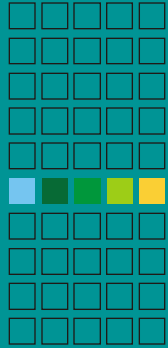
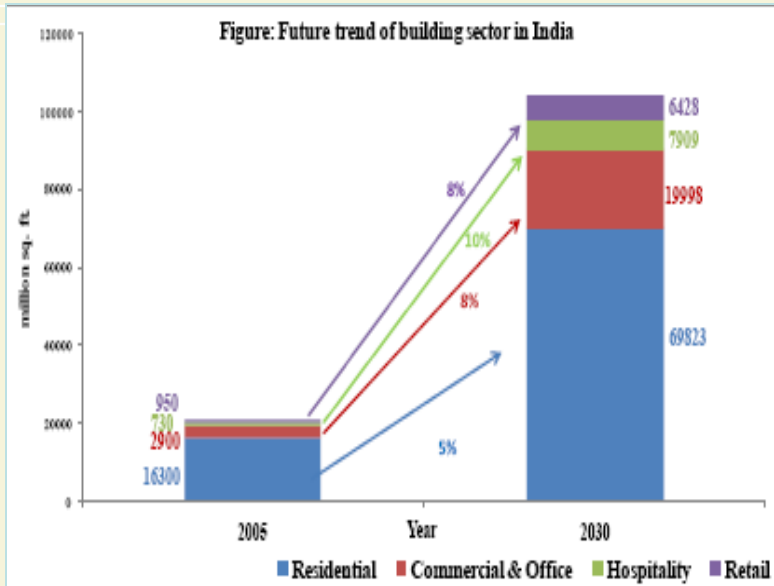


Energy Efficiency Initiatives in Commercial Buildings

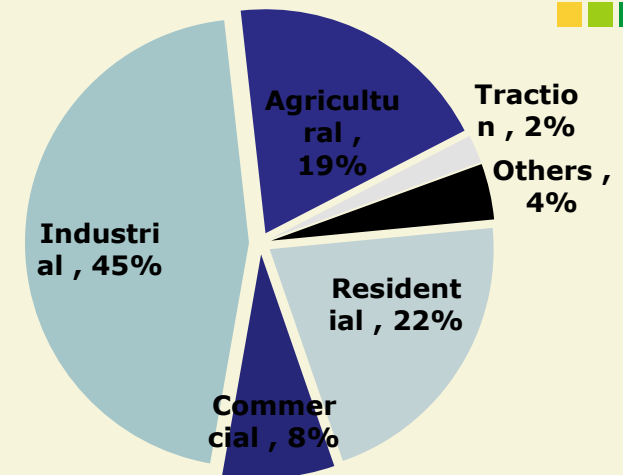


Bureau of Energy Efficiency
Government of India

Overview of India's Commercial Building Sector



Sector Wise Electricity Consumption



- The overall constructed area to increment by about 5 times from 21 billion square feet (2005) to approximately 104 billion square feet by 2030 at a CAGR between 5% to 10% .
- Building energy consumption accounts for over 30 percent of electrical energy consumption in the country, and is rising annually at 8 % .
- Lack of energy conscious designs lead to rampant inefficiencies in commercial buildings .Energy Audits show energy saving potential of up to 30-50% .Energy performance index (EPI) 200 to 300 kWh/sq m/year .

Growth in the Indian Building Sector

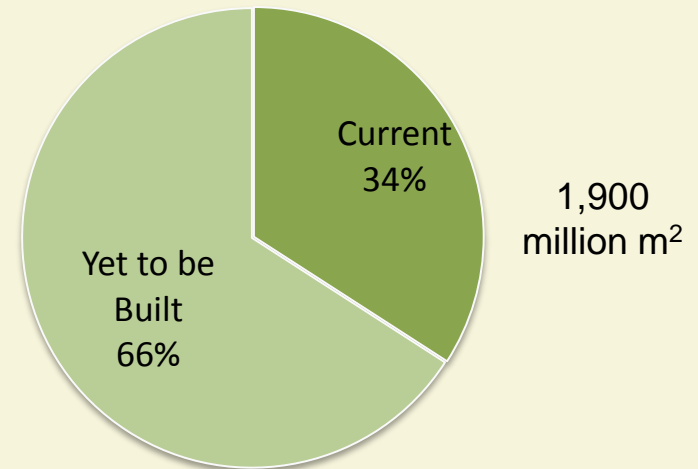


Commercial Buildings Floor Area - Growth Forecast

- Currently, ~ 659 million m² (USAID ECO-III Internal Estimate Using MOSPI, CEA and Benchmarked Energy Use data)
- In 2030, ~ 1,900 million m² (estimated)*
 - 66% building stock is yet to be constructed



