18th National Conference on Coal

"Transforming Coal Sector for a Net-Zero Future"

9th April, 2026

Hotel Le Meridien, New Delhi

Souvenir

Supported by :

- Ministry of Coal
- Ministry of Mines
- Ministry of Railways
- Ministry of Power
- Ministry of Steel
- NITI Aayog

Ministry of Environment, Forest and Climate Change

ORGANISERS

India Energy Forum — 25 Silver Jubilee 2001-2026

Mining Geological & Metallurgical Institute of India — MGMI - Delhi Chapter

Indian School of Mines ISMAA Delhi

PARTNER

NLC India — Creating Wealth for Wellbeing

SPONSORS

BEML — Beyond Possibilities

CCL — Fuelling Sustainable Growth — Central Coalfields Ltd.

MCL — Mahanadi Coalfields Limited (A Govt. of India Undertaking & Subsidiary of Coal India Limited)

NCL

NMDC

40 Years — Fuelling the Nation, Greening the Future

SECL — South Eastern Coalfields Limited

WCL — Western Coalfields Limited

CO-SPONSORS

ACB (India) Limited

50 — 5 Decades of Unearthing Energy — ECL

MTS — Intelligent Mining Solutions

SCCL — One Family, One Vision, One Mission — (A Government Company)

ASSOCIATES

Global Coal & Mining Pvt. Ltd.

Jaiprakash Power Ventures Limited

Jindal Power

NTPC

S. K. Samanta & Co. (P) Ltd.

18th National Conference on Coal

"Transforming Coal Sector for a Net-Zero Future"

9th April, 2026 • New Delhi

Contents

कोल इण्डिया Coal India

CCL

Fuelling Sustainable Growth

हमारा प्रयास : हितधारकों, ग्रामीणों एवं श्रमिकों का सर्वांगीण विकास

सेन्ट्रल कोलफील्ड्स लिमिटेड

(भारत सरकार का एक उपक्रम /कोल इण्डिया लिमिटेड की एक अनुषंगी कम्पनी)

दरभंगा हाउस, राँची – 834001 (झारखण्ड)

CentralCoalfieldsLtd | CCLRanchi | centralcoalfieldsltd | Central Coalfields Limited

जी. किशन रेड्डी
జి. కిషన్ రెడ్డి
G. Kishan Reddy

सत्यमेव जयते

कोयला एवं खान मंत्री
भारत सरकार
नई दिल्ली
MINISTER OF COAL AND MINES
GOVERNMENT OF INDIA
NEW DELHI

Message

I am pleased to learn that the India Energy Forum, in collaboration with the Delhi Chapter of the Mining, Geological & Metallurgical Institute (MGMI) and the Indian School of Mines Alumni Association (ISMAA), is organizing the 18th National Conference on 9th April 2026 in New Delhi. The theme, *"Transforming Coal Sector for a Net Zero Future,"* is both timely and of profound national importance.

Under the visionary leadership of Hon'ble Prime Minister Shri Narendra Modi, India's energy sector is undergoing a historic transformation, anchored in sustainability, innovation, and self-reliance. The coal sector, in particular, stands at the heart of this transition, balancing developmental imperatives with environmental responsibility. This conference provides a vital platform to deliberate on pathways that align Viksit Bharat's energy aspirations with global climate commitments.

In line with the vision of *Atmanirbhar Bharat*, our coal sector is transitioning from a focus on production to one of efficiency, sustainability, and value creation. Initiatives such as clean coal technologies, coal gasification, coal-to-chemical pathways, and enhanced first-mile connectivity are shaping a modern, environmentally responsible sector, while reinforcing our commitment to reducing carbon intensity.

The path to a Net Zero future calls for innovation, collaborative action, and forward-looking policies. I am confident that this conference will serve as a vibrant platform for stakeholders to exchange ideas, foster partnerships, and chart a roadmap for a cleaner and more efficient coal value chain.

I commend the organizers for this important initiative and extend my best wishes for the success of the conference. May the deliberations here contribute meaningfully to India's journey towards a sustainable, self-reliant, and developed future.

(G. Kishan Reddy)

Office : Room No. 353, 'A' Wing, 3rd Floor, Shastri Bhawan, New Delhi-110001, **Tel. :** 23387277, 23383109, 23386402
Residence: 6, Ashoka Road, New Delhi- 110001, Tel: 21411415, 21411403

INDIA ENERGY FORUM

R V Shahi
President, IEF
Former Secretary, Ministry of Power

Message

It gives me immense pleasure to welcome you to the 18th National Conference on Coal, organized by the India Energy Forum (IEF) in association with the Mining Geological and Metallurgical Institute of India (MGMI-DC) and the Indian School of Mines Alumni Association, Delhi Chapter (ISMAA-DC).

The theme of this year's conference, "Transforming Coal Sector for a Net Zero Future," is both timely and critical. As India marches toward its ambitious climate goals, the coal sector remains the backbone of our energy security. However, the transition to a sustainable future demands a paradigm shift. We must embrace innovation, cleaner technologies, and strategic diversification to ensure that coal remains a viable and responsible component of our energy mix.

I am confident that the deliberations today will provide a robust roadmap for the industry's evolution. I convey my best wishes to all the participants, speakers, and delegates for a highly productive and insightful session.

I would like to thank to the Core Group of 18th National Conference on Coal and its Chairman, Shri Alok Perti, Former Secretary (Coal), under his vision, and tireless efforts have been instrumental in conceptualizing this conference and bringing together a distinguished galaxy of experts to deliberate on these vital issues.

I wish the 18th National Conference on Coal a great success!

R.V. Shahi

India Energy Forum
908 Chiranjiv Tower, 43 Nehru Place, New Delhi 110 019 (India)
Tel : 011-46049584 E-mail : rvshhahi.ief@gmail.com

Alok Perti, IAS (Retd)
Former Secretary, Ministry of Coal

Message

The India Energy Forum (IEF), in collaboration with the Mining Geological and Metallurgical Institute of India (MGMI-DC) and the Indian School of Mines Alumni Association, Delhi Chapter (ISMAADC), is organizing the 18th National Conference on Coal on 9th April 2026 at Hotel Le Meridien, New Delhi. The theme of this year's conference, "Transforming the Coal Sector – For a Net Zero Future," is befitting at the present since the domestic coal sector in witnessing major policy changes.

To ensure continued major contribution of coal in the nation's growth story it has become imperative to update our mining methods and strategies deploying higher levels of mechanization, that reduces the overall carbon footprint. This transformation necessitates the deployment of energy-efficient equipment and a transition to electric and alternative-fuel-driven dumpers, excavators, and high-capacity conveyors to decarbonize excavation and transport. Furthermore, using digital technologies including AI can be leveraged to enable smarter mine planning, real-time analytics, and predictive maintenance. Additionally, a support system which enables faster environment clearances and award of mining leases, alongside changes required of provisions under the Coal Mines (Special Provisions) Act, 2015 and the MMDR Act, 1957 to cater to changed situations would be required.

Apart from increasing mining efficiency it is also necessary to promote technologies in end-user industries such as power, steel, and cement which are required for ensuring reduced emissions. The need today is of a judicious mix of all such efforts which leads towards reduction in GHGs. However, it is also necessary to acknowledge that all such efforts need a substantial research and development support both from government and industry. As we move towards our goal of achieving Net Zero all effort which lead to reduction in emission will continue to gain greater importance.

I welcome all stakeholders to actively deliberate on these essential themes to suggest the actionable frameworks and policy initiatives required for this rapid transformation. I am confident that the insights shared here will lead the Indian coal mining industry toward a future defined by both growth and sustainability.

I wish the conference all success.

Alok Perti

बी. साईराम
अध्यक्ष-सह-प्रबंध निदेशक
B. Sairam
Chairman-Cum-Managing Director

(एक महारत्न कंपनी)
5 DECADES OF UNEARTHING ENERGY

कोल इण्डिया लिमिटेड
COAL INDIA LIMITED
(Govt. of India Enterprise)
Premises No. 04 MAR, Plot No. AF-III
Action Area - 1A, New Town, Rajarhat
Kolkata - 700 163
CIN : 123109WB1973GOI028844

(An ISO 9001:2015, ISO 14001 : 2015 & ISO 50001:2011 Certified Company)

Message

The rallying cry world over for coal's discontinuance is based on climate concerns. While clean environment is vital, equally important is the energy security of the Nation. India's energy scenario is different from the other countries, in a sense that, our energy aspirations are predominantly coal driven, and this scenario would continue for at least two decades. The imminent step then is to mine coal with minimal impact on environment and adopting eco-friendly mining operations.

India has set a Net Zero goal by 2070, with gradual phase down of coal and Coal India has set itself a Net Zero goal by FY 2030 with a multipronged approach. Solar power generation of 3000 MW by FY 2028 is a big step in this direction. Other measures include production through surface miners and the proliferation of their fleet in future, impetus on first mile connectivity resulting in reduced road traffic of coal. A pilot study done in two major opencast projects revealed around 75% to 80% reduction in particulate matter and gaseous emissions. CIL also undertakes massive tree plantation measures for greening the mining areas. The company has signed a MoU with IIT, Hyderabad for establishing a Centre of Clean Coal Energy and Net Zero.

I am pleased to note that the India Energy Forum; Mining, Geological and Metallurgical Institute of India, Delhi Chapter; and the Indian School of Mines Alumni Association, Delhi Chapter have joined hands in organizing a one day, 18th National Conference on 9th April 2026 in New Delhi on the theme "Transforming Coal Sector for a Net Zero Future," which strikes at the heart of the strategic shift currently underway in India's energy landscape.

With the conglomeration of subject experts and academia, I am sure the deliberations of the Conference will be productive and will lead to actionable strategies for a sustainable and resilient Indian coal sector.

Best Wishes for the Success of the Conference.

24/3/2026
(B Sairam)

Kolkata
24.03.2026

INDIA ENERGY FORUM

A K Jha
Vice President - IEF
Former CMD, Coal India Limited

Message

I am pleased to learn that the India Energy Forum (IEF), jointly with the Mining, Geological and Metallurgical Institute of India, Delhi Chapter (MGMI-DC) and the Indian School of Mines Alumni Association, Delhi Chapter (ISMAADC), is organizing the 18th National Conference on Coal on 9th April 2026 at Hotel Le Meridien, New Delhi.

The theme of this year's conference, "Transforming the Coal Sector – For a Net Zero Future," is indeed the call of the day for building a sustainable energy ecosystem in India.

India, a rapidly growing economy and home to the world's largest population of about 1.47 billion people, continues to witness a steady rise in electricity demand. Over the past several years, coal has contributed towards more than 70% of India's electricity generation and has remained the most reliable and economical source of energy for the country. Given India's abundant coal reserves, coal is expected to continue playing a vital role in meeting the nation's energy requirements for the next few decades, not only for power generation but also for the core industries such as steel, cement, aluminium, fertilizer.

However, considering the significant carbon footprint associated with the coal value chain—from mining to transportation and ultimately energy generation—major transformations are required to minimize emissions and move toward a Net Zero ecosystem. The adoption of advanced and more efficient technologies in coal mining and transportation, along with the use of ultra-critical and ultra-supercritical power plants and carbon capture technologies, will be essential in reducing the carbon footprint associated with coal-based energy production.

I am confident that this conference, with its timely and relevant theme the coal sector, will serve as an important platform for experts, policymakers, and industry leaders to exchange ideas, share expertise, and deliberate upon the ways toward a Net-Zero future.

I wish the conference a grand success.

A K Jha

India Energy Forum
908 Chiranjiv Tower, 43 Nehru Place, New Delhi 110 019 (India)
Tel : 011-46049584 E-mail : iefindiaenergyforum@gmail.com, indiaenergyforum@gmail.com

प्रसन्न कुमार मोटुपल्ली
अध्यक्ष एवं प्रबंध निदेशक
Prasanna Kumar Motupalli
Chairman and Managing Director

एनएलसी इंडिया लिमिटेड
भारत सरकार का 'नवरत्न' उद्यम
NLC INDIA LIMITED
'Navratna'- Govt. of India Enterprise
दूरभाष / Phone : 04142-252280
फैक्स / Fax : 04142-252543
ई-मेल / E-mail : cmd@nlcindia.in

20th March 2026

Message

It gives me great pleasure to learn that the 18th National Conference on Coal, themed *"Transforming Coal Sector for a Net Zero Future,"* is being organised on 9th April 2026 at New Delhi.

Coal continues to play a pivotal role in ensuring India's energy security and supporting its economic growth. As the nation advances towards its Net Zero commitments, the coal sector is undergoing a fundamental transformation—balancing the imperatives of sustainability, efficiency, and reliability. This transition necessitates the adoption of advanced mining technologies, digitalisation, cleaner utilisation pathways, and environmentally responsible practices across the value chain.

NLC India Limited is actively contributing to this national vision through a balanced and forward-looking strategy. Alongside its core mining and power operations, NLCIL has made significant strides in renewable energy capacity addition, expanding its footprint in solar and wind power, thereby supporting India's clean energy transition. The Company is also implementing progressive land reclamation, mine closure planning, afforestation, water management, and carbon reduction initiatives to minimise environmental impact.

I am proud to note that NLCIL has already achieved Net Zero status for its mining operations through sustained sustainability and offset initiatives. Building on this milestone, the Company is now firmly progressing towards becoming a fully Net Zero organisation in the near future, in alignment with the nation's broader climate goals.

In this context, forums such as this Conference provide an excellent platform for policymakers, industry leaders, researchers, and practitioners to exchange insights and deliberate on emerging challenges and opportunities. The focus on clean coal technologies, carbon footprint reduction, and innovative utilisation methods is both timely and essential for shaping a resilient and sustainable energy future.

I commend the organisers for bringing together distinguished experts and stakeholders under one platform. I am confident that the deliberations and outcomes of this Conference will contribute meaningfully to policy direction and industry advancement.

I convey my best wishes for the grand success of the Conference and the Souvenir.

(Prasanna Kumar Motupalli)

निगमित कार्यालय : ब्लॉक-1, नेयवेली-607801 **Corporate Office: Block-1, Neyveli - 607801**
पंजीकृत कार्यालय: नबंर.135, ई. वी. आर. पेरियार हाई रोड, कीलपॉक, चेन्नई - 600 010
Regd. Office : No.135, E.V.R. Periyar High Road,Kilpauk, Chennai - 600 010.
CIN No.: L93090TN1956GOI003507 वेबसाइट / Website: www.nlcindia.in

DEVELOPED INDIA MISSION 1947 TO 2047

ಬಿಇಎಂಎಲ್ ಲಿಮಿಟೆಡ್
బి ఈ ఎమ ఎల లిమిటెడ
BEML LIMITED

బీ ఈ ఎమ ఎల BEML Beyond Possibilities

Schedule 'A' Company under Ministry of Defence, Govt. of India

Defence & Aerospace | Mining & Construction | Rail & Metro

Message

It is a matter of great pride that the **India Energy Forum**, the **Mining, Geological and Metallurgical Institute of India (MGMI) – Delhi Chapter**, and the **Indian School of Mines Alumni Association (ISMAA) – Delhi Chapter** are jointly organizing the **18th National Conference** on 9th April 2026 at Le Méridien, New Delhi.

