



ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power

Carbon market opportunities through energy efficiency projects

India Japan Environment week

12th January 2023

Girja Shankar, General Manager

- **About EESL**

- **Energy Efficiency Market**
- **Opportunities in cooling sector**

- **Integrated Energy Efficiency Solutions (IEES)**
- **Standard Package Offers (SPO) for Industries**
- **Standard EE Products**

- **New Initiatives (DEEP, IoT solutions)**

EESL is a joint venture company of four **Public Sector Enterprises (PSU)** of **Ministry of Power, Govt. of India**



A Maharatna Company



रूरल इलेक्ट्रीफिकेशन कारपोरेशन लिमिटेड
Rural Electrification Corporation Limited
(भारत सरकार का उद्यम / A Government of India Enterprise)



पावरग्रिड
Power Grid Corporation of India



A Public Energy Service Company (ESCO) under Ministry of Power



100% share holding with Public Sector Enterprises



Established in the year 2009



Board of Directors represented by Ministry of Power and Stake holding companies

Programs

Milestones

Programmes

Milestones



Energy Efficiency Business



Residential

UJALA
*Unnat Jyoti by
Affordable LEDs for All*

1

36.73 crore LED bulbs, **72.14 lakh** LED Tube lights and **23.44 lakh** Energy efficient fans distributed



Public
Infrastructure

SLNP
*Street Lighting National
program*

2

1.17 crore LED street lights installed with CCMS



Buildings

BEEP
*Building Energy
Efficiency programme*

3

Retrofitting work in **10,423+** **Government Buildings** has been completed

SMNP
*Smart Meter National
Programme*

4

16.52 lakh smart meters installed



Agricultural

AgDSM
*Agricultural Demand
Side Management*

5

76,222 Agriculture pumps replaced with efficient BEE star rated Pumps.

MEEP
*Municipal Energy
Efficiency program*

6

Agreement for **IGEA with 25 States/UTs**. IGEA report submitted for 390 cities



Clean Energy Business



Public Infrastructure

AJAY
Atal Jyoti Yojana

7

1.5 lakh Solar LED Street Lights Installed



Decentralized Solar

8

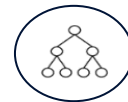
131 MWp of solar power Projects Installed/ Commissioned



Solar Study Lamps

9

61+ lakh solar study lamps distributed



Trigeneration

10

Project under Implementation with M&M, Ready pipeline of more **than 40 MW**.



Green Transportation



Electric Vehicles

National E-
Mobility
Programme

11

1,514 e-cars deployed/under deployment; **470 AC & DC Captive chargers installed**

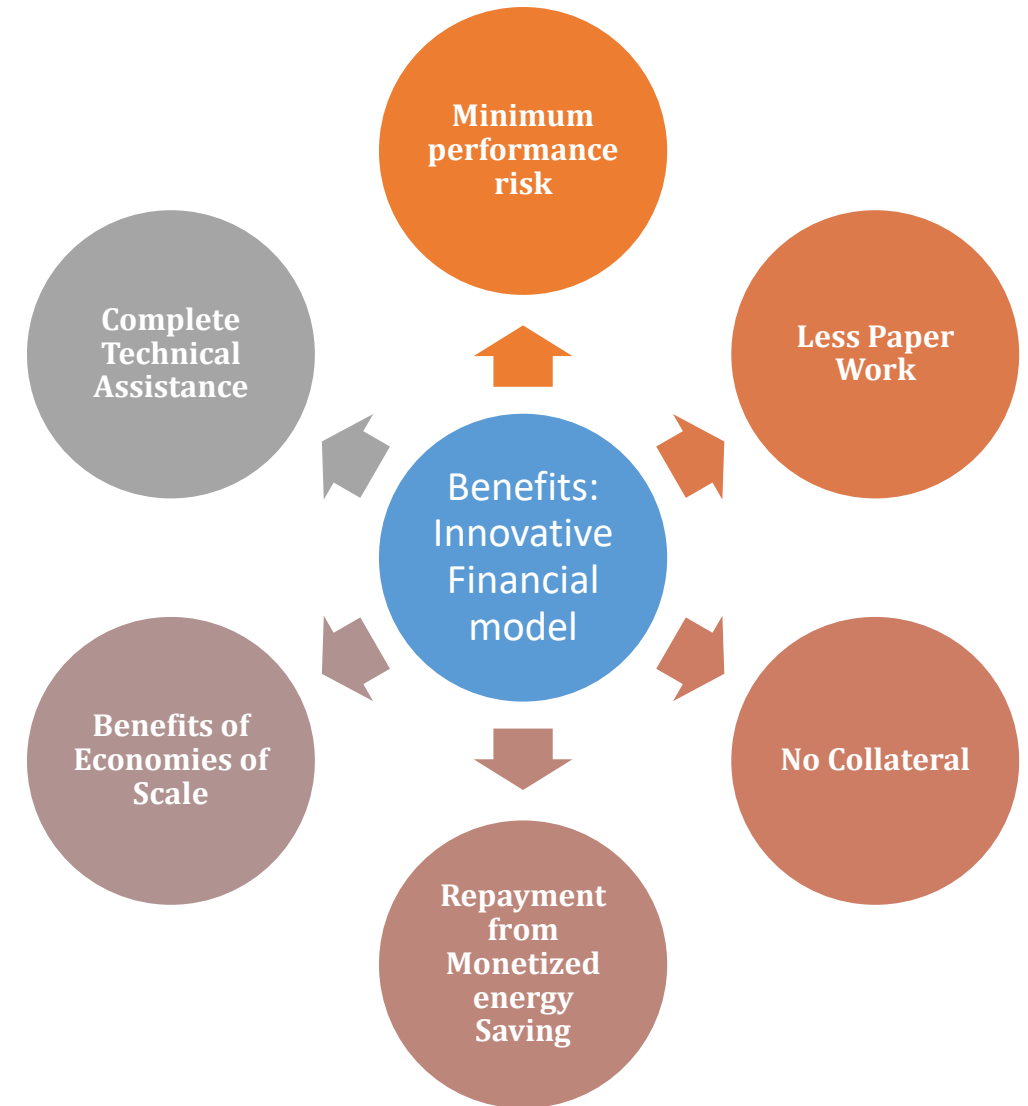


Public Charging
Infrastructure

66 public charging stations installed

EESL's Business Model

- Take the upfront **risk of performance** for end consumers/ users
- **Assure** end users of Pay As You Save (**PAYS**)
- **Innovative** risk allocation of **procurement, installation, service and maintenance**
- **Aggregate demand**
- **Bulk procurements** to **leverage economies to scale**
- Passing on the benefits to end users for more demand aggregation– **virtuous cycle**



Energy Efficiency market

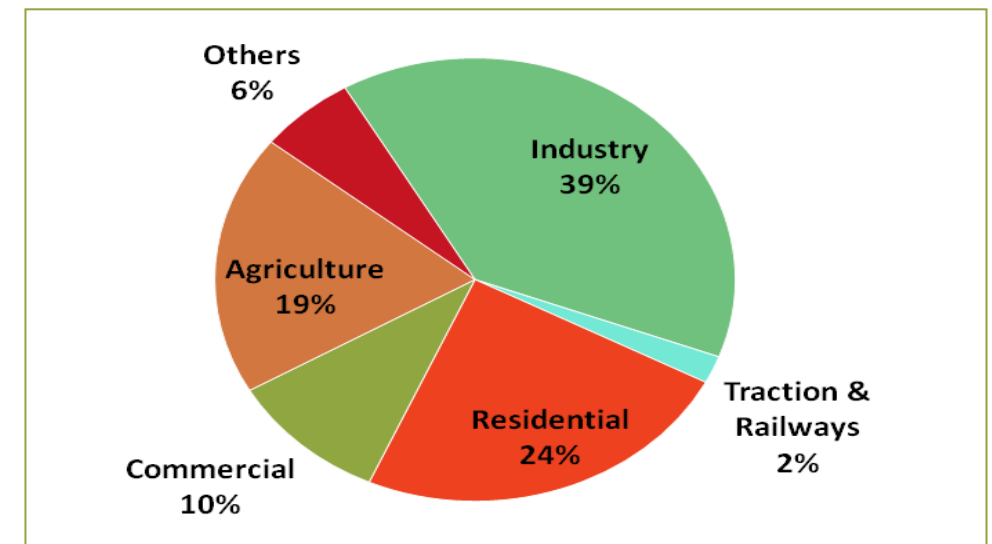
Energy Efficiency Market in India



India

Population : 1.32 billion
GDP : \$ 2.26 trillion
GDP Growth : 7.1% pa
GDP Share : Service Sector (58%)
Industry (25%)
Agriculture (17%)

- 3rd Largest Primary Energy Demand
- 1 / 3rd of World per capita Electricity consumption
- 1 / 13th of US per capita consumption



