Energy Efficiency Services Limited

Bureau of Energy Efficiency
(A Statutory body Under Ministry of Power)

Energy efficiency and decarbonization pathway

Energy Efficiency Programs in Industrial Sector– opportunities and Way Forward

(PaperTech 2024)-
11th September 2024 at HICC, Hyderabad

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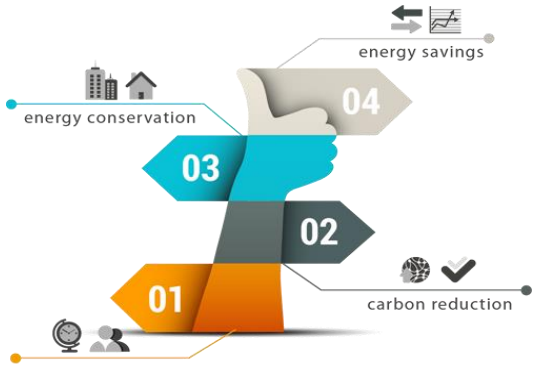
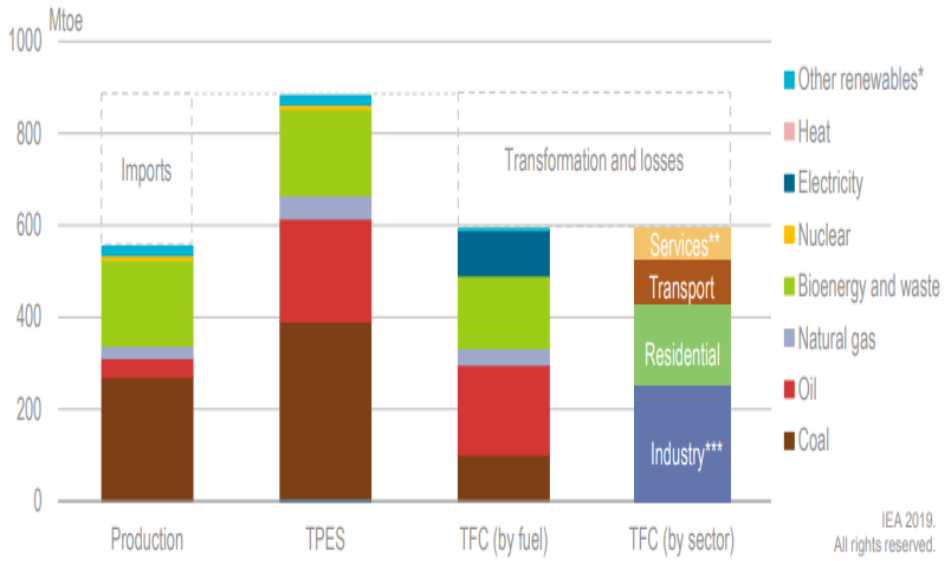
Ministry of Power, Govt. of India



Energy landscape

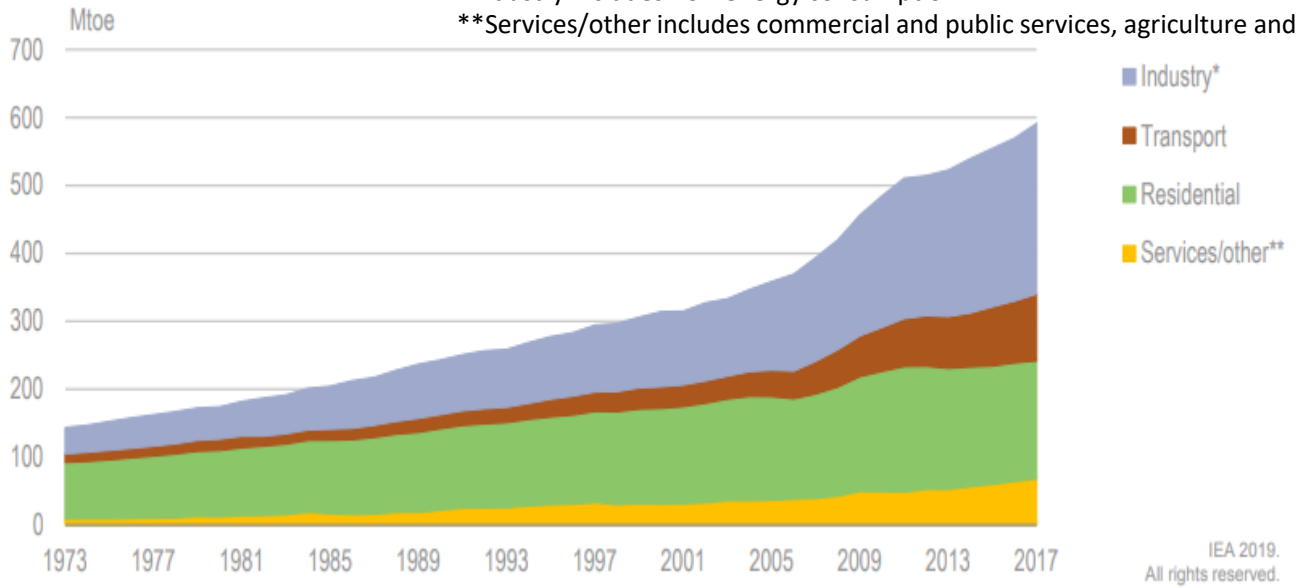
India's energy system by fuel and sector, 2017

