Energy Efficiency Improvements in Commercial Buildings

**Background**

The building sector in India growing at about 30 percent per annum, is worth US$12 billion, contributing 5 percent of the country’s gross domestic product. Of India’s total power consumption, about 7 percent emanates from large commercial buildings (growing 8 percent annually), which could do well to adopt energy efficiency features. It is estimated that new buildings can reduce between 30–40 percent of their energy consumption by incorporating appropriate design interventions in lighting, heating, ventilation, and air-conditioning systems.

In May 2007, the Bureau of Energy Efficiency proposed an Energy Conservation Building Code (ECBC) that sets minimum energy performance standards for new commercial buildings. The ECBC, however, is currently not mandatory due to a number of challenges such as lack of appropriate knowledge and capacities at various government levels, limited availability of trained designers and architects, and absence of suitable energy efficient materials and equipment in the local market.

A project has therefore been initiated by the Ministry of Environment, Forest, and Climate Change, Government of India, in partnership with UNDP to clearly outline exact activities and outputs required to achieve energy efficiency in commercial buildings.

**About the project**

The project aims to implement and operationalize the ECBC by reducing information gaps, capacity shortfall, institutional and financial deficit. The project adopts a comprehensive and integrated approach focussed on (a) strengthening of institutional capacities at various levels to implement ECBC and other energy efficiency programs of commercial buildings; (b) developing technical expertise and awareness raising of key partners; (c) demonstrating compliance with ECBC in eight model buildings (with total floor area of 1.47 million m²) in five climatic zones; (d) formulating fiscal and regulatory incentives for investors; and (e) monitoring, evaluation, knowledge sharing, and learning.
Reduction in annual direct carbon dioxide emission through ECBC compliance in the eight demonstration commercial buildings is estimated at 90.7 kTCO2 (kilo tonnes of carbon dioxide) per year or 181.4 kTCO2 during the project duration (assuming the buildings are operational for two years), and 2.27 million tonnes carbon dioxide cumulatively over 25 years of their lifetime.

The project website URL is www.eecbindia.com

Developments so far

Goal 1: Strengthening institutional capacities to promote the enactment and enforcement of ECBC in commercial buildings
- Notified ECBC in Rajasthan, Odisha, Uttarakhnd, Andhra Pradesh, Punjab, Telangana, Haryana, West Bengal, Karnataka, and Puducherry
- Established ECBC cells in Uttar Pradesh, Karnataka, Chhattisgarh, Punjab, and Haryana
- Developed Energy Performance Index (EPI) based on a sample size of 1160 commercial buildings across categories. The EPIs in kilo watt per metre square (kWh per m2) per year are given below:

<table>
<thead>
<tr>
<th>Type</th>
<th>Warm &amp; Humid</th>
<th>Composite</th>
<th>Hot &amp; Dry</th>
<th>Moderate</th>
<th>Simple Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office building, less than 50% air conditioning</td>
<td>101</td>
<td>86</td>
<td>90</td>
<td>94</td>
<td>93</td>
</tr>
<tr>
<td>Office building, more than 50% air conditioning</td>
<td>182</td>
<td>179</td>
<td>173</td>
<td>179</td>
<td>178</td>
</tr>
<tr>
<td>Shopping Mall</td>
<td>428</td>
<td>327</td>
<td>273</td>
<td>257</td>
<td>321</td>
</tr>
<tr>
<td>BPOs</td>
<td>452</td>
<td>437</td>
<td>-</td>
<td>433</td>
<td>440</td>
</tr>
<tr>
<td>Hotels - upto 3 stars</td>
<td>215</td>
<td>201</td>
<td>167</td>
<td>107</td>
<td>173</td>
</tr>
<tr>
<td>Hotel - above 5 stars</td>
<td>333</td>
<td>290</td>
<td>250</td>
<td>313</td>
<td>297</td>
</tr>
<tr>
<td>Hospitals</td>
<td>275</td>
<td>264</td>
<td>261</td>
<td>247</td>
<td>262</td>
</tr>
<tr>
<td>Institutes</td>
<td>150</td>
<td>117</td>
<td>106</td>
<td>129</td>
<td>126</td>
</tr>
</tbody>
</table>

Goal 2: Building technical capacity and expertise of local building practitioners and service providers
- Trained 3,300 stakeholders—architects, design professionals, developers, contractors and building material suppliers—on ECBC implementation in 82 training programmes
- Identified institutes training and capacity building of key stakeholders:
  - Administrative Staff College of India, Andhra Pradesh
  - Rachna Sansad Institute of Architecture, Maharashtra
  - Energy Management Centre, Kerala
  - Ela Green Buildings & Infrastructure Consultants, Chhattisgarh
  - Arunachal Pradesh Energy Development Agency, Arunachal Pradesh
  - Administrative Training Institute, Karnataka

Goal 3: Increasing new commercial ECBC compliant buildings
- Supported 14 demonstration commercial buildings for ECBC compliance. Following projects are nearing completion:
  - KK Guest House, Bengaluru, moderate climate
  - Dhanvantri OPD block, Jaipur, composite climate
  - SMS Medical College, Jaipur, composite climate
  - UPERC Office Building, Lucknow, composite climate
  - SAMVAD Office Building, Naya Raipur, composite climate

Goal 4: Encouraging investors and developers of energy efficient buildings through fiscal and regulatory frameworks incentives
- Covered part of the incremental construction cost for ECBC compliance to three demonstration projects.

Goal 5: Ensuring that information and knowledge products on best practices regarding energy efficient building technologies and measures are readily available and easily accessible/shared
- Developed 37 knowledge products, which can be accessed through project website (www.eecbindia.com). For example, Market Assessment of Energy Efficient Building Materials and Implementing Energy Efficiency in Buildings

Looking to the future

The project has set itself the following targets:
- It will create 11 more ECBC cells to support the states in issuing ECBC notification, institutionalizing training and building capacity on design compliance to ECBC.
- It will issue ECBC notification in 10 more states during project period. The project will support seven of them. Further, Government of India is keen to ensure all the states in India issue ECBC notification.
- The project will identify institutes in 10 more states and train the trainers, so that the training component is continued beyond end of the project.
- It will provide energy simulation tools to state public works departments/urban local bodies to design and evaluate potential of energy efficient strategies. Software like Design Builder/IDA ICE would be used to design ECBC compliant buildings.
- The syllabi of architecture and engineering colleges will include ECBC.
- The project will develop a million square metres of energy efficient model buildings in five clusters across hot–dry, composite, and warm–humid climatic zones.