Strategic Initiatives

Challenges/ opportunities

- Cities accommodate nearly 31% of India's current population and contribute 63% of GDP (Census 2011).
- Urban areas are expected to house 40% of India's population and contribute 75% of India's GDP by 2030

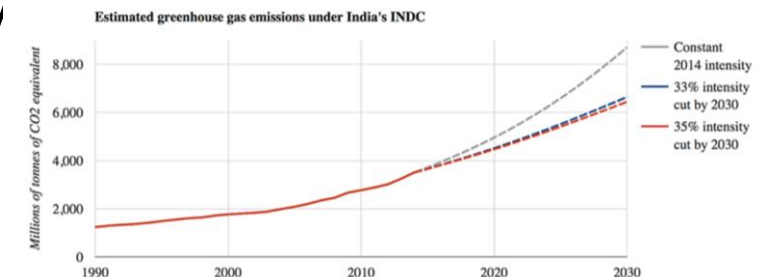
• **3 Missions of NAPCC 2008 and reports of performance of NAPCC**

- National Solar Mission: 100 GW Solar power target by 2022
- National Mission on Enhanced Energy Efficiency
- National Mission on Sustainable Habitat: Smart city mission, HRIDAY and AMRUT scheme

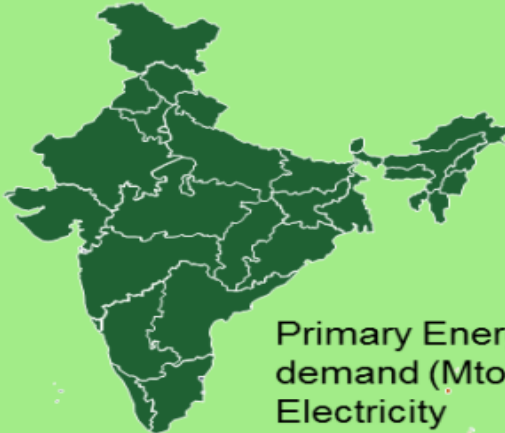
• **Report of the Expert Group on Low Carbon Strategies for Inclusive Growth: (2014)**

• **India's Intended Nationally Determined Contribution (INDC):**

- 40% of electric power installed capacity from non-fossil fuel by 2030, 175 GW renewable power by 2022
- 20-25% reduction in Emission intensity of GDP by 2020 compared to 2005 levels
- Emission reduction target of 3.59 billion tonnes of CO2 equivalent over B
- Emphasis on Sustainable Development, Climate Justice & Lifestyles



India's energy demand in 2016-17



Primary Energy demand (Mtoe): **790**
Electricity Demand (BU): **2261**

Energy saving potential by 2031



Total Energy Saving Potential of ~ **87 Mtoe (1010 TWh)**



Industrial & MSME sector: Maximum potential among the demand sectors, with **47 Mtoe (11%)**

Emissions and India's NDC target



Total emission reduction: **858 MtCO₂e in 2030**



36% reduction in emissions intensity by 2030 as opposed to NDC target of 33-35%

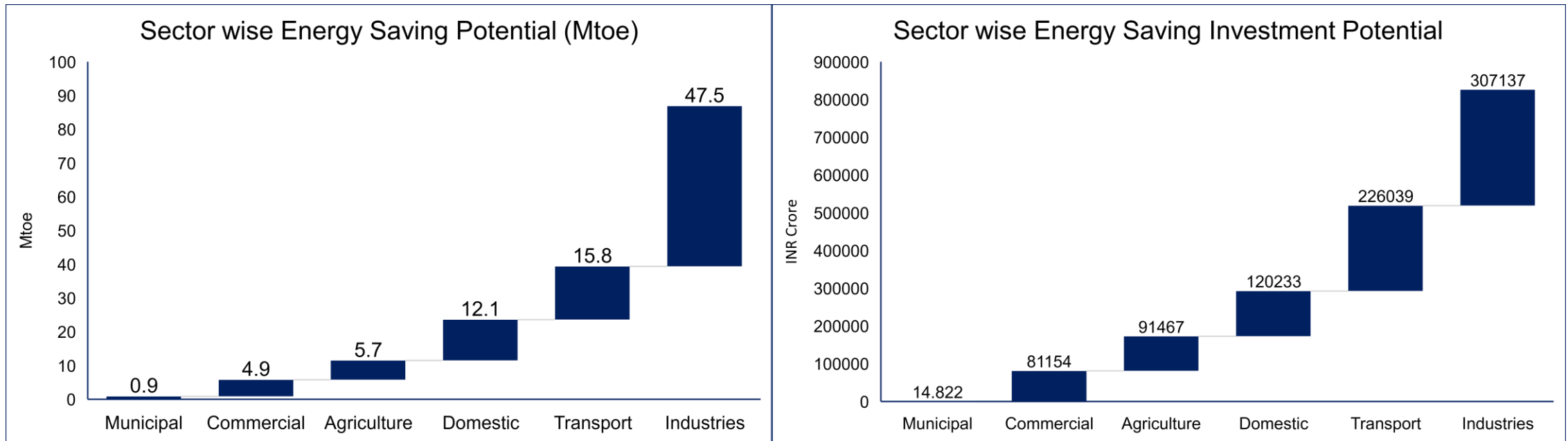
Emission reduction due to energy efficiency: **438 MtCO₂e (50% of total)**



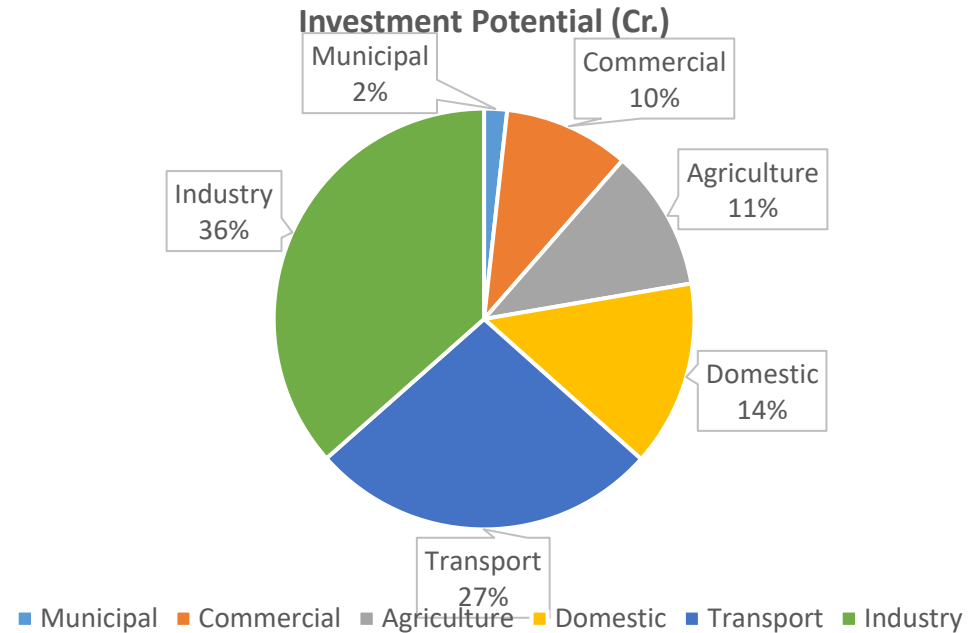
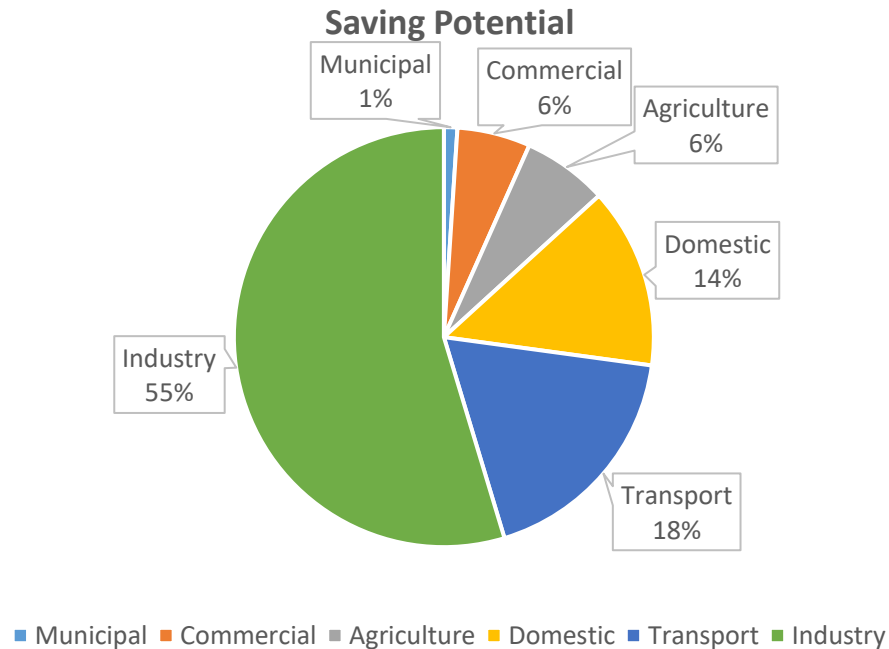
Total energy efficiency investment potential of **8.40 lakh crore by 2031**

