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India's Coal Gasification Push

A Strategic Leap Towards Energy
Self-Reliance



Introduction

India stands at a pivotal crossroad in its energy journey. With a rapidly growing economy, rising urbanization and a strategic commitment to reduce its staggering import bill, the nation is exploring every avenue to leverage its vast domestic coal reserves. The government's impending approval of a ₹37,500 crore incentive scheme for coal and lignite gasification projects marks a transformative policy shift—one that moves coal from being a mere combustion fuel to a versatile industrial feedstock.

This article delves deep into the technical, economic, and strategic dimensions of the coal gasification initiative, incorporating context from global benchmarks, historical data, and forward-looking analysis. It goes beyond the headlines to explain not just what is happening, but why it matters and how it could reshape India's energy-security landscape.



The Technology Behind Coal Gasification

What Is Coal Gasification?

Coal gasification is not a new technology—it dates back to the early 19th century, when “town gas” (syngas) was used for lighting and heating. However, modern gasification is a far more sophisticated process. At its core, coal is partially oxidized at high temperatures (700–1,600°C) under controlled conditions with limited oxygen and steam. The result is synthesis gas (syngas)—a mixture primarily composed of carbon monoxide (CO) and hydrogen (H₂), along with smaller amounts of methane (CH₄), carbon dioxide (CO₂), and other hydrocarbons.

The crucial advantage is that syngas can be further processed via the Fischer–Tropsch process, methanol synthesis, or ammonia synthesis to produce a wide range of high-value products:

- **Methanol** – A base chemical for plastics, solvents, and fuel blends.
- **Ammonia & Urea** – Key inputs for fertilizers.
- **Synthetic Natural Gas (SNG)** – A substitute for natural gas.
- **DME (Dimethyl Ether)** – A clean-burning diesel substitute.
- **Naphtha, Waxes, and Lubricants** – Through Fischer–Tropsch.

In effect, coal gasification converts a solid fossil fuel into a flexible, transportable gas, unlocking a chemical value chain that far surpasses the simple calorific value of burning coal.

How It Differs from Traditional Coal Use

Aspect	Conventional Coal Combustion	Coal Gasification
Primary end-use	Power generation (heat → steam → electricity)	Chemical feedstock for fuels, fertilizers, plastics
Emissions	Direct release of CO ₂ , SO _x , NO _x , particulates	Higher concentration of CO ₂ (easier to capture), lower SO _x /NO _x if cleaned
Efficiency	Typically, 33–40% in thermal power plants	Up to 45–50% when co-producing power and chemicals (polygeneration)
Product flexibility	Only electricity/heat	Syngas → multiple downstream products
Environmental control	Post-combustion scrubbers required	Pre-combustion carbon capture is more feasible

India's Coal Wealth: A Double-Edged Sword

India possesses approximately 400 billion tonnes of coal reserves, making it the second largest holder globally after China. However, the quality varies widely:

- Coking coal (used in steelmaking) constitutes only ~16% of total reserves; the rest is non-coking steam coal.
- The Gondwana coalfields (eastern states: Jharkhand, Odisha, Chhattisgarh, West Bengal) contain the bulk of high-ash coal.

The Energy Mix Reality

As of 2025, coal remains the backbone of India's energy infrastructure:

- Coal contributes >55% of total primary energy consumption (including power, industry, and direct use).
- Coal-fired thermal plants generate ~74% of the country's electricity.
- Annual coal demand has exceeded 1 billion tonnes (2024-25 estimate: ~1.18 billion tonnes from domestic production + imports).



Yet, despite this abundance, India's dependence on imported hydrocarbons is alarmingly high:

Commodity	Import Dependence (Approx.)
Crude Oil	83%
Natural Gas (LNG)	~50%
Methanol	>90%
Urea/Ammonia	30–35% (and rising due to domestic capacity constraints)
Coking coal (for steel)	~85%
DME, Ammonium Nitrate	Nearly 100%

This vulnerability was starkly exposed during the Russia-Ukraine war (2022–23) and the Red Sea crisis (2024), when LNG and ammonia prices spiked by over 200% in months. Coal gasification offers a domestic alternative for many of these imported commodities.



The ₹37,500 Crore Scheme: Design, Scale, and Strategic Intent

Key Parameters

The proposed incentive scheme, vetted by the Ministry of Coal and awaiting Cabinet nod, represents a fivefold increase in financial commitment compared to the earlier scheme (which had a total outlay of ~₹6,000 crore). Here's the detailed breakdown:

- **Total Outlay:** ₹37,500 crore (~\$4.5 billion at current exchange rates).
- **Maximum Per-Project Support:** ₹3,000 crore (increased from ₹1,000 crore for private firms and ₹1,350 crore for PSUs).
- **Unified Category:** No separate differentiation between private and public sector—encouraging equal participation.
- **Target Capacity:** Achieve 100 million tonnes (MT) of coal gasification capacity by 2030 (equivalent to about one-tenth of India's annual coal production).

What the Funds Will Support

The scheme is structured as viability gap funding (VGF) and capital subsidies to bridge the gap between the high capital cost of gasification plants and their commercial returns. Key eligible components include:

- Surface coal gasifiers (entrained-flow, fluidized-bed, or moving-bed designs).
- Syngas cleaning and conditioning units (to remove particulates, sulfur, and mercury).
- Downstream chemical synthesis units (methanol, ammonia, SNG).
- CO₂ capture and storage (CCS) integration (a separate incentive may be added later).

Comparison with Previous Policy

Feature	Previous Scheme (2023-24)	New Proposed Scheme
Total Outlay	~₹6,000 crore	₹37,500 crore
Max Support (Private)	₹1,000 crore per project	₹3,000 crore per project
Max Support (PSU)	₹1,350 crore per project	₹3,000 crore per project (unified)
Categorization	Separate private/PSU segments	Single unified window
Target Year	No explicit capacity target	100 MT by 2030
Focus Products	Methanol primarily	Methanol, Ammonia, SNG, DME, urea

The Road Ahead: Underground Coal Gasification (UCG)

One promising future pathway is Underground Coal Gasification (UCG), where coal is gasified *in situ* (within the coal seam) using injection wells. UCG avoids the need for coal mining and surface gasifiers, reducing water use and surface pollution. India has significant deep coal reserves (~100 billion tonnes) that cannot be economically mined using conventional methods.

The government has allowed pilot UCG projects in Mehsana (Gujarat), Jharia (Jharkhand), and Singareni (Telangana). If successful, UCG could unlock a new resource base without the environmental footprint of open-cast mining.



Conclusion: A Strategic, Not Just Economic, Initiative

India's ₹37,500 crore coal gasification scheme is far more than a financial handout—it is a strategic lever to reduce import vulnerability, create a domestic chemical industry, and transform coal from a pollutant into a platform molecule. The initiative aligns with the Atmanirbhar Bharat vision and India's Net Zero by 2070 target (since gasification enables CCS more easily than traditional coal use).

For investors, the scheme offers exposure to:

- A multi-year capital expenditure cycle in energy and chemicals.
- Stable, long-term returns from products with inelastic demand (fertilizers, methanol).
- Potential carbon credit revenues as CCUS matures.

The success of this scheme will depend on execution: timely project approvals, technology adaptation to Indian coal, and complementary policies on carbon pricing and water allocation. If these pieces fall into place, India could become a global leader in coal-to-chemicals—a transformation that would echo the shale revolution in the U.S., but through a very different resource base.





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