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NITI Aayog

Report of Workshop on Coal Gasification Technology for Indian High Ash Content Coal

NITI Aayog, New Delhi

2nd September 2025

NITI Aayog

About NITI Aayog

The National Institution for Transforming India (NITI Aayog) was formed via a resolution of the Union Cabinet on January 1, 2015. NITI Aayog is the premier policy 'Think Tank' of the Government of India, providing both directional and policy inputs. While designing strategic and long-term policies and programmes for the Government of India, NITI Aayog also provides relevant technical advice to the Centre and States. The Government of India, in keeping with its reform agenda, constituted the NITI Aayog to replace the Planning Commission, instituted in 1950. This was done to better serve the needs and aspirations of the people of India. An important evolutionary change from the past, NITI Aayog acts as the quintessential platform of the Government of India to bring States to act together in the national interest and thereby fosters Cooperative Federalism.

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Executive Summary

NITI Aayog organized a workshop titled **"Coal Gasification Technology for Indian High Ash Content Coal"** at NITI Bhawan, New Delhi, on 2nd September 2025. The workshop was chaired by Dr V K Saraswat, Member, NITI Aayog. This pivotal event brought together all the relevant stakeholders, including senior officials from the Ministry of Coal, IIT Delhi, Professor Fraunhofer IKTS, Germany and active participation from government organizations and industry partners such as BHEL, IIT Roorkee, GAIL, CIMFR, IOCL, CIL, TFL, NLCIL, EIL, L&T Group, JSPL, DVC, CCL, PDIL, CSIR-IMMT and Dastur Energy. The workshop served a critical platform to address the technological, financial, and policy challenges associated with achieving India's ambitious goal of 100 million tonnes per annum (MTPA) of coal gasification by 2030. It is also aligned with the "*Make in India*" and *"Atmanirbhar Bharat"* initiatives, promoting domestic manufacturing and reducing import dependency.

Coal gasification is a thermochemical process that converts coal into syngas (a mixture of CO, H_2, CO_2, CH_4 and others), which can have various applications such as electricity generation, chemical production (methanol, ammonia, urea), and liquid fuels. With rising global energy demand and the need for cleaner utilisation of coal resources, coal gasification has emerged as a strategic technology in several countries, including China, the US, South Africa, and India. India possesses the fourth-largest coal reserves globally, with an estimated 389 billion tonnes, of which 212 billion tonnes are classified as proven reserves. Coal gasification allows for the cleaner utilization of these vast resources to achieve energy security and self-reliance, reduce dependency on imports of natural gas, methanol, ammonium nitrate, and other products.

India now stands at an inflection point. With national ambitions for coal gasification expansion, it is essential to ensure that the technologies selected are not only proven globally but also work for the specific coal types available in India at a commercial scale. Therefore, NITI Aayog convened a workshop to get feedback from the national experts who have experimented with Indian coal for gasification, as well as international experts, e.g.,

Fraunhofer Institute and others, who have actively engaged in developing and refining coal gasification technologies to address the diverse characteristics of coal resources worldwide.

The workshop extensively explored the landscape of coal gasification technologies, both globally and indigenously, which are fit for Indian coal. It also majorly dispelled the long-standing myth that Indian coal is unsuitable for gasification, attributing past failures to a "technology mismatch" rather than inherent feedstock limitations.

The open forum discussion was marked by a shared sense of urgency and purpose. Key themes included the awareness about the specific initiatives taken by the Ministry of Coal to promote Coal Gasification, initial financial support through Viability Gap Funding (VGF) to de-risk pioneering projects, and the strategic integration of Carbon Capture, Utilization, and Storage (CCUS) to create a zero-emission pathway. A consensus emerged on the necessity of moving beyond import dependency and fostering a collaborative ecosystem where industry, academia, and government work in synergy to scale up "Made in India" technologies.