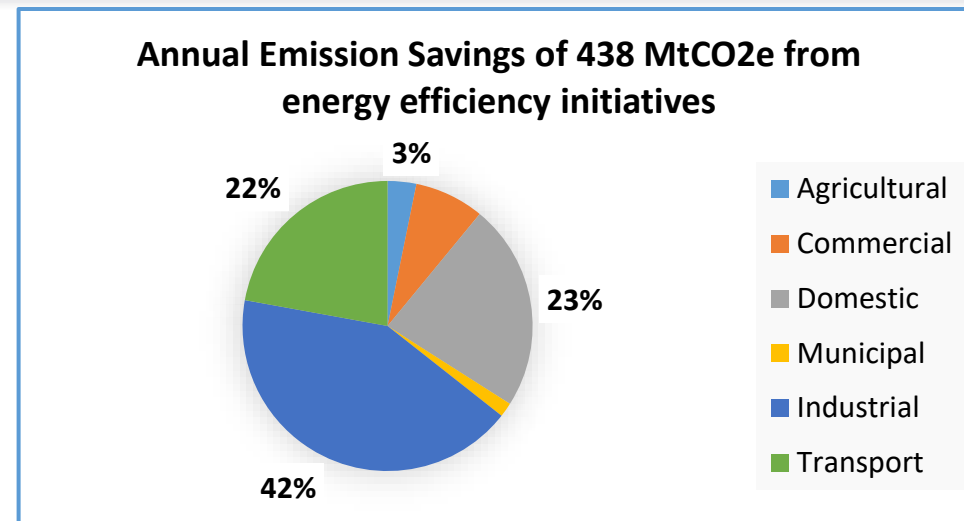
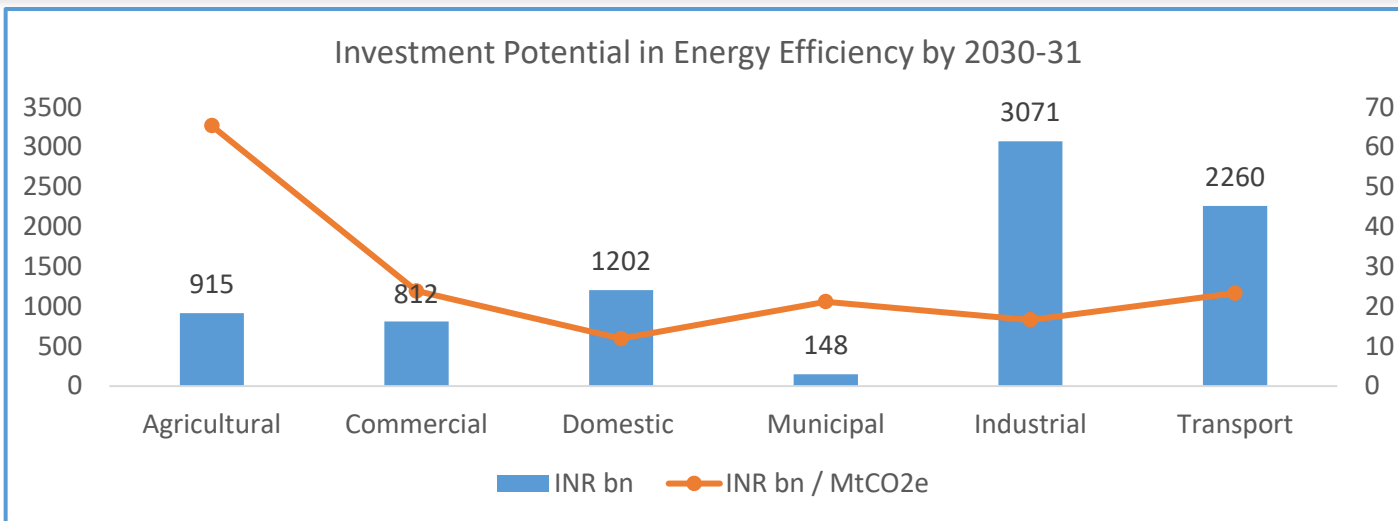
Energy Efficiency Market in India

- 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: INR 8409 billion by 2031



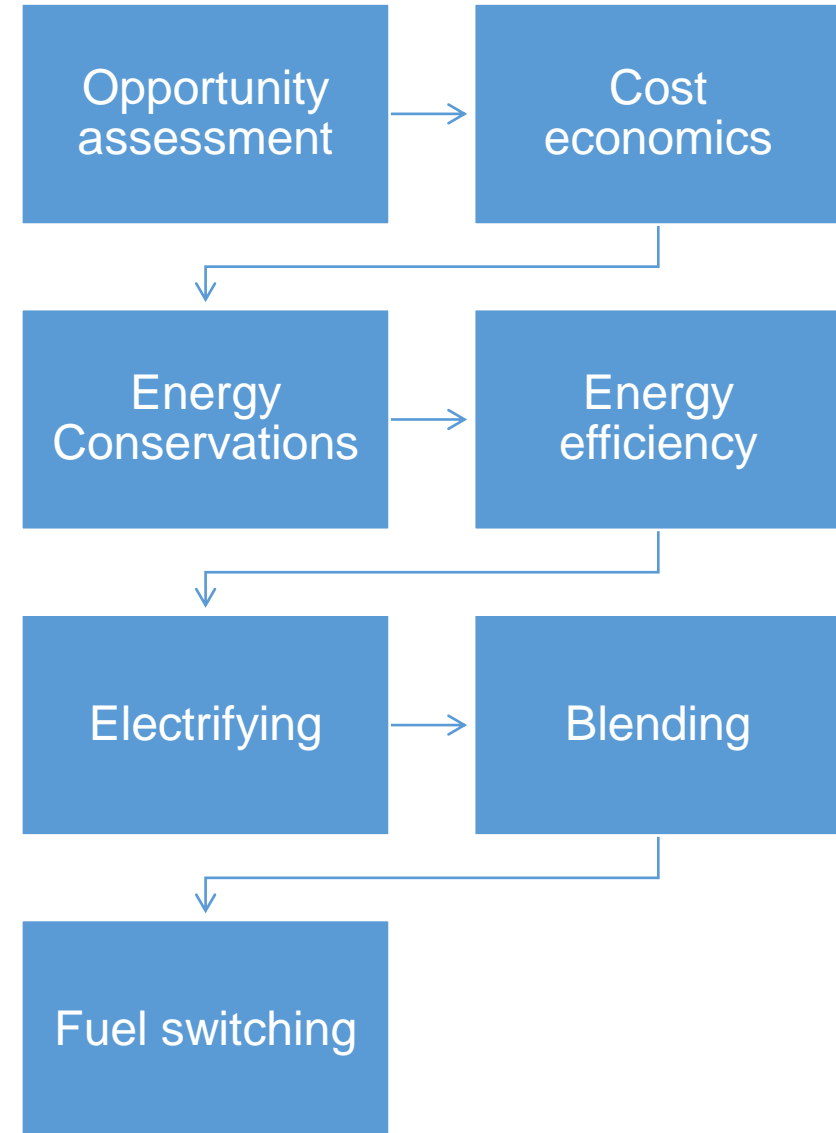
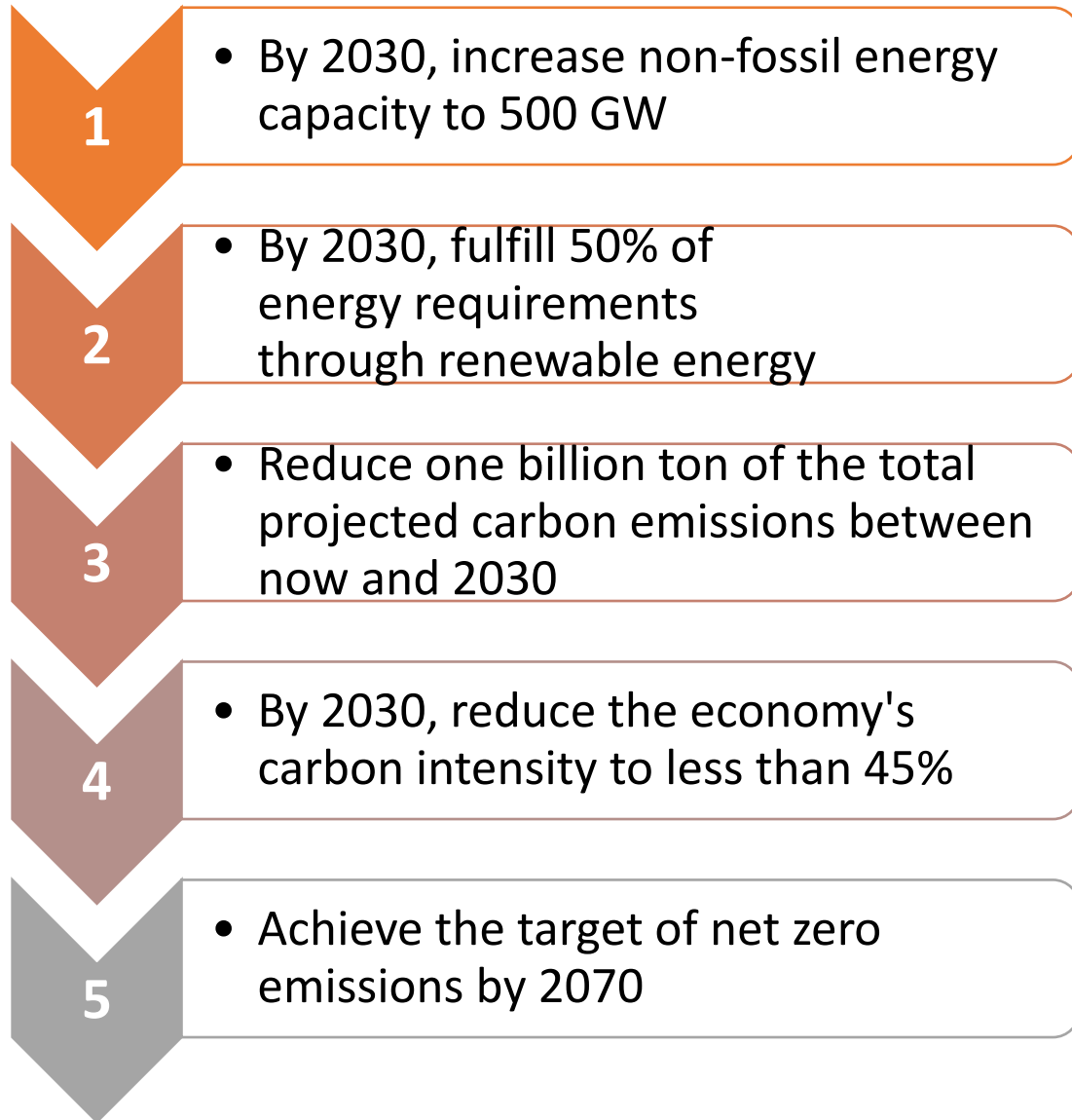
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- To achieve its NDC targets, India needs to reduce its annual emissions from all sources by **1000** MtCO₂e by the year 2030-31
- By 2030-31, annual emission reduction from energy efficiency measures is estimated at **438** MtCO₂e
- To enable this reduction, the estimated investment potential is **INR 8,409 billion** by 2031, largest requirement of INR 3,071 billion in Industry (36%)
- On overall basis, for every million ton of reduction in CO₂ emissions an investment of **INR 19.2 bn** is required
- Domestic and Industrial segment are the most economic avenues for reducing emissions requiring lower upfront investment/ MTCO₂
- Industrial Segment is the most critical segment:
 - Represented 63% of Total Energy Demand in 2016-17
 - To contribute 55% of total energy savings and 42% of total reduction in annual emissions by 2031

