

Technology Development Themes under IMPRINT II C

ADVANCED MATERIALS:

1. New electrolytes for energy storage devices (e.g. Li ion battery, solar energy harvesting, polymer storage cells, hydrogen generation and storage, solid state LEDs, etc.)
 - Efficient Lighting- Basic research in Solid State Lighting (LED Lighting) especially in LED chip making
 - Indigenous Development of low cost Li-ion and Li Polymer battery
 - Alternatives for Room Air-Conditioners
 - Measures to tackle corrosion/ erosion problems in Hydro Turbines
2. Rare earth element extraction, device fabrication (magnets, sensors)
 - Substitution for rare earth materials used for making of permanent magnets (Ferrite base permanent magnets) for DC motors
3. Advanced metallic materials (e.g. steel for transformer (CRGO), amorphous steel, degradable polymers (for food packaging), industrial waste material utilization, waste heat recovery (phase transformation compounds), ultra-supercritical power plant, re-entry space shuttle vehicles, etc.)
 - Materials for Advanced Ultra Supercritical power plant
 - Efficient heat transfer materials especially for waste heat recovery
 - Bio-degradable Packaging Materials for food products
 - Utilization of waste of different ceramic products like Sanitary ware, Crockery, Stoneware, Tiles etc.
 - Bio degradable pads using materials such as banana fiber etc.
 - Manufacturing of GRGO/ Amorphous core/ any other transformer core material in the country
 - Solar energy-based cooling solutions

ENVIRONMENT SCIENCE & CLIMATE CHANGE:

4. Solid waste management and recycling/utilization for various industry (mining, steel plant, power plant (fly ash), chemical/leather processing, construction, highway, agriculture (stubble), etc.) – waste to wealth
 - Waste Recycling
 - Stubble Burning
 - In situ crop residue management through machinery intervention
 - Effective utilization of wastes of Steel Plants like Slag, Slimes, Mill Scale etc in sectors like Construction, Highways, Agriculture etc.
 - Adoption of developing technologies for bulk utilizations of fly ash such as for replacement of sand
 - Use of fly ash for construction of geo-polymer roads
 - Mitigation of pollution during transportation of different ore, coal and clay

5. Greenhouse gas (CO₂, refrigeration) sequestration and global warming remediation, and coal gasification, dust and fine particle arrest/catching system
 - Development of Micro-algal process for CO₂ fixation
 - Improved dust catching system in mini cement plants

HEALTHCARE TECHNOLOGY:

6. Affordable bio-medical prosthesis, implants, hearing/vision aids, accessories, mobility devices, etc.
7. Bio-medical sensors, markers, diagnostic instruments/tools/machines, and bio-medical waste management protocol/devices, DNA origami
 - Affordable Low-Cost Medical Devices, Implants & Diagnostics
 - Tools for measuring gestation, foetal growth, pregnancy complication, placental functional, post-natal growth and development
 - Indigenous development of MRI/CT scanners
 - Disposal of Bio-Medical Waste
8. COVID like epidemic prevention, management and treatment

ENERGY SECURITY:

9. Smart grid design, smart meters, recycling of old electricity meters, transmission grid loss management, gas insulated transformer/transmission line
 - Smart Grid
 - Disposal/Reuse of old meters: (GOI plans to replace all existing meters by smart meters in prepaid mode. As several crores of meters will be replaced, so their Disposal / Reuse is a concern)
 - Eco friendly alternate of SF₆ gas with equal or better dielectric properties for use for insulation in circuit breakers, switchgear etc.
 - Gas Insulated Transmission Lines
 - Development of advanced Gasification Technology for coal having high ash content
10. Alternative affordable energy sources (Si and non-Si) solar devices, biofuel, biogas, solar cooling), low grade coal gasification including waste heat recovery
 - Waste heat recovery from liquid slag, flue gases and conversion of the same into electricity
 - Sustainable Biofuels
 - High efficiency, indigenous non-Si solar cells
 - Waste Recycling
 - Solar energy-based cooling solutions
 - Bio-fuel and bio-oil production
 - Biogas
 - Converting Sunlight to Storable Fuels or Chemicals
11. Energy storage devices (battery, fuel cell and portable fuel cell, Li ion battery, Li polymer battery, EV devices and fast charging stations)