The workshop concluded with a powerful call to action from Dr. V.K. Saraswat, urging the industry to embrace its role as a technology developer and implement indigenous solutions with speed and confidence. The outcomes of this workshop will serve as a crucial guide for policymakers and industry leaders in shaping a sustainable and self-reliant future for India's energy sector. The list of Participants in the workshop is attached at **Annexure-1.**

Background

India stands at a critical juncture in its energy transition. While committed to achieving its net-zero carbon emissions target by 2070, the nation's vast coal reserves remain a cornerstone of its energy security and industrial growth. The challenge lies in harnessing this resource in a clean, efficient, and sustainable manner. The global call for decisive action against climate change, amplified during COP26, has shifted the spotlight onto advancing clean coal technologies.

Coal gasification emerges as a potent instrument in this endeavor. It provides a pathway to convert high-ash Indian coal into valuable products like methanol, ammonia, hydrogen, and synthetic natural gas (SNG), thereby reducing reliance on imported fuels and feedstocks and conserving valuable foreign exchange. Recognizing this potential, the Government of India launched the **National Coal Gasification Mission**, with an ambitious target of achieving 100 MTPA gasification capacity by 2030, supported by a dedicated Viability Gap Funding (VGF) scheme.

However, the path to commercial-scale deployment is facing some challenges. The unique characteristics of Indian coal, such as high ash content (30-45%), variability in gross calorific value, and complex mineral matter, have historically posed significant technical hurdles. This workshop was convened to address these challenges by bringing together the brightest minds from policy, industry, and research to forge a clear and actionable roadmap for the successful implementation of coal gasification technology in India.

Inaugural Session

The inaugural session set the stage for a day of insightful and productive discussions, with key speakers framing the strategic context and core challenges of coal gasification in India.

Shri Rajnath Ram, Adviser (Energy), NITI Aayog, delivered the welcome address, providing an overview of the national efforts to promote coal gasification. He highlighted the proactive steps taken by the government, including the launch of the National Mission and the VGF scheme, designed to catalyze industry participation.

Dr. Anshu Bharadwaj, Program Director, NITI Aayog, emphasized the strategic imperatives driving the gasification agenda. He explained that gasification is not merely an energy technology but a critical enabler for India's industrial ecosystem, providing a domestic route to producing essential chemicals and fertilizers. Dr. Bharadwaj expressed hope that the workshop would facilitate a constructive exchange of ideas to address key bottlenecks, especially those arising from the mineral complexity and ash characteristics of Indian coal.

Dr. V.K. Saraswat, Member, NITI Aayog, delivered the keynote address, drawing attention to the national significance of coal gasification and the persistent perception that Indian

coal is unsuitable for gasification. He cited the example of China, which despite having relatively high-ash coal, has successfully developed a robust gasification industry producing chemicals, fertilizers, and other industrial products. Dr. Saraswat discussed pre-processing strategies and feedstock conditioning techniques that improve gasifier performance, and referenced domestic efforts by Larsen & Toubro, IIT Delhi, and other institutions in setting up gasification systems.

He noted that challenges often stem from equipment mismatch, ash chemistry, and operational integration. The successful demonstration by Thermax in converting high-ash coal directly into methanol without pre-treatment was highlighted as a model for replication. Trials conducted by CSIR-CIMFR and BHEL were also acknowledged. Dr. Saraswat underscored the need for clarity in technology selection and posed the central question of the workshop: "Which gasification technology is best suited for Indian coal?"

He concluded by expressing confidence that the deliberations would contribute meaningfully to achieving the Prime Minister's vision of 100 million tonnes of coal gasification capacity by 2030

Shri Vikram Dev Dutt, Secretary, Ministry of Coal, outlined the Ministry's multi-pronged strategy to support the gasification mission. He acknowledged the five key challenges faced by the industry and the steps/initiatives taken by the Ministry of Coal to overcome various challenges as mentioned below:

1. **Technology Adoption:** Adapting and re-engineering foreign and Indian designs suitable for Indian coal conditions.
2. **High CAPEX:** To support the gasification projects which involve high CAPEX, the Cabinet has approved an outlay of ₹ 8,500 crore as a financial incentive for the promotion of coal/lignite gasification projects for both government PSUs as well as the private sector. Also, a 50% rebate in the revenue share for coal used in gasification has been introduced in commercial coal block auctions, provided that at least 10% of the total coal production is used for gasification purposes.

