

**LIST OF ON-GOING R&D PROJECTS OF CIL**  
[As on 01.04.2020]

Sl.No.	Name of the projects and its details	Date of start	Date of completion	Approved outlay [ Rs. In lakh]
1	<p><b>Underground Trapped Miner Location system [ project code: CIL/R&amp;D/1/35/10]</b> Implementing Agencies: TCS/CMC, Kolkata and CMPDI, Ranchi.</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Establishment of a reliable system capable of achieving the primary goals of: <ul style="list-style-type: none"> <li>○ Locating trapped miners during/after a disaster.</li> <li>○ On line monitoring and facilitation of miners for regular operations through data and voice communication along with alerts.</li> </ul> </li> </ul> <p>A composite network will be developed and will be demonstrated at the identified mine Jhanjra in Eastern Coalfields Limited.</p>	Jan. 2010	<p>Mar. 2020</p> <p>No trial has been undertaken under this project within revised schedule of March 2020. As such, project could not be completed.</p>	<p>507.45</p> <p>[ TCS/CMC: 470.47; CMPDI: 36.98 ]</p>
2	<p><b>Design and development of an integrated system for monitoring and control of man and machine, to enhance safety and security in mines. [ Project code: CIL/ R&amp;D/1/52/2012]</b> Implementing Agency: CIMFR, Dhanbad &amp; Aryan It Solutions(AITS), Dhanbad and CCL, Ranchi</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ To develop an integrated system for management of man and machine along with safety and security.</li> <li>➤ To keep record of all activities.</li> <li>➤ To track incoming and outgoing transport vehicles.</li> <li>➤ Ensure proper vehicle utilization in coal mines.</li> </ul>	Jul. 2012	<p>May 2017</p> <p>[Could not be completed till date to some unavoidable reasons ]</p>	<p>437.29</p> <p>[ CIMFR: 60.59 AITS: 376.70 ]</p>

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3	<p><b>Development of guidelines for prevention &amp; mitigation of explosion hazard by risk assessment and determination of explosibility of Indian coal incorporating risk based mine emergency evacuation and re-entry protocol. [ Project code: CIL/R&amp;D/1/60/2016]</b></p> <p>Implementing Agencies: CIMFR, Dhanbad, IIT-ISM, Dhanbad, S&amp;R Division, CIL (HQ), Kolkata and SIMTARS, Australia</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>i.) To conduct risk assessment for identifying the gaps and shortcomings in existing fire &amp; explosion prevention technology in Indian mines.</li> <li>ii.) Characterisation of coal dust with respect to explosibility and self-heating characteristics from different coalfields of India</li> <li>iii.) Optimization of suitable inert material for mitigation in laboratory condition by 20 litre explosion chamber.</li> <li>iv.) Simulation of coal dust explosion initiated by methane explosion along with study of effect of different inertizing agents in 30 m long propagation tube.</li> <li>v.) Computational Fluid Dynamic (CFD) simulation of coal dust explosion in laboratory condition and its application to real time situations.</li> <li>vi.) Development of guidelines for prevention and mitigation of fire and explosion hazards in underground coal mines.</li> <li>vii.) Study and analysis of existing system of emergency response system prevailing in Indian coal mining industry with a view to find out its limitations.</li> <li>viii.) To develop risk assessment based Mine Evacuation &amp; Re-entry Protocol to Support Emergency Response Decision System for underground coal mines of India.</li> </ul>	15 <sup>th</sup> April 2016	14 <sup>th</sup> April 2021	2413.21 [IIT-ISM: 1617.07 , CIMFR: 796.14]