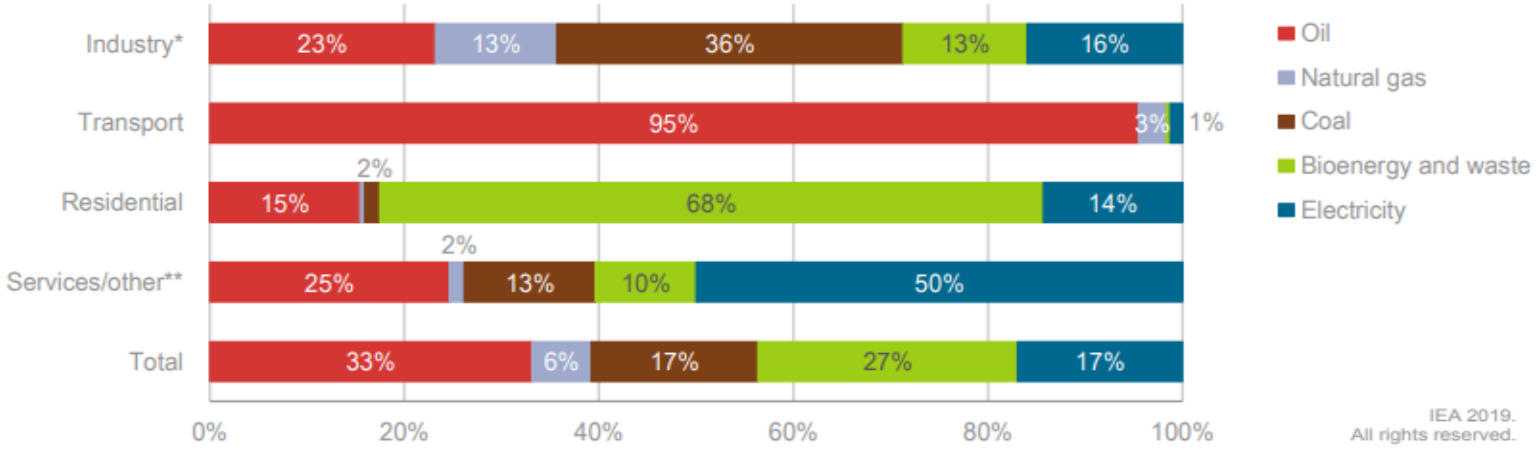


TPES: Total Primary Energy Supply
TFC: Total Final Consumption

Total Final Consumption (TFC) by sectors

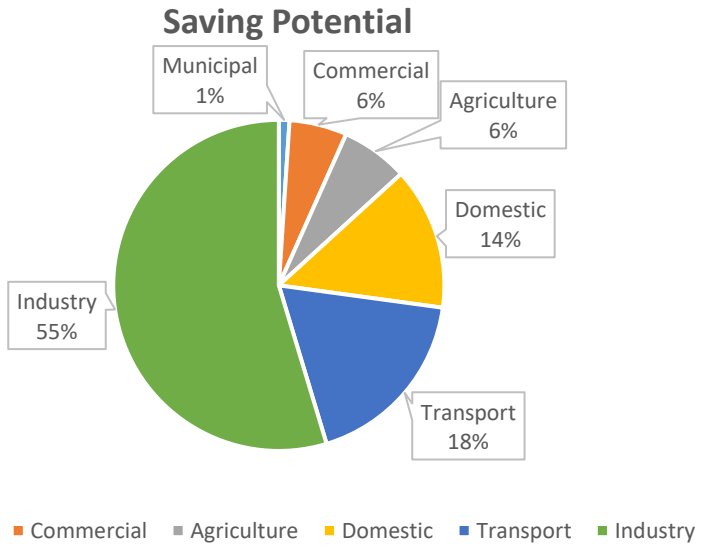
*Industry includes non-energy consumption.
**Services/other includes commercial and public services, agriculture and forestry.

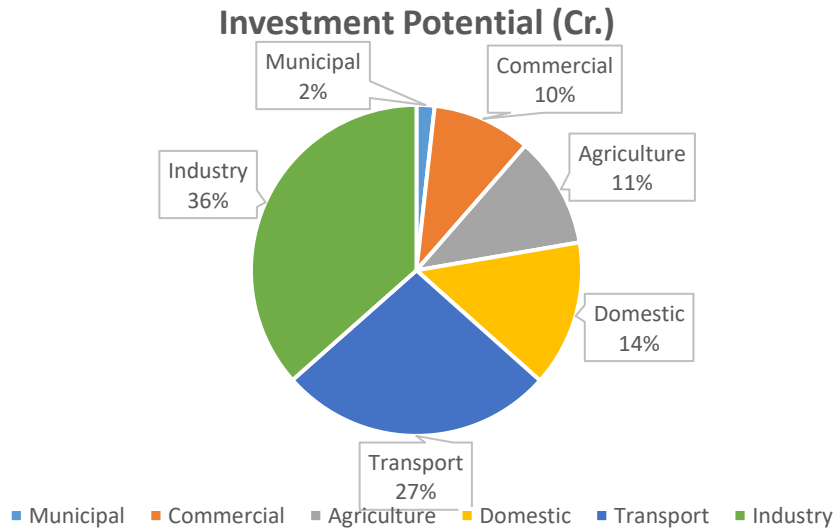




Energy Efficiency Market in India

- Primary Energy Demand in India: **790 Mtoe** (2016-17):
- Energy Saving potential: 87 Mtoe by 2031; (11.64 Mtoe by 2021)
- Energy Efficiency Investment potential: Rs. 8.40 lakh crore by 2031

