Bureau of Energy Efficiency

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Ministry of Power

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A Courtyard for Revolutionary Change in Building Energy Efficiency

An International Conference on Building Energy Efficiency

9th-11th September, 2019 | Hotel The LaLiT, New Delhi

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THIS PRESENTATION WAS SHARED BY

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FOR THE SESSION:

"Policy Framework for Energy Efficiency in Buildings (Codes and Standards)"

DURING ANGAN 2019

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Energy Efficiency in Buildings

New Delhi

Introduction

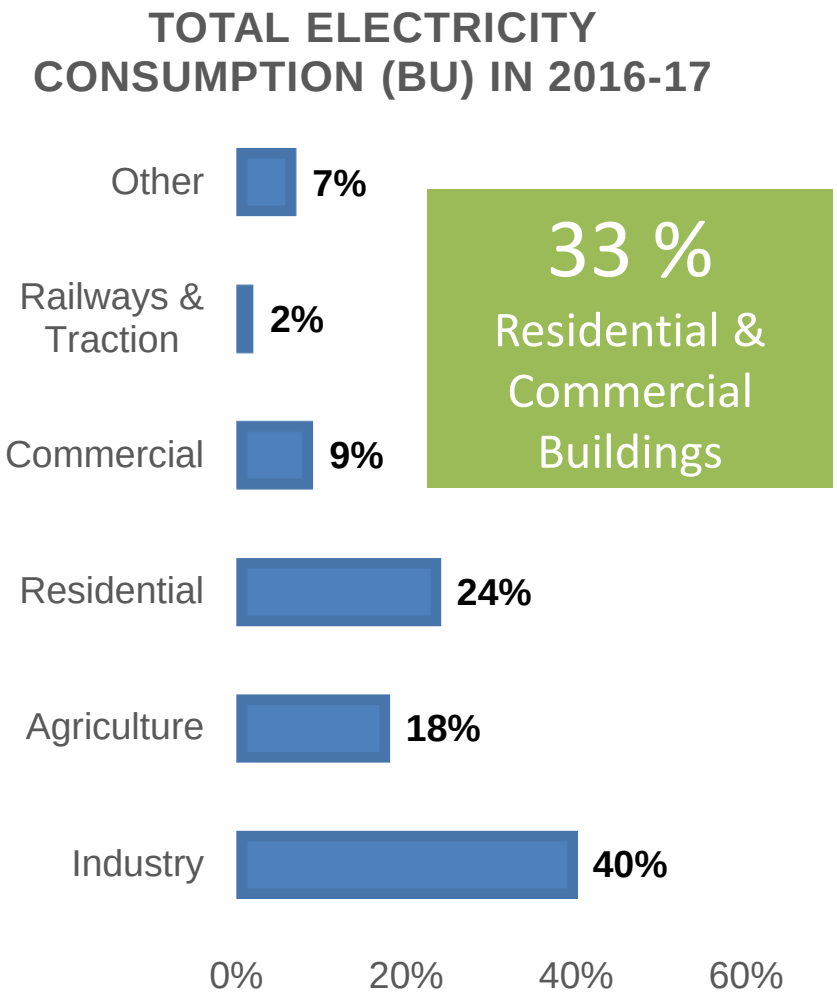
- Established in 2002 under EC ACT - 2001
- To discharge regulatory function on energy efficiency
- Provides the legal framework for promoting energy conservation activities:
  - Standards and Labelling for appliances & equipment
  - Energy Consumption norms for energy intensive industries
  - Demand Side Management (DSM) programme
  - Energy Conservation Building Code (ECBC) for commercial buildings.
  - Certification of Energy Auditors and Managers
- Mission Directorate for National Mission for Enhanced Energy Efficiency (NMEEE)
- Supported by **States Designated Agencies** at State level