Panchamrit and carbon neutral pathways



Energy Conservation Bill [2022] Amendment **CARBON TRADING** provisions:

- The Bill [passed in Aug. 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.
- 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.

Opportunities in cooling sector (DES)

(Identified under EESL OECC study)

Cooling need: A developmental need!

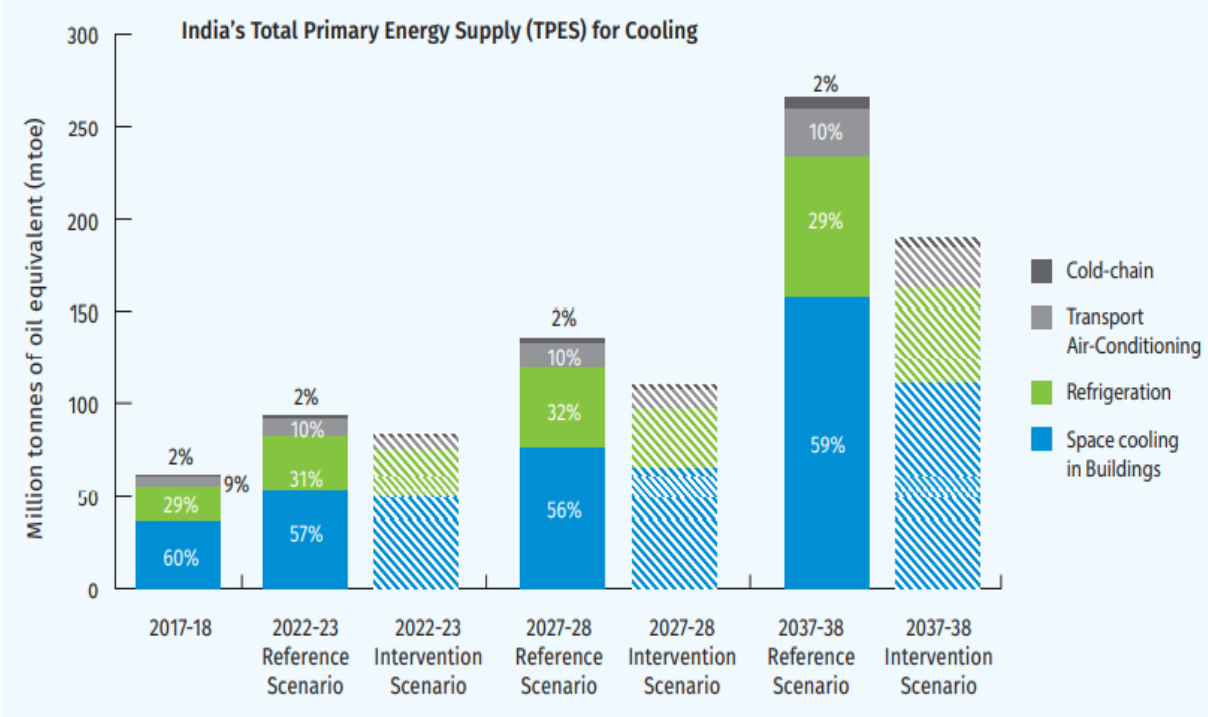
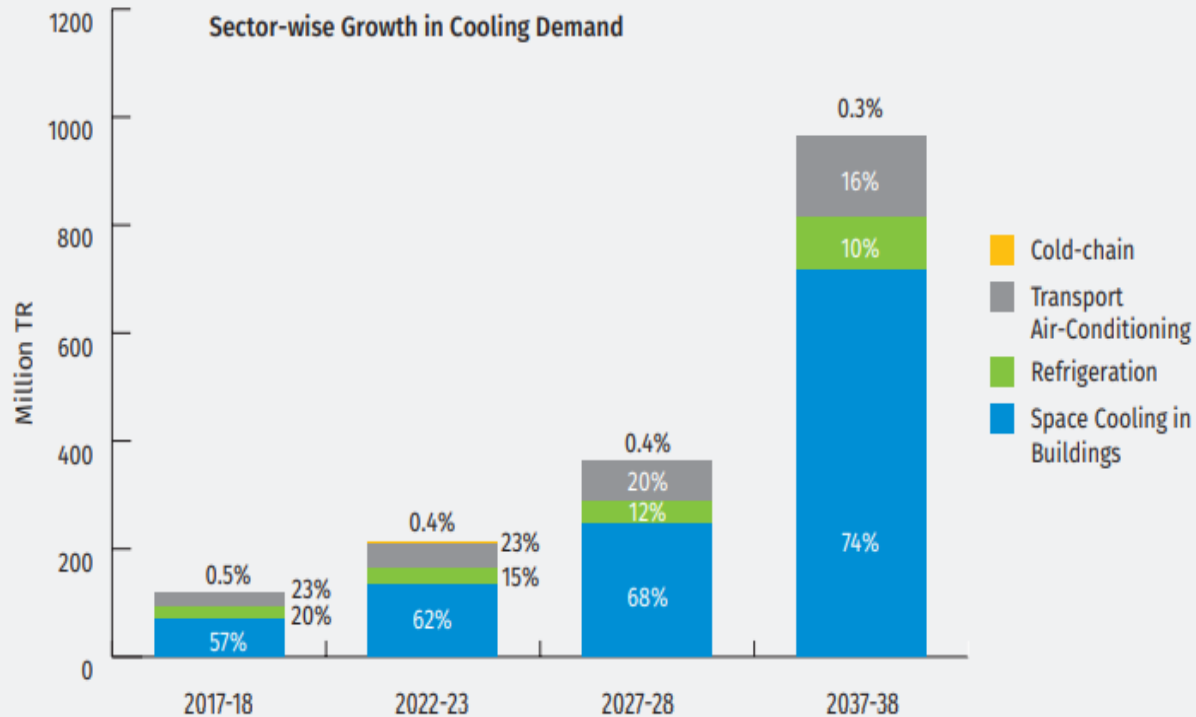


