



RESEARCH & DEVELOPMENT



RESEARCH & DEVELOPMENT

1. Status of Research Projects under S&T Grant of Ministry of Coal

The Research & Development (R&D) activities in Coal sector are administered through an apex body namely, Standing Scientific Research Committee (SSRC) with 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 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 Make-in-India concept).

CMPDI acts as the Nodal Agency for co-ordination of research activities in the coal sector, which involves identification of 'Thrust Areas' for research activities, identification of agencies which can take up the research work in the identified fields, processing the proposals for Government approval, preparation of budget estimates, disbursement of fund, monitoring the progress of implementation of the projects, etc.

2. Physical performance

The status of Coal S&T projects during 2023-24 (till 31.03.2024) are as under:

Sl. No.	Parameters	Quantity
1	Projects on-going as on 01.04.2023	15
2	Projects completed during 2023-24	4
3	Projects terminated during 2023-24	Nil
4	Projects approved by SSRC during 2023-24	11
5	Projects on-going as on 31.03.2024	22

3. Financial status

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

(in ₹ Crores)

2022-23			2023-24 (till 31.03.2024)			
RE	Fund received from MoC	Actual	BE	RE	Fund received from MoC	Actual
8.35	6.94	7.88	21.0	18.0	18.0	18.0



4.1 Following S&T project were approved during 2023-24 (till 31.03.2024):

- a) Assessing the Abiotic and Biotic Factors in Pit Lakes for Sustainable Management of Water and Environment.

Implementing agencies: BIT, Mesra; CMPDI, Ranchi & CCL, Ranchi.

- b) Indigenous Development of NIR spectroscope for instant prediction of Coal Quality Parameters.

Implementing agencies: CIMFR, Nagpur & Shri Ramdeobaba College of Engineering & Management (RCOEM), Nagpur.

- c) Recycling coal mine overburden to reuse as a secondary building material to promote Circular Economy

Implementing agencies: BIT, Mesra; CMPDI, Ranchi & CCL, Ranchi.

- d) Setting up a 5G Use Case Test lab in CMPDI for Coal Industry.

Implementing agencies: TCIL, New Delhi; IIIT, Ranchi and CMPDI, Ranchi.

- e) Development of Synthetic Lightweight Aggregates as Backfilling Material using Hydraulic Stowing Method

Implementing agencies: Indian Institute of Technology-ISM, Dhanbad.

- f) Design and development of an AI-enabled Dust Suppression System for Opencast Mines.

Implementing agencies: Central Mechanical Engineering Research Institute (CMERI), Durgapur; Centre for Development of Advanced Computing (C-DAC), Thiruvananthapuram; Unyrshapa Corporation Lord Tech. (UCLT), Ranchi and ECL, Sanctoria

- g) Development of hard carbons and ultrahigh specific surface area porous activated carbon

from coal for energy storage applications.

Implementing agencies: CMERI, Durgapur; Centre for Advanced Studies in Electronics Science and Technology (CASEST); School of Physics, University of Hyderabad, Hyderabad and SCCL, Kothagudem.

- h) Development of Indigenous technology for extraction of critical minerals including rare earth elements from overlying strata of North Eastern coalfields.

Implementing agencies: Indian Institute of Technology, Guwahati; Panjab University, Chandigarh and NEC, Margherita.

- i) Coal Mine Overburden Alkali-activated Composites (CMO AAC) for Pre-Fabricated 3D Volumetric Construction Elements & System thereof (3DV CES)

Implementing agencies: VNIT, Nagpur; JNARDDC, Nagpur; RI-IV, CMPDI, Nagpur and IIT (BHU), Varanasi.

- j) Design and Development of a Model Cargo-Hyperloop using Pipe Following Robot.

Implementing agencies: IIT, Kanpur.

- k) Development of an Indigenous Ground Vibration Monitoring and Analysis System using IoT Enabled Devices and AI-ML Techniques.

