flow gasifiers (e.g., Talcher) that can handle high throughput and variable coal quality.

b) Environmental: The carbon footprint

Coal gasification produces roughly 2.5 times more CO_2 than natural gas-based ammonia production. This can be mitigated by capturing its own CO_2 to react with ammonia to form urea (in-situ CCUS).

c) Financial: The capex risk

The capex for a coal-to-urea plant is significantly higher than for a gas-based plant while delays in projects like Talcher create stress with lenders. This can be mitigated by the government providing sovereign backstops for debt funding of strategic gasification projects, enabling banks to keep their credit lines open despite construction delays

Chapter 9

Strategic outlook: Building India's coal-to-chemicals economy

India's estimated geological coal reserves exceed 360 billion tons — the fifth-largest globally. Coal gasification can convert this domestic resource into the chemicals, fuels and fertilizers currently imported for over US$30 billion annually.

9.1
India's resource base

India possesses one of the largest coal reserves in the world, with estimated geological coal reserves exceeding 360 billion tons. Coal production crossed the milestone of one billion tons annually, demonstrating the scale of domestic resource availability. Currently, the majority of coal is used for power generation; however, coal can also serve as a feedstock for chemical and fuel production through gasification technologies.

9.2
Strategic benefits of coal gasification

Energy security

Coal gasification can substitute imported hydrocarbons with domestically available coal resources, reducing exposure to global energy price volatility and supply disruptions. By producing chemicals such as methanol, ammonia and DME domestically, India can strengthen the resilience of its industrial supply chains.

Industrial competitiveness

Domestic production of chemical feedstocks lowers the cost of inputs for key manufacturing sectors including textile manufacturing (MEG and polyester feedstocks), fertilizer production (ammonia and urea), plastics and polymer industries (olefins) and mining and infrastructure (ammonium nitrate). Reducing dependence on imported feedstocks can enhance the global competitiveness of Indian manufacturing.

Regional industrial development

Coal-to-chemicals projects can promote industrial development in coal-bearing regions. Large integrated gasification complexes can create industrial clusters generating employment opportunities and stimulating economic development in coal-producing states.

9.3
Integration with energy transition pathways

Coal gasification plants can be designed to incorporate carbon capture, utilization and storage (CCUS) technologies. Because gasification produces concentrated carbon dioxide streams during syngas processing, carbon capture can be implemented more efficiently than in conventional coal combustion systems. Captured CO_2 can be stored underground in geological formations, utilized in chemical synthesis or converted into synthetic fuels or fertilizers. Gasification infrastructure can also evolve over time to incorporate additional low-carbon feedstocks through co-gasification of coal and biomass, hydrogen production from syngas and integration with green hydrogen produced from renewable electricity..

9.4
Infrastructure and investment requirements

Coal-to-chemicals plants are capital-intensive industrial projects. Large-scale gasification complexes can require investments ranging from US$1 billion to US$4 billion, depending on plant scale and product mix. Establishing industrial clusters near coal mining regions can help reduce transportation costs and improve project economics.

9.5
Policy and institutional support

The Government of India has already initiated several policy measures to promote coal gasification: the National Coal Gasification Mission; financial incentives for early-stage projects; coal linkages for gasification plants; and promotion of pithead gasification facilities. Large-scale gasification projects typically require collaboration between public sector enterprises, private industrial companies, technology providers and financial institutions.

We have compiled some strategic interventions that the government can plan to promote coal gasification:

DME (Dimethyl ether):

Intervention: Notify a phased DME blending mandate requiring 10% to 20% inclusion in LPG cylinders by 2027 and create dedicated sub-missions on DME and urea under the National Coal Gasification Mission.

Objective: Create an immediate domestic offtake for gasification plants, decoupling cooking fuel prices from volatile West Asian propane benchmarks and reducing the import bill by over US$1 billion, while maintaining long term fertilizer affordability and energy security.

Synthetic ethanol

Intervention: Accord "Transition Fuel" status to coal-derived ethanol, allowing it to compete in OMC procurement tenders alongside bio-ethanol.

Objective: Enable the E20/E27 blending targets to remain weather-proof, preventing supply shocks during poor monsoon years when sugarcane yields drop.

Ammonia and urea: Fertilizer sovereignty:

Intervention: Explicitly recognize coal gasification-based urea amid aging plant profiles and rising demand; extend Fertilizer Investment Policy benefits, assured offtake under the Urea Subsidy Scheme and alignment with PM PRANAM.