The theme of the conference, **"Transforming Coal Sector for a Net Zero Future,"** resonates deeply with the evolving industrial landscape of our nation. As India pursues the ambitious goal of **Net Zero emissions by 2070**, the coal sector is undergoing a historic shift from traditional extraction to **"Climate-Smart Mining."** This transformation requires a synergistic approach—integrating advanced mechanization, digitalization, and eco-friendly technologies to ensure energy security while minimizing environmental footprints.

At **BEML Limited**, we are committed to being a partner in this green transition. Our focus has increasingly shifted toward the indigenous development of **Clean Energy Mining Solutions**, including India's first **21-cubic-metre Electric Rope Shovels** and high-capacity **Electric/Hybrid Mining Machinery**. By championing the **"Atmanirbhar Bharat"** initiative, we aim to provide the Indian coal industry with sustainable, high-efficiency equipment that reduces carbon intensity and dependency on imports.

I am confident that this conference will serve as a vital platform for stakeholders to share innovative ideas and technical expertise. The deliberations held here will undoubtedly help in shaping a roadmap for a modern, efficient, and sustainable coal sector that aligns with India's climate commitments.

I extend my heartiest congratulations to the organizers and wish all the participants a very productive and successful conference.

(Shantanu Roy)
Chairman & Managing Director

ಪ್ರಧಾನ ಕಚೇರಿ: ಬೆಮಲ್ ಸೌಧ, 23/1, ನಾಲ್ಕನೇ ಮುಖ್ಯ ರಸ್ತೆ, ಸಂಪಂಗಿರಾಮನಗರ, ಬೆಂಗಳೂರು - 560027
Corporate Office: BEML SOUDHA, 23/1, 4th Main, S.R. Nagar, Bengaluru - 560027,
Tel : +91-80-2222 6969 e-mail: coord@bemlltd.in @cmdbeml @BEMLHQ
CIN: L35202KA1964GOI001530 | GST No. 29AAACB8433D1ZU | www.bemlindia.in

हरीश दुहन
अध्यक्ष-सह-प्रबंध निदेशक
Harish Duhan
Chairman-cum-Managing Director

साऊथ ईस्टर्न कोलफील्ड्स लिमिटेड
South Eastern Coalfields Limited
मिनी रत्न कम्पनी (कोल इंडिया लिमिटेड की अनुषंगी कम्पनी)
A Mini Ratna Company (A Subsidiary of Coal India Limited)
CIN:U10102CT1985GOI003161

Message

It is a privilege to note that the India Energy Forum (IEF), in collaboration with the MGMI (Delhi Chapter) and ISMAA (Delhi Chapter), is organizing the **18th National Conference on Coal** on 9th April 2026 at New Delhi.

The theme, ***"Transforming Coal Sector for a Net Zero Future,"*** is not just a visionary goal but a survival imperative for the global energy industry. As India strides toward its *"Panchamrit"* climate targets, the coal sector is undergoing a paradigm shift — moving from being a traditional extractor to a technologically advanced, carbon-conscious energy provider.

At **South Eastern Coalfields Limited (SECL)**, we recognize our pivotal role in this journey. Operating some of the world's largest coal mines, we are integrating sustainability into our core operations through:

- **Mega-Project Sustainability:** Implementing advanced Surface Miners and high-capacity HEMM to reduce blasting and minimize environmental footprints in our massive Open Cast mines like Gevra and Kusmunda.
- **Massive Carbon Sequestration:** Pursuing aggressive Afforestation and Miyawaki plantation techniques on overburden dumps to create significant carbon sinks.
- **Renewable Integration:** Actively transitioning our own energy consumption toward Solar Power, with large-scale ground-mounted and rooftop solar projects across our operational areas.
- **Digital Transformation:** Leveraging ERP and real-time monitoring to optimize logistics, thereby reducing the carbon intensity per tonne of coal produced.

This conference brings together the brightest technical minds, distinguished academia and R&D research scholars and industry veterans to deliberate on balancing ***"Energy Equity"*** with ***"Environmental Integrity."*** I am certain that the deliberations today will provide a roadmap for a ***"Green Coal"*** era that supports India's industrial growth while honouring our Net Zero commitments.

I congratulate the organizers for their tireless efforts and wish the 18th National Conference and this Souvenir every success.

Shri Harish Duhan
Chairman-cum-Managing Director
South Eastern Coalfields Limited

पंजीकृत कार्यालयः एसईसीएल भवन, पो.बॉ.नं.60,
सीपत रोड, बिलासपुर-495006 (छत्तीसगढ़)
दूरभाषः 07752-246301/302 फैक्सः 07752-246450

Regd.Office: SECL Bhawan, Post Box No. 60,
Seepat Road, Bilaspur-495 006 (CG)
Ph: 07752-246301/302 Fax: 07752-246450
Email: cmd.secl.cil@coalindia.in

सतीश झा
Satish Jha
अध्यक्ष-सह-प्रबंध निदेशक
Chairman-cum-Managing Director

ECL

ईस्टर्न कोलफील्ड्स लिमिटेड
Eastern Coalfields Limited
(भारत सरकार का एक उपक्रम)
(A Govt. of India Undertaking)
(कोल इंडिया लि. की एक अनुषंगी)
(A Subsidiary of Coal India Limited)

Date:23.03.2026

Message

It gives me immense pleasure to learn that the India Energy Forum, in collaboration with the MGMI – Delhi Chapter and ISMAA – Delhi Chapter, is organizing the 18th National Conference on the theme "Transforming Coal Sector for a Net Zero Future" on April 9, 2026, in New Delhi.

The coal sector remains the bedrock of India's energy security, providing the vital fuel needed to power our nation's rapid economic growth. However, as we stand at a critical juncture in the global climate discourse, the industry must evolve. The transition towards a "Net Zero" future is no longer a distant goal but an immediate operational imperative. At Eastern Coalfields Limited (ECL), we are deeply committed to this transformation by integrating sustainable mining practices with advanced technological interventions.

ECL has proactively adopted various eco-friendly initiatives, including:

Renewable Energy Integration: Significant investments in solar power projects to offset our operational carbon footprint.

Sustainable Mining: Implementing the "10 R's" concept (Reduce, Recycle, Reuse, etc.) and land reclamation through extensive multi-tier plantation drives.

Technological Innovation: Exploring coal gasification and digitizing the energy value chain to enhance efficiency and reduce emissions.

This conference provides a timely platform for industry leaders, policymakers, and experts to deliberate on the roadmap for a decarbonized coal sector. The synergy between the India Energy Forum and prestigious professional bodies like MGMI and ISMAA will undoubtedly catalyze actionable strategies for a "Just Transition" that balances energy demands with environmental stewardship.

I congratulate the organizers for choosing such a pertinent theme and wish the 18th National Conference on Coal every success.

Warm regards,

Satish Jha
Chairman-cum-Managing Director
Eastern Coalfields Limited

पंजीकृत कार्यालय / Regd. Office
अध्यक्ष-सह-प्रबंध निदेशक का कार्यालय, सांकतोड़िया, डाकघर- डिसेरगढ़, जिला- पश्चिम बर्द्धमान, पश्चिम बंगाल
Office of the Chairman-cum-Managing Director, Sanctoria, Post- Dishergarh, Dist. Paschim Burdwan, W.B.
दूरभाष/Phone - 341-2523795, फैक्स/Fax 0341-2523906, ईमेल/e-Mail: cmd.ecl.cil@coalindia.in
CIN : U1010WB1975GO1030295, Website : www.easterncoal.nic.in

मनोज कुमार अग्रवाल
अध्यक्ष-सह-प्रबंध निदेशक

Manoj Kumar Agarwal
Chairman-cum-Managing Director

बीसीसीएल BCCL
भारत कोकिंग कोल लिमिटेड
Bharat Coking Coal Limited

भारत कोकिंग कोल लिमिटेड
(कोल इण्डिया लिमिटेड की एक अनुषंगी कम्पनी)
Bharat Coking Coal Limited
(A Subsidiary of Coal India Limited)
(एक मिनी रत्न कम्पनी / A Miniratna Company)
(भारत सरकार का उपक्रम / A Government of India Undertaking)

Message

It gives me immense pleasure to note that the India Energy Forum (IEF), in collaboration with the Mining Geological and Metallurgical Institute of India (MGMI-DC) and the Indian School of Mines Alumni Association, Delhi Chapter (ISMAADC), is organising the 18th National Conference on Coal on 9th April 2026 at Hotel Le Meridien, New Delhi.

The theme of this year's conference, "Transforming Coal Sector for a Net Zero Future," is exceptionally timely. As India pursues its ambitious goal of becoming a Net Zero economy by 2070, the coal sector remains the backbone of our national energy security, currently fueling over 70% of our electricity generation. The challenge before us is not just to produce more, but to produce responsibly.

At Bharat Coking Coal Limited (BCCL), we are committed to this transformation through:

- Technological Innovation: Implementing mass production technologies and cleaner mining practices to reduce our carbon footprint.
- Environmental Stewardship: Enhancing our land restoration and afforestation efforts to ensure mining and nature co-exist in harmony.
- Operational Excellence: Modernising our logistics and first-mile connectivity to minimise diesel consumption and environmental impact.

This conference provides a vital platform for policymakers, industry leaders, and academia—including the distinguished academia and R&D research scholars to deliberate on the roadmap for a sustainable energy landscape. Collaborative efforts and knowledge sharing are essential to navigating the complexities of this transition while ensuring the nation's growth remains uninterrupted.

I congratulate the organisers for choosing such a pertinent theme and bringing together the brightest minds of the industry. I wish the conference and the publication of this Souvenir a resounding success.

(Manoj Kumar Agarwal)

पंजीकृत कार्यालय: कोयला भवन, कोयला नगर, बीसीसीएल टाउनशिप, धनबाद, झारखंड-826005, भारत, फोन: 0326-2236000, वेबसाइट: www.bcclweb.i

सीएसआईआर
CSIR
भारत का नवाचार इंजन
The Innovation Engine of India

प्रो. अरविंद कुमार मिश्रा, एफ.आई.ई
निदेशक
Prof. Arvind Kumar Mishra, F.I.E
Director

सीएसआईआर-केन्द्रीय खनन एवं ईंधन अनुसंधान संस्थान
(वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद्)
(विज्ञान एवं प्रौद्योगिकी मंत्रालय, भारत सरकार)
बरवा रोड, धनबाद - 826001, झारखण्ड, भारत
CSIR-CENTRAL INSTITUTE OF MINING AND FUEL RESEARCH
(Council of Scientific & Industrial Research)
(Ministry of Science & Technology, Govt. of India)
Barwa Road, Dhanbad - 826001, Jharkhand, India

Message

I am glad to know that Mining Geological and Metallurgical Institute of India (MGMI-DC) jointly with Indian School of Mines Alumini Association, Delhi Chapter (ISMAA-DC) and India Energy Forum (IEF) shall be organizing 8TH Coal Summit on 18th January 2023 at Hotel Le Meridien New Delhi with theme of "Optimizing Coal Production and Productivity – Coal Pricing and Financing".

Coal Mining Industry in the country is facing a big challenge in meeting the continuously increasing demand of the consuming industry with focus on quality which calls for adopting latest mining technologies / mechanization and quality control techniques.

The economic reforms and changes in the global economy have propelled the Indian Coal Sector into a new competitive environment and under such conditions quality and cost effectiveness of coal produced would be the key parameters & would need to be addressed. The vision of enhanced production will only be realized, if enough skilled and trained executives and work force is available.

I wish the conference a grand success and convey my best wishes to the organizers of the conference.

02/04/23

[Arvind Kumar Mishra]

HQ :Dhanbad - Tel.: +91-326-2296023, 2296006 (O) Fax : +91-326-2296025 E-mail : director@cimfr.res.in
Digwadih Campus : Tel.: +91 - 326 - 2388202, Regional Centres : Bilaspur : Tel.: +91-7752-271450
Nagpur : Tel.: +91-712-2510604, 2510390, Ranchi : Tel.: +91-651-2461392, Roorkee : Tel.: +91-1332-275998
Website : www.cimfr.nic.in

N N Gautam

Former Advisor, Ministry of Coal & UNDP
Chairman, Coal Group, IEF
Convenor, Organising Committee, 18th NCC 2026

Message

It gives me immense pleasure to acknowledge that the India Energy Forum (IEF), is organizing the 18th National Conference on Coal on 9th April, 2026 at Hotel Le Meridien, New Delhi in collaboration with the Mining Geological and Metallurgical Institute of India (MGMI-DC) and the Indian School of Mines Alumni Association, Delhi Chapter (ISMAA-DC).

The conference theme, 'Transforming the Coal Sector – For a Net Zero Future,' reflects the critical evolution required of our industry. For decades, coal has been the bedrock of India's energy security. India needs efficient transformation of the coal sector value chain for balancing its growing energy needs with the imperative to reduce Greenhouse Gas (GHG) emissions.

A cornerstone of this transformation is the adoption of latest-generation, high-efficiency equipment. To achieve our production targets sustainably, the industry must pivot toward low-carbon footprint machinery and automated handling systems. From high-capacity Continuous Miners and Surface Miners to electrified transport fleets, the integration of 'Green Mining' technologies is essential to minimize operational emissions. Furthermore, given the high ash content of Indian coal, we must prioritize Coal Quality Upgradation through advanced washing and beneficiation technologies. On the coal utilization front, coal user industries like power steel and other coal consuming industries need to equally work towards efficient coal utilization for minimal carbon footprint. Also, old power plants need to be upgraded with super critical and ultra super critical systems for contributing towards a Net-Zero Future of the Industry.

I am confident that this conference will serve as a premier forum for deliberating on the deployment of energy-efficient equipment a smart handling solution that will define the future of the Indian coal sector towards a net-Zero Future.

I wish this timely and significant conference every success.

N.N. Gautam

Committees

National Advisory Board

Patrons

Shri R V Shahi
President, IEF
Former Secretary, Ministry of Power

Shri C. Balakrishnan
Former Secretary, Ministry of Coal

Shri Alok Perti
Former Secretary, Ministry of Coal

Chairman

Shri B Sairam
Chairman, CIL

Co-Chairmen

Shri Anil K Jha
Former CMD, CIL

Shri M Prasanna Kumar
CMD, NLC

Convenor

Shri N N Gautam
Former Advisor, Ministry of Coal

Co-Convenors

Shri V K Sehgal
Former CMD, SECL

Shri S K Grover
Former GM, NTPC

Members

Shri Pankaj Agarwal
Secretary, Ministry of Power
New Delhi

Shri Alok Kumar Singh
Adviser (Projects), Ministry of Coal
New Delhi

Shri Satish Pai
MD
HINDALCO

Shri Piyush Goyal
Secretary, Ministry of Mines
New Delhi

Shri Gurdeep Singh
CMD, NTPC Ltd
New Delhi

Dr Vinay Prakash
Director, Adani Natural Resources
Ahmedabad

Shri Tanmay Kumar
Secretary, Ministry of Environment
Forest & Climate Change, New Delhi

Shri D Krishna Bhaskar, IAS
CMD, Singareni Collieries Co. Ltd
Hyderabad

Shri Harish Duhan
CMD
WCL

Shri Hitendra Malhotra
Member (Operation & BD), Rly. Board
New Delhi

Prof Sukumar Mishra
Director, IIT (ISM)
Dhanbad

Shri Sunjoy Joshi
Chairman
ORF

Shri Sandeep Pondrik
Secretary, Ministry of Steel
New Delhi

Shri S K Chowdhary
Former CMD, CIL &
Executive President, Indian Coal Forum
New Delhi

Shri S M Mahajan
Secretary General, IEF
New Delhi

Smt Rupinder Brar
Additional Secretary, Ministry of Coal
New Delhi

Shri PS Bhattacharyya
Former Chairman
Coal India Ltd.

