ANNEXURE - 1

STATUS OF THE R&D PROJECTS PURSUED WITH FINANCIAL ASSISTANCE FROM SDF

COMPLETED PROJECTS

(In Rs. Crore)

Sl No	Name of the project	Implementing Agency	Total cost of the project	Approved SDF contribution	Fund Released from SDF	Status/ Outcome
	Projects approved in the 1st EC meeting held on 10.7.1998.					
1	Energy efficiency improvement in secondary steel sector in India	MECON Ltd., Ranchi.	0.6000	0.6000	0.6000	MECON carried out in-depth study of selected EAF (10 nos) & IF units (5 nos) for reduction/ optimization of energy consumption by improvements in operating practice & introduction of energy efficient technologies/ equipments. The findings when implemented could lead to reduction in energy consumption upto 90 Kwh with minimum investment. Further improvement can also be achieved by installation of major plant & machineries involving higher cost. Some of the steel plants implemented some of the suggestions and have benefitted by way of reduction in energy consumption thereby reducing the cost of steel production.
2	Chemical modification of lignite based additives and its application in beneficiation of iron ore fines and slimes	RRL, Jorhat	0.1120	0.0920	0.0920	The lignite based additives were developed by RRL Jorhat, The performance of the additives was tested at NMDC, Hyderabad. The additives were not effective for beneficiation of iron ore fines but it could reduce alumina by 4% from iron ore slimes containing 10% alumina.
3	To improve coking characteristics of non coking Chandrapura Coal of Western	IIT, Delhi & Usha Ispat Limited	0.0800	0.0178	0.0178	Laboratory scale experiments were carried out by Centre for Energy Studies at IIT Delhi and coke buttons was produced. Further research were also

	Coal Field Ltd					carried out at Usha Ispat & RDCIS. However, the results obtained were not encouraging.
4	Introduction of new mining methods and techniques for grounds control to enable mining of rich Manganese ore under very poor to fair grounds Conditions	National Institute of Rock Mechanics and MOIL	0.4000	0.1600	0.0800	Through this project, MOIL has successfully implemented a new mining method, designed & developed by NIRM Bangalore and CMRI Nagpur, in their Chikla Mine. The new method supports increase in productivity, better safety as well as reduction in the cost of production.
5	Development of on line expert system for continuous cast products (Billets/Blooms/Slabs)	MECON Ltd.	0.2800	0.1400	0.1400	Through this project MECON has developed indigenously an on line Real Time Process Control Expert System for continuously cast products.
	Projects approved in the 2nd EC meeting on 23.2.1999					
6	To achieve refractory consumption of international bench mark level in integrated steel plants	RDCIS, SAIL, Ranchi	8.7000	3.3835	3.3835	Through this R&D project, RDCIS has developed the following: • Designing of Customized Zonal lining of BOF and steel ladles. • Measurement of Refractory properties & wear profile of lining • Development of manufacturing process of MgO-C bricks & zonal lining in BOF. • Introduction of full MgO-C brick lining in ladles. • Development of Computerized Refractory Management Systems for effective monitoring & refractory consumption and cost. • To disseminate the know how generated a seminar was organized at RDCIS, Ranchi. • The knowledge generated through the project has been implemented in in the BOF shops of BSL, RSP, BSP & DSP yielding substantial technical & financial benefits.

7	Simulation of Thermo-mechanical Processing of steels and Hot Workability studies of High strength steels	RDCIS, SAIL, Ranchi	10.0000	6.3069	6.3069	• Through this project experiments were carried out to develop understanding of Thermo-mechanical Control Processing (TMCP) of lean chemistry HSLA steels on micro structural evolution using Thermo Mechanical Simulator (Gleeble-3500C) and 3tandardize the process to achieve high strength (YS> 500 Mb) and superior impact toughness properties. • Laboratory heats of HSLA steel, (containing Nb/V & Nb/Cu) were made in 100 Kg induction furnace and cast into 100 mmx100mm square ingots. • All heats were hot-rolled by following classical thermo-mechanical control processing technique in the experimental rolling mill at RDCIS. • Processing parameters during rolling, quenching and tempering were altered to achieve strength (YS>690 Mpa) and impact toughness (81 J at –85 C) • Through this project it has been established that various combination of alloying elements like Nb, V & Cu can replace costly alloying elements like Ni & Cu used for manufacture of API grade steel. • A Seminar was organized by RDCIS to disseminate the knowledge gained from this project. • Various plant based projects have been taken up by SAIL using the facilities/ knowledge developed through the project.
8	Development of welding consumables and assessment of weldability index for micro alloyed steels	Jadavpur University, Kolkata	0.2059	0.1555	0.1555	The project has studied the effects of shielding gas mixture (Ar + CO2 + O2) on the performance of micro alloyed steel weld using solid & flux cored wire in GMAW process. A Weldability Index has been proposed based on the properties of weldment.

9	Development of Cast & forged microalloyed steel	IIT, Kharagpur and Kharagpur Metal Industries	0.1546	0.1470	0.1470	Laboratory scale trials were carried out to investigate the effect of composition and subsequent heat treatment on the structure & properties of Ti-V micro alloyed steel castings. The trials confirmed that low carbon micro alloyed steel of proper alloy design may develop mechanical properties specially required for forging & casting components in automobile industries and this can replace the costlier alloy steels presently used.
10	To study various tolerable Indian non-coking coal sources with the aim of maximizing the usage of domestic non-coking coal in the COREX process	Jindal Vijayanagar Steel Ltd.	3.3500	0.9440	0.9440	Through this project, Jindal Vijayanagar Steel Ltd. has successfully completed trials of Indian Non-coking coal in both the modules of the COREX and have also successfully replaced imported coal to the extent of 10% with practically no change in fuel rate and productivity during hot metal production from COREX furnace.
11	Production of CC Billet/Bloom of quality suitable for single-stage conversion into special Bars	Tata Iron & Steel Co. Ltd. and RDCIS, SAIL, Ranchi	71.1000	27.0905	27.0905	• Main objective of the project was to develop Casting technology/ process for production of CC billet/ blooms of desirable quality for meeting the requirements in rolled products for engineering & automotive sectors. • To achieve the above objective, an improved secondary cooling system has been conceptualized, designed & developed in-house based on mathematical model. • The automated system has been installed & commissioned in Billet Caster of DSP. • Electromagnetic Stirrer has also been installed in Billet Caster of DSP and Bloom Caster of ASP. • The Systems were also installed and commissioned at LD#1 Shop of Tata Steel Limited. • Through this project it has been possible to produce special steels through CC route, remove