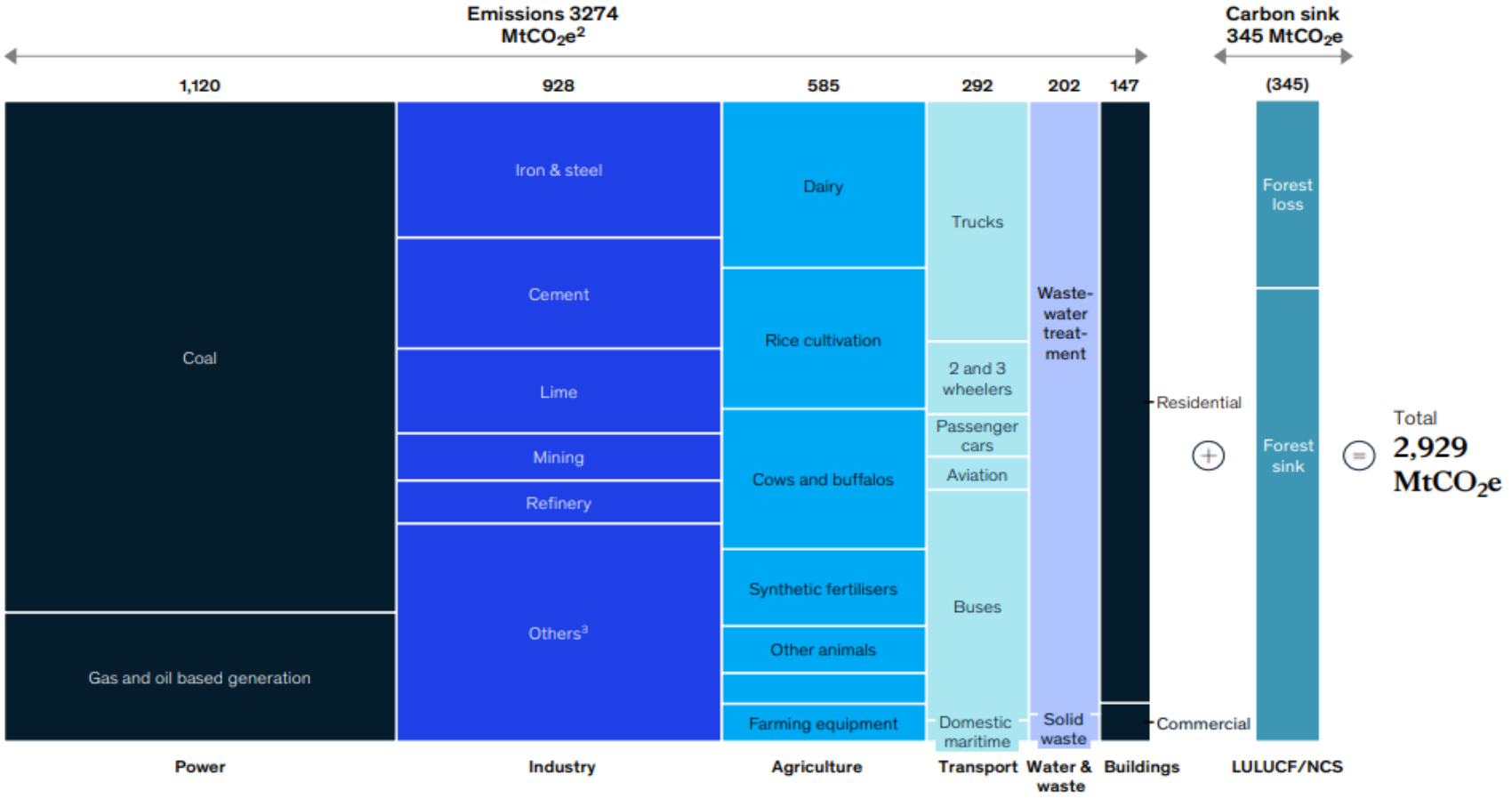




Source: BEE Unnatee report

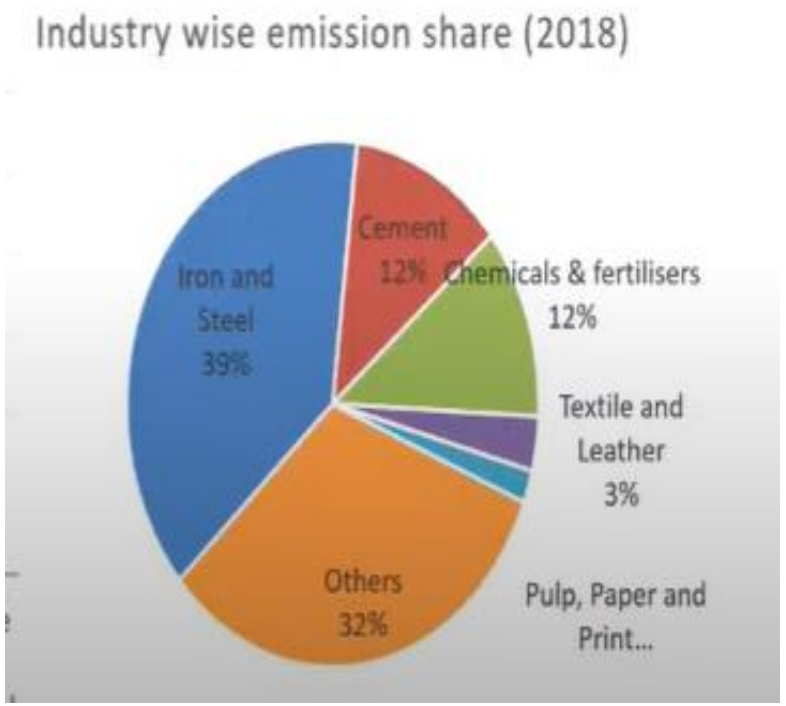
Baseline Co2 inventory

Baseline emissions, $MtCO_2e$[1], 2019



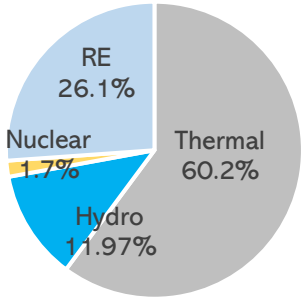
1. Converting GHGs into CO_2e assuming GWP-100 and AR5 methodology with India's BUR-3 reported emissions for 2016 as baseline.
2. Gross and net emissions for 2019 based on Climate Action Tracker overall emissions for India.
3. Others include: other industry oil & coal use, ammonia, aluminium, F-gases and ethylene.

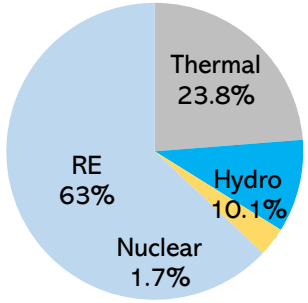
Source: McKinsey India Decarbonization Scenario Explorer report

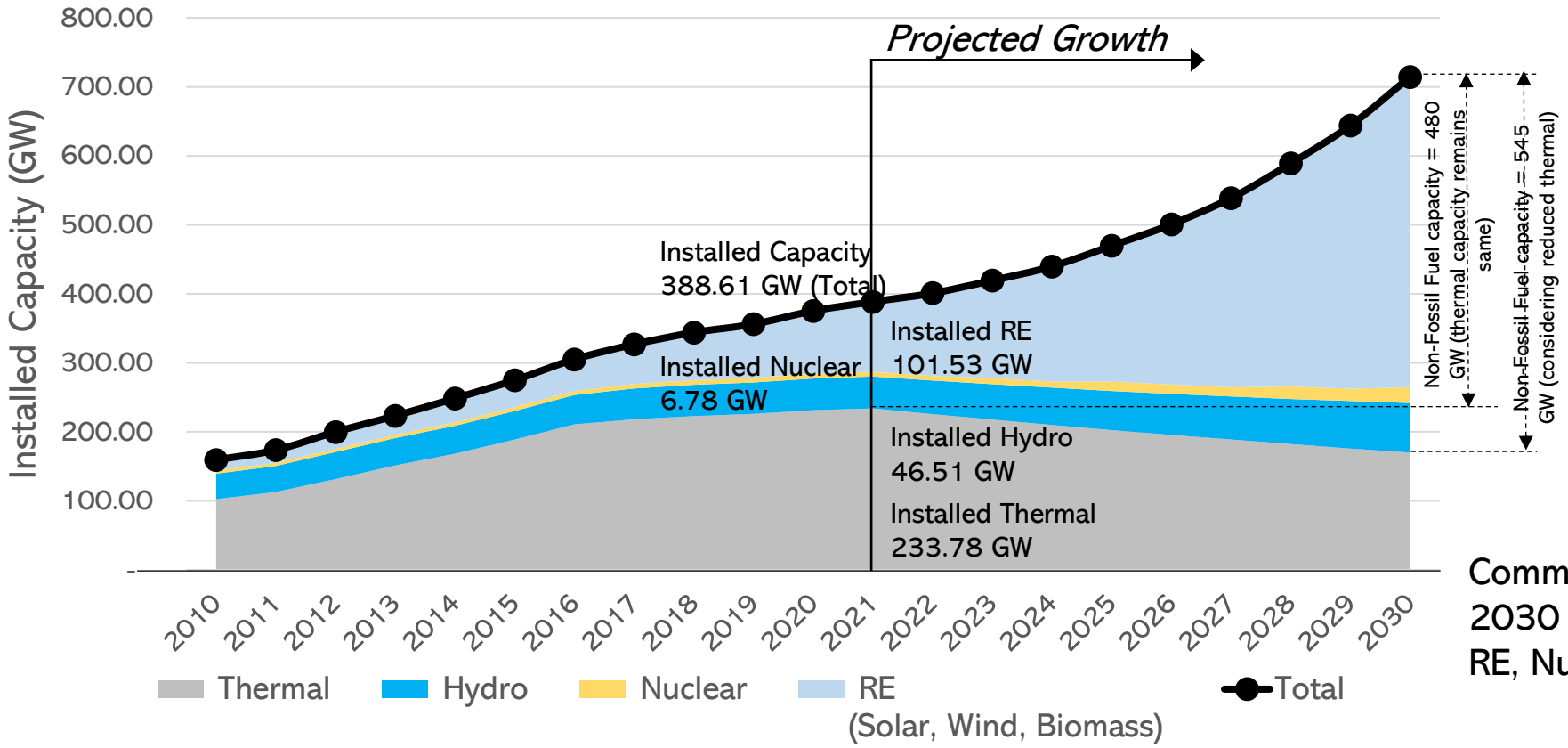


Decarbonization: Indian Market projections

Electricity Trajectory: BAU







Projected total capacity by 2030 >700 GW *(assuming growth rate at 7%)*

Commitments made for 2030 *(prior to COP 26)*

Non- Fossil fuel > 450 GW

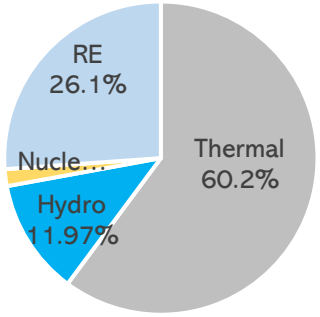
RE	> 175 GW
Nuclear	> 22 GW
Hydro	> 72 GW

