ECBC Implementation Experiences: Karnataka Initiatives

Presented by:
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Presentation Outline

- Content of State ECBC Notification
- Karnataka experience of implementing ECBC
CONTENT OF STATE ECBC NOTIFICATION
ECBC Implementation Process

Central government

State government

Local government

ECBC development and updating

Amend ECBC to meet state requirements

Notification of ECBC in the state gazette

Revision of DCR/Model Building Bye-laws

Revision of ULB Byelaws and approval process

Enforcement of ECBC

ECBC Implementation Support
- