R&D Projects undertaken under the R&D scheme with financial assistance from Government Fund:

(Rs. in Lakhs)

Sl. No.	R&D Projects	R&D Agency	Total Project Cost	Sanctioned Government Funding	Start Date/ Completion Date	Project Status
1	Improvement in sinter productivity through deep beneficiation and agglomeration technologies for rational utilization of low grade iron ores and fines	CSIR-NML	**1,255.80**	**1,255.80**	**Start Date: April 2010** **Completion Date: June 2014**	• **Project Completed.** • Detailed bench scale & pilot scale studies were undertaken for development of process route for beneficiation of the three iron ore samples. • Micro-pelletization studies on fine grained iron ore concentrate and Sintering studies were carried out using micro-pellets as the partial feed under varied conditions. • Use of (50%) the micro-pellets/pre-balled concentrate alongwith 50% sinter fines led to marked improvement in sinter productivity due to improved bed permeability. • Techno-economic feasibility studies of the processes developed have been carried out in association with MECON.
2	Development of Alternate complementary Route of Iron/Steel making with reference to Indian raw material viz low grade iron ore and non coking coal	CSIR-NML	**858.00**	**858.00**	**Start Date: April 2010** **Completion Date: December 2013**	• **Project completed.** • Coal samples were procured from various sources and flow sheets developed to obtain clean coal with ~12% ash for each one of them. • Clean coal and iron ore concentrate used to produce composite micro-pellets. • Micro pellets were reduced in coke oven with excess carbon to form ferro-carbon. Excellent metallization was achieved under optimum conditions. and sufficient quantity of ferro-carbon was produced in the pilot oven for

						further melting studies. • Smelting studies carried out with the generated ferro-carbon in the SAF for steel making. Although good metallization has been achieved in the Ferro Carbon (around 90%), the steel produced have around 1.5% C and 0.1% P which are not desirable. • Findings not encouraging for implementation.
3	Production of low Phosphorus Steel using DRI through Induction furnace route adopting innovative fluxes and/or design (refractory) changes.	CSIR-NML	**237.00**	**237.00**	**Start Date: April 2010** **Completion Date: November 2012**	• **Project completed.** • Process has been developed in laboratory scale for production of low Phosphorus steel in laboratory scale Induction Furnace using DRI. • Industrial Scale Trials taken up in 2nd Phase (Project Sl.No.9).
4	Smelting reduction of iron ore/fines by hydrogen plasma and elimination of CO2 emission	CSIT-IMMT	**990.35**	**990.35**	**Start Date: April 2010** **Completion Date: July 2015**	• **Project Completed.** • Very futuristic technology demonstration project. • Feasibility of smelting reduction of iron ore/fines using hydrogen plasma has been explored in laboratory/ pilot scale for which a patent has also been filed in the US
5	Beneficiation of Iron Ore slimes from Barsua Mine	RDCIS, SAIL	**2,769.40**	**1,408.20**	**Start Date: Jan 2012** **Scheduled completion Date: March 2017**	• **Project kept in abeyance.** • Pilot plant could not be setup pending statutory clearances at mine site.
6	Development of pilot scale pelletization technology for Indian Goethitic/hematite ore with varying degree of fineness	RDCIS, SAIL	**4,188.77**	**2,206.27**	**Start Date: Jan 2012** **Scheduled Completion Date: March 2018**	• **Project Completed. Project Completion Report to be submitted.** • Pilot Scale pelletisation plant setup. • The automated Pellet Heat Hardening System has been commissioned and test work has been carried out using the system. • Trials completed. • PCR to be submitted
7	CO2 abatement in Iron and Steel production by process optimization	IIT Kharagpur	**84.36**	**84.36**	**Start Date: Jan 2011**	• **Project completed.** • Based on the predictions of the

					Completion Date: September 2014	developed mathematical models the following optimization results has been obtained with Input conditions of moisture content 35-64 gms/Nm3, blast temperature 903-1018 C, sinter/ore ratio of 2.07-2.75 and validated during BF#3 Trials at RSP: ○ Increase of Productivity by about 10 - 12 % based on observed productivity 1.6-1.7 T/day/M3 of W.V ○ Decrease of CO2 in the exit gas by about 8 -10% ○ Decrease of Carbon rate by about 8 – 10 % based on observed C rate of around 500 kg/THM
8	Production of low ash (10% ash) coal (coking non coking) from high ash Indian coals including desulphurisation of high sulphur North East coal	CSIT-IMMT	**1,943.53**	**1,688.53**	**Start Date: Jan 2011** **Completion Date: June 2014**	• **Project completed.** • It has been established at laboratory scale that it is possible to beneficiate ROM coal with less than 30% ash to achieve 10% ash with appreciable yield. • Multiple flow sheets for beneficiation were developed for different grades of coking & non coking coals which can be used by the user industry.
9	Development of the technology for production of CRGO Steel Sheets and other value added Steel Products (DPR)	CSIR-NML	**137.83**	**34.46**	**Placement of Order for the DPR of the CRGO Project: May 2015** **Submission & Approval of DPR: Sept 2016**	• **DPR of the project prepared by MECON and approved by Stakeholders**. • Project to initiate after signing of Memorandum of Agreement by the stakeholders. • **CSIR is reluctant to sign the Memorandum of Agreement. Hence project could not be initiated.**
10	Production of low Phosphorus steel through Induction Furnace route using DRI as major ferruginous raw material – An Industrial Assessment	CSIR-NML	**193.00**	**193.00**	**Start Date: August 2014** **Completion Date: March 2016**	• **Project Completed.** • Industrial Trials completed showing encouraging results. • Follow up industrial trials in neutral lining IF planned to achieve lower phosphorus levels.