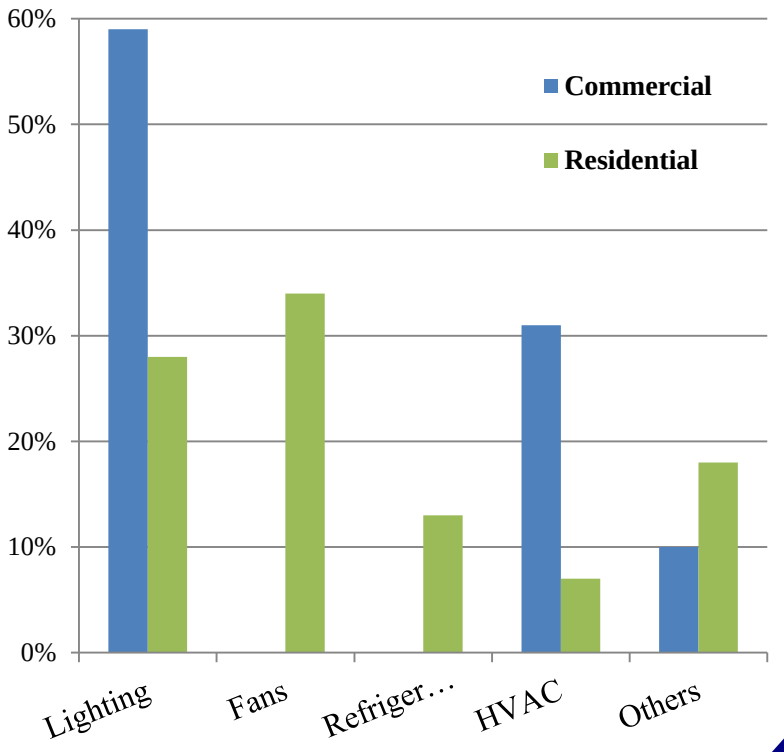
Government of India Initiatives for Buildings

- **Residential Buildings**
  - Eco-Niwas Samhita 2018
  - Energy Efficiency Labelling program
- **Commercial Buildings**
  - Energy Conservation Buildings Codes for New Buildings
  - Super ECBC in States
  - PAT scheme for buildings
  - Labeling of Existing Buildings
  - Energy Efficiency Retrofits in Existing Buildings
  - Energy Efficient Components (Appliances & Materials)
  - Net Zero energy buildings

