



RESEARCH & DEVELOPMENT



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The Research & Development (R&D) activities in the Coal sector are administered through an apex body namely, **Standing Scientific Research Committee (SSRC)** with the Secretary (Coal) as its Chairman. The other members of this apex body include Chairman, Coal India Limited (CIL), Chairman cum Managing Directors (CMDs) of Central Mine Planning and Design Institute (CMPDI), Singareni Collieries Company Limited (SCCL) and NLC India Limited (NLCIL), Director General (DG) of Directorate General of Mines Safety (DGMS), Directors of concerned CSIR Laboratories, Representatives from Department of S&T (DST), NITI Aayog and Research Institutions, Chairman of Technical Sub-committee, etc. The main functions of SSRC are to plan, programme, budget and oversee the implementation of research projects. The SSRC is assisted by a Technical Sub-Committee headed by the Head of Department (HoD) (Mining) of IIT- KGP/ BHU/ISM on annual rotation basis.

The R&D projects are broadly covered under 7 thematic areas, viz. Advanced technology / methodology for improvement of production & productivity, Improvement of safety, Health and environment, Waste to wealth, Alternative use of coal and clean coal technology, Coal beneficiation

and utilization, Exploration, Innovation and indigenization (Under the Make-in-India concept).

CMPDI acts as the Nodal Agency for co-ordinating research activities in the coal sector. This involves identifying 'Thrust Areas' for research activities, identifying agencies that can undertake research work in the identified fields, processing the proposals for Government approval, preparing budget estimates, disbursing fund, monitoring the progress of implementation of the projects, etc.

1.1 Physical performance -

The status of Coal S&T projects during 2024-25 (till 01.12.2024) are as under:

| Sl. No. | Parameters | Quantity |
|---------|--|----------|
| 1 | Projects ongoing as on 01.04.2024 | 22 |
| 2 | Projects completed during 2024-25 (till 01.12.2024) | 1* |
| 3 | Projects approved by SSRC during 2024-25 (till 01.12.2024) | 6 |
| 4 | Projects ongoing as on 01.12.2024 | 27 |

* Completion report to be accepted.

1.2 Financial status

Budget provisions vis-à-vis actual fund disbursement during the period are given below:

(in ₹ Crores)

| 2022-23 | | | 2023-24 | | | | 2024-25 (till 1.12.2024) | | | |
|---------|------------------------|--|---------|------|------------------------|--------|--------------------------|------|---------------|----------------|
| RE | Fund received from MoC | Actual | BE | RE | Fund received from MoC | Actual | BE | RE | Fund from MoC | Actual (Prov.) |
| 8.35 | 6.94 | 7.89 (utilizing unspent balance of previous year) | 21.0 | 18.0 | 18.0 | 18.0 | 21.0 | 21.0 | 15.75 | 13.28 |



1.3 Following S&T project were approved during 2024-25 (till 01.12.2024) -

- a) Payload monitoring of loading equipment (Hydraulic Excavators) displayed in the operator's cabin.

Implementing agencies: Gainwell Commosales Private Limited (GCPL), Kolkata and Eastern Coalfields Limited, Sanctoria.

- b) Technology to detect the effect of blasting on propagation of cracks in structures.

Implementing agencies: Indian Institute of Technology (Banaras Hindu University), Varanasi; Techno Wave Solutions Private Limited (TWSPL), Ranchi and NCL, Singrauli.

- c) Coal derived value-added carbonaceous nanomaterials for energy harvesting and gas detection-based sensor applications.

Implementing agencies: Central Mechanical Engineering Research Institute, Durgapur and Bharat Coking Coal Limited, Dhanbad.

- d) AI-ML cloud-based real-time comprehensive autonomous system for monitoring & suppression of dust particles & hazardous gases in coal mines using UAV.

Implementing agencies: Jaypee Institute of Information Technology (JIIT), Noida; Garuda UAV Soft Solutions Private Limited (GSSPL), Noida and MCL, Sambalpur.

- e) Development of a novel NDT instrument using 3D Asymmetric Giant Magneto impedance Sensors for coal mines

Implementing agencies: Centre for Advanced Studies in Electronics Science and Technology (CASEST), School of Physics, University of Hyderabad, Hyderabad; Gandhi Institute of Technology and Management (GITAM), Visakhapatnam; SCCL, Kothagudem and Ananth Technologies Pvt. Ltd., Hyderabad.

- f) Reusability assessment of Coal Tailing Extracts (CTE) for large-scale geotechnical fill application.

Implementing agencies: IIT, Dharwad and BCCL, Dhanbad.

1.4 Following S&T project was completed during 2024-25 (till 01.12.2024):

- a) Prevention of premature failures and enhancing life of bottom rollers used in bucket wheel excavators.

Implementing agencies: Centre for Applied Research & Development; NLCIL, Neyveli; NIT, Trichy and IISc, Bengaluru.

2.0 Status of Research Projects under the R&D Fund of Coal India Limited

An R&D board headed by the chairman of CIL also functions for CIL's in-house R&D work. CMPDI acts as the nodal agency for processing proposals for CIL approval, preparing budget estimates, disbursing funds, monitoring the progress of project implementation, etc.

To enhance the R&D base in command areas of CIL, the CIL Board in its meeting held on 24th March 2008 had delegated substantial powers to the CIL, R&D Board and the Apex Committee of the R&D Board. The Apex Committee is empowered to sanction individual R&D projects up to ₹ 5.0 Crore value with a limit of ₹ 25.0 Crore per annum considering all the projects together, whereas the CIL, R&D Board is empowered to sanction individual R&D projects up to ₹ 50.0 Crore.

2.1 Physical performance -

The status of CIL, R&D Projects during 2024-25 (till 01.12.2024) are as under:

| Sl. No. | Parameters | Quantity |
|---------|---|----------|
| 1 | Projects ongoing as on 01.04.2024 | 22 |
| 2 | Projects approved during 2024-25 (till 01.12.2024) | 3 |
| 3 | Projects completed during 2024-25 (till 01.12.2024) | 8+1* |
| 4 | Projects on-going as on 01.12.2024 | 16 |

* Completion report to be accepted.



2.2 Financial status -

Budget provisions vis-à-vis actual fund disbursement during the period are given below:

(₹ in Crores)

| 2022-23 | | 2023-24 | | 2024-25 (till 1.12.2024) | |
|---------|--------|---------|--------|--------------------------|--------|
| RE | Actual | BE | Actual | BE | Actual |
| 67.00 | 66.98 | 70.00 | 43.21 | 40.00 | 12.77 |

2.3 Following R&D projects were approved during 2024-25 (till 01.12.2024):

- a) Design of Geotechnical structures for extraction of coal seam at higher depth using Continuous Miner.

Implementing agencies: NIT, Rourkela.

- b) Development of Energy Efficient Ergonomically Designed (EEED) Chair Lift Man Riding System.

Implementing agencies: IIT-ISM, Dhanbad.

- c) Study on post-mining accelerated reclamation in coal mining areas using soil microbial community.

Implementing agencies: CIMFR, Dhanbad.

2.4 Following R&D projects were completed during 2024-25 (till 01.12.2024):

- a) Study on performance improvement of coking coal washery under Coal India Ltd. through modelling and simulation analysis.

Implementing agencies: NML, Jamshedpur.

- b) Development of guidelines for prevention & mitigation of explosion hazard by risk assessment and determination of explosibility of Indian coal incorporating risk-based mine emergency evacuation and re-entry protocol.

Implementing agencies: IIT-ISM, Dhanbad & CIMFR, Dhanbad.

- c) Development of Virtual Reality Mine Simulator (VRMS) for improving safety and productivity in coal mines.

Implementing agencies: IIT-ISM, Dhanbad.

- d) Design and development of knee and spinal smart protective devices for improving the health and safety of miners.

Implementing agencies: IIT-ISM, Dhanbad.

- e) Prediction of particulate matter and gaseous pollutants concentration through Artificial Neural Network [ANN], Probabilistic Neural Network [PNN], and Classification and Regression Tree [CART] models and comparison with CALPUF and AERMOD in Singrauli coal mines.

Implementing agencies: BIT, Mesra.

- f) Separation and recovery of fine particles from coal washery effluents using bio-coagulant.

Implementing agencies: IIT-ISM, Dhanbad.

- g) Effective utilization of middlings and fines of coking coal washery for recovery of carbon values.

Implementing agencies: NML, Jamshedpur.

- h) Design and Development of Drop Test Facility for Pit Bottom Buffer, used in Underground Coal Mines.

Implementing agencies: CMERI, Durgapur.

- i) Design and deployment of Ventilation Fan Wind Power Recovery System as an alternate source of Electrical Energy in Underground Coal Mines.

Implementing agencies: IIT-ISM, Dhanbad.



3.0 New Policies / Initiatives / Activities undertaken during the Year 2024-25 -

3.1 Hackathon on Coal Gasification -

As per the directives of MoC, CMPDI organized a "Hackathon on Coal Gasification" in the following (6) problem statements to harness a vital natural resource to meet the energy and chemical needs of the nation, fostering economic independence and environmental sustainability:

1. Coal to Blue Hydrogen
2. End-product optimization of coal gasification
3. Technology Advancement for Efficiency Enhancement in coal gasification

4. Emission Reduction in coal gasification
5. Utilization of by-products produced in the gasification process
6. Alternatives technologies

The hackathon invited scalable solutions, poised for demonstration or commercial replication within the intricate tapestry of coal companies. It also provided opportunities to start-ups, research organizations, academic institutes, etc. to innovate in the field of coal gasification.

The top 3 participants of each problem statement were declared Winners and they were facilitated on 04.10.2024 by the Hon'ble Minister of Coal (State).



Shri Satish Chandra Dubey, Hon'ble Minister of State for Coal and Mines, felicitated the winners of Hackathon on "Coal Gasification" organised by CMPDI at CMPDI (HQ), Ranchi on 4.10.2024

3.2 National Centre for Coal and Energy Research (NaCCER)

National Centre for Coal and Energy Research (NaCCER) (Phase-I) has been established at CMPDI, Ranchi to carry out research in domains of the coal and energy sector to sustainably, meet the energy demand of the nation through cutting-edge research, innovation and collaboration. The centre was inaugurated by the Hon'ble Minister of Coal on 07.10.2024.



Shri G. Kishan Reddy, Hon'ble Union Minister for Coal and Mines, inaugurated State of the Art, 'National Centre for Coal and Energy Research (NaCCER)' established at CMPDI (HQ), Ranchi through Video Conferencing from WCL HQ, Nagpur on 07.10.2024