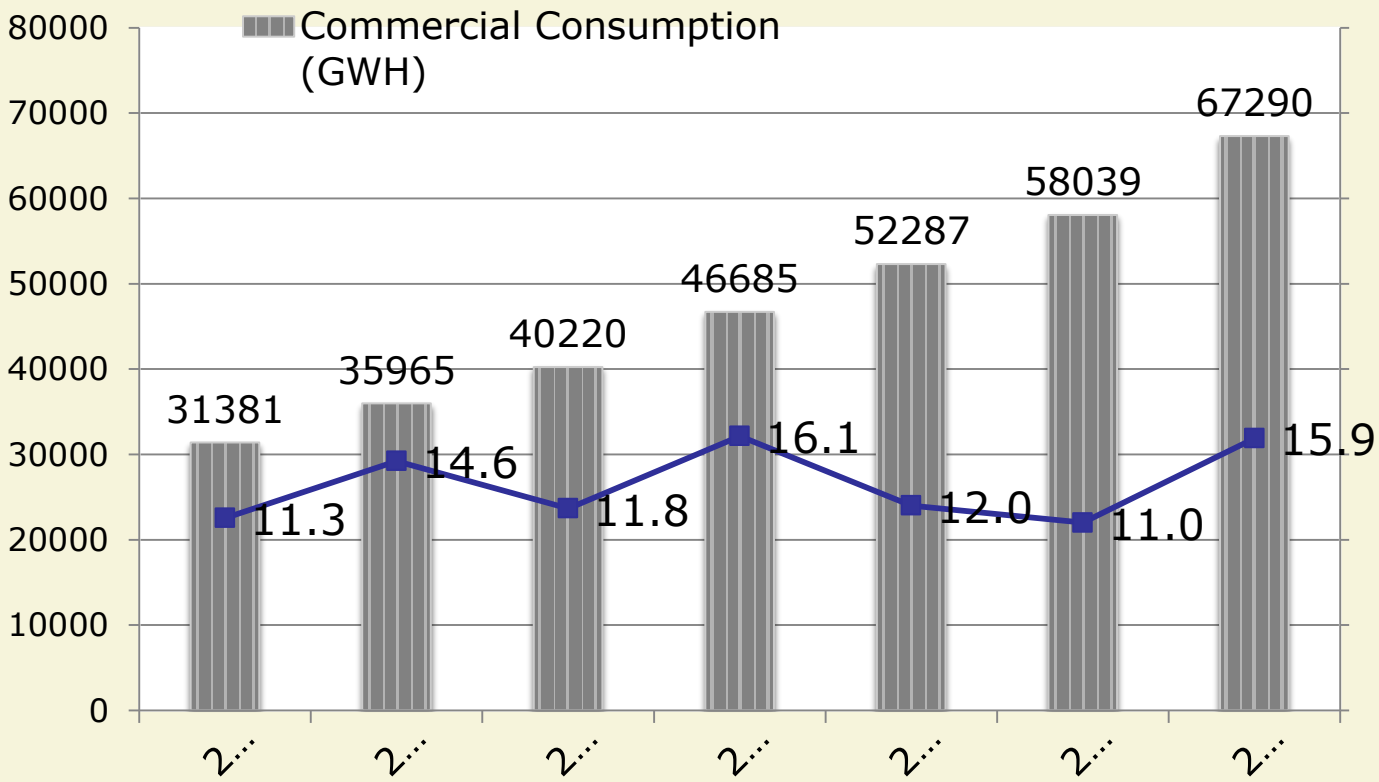
Year: 2010



Year :2030

* Assuming 5-6% Annual Growth

Electricity Growth in Commercial Sector



SOURCE: General Review 2009, Central Electricity Authority

_____ Growth in % over the previous year



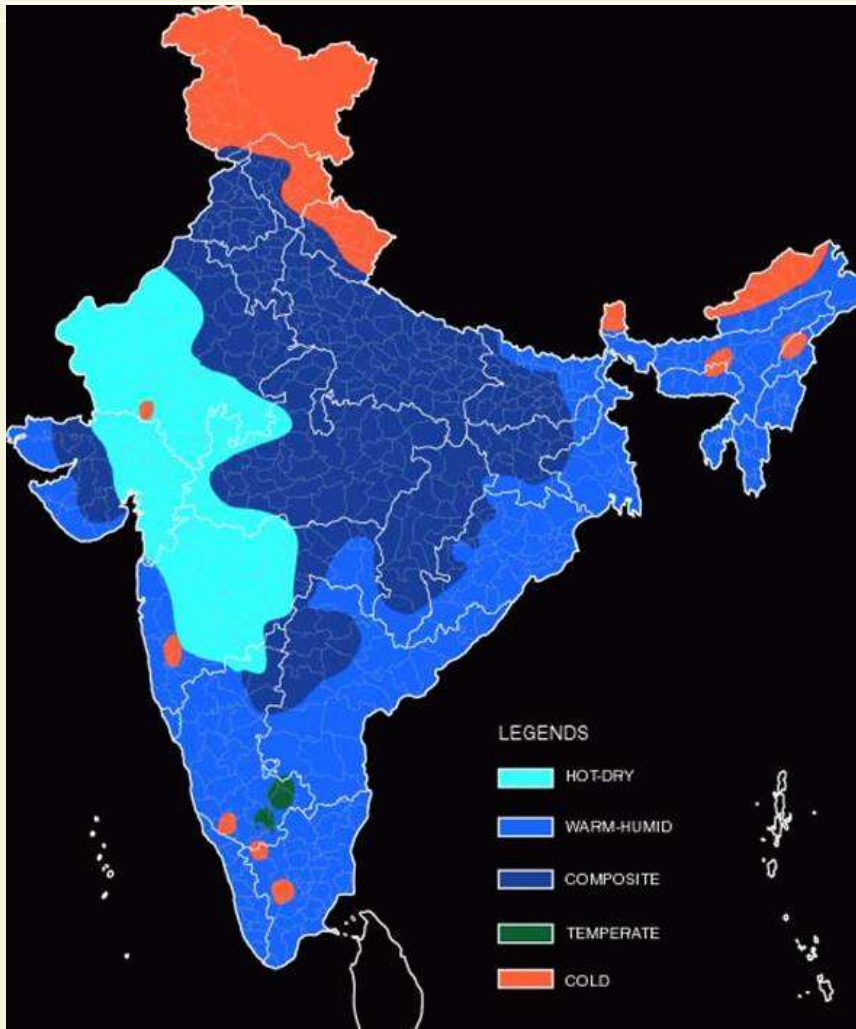
Projected growth in Floor Space & Energy Consumption- 'Business as Usual' scenario



Year	Floor space (mil. sq.m)	Energy consumption (BU)
2005	425	36
2012	745	166
2017	1114	240

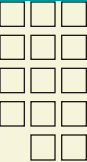
Source :“Interim Report of the Expert Group on Low Carbon Strategies for inclusive Growth” – Planning Commission

Climatic Zones of India



Five climate zones:-

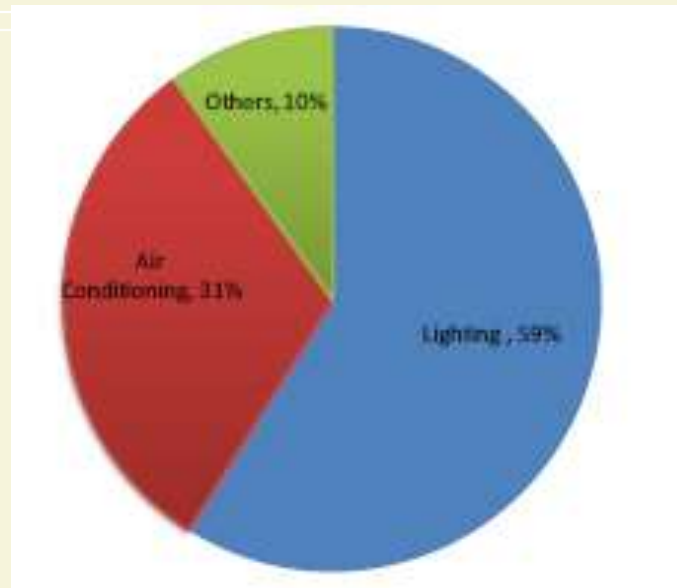
1. Composite (Delhi)
2. Hot Dry (Ahmedabad)
3. Hot Humid (Kolkata)
4. Moderate (Bangalore)
5. Cold (Shillong)



ENERGY IS LIFE
BEE
CONSERVE IT



Typical Building Energy Use



- Lighting and Air Conditioning account for over 80% of energy end use in a typical commercial building in India while in residential building fan and lighting load are predominant .
- Most of the existing lighting and air conditioning systems are not very efficient, leaving a wide scope for improvement in energy performance .
- Overall the energy savings estimates for the commercial and residential buildings vary between 30-70%.
- Challenge before India is to plan and implement energy efficiency measures during the early stages of growth in the building sector .