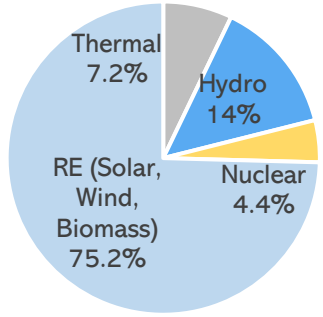
Commitment at COP26 for 2030

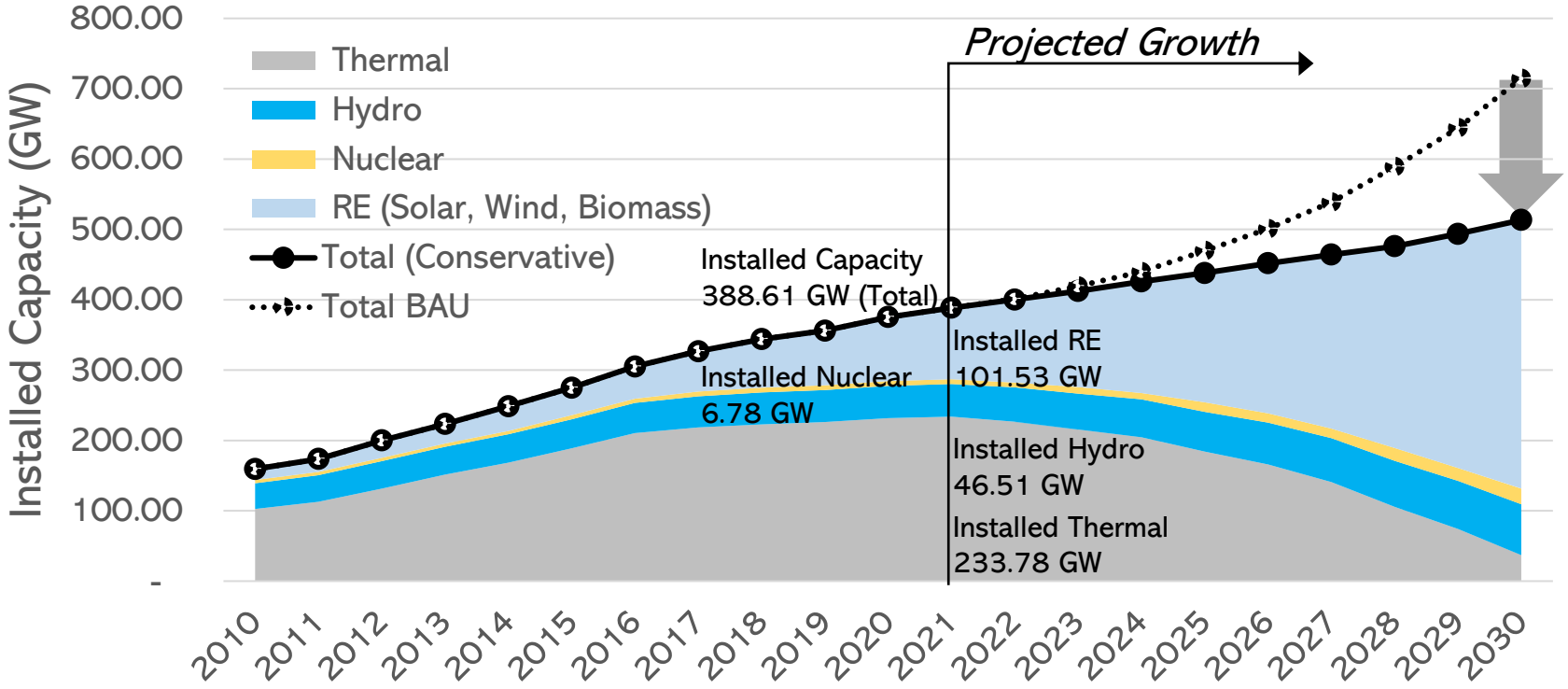
RE, Nuclear, Hydro >500 GW

Indian market projections

Electricity “Conscious” Trajectory





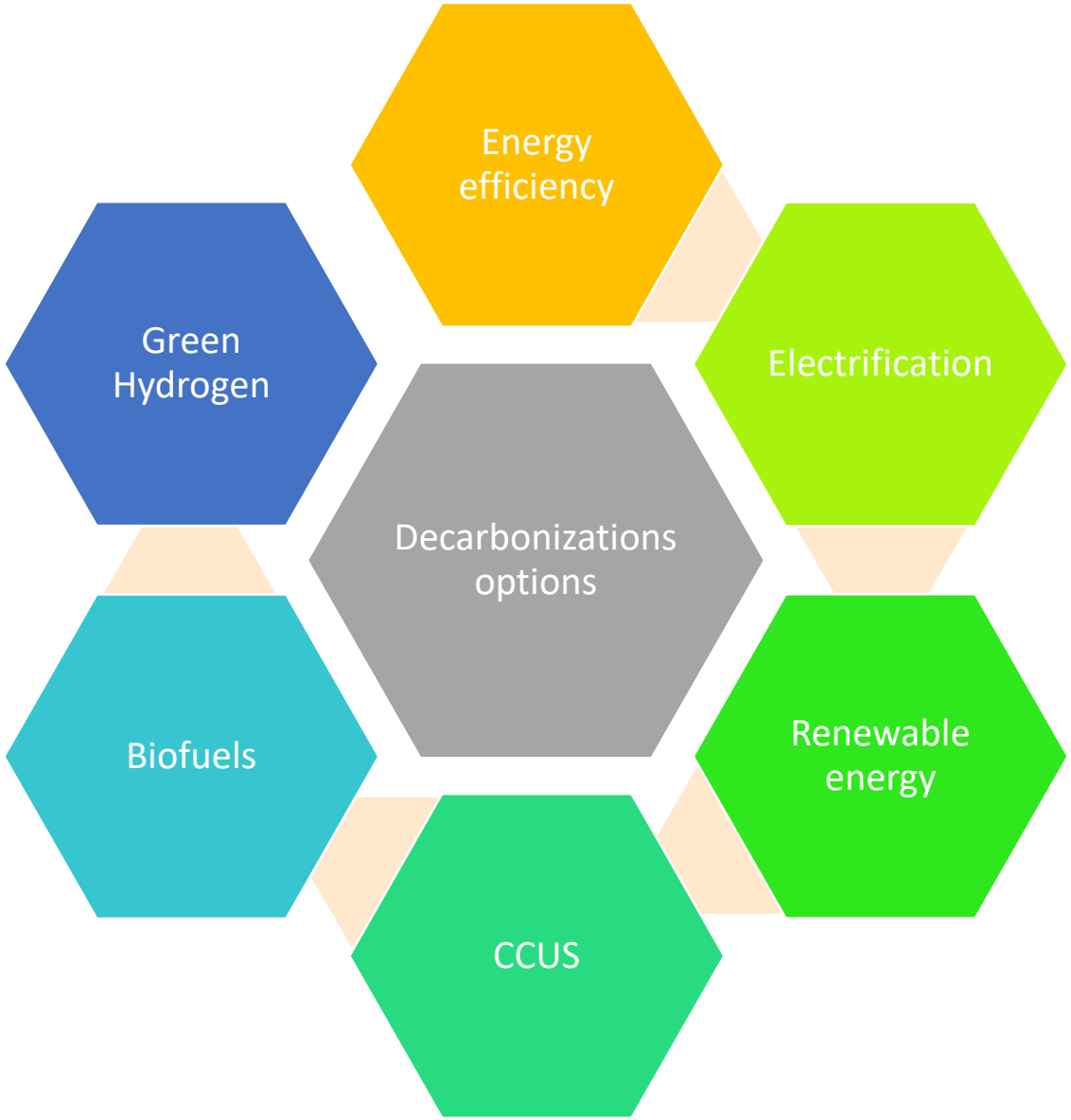


Energy Conservation & Efficiency Potential > 200 GW

Projected total capacity by 2030 at 500 GW (ambitious curtailment of growth at 3%)

Commitment at COP26 for 2030
RE, Nuclear, Hydro >500 GW

Decarbonization options for industrial sectors



Drivers

- Energy efficiency standards
- Emission reduction targets
- Renewable incentives
- Carbon pricing mechanism