						internal defects, eliminate sub-surface defects & increase caster productivity substantially. Substantial financial benefits have been achieved.
12	Desulphurisation of Assam Coal	IIT, Delhi	0.0980	0.0463	0.0463	Laboratory scale studies were conducted successfully at IIT Delhi. Experiments were carried out in 20 g scale in a Quartz Reactor designed & fabricated at IIT Delhi. It was found that suitable thermochemical treatment followed by vapour extraction provided significant improvement in sulfur removal.
13	Teaching Package on Structural Steel Design for Department of Civil/Structural Engineering	Institute for Steel Development and Growth (INSDAG), Kokata , IIT, Madras and Anna University, Chennai	0.6960	0.5195	0.5195	The aim of the project was to develop a teaching package on structural steel with an aim to improve knowledge & competence of fresh civil/ structural engineers coming out of the colleges, in steel structural design. The ultimate aim of the Package was to increase the steel intensive construction in India. The Teaching Package was successfully developed by INSDAG and was distributed to the Professors of various Engineering Colleges/ Institutes. Four Workshops were also held by INSDAG in metropolitan cities in this regard.
	Projects approved in the 3rd EC meeting on 21.9.1999					
14	Maximisation of blast furnace productivity with Indian iron ore	NML, Jamshedpur Tata Iron & Steel Co. Ltd and RDCIS, SAIL, Ranchi	80.4900	34.7675	34.7675	• Though this project three numbers of probes namely, Under Burden Probe, Vertical Probe & Core Sampler were installed & commissioned in BF#5 of Bokaro Steel Plant which resulted in substantial improvement in the BF productivity. • Based on the data obtained from these probes, steps were taken on burden distribution control for enhancing the central working of the furnace, suppressing wall-flow of gases and opening up intermediate region which was found excessively loaded.

						• The steps taken helped in substantial improvement in productivity & substantial savings. • A Workshop was organized by RDCIS to disseminate the knowledge gained from this project.
15	Utilisation of solid waste materials generated at Steel Plants by physical beneficiation techniques	RRL, Bhubaneswar, TISCO and RDCIS, SAIL, Ranchi	0.1395	0.0845	0.0845	Laboratory scale experimental trials were conducted to find out methods for recovery Iron & Carbon value from the Steel Plant wastes viz. BF Flue Dust, BOF Sludge & Acetylene Sludge from SAIL & TISCO. It was found that Carbon & Iron values in the BF Flue Dust can be recovered with reasonable yield by floatation and low intensity magnetic separation techniques. It was also found that a good concentrate of Iron could be recovered with reasonable yield from BOF sludge by scrubbing followed by classification.
16	Macromodeling of heat transfer and inclusion management in continuous and ingot casting of steel	IIT, Kharagpur & Mukand Limited	0.1550	0.0759	0.0759	Through this project a comprehensive macro/micro model has been developed which can be used to predict the inclusion behaviour in continuous casting slab. Through the experimental studies, distribution of non-metallic inclusion like iron oxide and iron sulphide in mild steel (0.2% C), was carried out to characterise the inclusion distribution in cast steel. The characterization was done by the help of optical microscope.
17	Design and development of TRIP aided ferrite-bainite steel for structural application	BESU, Shibpur	0.1330	0.0980	0.0980	On the basis of laboratory scale experiments, two target compositions of steel were selected for holding the industrial trials. Thereafter, Industrial trials were conducted for melting, casting & thermo-mechanical treatment as per the findings of the laboratory scale studies. It was found it was possible to produce TRIP induced dual phase steel of simple composition

						possessing high strength & ductility levels.
18	Cold Briquetting of Iron Oxide	RRL, Bhubaneswar & Ispat Metallics India Ltd	1.1000	0.2433	0.2433	RRL, Bhubaneswar has successfully developed a suitable blend ratio and binder for production of briquettes from Iron Oxide fines. RDCIS has tested and certified that the briquettes prepared by RRL, Bhubaneswar are suitable for charging in Blast Furnace.
	Projects approved in the 4th EC meeting on 25.7.2000					
19	Development of ultra high strength steel in as rolled condition through thermo mechanical controlled processing	BESU, Shibpur	0.2550	0.2239	0.2239	Low carbon copper bearing micro alloyed ultra high strength steel was successfully produced in laboratory scale. Further trials were conducted at Metal & Steel Factory, Ishapore for using such steel in manufacturing small arms & ammunition of the Indian Defence Services. Stabilliser blades for 125 mm HE ammunition and Barrel of 5.56 mm INSAS Rifle was successfully made from the steel produced in the trial heats and further treatments.
	Projects approved in the 5th meeting on 20.3.2001					
20	Damage assessment and integrity of welded components	Jadavpur University, Kolkata	0.0378	0.0358	0.0358	The project has studied the effect of different weld procedure on the performance of HSLA steel weldments including hydrogen induced cracking susceptibility using the GMAW process.
21	Mixing and mass transfer in steel making ladles stirred with dual porous plug	IIT, Kanpur	0.1121	0.1043	0.1043	The laboratory scale studies were successfully completed with the help of physical modeling & also Mathematical modeling. A workshop was also organized to disseminate the finding of the experiments.
22	Setting up of a semi pilot demonstration plant (30kg/Hr capacity) for production of synthetic rutile, pig iron &	NMDC, Hyderabad	1.1850	0.4090	0.4090	The semi pilot demonstration plant was successfully setup. metalized Ilmenite was produced in a continuous scale fluidized bed reactor. Thereafter, the metalized Ilmenite was melted in a moving bed

	high pure ferric oxide form east coast ilmenite using thermal plasma technology					plasma reactor. The findings has established the feasibility of producing a Titania Slag having more than 80% Tio2 and Pig Iron having more than 97% Fe at a power consumption of about 1.5 Kwh per Kg of Titania Slag.
	Projects approved in the 6th EC meeting on 07.01.2002					
23	Development of process for advanced hot dip coated products	RDCIS, SAIL	8.2380	4.5256	4.5256	• Hot Dip Process Simulator (HDPS) and Glow Discharge Apparatus (GDA) were procured, commissioned and extensively used in the experiments. • An ANN based predictive model for prediction of coating mass was developed in association with NIT Durgapur. A number of experiments were conducted to validate the model and obtain comparison between predicted and experimentally measured coating thickness. The model was capable of predicting coating mass with a confidence limit of ~ 93%. • The influence of process variables on the development of different micro-structural components and their effect on properties (in terms of formability and spangle size) was studied in detail. Optimum values of the variables for minimum spangle size while attaining high formability were identified. • The outcome of the findings of the study helped to identify the possible measures needed at in the Hot Dip Galvanising Line of Bokaro Steel Limited for close and precise control of coating mass. • Training Programmes were also successfully conducted to disseminate the knowledge generated for the benefit of the Indian Galvanising Industry.