Energy Conservation Building Code



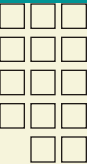
- ECBC covering the following components prepared:
 - Building Envelope (Walls, Roofs, Windows)
 - Lighting (Indoor and Outdoor)
 - Heating Ventilation and Air Conditioning (HVAC) System
 - Solar Hot Water Heating
 - Electrical Systems
- ECBC finalized after extensive consultation
- Voluntary introduction of ECBC in May 2007; mandatory after capacity building and implementation experience
- **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.**



Current Policies and Programme Initiatives



- Introduction of ECBC (Energy Conservation Building Code) in May, 2007 targeting new commercial buildings having connected load of 100 KW or 120 kVA being constructed in five climatic zones of the country .
- Taking up energy efficient retrofit measures in Central /State Govt /PSUs buildings through Performance Contracting .Empanelled 89 ESCOs to facilitate implementation through Performance Contracting .
- Providing Financial platforms for the ESCOs in the country for successful implementation of EE projects in above buildings through EESL and through MoU with other organizations .
- Benchmarking energy performance of commercial buildings like hospitals , offices, BPOs ,Shopping Malls ,Hotels etc under its Building star labeling program .
- Targeting the appliance and equipment like lighting and Air-conditioning inefficiencies under its star labeling program for the appliances .
- Outreach through media / ECBC Technical Tips Sheets & User Guide/ Curriculum development of students of engineering and architectural colleges in the country .



ECBC – Status of adoption by States



S. No.	Update status	Name of Sates/UTs
1	States where ECBC has been notified	Rajasthan, Odisha, Utrakhand, Punjab, Andhra Pradesh, and UT of Puducherry
2	States which have ammended ECBC for their state	Uttar Pradesh, Kerala, Karnataka, Chhattisgarh, Gujarat, Tamil Nadu, Maharashtra and West Bengal
3	States which are in the process of integrating ECBC provisions in their existing building bye-laws .	Haryana
4	Name of 7 states which have proposed to adopt ECBC during 2013-14	Himachal Pradesh, Bihar, Assam, Tripura, Jharkhand, Goa and Madhya Pradesh



Targets for 12th Plan Period



Objective:

- 75 % of all new starts of commercial buildings are ECBC compliant
- 20% of the existing commercial buildings reduce energy consumption through retrofits

Instruments:

- Adoption of ECBC by states
- Integration of ECBC within building bye-laws
- Capacity building of states for ECBC implementation
- Demonstration projects
- Availability of energy efficient material to support implementation
- Declaration of certain building categories as designated consumers
- Extension of Star Rating Scheme for other categories of buildings
- Implementation of retrofits in existing buildings

Outcome:

- Energy saving of 5.07 BU from commercial buildings



Support provided to states



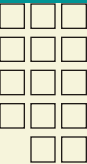
- State specific adaptation of ECBC
- Amendments in existing bye laws
- Amendments in standard templates for public buildings
- Amendment in PWD SoRs
- Support to public construction agency like PWD
- Support to increase in-house capacity
- Implementing star rating program
- Preparation of compliance documentation guidelines
- Establishment of organization structures and inter-institutional mechanisms for effective ECBC implementation



Energy Efficiency in Existing Buildings/ facilities



- Energy Audit Studies reveal a saving potential to the extent of 40% in end use energy such as lighting, cooling, ventilation, refrigeration etc.
- An exercise for expanding the number of existing ESCOs through an open invitation and evaluation process was taken up by BEE.
- In order to create a sense of credibility amongst the prospective agencies that are likely to secure the services of an ESCO as well as the financial institutions, a process of rating ESCOs was taken up through CRISIL, ICRA & CARE.
- Rating was carried out in terms of success in implementation of energy efficiency projects based on performance contracting, availability of technical manpower, financial strength, etc.
- 128 ESCOs empanelled with BEE after accreditation process. More than half of these accredited ESCOs are at levels 1 to 3 (Above Average)



Scheme for Rating of Buildings



- A National Commercial Building Energy Benchmarking Initiative was started with a goal to establish a framework to standardize energy data collection, baseline setting for typical commercial buildings, energy performance target setting and monitoring.
- This information would help the users and other stakeholders including builders, architects and code enforcing agencies to evaluate building's energy efficiency and track improvements compared to other buildings.
- The Star Rating Program for buildings is based on actual performance of the building in terms of specific energy usage (kWh/sq m/year).
- This programme would rate buildings on a 1-5 Star scale with 5 Star labeled buildings being the most efficient.
- Five categories of buildings - office buildings, hotels, hospitals, retail malls, and IT Parks in five climate zones in the country have been identified.