Shri V K Arora
Former Mentor
KCT

Shri Ujjawal Tah
DG, DGMS
Dhanbad

Shri Arun Kumar Singh
CMD
ONGC

Organising Committee

Chairman

Shri B Sairam
CMD, CIL

Co-Chairmen

Shri Anil K Jha
Former CMD, CIL

Shri Asheesh Kumar
Director (BD), Coal India Ltd

Convenor

Shri N N Gautam
Chairman, Coal Group, IEF & SG, ISMAA, Delhi Chapter

Co-Convenors

Shri P S Upadhyaya
Former Director (Tech), NMDC

Shri Bhim Sen
Hon. Secretary, MGMI

Members

Shri Manoj Kumar Gangeya
Joint Secretary
Ministry of Coal, New Delhi

Shri Uday A Koale
CMD
MCL

Shri Kapil Dhagat
Mining Consultant & Former EVP
JSPL

Shri Aadhar Raj
Joint Secretary (Thermal & Coal),
Ministry of Power, New Delhi

Shri Satish Jha
CMD
ECL

Shri Birendra Kumar Thakur
Director (Tech)
Ministry of Coal

Shri P K Ojha
Executive Director (TT)
Railway Board, New Delhi

Shri N K Singh
CMD
CCL

Shri L V Suryanarayanana
Director (OP)
SCCL

Shri V K Bajpai, IAS
Jt Secretary
Ministry of Mines

Shri Mukesh Choudhary
Director (Marketing)
CIL, Kolkata

Dr M M Seam
Former Advisor
Essar Minerals

Shri Manoj Kumar Agarwal
CMD
BCCL

Shri Sajeesh Kumar N
Coal Controller

Shri A.K. Tooley
Former Director
WCL

Shri Harish Duhan
CMD
SECL & WCL

Dr Suresh Chandra Suman
Director (Mines)
NLC

Shri S K Grover
Former GM Fuel
NTPC

Shri Choudhary Shivraj Singh
CMD
CMPDI, Ranchi, Jharkhand

Shri M N Jha
Former CMD
SECL

Shri CSK Singh
Honorary Secretary
MGMI, Kolkatta

Souvenir Committee

Chairman

Shri P S Upadhyaya
Former Director (Tech)
NMDC

Co-Chairman

Shri Uma Shankar
Coal Mining Specialist

Members

Shri N N Gautam
Chairman, Coal Group
IEF & SG, ISMAA, Delhi Chapter

Shri M N Jha
Former CMD
SECL

Shri R N Jha
Former CMD
CMPDI

Core Group

Members

Shri Alok Perti
Former Secretary
Ministry of Coal

Shri Anil K Jha
VP, IEF & Former CMD
CIL

Shri S K Grover
Former GM Fuel
NTPC

Shri P S Upadhyaya
Former Director (Tech)
NMDC

Shri N N Gautam
Chairman, Coal Group
IEF & SG, ISMAA, Delhi Chapter

Shri A.K. Tooley
Former Director
WCL

Shri M N Jha
President, MGMI DC &
Former CMD, SECL/CMPDI

Shri V.K. Sehgal
Former CMD
SECL

Shri Kapil Dhagat
Mining Consultant & Former EVP
JSPL

Shri Tarun Mishra
CEO, EvotAi Technologies Pvt. Ltd.
Divitson Pvt. Ltd.

From the Secretariat

Shri S S Rawat
Head (Admn)
IEF

18th National Conference on Coal

"Transforming Coal Sector for a Net-Zero Future"

Programme

09:00 a.m. - 09:30 a.m.	:	**REGISTRATION**
09:30 a.m. - 10:30 a.m.	:	**INAUGURAL SESSION OF THE CONFERENCE**
Introductory Remarks by	:	**Shri N N Gautam**, Chairman, Coal Group, IEF
Welcome Address by	:	**Shri Alok Perti**, Patron, 18th National Conference on Coal 2026 and Former Secretary, Ministry of Coal
Presidential Address by	:	**Shri R V Shahi**, President, IEF and Former Secretary, Ministry of Power Power
Address by the Guests of Honour	:	**Shri B Sairam**, Chairman, Coal India Ltd.
Inaugural Address by the Chief Guest	:	**Shri G Kishan Reddy**, Hon'ble Minister for Coal and Mines
Vote of Thanks by	:	**Shri Anil K Jha**, Vice President, IEF and Former CMD, CIL
10.30 a.m. - 11.00 a.m.	:	Tea Break
11:00 a.m. - 12.15 p.m.	:	**SESSION I** *"Strategic Policy Initiatives Required to Facilitate Transformation of Coal Sector"*
Chairperson	:	**Shri S K Srivastava**, Former Secretary, Ministry of Coal
Co-Chair	:	**Shri P M Prasad**, Former CMD, CIL
Speakers	:	• **Dr B Veera Reddy**, Advisor, CIL • **Shri Rajnath Ram**, Advisor (Energy), NITI Aayog • **Shri C P Garg,** Executive Director (S&R), Coal India Ltd • **Shri Alok Jain**, Chief Commercial Officer, MTCSL
Session Coordinator	:	**Shri Tarun Mishra**, CEO, EvotAi Technologies

12:15 p.m. - 01.30 p.m. : **SESSION II**

"Reducing Carbon Footprint in Coal Utilization: Conventional Methods"

Chairperson : **Shri Shivam Srivastava**, Director, NTPC

Co-Chair : **Shri Asheesh Kumar**, Director (BD), CIL

Speakers :
- **Shri Siddhartha Saxena**, Director (Infra), Grant Thornton Bharat LLP
- **Prof Dr Arvind Kumar Mishra**, Director, CIMFR
- **Prof. Debashish Chakravarty,** IIT Kharagpur
- **Shri Rajib Maitra**, Partner, Deloitte Touche Tohmatsu India LLP
- **Prof. Khanindra Pathak**, Adviser, Geospatial Academy, IIT Kharagpur

Session Coordinator : **Shri Umashankar**, Project Management Advisor

01.30 p.m. - 02.30 p.m. : Lunch

02.30 p.m. - 03.45 p.m. : **SESSION III**

"Reducing Carbon Footprint in Coal Utilization: Advance Alternate Methods"

Chairperson : **Shri R P Ritolia,** Former CMD, CCL

Co-Chair : **Shri A K Balyan**, Former MD & CEO, Petronet LNG

Speakers :
- **Shri Naveen Kumar Ahlawat**, President, Sustainability and Decarbonisation, Jindal Steel
- **Dr Sanjay Kumar**, Former Director (P), WCL
- **Shri Sujay Karmakar**, CGM, NETRA (NTPC Energy Technology Research Alliance)
- **Dr. Peeyush Kumar**, MD, Bharat Coal Gasification and Chemicals Ltd

Session Coordinator : **Shri P S Upadhyaya**, Former Director, NMDC

03.45 p.m. - 04.00 p.m. : Tea

04.00 p.m. - 04.30 p.m. : **VALEDICTORY SESSION**

Chief Guest : **Shri Pankaj Agarwal,** Secretary, Ministry of Power

Summing Up by : **Shri R V Shahi**, President, IEF & Former Secretary, Ministry of Power

Recommendations by : **Shri Alok Perti**, Former Secretary, Ministry of Coal

Vote of Thanks by : **Shri S M Mahajan**, SG, IEF

Organisers

India Energy Forum

India Energy Forum is a unique, independent, non-profit research organization and represents the energy sector as a whole. It was set up in February 2001 and formally inaugurated in January 2002. The mission of IEF is to help evolve a National Energy Policy aimed at development of a sustainable and competitive energy sector in India. It is, probably, the only organization which championed the cause of TOTAL ENERGY– all forms of energy ranging from Coal, Power – Thermal & Hydro, Oil & Gas, Nuclear and Renewable from the beginning of its function. This feature of its functioning gave a distinctive advantage of taking an integrated look on the energy scene.

In fact, IEF framed an Energy Policy document which became an input to the Planning Commission's Integrated Energy Policy brought out in August 2006. Its membership includes all the key players of the energy sector both from private and public and over 140 highly respected energy experts.

The Forum has an MOU with International Solar Alliance to promote the development of solar power projects not only in India but throughout the world.

Every year it organizes its flagship events viz, National Power Conference, Oil and Gas Conference, Renewable Energy Conference, National Conference on Coal and Nuclear Energy Conclave besides webinars which are organized almost every month.

It also organises "India Energy Debate" – a new monthly discussion to debate the critical issues of India's energy sector.

It publishes a monthly e-journal TOTAL ENERGY which provides authentic information on the whole energy sector at one source. It also brings out DAILY ENERGY NEWS REPORT.

MGMI – Delhi Chapter

Mining, Geological and Metallurgical Institute of India (MGMI) is the oldest technical organization of this nature in Asia. It was set up in 1906 and today it has a membership of more than 3000 professionals from different fields of mineral based industries, Technocrats, Planners and Policy Makers both in Private & Public sector at State/Central levels, experienced Managers in different sub-disciplines in evaluation of resources and their eco-friendly exploitation, Academicians, Research workers and students from Geology, Mining and Metallurgy streams & Chief Executives of most of organizations related to mining and minerals in India. The Institute is now recognized as one of the preferred professional societies for membership by all appropriately qualified personnel associated with the study and use of minerals and mineral-related industries in India.

ISM Alumni Association

This is an association of Alumni of Indian School of Mines and Applied Geology (now IIT-ISM), the internationally recognized Mining institution based at Dhanbad. It has chapters at all the mineral-related centres in India and even abroad where the alumni of this institution work and operate. This Association is also a think tank & contributes to exchange & dissemination of mineral-related information and practices.

For Further enquires, please contact:

Shri S S Rawat
Head (Administration), India Energy Forum
Conference Secretariat
908, Chiranjiv Tower, 43, Nehru Place, New Delhi - 110019
Tel. : +91-11-46094258 • E-mail : coalsummits@gmail.com

Glimpses of Previous Conference


INDIA ENERGY FORUM
RAJAT MUKHERJEE
ANIL K JHA


INDIA ENERGY FORUM
KAPIL DHAGAT
RUPINDER BRAR
SATISH JHA


FORUM


5 DECADES OF UNEARTHING ENERGY
ECL
Great Place To Work. Certified
SEP 2025 – SEP 2026 INDIA
Fueling industries ... Illuminating homes
Empowering India
Scan to us follow us on :


Theme Papers

MTCS

INTELLIGENT MINING SOLUTIONS

MINING TECH CONSULTANCY SERVICES

Our Services

With 29 drilling rigs and Geophysical logger van supporting deep exploration up to 1200m, we bring robust field capabilities to every project. Our holistic, cross-functional approach ensures technical, operational, and financial excellence.

- **Geological Exploration, Geological Report (GR) Preparation and Surveying**
- **Geospatial Analysis and Digital Tech in Mining**
- **Mine Planning and Operational Scheduling**
- **Mining Plan, Mine Closure Plan, JORC Reports**
- **Feasibility, Pre-Feasibility and Detailed Project Reports**
- **Due Diligence, Lender's Engineer, and Audit Reports**
- **Operational (Optimisation) Studies – Cost, ROM Quality and Productivity**
- **Financial Modelling and DPR Preparation**

Accreditation

- **Accredited Prospecting/Exploration Agency (APA)**
- **Mining Plan Preparing Agency (MPPA)**
- **Accredited Exploration Agency (AEA) under QCI-NABET**
- **Notified Private Exploration Agency (NPEA)**
- **Notified Accredited Prospecting Agency (NAPA)**

For enquiries, contact:

info@mtcspl.com +91 7227920401, +91 7486006336

Commerce House 6, Corporate Road, Off SG Highway, Prahladnagar,
Ahmedabad – 380 051, Gujarat, INDIA

Transforming the Indian Coal Sector for a Net Zero Future

— **Abhinav Sengupta**
Mining Sector Expert

1. Introduction

India is the world's second largest producer and consumer of coal and generates about three quarters of its electricity from coal. Coal mining, transport and consumption therefore underpin national energy security, industrial development and employment. However, these activities also generate substantial greenhouse gas (GHG) emissions through fugitive methane release, diesel intensive haulage, land disturbances and carbon intensive electricity use. India has committed to reduce its emissions intensity by 45 per cent by 2030 and to achieve net zero emissions by 2070. This means that decarbonization of the coal sector is no longer optional it is integral to India's clean energy transition and its economic competitiveness.

The Ministry of Coal (MoC) has acknowledged this dual challenge. In 2019 it created a Sustainable Development Cell (SDC) to mainstream environmental, social and governance (ESG) principles across coal mining. The SDC identified priorities such as water utilisation, eco parks, overburden management, renewable energy deployment and first mile connectivity projects to reduce truck haulage. Recent national workshops and policy documents emphasize aligning coal mining with global sustainability goals, adopting coal gasification, enhancing safety, engaging communities, improving transportation and ensuring robust mine closure and land reclamation. The coal minister stated that carbon capture and storage (CCUS) is being integrated with coal gasification hubs, that the government's Coal Gasification Mission targets 100 million tonnes of gasification by 2030 supported by an ₹8500 crore incentive scheme, and that more than 57000 ha of degraded land have already been restored. Coal PSUs are being encouraged to diversify into renewable energy and critical minerals while aiming to reclaim at least 100000 ha of mined land by 2047.

This article provides a comprehensive analysis of how to transform India's coal sector for a net zero future. It explains why change is necessary, what transformation entails across mining operations, logistics, utilization and post mining activities, how the transition can be achieved through technology, policy and finance, and which stakeholders' government, miners, financiers and technology providers must take specific actions. Drawing from recent government releases, industry reports and academic analyses, it aims to inform policymakers and business leaders about pathways that reconcile energy security, economic development and climate commitments.