						• Analysis of the galvansing samples received from other steel plants were also done for the benefit of other steel producers. • Facilities setup in the project were also used for pursuing other studies viz. Simulation work for Tata Steel, Optimisation of Continuous annealing parameters at BSL, Dew point optimization for HDGL at BLS and Parameters for achieving full hard galvanized sheets.
24	Smelting reduction of chromite for ferro chrome/charge chrome making	RRL, Bhubaneswar	3.0000	0.2331	0.2331	A process was successfully developed in laboratory scale to produce ferro chrome by smelting reduction of chromite. However, the findings indicated that the process can produce ferro chrome containing only 49% Chromium and not suitable for commercial purpose.
	Projects approved in the 7th meeting on 21.04.2003					
25	Development of Micro Alloyed Steel Structural products in Secondary steel sector through Induction Furnace and Controlled Rolling Route	NISST & AIIFA	0.0600	0.0400	0.0400	Micro Alloyed Steel of suitable grade was designed & produced in a laboratory scale Induction furnace. The steel was cast into pencil ingots and thereafter rolled into ribbed bars. The results of trials established that micro alloyed steels with vanadium and niobium produced better strength and ductility values as compared to TMT bars produced through conventional method and also with lower cost.
	Projects approved in the 8th EC meeting on 05.12.2003					
26	Development of intelligent Mill setup model for dynamic and adaptive control of plate mill	RDCIS, SAIL, Ranchi	26.3100	11.9600	11.5958	RDCIS has successfully completed and implemented the project in Bhilai steel Plant with the objectives for rolling of plates within a tolerance of +0.3 mm to – 0.2 mm for 14 to 22 mm thick plates by using software-based solution as envisaged in the project proposal.
	Projects approved in the 9th EC meeting on 01.03.2004					
27	Pilot Scale Smelting and pre	NML,	1.0696	0.2945	0.2945	• Smelting campaign was successfully conducted in

	feasibility Studies on Nickel-Chromium-Cobalt bearing Magnetite ores for commercial production	Jamshedpur & Government of Nagaland				pilot scale 500 kVA submerged arc furnace at NML Jamshedpur with a view to optimize the smelting parameters for maximum recovery of metallic values in the alloy iron produced. • The alloy iron obtained is suitable for manufacture of special cast iron like Ni-hard iron and abrasive resistant cast iron alloys. • The investigation has established & strongly recommends the smelting route for economical exploitation of this ore body as it cannot be used in the blast furnace. • Based on the result of this pilot scale investigation one medium scale commercial plant may be designed with the assistance of an expert consultants like M/s M. N. Dastur& Company or MECON, Ranchi. • An appropriate site may select in the state of Nagaland near the deposit of magnetite body. • Suitable entrepreneur may be chosen for establishing the commercial plant having at least 9 MVA submerged arc furnace with its accessories and necessary utilities. • Ministry wrote to Directorate of Geology & Mining, Government of Nagaland for establishing a roadmap for development of a commercial scale Pilot Plant.
	Projects approved in the 10th EC meeting on 23.06.2004					
28	Research proposal on Development & Characterization of Spot Welding Techniques for Coated Steel Sheets	Jadavpur University, Kolkata & Tata Steel	0.1738	0.1138	0.1138	The aim of the project was to evaluate the spot weldability of steel sheets coated with different types/ thickness of metallic coatings. The project has been successfully completed. The work has provided a deeper understanding and also a database on spot welding of different galvannealed steel grades.

29	Extension of project proposal on Documentation and development of iron making process used by Tribals of India	National Metallurgical Laboratory, Jamshedpur	0.1485	0.1485	0.1485	Detailed documentation of the ancient Indian iron making process was carried out in two types of furnace. Several technological modifications were carried out to make the processes more productive, energy efficient and cost effective so that these may be adopted by the tribals and the rural populace of the country. A laboratory scale furnace was setup and the process demonstrated in the tribal/ rural regions.
	Projects approved in the 11th EC meeting on 27.09.2004					
30	Development of Value added refractory products for Indian bauxite	Central Glass & Ceramic Research Institute	0.7720	0.1600	0.1600	Experiments were carried out with various alternatives to develop techno-economically viable refractory aggregates from Indian Bauxite. Two of the technological routes, namely, bauxite with silica sol and bauxite with rice husk ash gave promising results at laboratory level.
31	Modelling and control of microstructure & mechanism properties during hot strip rolling	RDCIS, Ranchi	3.6840	1.0000	0.5700	• An integrated mathematical hybrid model has been developed to predict microstructural evolution and mechanical properties for C-Mn and micro-alloyed steel grades of hot rolled coils of Hot Strip Mill of Bokaro Steel Plant. • An online predictive model has also been developed for real time control of mechanical properties along coil length. • After validation with measured property data of about 3000 samples, the online predictive model has been installed at Hot Strip Mill, Bokaro Steel Plant. Additionally, the system also generates a Virtual Test Certificate (VTC) based on model predictions. • This has resulted in considerable benefits to BSL.
	Projects approved in the 14th EC meeting on 30.9.2005					

32	Development of Coke Dry Cooling Technology (CDCT) for Non-Recovery Coke ovens	MECON Ltd., Ranchi	0.9500	0.4647	0.4647	Various Design Aspects for adopting Coke Dry Cooling Technology for Non Recovery Ovens were studied in details and Basic Engineering was carried out. The Basic Engineering suggested some changes/ modifications in the Plant & Equipment. Technical Specifications and Basic Engineering Drawing of the Plant & Equipment was also developed.
33	High Efficiency High Temperature Top Fired Stoves	MECON Ltd., Ranchi	0.3900	0.2569	0.2569	MECON has indigenously designed & developed the High Efficiency High Temperature Top Fired Stoves with an objective for achieving 1200-1250 deg C Hot Blast Temperature. MECON has also developed the Basic Engineering & Detailed Engineering Drawings and the Technical Specifications of the Stoves.
	Projects approved in the 15th EC meeting on 17.01.2006					
34	Secondary Steel Making and Vacuum Automation Reckoner (SVAR)	Kalyani Carpenter Special Steel Ltd. Mundhwa	0.7600	0.2140	0.1370	• The objective of the project was to develop a model based temperature and composition control system designated as Secondary Steel Making and Vacuum Automation Reckoner (SVAR). • On receipt of the PCR, it was circulated to the members of the Evaluation Group and subsequently officials from Ministry of Steel & JPC visited the company to see the actual work done. • It was found that the work done was not as per the objectives of the project. • As directed, the R&D agency refunded the entire SDF grant along with interest to JPC.
35	Prevention of Grain Growth in 38 MnS 6 Micro alloyed steel	Kalyani Carpenter Special Steel Ltd. Mundhwa,	0.3700	0.1090	0.0645	• The objective of the project was to get fine grain structure in the micro-alloyed steel in the final forged product (crank shaft). • On receipt of the PCR, it was circulated to the members of the Evaluation Group and

						subsequently officials from Ministry of Steel & JPC visited the company to see the actual work done. • It was noted that the work of the R&D project has been completed with an expenditure of Rs. 1.28 lakh and the company is having unspent amount of Rs. 5.17 lakh with them. • As directed, the R&D Agency returned the balance money along with interest amounting to Rs. 6.33 lakh to JPC Kolkata.
	Projects approved in the 16th EC meeting on 23.08.2006					
36	Quality Improvement of Low Grade Iron Ore	RDCIS, SAIL, Ranchi	7.3000	4.1000	3.5200	• Through this project a laboratory scale setup was installed at RDCIS Ranchi for beneficiation of low grade iron ores from Dalli & Gua mines. • A technical shed was erected which housed the equipment viz. Jaw crusher & Disc pulveriser, Spiral classifier, Wet High Intensity Magnetic Separator (WHIMS), Pneumatic Jig, Pressure Filter etc. • Processes developed at Laboratory Scale for beneficiation on low grade ores from Dalli & Gua Mines. • Based on the results of this project SAIL is setting up Beneficiation & Pelletisation Plant for processing low grade ores/fines of Dalli mines. Further, SAIL is also setting up a Beneficiation & Pelletisation Plant at RSP for pressing dumped fines from Gua mines.
37	An integrated approach to fatigue behaviour of spot-welded, laser-welded and adhesive bonded high strength steel sheets	Jadavpur University, Kolkata.	1.8315	1.5413	1.5413	Spot Welding, Weld-Bonding and Laser Welding experiments were carried out in Interstitial Free High Strength (IFHS) and two AHS Dual Phase (DP590 & DP780) Automotive Steels. Correlation was established between processing parameters, nugget