Challenges

- Technology readiness
- Scale and infrastructure
- Cost, financing/ investments options
- Regulatory framework

National priority and policy landscape

Energy Conservation Act 2022 (Amendment) provisions for CARBON TRADING:

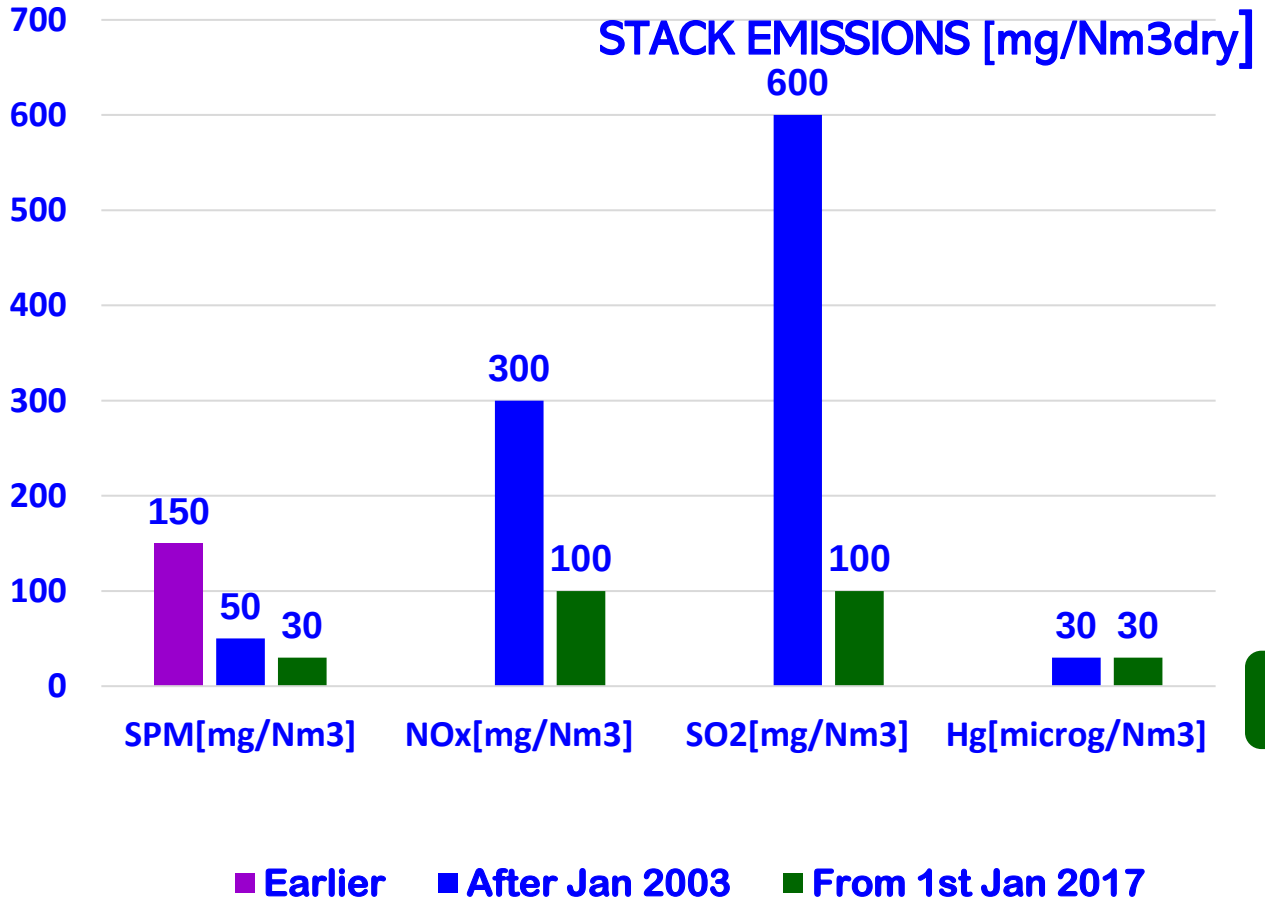
- The EC Act (Amended 2022] empowers Central government to specify a **Carbon credit trading scheme.** Carbon credit implies a tradeable permit to produce a specified amount of carbon emissions.
- Central government or any authorised agency may issue **Carbon credit certificates** to entities registered under and compliant with the scheme.
- **Carbon Credit Trading Scheme, 2023 notified June 28th 2023**
- The entities will be entitled to purchase or sell the certificate. Any other person may also purchase a Carbon credit certificate on a voluntary basis.

LiFE: Lifestyle for Environment

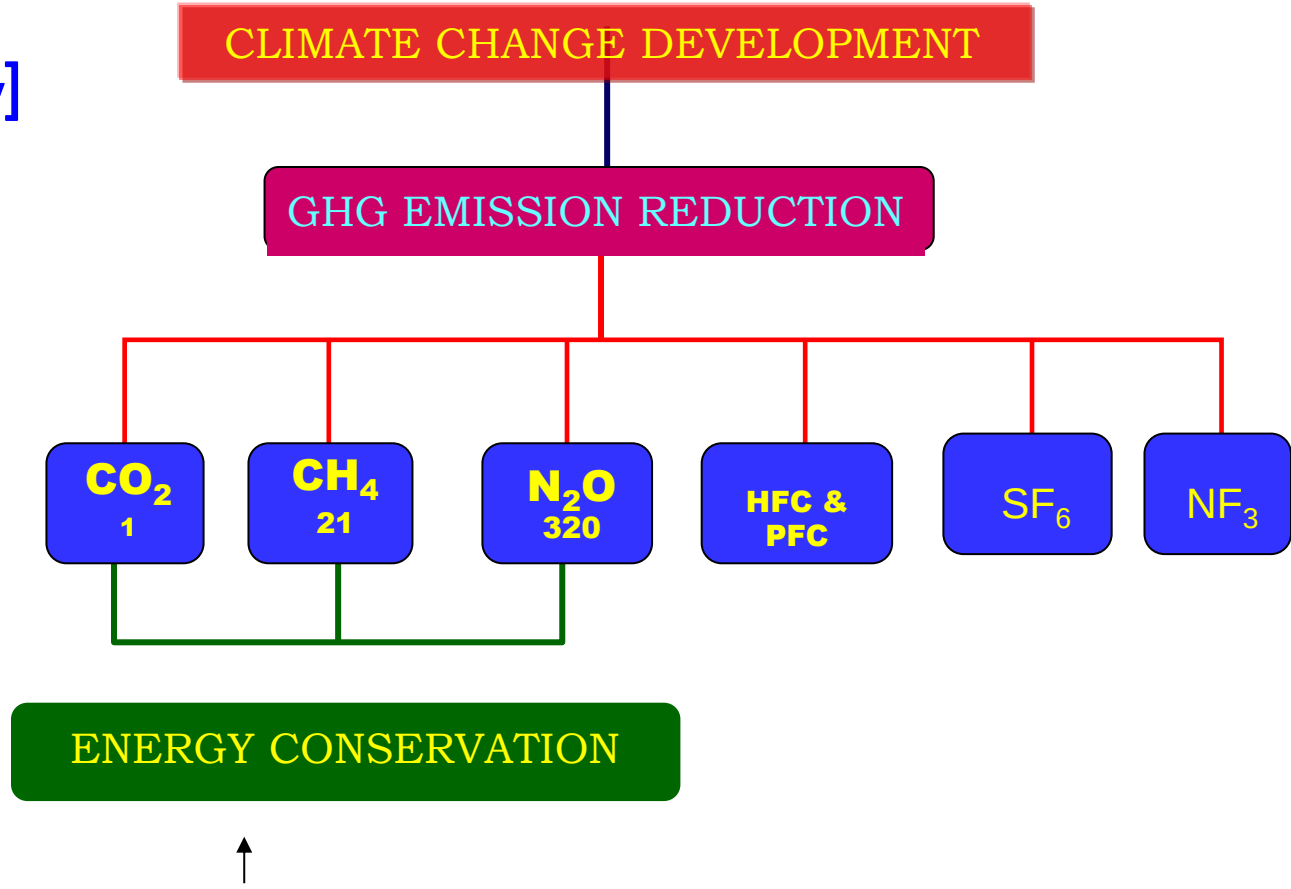
- **LiFE movement** aiming at encouraging sustainable lifestyles by driving consumer/community towards **behavioural changes** to incentivize environment friendly practices.
- MoEFCC Notified (26th June 2023) **Green Credit Programme Implementation Rules**,. Create a market-based mechanism for providing incentives in the form of Green Credits to individuals, organisations, industries for environment positive actions;
- Create mass movement around environment positive actions and realise the vision of "Mission LiFE“ through pro-planet-people and entities