2. Why the Coal Sector Must Transform

a. Climate imperatives and methane risk

Coal related emissions threaten India's climate goals. Fugitive methane released during mining is a potent GHG, with 28 times the warming potential of CO_2 over 100 years. Ember's analysis warns that if Indian coal production grows as planned, methane emissions could exceed 1.6 million tonnes per year

by 2029 more than double 2019 levels causing greater annual warming than emissions from all India's trucks and buses in 2021. The study estimates that mitigating coal mine methane could reduce emissions by 35% annually by 2030, cutting 1.6 million tonnes of methane (≈45 Mt CO_2e) over 5 years and saving about US$980 million in imported gas costs. Without mitigation, methane venting would undermine national carbon budgets and global efforts to limit warming.

b. Air quality, health and social concerns

Coal mining generates air and water pollution, dust, noise and land degradation that harm local communities and ecosystems. Fine particulate pollution from coal vehicles and blasting contributes to respiratory illnesses and reduces agricultural productivity. Opencast mines require large land footprints and cause deforestation; underground mining can trigger subsidence and fires (as in Jharia). Improving air quality, water management and land restoration is therefore crucial not only for climate reasons but also for public health and social license to operate. The MoC's push to develop eco parks and reclaim land aims to provide local employment through tourism, afforestation and horticulture.

c. Economic and financial drivers

Modernizing coal operations enhances productivity, safety and cost competitiveness. Diesel powered haul trucks, ventilation fans and coal handling plants consume large volumes of fuel and electricity. Electrification, automation and digital optimization reduce operating costs, while harnessing methane or overburden sand generates new revenue. Investors increasingly scrutinize ESG performance, and financiers are reluctant to support carbon intensive assets. Access to capital now depends on credible decarbonization plans, with potential to tap sustainability linked loans, green bonds and carbon credit markets. Furthermore, the cost of renewable energy and battery storage has fallen dramatically, making renewable integration economically attractive. Coal companies that fail to adapt risk stranded assets and loss of competitiveness.

d. Policy commitments and international scrutiny

India's updated NDCs, the National Coal Gasification Mission (100 MT by 2030) and forthcoming carbon credit trading system create policy momentum for change. Internationally, trade partners and investors may impose carbon border adjustments, so exporting countries must demonstrate decarbonization. Moreover, just transition principles emphasize fair outcomes for workers and communities, requiring proactive planning. Thus, the coal sector must transform to meet domestic policies and retain global competitiveness.

3. What Transformation Entails

Transforming the coal sector for a net zero future requires a holistic approach across the entire value chain: mining operations, logistics and coal handling, coal utilisation, land reclamation and mine closure, and institutional and financial systems. The section below defines these pillars and summarizes current initiatives.

a. Decarbonizing mining operations

Electricity is consumed in ventilation, pumping, crushing, conveying and lighting. To cut energy intensity, coal PSUs plan to replace inefficient equipment with energy efficient motors, pumps and lighting. Coal India's (CIL) decarbonization plan includes retrofitting 1700 pumps with high efficiency motors, replacing 5000 air conditioners with efficient models, installing 250000 LED lights and using 100000 super efficient fans across offices and residential colonies. Such measures reduce power demand and lighten the load on the grid. Electrification of mine mobility is another priority. CIL aims to deploy 1500 electric vehicles across all mining areas within 5 years, gradually replacing diesel pickups, cars and buses.

b. Low carbon logistics and first mile connectivity

Transporting coal from pitheads to railheads or consumers often relies on diesel trucks, causing emissions, dust and congestion. The First Mile Connectivity (FMC) initiative aims to replace road transport with mechanized coal handling plants, conveyor belts, silos and rapid loading systems that feed directly into rail wagons. Over the longer term, the CIL plans 92 FMC projects with capacity of 994 MT per year by FY 2029, enabling nearly all coal to be loaded onto trains without trucks. This significantly cuts diesel consumption and dust pollution. Converting haulage within mines to conveyor belts and ropeways also reduces diesel use. In some new mines, in-pit crushing and conveying (IPCC) systems feed coal to surface conveyors, eliminating the need for truck haulage. Pilot projects combining IPCC with electric or hybrid haul trucks can achieve substantial fuel savings.

c. Renewable energy integration

Coal PSUs recognize that using renewable power for mining operations (Scope 2) emissions is essential. CIL aims to become a Net Zero Energy Company by meeting all its power needs from renewables. These renewable plants not only decarbonize mine operations but also repurpose mined out land. Singareni Collieries Company Ltd (SCCL) is another leader. Such projects set a precedent for other miners to harness solar, wind and battery storage to supply their operations and feed surplus power into the grid.

d. Coal utilisation and gasification

Reducing emissions from coal use is as important as cleaning up mining. India's National Coal Gasification Mission aims to gasify 100 MT of coal by 2030 to produce syngas for chemicals, fertilizers, liquid fuels or power. The government approved an ₹8500 crore incentive scheme and identified seven projects under implementation. Gasification can lower emissions relative to pulverized coal combustion when coupled with carbon capture, utilisation and storage (CCUS). Gasification also diversifies coal use and creates new industries, reducing dependence on imported feedstocks like natural gas for fertilizer.

e. Land reclamation, biodiversity and community development

Coal mining disturbs ecosystems and displaces communities; thus, reclamation, biodiversity restoration and socio economic support are vital to a just transition. The MoC's SDC promotes bio

reclamation and tree plantation, and emphasizes creating eco parks, urban forests and water bodies on reclaimed land. The Mission Green Coal Regions aims to restore 16000 ha by 2030, building on the 57000 ha already restored. Reclaimed land is being used for solar parks, agriculture, horticulture and eco tourism. Coal India and SCCL have developed eco tourism projects in open cast pits, offering boating, wildlife and recreation. Mine closure plans are now compulsory and include provisions for land reclamation, afforestation, pond construction, soil stabilization and alternative livelihoods. These initiatives align with just transition principles by ensuring that communities benefit from decarbonization and that mining legacies become assets for local economies.

f. Institutional and financial reforms

Transforming the coal sector requires new institutions and financial mechanisms. The SDC coordinates sustainability initiatives and promotes adoption across PSUs and private miners. The government is developing a domestic carbon market, with the Bureau of Energy Efficiency (BEE) readying methodologies for a carbon credit trading scheme by 2025. This will enable coal companies to generate and trade credits from methane capture, energy efficiency and renewable projects, creating revenue streams and setting implicit carbon prices. Financial instruments are evolving. Coal PSUs are exploring sustainability linked loans (SLLs), transition bonds and blended finance structures. District Mineral Foundation funds and corporate social responsibility budgets can support community development and reclamation. These reforms must ensure transparency, accountability and environmental justice.

4. How to Transform: Strategies and Measures

a. Technical Measures

i. Methane Management

- **Pre drainage and Gob gas drainage -** Drill boreholes ahead of mining to suck out methane and after mining to capture gas from goaf areas. Use vacuum pumps and gas gathering pipelines. Prioritize gassy seams in Jharia, Raniganj and Sohagpur as identified by CMPDI. Deploy best practices from countries like Australia and China.
- **Commercial CBM exploitation -** Partner with oil and gas firms to develop CBM wells within and adjacent to coal mines. Sell gas through pipelines or compress into CNG for local use. Integrate with city gas distribution networks. Regulatory clarity on rights and pricing is essential.
- **Monitoring and Monitoring, Reporting, and Verification (MRV) -** Install continuous methane monitoring systems at mine seals, ventilation shafts and drainage points. Provide real time data to operations and regulators. This improves safety and ensures emission reductions are verifiable for carbon credits.

ii. Energy Efficiency and Electrification

- **High efficiency motors and variable frequency drives (VFDs) -** Upgrade motors used in ventilation fans, pumps and conveyors to high efficiency models. Use VFDs to match motor speed with load, saving energy particularly during partial load operations.

- **Smart ventilation and pumping -** Deploy sensors and control systems that adjust ventilation and pumping rates based on gas concentrations, equipment loads and production schedules. This reduces over ventilation and pumping.
- **Electrification of mobile equipment -** Replace diesel haul trucks, dozers and vehicles with battery electric or hybrid models. Where battery technology for ultra class trucks is not yet mature, implement trolley assist systems that power trucks through overhead lines on uphill haulage routes.
- **In pit crushing and conveying (IPCC) -** Install mobile crushers in the pit and conveyors to deliver coal to the surface, eliminating truck haulage. Combine with continuous surface miners (drum cutters) to avoid blasting and reduce energy use.
- **Digitalization and Automation -** Use fleet management systems, GPS tracking and AI driven dispatch to optimize truck loading, routing and maintenance schedules, reducing idle time and fuel burn. Adopt predictive maintenance to minimize downtime.

iii. Renewable Integration and Green Microgrids

- **Ground mounted and rooftop solar -** Develop solar farms on degraded or reclaimed land and install panels on workshops, offices and housing colonies. Use net metering to feed excess power to the grid.
- **Floating solar on mine pit lakes -** Convert water filled pits into floating solar farms. They avoid land occupation and reduce water evaporation.
- **Wind, small hydro and biomass -** Diversify renewable portfolio to mitigate intermittency.
- **Battery energy storage systems (BESS) -** Install BESS to store solar power and provide firm supply for mining operations. BESS can also smooth demand peaks and participate in ancillary services markets.
- **Microgrids with demand response -** In remote coalfields, integrate renewable generation with diesel or gas peakers to form microgrids. Deploy demand response technologies to shift loads (e.g., pumping and crushing) to times of high solar output.
- **Green open access -** Use open access regulations to purchase renewable electricity from third party providers, ensuring mines have continuous green power. State electricity regulators should facilitate open access connectivity for mines.

iv. Gasification and CCUS

- **Syngas for chemicals and fuels -** Develop coal gasifiers that convert coal into syngas (CO, H_2). Use it to produce methanol, fertilizers, synthetic natural gas or hydrogen. This reduces direct coal burning and creates value added products.
- **Integrated gasification combined cycle (IGCC) -** Combine gasification with gas and steam turbines to generate electricity with higher efficiency than pulverized coal plants. Pair with carbon capture technologies (e.g., pre combustion CO_2 removal) to produce low carbon power.

- **Carbon capture, utilisation and storage (CCUS) -** Capture CO_2 from gasifiers or existing coal plants and either utilize it (e.g., in chemicals, building materials) or store it in geological formations. However, CCUS is capital intensive and requires regulatory frameworks and transport/storage infrastructure.

v. Land and Biodiversity Management

- **Concurrent reclamation and afforestation -** Start reclaiming overburden dumps and mined out areas during active mining. Use terracing and soil amendments, plant native species and adopt innovative techniques like seed balls, and drone seeding emphasizes such methods improving survival rates and trapping dust.
- **Eco parks and tourism -** Transform mined out pits into eco parks with lakes, forests and recreational facilities, providing community employment.
- **Water management and irrigation -** Reuse mine water for irrigation, dust suppression and drinking by treating it. Over 60% of mine water can be reused, supplying water to nearby villages. Converting pit lakes into reservoirs supports fish farming and groundwater recharge.
- **Just transition programs -** Provide skill training and alternative livelihoods (renewable energy installation, plantation, tourism) for workers and communities as mining declines in some areas. Use District Mineral Foundation (DMF) funds to finance health, education and infrastructure.

vi. Promoting Ultra Mega Power Plant (UMPPs)

- Ultra Mega Power Plants (UMPPs) using supercritical and ultra-supercritical technologies are critical for reducing emissions in India's coal-based power sector while ensuring energy security. Compared to subcritical plants (32-34% efficiency), supercritical systems (38-40%) and ultra-supercritical systems (up to 45%) significantly improve efficiency, leading to 15-20% lower CO_2 emissions per unit of electricity and reduced coal consumption, ash generation, and logistics burden.
- UMPPs also enable consolidation of capacity by replacing older, inefficient thermal plants and providing stable baseload power to support renewable energy integration. Their higher efficiency reduces the environmental footprint while maintaining grid reliability.
- Policy focus should be on reviving the UMPP framework with mandatory adoption of advanced technologies, linking new capacity to phased retirement of subcritical plants, and ensuring future readiness for carbon capture (CCUS). Thus, UMPPs act as a strategic bridge, enabling a gradual transition from coal dependence to a cleaner energy system.

b. Policy and Regulatory measures

- **Mandatory MRV and emissions disclosure -** Require all coal mines to measure and report Scope 1 and 2 emissions (methane, diesel, electricity use) quarterly. Adopt digital MRV systems and publish mine wise GHG intensity league tables, as suggested in the policy recommendations. This improves transparency and allows carbon markets to function.

- **Methane regulation and crediting -** Set methane intensity benchmarks and require gassy mines to develop mitigation plans. Establish a methodology for methane reductions in the carbon market so that mines earn credits for capturing or destroying methane. Provide viability gap funding and price floors through offtake contracts.
- **Performance linked royalty rebates -** Offer royalty or revenue share rebates for mines that meet emission intensity targets or use gasification, similar to the concession offered for coal used in gasification.
- **Green open access policy -** Allow mines to procure renewable power directly from third party generators or via the grid without cross subsidy surcharges. Ensure timely grid connections and flexible demand response tariffs. Harmonize central and state regulations.
- **Standards for electric and hybrid equipment -** Develop standards for electric haul trucks, trolley systems and charging infrastructure. Provide accelerated depreciation and import duty reductions for electric or low emission mining equipment.
- **Land reclamation and closure norms -** Strengthen mine closure guidelines to require progressive reclamation, post closure land use plans, biodiversity offsets and long term monitoring. Link environmental security deposits to reclamation performance.
- **Just transition framework -** Create a national just transition policy covering social protection, retraining, diversification and community development in coal regions. Integrate this with the coal sector's decarbonization roadmap to ensure fairness.

c. Financing and Economic Instruments

- **Blended finance -** Mobilize concessional funds (from the government or multilateral agencies) alongside commercial debt to de risk high impact projects (methane capture, gasification, CCUS, large solar farms). Create a Mine Decarbonization Line of Credit to support pilot projects.
- **Sustainability linked loans and transition bonds -** Structure loans where interest rates fall if the borrower meets emission reduction targets (e.g., tonnes CO_2e per tonne of coal mined, volume of methane captured, share of renewable energy). Issue transition bonds to finance green retrofits, backed by commitments to reduce emissions.
- **Carbon revenue stacking -** Combine revenue from carbon credits (domestic and international) with savings from energy efficiency to improve project returns. For example, a methane capture project could earn carbon credits, reduce ventilation costs and supply gas to a power plant.
- **OEM financing and service models -** Encourage original equipment manufacturers (OEMs) to offer mining equipment as a service, bundling equipment, maintenance and performance guarantees.
- **Green bonds and sovereign guarantees -** Coal PSUs could issue green bonds to finance renewable projects; sovereign guarantees can lower borrowing costs for high impact projects. District Mineral Foundation and CSR funds can co finance reclamation and community projects.

- **Tax incentives and accelerated depreciation -** Provide tax credits for investments in renewable energy, electric equipment and methane capture. Accelerate depreciation allowances for low emission assets to improve their net present value (NPV).

5. Stakeholder Responsibilities and Action Plan

Achieving transformation requires coordinated actions by government, miners, financiers, technology providers and civil society. Below Table outlines the key tasks over the next decade.