						diameters and mechanical performance in terms of fatigue life of the joints. Optimal processing conditions of various joining methods for providing the best fatigue properties were developed. It was found that the fatigue life of the weld-bonded samples were significantly higher which may be suitable for commercial applications.
38	Smelting reduction of manganese ore for manufacture of Ferro-Manganese	RRL, Bhubaneswar	0.4083	0.1152	0.1152	• A large number of experiments, on smelting reduction of manganese ore, 500-1000 g scale, have been conducted using plasma reactor and induction furnace. • Efforts have been made to optimize slag composition to reduce loss of manganese in slag thus improving the manganese recovery in alloy. The effect of slag basicity on foaming of the slag, reduction of the manganese ore and loss of manganese in the slag has been studied in detailed. • It has been established that it is possible to achieve reduction in manganese loss in slag to a level of 15.97% with 80% Mn recovery in the alloy. • Experiments, to reduce electrical energy consumption have also been conducted simulating the oxy-coal process in the induction furnace. With 5 ltr/min oxygen injection on top of the molten slag covered with 25-50 Kg coke for duration of 2-10 minutes, it has been possible to reduce electrical energy consumption by 30% without affecting manganese content in the alloy as well as recovery of manganese. • The results of the project were sent to industry viz. MOIL, RDCIS and MEL, who appreciated the project and submitted that the project may be

						carried out on a larger scale. • IMMT is examining ways for carrying out Pilot Scale studies in association of the industry.
39	Development and Implementation of Slag Detection System for Converter and Castor	MECON Ltd., Ranchi	1.4300	0.9525	0.8826	MECON has successfully developed and implemented the method of slag control during steel making in Converter and Caster Shop of RSP.
	Projects approved in the 17th EC meeting on 22.02.2007					
40	Development of continuous NO_x monitoring system	MECON Ltd., Ranchi	0.5450	0.4885	0.4450	Through this project MECON has successfully designed and developed an indigenous Non Dispersive Infra Red equipment for the first time, capable of monitoring continuously and on-line the NOx gas present in the flue gas.
41	Installation of demonstration plant of Continuous Induction Furnace (CONTIFUR) for production of Iron and Steel using iron ore fines and slimes	Electrotherm (India) Ltd., Ahemdabad	40.6500	11.0000	10.5347	• Through this project an innovative new process has been developed for utilization of iron ore fines through production of green pellets and using it in a Pilot Scale Continuous Induction Furnace (CONTIFUR) for production of Hot Metal as well as Steel. • The trials with 100% DRI and with replacement of DRI by 10%, 20% & 30% composite pellets were completed in Contifur as per the plan. • Iron Making Trials were successfully completed and Steel Making Trials was partially successful. • It is possible to produce high carbon steel in the carbon range of 0.5 to 2.0 %, which is required for foundry grade steel castings for automotive parts. Production of low carbon steel is also possible as per results obtained in few heats but could not be produced due to lower capacity of inductor power. • It may be possible to make steel in CONTIFUR

						viable by increasing the inductor power, scale of operation and charging of hot pre-reduced composite pellets. • In view of successful completion of the project on pilot scale, ETIL has proposed to setup a semi-commercial scale plant for iron/ steel making in association with MECON.
42	Reduction of Coke rate using probing and modeling techniques in BF No.7 of Bhilai Steel Plant	RDCIS, SAIL, Ranchi & NML, Jamshedpur	116.9420	23.2220	6.9130	• The Objective of the R&D project was to reduce the coke rate in the blast furnace by adopting modeling/probing technique and implementing the Real Time Process Simulator (RTPS). • BF # 7 of BSP was selected for enhancing coal injection rate with the help in controlling the burden and gas distribution by installing Multi Point above Burden Probe (MPOBP) inside the blast furnace. The MPOBP was installing and commissioned by BSP. • Various process models like Burden Distribution Model, Thermo-chemical Model, Raceway Model, Real Time Process Simulator (RTPS) etc. were developed by National Metallurgical Laboratory, Jamshedpur, successfully tuned, customized and installed at BF-7, BSP, Bhilai for capturing the furnace data and to monitor and predict the internal state and furnace irregularities in real time. • Based on MPOBP data on radial gas distribution, steps were taken on burden distribution control for enhancing the central working of the furnace, suppressing wall-flow of gases and opening up the intermediate region. • This has helped in maintaining high level of CDI rate despite poor condition of cooling system and

						high slag rate. A reduction in coke rate of 8-11 kg/thm during trial periods as compared to base period was obtained. • Technology dissemination on the work done under this project was attempted through interactions with operating personnel of other steel plants of SAIL • A one day workshop on "Enhancement of Coal Dust Injection rate in Blast Furnace" was organized on 6th May'2011 at RDCIS, Ranchi. Presentations were made by major steel plants of India highlighting steps take in their blast furnaces to enhance coal injection rate. • Knowledge gained through probing & modeling facilities is being transferred to other blast furnace in BSP. • Anticipated savings from the project is around Rs. 32 lakhs per month.
	Projects approved in the 18th EC meeting on 14.08.2007					
43	Develop Procedures for Friction Stir Spot Welding (FSSW) of formable quality, high strength and advance high strength steel sheets and characterize the welding joints.	Jadavpur University, Kolkata & Tata Steel	2.0886	1.8801	1.8801	• Joining of dual phase, carbon-manganese and interstitial free steel applying Friction Stir Spot Welding was evaluated using Polycrystalline Cubic Boron Nitrate (PCBN) tool. • The operating parameters have been established. The welds have been compared with standard resistance spot welds in terms of weld dimension and performance. • It has been possible to get suitable nugget diameters comparable with spot weld nuggets. It is also possible to complete the entire welding cycle in 4 seconds time which is close to the RSW practice.

						• Detailed study on the weld quality was carried out in terms of microstructure and mechanical property. • The assessment results obtained on the joint performance are satisfactory and encouraging. The tensile and fatigue properties of the FSSW joints are superior to RSW joints. • The information generated is valuable for the Industry.
44	Development of Synthetic Flux through Self Propagating Sintering of LD Sludge	NML, Jamshedpur	0.7445	0.7245	0.6510	• Synthetic flux was produced at lab scale in the form of sinter using LD sludge, blast furnace flue dust and lime fines. • Due to excessive fineness of the raw materials, in order to make them suitable for sintering, at first micro pellets were prepared. These micro pellets were strengthened by gas treatment using Carbon dioxide. The gas treated micro pellets were subsequently sintered without addition of coke breeze. • The quality of sinter was evaluated by series of tests and found to have excellent properties to use as flux in LD converter. • The results of the project were sent to the Steel Companies who commented favorably. • NML Jamshedpur was informed to explore the process developed at higher scale to find out the techno-economic feasibility of the process at higher scale.
45	Study of the requirement of manpower at different levels	IIM, Kolkata	0.1150	0.1150	0.1150	The manpower requirements for a production of 200 MT of crude steel by 2020 were estimated. The gaps in the availability & requirement were also identified and some remedial measures were suggested.