3. **Technology Transfer Barriers:** A framework has been established for granting waivers from registration for Transfer of Technology (ToT) from land-border-sharing countries on a case-by-case basis. Waiver to one application has been granted.

4. **Assured Coal Supply:** A new sub-sector, "Production of Syngas leading to coal gasification," was created under the NRS linkage auctions policy to support this initiative.

5. **High cost of coal as raw material:** The Government has allowed coal supply to gasification projects under the NRS auction with a floor price at the notified price of the regulated sector, for the projects commissioning within the next seven years.

Presentation 1: Global Experiences in various Coal Gasification Technologies – by Fraunhofer Institute for Ceramic Technologies and Systems IKTS

The first technical session commenced with a presentation by Prof. Martin Grabner from Fraunhofer, who provided a comprehensive global overview of coal gasification technologies. Drawing from his extensive experience at Fraunhofer IKTS and collaborations with major industry players, Prof. Grabner set an analytical tone for the workshop by contextualizing the challenges specific to Indian high-ash coal within the global landscape.

Highlights of the presentations:

Prof. Grabner began by tracing the evolution of gasification technologies through three distinct generations. He noted that the current global market is dominated by **entrained-flow gasifiers**, primarily due to their proven scalability and relatively lower capital expenditure for coals with favourable characteristics. He highlighted that Chinese manufacturers have become leaders in this space, leveraging entrained-flow designs for a wide range of chemical and energy applications.

However, he critically analyzed the suitability of these dominant technologies for the unique properties of Indian coal. He identified several key challenges:

1. **High and Variable Ash Content (30-45%):** Unlike many Northern Hemisphere coals, Indian coal's ash content is not only high but also highly variable, which complicates stable plant operation.
2. **Complex Ash Chemistry:** The presence of high concentrations of silica and alumina, coupled with low levels of iron and lime, results in a high ash fusion temperature (AFT) and a very low basicity. This makes slagging operations in entrained-flow gasifiers particularly challenging, often requiring significant quantities of fluxing agents (like limestone) to lower the melting point. This not only adds to the operational cost but also increases the overall solid throughput and potential for refractory wear.
3. **Syngenetic Nature of Ash:** Prof. Grabner explained that the intergrowth of mineral matter with the carbon matrix in Indian coal makes physical cleaning (washing) less effective, meaning that a significant portion of the ash remains even after pre-treatment.

Based on this analysis, Prof. Grabner offered a comparative recommendation for India:

1. **Entrained-Flow Gasifiers:** Deemed the 'least suitable' for widespread application with raw, high-ash Indian coal due to the aforementioned issues.
2. **Fixed-Bed (Moving Bed) Gasifiers:** While highly energy-efficient, their inability to handle the high percentage of fines generated during the mining and crushing of Indian coal remains a major operational bottleneck.
3. **Fluidized-Bed Gasifiers:** Presented as the most promising and robust option. Their key advantages include tolerance for a wide range of particle sizes (including fines/particles), the ability to operate at lower, non-slagging temperatures, and inherent flexibility in managing fluctuating feedstock quality.

Q&A and Discussion:

The presentation was followed by an insightful Q&A session that delved deeper into the technical discussions.

i. A representative from **Greta Energy** raised a pertinent question regarding feedstock compatibility, asking whether entrained-flow gasifiers could be adapted to handle high-ash coal. Prof. Grabner responded that while it is technically possible through design modifications and blending with lower-ash feedstock or petcoke, such adaptations come with significant operational compromises and economic penalties, reinforcing his view that it is not the most optimal path for India's indigenous coal.

ii. **Dr. V.K. Saraswat** intervened to emphasize a crucial strategic point: that India's goal should be to develop or adopt technologies that are largely **"agnostic" to coal composition**. This would enable the utilization of coal from various mines across the country without requiring bespoke solutions for each source, thereby ensuring the scalability and economic viability of the national gasification mission.

iii. A query from **New Era Cleantech** about the potential for automation led to a discussion on process control. Prof. Grabner noted that Fluidized Bed systems, due to their stable and well-mixed nature, are inherently better suited for automation. However, he cautioned that the high and variable ash levels in Indian coal can still introduce complexities that would challenge fully autonomous operation, suggesting that a combination of advanced process control and skilled human oversight would be necessary.