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4	<p><b>Multiple layer trial blasting for better recovery with less diluted coal.</b> [ Project code: CIL/R&amp;D/1/61/2016]</p> <ul style="list-style-type: none"> <li>Implementing Agencies: IIT-ISM, Dhanbad, CMPDI, Ranchi</li> <li>Technical Participation-University of Queensland, Brisbane, Australia</li> </ul> <p><b>Objectives:</b> To develop a method to improve safety, productivity and quality of coal extraction from multi-seam deposits by multiple layer blasting or thru seam blasting in an open cut coal mine.</p>	15 <sup>th</sup> Jul. 2016	31 <sup>st</sup> Mar 2020 [Actual techno-economic will be established only after undertaking some more trial blasts. As such, project could not be completed within schedule]	496.24 [ ISM:431.24: CMPDI.65.00
5	<p><b>Indigenous Development of Through The Earth (TTE) Two- Way Voice Communication System for Underground Mines.</b> [ Project code: CIL/R&amp;D/01/62/2016 ] Implementing Agencies:IIT, Bombay and CMPDI, Ranchi .</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ To develop a wireless system that would support two – way voice communication and study the effect of various earthy materials present in different underground mines on developed Through The Earth (TTE) communication system.</li> </ul>	15 <sup>th</sup> Oct. 2016	14 <sup>th</sup> July 2020	126.715 [IIT, Bombay: 108.715 CMPDI:18.00 ]
6	<p><b>Requirement of air in mine for Mass Production Technology.</b> [ Project code: CIL/R&amp;D/01/63/2016 ] Implementing Agency: UMD, CMPDI(HQ), Ranchi</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ Optimization of ventilation requirement for mass production technology with special reference to Indian coal mines.</li> <li>➤ To find out minimum infrastructure required in terms of inclines, shafts, fan, drifts, fan capacity etc. for a mine where mass production technologies can be introduced.</li> <li>➤ To study the effect of particulate matters emitted from diesel equipment in underground mines and effects of formation of aldehydes and ketones on a mine environment in UG mines.</li> </ul>	1 <sup>st</sup> Nov. 2016	31 <sup>st</sup> Oct. 2020	491.27

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7	<p><b>Development of Guidelines for Increasing the Height of Overburden Dumps at Opencast Coal Mines in India.</b> [Project Code: CIL/R&amp;D/01/64/2017] Implementing agencies: Environment Division, CMPDI (HQ), Ranchi and IIT, Delhi</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>➤ To make scientific guidelines for increasing the height of the overburden dumps at opencast coal mines through a detailed geotechnical characterization and stability analysis of coal mine overburden dumps in India to meet techno-economic and operational challenge to go for the most efficient overburden dump design, that is steep enough to be safe and flat enough to be economically acceptable.</li> </ul>	1 <sup>st</sup> June 2017	31 <sup>st</sup> May 2020	428.08 [ CMPDI- 378.45 IIT, Delhi- 49.63 ]
8	<p><b>Optical fiber based solar illumination of pit bottom and underground mine roadways and working face</b> [[Project Code: CIL/R&amp;D/01/66/2017 ] Implementing Agencies: IIT, Kharagpur and ECL, Sanctoria</p> <ul style="list-style-type: none"> <li>➤ To design an optical fiber based hybrid illumination system for mines that will function during sunny / cloudy days and nights through R&amp;D efforts.</li> <li>➤ The above study will find out the applicability of the optical fiber cable for multipurpose (illumination &amp; sensing) applications and development of a business model for implementation of optical fiber based illumination to mine roadways and working faces. It will also evaluate the replacement costs of the existing system and analyse the payback period. Jhanjra (Combined) UG project, ECL has been identified for execution of the project.</li> </ul>	1 <sup>st</sup> Aug. 2017	Jul. 2020	155.53