India's Electricity Scenario

Electricity Consumption in 2016-17=1066 BU





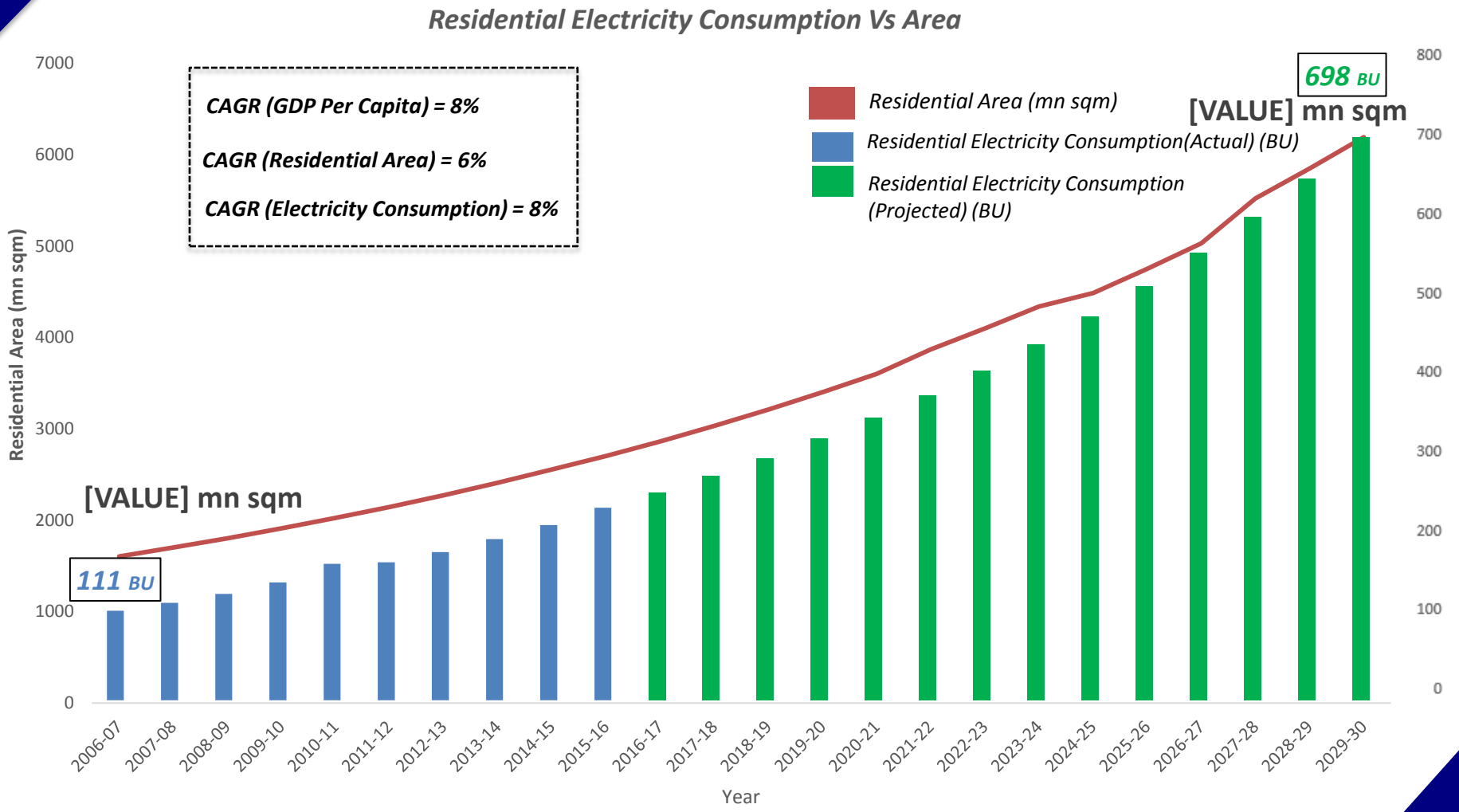
Source: Energy Statistics 2018

Energy Efficiency in Residential Buildings

Background

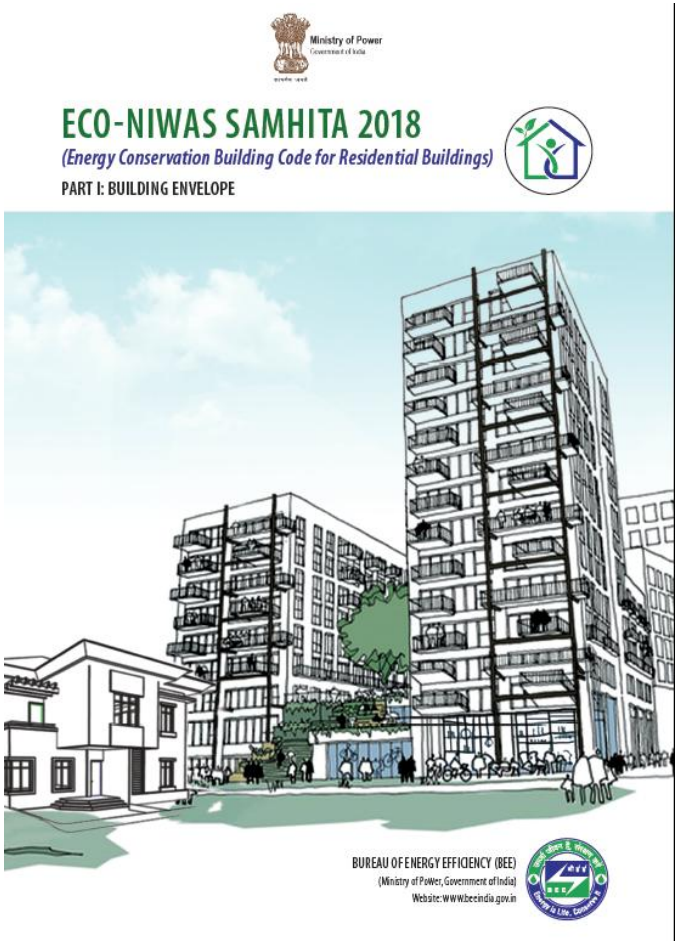
- Residential buildings, today, account for nearly 24% of the total energy consumed.
- Residential electricity consumption has shown rapid increase.
- With increased built-up area and increasing affordability of air-conditioning, residential buildings to become the largest consumer of electricity.
- The residential buildings expected to increase 2 times in terms of floor area by 2030 in India.
- 12 million new affordable homes in urban areas under PMAY (Pradhan Mantri Awas Yojana) by 2022.

Building Sector- Built up area and electricity consumption projection



India will add
3 Billion m2 by 2030 of New residential building w.r.t Year 2018

Eco-Niwas Samhita 2018



The code sets minimum performance standards for building envelope to limit heat gains (for cooling dominated climates) and limit heat loss (for heating dominated climates) through it.

Focus Area

- Eco-Niwas Samhita 2018 aims to improve thermal comfort and reduce energy use in residential buildings.
- The part-I primarily focuses on Building envelope (roof, walls, windows and outside openings)
- Also, it sets minimum building envelope performance standards to
  - Limit heat gains (for cooling dominated climates) and to limit heat loss (for heating dominated climates)
  - Ensuring adequate natural ventilation potential
  - Ensuring adequate daylighting potential.
- Residential buildings built on plot area ≥ 500 m^2 (States and Municipal Corporations can lower this limit)
  - Individual houses
  - Multi-family housing
  - Flats
  - Group Housing

Scope

- **The code applies to (a) 'Residential buildings'** built on a plot area ≥500 m2 and (b) Residential part of 'Mixed land-use building projects', built on a plot area of ≥500 m2.