Emphasis on Sustainable Development, Climate Justice & Lifestyle: INDC

ICAP targets (2037-38) :

- reduce cooling demand : 20% to 25%
- reduce refrigerant demand: 25% to 30%
- Reduce cooling energy requirements: by 25% to 40%

- Cooling demand 8 times, building sector cooling demand 11 times,
- Continued growth in building construction, rate of urbanization, and improved lifestyle and aspirations



The TPES requirement for cooling is expected to grow nearly 4.5 times in 2037-38 under Reference Scenario, over the 2017-18 baseline. Under Intervention Scenario this requirement can be reduced by up to 30%

LIGHT TOUCH



- 7 cities supported and 5 city rapid assessments published (Bhopal, Coimbatore, Pune, Rajkot, Thane)
- Methodologies and tools developed and made for all cities
- Supported Chennai & Surat under GEF Sustainable Cities Impact Programme

PILOTS

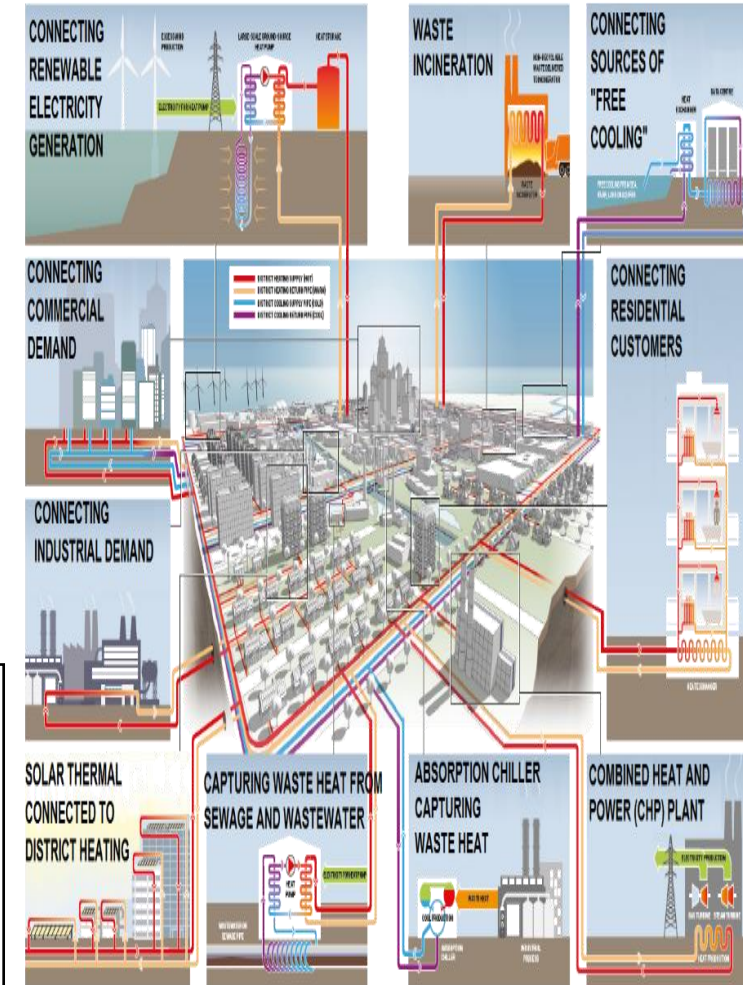


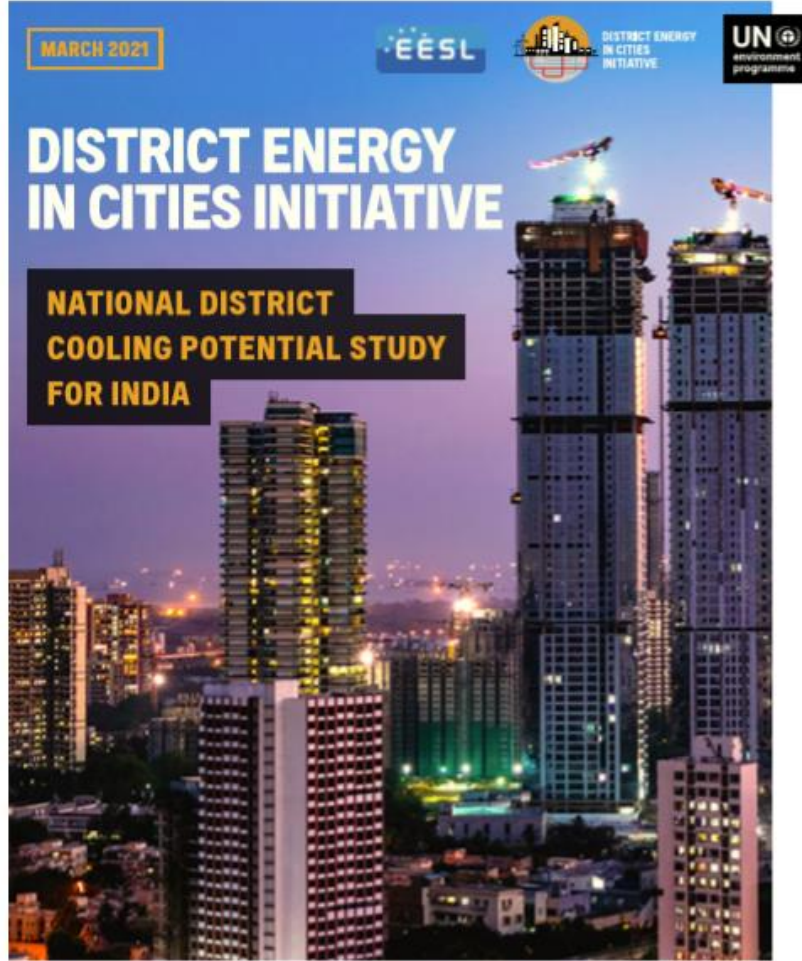
- Amaravati, Hyderabad Pharma City, Rajkot and Thane currently supported as pilot cities. Exploring Gujarat as a pilot state
- Technical, financial and legal support for pilot projects
- Support for long-term planning on district cooling and policy development
- Capacity building, energy mapping, Monitoring and Reporting framework

NATIONAL



- EESL national coordinator
- National potentials study for district cooling published
- Global and country-level Virtual Platform
- Technical assistance being established as support to NIUA
- Proposed policy frameworks, financial mechanisms (GEF-7 proposal made)

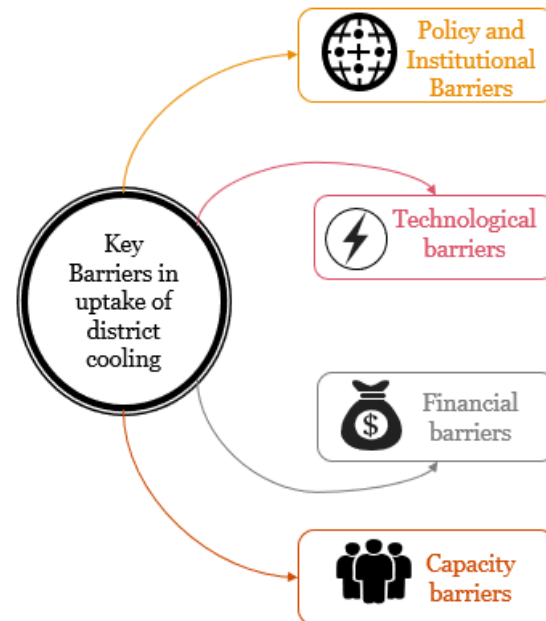




new space cooling demand in India connect to district cooling:

51 million TR ± 15%

(If developed: reduce 25GW of peak power demand; 27 million tCO₂; 4361 tonnes of refrigerant and save 32 TWh of energy annually)



Potential Savings in Nutshell with optimistic scenario by year 2037-38

~ \$35 Bn

Investment potential (Billion dollars) to set up 274 District Cooling plants by 2037-38

~ 7850 GWh

Annual Energy Savings

~ 6100 MW

Energy Demand Savings

~ 6.6 Mn tonnes

Annual CO₂ emission reduction

~ 1068 tonnes

Refrigerant Savings

~ 78850 mn Ltr

Potable water savings

~ \$10.5 Bn

Investment savings from infrastructure on power plant, city transformers, cables, water supply system etc.

