Annexure-2

Research & Development Projects to address common issues of the Iron & Steel Sector

S.No	R&D Area	Objective	Remarks
1	Heat Recovery and Dry Slag Granulation Plant for Blast Furnace and Steel Slag	Wet BF granulation consumes large volumes of water and generate acid mist causing air pollution besides wastage of large amount of heat contained in the molten slag. On cooling from around 1500 °C to ambient temperature, there is a loss of around 1.8 GJ of heat / tonne of molten slag and thus there is an opportunity loss.	This is a new concept and not implemented yet. However, CSIRO Australia has taken it to small pilot scale. A pilot plant can be proposed to be set up in collaboration with RDCIS, IIT Chennai and MECON. Once established, the same technology can be implemented in secondary sector also using Electric arc Furnace.
2	Carbon Capture & Utilisation	CO_2 capture through available technologies can be adapted through pilot plants in existing steel plants in the country. R&D can be taken up also for conversion of the captured CO2 into valuable products. Existing steel production facilities with BF-BOF route can be retrofitted to aid in emission reductions. CCUS retrofits should focus on the relatively young BF-BOF steel making process, if energy and climate goals are to be achieved. Tata Steel has installed a 5 TPD CO_2 Capture & Utilisation Pilot Plant in one of the BF at Jamshedpur Works.	More such pilot plants for adaptation of available technologies for Carbon Capture & Utilisation need to be taken up. Projects shall be taken up by the steel industry in collaboration with Indian institutes like IITs, IMMT, NML, CIMFR etc.
3	Hydrogen Recovery, utilization of Coke Oven gas, plastic/polymer injection, charcoal etc in BF	Hydrogen generation is a very costly process besides it creates environmental hazards also. Use of Coke Oven Gas and Plastics in BF has can help in minimizing consumption of imported coking coal as well as improving BF productivity besides supporting green technologies in Iron & Steel making. Additional green Technology like Polymer Injection, Oxy Fuel, Use of Plastics etc. shall also be covered	Projects shall be taken up by the steel industry in collaboration with Indian institutes like IMMT, NML etc.
4	Integrated Slag utilization Project in Cement, Agriculture, Road, Insulation material, Fertlizer, etc	Huge amount of slag is lying in various steel plants occupying large area of the plant. It is proposed to make use of such material.	Projects can be taken up by the steel industry in collaboration with Indian institutes like IARI, CRRI, IMMT, NML etc.

S.No	R&D Area	Objective	Remarks
5	Advanced Coal Washery System using Dry and wet washing system.	The main objective is to develop technology suitable for increasing yield of coking coal in washeries so that import of the same can be minimized. This may also help in removing ash so that BF productivity is increased.	RDCIS & Tata Steel may take up pilot projects in collaboration with CSIR labs CIMFR, IMMT & NML.
6	Beneficiation of low grade iron ore & fines and agglomeration	As availability of high grade iron ore lumps are fast depleting it is essential to develop technologies for beneficiation of the ore and also palletisation of iron ore fines to effective replace lump ores.	Projects shall be taken up by the steel industry in collaboration with Indian institutes like IMMT, NML etc.
7	Use of Green Hydrogen in DRI process	Green H_2 can be directly used in gas based DRI plants, through blending with natural gas, with the setting up of the required additional pilot facilities in the existing plants.	JSW and AMNS have already given commitments for setting up of such pilot facilities.
8	Use of Green Hydrogen in Blast Furnace process	There is also potential for using Green H2 as replacement of CDI coal in Blast furnace and in this regard, Tata Steel has already made trials for using CBM in one of the Blast Furnaces at Jamshedpur.	Tata Steel has now conceptualised a project proposal for production & utilisation of green H2 as partial replacement of CDI coal in Blast Furnace. (15 TPD Hydrogen Production and Injection in the Blast Furnace).
9	Alternate Ironmaking Technology with Green Hydrogen	Sustainable Generation of Hydrogen by Electrolysis & Semicoke-making (Coal Gas) technique and its Utilisation for Production of Green & Clean Steel in 100 kg scale proposed by CSIR-IMMT & CSIR-CIMFR	This project can be scaled up.
10	Water Consumption & Effluent treatment	It is essential to reduce the water consumption of the Indian steel industry at par with the global counterparts, as this is a highly valuable resource. Effluent treatment is also need to be developed further in view of the ever stringent environmental norms.	Projects shall be taken up by the steel industry in collaboration with Indian institutes like IMMT, NML etc.
11	R&D to address Challenges & Issues specific to the Secondary Steel Sector	Secondary sector primarily the smaller units producing coal based DRI and the steel units producing steel in Induction Furnace faces challenges such as in producing quality steel, higher emissions, etc.	The secondary sector association can play a lead role in taking up R&D projects in association with the research labs & academia.
12	Conversion of coal based DRI into gas based DRI	Downscaling of available technologies (like MIDREX, HYL) to shift coal based DRI Rotary Kiln to gas based DRI by small plants and ready them to use Green H_2 as and when available.	The secondary sector association can play a lead role in taking up R&D projects in association with the research labs & academia.