- **Part I – Building Envelope of ECBC-R focusses on only building design and envelope** and electromechanical system is not considered in Part I. The code gives the following provisions to this effect:

- **Building Envelope (except roof)**

For Four climates	• Maximum value of residential envelope transmittance value (RETV) for building envelope (except roof) applicable for four climate zones namely, Composite Climate, Hot-Dry Climate, Warm-Humid Climate, and Temperate Climate.
For Cold Climate	• Maximum value of thermal transmittance of building envelope (except roof) for Cold Climate zone (U envelope, cold).

- **Building Envelope-Roof**
  Roof: Maximum value of thermal transmittance of roof (U roof) for all climate zones.

Scope

Openable window-to-floor area ratio (WFRop).

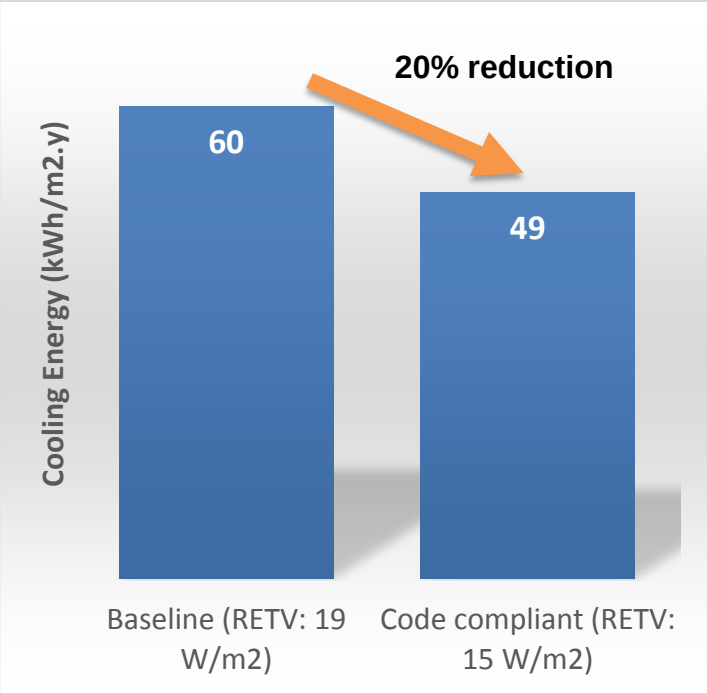
- The code sets minimum building envelope performance standard for adequate natural ventilation potential by specifying minimum openable window-to-floor area ratio (WFRop).

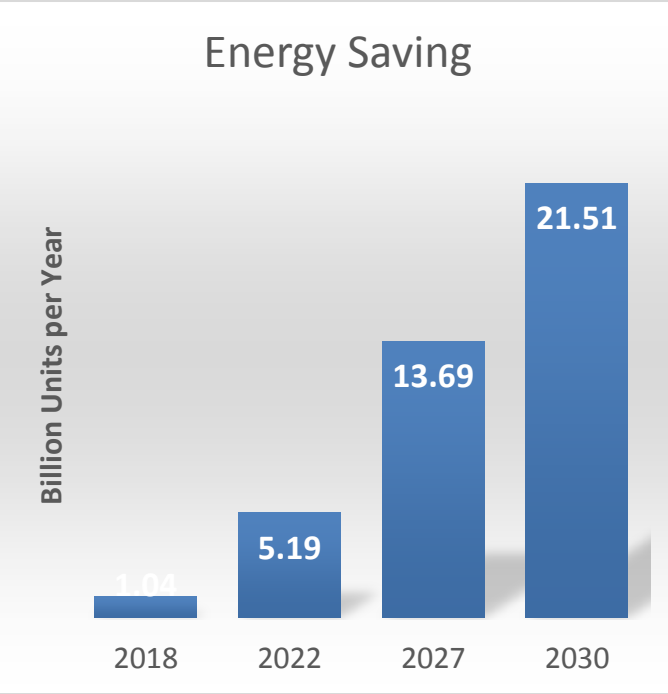
Visible light transmittance (VLT)

- The code sets minimum building envelope performance standard for adequate daylight potential by specifying minimum visible light transmittance (VLT) for the non-opaque building envelope components.