The session of Prof. Grabner concluded with a clear consensus that a deep, scientific understanding of India's unique feedstock characteristics must be the starting point for any technology selection, and that a one-size-fits-all global approach is unlikely to succeed.

Presentation 2: The development of a Fluidized Bed Gasification for Methanol production with Indian Coal – by IIT Delhi

This session provided a powerful testament to India's indigenous innovation capabilities, with Prof. R.R. Sonde, IIT Delhi, presenting the two-decade journey and landmark success of the indigenous fluidized bed gasification technology.

Key Points of the Presentation:

Prof. Sonde began his presentation by celebrating the **"Wow Moment"** - the first successful production of high-purity methanol from high-ash **(>45%)** Indian coal at the Coal-to-Methanol (CTM) pilot plant in February 2022. He framed this as a pivotal achievement for the nation, born from a multi-agency collaboration of 20 domestic partners, led by IIT Delhi and Thermax.

He systematically deconstructed the historical "myth" surrounding the failures of the **Talcher** and **Ramagundem** projects, attributing them squarely to the force-fitting of inappropriate imported technologies. Based on a rigorous fundamental analysis of coal characteristics, including reactivity, particle size, and ash properties. He presented an

“unambiguous” conclusion: **that the circulating fluidized bed design is the most effective and appropriate technology for managing India’s high-ash, fines-laden coal.**

Key highlights of the CTM plant’s success included:

1. **High Performance:** The plant has achieved a Carbon Conversion Efficiency (CCE) of 92% and a Cold Gas Efficiency (CGE) of 70%, demonstrating its high performance even with challenging feedstock. The team is now working to push the technology to a "Mark IV" level.
2. **Financial Viability:** Prof. Sonde presented a detailed financial analysis, revealing that SNG produced from pithead coal could be up to 20 times cheaper than imported natural gas. He acknowledged the higher initial CAPEX of the R&D-scale plant but projected that with economies of scale and a strengthened indigenous supply chain involving MSMEs, the cost would become highly competitive.
3. **Call for Policy Support:** He made a strong case for initial government support, specifically advocating for a **70% Viability Gap Funding (VGF) grant** to de-risk the first few commercial-scale projects (100-300 TPD). This, he argued, would be a critical step to bridge the gap from pilot to full commercial deployment.

Q&A and Discussion:

The presentation sparked a highly engaged Q&A session, focusing on the practical aspects of the CTM technology and its commercial roadmap.

i. Participants inquired about the plant's ability to handle impurities. Prof. Sonde explained that the technology incorporates a sophisticated, non-aqueous gas cleanup system, which not only removes contaminants like tar and mercury but also offers significant ecological benefits by minimizing water usage and effluent discharge.

ii. The scalability of the technology was a key point of interest. Prof. Sonde detailed a phased scale-up plan, moving from the current pilot plant to a **100-300 TPD**

demonstrator, before eventually reaching large commercial scales. He assured the audience that the underlying principles of the fluidized bed design allow for confident and manageable scaling.

iii. In response to a question about the project's documentation, Prof. Sonde announced that a detailed **white paper** documenting the entire journey—from design and challenges to operational learnings and future projections—would be submitted to all stakeholders for review and knowledge sharing. This was widely appreciated as a transparent and valuable contribution to the national effort.

The Presentation session concluded with a strong sense of optimism, with Prof. Sonde's presentation providing tangible proof of India's capability to develop world-class, context-specific solutions for its energy challenges.

Presentation 3: Industry Leadership and Indigenous Capabilities - by BHEL

This presentation focused on the key public sector institutions that are at the forefront of implementing and supporting India's gasification mission. The team from **Bharat Heavy Electricals Limited (BHEL)** shared insights from their ongoing coal gasification initiatives, notably the construction of a **2000 TPD ammonia plant** in a joint venture with **Coal India Ltd**. The plant design incorporates a **pressurised fluidized bed gasifier**, selected to address the variability in coal chemistry and the presence of impurities such as **silica and alumina**. Additional units have been integrated to remove coal-borne contaminants and to enable carbon circularity within the facility.