Table 1 : Stakeholder tasks for transforming India's Coal Sector

Stakeholder	Immediate (0-2 yr) tasks	Medium term (2-5 yr) tasks	Longer term (5+ yr) tasks
Government & Regulators	Establish mandatory MRV framework; notify methane and emission intensity standards; launch carbon credit trading and methane VGF; revise mine closure and reclamation guidelines; facilitate green open access for mines; create just transition policy.	Implement performance linked royalty rebates; integrate CCUS into industrial hubs; streamline approvals for gasification, IPCC and renewable projects; harmonize central and state regulations; enable grid connections and flexible tariffs; coordinate inter ministerial planning.	Phase in stricter emission limits; embed coal mine emissions in national inventory; develop hydrogen from coal with CCUS; scale carbon market and crediting; ensure long term reclamation monitoring.
CPSU/SPSU (CIL, SCCL, NLC)	Conduct baseline emissions assessment; retrofit pumps, fans and lighting; roll out electric vehicles; pilot methane drainage and utilisation; commission solar and battery projects; expanding FMC projects; train workforce for new technologies.	Scale methane captures across gassy mines; complete 3 GW solar deployment; adopt IPCC systems; electrify haulage via trolley assist; implement ISO 50001 energy management; develop gasification and CCUS pilot plants; implement progressive Mine reclamation; publish annual sustainability reports.	Achieve net zero energy supply; convert majority of fleet to electric/hybrid; operate low carbon gasification complexes; repurpose mined land into renewable parks and eco tourism hubs; maintain biodiversity; diversify into critical minerals and renewables businesses.
Private and Captive Miners	Adopt SDC guidelines; invest in high efficiency equipment and digital dispatch; integrate renewable power; prepare methane plans; participate in carbon market; ensure community engagement and reclamation.	Scale up conveyor and ropeway systems; implement gasification with CCUS where relevant; aim for renewable or low emission power for captive consumption; pursue joint ventures for gas or chemical projects; align with just transition frameworks.	Diversify energy portfolios; transform captive mines into net zero operations; integrate with grid hydrogen clusters; manage post mining transition.

Financiers (PSBs, DFIs, MDBs, private banks)	Establish mine decarbonization finance windows; develop standard templates for SLLs and transition bonds; provide concessional tranches for methane and renewable projects; require ESG disclosures.	Support blended finance for gasification and CCUS; invest in infrastructure for carbon storage; build capacity in risk assessment; integrate carbon prices in credit decisions; support just transition programs.	Facilitate large scale green infrastructure bonds; adopt scenario analysis for mining portfolios; phase out financing for unabated coal projects; enhance social impact investing.
Technology Providers and Research Institutions	Pilot electric and hybrid haul trucks; develop methane drainage systems; design IPCC and conveyor solutions; develop low cost sensors and MRV platforms; provide training and maintenance.	Scale manufacturing of mining EVs, VAM oxidizers, gasifiers and CCUS equipment; collaborate with miners for site specific solutions; innovate in battery storage and hydrogen; support digital twins and AI optimization.	Develop next generation technologies (solid state batteries, carbon mineralization); lead R&D on deep underground CCUS; support hydrogen production from coal with near zero emissions; provide ongoing training.
Civil Society & Communities	Monitor and report environmental performance; engage in mine planning and reclamation; participate in eco tourism and afforestation activities; demand transparency; advocate for workers and just transition.	Co design diversification projects; participate in skills programs; hold companies accountable on social and environmental pledges; support biodiversity conservation.	Participate in post coal economic activities; help evaluate long term environmental impacts; integrate local knowledge in sustainable land use.

6. Challenges and Barriers

Despite progress, several challenges impede rapid transformation:

a. **High capital costs and technology maturity -** Electric haul trucks, methane drainage systems, gasifiers and CCUS are capital intensive. Demonstration projects face financing hurdles, particularly for private miners without sovereign backing. Many technologies (e.g., hydrogen haul trucks) are still nascent.

b. **Regulatory and policy uncertainties -** Overlaps between coal and petroleum legislation complicate CBM development. Lack of clear rules for carbon crediting and royalty rebates delays investments. State level differences in open access regulations and electricity tariffs hinder renewable procurement.

c. **Operational disruptions -** Retrofitting FMC or IPCC systems can disrupt production. Miners may resist new practices if they perceive risks to output or productivity. Effective planning and phased deployment are necessary.

d. **Skill gaps and workforce transitions -** Modern equipment, digital systems and renewable operations require new skill sets. Reskilling programs must anticipate job losses from automation and help workers transition to sustainable livelihoods.

e. **Community acceptance -** Communities must be consulted on mine expansion, gasification and reclamation. Past displacement and environmental degradation have eroded trust; without genuine benefit sharing, opposition may grow.

f. **Financing constraints -** Domestic banks still finance coal but may be reluctant to fund decarbonizations projects without clear revenue streams. International financiers often avoid coal due to climate concerns, limiting access to concessional capital.

g. **Long Term demand uncertainty -** While coal demand in India is expected to grow to 1.6 billion tonnes by 2030, a long term decline is likely as renewables and storage scale up. This raises questions about investing heavily in coal assets with uncertain lifespans; however, decarbonizations can extend their viability by reducing emissions and diversifying revenue.

7. Roadmap and Way Forward

A coordinated roadmap can guide the coal sector from incremental improvements to transformative change.

a. *Short term (2026-2027)*

- **Baseline assessments -** All coal mines conduct comprehensive GHG inventories, energy audits and methane surveys. Establish MRV systems with digital dashboards and publish mine wise emission intensity metrics.
- **Pilot projects -** Implement pilot methane drainage at gassy seams and pilot pre drainage in under explored blocks. Deploy initial LNG or electric dump trucks and trolley assist on uphill haul routes. Commission IPCC and conveyor systems in new and expanding mines.
- **Capacity building -** Train engineers and operators in methane capture, electrification and renewable O&M. Develop guidelines for safe gas handling. Engage local communities through consultations, skill programs and small enterprise development.
- **Policy actions -** Notify MRV standards, methane guidelines and open access rules. Finalize the carbon credit trading framework and set up the registry. Launch the methane VGF scheme and royalty rebates.

b. Medium term (2028-2032)

- **Gasification and CCUS -** Build and commission multiple coal to gas and coal to chemicals facilities with CCUS. Develop storage sites for CO_2 and pipeline networks. Pilot hydrogen production from syngas for industrial use.
- **Financial innovation -** Mainstream Sustainability Linked Loans (SLLs) and transition bonds, secure international climate finance for demonstration projects. Use carbon credit revenues to co finance projects. Strengthen just transition funds.

- **Policy tightening -** Introduce emission intensity caps and ratchet them down over time; adjust royalty rebates to encourage early movers; integrate coal mine emissions into national climate targets. Enhance enforcement of reclamation obligations.

c. Long term (2032-2047)

- **Net-Zero operations -** Achieve net zero operational emissions in major coal PSUs via renewable energy, electric fleets, and methane elimination. Continue to reduce residual emissions through CCUS or offsets.
- **Diversification and repurposing -** Transition some coal companies into diversified energy and materials enterprises. Repurpose mined land for large renewable parks, pumped hydro, agriculture and tourism. Expand into critical minerals and green hydrogen.
- **Innovation leadership -** Invest in next generation technologies: solid state batteries, hydrogen haulage, direct air capture and carbon mineralization. Position India as a global leader in sustainable mining and carbon management.

8. Conclusion

India's coal sector is at a crossroads. On one side lies the reality of rising coal demand to fuel industrial growth and provide affordable power; on the other side it is imperative to decarbonize, restore ecosystems and protect communities. This article argued that transforming the coal sector is not only feasible but essential to reconcile these objectives. Decarbonizing mining operations through methane management, energy efficiency and electrification; integrating large scale renewable energy; shifting to low carbon transport and logistics; embracing coal gasification with CCUS; reclaiming land and supporting communities; and reforming policies and finance all contribute to a net zero future.

The path ahead demands collective action. (Annexure I & II). Government must provide clear regulations, incentives and just transition frameworks; coal companies must invest in technology and transparency; financiers must develop innovative instruments and integrate ESG in lending; technology providers must localize solutions; and communities must be partners in planning and benefit sharing. Only by moving beyond siloed efforts to a coordinated transformation can India's coal sector continue to serve the nation's energy needs while aligning with global climate goals. The transition will be challenging, but it also offers a historic opportunity to redefine coal's role from a symbol of the past to a pillar of a sustainable energy future.

9. References:

i. Ministry of Coal, Coal Gasification Mission Policy Documents, Government of India. https://coal.nic.in

ii. Press Information Bureau, Coal Gasification Initiative - ₹8,500 Crore Incentive Scheme, Government of India (2024-2025). https://www.pib.gov.in/PressReleasePage.aspx?PRID=2112723

iii. Press Information Bureau, Coal Gasification Key to India's Energy Security (2025). https://www.pib.gov.in/PressReleasePage.aspx?PRID=2243623

iv. Press Information Bureau, Year-End Review - Ministry of Coal (2025).
hs://www.pib.gov.in/PressReleasePage.aspx?PRID=2213723

v. Ministry of Coal, Sustainable Development Cell Initiatives and Coal Sector Sustainability Framework.
https://coal.nic.in

vi. Ember, Coal Mine Methane: A Critical Moment for India (2024).
https://ember-energy.org/app/uploads/2024/09/Report-Coal-mine-methanes-critical-moment-in-India-2.pdf

vii. International Institute for Sustainable Development, Mapping India's Energy Policy 2025.
https://www.iisd.org/system/files/2025-12/mapping-india-energy-policy-2025.pdf

viii. Coal India Limited, Sustainability Initiatives and Renewable Energy Plans.
https://www.coalindia.in

ix. NLC India Limited, Renewable Energy Projects and Sustainability Initiatives.
https://www.nlcindia.in

x. Central Mine Planning and Design Institute, Coal Mine Methane and CBM Development Initiatives.
https://cmpdi.co.in

xi. Bureau of Energy Efficiency, Carbon Market and Energy Efficiency Frameworks.
https://beeindia.gov.in

xii. ETEnergyWorld, CCUS Integration and Coal Sector Transition News Reports (2025).
https://energy.economictimes.indiatimes.com

xiii. ETEnergyWorld, First Mile Connectivity and Eco-Friendly Coal Transport Developments (2025).
https://energy.economictimes.indiatimes.com

xiv. Ministry of Environment, Forest and Climate Change, Environmental Regulations and Mine Closure Guidelines.
https://moefcc.gov.in

xv. International Energy Agency, Global Coal Market and Energy Transition Reports.
https://www.iea.org

Annexure I : Indicative RACI Matrix for Strategic Initiatives / Workstreams to be undertaken by various stakeholders

No.	Initiative/ Workstream	Ministry of Coal/ Govt.	Coal PSUs/ Mine Operators	Private/ Captive Mine Operators	Financiers/ Banks/ DFIs	Technology Providers/ OEMs	Regulators/ MoEFCC/ BEE/CEA	Research/ Academia/ CMPDI/ CSIR	Local Community/ DMF
1	Sector-wide Net-Zero coal transition roadmap	A/R	C	C	I	I	C	C	I
2	Mine-Level GHG baseline and MRV framework	A	R	R	I	C	C	C	I
3	Methane mapping in UG/Gassy mines	C	A/R	R	I	C	C	C/R	I
4	Coal Mine Methane Capture, Drainage and utilization projects	C	A/R	R	C	R	C	C	I
5	Abandoned Mine methane recovery	C	A/R	C	C	R	C	C	I
6	First Mile Connectivity/ Conveyor Evacuation systems	C	A/R	R	C	R	I	C	I
7	Electrification of Mine Mobility and Light Vehicles	C	A/R	R	C	R	I	C	I
8	Trolley-assist/ Battery-Electric Heavy haul pilots	C	A/R	R	C	R	I	C	I
9	Renewable Energy integration for Mining Operations	C	A/R	R	C	R	C	C	I
10	BESS/Mine Microgrids/flexible power systems	I	A/R	R	C	R	C	C	I
11	Energy Efficiency in Pumps, Ventilation, CHP, workshops	I	A/R	R	I	R	C	C	I
12	Digital Mine optimization/AI/ dispatch/ISO 50001 systems	I	A/R	R	I	R	I	C	I

13	Coal Gasification Projects	A	R	R	C	C	C	C	I
14	CCUS integration with Coal Gasification/ Industrial Hubs	A	R	R	C	R	C	C	I
15	Carbon Market Participation/ Credit Generation methodologies	C	R	R	C	I	A/R	C	I
16	Transition Finance Structures (SLLs, Transition bonds, blended finance)	I	C	C	A/R	I	C	I	I
17	Viability Gap Funding/Policy Incentives/Tax Support	A/R	C	C	C	I	C	I	I
18	Mine Closure, Reclamation and Biodiversity Restoration	C	A/R	R	I	C	C/A	C	C/R
19	Repurposing Mined-out Land for Solar, Storage, Eco-tourism, Water use	C	A/R	R	C	C	C	C	C/R
20	Community Engagement and Just Transition Planning	C	A/R	R	I	I	C	C	C/R
21	Skill Development/ Reskilling of Workforce	C	A/R	R	I	C	I	C/R	C
22	ESG Disclosure/ Annual Sustainability Reporting	I	A/R	R	C	I	C	I	I
23	Safety Integration with Low-Carbon Transition Technologies	C	A/R	R	I	C	C	C	I
24	Monitoring, Audit and Performance Benchmarking	C	R	R	I	I	A/R	C	I

R: Responsible; A: Accountable; C: Consulted; I: Informed

Annexure II : Stakeholders' Role in Net Zero Transition

No.	Stakeholder	Primary Role in the Transition
1	Ministry of Coal / Government of India	Set policy direction, create incentives, approve mission-mode programs, align coal transition with energy security and net-zero goals
2	Coal PSUs / Mine Operators	Execute projects on ground, invest in decarbonization technologies, report KPIs, lead pilots and scale-up
3	Private / Captive Mine Operators	Adopt efficient and low-carbon mining models, align with sectoral standards, replicate commercial best practices
4	Financiers / Banks / DFIs	Provide blended finance, transition finance, concessional capital, KPI-linked lending structures
5	Technology Providers / OEMs	Supply proven equipment, pilot emerging technologies, localize solutions, provide uptime and service guarantees
6	Regulators / MoEFCC / BEE / CEA	Define standards, enforce compliance, create MRV rules, enable carbon market and environmental approvals
7	Research Institutions / CMPDI / CSIR / Academia	Resource mapping, technical studies, pilot design, benchmarking, innovation support, training
8	Local Communities / DMF / State Agencies	Participating in land repurpose, mine closure, livelihood planning, social acceptance and just transition implementation

Reframing Coal Utilization in India: Gasification and Coal-to-Liquids for Energy Security

— **Anil Jha**
Former Chairman & MD, Coal India Ltd, Kolkata

— **Dr Sanjay Kumar**
Former Director (HR), Western Coalfields Ltd, Nagpur

Abstract

These are difficult times for nations dependent on imports for their energy requirements. Geopolitical uncertainties and supply disruptions have renewed concerns around energy security. Against this backdrop, coal continues to remain centre-stage along with heightened structural relevance in several economies, including India. This paper examines the strategic potential of coal gasification and coal-to-liquids (CTL) as pathways to transform coal utilization from combustion to value-added conversion. Drawing on global experience, particularly large-scale deployment in China, the paper puts forth the point that these technologies have the potential to support import substitution thereby facilitating our progress towards energy security. However, their viability in India would be a function of techno-economic alignment, policy integration, and environmental safeguards. The paper advocates adoption of a calibrated cum selective deployment framework.