	Projects approved in the 20th EC meeting on 19.08.2009					
46	Processing of Vanadium–bearing Titaniferrous – Magnetite Ores of Eastern India.	Jadavpur University, Kolkata	0.2641	0.2641	0.2599	• The project was planned to be pursued in two phase namely geological part (Phase-1) and metallurgical part (Phase-2). • This project was the Phase-1 under which detail study was carried out on petro mineralogical aspects, chemical analysis and electron probe micro analysis (EPMA) of the collected field samples of Eastern India with major emphasis on Baula-Nuasahi sector of Keonjhar district. • Through this project it has been established that Tinaiferous Magnetite bodies in the Eastern Field contain significant amount of Titanium and some of them contain significant amount of Vanadium too. • However, the 2nd Phase of the project (Metallurgical Part), was not proposed by the R&D agency in view of the non-availability of estimates of the reserves of the said ores in the area.
47	Development of Thermo electrically Cooled/heated Helmet for Industrial application	MECON Ltd., Ranchi	1.3222	1.2000	0.9568	• MECON has developed three types of cooling/ heating helmet based on the principle of thermoelectric cooling (Peltier Effect), operated by rechargeable battery. • In Type-1 the cooling unit was directly mounted on the Helmet (direct cooling helmet). In Type-2 the system was mounted on a back pack. In Type-3 is the trolley based system. • The direct cooling helmet was accepted for holding field trials at BSP. The Field Trials were successful and users expressed their appreciation on the cooling effect generated. • Live demonstration of the systems developed by

						MECON was also shown to representatives of JSW Steel. • Steps are being taken for commercialization of the product by MECON.
	Proposals approved in the 18th EC meeting on 14.08.2007					
48	Creation of Steel Research Centre	IIT, Kharagpur	20.2586	16.2069	15.3466	• STC at IIT Kharagpur was approved by the EC in its 18th Meeting held on 14.08.2007 for creating a state-of-the-art R&D facility for human resource development in the steel sector. • This project was jointly funded by Ministry of Steel's SDF (80%) and Department of Science and Technology (DST) (20%). Fund was released for an initial period of five years (2008-09 to 2012-13). • A good state-of-the-art R&D infrastructure has been created and considerable work has been done at STC by pursuing B.Tech, M.Tech & Ph.D level projects and also some Joint Collaborative projects. • The STC has been setup after renovating an existing building (Foundry Section) of the Institute. Further, a new shed has also been constructed wherein major equipment procured through the project viz. cold & hot rolling mills, reheating furnace, forging press etc. have been installed. • The Centre was also inspected by a Committee under the Chairmanship of Director IMMT Bhubaneswar in April 2015. The Committee has felt that setting up of the STC at IIT Kharagpur has made a marked difference in the attitude of the students towards Iron & Steel as a career & research. • The Empowered Committee in its 25th Meeting

						held on 29th March 2016, also appreciated the work done at STC. • STC is being operated from the allocated budget from IIT Kharagpur. Further efforts are being made at STC to strengthen the collaborations, particularly with the steel industry. A number of proposals have been submitted to the Industry. Proposals have also been submitted to Government Agencies for funding.
	Proposals approved in the 21st EC meeting on 23.05.2011					
49	A comprehensive water modeling facility for steelmaking process analysis and design	IIT, Kanpur	0.77896	0.6190	0.6190	A comprehensive water modeling facility has been built up at IIT Kanpur. Scaled water models of EAF/EBT, Tropedo, BOF, ladle, tundish (bloom and slab casting both, operated with slide gate and Stopper rod), tundish – mold assembly and ingot mould have been fabricated and commissioned. The water modeling set up by IIT, Kanpur is helping the industry in resolving the problems. The system has also been replicated at some of the steel plants namely Essar Steel Limited and JSW Steel.
50	Development of Continuous Multi Gas Monitor	MECON Limited, Ranchi	1.0200	0.5100	0.5100	The continuous multi gas monitoring system has been developed by MECON and has been successfully implemented at Coke Oven Battery No. 10 at Bhilai Steel Plant.
51	Infrared Camera Based Ladle Condition Monitoring System	MECON Limited, Ranchi	1.8500	0.9250	0.7300	The system has been successfully developed by MECON and commissioned and operationalised in SMS-II of RSP.
	Proposals approved in the 22nd EC meeting on 15.06.2012					
52	Development of suitable Gas Metal Arc Welding (GMAW) procedure for high performance weld joints of	Jadavpur University, Kolkata.	0.7891	0.7656	0.6801	• Long-term maintenance cost of carbon steels and high cost of standard stainless steel have basically forced the steel manufacturers to develop new generation of stainless steels such as modified

	modified Ferritic stainless steel and low-nickel austenitic stainless steel					ferritic stainless steel (FSS) with 11-12 wt. % Cr (designated as 409M FSS) and low nickel austenitic stainless steel with around 1 wt. % Ni (designated as LNiASS) as low cost utility stainless steels. • These materials find applications in bulk solids handling areas, transport, petrochemical, sugar industries, nuclear, electric power generation, cryogenic vessels, and many other engineering applications. • Since GMAW is given more emphasis by fabricating industries now a days due to its higher productivity, good quality and flexibility to weld in various positions, the effect of different operating conditions in terms of modes of metal transfer, filler metals, shielding gas compositions etc., on the joint performance is of concern. • The main aim of the study was to develop suitable GMAW procedure for high performance weld joints of modified ferritic and low-nickel austenitic stainless steel. The 409M FSS and LNiASS sheets of 4 mm thickness were gas metal arc welded under various modes of metal transfer, using three different austenitic filler metals (308L, 316L and 304L) with various shielding gas compositions. • The microstructural changes in welded joints were investigated to understand the grain structure, changes in phase fraction, dislocation behaviour and precipitation behaviour. Mechanical properties such as hardness, tensile strength, toughness and high cycle fatigue was evaluated to find out cost effective welding conditions for producing high performance welded joints. • Finally, from the whole study, it was concluded