Extend targeted investment incentives for coal to urea projects through inclusion in the harmonized list of infrastructure sub sectors, exemption of GST and customs duty on capital equipment (to offset capex nearly three times that of gas based plants), provision of Viability Gap Funding, and time bound direct and indirect tax benefits such as tax holidays.

Objective: Insulate the national fertilizer subsidy bill from global LNG price spikes while safeguarding the viability of mega-projects such as the Talcher and Lakhanpur complexes.

e-SAF:

Intervention: Notify a gradual domestic blending mandate (starting at 1% in 2027, scaling to 5% by 2030) for all departing international flights and incentives (e.g., subsidies, tax breaks) to make SAF affordable.

Objective: Provide price certainty for the massive capital expenditure required for a Fischer-Tropsch Plant. This intervention enables Indian carriers to meet ICAO's CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) requirements using domestically produced e-SAF rather than expensive imported biofuels.

Methanol:

Intervention: Introduce a zero-duty regime on gasification hardware and establish a Price Stabilization Fund (PSF) to provide a floor price for domestic methanol.

Objective: Incentivize private investment by protecting Indian players from price dips due to international over-supply (e.g., China dumping excess methanol in India and reducing market price). This is crucial in a sector where India currently faces nearly 90% import dependency, securing the feedstock for the US$100 billion downstream chemical industry.

Coal-to-olefins (CTO): Petrochemical autonomy

Intervention: Onboard coal-to-olefin (CTO) projects into the Production Linked Incentive (PLI) scheme for specialty chemicals.

Objective: Neutralize the scale advantage of imported Chinese polymers and catalyze domestic manufacturing in the high-value plastics and textile value chains.

9.6 Global market outlook

Global demand for petrochemicals and industrial chemicals continues to rise due to expanding manufacturing, urbanization and infrastructure development. With adequate scale and technological capability, India could also develop export-oriented coal-to-chemicals production, positioning itself as a regional supplier of industrial chemicals in Asia

Chapter 10

The Chinese paradigm: A blueprint for industrial sovereignty

China represents the global frontier in coal gasification, currently operating over 90% of the world's coal-to-chemical capacity. For India, the Chinese experience is not just a technological reference but a strategic playbook on how to utilize "stranded" domestic coal to build world-class petrochemical and fertilizer industry.

10.1 Scale and output: The 350 MT benchmark

By late 2025, China's modern coal chemical industry had evolved into a mature, multi vertical industrial system with a scale unmatched globally. The sector continues to expand even as the broader coal economy undergoes decarbonization pressures, with coal to chemicals emerging as the only segment consistently registering growth – rising approximately 18%. Annual coal gasification volumes dedicated to chemical production now exceed 340–350 MT, forming the backbone of several downstream value chains. Coal derived methanol accounts for nearly 84% of China's total methanol output, reaching close to 80 MTPA, while coal based ammonia meets 97% of total domestic requirements, and coal derived DME supplies close to 90% of national demand, reinforcing the country's strategic food security imperatives. Furthermore, coal to olefin (CTO) projects have become a critical competitive pathway, supplying about 27% of China's total olefin output and increasingly rivaling traditional oil based naphtha crackers in scale and efficiency. Overall, the industry's integrated development, large scale feedstock utilization and expanding downstream linkages underscore its central role in China's energy industrial landscape

10.2 Strategic drivers: The "Malacca Dilemma" and import substitution

China's gasification strategy was shaped by its "Malacca Dilemma," with over 80% of crude oil and 60% of gas imports routed through the vulnerable Strait of Malacca. To reduce this exposure, China expanded its coal to chemicals portfolio – CTL, CTG and CTO (coal-to-liquid, coal-to-natural gas and coal-to-olefins), which together displaced about 38 MT of oil and gas equivalent in 2024. This shift, anchored in low cost domestic coal, helped shield key downstream sectors such as textiles, plastics and fertilizers from severe global LNG price volatility during 2022–2024.

10.3 The cluster strategy: Syngas cities and hubs

China shifted from standalone gasification plants to large integrated industrial clusters – a model now being replicated in Odisha and West Bengal. A leading illustration of this model is a large-scale industrial hub located in Northern China, which hosts a coal-based new materials complex that converts coal-to-olefins (CTO). The first phase of this integrated project, commissioned with a capital investment of approximately RMB 47.8 billion (US$6.6 billion), delivers 3 MTPA of olefin capacity, underscoring the scale, technical maturity, and commercial viability of modern coal-to-chemicals platforms. These integrated hubs also adopt polygeneration systems, utilizing a common gasification stream to simultaneously produce power, heat and chemicals such as methanol and urea, improving overall thermal efficiency by 10% to 15% compared to single product plants.