National priority and policy landscape

LiFE: Lifestyle for Environment



Carbon credit trading scheme

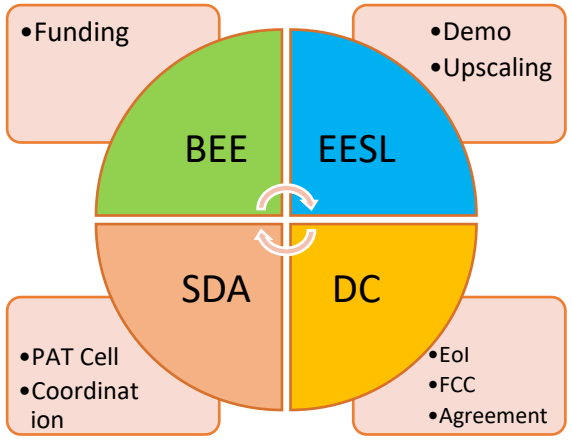


Demonstration of Energy Efficiency Projects (DEEP) in PAT Industries

***Project Objective*:**

Phase-I : 8 innovative Energy Efficient Technologies; 27 Demos

Phase-II : Replication and Scale-Up of successful Demos



***Key Project Activities*:**

- Identification/Finalization of Innovative Energy Efficient Technologies
- Selection of Beneficiary PAT Industries
- Demonstration of Energy Efficient Technologies (EETs)
- Development of IT/IoT based M&V Platforms
- Knowledge Dissemination and Capacity Building
- Upscaling of Demonstrated Technologies (Phase-II)

Implementation modalities

Identify **Energy Efficient technologies**

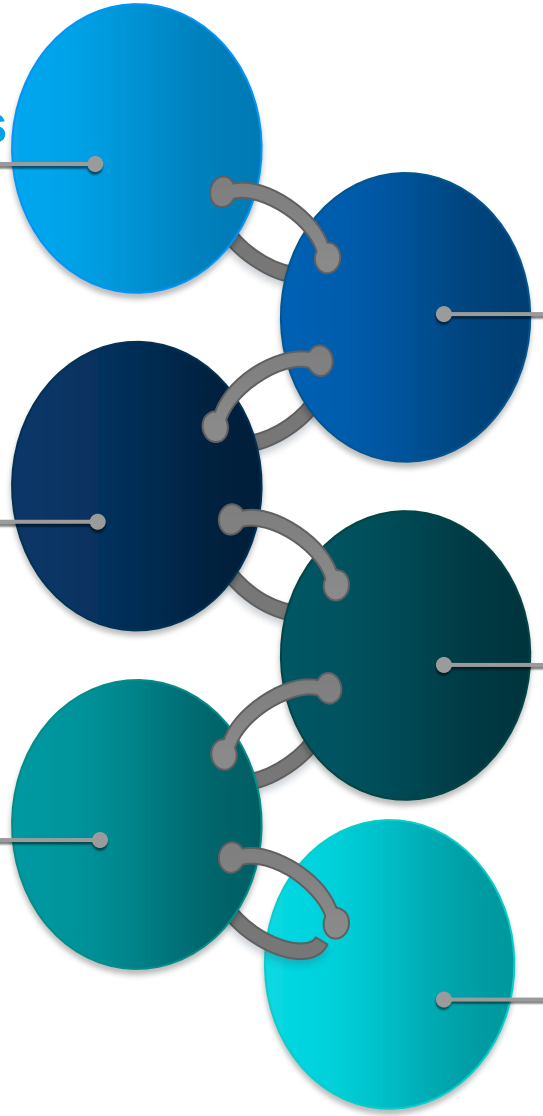
Financing models to support replication of EE projects in DCs

Demonstration of the Identified technology

To build up IOT based **Monitoring and verification** protocol for the technology

Demand aggregation for the Identified technology in the clusters

Creation of Revolving Fund



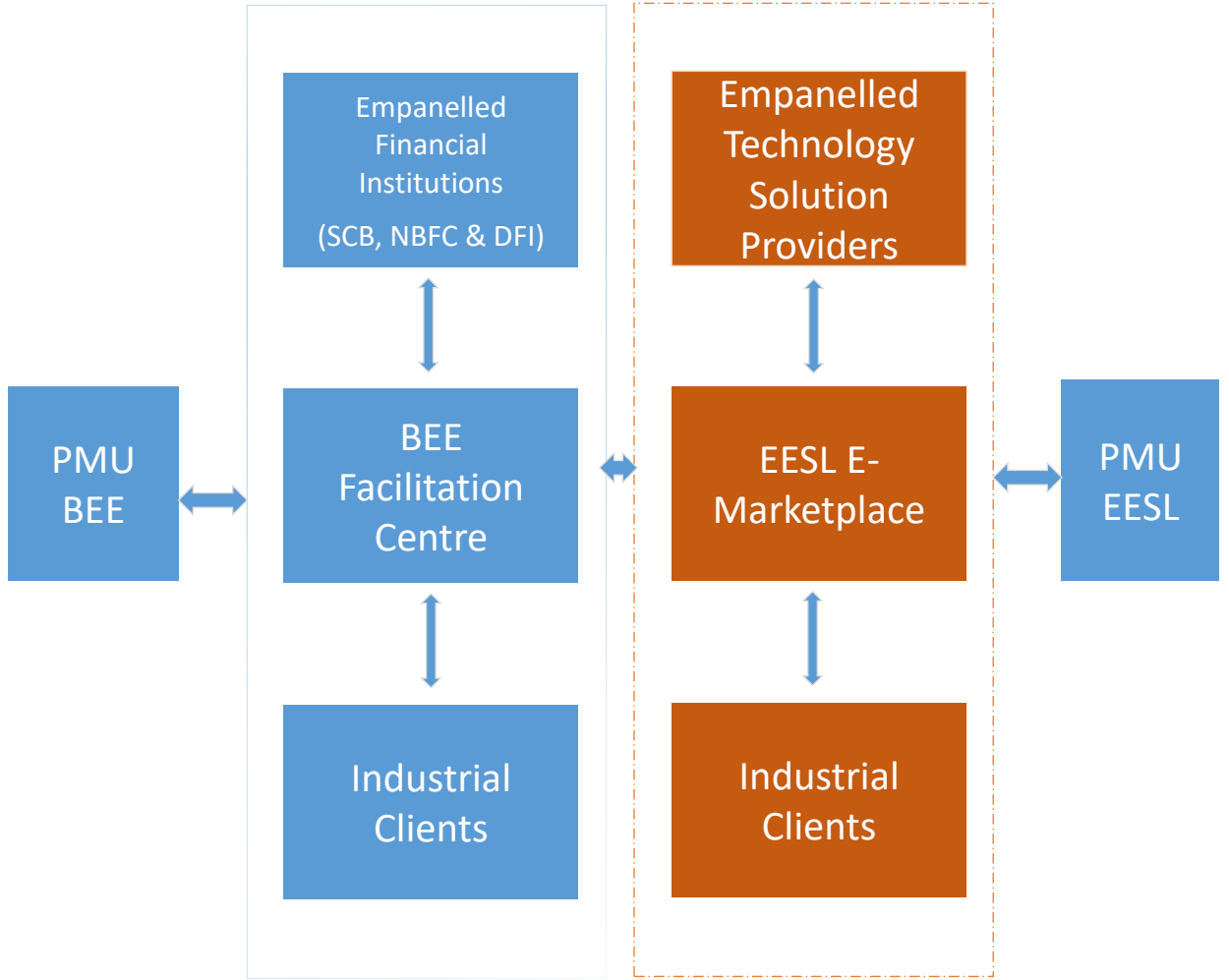
Micro-Turbine	Turbo-Blower	Energy Efficient Screw Compressor
Low Grade Waste Heat Recovery (LGWHR)	High Grade Waste Heat Recovery	Cooling solution from WHR (VAM)
Industrial Automation	IE4 Motors with VFD	Inlet Air Cooling

