List of Energy Efficiency technologies (sector – wise) that may be covered under PRGFEE

S.NO.	*SECTORS*	*TECHNOLOGIES*
01.	TEXTILES	PLC Based Jet Dying M/C
		Micro Turbine
		Energy Efficient Boilers
		Installation Of VFD
		EE Motor
		Apfc
		LED Lamps
02.	CHEMICALS	EE Boilers
		Hot Air Generators
		Waste Heat Recovery System (WHR)
		Energy Efficient Pumps
		Vertical agitator system
		Installation of VFD
		EE Motor
		APFC
		LED Lamps
03.	BRICK	Process change from Straight line firing to Zig-zag firing
		Installation of Induced Draft Fans
		Vertical Shaft Brick Kilns
		LED Lamps
04.	CASTING & FORGING CLUSTER	Replace blast copula with energy efficient divided blast copula
		Install induction melting furnace in place of oil fired rotary furnace
		Installation of VFD
		EE Motor
		LED Lamps
05.	TEA	Energy Efficient Gas Burners for use in Tea Drier's
		Installation of energy efficient air blowing system for withering
		Modification of coal fired heaters to inhance its efficiency
		Installation of VFD
		EE Motor

		APFC
		LED Lamps
06.	LIMESTONE	VERTICAL SHAFT KILN WITH STEEL SHELL
		Gas Fired Forced Draft Hot Air Generator
		EE Motor
		APFC
		LED Lamps
07.	CERAMICS	Improvement in Kiln Insulation Results in Saving in Fuel Consumption of Kiln
		Installation of Recuperator in Tunnel Kiln Thereby Preheating Combustion Air through Smoke Air Results in Saving in Fuel Consumption in Kiln
		Use of Hot Air of Cooling Zone of Tunnel Kiln as Combustion Air Results in Saving in Fuel Consumption in Kiln
		Installation of VFD
		EE Motor
		APFC
		LED Lamps
08.	SPONGE IRON	Install Waste heat recovery system to generate Power
		Installing Fuel Economizer i.e. Raw material preheating System
		Installation of VFD
		EE Motor
		APFC
		LED Lamps
09.	RICE MILL	Boiler
		Heat Exchanger tubes
		Bed Dryer for drying Paddy
		Installation of VFD
		Elevator buckets
		Hot Air Dryer Blowers
		Air Compressors
		EE Motor
		APFC
		LED Lamps

Technologies used in Cement Sector

PROCESS	Raw Materials Preparation	Clinker Production (Wet)	Clinker Production (Dry)	Finish Grinding	General Measures
EE Projects	Implementation of Efficient transport systems (dry process)	Use of Energy management and process control	Use of Energy management and process control	Use of Energy management and process control	Preventative maintenance of insulation, compressed air systems.
	Slurry blending and homogenization (wet process)	Seal replacement	Seal replacement	Use of Improved grinding media (ball mills)	Shift to High efficiency motors
	Raw meal blending systems (dry process)	Kiln combustion system improvements	Kiln combustion system improvements	High-pressure roller press	Installation of Efficient fans with variable speed drives
	Conversion to closed circuit wash mill (wet process)	Kiln shell heat loss reduction	Kiln shell heat loss reduction	Use of High efficiency classifiers	Optimization of compressed air systems
	Replacement to High-efficiency roller mills (dry process)	Use of waste fuels	Use of waste fuels		Use of Efficient lighting
	Replacement to High-efficiency classifiers (dry process)	Conversion to modern grate cooler	Conversion to modern grate cooler		
		Refractories	Refractories		
		Optimize grate coolers	Heat recovery for power generation		
		Conversion to pre-heater, pre-calciner kilns	Low pressure drop cyclones for suspension pre-heaters		
		Conversion to semi-dry kiln (slurry drier)	Optimize grate coolers		
		Conversion to semi-wet kiln	Addition of pre-calciner to pre-heater kiln		
		Efficient kiln drives	Long dry kiln conversion to multi-stage pre-heater kiln		
		Oxygen enrichment	Long dry kiln conversion to multi-stage pre-heater, precalciner kiln		
			Efficient kiln drives		
			Oxygen enrichment		