1. Introduction

1.1 Energy Transition in a Disrupted World

The global energy transition is often conceptualized as a linear progression from fossil fuels to cleaner alternatives. However, recent geopolitical developments have underscored a more complex reality. Supply disruptions, regional conflicts, and volatility in oil and gas markets have reintroduced energy security as a central concern in national policy frameworks.

Disruptions impacting key supply corridors catering to crude oil and liquefied natural gas (LNG) markets have demonstrated how quickly energy systems can come under stress. Instinctively, nations revert to domestically available and reliable energy sources, even at the cost of their being carbon-intensive. As a natural corollary, there could be a temporary but notable resurgence in coal utilization across several nations bestowed with abundance of coal.

This evolving global scenarios and associated context are pointers that energy transitions do not solely depend on technological or environmental processes; they are structurally influenced by geopolitical and economic considerations. For countries like India, where energy demand is growing and import dependence remains significant, the challenge is not merely to transition away from coal, but to transform how coal is utilized.

2. India's Energy Architecture & Coal

Coal continues to occupy a central position in India's energy architecture. It not only supports baseload power generation and provides critical inputs to core industries such as steel and cement but also acts as the energy backbone of the country by contributing to energy affordability and accessibility.

While renewable energy capacity has expanded rapidly, structural constraints such as intermittency, storage limitations, and grid integration challenges mean that coal is likely to remain relevant in the medium to long term. Most credible projections indicate that coal will continue to play a significant role in India's energy mix at least through 2047.

Given this reality, the policy question shifts from whether coal should be phased down, to how coal can be utilized in a manner consistent with environmental objectives and economic growth. In this context, the question is not whether coal remains relevant, but whether its mode of utilization can be fundamentally re-engineered.

This requires a transition from traditional combustion-based use to more efficient and value-enhancing pathways.

3. Coal Gasification: From Combustion to Conversion

Coal gasification represents a fundamental shift in coal utilization methodology. In this process, coal is not subjected to direct combustion and is instead, converted into synthesis gas (syngas), which can then be used as a feedstock for producing a range of products including methanol, ammonia, synthetic fuels, and potentially hydrogen.

This pathway offers several strategic advantages:

- ***Import Substitution:*** Reduced dependence on imported natural gas and petrochemical feedstocks
- ***Industrial Integration:*** Linkages with fertilizer, chemical, and refining sectors
- ***Value Addition:*** Higher economic value compared to direct combustion
- ***Future Flexibility:*** Potential integration with hydrogen economy pathways

India's National Coal Gasification Mission, with its target of gasifying 100 million tonnes of coal, intends to leverage the vast reserves of coal to reduce the import burden thereby strengthening the concept of " Atmanirbhar Bharat" (Self-reliant India).

However, gasification should not be viewed merely as a commercial cum technological alternative. It represents a broader shift toward carbon utilization including potential integration with carbon capture, utilization and storage (CCUS) frameworks, where the objective is to extract maximum economic value from each unit of carbon while managing emissions more effectively.

4. Coal-to-Liquids (CTL): Strategic Relevance in a Volatile World

Coal-to-liquids (CTL) technology extends the concept of gasification by converting coal-derived syngas into liquid fuels such as diesel, petrol, and aviation fuel.

Historically, CTL has been deployed under conditions of resource constraint or geopolitical isolation. During the Second World War, Germany relied heavily on CTL to sustain its fuel supply. Later, South Africa developed large-scale CTL capacity in response to international sanctions and oil supply disruptions.

In recent times, China has emerged as a major implementer of coal conversion technologies, including CTL and coal-to-chemicals. A large number of mega-scale facilities have been developed to convert coal into fuels, fertilizers, and petrochemical feedstocks, driven by a strategic objective to reduce dependence on imported oil and gas.

The scale of such operations demonstrates that CTL can move beyond niche applications under the right conditions. Importantly, its viability is not determined solely by short-term oil price parity. It is also influenced by:

- Energy security considerations
- Supply chain resilience
- Domestic resource utilization
- Strategic autonomy

Thus, CTL should be understood not merely as an economic option, but as a strategic hedge against external energy vulnerabilities.

5. Geopolitics and Energy Reprioritisation

Recent geopolitical developments have over-emphasised the importance of energy security related decision-making for nations. Disruptions in oil and gas supplies have had cascading effects on domestic energy availability and its consumption. If the disruptions continue it would have an adverse bearing on industrial output thereby impacting economic stability across multiple regions.

Faced with the spectre of oil-gas stockout, several countries do not seem to have too many options but to fall back on 'King Coal' and go in for increased coal utilization, despite stated commitments to reduce reliance on fossil fuels. This reflects a broader and generic recalibration where affordability and reliability are being prioritized at the expense of sustainability.

Such developments highlight a key reality:

"Energy transitions are subject to reversal or slowdown when confronted with systemic shocks"

For India, which imports a significant portion of its oil and gas requirements, exposure to global market volatility remains a strategic concern. In this context, leveraging domestic coal resources through conversion technologies can enhance resilience besides reducing import dependence.

6. India-Specific Constraints and Considerations

While the strategic case for coal gasification and CTL is compelling, their deployment in India must be evaluated in light of specific constraints:

a. Technical and Resource Constraints

- High ash content in Indian coal affecting process efficiency
- Water requirements for gasification and CTL processes
- Technology adaptation challenges

b. Economic Constraints

- High capital intensity
- Long gestation periods
- Uncertain returns under fluctuating energy prices

c. Environmental Considerations

- Carbon emissions associated with conversion processes
- Need for integration with carbon capture and management systems

d. Institutional and Policy Requirements

- Alignment across energy, industry, and environmental policies
- Demand assurance for downstream products
- Financial risk-sharing mechanisms

These factors suggest that a blanket or large-scale replication of global models may not be appropriate. Instead, a calibrated approach is required.

7. An Integrated Pathway for India

A pragmatic approach to coal conversion in India would involve:

a. ***Selective Deployment:*** Focusing on applications where strategic and economic benefits are clearly demonstrable, such as fertilizers and specific chemical value chains.

b. ***Cluster-Based Development:*** Developing integrated facilities near coal-bearing regions to optimize logistics, water use, and industrial linkages.

c. ***Technology Partnerships:*** Combining indigenous capabilities with global expertise to adapt technologies to Indian coal characteristics.

d. ***Policy and Financial Support:*** Designing mechanisms to mitigate capital risk, including viability gap funding and long-term offtake agreements including carbon pricing signals or incentives where applicable

e. ***Environmental Integration:*** Embedding carbon management strategies, including potential CCUS integration, to align with long-term climate goals.

Such an approach ensures that coal conversion technologies are deployed not as isolated projects, but as part of a broader industrial and energy strategy.

8. Conclusion : From Resource to Strategic Capability

Coal is unlikely to disappear from India's energy landscape in the foreseeable future. The more relevant policy challenge is to transform its role in a manner that aligns with evolving economic, environmental, and geopolitical realities.

Coal gasification and coal-to-liquids (CTL) offer pathways to shift from combustion-based use to value-added conversion. When deployed judiciously, these technologies can contribute to energy security, reduce import dependence, and support industrial growth.

However, their success depends on careful calibration — balancing economic viability, environmental responsibility, and strategic objectives.

The opportunity before India is not merely to adopt these technologies, but to integrate them into a coherent framework that transforms coal from a source of emissions into a driver of industrial capability, resilience and strategic autonomy.

Hydrogen-Enabled Decarbonization and CCUS Integration in Coal Utilization: Pathways for Low-Carbon Mining and Energy Systems

— **Arvind Kumar Mishra**
Director, CSIR-Central Institute of Mining and Fuel Research, Dhanbad

Abstract

Coal-based systems remain central to industrial energy supply but are inherently carbon-intensive, contributing significantly to global CO_2 emissions across mining, processing, and utilization stages. Additionally, mining activities, such as haulage, ventilation, and methane emissions from coal seams, represent a considerable carbon footprint. Conventional mitigation strategies, such as efficiency improvements and fuel switching, offer only incremental reductions, necessitating transformative approaches for deep decarbonization. In this context, the integration of hydrogen and Carbon Capture, Utilization, and Storage (CCUS) presents a promising pathway for reducing the carbon footprint of mining operations and coal utilization systems. Here, the dual role of hydrogen as a clean energy carrier and reactive feedstock, alongside CCUS technologies for capturing and valorizing CO_2 emissions, has been explored. Some of the key approaches include hydrogen substitution in heavy earth-moving machinery (HEMM), underground haulage fleets, ventilation and mine-site power systems, hydrogen-enriched combustion, and the deployment of fuel cells for decentralized energy generation. On the other hand, CCUS strategies involve post- and pre-combustion CO_2 capture from mine-site power plants, coal washeries, flue gas, coke oven gas (COG), and syngas streams using advanced sorbents and membrane-based separation. Notably, closed and active coal mines offer significant potential for geological CO_2 storage, enhanced coal bed methane recovery, and subsurface energy storage. The captured CO_2 is further utilized through thermo-, electro-, and photo-catalytic conversion pathways to produce value-added fuels and chemicals. The integration of hydrogen and CCUS within mining systems enables a circular carbon framework, where emissions from both extraction and utilization stages are transformed into resources, enhancing overall process efficiency and sustainability. The highlight here is that such hybrid systems can achieve significant emission reductions while maintaining compatibility with existing coal infrastructure, offering a scalable and transition-ready solution for low-carbon mining and energy systems.

Keywords : Hydrogen, CCUS, Coal Mining, Coal Utilization, Coke Oven Gas, Coal Bed Methane, CO_2 Storage, Decarbonization, Syngas.

UNSTOPPABLE ENERGY.....

Milestones

- **Highest Coal Production 131.17 MT**
- **Dispatched all time highest offtake of 133.51 MT**
- **Highest OBR of 462.10 MCuM**

Northern Coalfields Limited
A Miniratna Company
(A Subsidiary of Coal India Limited)
Singrauli (M.P). 486889

/northerncoalfields @NCL_SINGRAULI /northerncoalfields

Distinguished Speakers

एनएमडीसी

NMDC

Responsible Mining

New Look
Soaring Aspirations
Incredible Possibilities

Since our incorporation in 1958, we have raised the bar in mining and become India's largest iron ore producer. Our philosophy as a Responsible Mining Company has resulted in socio-economic development of people around our projects.

NMDC Limited

(A Govt. of India Enterprise)

Regd. Office: Khanij Bhavan, 10-3-311/A, Castle Hills, Masab Tank, Hyderabad - 500 028

CIN: L13100TG1958GOI001674

nmdc.co.in

/nmdclimited

Shri G. Kishan Reddy

Hon'ble Minister for Coal and Mines
Government of India

Shri G. Kishan Reddy is the Hon'ble Union Minister for Coal and Mines, Government of India. Representing the Secunderabad constituency in Telangana, he has been a stalwart of the Bharatiya Janata Party (BJP) since its inception in 1980. With a professional background in Tool Engineering and a deep-rooted commitment to social work and agriculture, Shri Reddy has held significant leadership roles, including serving as the National President of Bharatiya Janata Yuva Morcha (BJYM) and State President of the BJP for both undivided Andhra Pradesh and Telangana. His legislative experience spans over two decades, having served as a three-term MLA before his election to the Lok Sabha in 2019. Under his current leadership, the Ministry of Coal has achieved historic milestones, including surpassing 1 billion tonnes in coal production and dispatch during the 2024-25 financial year. Shri Reddy is spearheading India's journey towards energy self-reliance through the National Critical Mineral Mission and a ₹8,500 crore incentive scheme for coal gasification. His tenure is marked by a "whole-of-government" approach that balances aggressive industrial growth with social responsibility, notably through enhanced welfare frameworks and insurance schemes for the mining workforce.

In his previous roles as Union Cabinet Minister for Culture, Tourism, and the Development of North Eastern Region (DoNER), Shri Reddy was instrumental in modernising regional infrastructure and promoting India's heritage globally. As the Minister of State for Home Affairs, he played a crucial role in national security and crisis management during the COVID-19 pandemic. Today, he remains a key figure in the Union Cabinet, focused on transforming India's coal and mineral sectors into sustainable, technology-driven pillars of the national economy.

Shri Pankaj Agarwal, IAS

Secretary, Ministry of Power
Government of India

Shri Pankaj Agarwal is Secretary, Ministry of Power, Government of India from 1st July, 2023.

Prior to this, Shri Agarwal was Additional Secretary & Director General (Acquisition), Ministry of Defence, Government of India since January, 2022. He was Additional Secretary and Joint Secretary in Cabinet Sectt from 2019 to 2022. Before this, he has held various important portfolios in the Government of Madhya Pradesh. Amongst them, he was Principal Secretary, Public Health Engg., Water Resources, Narmada Valley Development and Micro, Small and Medium Enterprises (MSME) in the State Government of Madhya Pradesh.

Shri Agarwal belongs to the Indian Administrative Service of 1992 batch and has wide experience in the area of Health, Industry, Infrastructure and Finance in a career spanning 29 years. He studied Civil Engineering at IIT, Roorkee followed by Master of Technology in Construction Management at IIT, Delhi and Masters in Public Management at National University of Singapore.

Shri R. V. Shahi

President, IEF
Former Secretary, Ministry of Power

Mr. R V Shahi was Secretary, Ministry of Power, Government of India, from 2002-07 which is the longest term served by any incumbent. In this position, he was responsible for policy initiatives and implementation for India's entire Power Sector (2,00,000 MW capacity) and over significant restructuring with the institution of the Electricity Act 2003, National Electricity Policy 2005 and National Tariff Policy 2006. Other major initiatives include 50,000 MW Hydro Power Initiative 2003, Accelerated Power Development and Reform Programme 2003, Setting up Bureau of Energy Efficiency 2003, Rural Electrification Policy 2005, Ultra Mega Power Policy 2006 and Merchant Power Policy 2006. Mr. Shahi is currently the Chairman of Energy Infratech Pvt. Ltd. and was formerly the Chairman and Managing Director (1994-2002) of professionally managed BSES Ltd (later taken over by Reliance Energy in 2004). He transformed BSES from a small distribution utility to a multi-unit fully integrated power utility having generation, transmission and distribution. At National Thermal Power Corporation (NTPC) from 1978-94, he was the General Manager in charge of Dadri Power Project; Executive Director in charge of Southern Region of NTPC, and Member on the Board of Directors of NTPC in-charge of Operations, R&D and Commercial functions. He has authored several books on the power sector, is a Fellow of the World Academy of Productivity Sciences, Institution of Engineers (India), International Institute of Electrical Engineers, and Indian National Academy of Engineering. He has been on the Boards of Xavier Management Institute Bhubaneshwar, IIM Lucknow, and Management Development Institute in Gurugram. Mr. Shahi is a graduate in mechanical engineering from the National Institute of Technology, Jamshedpur, post-graduate in Industrial Engineering, post graduate in Business Management (MBA), and a diploma in Advanced Industrial Management (Delft, Holland). Mr. Shahi is currently, as Consultant, Senior Energy Advisor with the World Bank for South Asia Regional Integration.