- Lack of promotion at national and state level urban development programs/schemes
- Lack of policy drivers like Act, codes, electricity tariffs, fiscal instruments, contracting and leasing arrangements;
- Design risks like under or over projected loads
- Insufficient research and case studies in India
- Lack of mapping of underground utilities and reserving space
- Higher capital investment requirements
- Revenue generation risks due to under or over projected loads
- Lack of skilled professionals to design, operate and maintain
- Lack of awareness among key stakeholders
- Lack of capacity in government sector to develop master plans with integrating district cooling

DES updates

- EESL UNEP signed SSFA on DES 2018
 - National Project Steering Committee (Co-Chaired by MoEFCC & BEE:
 - UNEP-EESL conducted Rapid assessment study on DES
 - Conduct National District Cooling potential study
 - Part on ICAP, HCFC Phase-out Management Plan (HPMP-I/II)
- 7 cities supported and 5 city rapid assessments published (Bhopal, Coimbatore, Pune, Rajkot, Thane)
 - Methodologies and tools developed and made for all cities
 - Can support Chennai & Surat under GEF Sustainable Cities Impact Programme
 - Seeking cofinance and collaboration to support all light touch cities
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- **India Japan Vision Statement 2018: Partnership for global action**
 - Strengthening environmental partnership on climate change and wastewater management
 - Finalizing the work programme for implementation of Paris agreement and accelerate further consultations for establishing the Joint Crediting Mechanism
 - Strengthening cooperation on sustainable and clean form of energy: renewable energy, hydrogen-based energy
 - Japan India Energy Transition Cooperation Plan
 - **Collaborate on energy efficiency, energy storage, manufacturing of eco-friendly vehicles including hybrid and electrical vehicles**
 - Member of International Solar Alliance

Terms of Reference of the study:

EESL conducted study on DES opportunities under JFJCM
Objective of the study under the OECC study (December 2020).

- **Identification of potential JCM project in India**
- **Identification of potential JFJCM project**

Conduct a study on district cooling systems in India to:

Identify the opportunities to introduce district cooling systems in India with a view to contribute to improving energy efficiency in industrial and commercial zones



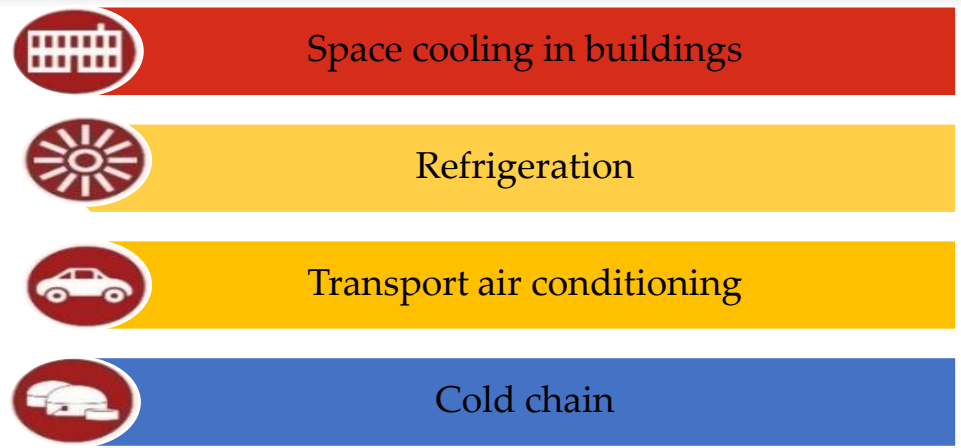
一般社団法人 **海外環境協力センター**
Overseas Environmental Cooperation Center, Japan

Assess whether the said identified opportunities can be developed into the ADB-financed project with support from the JFJCM.

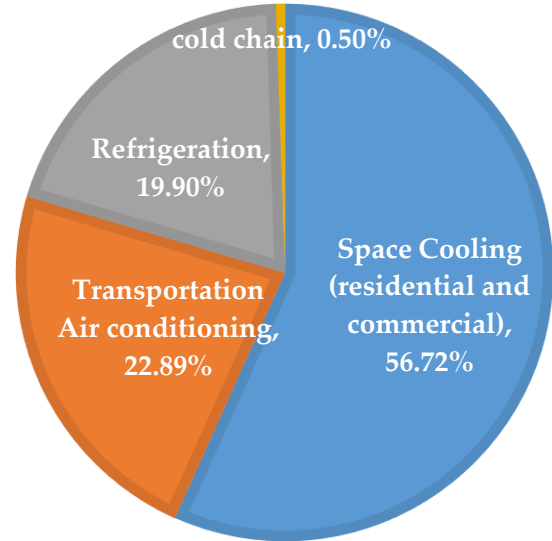
The brief study on district cooling systems in India has been made under the assignment

Cooling Demand Potential as per ICAP

- ❑ The urban population of the country is expected to grow from 410 to 814 mn from 2014 till 2050 (census data).
- ❑ India is going to be the largest consumer of space cooling in the world with space cooling potentially responsible for **28% of electricity demand** and **44% of the peak load**.
- ❑ The building sector is the biggest consumer of energy and accounts for approximately **57%** of the total cooling demand (ICAP).
 - ❑ Dominated by air-conditioning systems used for space cooling.
- ❑ This clearly depicts a rise of nearly **5.3 times** in the **electricity consumption by chillers** in the coming two decades.

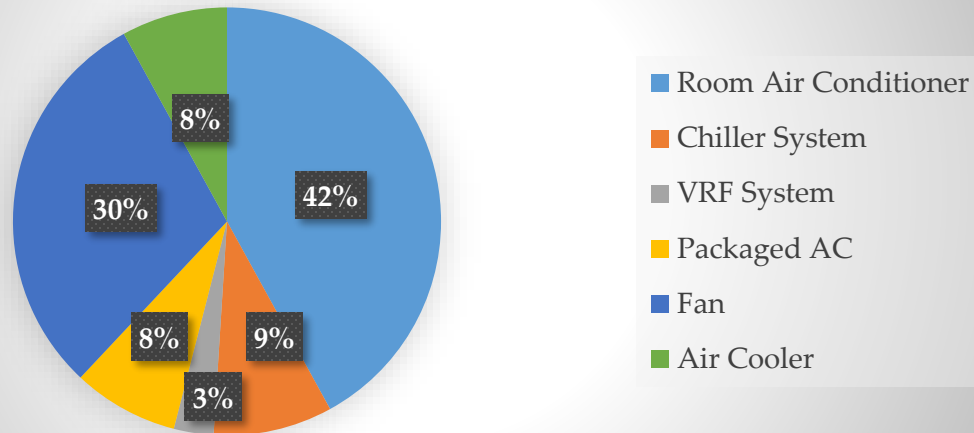


SHARE OF COOLING DEMAND (2018) (IN TERMS OF ENERGY)



Breakup of Existing Cooling Demand

2017-18 - 135000 MWh



❑ Room air conditioners hold a dominant share of the sector's cooling energy consumption – at 42%

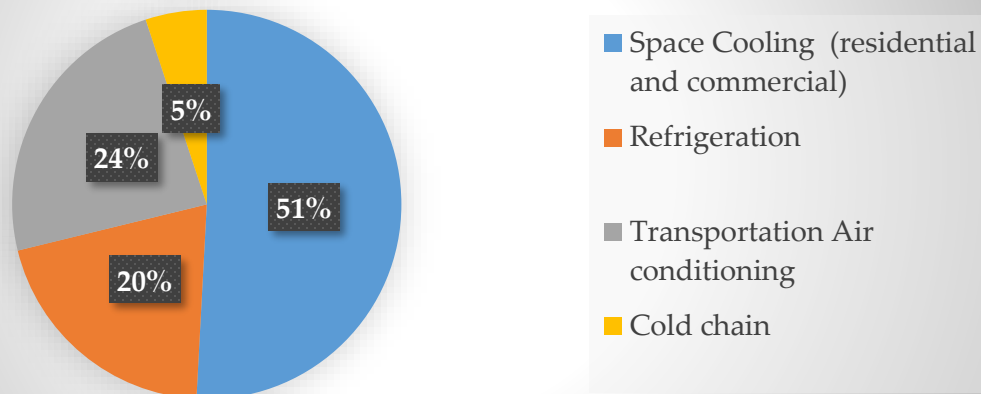
❑ The consumption in the commercial sector, which comprises of Chillers, VRF (already being used in high end residences also apart from commercial buildings) and packaged AC is currently at 27000 GWh

❑ Energy efficiency in room air conditioner segment is already targeted through the following initiatives:

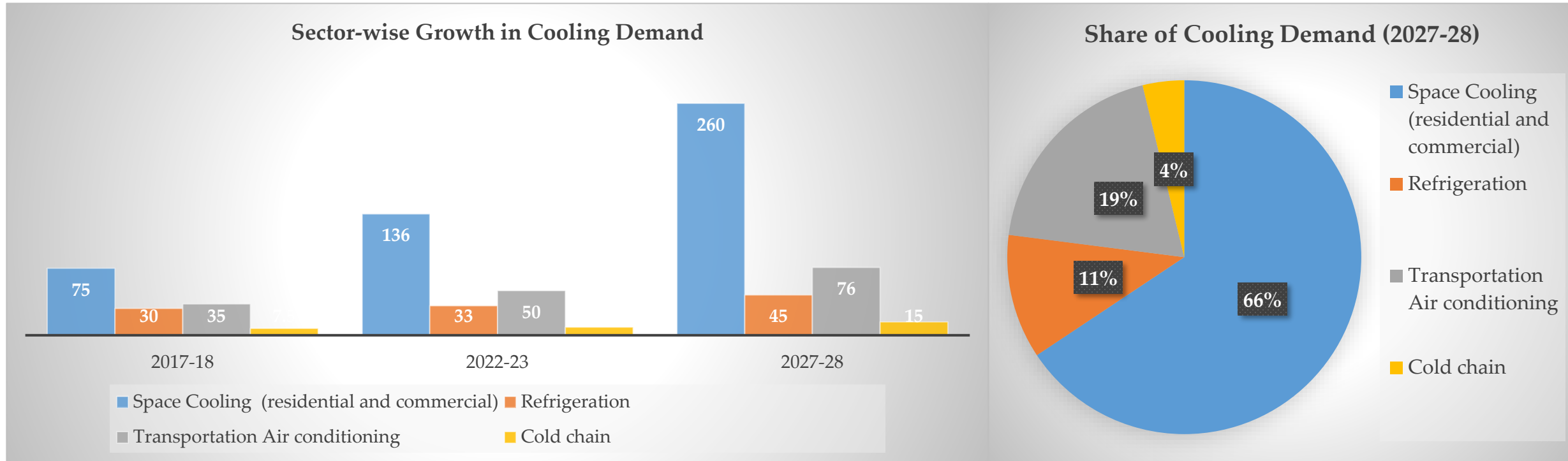
❑ *Standard and labelling programme of Bureau of Energy Efficiency (BEE) for fixed as well as variable speed air conditioners*

❑ *SEAC programme of Energy Efficiency Services Limited for promoting super-efficient and climate friendly air conditioners*

Share of Cooling Demand (2017-18) in (mn TR)



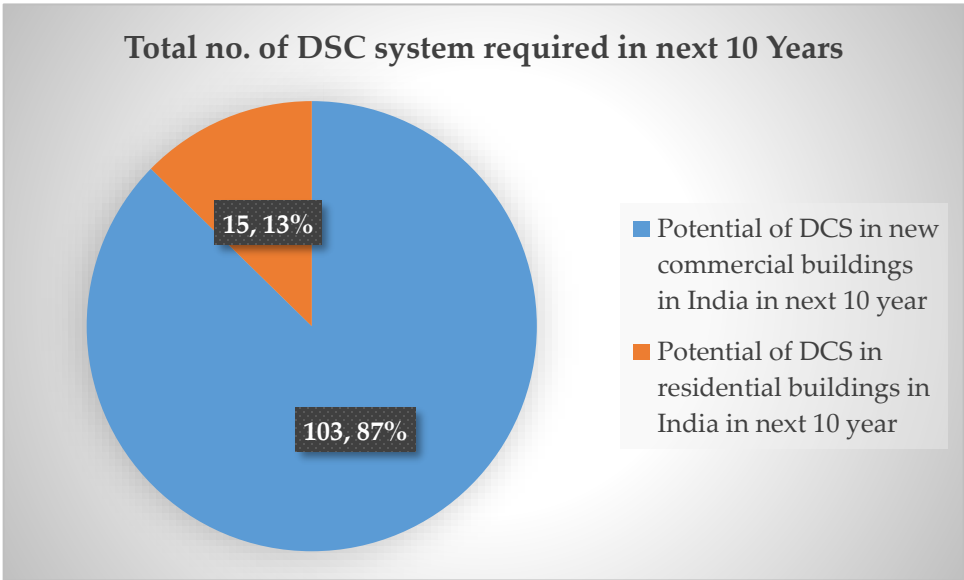
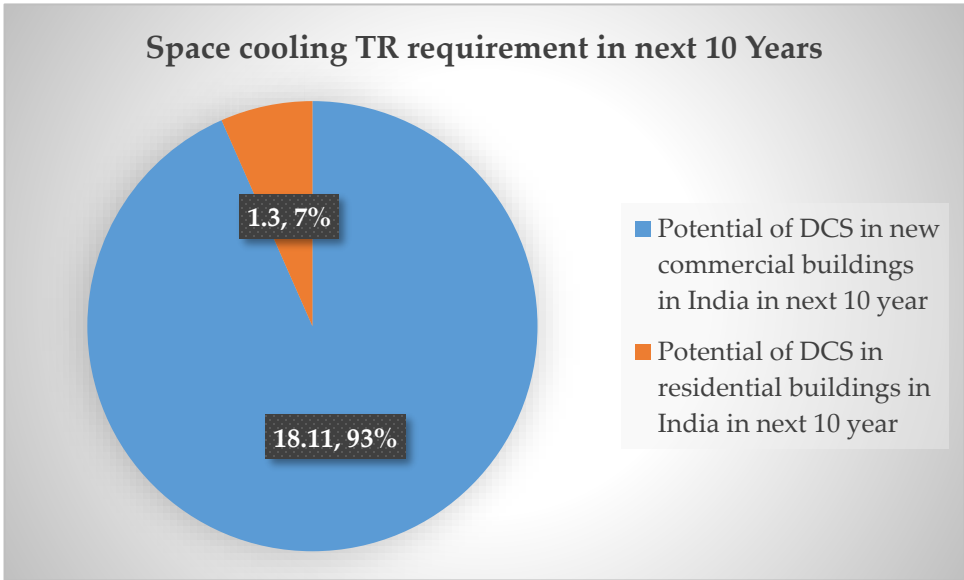
Projection of growth in cooling demand



- ❑ The space cooling demand is going to rise by 3.46 times from the year 2018 to the year 2028 (ICAP).
- ❑ It was observed that the national cooling demand for space cooling, in commercial buildings, lies in the range of 260 mn TR \pm 25%, by year 2027-28.
- ❑ However, it is to be noted that a considerable percentage of space cooling demand can be tapped/catered by DCSs in India.

DCS Potential

Parameters	Tier-1 cities (12 cities)		Tier-2 city (9 cities)		Total, 21 cities	
	Cooling requirement, (mn TR)	DCS plants	Cooling requirement (mn TR)	DCS plants	Cooling requirement (mn TR)	DCS plants
Potential of DCS in new commercial buildings in India in next 10 year	3.40	84	83.77	20	18.11	103
Potential of DCS in residential buildings in India in next 10 year					1.3	15



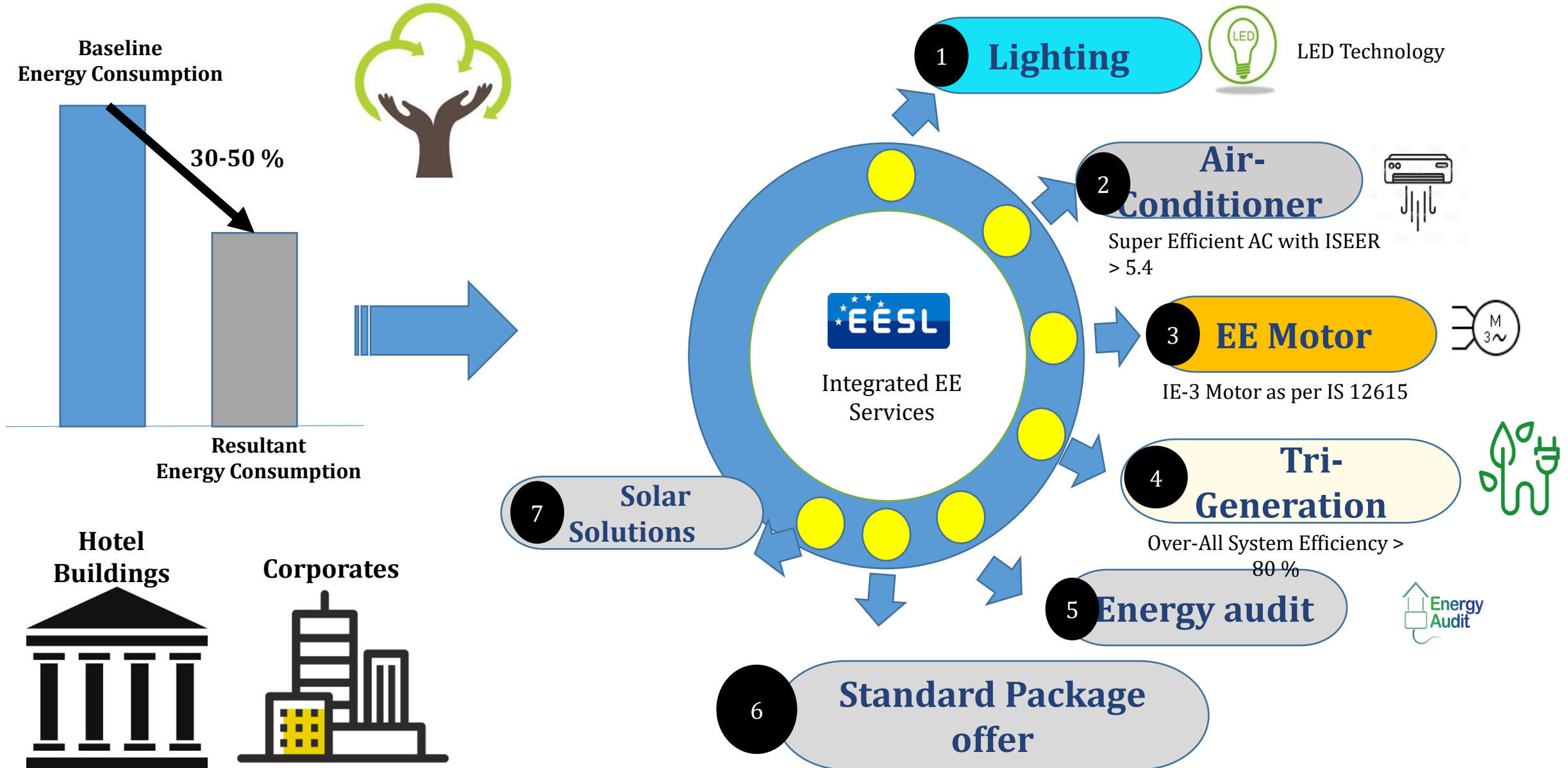
Investment potential of DCS in next 10 years