						that pulse mode of metal transfer using 304L filler metal and Ar+10%CO2 shielding gas composition may be utilised as highly productive and cost effective fabrication process for 409M and LNiASS.
	Study Reports Approved in the 25th EC meeting on 29.03.2016					
53	Study on requirement and availability of technical manpower for steel industry in India by IIT Kanpur	IIT Kanpur	0.1926	0.1926	0.1926	**Conclusion of the Report:** • If future steel plants employ modern technology & automation and employ manpower as per global standards, then no shortfall is envisaged for graduate engineers in any discipline including metallurgical engineering. • However, if steel plants continue to remain at the same level as these are today, there is like to be some shortfall in the supply of graduate metallurgical engineers and to some extent ceramic engineers. • No shortage is envisaged in the case of diploma engineers and ITI trained manpower in both the scenarios.
54	Evaluation of the R&D Scheme	ASCI Hyderabad	0.0680	0.0680	0.0680	• **Conclusion of the Report**: Even though Steel is categorized as a medium low technology industry by OECD classification, the benefits of investing in R&D is quite substantial. India has a fairly good capability in R&D in steel and can augment it to create a competitive advantage. Post 1991 liberalization of the economy in the country, R&D has not been given the focus it deserves, resulting in lowering of internal capability of the industry to cope with competition and crisis of raw materials in the near past. The Ministry of Steel is doing a commendable job in managing a R&D scheme which is a specialized task. The R&D scheme being

						pursued with financial assistance from the Steel Development Fund (SDF) has contributed significantly towards the areas of national importance concerning iron & steel industry. As a whole this scheme has emerged as a fruitful scheme for R&D in steel and plays a pivotal role in developing valuable insights and innovative solutions for addressing the challenges in iron & steel industry in the country. This scheme is indispensable on the national perspective and hence should be continued in the long run.
55	Evaluation of the scheme - 'Ministry of Steel Chair Professor and scholarships to undergraduate students pursuing study in Metallurgical Engineering"	ASCI Hyderabad	0.0742	0.0742	0.0556	**Conclusion of the Report:** • Both components of the scheme are well received in the institutes and most stakeholders agree that the scheme is beneficial in improving the quality and quantity of manpower for the iron and steel industry. • The scholarship scheme has helped attract bright and meritorious students to pursue metallurgical engineering. The average rankings of students joining this stream are going down over the years signifying the positive impact of the scheme. • The scheme had a significant positive impact on the number of students from Metallurgy joining Post graduation in Metallurgical engineering and the number of students admitted to Ph.D in Metallurgical Engineering from the same department. • Analysis of data of five institutes which have shared data on the number of students of metallurgical engineering opting for a career in the iron and steel industry show a 200% increase. • Scheme has been able to attract talented faculty

						as Chair Professors over and above the regular appointments of the institutes and the scheme has been successful in contributing to human resource development in ferrous metallurgy. • There is however, no unanimity on whether the scheme has been able to address the issue of shortage of technical manpower in the steel industry. • The scheme has impacted the steel industry positively and that many of the positive effects of the scheme will be eroded quickly, if the scheme is discontinued at this stage.
	Proposals approved in the 16th EC meeting (on 23.08.2006)					
56	Development of Integrated treatment process for coke oven effluents	RDCIS, SAIL, Ranchi	7.1800	3.6400	3.6400	• Laboratory Scale process for treatment of Coke Oven Effluents have been completed IIT Delhi. Design of the pilot plant has been done based on the laboratory scale process developed by IIT Delhi. • An experimental effluent treatment pilot plant has been setup and trials successfully conducted. • Based on the knowledge & results obtained set of actionable points have been identified and recommended for existing & new effluent plants of SAIL.
	Proposals approved in the 20th EC meeting (on 19.08.2009)					
57	Investigation of Deformation and Damage Mechanism in Bare and Coated Automotive Steels through In-Situ Scanning Electron Microscope	Jadavpur University, Kolkata.	3.3755	3.2666	3.2665	• The project aims at investigating the deformation & damage behavior in formable and high strength bare & coated steels through in-situ observation under Scanning Electron Microscope which will generate valuable data for the automotive steel sector. • Different aspects of deformation and damage

						behavior of automotive grade sheet steels have been evaluated.
	Projects approved in the 22nd EC meeting on 15.06.2012					
58	Development of Expert system for Indian Blast furnace	IIT, Kharagpur	1.5446	0.8446	0.3857	• The aim of the project is to develop a Diagnostic Expert System for Blast Furnace Operation. • The Expert System has successfully identified the variables for optimum performance of the Blast Furnace.
59	Development of Copper (Cu) – Carbon Nanomaterial (CN) Based Nanocomposite Formulations for Heat Recovery in Different Processes in a steel plant	IIT Guwahati	3.3600	2.9440	2.9440	• The aim of the project is to develop a highly conducting heat transfer fluid and composites using nanotechnology and explore the feasibility of using them in a steel making processes. • The proposed system has been successfully developed and feasibility evaluated in lab scale.
60	Development of an Entrained flow Gasification System using non-coking coal (F-grade) blended with Dolochar for thermal applications	IMMT, Bhubaneswar	0.9200	0.7500	0.7335	• The objective of the project is to design and develop a prototype entrained flow gasifier for efficient gasification of Dolochar, which is a waste generated during sponge iron production through coal based route. • The high temperature producer gas with a calorific value of 8-12 MJ/Nm3 can be used for various thermal applications such as in rotary kilns of sponge iron units. • Bulk quantities of Dolochar & F-grade coal for the project have been procured & processed. • Prototype entrained flow gasifier successfully developed & demonstrated.
	Proposals approved in the 23rd EC meeting on 05.08.2013					
61	Utilisation of Steel Plant Waste in manufacture of Paver Blocks and Slag Foams	Sathybama University, Chennai	0.7300	0.5110	0.5110	• The project aims to utilize the slag generated in Induction Furnace for manufacture of Paver Blocks & Slag Foams. • Paver Blocks have been developed by replacing

						coarse aggregate with steel slag and cement with fly ash. Studies were also conducted for making concrete by replacing coarse aggregate with steel slag and river sand with ramming mass with varying proportions.
62	Computer Simulation & e-Demonstration of Reheating Furnace	NISST Mandi Gobindgarh	2.3500	2.3500	2.3446	• Successfully developed computer based demonstrative programme for designing of furnace/ imparting educational training/capacity building for Small and Medium Enterprises (SMEs) in the steel sector.
63	Fundamental studies on the reduction kinetics, Heat and Mass Transfer during reduction of iron ore coal composite pellets in Rotary hearth furnace	IIT Kharagpur	0.5376	0.5376	0.5146	• The project aims at enhancement of heat and mass transfer conductance through the multi-layer bed in rotary Hearth Furnace and Optimization of design and operating parameters for maximum efficacy of the process for utilizing iron-ore and coal fines of Indian origin. • Development of Mathematical Models and experiments in multilayer bed in a laboratory scale electrically heated Rotary Hearth Furnace having 2-meter outer diameter in progress. • Effect of Carbon content and additives on the reduction efficiency of composite pellets in a 3 layer bed in RHF studied & optimum conditions identified. Sponge Iron production demonstrated a metallization of 70%.
	Proposals approved in the 24th EC meeting (on 23.04.2014)					
64	Production of quality steel through Induction Furnace	JAMIPOL Jamshedpur	0.5334	0.3057	0.2271	Industrial Trials completed at AC Steel Raipur. Further trials have been conducted at Patnaik Steel, Keonjhar. Results are not encouraging.