Technologies used in Fertilizer Sector

PROCESS	Reforming Section	Purification Section		Ammonia Synthesis Section	Urea Plant	Moving Machines	Miscellaneous Measures
EE Projects	Use of Reformer tubes of better metallurgy	**CO Shift Conversion**	**CO2 Removal Section**	Purge Gas recovery	High Efficiency Urea Reactor Trays/additional trays.	Modification of Compressor Internals.	Provision of Gas Turbine for Air Compressor with HRU for Steam Generation
	Use of Additional Heat Recovery In Reformer Convection Zone - Installing	LTS Guard With Heat Recovery	Single Stage to Two Stage Regeneration	Conversion of Converter from Axial to Axial Radial S-50 and S-300 Converters	Replacement of conventional Stripper with Bimetallic Stripper	Modification or Replacement of Turbines.	Use of Variable Frequency Drive
	Use of Additional BFW Coil, Air Pre-heater		Replacement of Solvent Hydaulic Turbine	Additional Purification of Synthesis Gas	Heat Recovery from Vapours of Decomposer	Chilling of Air at Suction of Air Compressor.	Trimming of Pumps Impellers to match the Load Requirement
	Changing coil type exchanger to plate type heat exchanger for air preheater		Change Over of Random Packing with Structured Packing	1)Liquid Ammonia Wash of Make Up Synthesis Gas to remove impurities of CO2 and moisture	Installation of MP Pre-decomposer	Replacement of Hydraulic Governors with Electronic Governors.	Change of Drives of Pumps and Fans from Steam Turbine to EE Motors
	Modification in reformer burners		Modification of Internals in Towers.	2)Drying of Synthesis Gas by Molecular Sieve	Installation of Pre-concentrator Before Vacuum Concentrationn section.		Use of Advance Process Control
	Installation of Pre-reformer			Chilling of Make up Synthesis Gas to Save Compressor Power	Use of Urea Hydrolyzer		Implementation of Load Management System
	Installation of Reformer Exchanger				Utilization of off gases from inert washing column (C-3) as fuel in reformer or boilers		

Technologies used in Iron and Steel sector

PROCESS	Iron Ore and Ferrous Reverts Preparation (Sintering)	Coke Making	Iron Making – Blast Furnace	Steelmaking – BOF	Steelmaking – EAF	Casting and Refining	Shaping	Hot Rolling	Cold Rolling
EE Projects	Heat recovery from sintering and sinter cooler	Use of Coal moisture controlling system	Injection of pulverized coal	Recovery of BOF gas and sensible heat	Increasing power	Integration of casting and rolling	Use efficient drive units	Use of Recuperative or regenerative burners	Utilization of Continuous annealing
	Use of waste fuel in sinter plant	Use of Coke dry quenching (CDQ)	Recovery of blast furnace gas	Improvement of process monitoring and control	Use of Adjustable speed drives (ASDs)	Utilization of Tundish heating	Installation of lubrication system	Integration of casting and rolling	Inter-electrode insulation in electrolytic pickling line
	Reduction of air leakage	Programmed heating	Injection of natural gas	Use of Variable speed drive on ventilation fans	Use of Direct current (DC) arc furnace	Use of Ladle preheating	Use of Gate Communicated Turn-Off (GCT) inverters	Use of Flameless burners	Reducing losses on annealing line
	Improve charging method	Use of Coke oven gas (COG)	Use of Top gas recycling	Use of Programmed and efficient ladle heating	Use of Oxy-fuel burners/lancing			To Proper reheat temperature	Use of Automated monitoring and targeting systems
	Increasing bed depth	Use of Variable speed drive coke oven gas compressors	Injection of oil	Use of Ladle preheating	Use of Scrap preheating			Controlling oxygen levels and variable speed drives on combustion air fans	Reduced steam use in the acid pickling line
	Improve ignition oven efficiency	Next generation coke making technology	Improved blast furnace control		Post-combustion of flue gases			Process control in hot strip mill	

	Use of Emission Optimized Sintering (EOS®)	Use of Single Chamber System (SCS)	Injection of plastic waste		Use of Waste injection			Avoiding overload of reheat furnaces	
			Slag heat recovery		Improving process control			Heat recovery to the product	
			Injection of coke oven gas and basic oxygen furnace gas		Airtight operation			Insulation of reheat furnaces	
			Preheating of fuel for hot stove		Foamy slag practices			Waste heat recovery from cooling water	
			Charging carbon composite agglomerates (CCB)		Bottom stirring/gas injection			Use of Hot charging	
			Improvement of combustion in hot stove						
			Top-pressure recovery turbines (TRT)						
			Improved hot stove control						

Technologies used in Pulp and Paper

PROCESS	Raw Material Preparation	Chemical Pulping			Mechanical Pulping	Papermaking
EE Projects	Use of Cradle debarkers	Pulping	Bleaching	Chemical Recovery	Refiner improvements	Advanced dryer controls
	Automatic chip handling and screening	Use of pulping aids to increase yield	Heat recovery from bleach plant effluents	Lime kiln oxygen enrichment	Increased use of recycle pulp	Use of Waste heat recovery
	Replace pneumatic chip conveyors with belt conveyors	Use of Digester improvement	Use of Chlorine dioxide (ClO2) heat exchange	Use of Improved composite tubes for recovery boiler	Refiner optimization for overall energy use	Control of dew point
	Use of Bar-type chip screening	Optimize the dilution factor control	Improved brownstock washing	Lime kiln modifications	Heat recovery from de-inking plant	Paper machine vacuum system optimization
	Use secondary heat instead of steam in debarking	Digester blow/flash heat recovery		Recovery boiler deposition monitoring	Pressurized groundwood	Optimization of water removal in forming and pressing
	Use of Chip conditioning	Use of Continuous digester control system		Utilization of Lime kiln electrostatic precipitation	Fractionation of recycled fibers	Shoe (extended nip) press
				Use of Quaternary air injection	Utilization ofContinuous repulping	Reduction of blowthrough losses
				Use of Black liquor solids concentration	Use of Thermopulping	Gap forming
					Utilization of Efficient repulping rotors	Reduction air requirements
					Utilization ofRTS pulping	CondeBelt drying
					Utilization ofDrum pulpers	Optimizing pocket ventilation temperature
					Utilization of Heat recovery in TMP	Air impingement drying