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9	<p><b>Development of Virtual Reality Mine Simulator (VRMS) for improving safety and productivity in coal mines.</b> [ Project code: CIL/R&amp;D/01/67/2017]</p> <ul style="list-style-type: none"> <li>● Implementing Agencies: IIT-ISM, Dhanbad, UMD, CMPDI, Ranchi, ECL , NCL and SIMTARS, Australia</li> <li>● <b>Objectives:</b> <ul style="list-style-type: none"> <li>❖ Development of an immersive 360-degree Virtual Reality Mine Simulator (VRMS) to simulate workplace environment for mines safety training under various scenarios and development of safety training strategies using various training aids at IIT-ISM, Dhanbad in collaboration with SIMTARS, Australia.</li> </ul> </li> </ul>	01 <sup>st</sup> Sep. 2017	28 <sup>th</sup> Feb. 2021	1410.10 [IIT-ISM-1320.10 CMPDI:90.00 ]
10	<p><b>Development of guidelines for design of all tiers of shovel-dumper dump above dragline dump, with delineation of phreatic surface, within dragline dump, throughout the year and validation study on two dragline mines of Coal India Limited (CIL)</b> [ Project code: CIL/R&amp;D/01/68/2018]</p> <ul style="list-style-type: none"> <li>● Implementing agency: BIT, Mesra</li> <li>● <b>Objectives:</b> <ul style="list-style-type: none"> <li>❖ To develop guidelines for design of all tiers of shovel-dumper dump above dragline dump with delineation of phreatic surface within dragline dump throughout the year and assessment of its impact on stability to reduce the land requirement for external dumping in opencast excavation, with due consideration of safety.</li> <li>❖ The proposed guidelines will be applicable to all the mines of Coal India Limited, where shovel and dragline dumps exist.</li> </ul> </li> </ul>	1 <sup>st</sup> May 2018	30 <sup>th</sup> April 2021	75.30

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11	<p><b>Design guidelines for underground coal extraction beneath massive competent strata: a case study validation.</b> [ Project code: CIL/R&amp;D/01/70/2018 ]</p> <ul style="list-style-type: none"> <li>• Implementing agencies: WCL, Nagpur; and CIMFR, Dhanbad</li> <li>• <b>Objectives:</b> <ul style="list-style-type: none"> <li>❖ To provide implementable solution to a severe geotechnical problem while extracting coal below massive competent strata (Basalt traps). Maori mine of Kanhan area, WCL [where coal measures are overlain by massive Basalt Traps of volcanic origin] has been identified for execution of the project.</li> </ul> </li> </ul>	1st May 2018	30 <sup>th</sup> Apr. 2020 [ Delayed due to DGMS permission]	407.685 [ WCL-255.907 CIMFR-151.778 ]
12	<p><b>Design of cost effective process flowsheet for improved washing efficiency of Indian Coking and Non-coking coals.</b> [ Lab scale only] [ Project code: CIL/R&amp;D/02/07/2017]</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>❖ To develop a suitable beneficiation strategy to effectively utilize the high ash Indian coals for production of low ash product which can be used in metallurgical and thermal power stations. Through this objective, the country will be able to augment and meet the requirement of washed coal, either through designing new washing circuits and/or by improving the washing efficiency of the existing washeries.</li> <li>❖ The outcome of the project will be useful to CIL in making decisions on selection of an appropriate equipment (for coarse coal), just by washing the given coal in both Dense Medium Cyclone and Batac Jig simultaneously at the pilot-scale. Based on the relative performance results obtained from the trial runs, it will be possible to decide upon the type of washing unit needed.</li> </ul>	17 <sup>th</sup> Apr. 2017	20 <sup>th</sup> Oct. 2020	238.65 [IIT-ISM-223.65 ; CMPDI: 15.0 ]

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13	<p><b>Demonstration of Coal Dry Beneficiation System using Radiometric Technique.</b>  Project Code: CIL/R&amp;D/2/05/10  Imple. Agencies : CMPDIL, Ranchi ; Ardee Hi-Tech Pvt Ltd, Vishakhapatnam &amp; BCCL, Dhanbad</p> <p><b>Objectives:</b>  ❖ To develop a demonstration scale plant for dry deshaling of coal based on modified radiometric detection and pneumatic removal technology (ArdeeSort).</p>	01 <sup>st</sup> Sep. 2010	31 <sup>st</sup> Mar. 2020  [As installation of infrastructure at Madhuban washery has not been completed, field trial could not be undertaken till date. As such, project could not be completed within revised schedule].	2565.70 [CMPDI-1814.40, ArdeeHi-Tech- 751.30]
14	<p><b>High ash coal gasification and associated upstream and downstream processes [ Coal to Chemicals, CTC)</b>  [Project code:CIL/R&amp;D/03/03/2017]</p> <p><b>Implementing Agencies:</b> IIT-ISM, Dhanbad, IIT, Roorkee, CMPDI, Ranchi, MCL, Sambalpur, ECL, Sanctoria and CCL, Ranchi.</p> <p><b>Objectives:</b>  ❖ To convert high ash (preferably 35-45%) Indian coal to value-added chemicals through indigenous developed coal gasification technology with proper environmental considerations through R&amp;D efforts.</p>	20 <sup>th</sup> Jul. 2017	19 <sup>th</sup> Jul. 2020	2160.721 [ IIT-ISM-1872.007; IIT,Roorkee-131.804; CMPDI-156.910]
15	<p><b>Development of a methodology for regional air quality monitoring in coalfield area using satellite data and ground observations.</b>  [Project code: CIL/R&amp;D/04/08/2017]</p> <p>• Implementing Agencies: Geomatics Department, CMPDI (HQ), Ranchi and National Remote Sensing Centre (NRSC), ISRO, Hyderabad.</p> <p><b>Objectives:</b>  ❖ To develop a methodology for air quality monitoring and modeling by analysis of satellite data at regional level and collection of ground based observations with emphasis on dust (PM<sub>10</sub>, PM<sub>2.5</sub>), NO<sub>x</sub>, SO<sub>x</sub> in coal field areas.</p>	15 <sup>th</sup> Mar. 2017	14 <sup>th</sup> Mar. 2020 [ Delayed due to delay in procurement of equipment]	709.82 [ NRSC-589.87; CMPDI-119.95 ]