10.4 Environmental mitigation and dual carbon control

China is steering its gasification sector through a "Green Pivot" to align with its 2030 and 2060 climate commitments. Conventional CTO processes require 26–30 tons of water per ton of olefin, prompting the 15th Five Year Plan (2026–2030) to mandate ultra low water systems and zero liquid discharge (ZLD) standards for all new inland projects. At the same time, next generation facilities – such as the Shenhua Baotou upgrade – are adopting solar to chemical configurations that integrate green hydrogen from large wind solar bases into the syngas stream, cutting CO_2 intensity by up to 70%.

10.5 Lessons for the Indian roadmap

China's gasification build out followed three operating principles, China's gasification build out followed three operating principles: locating plants at the pit head to eliminate rail freight costs; prioritizing large scale facilities over pilot sized units to achieve competitiveness at capacities above 1 MTPA; and accelerating technology localization. The sector transitioned from reliance on imported General Electric and Shell gasifiers to advanced domestic systems such as the OMB design developed by East China University, enabling better handling of diverse coal grades. For India, rapid technology development by BHEL and Thermax will be essential to replicate this model.

We conclude this case by compiling a few lessons that India can imbibe from China's coal gasification journey:

Pit-head integration: China maximized margins by co-locating gasification hubs at coal mine mouths; India should adopt this "source-to-syngas" model to eliminate the 30% to 50% "logistics tax" incurred by rail freight.

Technology sovereignty: Following China's shift from Western licenses to indigenous gasifiers, India should aggressively commercialize BHEL's high-ash coal gasification technology to suit domestic feedstock.

Cross-sectoral synergy: China's "Champion Players" like CHN Energy succeed via vertical integration; India requires a unified PSU-private JV framework to synchronize coal mining, logistics and chemical offtake.

Green hydrogen coupling: By injecting solar-powered hydrogen into the gasification process, China is "decarbonizing" coal; India should mandate similar hybrid models to meet net-zero goals while maintaining industrial scale.

Market-side mandates: China's rapid scale was supported by state-mandated domestic offtake; India should implement "Domestic Molecule Obligations" to provide a protected, non-cyclical market for high-capex gasification plants.

Chapter 11

New Era Cleantech Solution : India's first integrated coal gasification complex

The strategic imperatives outlined in this white paper are not merely policy aspirations. They are being actively translated into industrial reality through the development of the NECSPL Integrated Coal Gasification and Carbon Capture Complex in Chandrapur, Maharashtra.

11.1 Project overview

The NECSPL complex is being developed on approximately 1,650 acres of land in Chandrapur district, Maharashtra – one of India's most significant coal-producing regions. Chandrapur's proximity to coal mines, existing industrial infrastructure and rail and road connectivity make it an ideal location for a pithead coal gasification complex. The project has received the "Ultramega Project" designation from the Government of Maharashtra, recognizing its significance as a transformational industrial investment for the state.

1,650 acres Project area	INR1,100 Cr MoC Grant
Chandrapur, Maharashtra Location	Ultra-mega Project Status

11.2 Product portfolio

The NECSPL complex is designed as a fully integrated gasification facility producing a diversified range of high-value chemicals and fuels from domestically sourced coal. The product portfolio directly addresses India's most significant chemical import dependencies:

Mono ethylene glycol (MEG)

India imports over 2.1 million tons of MEG annually. Domestic production from this complex will directly reduce import dependence and strengthen the textile and polyester manufacturing supply chain.

Urea

With India importing nearly 7 million tons of urea annually and a fertilizer subsidy bill that exceeded INR2.54 lakh crore in FY23, domestic urea production from coal gasification offers a direct pathway to reducing fiscal pressure and strengthening agricultural input security.

Ammonium nitrate

A critical industrial explosive for India's coal and iron ore mining operations, which together extract over 1.25 billion tons of mineral output annually. Domestic production will reduce dependence on imports from Russia, Turkey and Central Asia.

Sustainable aviation fuel (SAF)

Through Fischer-Tropsch synthesis from syngas, NECSPL will produce SAF to support India's rapidly growing aviation sector and its emerging regulatory requirements for sustainable fuel blending.