LIST OF PROJECTS STOPPED/ NOT PURSUED/ TRANSFERRED

(In Rs. Crore)

Sl No	Name of the project & Implementing organization	Implementing Agency	Total cost of the project	Approved SDF contribution	Fund Released from SDF	Remarks
	Projects approved in the 2nd EC meeting on 23.2.1999					
1	Documentation and development of iron making process used by Tribals of India	NML, Jamshedpur	0.1400	0.0350	0.0350	Empowered Committee decided to stop the project as it was felt that this technology is redundant and cannot be improved upon. However, a new R&D project was approved to pursue further work in the area.
	Projects approved in the 3rd EC meeting on 21.9.1999					
2	Improved leak proof design of door in coke oven battery at Rashtriya Ispat Nigam Ltd., Visakhapatnam	MECON Ltd, Ranchi	0.1000	0.05	0.0000	The EC decided to stop the project as the initial design developed by MECON was not successful and there was lack of further progress in the project.
	Projects approved in the 6th EC meeting on 07.01.2002					
3	On-line Implementation of Indigenously developed expert system for continuously cast products in billet caster of Modern Steel, Mandi Gobindgarh	MECON Limited	0.7500	0.0700	0.0700	Project was stopped by the Empowered Committee as the Industrial Partner did not pursue the project due to financial constraints.
	Projects approved in the 7th meeting on 21.04.2003					
4	Setting up a Mini Sinter Plant to utilize waste generated out of pig iron produced through Mini Blast Furnace (MBF)	Tata Metalicks, Kharagpur	3.7500	0.25	0.0000	The EC decided to stop the project as Tata Metaliks was not willing to install pot sintering machine to meet their requirement for the two blast furnaces.
	Projects approved in the 11th EC meeting on 27.09.2004					
5	Documentation of traditional iron smelting by Agaria community	Bappa Ray Production, New Delhi	0.1400	0.14	0.0000	The EC decided to stop the project as it was found that traditional iron making by Agaria community especially from Madhya Pradesh

						and Chattisgarh has been covered in documentation film sponsored by SAIL and no further work is required in this direction.
	Projects approved in the 14th EC meeting on 30.9.2005					
6	High Efficiency Copper Stave Coolers : by MECON Ltd	MECON Ltd., Ranchi	0.4700	0.4175	0.0000	The EC decided to stop the project because of the difficulty faced by MECON in manufacture of the copper stave coolers as per their design.
7	Indigenous Development of Mini Pellet Plant of 0.5 Mt/yr for utilization of iron ore ultra fines	MECON Ltd., Ranchi	1.3000	1.04	0.0000	The EC decided to stop the project because of lakh of progress in the project by MECON.
	Projects approved in the 15th EC meeting on 17.01.2006					
8	To set up a Steel Research & Development Mission (SRDM)		65.0000	65.0000	0.00	In pursuance of the recommendations of the Task Force, the Empowered Committee in its 15th Meeting held on 17.01.2006 approved a project for setting up SRDM at Hyderabad (AP) and sanctioned Rs. 50 crores as an initial corpus to pursue R&D projects and Rs. 15 crores to meet the initial establishment and running cost for the first three years, upon which the centre is expected to be self-reliant. Follow up actions in this regard were taken towards actual setting up of the centre at Hyderabad. SRDM was registered as a Society at Hyderabad. However, due to limited liquid fund availability in SDF, it was decided later to rope in major steel producers for funding the SRDM. However, the steel companies showed their reluctance to extend any fund for SRDM. Consequently, SRDM could not be started due to paucity of funds.
9	Indigenous Development of Models for Dynamic BOF Process automation system at RSP	RDCIS, SAIL, Ranchi & IIT, Kanpur	7.0507	4.4007	2.0360	• The project was conceived with the idea of implementation of Static model (off-line) based on charge balance calculation,

						Dynamic model (on-line) based on post combustion ratio and De-oxidation model for Ferro-alloy additions in steel ladle. • Both the Static and Dynamic models were successfully developed by IIT Kanpur and field trials were carried out at SMS-II of RSP. • As planned, trials of 100 heats were completed in two batches and the performance of the models was evaluated with respect to the objectives of the project. However, the trials were partly successful. • The Static Model, Flux charging Tracking module, Data Acquisition systems etc. have been successfully implemented at BOF of RSP and are being used extensively during the blowing operation. • SAIL have benefited considerably from this R&D Project and are also working on the different aspects of the systems to improve the usability.
	Projects approved in the 16th EC meeting on 23.08.2006					
10	Production of Ferro-Chrome from Chrome Ore Fines and concentrates by solid state reduction in fludized based reactor with use of natural gas	Facor Alloys Ltd	0.3000	0.1500	0.0000	The project was approved to be pursued in laboratory scale fluidized bed reactor. However, Facor Alloys requested to procure 1 T per hour capacity pilot plant and also enhance the SDF assistance to Rs. 3.75 crore. Because of this deviation, EC decided to stop the project.
	Projects approved in the 17th EC meeting on 22.02.2007					
11	Characterization and utilization of Dolochar from Sponge Iron Industries	RRL, Bhubaneswar & West Bengal Sponge Iron	0.1026	0.0513	0.0000	The EC decided to stop the project as RRL Bhubaneswar informed that they have come to the conclusion that the scope of the project cannot give an adequate solution for complete

		Manufacturers Association (WBSIMA)				utilisation of the dolochar.
	Projects approved in the 20th EC meeting on 19.08.2009					
12	Process for Direct Reduction of Pig Iron Ore Fines using Thermal Plasma Route	IMMT, Bhubaneswar	0.8887	0.5606	0.4388	• The objective of this project was to develop an innovative process through thermal plasma for direct production of pig iron from iron ore fines using carbon as reductant. • The experiment was carried out in an existing 1 Kg reactor at IMMT. The consumption of electrical energy was too high @ 18.4, 17.8 & 12 KWh per kg of iron making & further experiments were pursued to reduce the power consumption. • Further experiments were carried out at 1 Kg scale at varying basicity, smelting time & power input for optimization of Process Parameters by computer modeling. • After extensive study & optimization of various parameters, it has been possible to bring down the electricity consumption to around 7-8 KWh/Kg of Pig Iron, which is still too high. It was also reported that the quality of pig iron was very good and much better than normal pig iron. But in view of such a high power consumption & high power cost in India, the process was not found economically viable. The project was stopped at this stage.
	Projects approved in the 23rd EC meeting on 05.08.2013					

13	Development of Coal Briquettes for iron making with upto 25% of Indian non-coking coal	Essar Steel	3.5000	1.7500	0.0000	Project not being pursued by Essar Steel.
	Projects approved in the 23rd EC meeting on 05.08.2013					
14	Development of Automation System for Optimum Coal Blending at Coal Handling Plant of Coke Oven Batteries	RDCIS, SAIL, Ranchi	12.9000	6.4500		This project has been transferred and is being pursued with financial assistance from Government Fund.
15	Production of better quality structural steel for value addition by improving fatigue strength using Common Air Induction Melting and External Dephosphorization-Desulphurization through LRF	NISST, Mandi Gobindgarh	4.8990	3.1490		Project could not be pursued due to techno commercial issues faced in selection of supplier of LRF and also selection of the industrial unit for pursuing the trials. No funds released.
	Projects approved in the 25th EC meeting on 29.03.2016					
16	Nickel Extraction from Lateritic Ores Overburden of Sukinda Valley (**Preparation of DPR**)	Tata Steel	3.0000 (Estimated)	3.0000 (Estimated)		• Objective is to develop an eco-friendly and economical process to recover Ni and other valuable metals from stockpiled laterite ore overburden at Sukinda • Preparation of DPR in progress. Cost to be firmed up in DPR. • The PI has superannuated from Tata Steel. No fund has been released
17	Development of Smelting Process for The Utilization of Steel Plant Wastes	Tata Steel	10.0000	5.0000		• To Setup a dedicated facility for production of briquettes using steel plant wastes. The briquettes will become a part of the blast Furnace burden replacing the conventional iron ore lump. • The PI has superannuated from Tata Steel. No fund has been released.

