Energy Efficiency Initiatives in Commercial Buildings
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

* Assuming 5-6% Annual Growth

Year: 2010

Year: 2030

1,900 million m²

Yet to be Built 66%

Current 34%
Electricity Growth in Commercial Sector

Growth of Electricity Consumption in Commercial Sector in India (2003-08)

Source: General Review 2009, Central Electricity Authority
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.
Five climate zones:-
1. Composite (Delhi)
2. Hot Dry (Ahmedabad)
3. Hot Humid (Kolkata)
4. Moderate (Bangalore)
5. Cold (Shillong)
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

- Impact of ECBC - Reduced Energy Use for buildings
  - National Benchmark ~ 180 kWh/m²/year
  - ECBC Compliant building ~ 110 kWh/m²/year
Roadmap towards implementation

- Development of ECBC training package covering the various aspects of the code
- Development of ECBC User Guide
- Conformance Check Tool developed
- Implementation of ECBC
  - Amendment of ECBC to suit local & regional climatic condition
  - Notification of ECBC in progress
  - Integration of ECBC in building bye-laws
- Modification in schedule of rates
- Harmonization with NBC (National Building Code)
Challenges to ECBC implementation

- **Adoption**
  - State by state adoption after mandatory requirement

- **Implementation**
  - Lack of expertise amongst architects, engineers and contractors
  - Lack of availability of equipment with prescribed efficiency levels
  - Lack of third party objective testing facilities that measure product efficiency with standard test procedures.

- **Enforcement**
  - Enforcement at urban local bodies
  - Lack of expertise and human resources
  - Occupancy approval does not include all building systems
Projected growth in Floor Space & Energy Consumption- ‘Business as Usual’ scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>Floor space (sq.m)</th>
<th>Energy consumption (BU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>425</td>
<td>36</td>
</tr>
<tr>
<td>2012</td>
<td>745</td>
<td>166</td>
</tr>
<tr>
<td>2017</td>
<td>1114</td>
<td>240</td>
</tr>
</tbody>
</table>

Projected savings in new built up spaces

Energy Scenario in New Built up spaces

- BAU Scenario (2017) (W/O EFFORT)
- 75% ECBC complied
- Total kWh for new floor Space
- Decrease in kWh for new Building

![Graph showing energy savings over years]

- 2012-13
- 2013-14
- 2014-15
- 2015-16
- 2016-17

- 0
- 2000
- 4000
- 6000
- 8000
- 10000
- 12000
- 14000
- 16000
- 18000
- 20000
Cool Roofs – roadmap ahead

- The Energy Conservation Building Code (ECBC) defines prescriptive requirements for cool roofs.
- Promotion of Cool Roofs would include:
  - Building parameters
  - Application options- materials and their energy performance
  - Implementation options- policy, promotional
  - Various technical and design considerations applicable.
  - Cool roofing, application, and maintenance issues.
- Providing details of cool roof technology and application, and access to the research carried out.
- Analysis of the energy savings on account of application of cool roofs