Bandwidths- Less than 50% air-conditioned



Composite

EPI(Kwh/sqm/year)	Star Label
80-70	1 Star
70-60	2 Star
60-50	3 Star
50-40	4 Star
Below 40	5 Star

Warm and Humid

EPI(Kwh/sqm/year)	Star Label
85-75	1 Star
75-65	2 Star
65-55	3 Star
55-45	4 Star
Below 45	5 Star

Hot and Dry

EPI(Kwh/sqm/year)	Star Label
75-65	1 Star
65-55	2 Star
55-45	3 Star
45-35	4 Star
Below 35	5 Star



Bandwidths- more than 50% air-conditioned



Composite

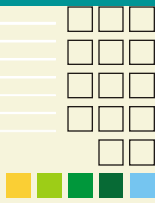
EPI(Kwh/sqm/year)	Star Label
190-165	1 Star
165-140	2 Star
140-115	3 Star
115-90	4 Star
Below 90	5 Star

Warm and Humid

EPI(Kwh/sqm/year)	Star Label
200-175	1 Star
175-150	2 Star
150-125	3 Star
125-100	4 Star
Below 100	5 Star

Hot and Dry

EPI(Kwh/sqm/year)	Star Label
180-155	1 Star
155-130	2 Star
130-105	3 Star
105-80	4 Star
Below 80	5 Star



Bandwidths for BPOs



Climatic Zone - Composite

Average Annual hourly EPI AAhEPI (Wh/hr/Sqm)	Star Rating
45-40	1 Star
40-35	2 Star
35-30	3 Star
30-25	4 Star
Below 25	5 Star

Climatic Zone - Warm and Humid

Average Annual hourly EPI AAhEPI (Wh/hr/Sqm)	Star Rating
50-45	1 Star
45-40	2 Star
40-35	3 Star
35-30	4 Star
Below 30	5 Star

Climatic Zone - Hot and Dry

Average Annual hourly EPI AAhEPI (Wh/hr/Sqm)	Star Rating
35-30	1 Star
30-25	2 Star
25-20	3 Star
20-15	4 Star
Below 15	5 Star

Climatic Zone - Temperate

Average Annual hourly EPI AAhEPI (Wh/hr/Sqm)	Star Rating
40-35	1 Star
35-30	2 Star
30-25	3 Star
25-20	4 Star
Below 20	5 Star

Bandwidths – Shopping malls



Composite

EPI(Kwh/sqm/year)	Star Label
350-300	1 Star
300-250	2 Star
250-200	3 Star
200-150	4 Star
Below 150	5 Star

Warm and Humid

EPI(Kwh/sqm/year)	Star Label
450-400	1 Star
400-350	2 Star
350-300	3 Star
300-250	4 Star
Below 250	5 Star

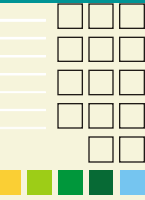


Label for Buildings



Energy Performance Index:
kWh/ sq m/ year

Name of the Building : _____
Category of Building : _____
Type : _____
Climatic Zone : _____
Connected Load : _____
Build up Area : _____



Activities under bilateral programmes



Indo – US PACE D

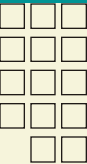
- Institutional Capacity Building for Administration, Enforcement & Implementation of the ECBC
- ECBC Technical Update and promotion of Net-Zero Energy Buildings (NZEBS) :
- Facilitation of NZEB Demonstration projects

Indo - Swiss BEEP

- Energy efficiency advisory for select commercial projects through integrated design chartrattes
- Developing insulation material testing protocols, infrastructure and data-book
- Developing guidelines, labels and tools for residential & public buildings
- Capacity building through training programmes, website and knowledge products

UNDP GEF BEE

- Training programme for design professionals
- Demonstration project for ECBC Implementation
- Building material test facilities and augmenting the capacities of existing labs
- Development of fiscal and financial incentive policies



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