Shri Alok Perti - IAS (Retd.)

Former Secretary, Ministry of Coal
Patron, National Advisory Board, 18th National Conference on Coal

Shri Alok Perti is an Adviser and former Secretary in Ministry of Coal, Govt. of India. He is an IAS of 1977 batch (Assam-Meghalaya cadre), and has worked in the Ministry of Coal, Health and Welfare, Ministry of Defence etc at centre as well various departments in Govt. of Assam.

He was on the board of several Defence PSUs as official director when is worked as Joint Secretary in Ministry of Defence. He was also official director on the board of Coal India Ltd. and NLC when he was serving in the Ministry of Coal. He has also been a non-official part time Independent Director on the Board of Coal India Limited and various other companies.

Mr. Perti holds a bachelor's degree in science and a master's degree in physics from the University of Allahabad and also completed a master's course in Social Planning and Policy in Developing Countries from the London School of Economics, UK. He was also a member secretary to the Kelkar Committee set up by the Ministry of Defence to suggest modifications to defence acquisitions, WHO consultant for conducting study and validation of National Immunization Programme in Bhutan and also served as a consultant to UNICEF to develop a material management systems for supply in Myanmar.

Shri S.K. Srivastava - IAS (Retd.)

Former Secretary,
Ministry of Coal

Shri S.K. Srivastava is a distinguished former Indian Administrative Service (IAS) officer with over 36 years of distinguished experience in public administration. He superannuated in October 2014 as Secretary, Ministry of Coal, Government of India, and has also held senior positions including Special/Additional Secretary in the Ministries of Mines and Labour, where he oversaw key policy areas including engagement with the International Labour Organization (ILO).

His career spans diverse sectors such as industry, coal and minerals, power, labour, and human resources, with extensive experience at both state (Assam and Meghalaya) and central government levels.

Post-retirement, he has served as an Independent Director on the boards of major Public Sector Undertakings, Advisor to a bank, and as an expert with the Union Public Service Commission (UPSC) for Civil Services interviews. He has also been a member of expert panels constituted by the Department of Personnel & Training (DoPT) and the Ministry of Home Affairs for assessment and empanelment of senior officers.

Shri P M Prasad

Former Chairman -cum- Managing Director
Coal India Ltd.

Shri P.M. Prasad is the former Chairman-cum-Managing Director of Coal India Limited, having served in this role from July 2023 to October 2025. Prior to this, he was the CMD of Central Coalfields Limited from September 2020.A mining engineer from Osmania University, he holds an M.Tech in Opencast Mining from IIT (ISM) Dhanbad and a law degree from Nagpur University. He brings over 38 years of rich experience in mining operations and management. He began his career with Western Coalfields Limited in 1984 and rose through key leadership roles across Coal India subsidiaries. He has been instrumental in executing major projects, including reopening fire-affected mines, commissioning the Kaniha Opencast Project, and unlocking significant coal reserves in Talcher. His tenures at NTPC, and later at NCL and BCCL, were marked by operational excellence, environmental achievements, and strong crisis leadership during the pandemic. Known for his technical expertise, strong focus on safety, and team-oriented leadership, Shri Prasad has consistently driven performance and innovation across organizations.

Shri Anil Kumar Jha

Former CMD
Coal India Limited

Shri A.K. Jha did his graduation in mining engineering in the year 1983 from IIT-ISM, Dhanbad.and M.Tech. with specialization in Mine Planning & Design with distinction in the year 1988 from the same Institute.

Having worked in various Subsidiaries of CIL & MOIL Shri Jha assumed the charge of CMD of Coal India Limited on 18th May 2018. Prior to this he was CMD, Mahanadi Coalfields Limited, a Miniratna Company contributing about 25% of the coal production and 50% of the profit of CIL.

He also worked as Chairman, Jindal Power Limited (JPL) (02.02.2021 to 31.03.2024) - one of the largest power producers in India with an installed power generation capacity of 4300 MW that caters to the need of country's power 24×7.

He also worked as Advisor, Steel Authority of India Ltd.

Shri R. P. Ritolia

Former CMD
CCL

Shri R P Ritolia, Advisor, India Power Corporation Ltd. is Former Chairman-cum-Managing Director of Central Coalfields Ltd and Former Advisor (Coal) to MD Tata Steel Ltd. An alumnus of IIT(ISM), Dhanbad, Sri Ritolia has had almost 50 years of experience in the coal mining industry in various capacities. In addition to being CMD, CCL, he has been the Director of Coal India Ltd. and Chairman of Coal Videsh Ltd.

Shri Ritolia is considered to be a result oriented executive and he has the credit of converting Central Coalfields Ltd from BIFR to a Mini Ratna status company by registering more than Rs. 1000 crores profit consecutively for three years.

Shri Ritolia has travelled extensively and acquired experience in the state of the art Mining Technology in various countries such as USA, UK, Australia, Germany, China etc. He has contributed a number of technical papers in various national and international forums and is the recipient of a number of awards including the most prestigious Dewan Bahadur DD Thacker Gold Medal Award for outstanding contribution in the coal mining industry.

He has been associated with a number of professional and technical institutes and is a Past President of Mining, Geological and Metallurgical Institute of India.

Shri A K Balyan

Former MD & CEO, Petronet LNG
SG, Coal Gasifiers Association of India

Shri A K Balyan passed his M.Tech from IIT Delhi in 1972 and Phd from from Germany in 1981.

He has About 45 years of experience in Oil & Gas business in Upstream, LNG and Downstream Petrochemicals, Renewable Energy Sectors. p c

He Worked in ONGC E&P Group from 1976 till 2010 and held the positions of Director (HR) and Business Development . He was also CEO (Oil & gas), ADA Group.

Currently he is Secretary General of Coal Gasifiers Association of India.

Shri Shivam Srivastava

Director (Fuels)
NTPC

Shri Shivam Srivastava, a Mechanical Engineering graduate from Kamala Nehru Institute of Technology, Sultanpur (Avadh University), Post Graduate in Business Management from MDI Gurgaon, had joined NTPC as 13th batch executive trainee in 1988. He has also undergone a Leadership Management course from Harvard Business School, Boston (USA). In his professional career, he has accumulated over 34 years of experience with outstanding contribution in areas of Fuel Handling, Fuel management, Safety, plant operation & maintenance and in coal mining projects.

His experience in the energy sector includes exposures as Head of Fuel Management functions, Head of Operation & Maintenance functions in power plants along with experience as Business Unit Head of two coal mining projects of NTPC. Prior to his elevation to the post of Director (Fuel), he was working as CGM and Business Unit Head of Pakri Barwadih Coal Mining Project of NTPC Limited where he has been instrumental in ensuring fuel security and building self-reliance in coal supply to power projects of NTPC.

As Director (Fuel), NTPC, he is responsible for ensuring fuel availability, affordability, and security for generating stations along with development and safe operation of captive coal mines of NTPC. He is also responsible for Fuel Supply Agreements with Gas Suppliers, Coal suppliers and ensuring timely supply of quality coal at power stations as per power generation requirement alongside maintaining adequate stock levels.

He is also Chairman of NTPC Mining Limited, NTPC Vidyut Vyapar Nigam Limited and NTPC Electric Supply Company Limited.

Shri Asheesh Kumar

Director (BD)
Coal India Ltd.

Shri Asheesh Kumar took over the charge of Director (Business Development) w.e.f. 21.08.2025. He completed his B.Tech from ISM, Dhanbad in the year 1993. Shri Asheesh Kumar is also a Post Graduate in Business Administration from BIT, Mesra and also has to his credit a Diploma in Contract Management from Indian Institute of Material Management. He joined Coal India Limited in 1994 as a Graduate Engineering Trainee (Mining) in Central Coalfields Limited. Shri Kumar has extensive Mining experience of over 30 years involving various domains such as operations, contract management, vigilance, policy formulation, planning and project monitoring. He also led diversification of CIL into Critical Minerals as HoD - Critical Minerals and International Cooperation. Before moving to the role of Director (Business Development) he worked as Adviser Project, Ministry of Coal where he was instrumental in formulation of policy reforms leading to ease of doing business in Coal Sector.

Shri Naveen Ahlawat

President, Sustainability and Decarbonisation
Jindal Steel

Shri Naveen Ahlawat leads the Decarbonisation & Sustainability vertical at Jindal Steel Limited, where he is driving the company's journey toward low-carbon steel through initiatives in Green Steel, Green Hydrogen, and Carbon Capture, Utilization & Storage. With over 13 years of experience across specialty chemicals, petrochemicals, coal gasification, and integrated steel manufacturing, he has contributed to several landmark industrial projects, including being part of the leadership team behind the world's first coal gasification-based DRI plant in Angul, Odisha. Naveen is also actively engaged in the global energy transition ecosystem as a member of the UN Council of Engineers for Energy Transition and advisor to multiple international sustainability platforms.

Professor Debashish Chakravarty

Associate Professor
IIT, Kharagpur

Prof. Debashish Chakravarty did his B Tech in Mining Engineering in 1993 and Ph.D. in 2001 from IIT Kharagpur and now He has taken over as Dean of Alumni Affairs, IIT Kharagpur.

Prof. Debashish Chakravarty specializes in several advanced fields, including Mine Mapping and Locational Surveillance, Mine Automation, Robotics & Intelligence, Numerical Analysis, Data Analytics, AI/ML, and Geo-Image, Video, and Signal Perception in 3D. His work focuses on innovative mining technologies, particularly in rescue robotics, SLAM-based robotic surveying/mapping, and using virtual reality to enhance slope stability, situational awareness, production, safety, and efficiency across all phases of mining operations—pre-mining, mining, and post-mining.

Affectionately known as DC Sir among students, Prof. Chakravarty is the Principal Investigator for the Geo Environmental Parameters Study at JPL, Tamnar for Gare Palma IV/2 & IV/3 OCCM at Jindal Power Ltd. He has also played a pivotal role in developing the AGV - Autonomous Ground Vehicle, currently under the Autonomy & Intelligence Students' Research Laboratory within the Center of Excellence in Robotics Research.

Shri Chandra Prakash Garg

Executive Director (S&R)
Coal India Ltd

Shri C.P. Garg is the Executive Director (Safety & Rescue) at Coal India Limited (CIL), having assumed the role on December 26, 2025. A veteran in the coal mining industry, he brings approximately 35 years of extensive experience to this senior management position, which is situated one level below the Board of Directors. Shri Garg began his professional journey with Coal India in 1990 after graduating with a Bachelor of Engineering in Mining Engineering from MBM Engineering College, Jodhpur.

Throughout his career, Shri Garg has developed specialized expertise in Safety Management, notably holding a certification from SIMTARS Australia, a globally recognized institute for mining safety research. Before his promotion to Executive Director, he served as General Manager (Mining) at Mahanadi Coalfields Limited (MCL), where he also headed the Safety & Rescue department. In his current capacity, he is responsible for implementing advanced Safety Management Systems (SMS) to achieve CIL's "Zero Harm" objective, modernizing mine rescue stations, and ensuring strict regulatory compliance with Directorate General of Mines Safety (DGMS) guidelines across all CIL subsidiaries.

Shri Alok Jain

Chief Commercial Officer
MTCSL

With over 33 years of extensive multi-functional managerial experience, he has built a strong track record across the Coal, Energy, and Infrastructure sectors. He is currently serving as the Chief Commercial Officer for the India Coal Mining business at Adani Enterprises. He brings deep expertise in Commercial Management, Contract Administration, Dispute Resolution, and Arbitration, along with significant experience in executing and managing projects under BOT and EPC frameworks. His project exposure spans a diverse portfolio including coal-linked infrastructure, power transmission, Metro Rail, highways, industrial, water and urban infrastructure, as well as housing and building projects. He also has extensive experience across international infrastructure projects spanning over 25 countries. He has played a key role in Business Development and Strategic Planning, actively engaging with government authorities and key stakeholders, and coordinating with Independent Engineers and Consultants to ensure seamless project execution. He has also led contract structuring, subcontractor and vendor management, and cross-functional teams, consistently driving efficient, compliant, and commercially optimized project delivery across complex infrastructure environments.

Shri Sujay Karmakar

Chief General Manager
NETRA (NTPC Energy Technology Research Alliance)

Shri Sujay Karmakar, Chief General Manager at NETRA (NTPC's R&D Wing), spearheads initiatives in Decarbonization, including Carbon Capture, Utilization & Storage (CCUS), Green Hydrogen, and Energy Storage.

A B.E. (Mechanical) and M.Tech from IIT Delhi, he joined NTPC in 1991 and brings over three decades of experience in commissioning, operations, process improvement across coal and gas-based power generation, IGCC development and energy transition technologies,

He has led many R&D Projects to fruition like biomass co-firing trials at NTPC Dadri, MSW/RDF gasification-based power generation, NETRA Green Hydrogen Grid, High-Temperature Steam Electrolysis, Seawater Electrolysis. Under his leadership, NTPC executed and commissioned India's first fully integrated CO_2-to-Methanol plant at NTPC Vindhyachal. He also guided NTPC Vindhyachal to achieve "Platinum" recognition in CII-Exim Bank Business Excellence 2024, the highest honour for a debutant applicant.

He has co-guided four PhD scholars, published 15 international papers, filed seven patents, and is a recipient of NTPC's Best Employee Award (2013).

Dr. Peeyush Kumar

Managing Director, Bharat Coal Gasification and Chemicals Limited
Director - I/c, Coal Gas India Limited

Dr Peeyush Kumar is Managing Director of Bharat Coal Gasification and Chemicals Limited and Director I/c of Coal Gas India Limited. He is Head, Coal to Chemical Department of Coal India Limited, Kolkata. He worked as Director Technical in Ministry of Coal from 2013 to 2020 and served as Government nominee director in the board of several companies such as MECL, SCCL, CMPDI, BCCL.

Dr Kumar has B Tech (Mining) (Silver Medallist) and PhD (Management Studies) from IIT ISM Dhanbad and 32 years of experience in mine operations, Corporate Planning and Management, Project Appraisal and Monitoring, Clean Coal Technologies, Mine Safety, Strategic Planning and Policy formulation at National level.

He is recipient of Sir John Dunn Medal from MGMI, The IME Journal Golden Jubilee Award for Coal Mining and Prof Ajoy K Ghose Memorial Diamond Jubilee Award from IME Journal in recognition to Coal Gasification Initiatives and Innovation in Coal Mining.

Dr. Sanjay Kumar

Former Director (P)
Western Coalfields Ltd.

Dr. Sanjay Kumar possesses about four decades of experience with leading Oil-Gas and Coal Mining companies like ONGC, GAIL, Coal India Ltd. He was the Director (Personnel) of Western Coalfields Ltd, Nagpur (a subsidiary of Coal India Ltd) from July 2015 to July 2023 before attaining the age of superannuation.