Implementing agencies: CMPDI, Ranchi; IIT, Kharagpur & NCL, Singrauli

4.2 Following S&T projects were completed during 2023-24 (till 31.03.2024):

- a) Study of hazards due to mining induced sub-surface cavities and waterlogged areas in inaccessible old workings in underground coal mines using geophysical technique.

Implementing agencies: IIT-ISM, Dhanbad and ECL, Sanctoria.



- b) Assessment of Rare Earth Elements (REE) and other economic resources in Coal & Non-Coal Strata and Characterization of Acid Mine Drainage and its pollution control from the North Eastern Region (NER) Coalfield.

Implementing agencies: Panjab University, Chandigarh; CMPDI, Ranchi and Duke University, USA.

- c) Indigenous development of early warning radar system for predicting failures/slope instabilities in open cast mines.

Implementing agencies: SAMEER, Mumbai; CSRE; IIT, Bombay & CMPDI, Ranchi.

- d) Indigenous Development of IoT Enabled Technology for Monitoring, Analysis and Interpretation of Longwall Shield Pressures for Improving Safety and Productivity.

Implementing agencies: CMPDI, Ranchi; IIT, Kharagpur and Eastern Coalfields Limited (ECL), Sanctoria.

5. Status of Research Projects under CIL R&D

For in-house R&D work of CIL, an R&D Board headed by Chairman, CIL is also functioning. CMPDI acts as the Nodal Agency for processing the proposals for CIL approval, preparation of budget estimates, disbursement of fund, monitoring the progress of implementation of the projects, etc.

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

5.1 Physical performance

The status of CIL R&D Projects during 2023-24 (till 31.03.2024) are as under:

Sl. No.	Parameters	Quantity
1	Projects on-going as on 01.04.2023	26
2	Projects approved during 2023-24	3
3	Projects completed during 2023-24	5
4	Projects terminated during 2023-24	2
5	Projects on-going as on 31.03.2024	22

5.2 Financial status

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

(₹ in Crores)

2022-23		2023-24	
RE	Actual	RE	Actual
67.00	66.98	70.00	43.31

5.3 Following R&D projects were approved during 2023-24 (till 31.03.2024):

- a) Bi-facial Perovskite Module - Leading to 4-T Perovskite-Si Tandem Structure.

Implementing agencies: IIT, Bombay.

- b) 5G Captive non- public network for integrated voice, video & data communication in opencast coal mines.

Implementing agencies: Centre for Development of Advance Computing (CDAC), Thriuvananthapuram and Mine Electronics Division, CMPDI, Ranchi.

- c) A Pilot Project on Underground Coal Gasification (UCG) to establish technology in Indian geo-mining conditions (Phase-I).

Implementing agencies: CMPDI (HQ), Ranchi; ECL, Sanctoria and M/s Ergo Exergy Technologies Inc (EETI), Canada.



5.4 Following R&D projects were completed during 2023-24 (till 31.03.2024):

- a) Development of an indigenous optical fiber-based instrument for measuring in-the-hole Velocity of Detonation [VOD] and analyze the performance of explosive in field condition.

Implementing agencies: Innovation Cell & Mining Electronic (ME) Division, CMPDI (HQ), Ranchi.

- b) Development and adoption of Real-Time Prognosis System (RTPS) for cost-effective safe operation of mobile machinery: show-cased demonstration of dumper fleet.

Implementing agencies: IIT, Kharagpur; CIMFR, Dhanbad; Lulea Technological University (LTU), Sweden and ECL, Sanctoria.

- c) Effect of Blasting on Opencast Mine Dump and Development of Relationship between Blast Induced Vibration and Dump Design.

Implementing agencies: Blasting Division, CMPDI (HQ), Ranchi; BIT, Mesra and IIT-ISM, Dhanbad.

- d) Design of Protective Barrier Pillar against Large Water Head in Underground Coal Mines.

Implementing agencies: IIT-BHU, Varanasi and ECL, Sanctoria.

- e) Appraisal of Gondwana Sediments (Coal, Clay, Shale, Sandstone) for Trace Elements & REE concentration in the Singrauli coalfield.

Implementing agencies: Exploration Division, CMPDI (HQ), Ranchi and NCL, Singrauli.