11	Development of Automation System for Optimum Coal Blending at Coal Handling Plant of Coke Oven Batteries	RDCIS, SAIL	**1,290.00**	**645.00**	**Start Date: June 2015** **Scheduled Completion Date: May 2018**	• **Project in progress.** • Project Delayed • Scheduled to be completed in May 2018 • Expected to be completed in 2018-19 (December 2018)
12	Economic production of iron through direct reduction of Mill Scale by low grade coal of Rajasthan	MNIT	**540.00**	**166.00**	**Start Date: October 2015** **Scheduled Completion Date: September 2018**	• **Project in progress.** • Project on Schedule • Expected to be completed in September 2018
13	Develop Procedure for Joining Next Generation High Temperature Material to be used for Supercritical/ Ultra Supercritical Power Plant by Friction Stir Welding	Jadavpur University	**567.26**	**558.26**	**Start Date: October 2015** **Scheduled Completion Date: September 2018**	• **Project in progress.** • Project Delayed • Scheduled to be completed in 2018-19 • Actual Completion date not certain • Committee under Director SRTMI to examine viability of the project.
14	Development of Cost Effective Refractory Lining Materials for Induction Melting Furnace suitable for production of Quality Steel	CSIR-CGCRI	**165.00**	**165.00**	**Start Date: April 2016** **Completion Date: March 2018**	• **Project Completed. PCR to be submitted.** • Refractory lining ramming mass developed and trials done in lab scale induction furnace • PCR to be submitted
15	Development of Dry Slag Granulation Technology and Energy Recovery System for Blast Furnace Slag for Producing Clinker Compatible Product	IIT Madras	**168.74**	**84.37**	**Start Date: April 2016** **Scheduled Completion Date: March 2020**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2019-20
16	Development of Infrared Camera Based Torpedo Ladle Car Condition Monitoring System	MECON	**308.00**	**154.00**	**Start Date: August 2016** **Scheduled Completion Date: July 2018**	• **Project in progress.** • Project on Schedule • Expected to be completed in July 2018
17	Development of nickel free nitrogen austenitic stainless steel for biomedical applications	IIT BHU	**284.45**	**284.45**	**Start Date: Jan 2017** **Scheduled**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2019-20

					Completion Date: Dec 2019	
18	Indigenous Development of Model based Breakout Prediction System (BOPS) for Continuous Casters	RDCIS	**582.00**	**260.00**	**Start Date: Jan 2017** **Scheduled Completion Date: Dec 2019**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2019-20
19	Development of Fluidised Bed Reduction Roasting Process for slimes & low grade iron ores by utilizing thermal grade coal for their magnetic susceptibility properties and maximizing the iron recovery	IIT Madras & JSW Steel	**245.52**	**122.76**	**Start Date: Dec 2016** **Scheduled Completion Date: Nov 2020**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2020-21
20	Production of low Carbon & low Phosphorus Ferromanganese by metallothermic treatment of high Manganese Slag using Silicomanganese	CSIR-NML Jamshedpur.	**150.00**	**150.00**	**Start Date: Jan 2017** **Scheduled Completion Date: Dec 2018**	• **Project in progress.** • Project on Schedule • Expected to be completed in December 2018
21	Production of highly metallised Directly Reduced Iron from mill scale & lean grade coal in Tunnel Kiln	CSIR-NML Jamshedpur.	**203.00**	**151.00**	**Start Date: Dec 2016** **Completion Date: March 2018**	• **Project completed in March 2018.** Production of highly metallised iron through Tunnel Kiln achieved successfully • PCR to be submitted
22	Reduction Roasting and Microwave Heating of some difficult to treat Ores for the production of Pellet Feed Concentrate	CSIR-IMMT Bhubaneswar	**124.80**	**124.80**	**Start Date: Dec 2016** **Scheduled Completion Date: Nov 2019**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2019-20
23	Modeling & Optimization of High Concentration Iron Ore fines /concentrate slurry Pipelines for Indian Iron Ore Processing Industries	CSIR-IMMT Bhubaneswar & NMDC Ltd.	**425.00**	**212.50**	**Start Date: Jan 2017** **Scheduled Completion Date: Dec 2019**	• **Project in progress.** • Project on Schedule • Expected to be completed in 2019-20
24	Development of a cost effective green technology for Pre Reduction of Chromite Ore in Tunnel Kiln and Production of High Carbon Ferro Chrome in SAF	NISST, NML & MECPL	**614.00**	**306.50**	Start Date: October 2017 Scheduled Completion Date: September 2019	• **Project in progress.** • Project on Schedule • Scheduled to be completed in 2019-20
25	A Novel Approach of Making Green	IIT Kharagpur	**139.20**	**139.20**	Start Date:	• **Project in progress.**

	Belite Cement from Electric Arc Furnace Steel Making Slag				October 2017 Scheduled Completion Date: September 2020	• Project on Schedule • Scheduled to be completed in 2020-21
26	Amorphous Electrical Steel (AES) for Energy Application submitted by NML Jamshedpur	CSIR-NML Jamshedpur.	**3634.00**	**3634.00**	Start Date: Nov 2017 Scheduled Completion Date: Oct 2021	• **Project in progress.** • Project on Schedule • Scheduled to be completed in 2021-22
	Total		**22,099.01**	**16,113.81**		