- Battery storage technologies for EV and Grid Scale application
- Electric Mobility issues - development of super-efficient batteries with fast charging capabilities suitable for transport application
- Indigenous development of electrolyte membranes and porous graphite electrode substrate for PEM Fuel cells
- Fuel Cell Development
- Portable Fuel Cells
- Micro Fuel Cell

INFORMATION & COMMUNICATION TECHNOLOGY:

12. Big data analytics, artificial intelligence, evidence-based planning, Industry 4.0
 - Data exchange & aggregation for health records, analytics, evidence-based planning etc.
 - Promotion on Industry 4.0 & industrial lot for production and Quality improvements
 - Big data analytics and Artificial intelligence
13. Digital communication and personal security devices including natural language processing and translation, standalone language translators
 - Standalone Language Translators
 - Cost effective ICT tools for making the daily operations of MSMEs more easy accountable and Systemic
 - Cost effective and legally valid personal security devices

MANUFACTURING TECHNOLOGY:

14. Robotic inspection of machines, pipelines, human system, and aerial inspection of terrains by UAV/drones
 - Robotic Inspection of inaccessible/congested hazardous areas inside boilers and other enclosures
 - Application of latest technologies such as Drone/LiDAR, Robotics, Phasor Matching Units in power plants
15. Advanced manufacturing of efficient machines, electric vehicles, energy devices including laser assisted additive manufacturing, cladding, corrosion/wear resistant coating
 - Laser Cladding process using for dimensional repair/rebuilding of rotor shaft
 - Laser penning of LP steam turbine titanium blades of large turbines.
 - Fuel Cell Development
 - In situ crop residue management through machinery intervention
 - Development of advanced Gasification Technology for coal having high ash content
 - High speed charging of electric vehicles

NANO TECHNOLOGY HARDWARE:

16. Nanotechnology based solutions for waste/contaminated ground/surface water and effluent, thermal/nano-fluids, ferro-fluids, water meter
 - Use of Nano Technology for effluent Treatment and recycling to minimize waterfoot print
 - Development of Nanotechnology based robots for various applications
 - Use of nano-coolant to enhance heat transfer
17. Nano-sensors and actuators, nano-materials for battery, nano-robots, food quality sensors, gas sensors, DNA origami, explosive sensors, smart coating for energy harvesting and heat management
 - DNA Origamy
 - Food Adulteration
 - Indigenous Development of low cost Li-ion and Li Polymer battery

SECURITY and DEFENSE:

18. Cyber security, Quantum computing, IoT, Block chain, Personal security devices
 - Cost effective and legally valid personal security devices
 - Big data analytics
 - Artificial intelligence
19. Advanced materials for Defense
 - Functionally graded material and High specific strength superalloy

SUSTAINABLE HABITAT:

20. Municipality waste management and recycling, vertical farming, natural air conditioning
 - Develop building materials with advanced thermal and optical properties that curtail heat ingress
 - A study may be carried out for classification of sludge generated from the STPs and their utilization in an environmentally safe management
 - Zero Liquid discharge
 - Innovative passive cooling designs to minimize space cooling needs for various Indian climates

WATER RESOURCES & river SYSTEMS:

21. Desalination and liquid effluent treatment and recycling
 - Mini Desalination plants in coastal areas
 - Developing replacement of Sodium Chloride (common salt) in leather tanning. Sodium Chloride is a major source for increasing water load in effluent
 - Technology for recycling of waste water
 - Reduce water consumption in leather processing
 - Reduce toxic matter of water effluents of leather industries
 - Zero Liquid discharge
 - Digital Water Management
 - Mini desalination plants in coastal areas