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16	<p><b>Restoration of Orchid flora of Makum Coalfield areas of Digboi Forest Division.</b> [Project code: CIL/R&amp;D/04/09/2018]</p> <p><b>Objectives:</b> ❖ The prime aims of above project are inventorization of the orchids found in NEC areas, mass multiplication of the rare, endangered and threatened orchids and re-introduction in wild for germplasm conservation of important orchids of Digboi forest region, which will help them in colonizing the forest that may be developed in future on the mined areas and mine-dumps and to Conserve them outside the range (ex-situ conservation) in orchidaria at RFRI, Jorhat and NEC, Margherita.</p>	20 <sup>th</sup> Jan. 2019	19 <sup>th</sup> Jan. 2022	45.14
17	<p><b>Development and adoption of Real-Time Prognosis System (RTPS) for cost effective safe operation of mobile machinery: show-cased demonstration of dumper fleet.</b> [ Project code:CIL/R&amp;D/01/71/2019]</p> <p>Implementing agencies: IIT, Kharagpur, CIMFR, Dhanbad, Lulea Technological University (LTU), Sweden and ECL, Sanctoria.</p> <p><b>Objectives:</b> ❖ The prime objective of the project is the development of surface mining asset utilization framework, based on advanced technology and demonstration of above framework in a conventional surface mine with shovel-dumper combination with a specific aim to show-cased demonstration of prognosis technology for dumper fleet with better utilization and safety.</p>	16 <sup>th</sup> Dec.2019	15 <sup>th</sup> Dec. 2021	440.30 [ IIT - 180.36 ; CIMFR, -180.00 LTU- 79.94]



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18	<p><b>Development of suitable Paste Fill material from Fly Ash (Power Plant Reject) and its transportation system to underground coal mines for stabilization of working as an alternative of sand stowing for increasing the percentage of extraction of coal with due regard to safety and environment to ascertain its cost effectiveness in Sarni UG Mine, Pathakhera Area, WCL. [ Project code:CIL/R&amp;D/02/10/2019</b>  Implementing agencies: WCL, Nagpur and CIMFR, Dhanbad</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>❖ To ascertain the Strength of fly ash paste as stowing to withstand sufficient abutment pressure.</li> <li>❖ To increase % of extraction of coal over the present Wide &amp; Stall method through introduction of fly ash paste filling</li> <li>❖ To ascertain cost effectiveness</li> <li>❖ To improve the Safety and excavation rate of coal mining</li> <li>❖ To ascertain the effect on Surface Subsidence.</li> <li>❖ To ascertain the impact on environment.</li> <li>❖ To optimum utilization of Coal Reserve.</li> <li>❖ To comply the conditions of MoEF &amp; MPPCB &amp; DGMS.</li> </ul>	16 <sup>th</sup> Dec.2019	15 <sup>th</sup> Dec.2021	300.00 WCL-230.00; CIMFR-70.00

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