BHEL's Four-Decade Journey in Gasification

The presentation by **BHEL** showcased their extensive and pioneering journey in the field of coal gasification. The representative traced BHEL's four-decade legacy, from its initial work

with Moving Bed gasifiers in the 1980s to its current leadership in **Pressurized Fluidized Bed Gasification (PFBG)**.

Key highlights included:

1. **Indigenous PFBG Technology:** BHEL has successfully developed and demonstrated its own PFBG technology, which is specifically tailored to handle the high ash and variability of Indian coal. A key advantage highlighted was its ability to accept fines and operate in a non-slagging mode, thereby avoiding the tar formation issues associated with other technologies.
2. **Commercial Readiness:** The presentation detailed BHEL's readiness for large-scale commercial deployment. The design for a **2400 TPD gasifier** has undergone rigorous vetting by national and international experts, including IIT Madras and Prof. Bo Leckner, and is now being implemented for the Coal-to-Ammonium Nitrate (CtAN) joint venture project with Coal India Limited (CIL).
3. **Manufacturing Prowess:** BHEL emphasized its end-to-end **"Make in India"** manufacturing ecosystem, with 16 facilities across the country capable of producing all critical components of the gasification island. This positions BHEL as a crucial partner in building a self-reliant supply chain.

Q&A and Discussion:

During the Q&A, BHEL confirmed that the financial closure for their JV project is targeted for September 2025 and reiterated their confidence in scaling the technology further, expressing a target of achieving a **14.3x** scale-up factor from their initial designs.

In response**, Dr. V.K. Saraswat, Member**, NITI Aayog, proposed the establishment of a mechanism for periodic data sharing across institutions and developers to facilitate knowledge exchange and accelerate technology adaptation.

Presentation 4: Industry Leadership and Indigenous Capabilities - by CSIR - CIMFR

CSIR-CIMFR's R&D and Feedstock Expertise

The presentation by the **CSIR-Central Institute of Mining and Fuel Research (CIMFR)** underscored its vital role as the scientific backbone of India's gasification mission. The representative highlighted their comprehensive study with CMPDIL, titled **"Gasification Potential Mapping of Indian Coal,"** submitted to NITI Aayog which serves as a foundational resource for the industry.

Key contributions and capabilities presented were:

i. **Advanced R&D Facilities:** CIMFR operates a 1.5 TPD PFBG pilot plant and state-of-the-art analytical hubs, which have been instrumental in developing operational

philosophies for gasifying not just high-ash coal, but also lignite and biomass. Their trials have demonstrated a cold gas efficiency of up to 65%.

ii. **Industry Support and Knowledge Sharing:** CIMFR offers its expertise to industry partners in crucial areas such as feedstock pre-processing, techno-economic feasibility analysis, and the development of indigenous catalysts and gas cleanup technologies.

iii. **Future Focus:** The presentation identified the need for further research in AI-based automation for process optimization and expanded CFD modelling to cover the entire gasification value chain.

Q&A and Discussion:

The panelists noted that adaptations would be necessary for any organization seeking to deploy gasification units at some scale, because these challenges have been addressed within CIMFR's own facility. As there's some ongoing work that includes improvements in process modelling, logistics planning, and circularity integration.

In response to a query regarding simulation tools, the CIMFR team emphasised the need for **integrated simulation packages** that account for key process parameters such as feedstock variability, impurity profiles, and gasifier dynamics. CIMFR was ready to offer its resources and services to the industry for the successful realization of Coal gasification on a commercial scale using Indian High Ash Coal.

Open Forum for Discussion

The Open Forum was a highly interactive session that brought together the diverse perspectives of all stakeholders, leading to a set of clear and actionable recommendations.