Replication phase

Proposed Structure for replication

Demand aggregation for scaling of technology identified via following activities

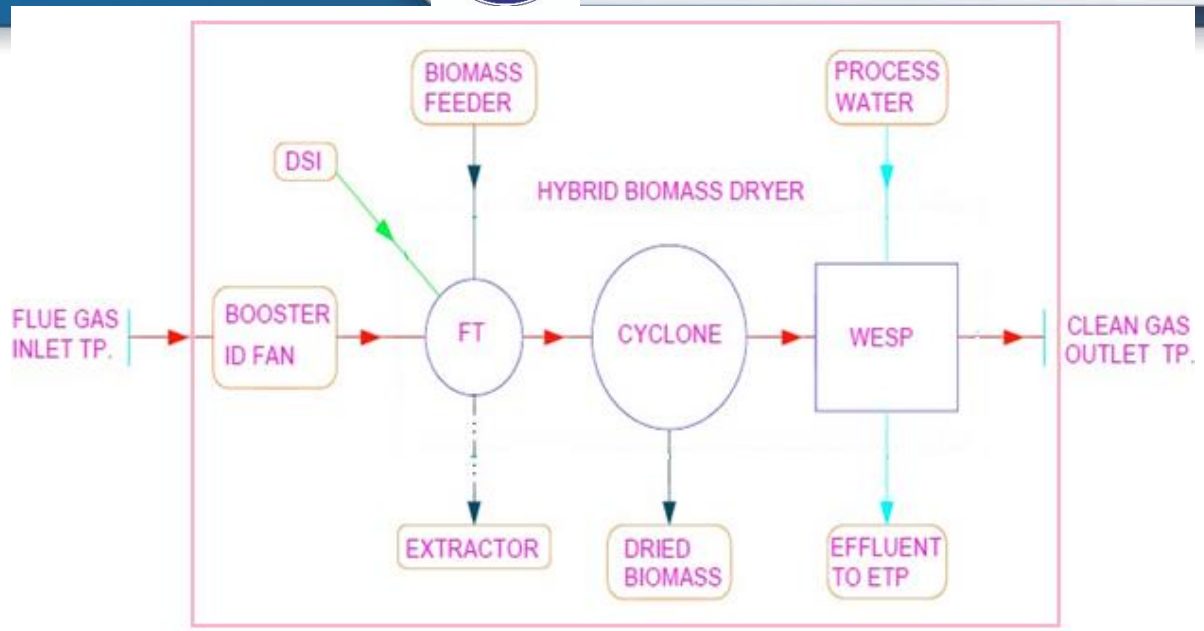
1) **Arrangement of Workshops for EoI**
2) **Engagement of various activities for demand aggregation with Industry associations & firms.**
3) **Course correction in the process of on boarding of DC**
   - i. **Publication of EoIs & Scrutanisation of EoIs : 30 Days for EoI & 15 days for Scrutinization.**
   - ii. **DPR and Baseline processing for finalised DCs**
   - iii. **Signing of Agreement by DCs with EESL & Financial Institutes**
   - iv. **Procurement**
   - v. **Implementations and M&V**



Technology options for Pulp and Paper Industries under DEEP project of BEE

Tech-1: Low Grade Waste Heat Recovery system

- **Hybrid Biomass Dryer:** Reducing the moisture level from the biomass/pith/wood chip dust/bagasse by utilizing the waste heat from boiler flue gas
- Integrating Cyclone separator & Wet ESP system for finer cleaning of flue gas SPM



Particulars of Baseline Establishment	Units	During study period	Historical 3 years
		June-24	May 21 - Apr 24
Moisture in fuel inlet (Biomass)	%	36.4%	36.4%
Moisture in outlet fuel (Biomass)	%	20%	20%
Mass of fuel (Biomass)	TPH	4.2	4.3
Heat required for drying	kcal/h	484099	495718
Effectiveness of the heat exchanger	%	70%	70%
Proposed flue gas temperature after dryer	^{o}C	**80.0**	**80.0**
Annual operating hours per annum	h	8400	8400
Annual fuel savings	MT/annum	1004.5	976.1
Average fuel cost per tonne	INR / MT fuel	9000	9000

Particulars of Baseline Establishment	Units	During study period	Historical 3 years
		24	May 21 - Apr 24
Paper production	TPD	522	468
Steam generation	TPD	2,229	1,850
Biomass fuel consumption	*TPD*	*101*	*103*
Coal fuel consumption	*TPD*	*366*	*246*
Mixed fuel consumption	TPD	467	350
Moisture of the mixed fuel	%	31.5	28.8
Calorific value of mixed fuel	kcal/kg	4,048	4,266.2
Total Heat input from the fuel	Million kcal/day	1890.6	1492.3
Specific energy consumption of steam	kcal/MT	848,183	806,424
Flow volume of flue gas chimney exhaust	m^3/h	191,799	143,662
Present flue gas inlet temperature	^{o}C	142	142

Other technology options

Tech-2: Compressor capacity optimisation with WHR Technology

- Replacement of old inefficient multiple compressors with JUMBO compressors having waste heat recovery inbuilt technology for better cost economics.

Benefits:

- The JUMBO compressor have better lifespan & efficiencies.
- Heat liberated (85% of total input) is utilized in process hot water requirements

Scalability:

- Cross sector applications
- Plants having requirements of Compressed air & hot water as well.

Tech-3: Cooling water flow optimisation to reduce APC for Net heat rate improvement

- Cooling Water Pump with VFD optimize the cooling water flow to condenser to suit the varying condensing steam flows which otherwise designed for exhaust steam condensation rated capacity

Benefits:

The APC from CW pump(s) shall be lowered- resulting in increase in net power available for process

Improved system efficiency.