Dimethyl ether (DME)

DME is a clean-burning LPG substitute that can reduce India's LPG import bill of US$13-US$15 billion annually. NECSPL's integrated methanol-to-DME pathway positions the project as a strategic contributor to India's household fuel security.

11.3 Government recognitions and regulatory milestones

Milestone	Details
Environment clearance	Received from MoEFCC, Government of India
Ultra mega project status	Designated by Government of Maharashtra
MoC financial incentive	INR1,100 crore grant – the largest to any private sector recipient under MoC scheme
Coal mine allocation	Dedicated coal mine allocated; Mining Plan approved by Ministry of Coal
Land acquisition	1,650 acres secured in Chandrapur district, Maharashtra

11.4
Carbon capture integration

The NECSPL complex is designed from the outset as an Integrated Coal Gasification and Carbon Capture Complex, incorporating CCUS infrastructure as a core engineering component rather than a retrofit. The concentrated CO_2 streams produced during coal gasification are ideally suited for efficient carbon capture. Captured CO_2 from the complex will be utilized in the urea synthesis loop, converted into chemical intermediates and progressively directed toward long-term geological storage as India's carbon market frameworks mature.

11.5
Maharashtra's role in India's coal-to-chemicals future

The NECSPL project positions Maharashtra as the anchor state for India's emerging coal-to-chemicals economy. Chandrapur's existing coal infrastructure, industrial workforce and logistical connectivity provide a natural foundation for the development of an integrated chemical manufacturing cluster that can attract downstream industries including textiles, fertilizers, mining explosives and clean fuels. As a first-mover project in India's greenfield coal gasification sector, NECSPL is creating the technical precedents, regulatory frameworks and institutional knowledge that will facilitate replication across other coal-bearing states.

11.6
Going forward

New Era Cleantech Solution Pvt. Ltd. is not merely participating in India's coal-to-chemicals story – it is helping to write it. The groundbreaking of the Chandrapur Integrated Coal Gasification and Carbon Capture Complex marks the beginning of a new era for India's chemical industry: one anchored in domestic resources, oriented toward energy independence and built for long-term industrial resilience.

Chapter 12

Conclusion

Coal gasification presents a strategic opportunity for India to convert its abundant domestic coal resources into critical industrial chemicals and alternative fuels. By producing synthesis gas that can be transformed into methanol, ammonia, dimethyl ether (DME), mono ethylene glycol (MEG), synthetic natural gas and hydrogen, coal gasification can significantly reduce India's dependence on imported hydrocarbons and petrochemical feedstocks essential for sectors such as fertilizers, textiles, plastics, mining and manufacturing.

Recent geopolitical tensions in West Asia and disruptions affecting the Strait of Hormuz have once again highlighted the vulnerability of global energy supply chains. As a major importer of crude oil, LNG and LPG, India remains exposed to volatility in international energy markets. Such disruptions not only increase the country's energy import bill but also affect the supply of industrial chemical feedstocks whose prices are closely linked to global oil and gas markets.

Coal gasification offers a pathway to strengthen India's industrial resilience by enabling domestic production of several strategic chemicals currently imported in large volumes. In addition, products such as dimethyl ether can partially substitute LPG imports, helping reduce India's exposure to global fuel supply shocks.

At the same time, modern gasification technologies can be integrated with carbon capture, utilization and storage systems, enabling lower-emission production of fuels and chemicals. When combined with emerging policy initiatives such as the Methanol Economy program, development of the national carbon market and international climate finance mechanisms, coal gasification can support both energy security and long-term sustainability objectives.

Scaling coal gasification demands a coherent, product-specific and mission-oriented policy approach. Demand creation through instruments such as DME blending mandates, coupled with a dedicated coal-to-urea investment and offtake policy, can place coal-based production on an equitable footing while addressing aging fertilizer capacity and rising demand. At the same time, targeted enablers – VGF, infrastructure status, GST and customs duty rationalization, and selective fiscal incentives – are essential to offset the significantly higher capital intensity of coal-based projects and unlock long-term private investment. This integrated policy framework will effectively de-risk the transition to a "coal-to-chemicals" economy, facilitating long-term price stability and supply chain resilience across the nation's energy and chemical sectors.

In an increasingly uncertain global energy environment, developing a domestic coal-to-chemicals ecosystem offers India a practical pathway to reduce import dependence, strengthen industrial supply chains and build a more resilient and sustainable energy future.

Chapter 13

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