- ❑ Number of District cooling plants is approximately 118 nos.
- ❑ Investment potential is about 13.5 Bn \$
- ❑ Annual Energy Saving 2964 GWh
- ❑ CO₂ emission reduction 2520 Mn Kg
- ❑ Potable water savings in cooling tower make up water 29755 mn liters

Major DCS projects in India

- ❑ GIFT City, Ahmedabad – 180,000 TR capacity
- ❑ DLF cyber city (trigeneration based) – 78,000 TR capacity
- ❑ Delhi Airport – Approx. 20,000 TR capacity
- ❑ Mumbai Airport – Approx. 20,000 TR capacity
- ❑ Chennai Airport – Approx. 12,000 TR capacity
- ❑ Kolkata Airport – Approx. 12,000 TR capacity
- ❑ Dhirubhai Ambani Knowledge City, Navi Mumbai- Approx. 12,000 TR capacity
- ❑ Infosys (various campuses) – Approx. 50,000 TR (approx.)
- ❑ Pragati Maidan, Delhi - Approx. 12,000 TR capacity (In Construction)
- ❑ India International Convention Centre, Delhi – Approx. 10,000 TR capacity (In Construction)

EESL's portfolio on industrial energy efficiency



Standard Package Offer

EESL ENERGY EFFICIENCY SERVICES LIMITED
A JV of PSUs under the Ministry of Power



Scheme on

Standard Package Offers On Energy Efficient Solutions For MSMEs

under

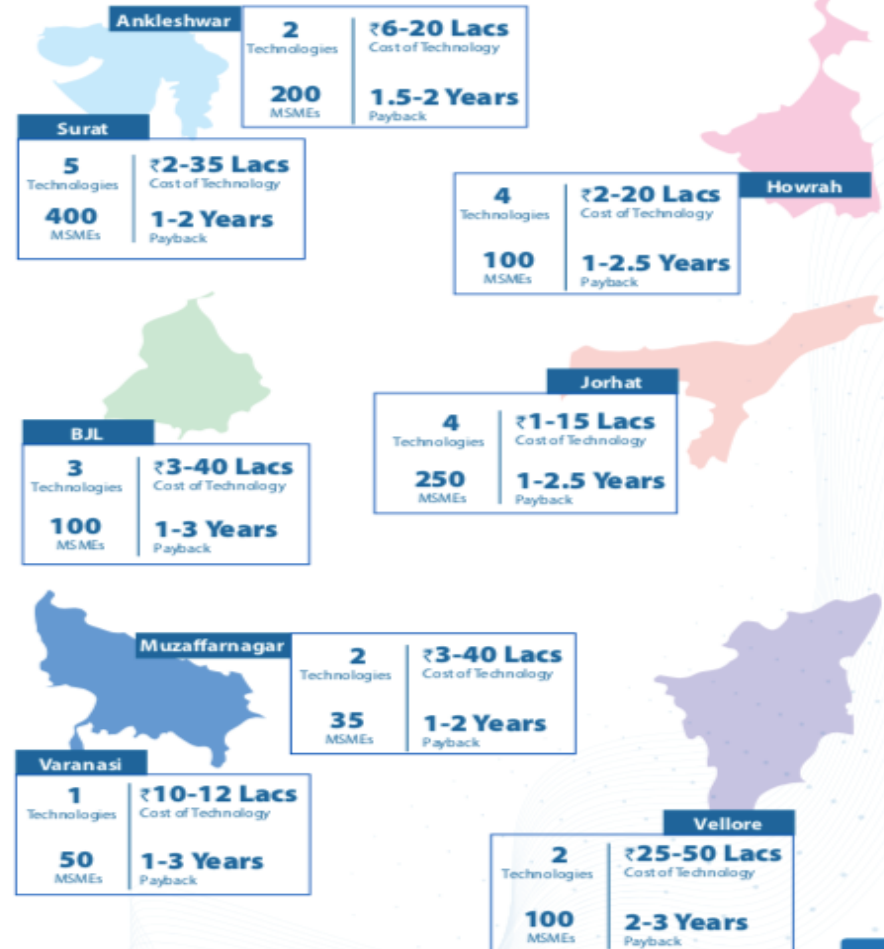
Promoting Market Transformation For Energy Efficiency In MSME Project



Bureau of Energy Efficiency



Package Information



Identified Energy Efficient Technologies (Standard Package Offer)

Textile



- Screw Compressor (PM motor +VFD)
- PLC Automation
- Boiler automation
- Micro Turbine
- Condensate recovery

Chemical



- Scroll Chiller
- Vertical Agitator
- IBR Boiler Agitated Nutsche
- Filter Dryer (ANFD)

Tea



- FRP based Fan
- Modulating Burner
- Dryer Automation
- Weathering automation

SRRM & Foundry



- Metallic Recuperator
- Automation of reheating furnace
- Divided Blast Cupola
- Swirl Burners

Forging



- Induction Billet heater
- Special purpose machine
- Servo Motor

Rice Mills



- LSU Dryer
- IBR Boiler

Paper



- Vacuum Pump
- Direct Driven Agitators

Pharma



- Automatic tube cleaning system
- Electric Vacuum Pump
- Side Stream Filtration
- Mist Cooling Towers

Demonstration of Energy Efficiency Project (DEEP)



- **MoU Date:** 24th March 2022
- **Objective:** To upscale commercialization of innovative EE technologies across PAT sector for designated consumers
- **Offerings:**
 - **Phase I:** Undertake projects in 27 facilities for 8 innovative technologies
 - **Phase II:** Upscaling of technologies for market transformation
- **Project Fund allocation (INR 63.99 Cr)**
 - **Demo Stage:**
 - **Upscale:**
 - **Tenure:** 1 year
- **Financial Model:** Upfront payment through BEE funds and DC contribution

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DEEP	Micro-turbine			Efficient Compressor			Turbo Blower			LG Waste Heat Recovery			Total (4 tech)		
	EoI	Feasible Project	Feasible Equipment	EoI	Feasible Project	Feasible Equipment	EoI	Feasible Project	Feasible Equipment	EoI	Feasible Project	Feasible Equipment	EoI	Feasible Project	Feasible Equipment
Aluminium	1	0	0	2	1	1	1	0	0	0	0	0	4	1	1
Cement	2	0	0	15	12	39	4	3	5	5	0	0	26	15	44
Chlor Alkali	1	1	4	1	1	1	0	0	0	0	0	0	2	2	5
Fertilizer	1	0	0	1	1	1	1	1	1	0	0	0	3	2	2
Iron and steel	3	0	0	5	5	11	2	1	1	1	1	5	11	7	17
Petrochemicals	0	0	0	3	1	1	1	1	2	1	1	1	5	3	4
Pulp and paper	2	2	2	1	0	0	0	0	0	1	1	1	4	3	3
Refinery	1	0	0	1	1	3	0	0	0	0	0	0	2	1	3
Textiles	3	2	4	8	4	7	3	2	7	4	4	4	18	12	22
Thermal power plant	2	2	3	3	2	10	0	0	0	0	0	0	5	4	13
Grand Total	16	7	13	40	28	74	12	8	16	12	7	11	80	50	114

1. High Grade Waste Heat Recovery system (2A1)
 - Scrap Preheating with Electric Arc furnace Exhaust
 - Regenerative Burner for Reheating Furnace
 - Recuperator
2. Cooling solutions from waste heat recovery (2A2)
3. Industrial automation with an objective of energy efficiency improvement along with *Plant Performance Management/ Process Optimisation (3A1)*
4. Inlet air cooling system from waste heat recovery (3A2)
5. IE4 motors with VFD (3A3)



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A JV of PSUs under the Ministry of Power

Girja Shankar

**General Manager & Head CDP
(Corporate Driven Programme)**

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