18	Steel Research & Technology Mission of India	SAIL, RINL, NMDC, Tata Steel, JSW, JSPL & MECON	200.0000	100.0000		Scope of SRTMI broadened to include skill development, training, market development & IEC. Taken outside the Empowered Committee mechanism.

LIST OF PROJECTS IN PROGRESS (SDF)

(In Rs. Crore)

Sl No	Name of the project & Implementing organization	Implementing Agency	Total cost of the project	Approved SDF contribution	Fund Released from SDF	Remarks
	Projects approved in the 18th EC meeting on 14.08.2007					
1	Creation of Chair of Professor and Five Scholarship to undergraduate students of Metallurgy in institutes teaching metallurgy	Various Institutes pursuing Metallurgical Engineering	42.1200	42.1200	19.2625	• In pursuance of an expert committee headed by Prof S.P.Mehrotra, former Director, NML, Jamshepur, a scheme was approved by the Empowered Committee under the Chairmanship of Secretary (Steel), in its 19th meeting held on 28.05.2008 to address the shortages of the faculty and also attract students to pursue Metallurgical Engineering. • Scheme was effective for five years from 2008-09 to 2012-13. Under this broad scheme the Scholarships scheme was implemented in 9 institutes (covering 10 students from each institute, 5 students each in 2 batches with a scholarship @ Rs 4000 per month in all four years) and Chair professors were appointed in 7 institutes. • The EC in its 24th meeting held on 23rd April 2014 approved the extension of the scheme for five years (2013-14 to 2017-18) with

						revised terms & conditions for increasing the scholarships amount as well as the allowances of the Chair Professor. • The revised Scholarship scheme has been implemented in 16 institutes (covering 20 students from each institute with 5 students in 4 batches, a scholarship @ Rs 10,000 per month for 3rd & 4th year) and Chair Professors have been appointed in 13 institutes.
	Projects approved in the 20th EC meeting on 19.08.2009					
2	Development of High Strength Low Carbon Multiphase Steels	BESU, Shibpur, Kolkata	6.5320	6.0000	6.0000	• Project initiated in May 2010. • The project aims to implement a design based approach for development of high-performance HR flat steel to enrich India's special steel product basket for automobiles. • A laboratory scale Rolling Mill has been installed at the Foundry Shop of the Department of Metallurgy & Material Engineering of the Institute and it is under commissioning. • Likely completion December 2019.
	Projects approved in the 21st EC meeting on 23.05.2011					
3	To develop welding/joining conditions and evaluate joint performance of sheet/tubes of formable/HS/AHS Steel using different processes	Tata Steel Limited, Jamshedpur	21.3500	10.6750	10.6750	• Project initiated in September 2011 • The project aims to examine weldability and weld performance of various welding processes on advance high strength steel sheets & tubes for use in the automotive sector. • A state of the art welding centre has been setup through the project. Welding trials & testing of weld joints on progress.

						• Likely completion December 2018.
	Projects approved in the 22nd EC meeting on 15.06.2012					
4	Setting up of the Centre of Excellence in Steel Technology (CoEST) at IIT, Bombay	IIT, Bombay	33.0600	33.0600	20.3760	• Project initiated in Oct 2013 • Ministry of Steel has taken a major initiative to setup Centre of Excellences in leading Academic Institutions in the country, to create world class research facilities with the main focus to promote human resource in the field of metallurgy required for the industry, academia and research laboratories. • The CoEST was formally inaugurated by for former Secretary (Steel) on 20th June 2014 at IIT Bombay. • Space has been provided in the first floor of the Department of Metallurgical Engineering & Material Science Building at IIT Bombay for temporary housing of the Office of the CoEST and space has also been provided at the basement of the building for installation of the equipment. • A new Building for the CoEST with a cost of Rs. 35 crore has also been sanctioned by the Board of Governors of IIT Bombay from their own funds. • Three high value equipments viz. Thermo-mechanical Simulator, Dilatometer and Digital Image Co-relation System have been procured and commissioned. • Several R&D projects have been approved and are being pursued under CoEST. • Short term courses have been conducted.

						• Several interactions/ collaborations have been done with the steel industry • Scheduled Completion by Sept 2018
	Projects approved in the 23rd EC meeting on 05.08.2013					
5	Study on the Interface Layer Formation during Hot Dip Galvanizing of Advanced High Strength or Dual Phase Steels for Automotive Applications	CSIR-NML, in collaboration with Tata Steel Limited	15.9400	7.5200	7.0400	• Project initiated in Jan 2014 • The objective of the project is to study the effect of various process parameters on the formation of adherent coating on Advanced High Strength or Dual Phase Steels for Automotive Applications. • A state of the art Hot Dip Process Simulator has been installed & commissioned. • Optimization of annealing cycles for the DP steels and development of GI and GA coatings on DP steels with or without precoatings of Fe & Cu carried out. • Development of Al-Si and Zn-Al-Mg coatings on AHS grade steels to be carried out. • Likely to be completed in September 2018
6	Development of Diffusion bonding technology for development of fatigue and fracture resistant carbon steel and stainless steel joints with different inter-layers	IIT Roorkee	0.8165	0.8165	0.7832	• The aim of the project is to investigate the influence of process parameters on mechanical and metallurgical characteristics diffusion bonds. • Necessary laboratory infrastructure has been installed. Studies on influence of input process parameters pressure, time and temperature on tensile shear strength of diffusion bonds carried out. Further experiments in progress. • Likely to be completed in June 2018.
7	Setting up an Advanced Research Center for Iron and Steel	IIT BHU	30.9800	30.9800	3.9000	Project initiated in April 2016. Completion by March 2021.

	Projects approved in the 25th EC meeting on 29.03.2016					
8	Centre of Excellence in Iron & Steel Technology (COEXIST)	IIT Madras	35.4500	35.4500	11.106	Project initiated in May 2017. Scheduled Completion Date April 2022.
9	Development of Microwave Assisted Iron Making Process	Industrial Microwave Research Center, Navi Mumbai	5.6000	2.7500	2.14	• To develop microwave assisted technology for iron making. To establish 1T/day pilot plant • Project initiated in Oct 2016 and is in progress. • Scheduled to be completed in September 2019