1. **Shri Atanu Mukherjee, CEO of Dastur Energy**, provided a nuanced industry perspective, stating that for Indian coal, **non-slagging gasifiers are generally the most suitable option**. He acknowledged the operational flexibility of fluidized bed gasifiers but pointed out that achieving large scale may require multiple units, which could dilute economies of scale. He suggested that for broader deployment, non-slagging designs remain preferable.
2. The representative from **BHEL** raised a critical procedural issue: the need for **regulatory alignment and expedited clearance under the Indian Boiler Regulations (IBR)**. Streamlining this process was identified as a key factor in improving project timelines and reducing bottlenecks.
3. **Shri Naveen Ahlawat, Head of Gasification Projects at JSPL**, shared valuable operational insights from their Angul facility. He highlighted the successful role of the **MSME sector** in domestic component sourcing, reinforcing the potential for a robust indigenous supply chain. He strongly advocated for the integration of **CCUS** to ensure environmental sustainability and stressed the need for **guaranteed offtake mechanisms** for gasification-derived products to attract and secure private investment.
4. A strong consensus emerged that the coal characterization expertise available at institutions like **CSIR-CIMFR and IIT Delhi** should be formally leveraged by the industry for feedstock mapping and technology selection.

Concluding Remarks and Actionable Roadmap

The workshop concluded with powerful closing remarks that synthesized the day's deliberations into a clear vision for the future.

Shri Vikram Dev Dutt, Secretary, Ministry of Coal, thanked all participants and reaffirmed the government's full support for the coal gasification mission, backed by the VGF scheme. He emphasized the need for a collaborative ecosystem and urged stakeholders to move with speed, assuring them of the Ministry's help in overcoming any hurdles.

Dr. V.K. Saraswat, in his concluding address, delivered a passionate call to action. He expressed his frustration with the industry's historical reliance on imported technology and what he termed "biased foreign data". He declared that India has reached an inflection point and urged the Indian industry to shed its inhibitions and evolve from being assemblers of foreign designs to becoming confident **technology developers**.

He asserted that with the proven successes of BHEL, CIMFR, and the IITD-Thermax collaboration, the expertise to handle Indian coal now resides firmly within the country. He proposed that **project funding mechanisms should be linked to domestic procurement of components** to strengthen local manufacturing. He concluded by stating that the time for deliberation is over, and the time for swift, decisive implementation is now, driven by a collective belief in India's indigenous technological capabilities.

Way Forward

Participants emphasised the need for scaling pilot projects to commercial levels, integrating CCUS, and ensuring industry involvement in core technology development. With policy support through Viability Gap Funding, assured coal supply, and dedicated auction mechanisms, India is well-positioned to advance its coal gasification roadmap from an energy security perspective and take up large-scale coal gasification projects.

Most of the experts recommended circulating fluidized bed gasification technology for Indian High Ash Content Coal, specifically due to the fact that the chemistry of Indian coal ash does not support other gasification technologies viz, entrained bed and fixed bed.

Annexure-I

List of participants attended the workshop held on 2nd September 2025 at NITI Aayog

S.No	Name	Designation	Organization
1.	Dr. V.K. Saraswat	Member	NITI Aayog
2.	Shri Vikram Dev Dutt	Secretary	Ministry of Coal
3.	Ms. Rupindar Brar	Additional Secretary	Ministry of Coal
4.	Shri Sanoj Kumar Jha	Additional Secretary	Ministry of Coal
5.	Sh. Birendra Kumar Thakur	Director – Technical	Ministry of Coal
6.	Shri Alok Kumar Singh	OSD	Ministry of Coal
7.	Deputy Secretary		D/o Fertilisers
8.	Dr. Anshu Bharadwaj	PD, GTE&CC	
9.	Shri Rajnath Ram	Adviser (Energy)	NITI Aayog
10.	Ravi Kumar	Consultant, Grade-1	NITI Aayog
11.	Ms. Anupama Kumari	Consultant (Deputation)	NITI Aayog
12.	Vishal Kumar	Young Professional	NITI Aayog
13.	Chandrabhal Chakraborty	Young Professional	NITI Aayog
14.	Sh. Peeyush Kumar	MD, BCGCL	Coal India Ltd
15.	Sh. Asheesh Kumar	Director BD	Coal India Ltd
16.	Shri Suman Kumar	GM (Washery)	CCL
17.	Dr. Suresh Chandra Suman	Director (Mines) & Director (P&P)	NLCIL
18.	Shri Rajkumar	Deputy General Manager	NLCIL
19.	Shri Vikrant Malick	Executive Engineer	NLCIL
20.	Prof. R.R. Sonde	Professor, Chemical Engineering	IIT Delhi
21.	Sh. Manjesh Kumar	—	IIT Delhi
22.	Dr-Ing. Martin Grabner	Professor	TU Freiberg / Fraunhofer IKTS
23.	Sh. Koppu Sadashiv Murthy	CMD	BHEL
24.	Sh. S. M. Ramanathan	Director (E, R&D)	BHEL
25.	Sh. V. Shyamala	GM & Head (CTM)	BHEL
26.	Sh. S. S. Verma	GM	BHEL
27.	Sh. Vivek Kumar Gupta	DGM	BHEL