Expected Outcomes

- Approx. 20% saving in cooling energy as compared to conventional building design
- Minimum 125 BU of saving in electricity for period 2018-2030
- Minimum 100 MT of CO2 equivalent abatement for period 2018-2030





Expected Outcomes

Proper design and shading of windows to reduce heat gains, adequate window size for natural ventilation and light weight and good thermal insulation (AAC blocks etc) to reduce heat gains, thus leading to Energy Efficient Homes.

Daylight

Thermal Comfort

Natural Ventilation

Monetary Savings

EE Homes

Energy Efficiency Label for Residential Buildings

- Recently launched on February 26, 2019 by Hon'ble Minister of Power and New & Renewable Energy.
- **Objectives:**

➢ To provide information to consumers for EE Homes

➢ Energy Sustainability for India

➢ To facilitate in meeting the Indian NDC Targets

➢ Market Transformation for Energy Efficiency in each Home

GOVERNMENT OF INDIA
MINISTRY OF POWER

Indicator for the proposed labelling program

- **Indicator : Energy Performance Index (EPI)**
- **EPI = Annual Energy consumption (kWh/yr)/built up area(m2)**

- **EPI Calculation = EPI for AC spaces at 24 degrees set-point (E1) + EPI for other spaces at IMAC NV set-points (E2) and EPI for other appliances (E3) (constant value)**

***E1 and E2 includes following systems**

- Building envelope characteristic
- Lighting system
- Comfort system (AC)

***E3 includes appliances**

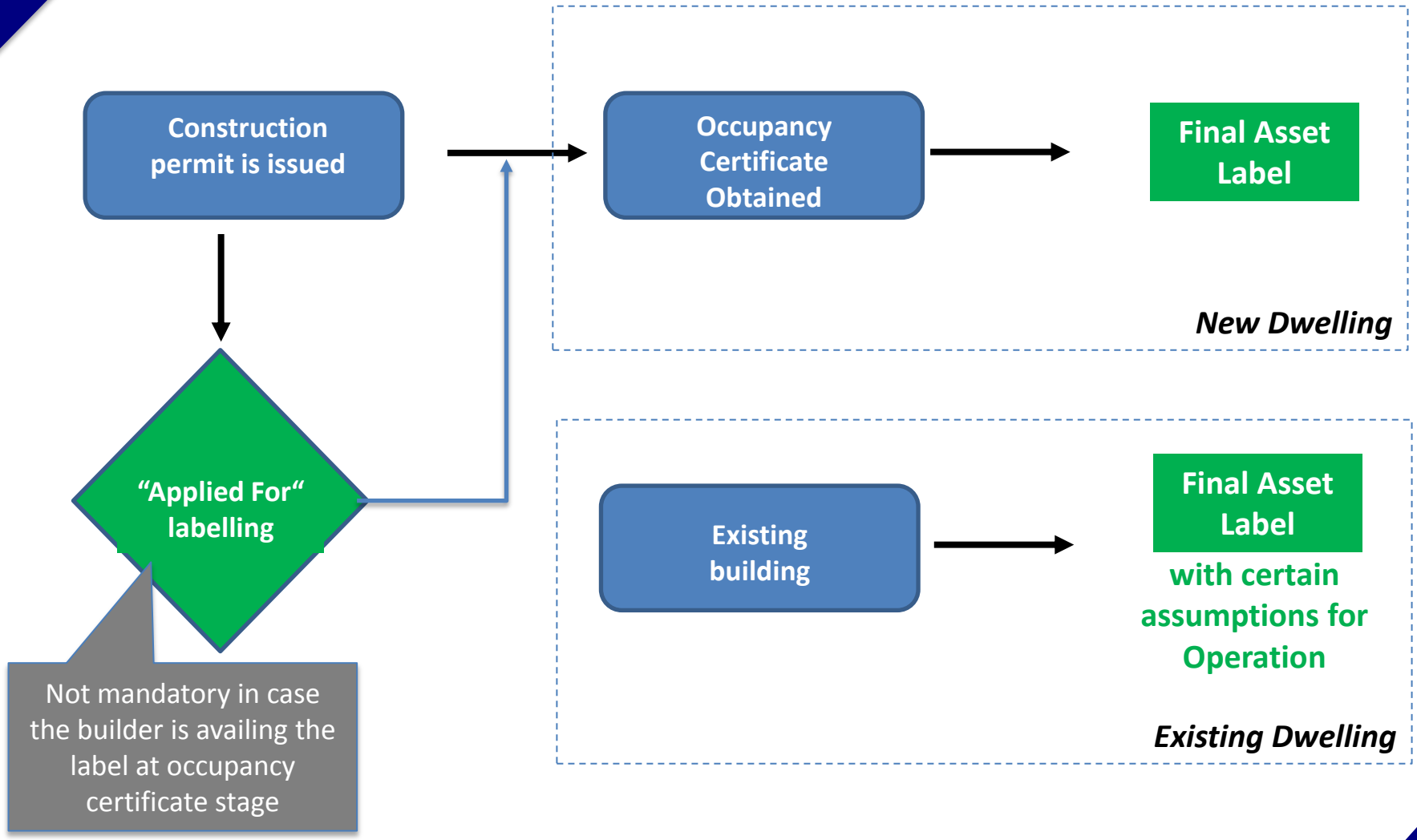
- Microwave oven
- Grinder
- Refrigerators
- TV
- Water Pump
- Washing Machine