Scalability:

- Cross sector applications

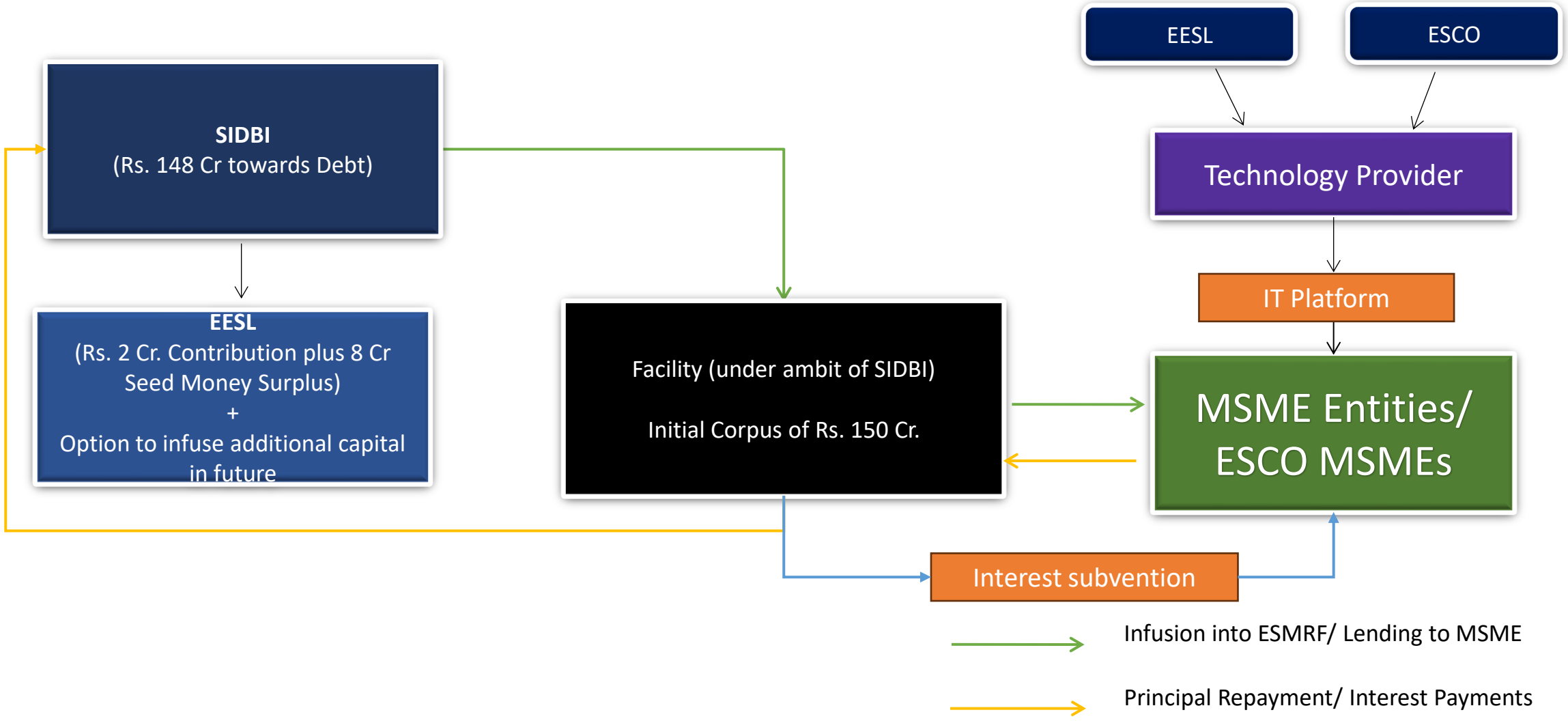
Energy Efficiency in MSMEs

- EESL is implementing GEF-5 project; “Promoting Market Transformation for Energy Efficiency in Micro, Small & Medium Enterprises (MSME)”
- **Partners: MoMSME, UNIDO, BEE, SIDBI.**
- The program is being implemented in 12 MSME clusters across India.
- 36 technologies identified; 22 technologies demonstrated across the identified clusters.
- EESL has conducted 800 surveys and 80 detailed energy audits in the MSME units.
- EESL has signed more than 55 energy performance agreements with the MSME units

Way Forward:

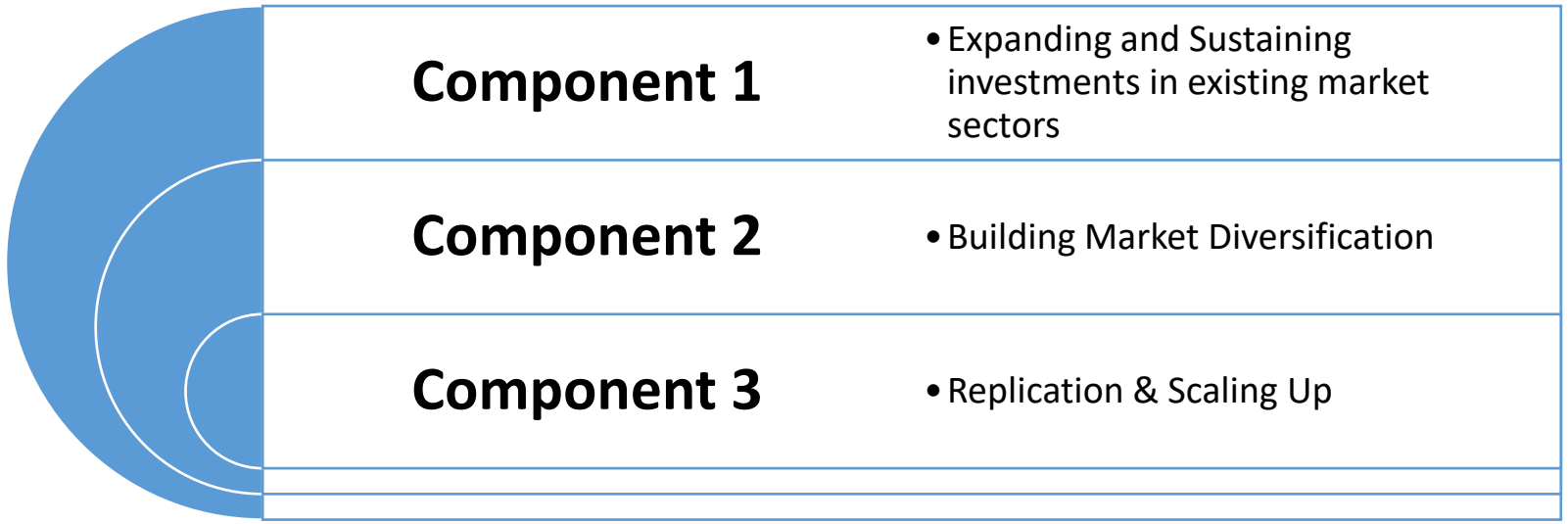
- Aggregation of Demand through Demand Aggregator agencies
- Rolling out of EMRF (Energy MSME Revolving Fund) of INR 150 Cr. in partnership with SIDBI
- Bulk procurement of 14 standard Technologies and customized 08 technologies
- Launch of National programs for 400 EE projects

Structuring of EMRF



UNEP support under GEF-6 project

- EESL is implementing GEF-6 project; "**Creating and sustaining markets for Energy Efficiency**"



UNEP support for

- Market Assessment
- Feasibility Studies
- Market Outreach
- Technology toolkits

- Additional technologies:
- Industrial utility-based technologies (Compressors, Turbo blowers and Micro Turbines)
- Waste Heat Recovery Solutions (WHRS),
- Industrial Automation Technologies
- Industrial EE Improvement through heating & cooling solutions- Heat pump

Support from GEF-6 project

- **Market assessment study**
  - WHR
  - Industrial heating and cooling
  - Industrial utilities
- **Feasibility study on WHR**
- **IT support on Marketplace**
- **Impact assessment of streetlight**
- **Technical expert hiring** on
  - Industrial utilities
  - Industrial automation
  - Cooling and heating solutions
  - GHG accounting
- **Demand aggregation workshops**
  - Hyderabad, Bhubaneshwar, Ranchi, Pune, Raipur, Coimbatore, Ahmedabad

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A JV of PSUs under the Ministry of Power

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