28.	Sh. Sandeep Goyal	Sr Manager	BHEL
29.	Sh. Shivam Agarwal	Manager	BHEL
30.	Sh. Deepak Gupta	Director (Projects)	GAIL
31.	Sh. Sanjeev Kumar Gupta	General Manager	GAIL
32.	Sh. Harindra Kumar	General Manager	GAIL
33.	Shri Suresh Tiwari	Dy. General Manager	GAIL
34.	Shri Suman Kumar	Director (P&BD)	IOCL
35.	Shri SK Papneja	ED (PS-PJ)	IOCL
36.	Sh. Ranjan Nair	Business Head – Renewable Energy	BPCL
37.	G Vikram	Member, Coal Gas Task Force	BPCL
38.	Prof. Arvind Kumar Mishra	Director	CSIR-CIMFR
39.	Dr. Prakash D Chavan	Chief Scientist	CSIR-CIMFR
40.	Dr S Dutta	—	CSIR-CIMFR
41.	Dr. Alok Tripathy	—	CSIR-IMMT
42.	Dr. SP Das	Scientist, Mineral Processing	CSIR-IMMT
43.	Mrityunjay Prasad	GM	DVC
44.	Sh. A K Balyan	Secretary General	CGAI
45.	Sh. Naveen Ahlawat	Head – Gasification Projects	JSPL
46.	Mr. Venkatesh M	CTO & Head – Design Competency Center	L&T Group
47.	P. Balaramakrishna	GM	L&T Group
48.	Mr. Pankaj Garg	DGM, Corporate Affairs	L&T Group
49.	Sh. Shirish Dalal	VP & Head, AdVENT	L&T Group
50.	Varun Jindal	Managing Director	Dev Energy
51.	Dr. Dev Kumar Gupta	Head – Innovation Projects & Energy Solutions	Thermax
52.	Kiran Chauhan	Program Manager	Thermax
53.	Sh. Kamal Kishore Pant	Director	IIT Roorkee
54.	Ms. Komal Tripathi	Assistant Professor	IIT Roorkee
55.	Ritu Mathur	Director, Energy & Climate Studies	TERI
56.	Sh. Atanu Mukherjee	Founder & CEO	Dastur Energy
57.	Dr. Suprotim Ganguly	Techno-strategic Advisor	Dastur Energy
58.	Mr. Ashis Mahapatro	CEO – Steel	Greta Energy Ltd
59.	Sh. Vaibhav Kakulte	Vice President	Greta Energy Ltd

60.	Sh. Nitesh Chaudhary	—	Greta Energy Ltd
61.	Anup Goyal	Director	Greta Energy Ltd
62.	Sh. Balasaheb Darade	Founder & MD	New Era Cleantech
63.	Rakesh Kumar	CBO	New Era Cleantech
64.	Reshma Mohan	Credit Analyst	SBI Caps
65.	Subham Goel	VP	SBI Caps
66.	Rajeev Ranjan Singh	Manager	SBI Caps
67.	Himanshu Singh	Manager	Chakr Innovation
68.	Shravan K. Pushkar	Consultant	NITI Aayog
69.	Prince Tiwari	YP	NITI Aayog
70.	Fayaz Tantray	Consultant	NITI Aayog
71.	Sounak Mukherjee	Consultant	NITI Aayog
72.	Sapna Bisht	Consultant	NITI Aayog
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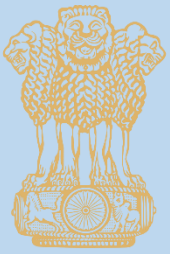

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