As an HR professional, he has dealt with HR Policies, Performance Management System (PMS), Manning Strategies, Project HR, Restructuring, Change Management, HRD initiatives, Leadership Development, Managing Manpower Surpluses & Shortages, Employment oriented skill development etc.

He possesses rich project management experience. He has been associated with execution of mega-Projects-Hydrocarbon exploration, Cross-country pipelines, Petrochemical Complex, City Gas and Coal Mining. He is well versed with policy framework in the Energy Sector including formulation & implementation by Government ministries such as Ministry of Petroleum & Natural Gas, Ministry of Coal etc. His field & corporate level experience has enabled understanding of the entire energy value chain & associated impact on stakeholders.

Dr Kumar also has interests in training/teaching and has published articles in leading Indian journals and newspapers. Two of his articles have been translated into Chinese & republished in PMI Network in China journal in 2015.He was invited by SAFEA, China (2016) and PMI Japan (2019) for delivering lectures. During the Covid19 lockdown, he conducted Webinars for Regenesys Business School South Africa, PMI Lima, PMI Ghana and PMI Argentina chapters.

As an independent consultant, Dr Kumar is involved in training , teaching and advisory in areas like energy transition, project management and people practices.

Shri Rajib Maitra

Partner
Deloitte Touche Tohmatsu India LLP

Rajib is a Partner and Sector Leader at Deloitte Asia with 23+ years of experience, focused on strategy, operations and transformational programs in mining and metals sector across global and Indian organizations. He has led more than 125 high impact engagements for mining and metals clients across commodities such as coal, ferrous minerals / metals, non-ferrous minerals / metals, and critical minerals. He has deep experience in strategy & business transformation, operations improvement, business plan formulation, digital transformation, capital project advisory, mergers & acquisition. He has significant experience in mineral policies and is playing a leading role in initiatives related to critical minerals.

Prof. Arvind Kumar Mishra

Director
CSIR-CIMFR, Dhanbad

Professor (Dr.) Arvind Kumar Mishra, a luminary in Mining Engineering, is the current Director of CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR) in Dhanbad, India. With over three decades of experience spanning academia, industry, and research, Prof. Mishra is a Fellow of the Institution of Engineers (India) and holds advanced degrees, including a PhD in Mining Engineering, from the prestigious Indian Institute of Technology (Indian School of Mines), Dhanbad. His career commenced with Coal India Limited, where he contributed as a Mining Engineer before transitioning into academia at IIT (ISM) Dhanbad in 1992.

Prof. Mishra embodies the confluence of academic brilliance, industrial acumen, and a visionary approach to technology and societal welfare. His enduring legacy lies in pioneering innovations, fostering knowledge exchange, and mentoring future leaders in Mining and fuel sciences.

Shri Rajnath Ram

Advisor (Energy)
NITI Aayog

Shri Rajnath Ram, Advisor (Energy) at NITI Aayog is a seasoned energy sector professional with over 28 years of experience in government service. He is an alumnus of IIT (ISM) Dhanbad and FMS, Delhi.

Presently, he is leading the program & policies related to Energy & Energy Transition w.r.t Power, Renewable, Coal, Oil & Gas and Atomic Power. He has been responsible for Energy data management and development of India Climate Energy Dashboard and instrumental in updating and finalizing the India Energy Security Scenario – 2047 (v-2 and V-3) energy model which is currently being utilized in developing long term energy scenarios including net-zero roadmap for India. He has played a key role in major national initiatives such as the National Green Hydrogen Mission, and PLI scheme for solar PV manufacturing.

Shri Ram has held important positions including Joint Adviser at Petroleum and Natural Gas Regulatory Board and has contributed to critical regulatory frameworks and policy reforms. Shri Rajnath Ram represented India for Energy Transition Working Group in G20 meeting in Turkey and G-20 ESWG, 2023 under Indian Leadership.

He is currently serving as Director on the Board of NPCIL since August 2020.

Dr. B Veera Reddy

Advisor, CIL

Dr. B. Veera Reddy is the Adviser, Minister of Coal. Previously, he served as Director (Technical) at Coal India Ltd and CMD of Central Coalfields Ltd. He was also Director (Technical) Operations at Eastern Coalfields Limited.

With a B.Tech and M.Tech in Mining from Osmania University, he has over 3 decades of experience in coal mining, planning, and operations. He held key roles at SCCL, including General Manager of Adriyala Longwall Project. An expert in mechanized mining, he has published over 30 technical papers at national and international conferences.

Shri Siddhartha Saxena

Director (Infra), Grant Thornton Bharat LLP

Specialization:

Raw material procurement & sales, acquisition of mining assets, cost optimization, contract management and procurement transformation

Education :

- B.E. (Hons), EEE – BITS PILANI
- PGDM, Marketing – MDI Gurgaon

Key Past Employment:

- Hindalco Industries Limited
- Coal India Limited

Summary

- Siddhartha has 15+ years of experience in raw material strategy, transaction advisory, supply chain management, operations improvement, market assessment and business planning.
- He specializes in procurement planning, cost optimization, contract management and digital transformation. He has worked for reputed companies in the Metals & Mining sector before joining consulting.

Representative Experience

Managing end-to-end procurement of ~16 million tonnes of coal of value close to Rs 7000 crore for a major metal player; Business process review and framing standard operating procedure for fuel procurement of a key metal producer; Negotiating and drafting commercial terms & operational modalities of sale and procurement contracts; Digitization initiatives like automation of coal planning tool and robotic process automation of e-auction bidding process; Key role in functional design of system for e-auction of coal linkages by Coal India Limited under policies of Government of India; Rationalization of notified prices of non-coking coal published by Coal India Limited; Evaluation of coal and critical mineral blocks/ mines for various clients including Market assessment, Financial modelling, Competition benchmarking and Bidding strategy with focus on Lithium, Graphite, Copper & Nickel; Reduction of procurement cost of key raw materials like coal, calcined pet coke etc. in the metals sector; Identification of hotspots of value loss in integrated plants and suggesting corrective interventions to various clients in metals space; Assessing the impact of energy transition on a key coal mining State and evaluating interventions and financing options to mitigate adverse outcomes on State revenues and livelihoods

Shri N. N. Gautam

Chairman, Coal Group, IEF
Former Advisor, Ministry of Coal & UNDP

Graduated BSc. (Hons.). Mining from Indian School of Mines, Dhanbad in 1962.

Worked 30 years in Bengal coal Co. a British Company & Coal India Ltd in deep underground mechanized mines and large mechanized open cast mines.

Worked as Director (Technical)/ Advisor (Projects) in Ministry of Coal, Government of India.

Worked as Advisor UNDP/GEF-GoI "CBM Recovery and Commercial Utilisation Project" costing 100 crs. CBM from Vertical wells at Moonidih mine of BCCL was recovered and 1 MW power was generated.

Positions held

Vice President, Mining Metallurgical Geological Institute (MGMI), Past President of MGMI - Delhi Chapter, Advisor, ACB (India) Ltd.

Currently

- Advisor JSPL
- Chairman Coal group of India Energy Forum an NGO of Energy Experts, Secretary General, Indian Coal Forum, an NGO of Coal Experts
- President of IIT(ISM) Alumni Association Delhi Chapter
- Special Secretary (Events) MGMI DC
- Secretary General Coal Producers Association (CPA)
- Distinguished Alumnus Award from Indian School of Mines Dhanbad
- Life Time Achievement Award of Energy and Environment Foundation
- Presented over 50 technical papers in International & National Journals and seminars.

Shri Prem Shankar Upadhyaya

Former Director,
NMDC

Shri P S Upadhyay is a Mining Engineer with 50+ years of experience and served on Board level positions with a number of leading Coal, Steel, and Metal Mining Organizations.

Shri S Upadhyaya, is a mining graduate from Indian School of Mines. He has also done PGDCA from IMS, YMCA, New Delhi and Special Management Program from University of Delhi.

He Joined NMDC Ltd (a PSU under Ministry of Steel), in 1971 and worked on various positions and finally retired as Director (Technical) in 2008. In between, he worked in Engineers India Ltd from 1982-2002.

Post retirement Shri Upadhyaya worked with KSK Mineral Resources as Managing Director from 2008-2011. He is still serving and served as Consultants with Golder Associated Consulting India, PricewaterhouseCoopers (PWC), State Bank of India (SBI), Quality Council of India (QCI) etc.

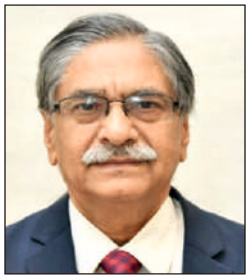
His specific areas of interest include operation, consulting and project management in the coal and metal mines sector.

Shri Uma Shankar

Coal Mining Specialist

Shri Uma Shankar is a veteran in coal mining industry having worked for more than four decades in public and private sectors with specialisation in drilling/exploration, Mine planning, Mine operation, Safety, environment, and mine development of greenfield coal block in accordance with approved mining plan and mine closure plan. He has extensive experience of working in Coal India Limited and Adani Enterprises Limited in senior management positions in the field of operation of highly mechanised underground mine, Opencast mine, mine infrastructure development including CHP/CPP and Pit top Railway siding with RLS. Planning of large opencast mine with EC, FC and Land acquisition with all other permit & clearances to start the mine in responsible & sustainable manner.

He led development and operationalization of multiple coal mines in his last role and presently advising mining companies on participation in auction/development of mines including private land, Forest land and Environment clearances of coal projects.



Shri S M Mahajan

SG, IEF and
Former ED, BHEL

Mechanical Engineer from DCE 70 Batch, M.Tech in Management & Systems from IIT, Delhi, Served in BHEL for 39 years in various capacities, functions and units before superannuating as Executive Director. Handled Manufacturing Technology Up-gradation, Investment Planning, Modernization of manufacturing facilities in BHEL units, Material management & operation management, manufacturing of nuclear power equipment in BHEL. Post BHEL, engaged with the manufacturing industry guiding them in business development and manufacturing capabilities- in fabrication industry for Power, infrastructure and Aviation sectors. Has served as an Industry Expert with two banks for evaluation of Bank Investments and due diligence. Associated with Ministry of Electronics and IT as Expert in evaluation and recommendation of R&D proposals in area of Electronic System Development for different sectors. Have guided several projects for successfully completion. Associated with many professional Associations. President of Asian Welding Federation and Former President of Indian Welding Society. Currently Consultant with an Aviation Sector Manufacturing Company and a Dubai based company in Renewable Energy: Convenor, Nuclear Energy Group of India Energy Forum.

Shri Tarun Mishra

Entrepreneur | CEO
EvotAi Technologies Pvt. Ltd. & Divitson Pvt. Ltd.

Tarun Mishra is a distinguished entrepreneur and industry strategist with over 17 years of multi-disciplinary experience spanning the Mining, Energy, and Technology sectors. As the Founder and CEO of EvotAi Technologies Pvt. Ltd. and Divitson Pvt. Ltd., he is at the forefront of delivering high-tier technology and IT-solutions, specialized project services, and mission-critical industrial equipment to the mining, metals, and infrastructure industries.

An alumnus of the prestigious IIT (ISM) Dhanbad (B.Tech in Mining Engineering) and IIFT Delhi (Masters in International Business), Tarun bridges the gap between complex engineering requirements and commercial strategy. Beyond his corporate leadership, he is a dedicated advocate for industry advancement in association with the India Energy Forum (IEF) an the Coal Producers Association (CPA).

Turning coal into eco-friendly fuel for a fuel-efficient India

ACB (INDIA) LIMITED

India's largest* coal beneficiation company

*(Source CRISIL Research Review and Outlook on Power and Coal, September 2014)

40 Years
Fuelling the Nation, Greening the Future

SECL
South Eastern Coalfields Limited

PRODUCTION WITH PURITY
DISPATCH WITH QUALITY

South Eastern Coalfields Limited
(A Govt. of India Undertaking)
SECL Bhawan, Seepat Road, Bilaspur (C.G.)

New INITIATIVES of Team WCL

ECO-MINE TOURISM & ECO PARK

First of its kind initiative in India
Created with an aim to dispel the notion
of pollution and environmental degradation
associated with Coal Industry

COAL NEER PLANT

A significant initiative of using
Mine water and turning it into potable
& safe drinking water using
reverse osmosis water purification process.

SAND PLANT

WCL has introduced a new Green technology
to safely extract sand from
its Overburden (Earth material
removed to extract coal) dumps.

admas

**EXCELLENT INDIVIDUALS
BUILD
EXCELLENT COMPANIES**

Western Coalfields Ltd.

Mini-Ratna Company
(A Subsidiary of Coal India Limited)
COAL ESTATE ■ CIVIL LINES ■ NAGPUR - 440 001

@Team WCL

Western Coalfields Limited

www.westerncoal.in

कोयला मंत्रालय
Ministry of Coal

CREATING WEALTH FOR WELLBEING

NLC India Limited
Contributing to The Nation's Energy Future Through Sustainable Practices

NLCIL is committed to play its role in the evolving multi-dimensional energy grid of the Nation, a key component of a resurgent economy and a "VIKSIT BHARAT."

AT THE FOREFRONT OF AMBITIOUS GOALS AND COMMUNITY WELFARE:

- Poised to expand installed capacity of power generation through existing and planned Lignite, Coal and Renewable Energy projects to more than 20,000 MW by 2030, from the present 6,731 MW.
- Reaching a Mining capacity of over 100 Million tonnes when Machhakata and Patrapara coal blocks come into operation.
- A major thrust to Renewable power projects - a 2000 MW capacity Solar project in Rajasthan and 1000 MW capacity Solar power project in Assam along with a pilot-scale Green Hydrogen project in Neyveli.
- Unwavering support through physical relief works at flood-affected cities / areas including de-watering inundated areas with high capacity industrial pumps and providing food packets to the needy during floods.
- Unflinching commitment to large-scale CSR initiatives in Education (construction of classrooms and provision of educational aids) to schools in and around Neyveli, conduct of Health camps in surrounding villages and distribution of Aid and assistive devices to the differently abled.
- Collaboration with NPTI to provide job oriented Post-Diploma and PG Diploma courses to Project Affected Persons (PAPs) of NLCIL, enabling them to get employment opportunities in premier companies.

CREATING WEALTH FOR WELLBEING

NLC India Limited

'NAVRATNA' - Government of India Enterprise

CIN No.: L93090TN1956GOI003507

www.nlcindia.in

NLC India Limited, a "Navratna" PSU with over 60 years in the energy sector, operates nationwide and is poised to play a large role in a "Viksit Bharat" with a targeted Mining Capacity of 104 MTPA and 10 GW of Thermal Power generation by 2030.

Being the first PSU to cross 1 GW of Renewable Energy generation, NLCIL also aims to reach 10.11GW renewable energy generation by 2030 with plans for Green Hydrogen and Floating solar projects.

Registered Office: No-135, EVR Periyar High Road, Kilpauk, Chennai-600 010, Tamil Nadu, India. **Corporate Office:** Block - 1, Neyveli - 607 801, Cuddalore District, Tamilnadu.