Star rating benchmarking

- For Composite, Warm and Humid, and Hot and Dry: 25% area operated at 24°C and 75% area operated at IMAC-NV set-point temperature
- For Temperate: 100% area operated at IMAC-NV set-point temperature
- E1 and E2 includes following systems: Building envelope characteristic; Lighting system; and Comfort system (AC)

Residential Building Star Rating Plan				
Period: 14 December 2018 to 31 December 2024				
Star Rating	Energy Performance Index (E1 + E2) of Dwelling Unit			
	Composite	Warm & Humid	Hot and Dry	Temperate
1-star	52 < EPI ≤ 60	58 < EPI ≤ 64	55 < EPI ≤ 67	28 < EPI ≤ 31
2-star	45 < EPI ≤ 52	49 < EPI ≤ 58	47 < EPI ≤ 55	24 < EPI ≤ 28
3-star	37 < EPI ≤ 45	39 < EPI ≤ 49	38 < EPI ≤ 47	21 < EPI ≤ 24
4-star	29 < EPI ≤ 37	30 < EPI ≤ 39	29 < EPI ≤ 38	17 < EPI ≤ 21
5-star	EPI ≤ 29	EPI ≤ 30	EPI ≤ 29	EPI ≤ 17

Key stages of proposed labelling scheme



Proposed institutional structure

BEE may appoint an **Independent Agency (third party)** with to support the overall implementation of Residential Building labelling program

Communication with BEE and its appointed organization for entire process AND handholding the applicants	Creation of a **helpdesk** for responding queries
	Sample of **filled applications (illustrative)** to be provided
	Answers to FAQ's to be provided
	Brief guideline on key steps

Mechanism required for exchange of information

- Creation of an **Online Portal and Database for respective information**

To initiate the labelling process owner/developer/certified professional shall create a username and password on the online portal

For both:
- **New Buildings**
- **Existing Buildings**

- The Independent third party agency shall have the access for specific stages of Online Portal. The whole process shall be controlled by BEE through Digital Signatures

Outline of process for awarding BEE Star Label

BEE Star Label for Residential Building:

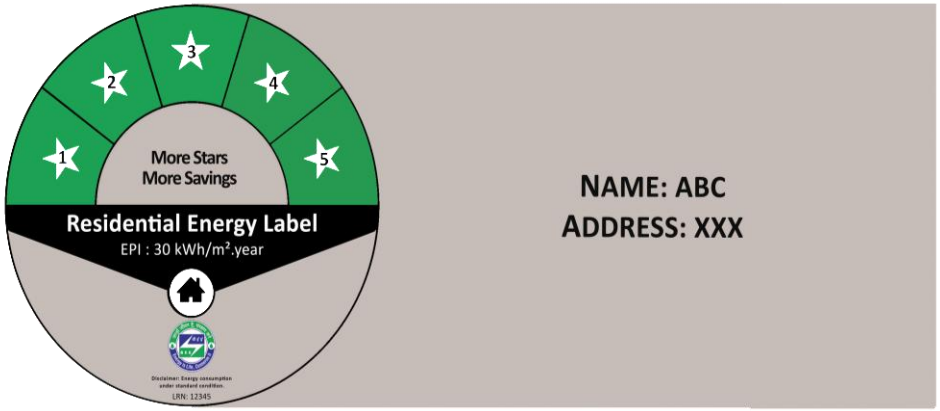
- Applied For Label (specifically for developers or under construction residential buildings – Will be always Voluntary)
- Final Asset Label

Outline of process for awarding BEE Star Label

Preparation stage	Application processing	Implementation stage	Monitoring & Verification
Pre-requisites for applying to BEE	Application submission	Label renewal	Verification audits
Evaluation for eligibility requirements	Scrutiny of received application	Label transfer	Data reporting for monitoring the progress
	Approval for label	Changes in label awarded already	
		Uptake strategies	

Label and Passport

Label in a form of Plaque to be placed as a Name Plate



Building Passport containing details of the respective house /residential building

The energy saving potential through proposed labelling program is around 388 BU by the year 2030.