Technologies used in Aluminium

EE Projects
Reduction in Stub to Carbon voltage drop
Reduction in Pot voltage.
Improvement of current efficiency of pots.
Implementation of slotted anode in pots
Reduction of compressed air consumption.
Reduction of dead pot voltage and crossover voltage.
Optimization of Compressor running.
Online addition of pots into circuit by fuse blown technology.
HTM heater set point optimization in GAP.
Reduction of the Specific Energy consumption of Wire Rod Mill.
Improve Rodding shop availability

Technologies used in Textile

PROCESS	Spinning	Processing
EE Projects	Install EE Pnuemafil Fans in Ring Frames	Reduce the Speed of Exhaust Fans in Stenters
	Avoid Idle Operation of Motors by Providing Stop Motion Circuit for Blow Room	Install VFD for water Circulating Pumps of Jet Dyeing Machine
	Install VFD for Autocoro Suction Motor and operate at lower suction pressure	Combine Preparatory Treatments in wet processing.
	Use of EE spindle oil	Cold-Pad-Batch pretreatment up to 38% of pretreatment fuel use.
	False ceiling in Ring spinning section to reduce the humidification load	Installing automatic valves in continuous washing machine.
	Installation of EE motor in Ring frame	Reduce live steam pressure in continuous washing machine.
	Installation of EE excel fans in place of conventional alumunium fans in the suction of Ring Frame	Introducing Point-of-Use water heating in continuous washing machine
	Installation of a soft starter on motor drive of Ring Frame	Use of integrated dirt removal/ grease recovery loops in wool scouring plant.
	Installation of VFD on Autoconer machine	Installation of VFD on pump motor of Top dyeing machines.
	Intermittent mode of movement of empty bobbin conveyer in the Autoconer/cone winding machine.	Heat Insulation of high temp/high pressure dyeing machines.
		Installation of VFD on circulation pumps and color tank stirrers
		Reducing the process temp in wet batch pressure dyeing machines
		Use of steam coil instead of direct steam heating in batch dyeing machine (Winch & Jigger)
		Reducing the process time in wet batch pressure dyeing machines.
		Installation of covers or hoods in atmospheric wet batch machines
		Careful control of temp in atmospheric wet batch machines.
		Recover heat from hot rinse water
		EE improvement in cylinder dryer.
		Recover condensate and flash steam.
		Select processes for their low water add-on characteristics.
		Avoid intermediate Drying
		Operate cylinders at higher steam pressures
		Conversion of thermic fluid heating system to direct gas firing system in Stenters and Dryers
		Introduce mechanical De-watering or Contact Drying before Stenter
		Close Exhaust Streams during Idling
		Efficient burner technology in Direct Gas Fired systems and improve combustion efficiency
		Automatic steam control valves in Desizing, Dyeing and Finishing
		The recovery of condensate in wet processing plants
		Heat recovery from the air compressors for use in drying woven nylon nets
		Utilization of heat exchanger for heat recovery from wet-processes wastewater.

Technologies used in Textile

EE Projects
Modifications in Liquid chlorine transfer line
Introduction of Surface condenser in fusion plant
Modifications in brine recovery system
Bypass line in brine unit
Avoiding venting of air from air agitation blower
Recovering the waste heat from the fusion plant exhaust gas (utilizing in VAM instead of operating a refrigeration compressor)
Installation of VFD for Raw Water Pump
Downsizing of process water pump
Downsizing of Filtered brine pump
Downsizing of Sulphuric Acid Circulation Pump
Replacement of Motor with EE motor class
Installation of VFD to Annolyte pumps
Using waste steam from FACT
The continuous caustic fusion plant cooling tower pump impeller size reduced
Transformer load shifting
Installation of VFD for Filtered Brine pump
Installation of VFD for Clarified Brine pump
The continuous caustic fusion plant cooling tower pump impeller size reduced
Transformer load shifting
Installation of VFD for Filtered Brine pump
Installation of VFD for Clarified Brine pump
Installation of VFD for Dechlorinated Brine pump
Installation of Capacitor bank/Harmonic Filter