Energy Efficiency in Commercial Buildings

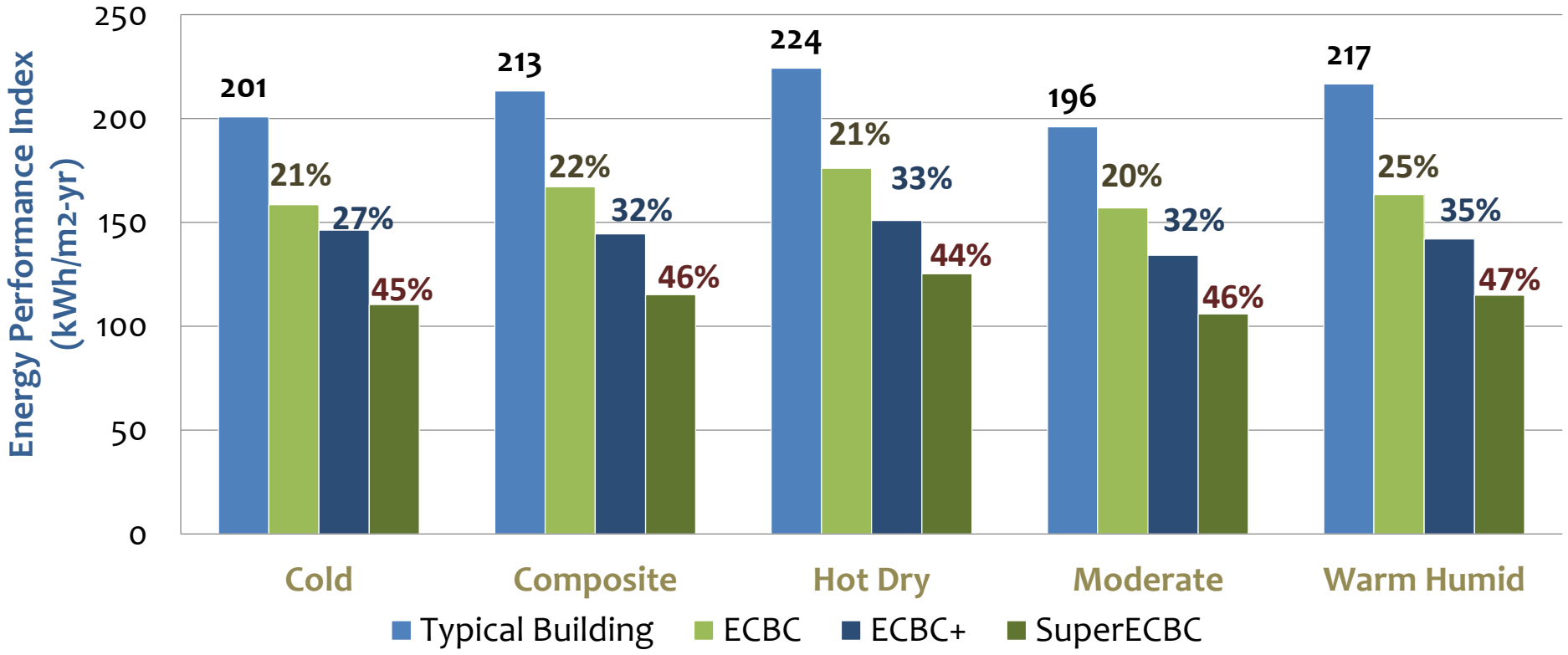
Energy Conservation Building Code 2017

- Applicable to New Commercial buildings (Inclusive Govt. Buildings) having connected load of 100 kW or greater or a contract demand of 120 kVA or greater.
- Currently is under voluntary stage
- Mandatory notification in progress in different States
- While the ECBC has been developed by BEE, its enforcement lies with the State governments and urban local bodies through notification within their states as per their regional requirements

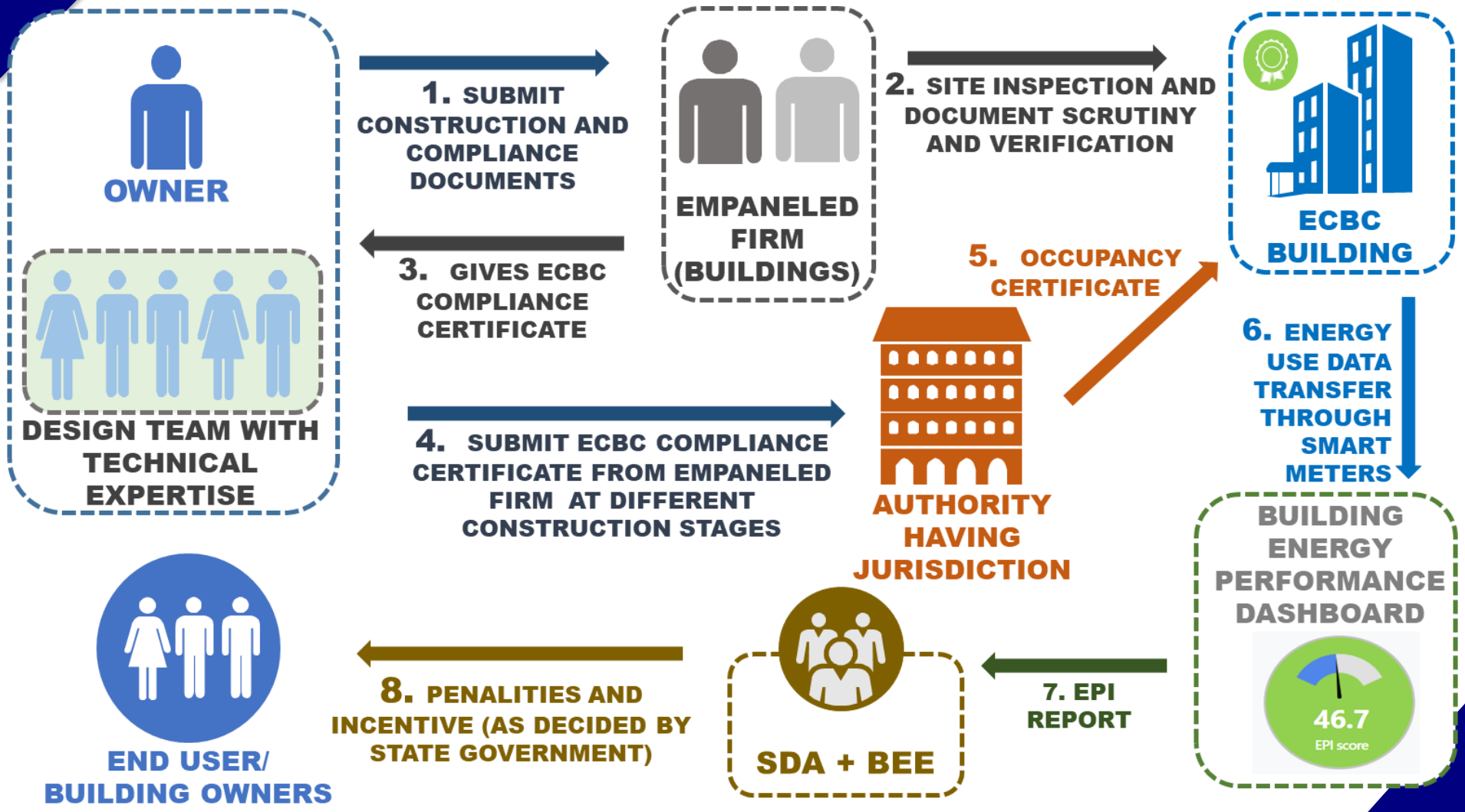
Features of ECBC 2017

- **Technology Neutral**
- **Renewable Energy Integration**
- **Incremental energy performance levels**
- **Applicability to various categories of buildings and Passive Design Strategies.**
- **Additional improvements in higher grades**
  - ✓ **ECBC plus: 35% or higher**
  - ✓ **Super ECBC: 50% or higher**

Impact


Energy Performance Index (kWh/m2-yr)
250
200
150
100
50
0
201
21%
27%
45%
213
22%
32%
46%
224
21%
33%
44%
196
20%
32%
46%
217
25%
35%
47%
Cold
Composite
Hot Dry
Moderate
Warm Humid
Typical Building
ECBC
ECBC+
SuperECBC

Compliance Mechanism



THANK YOU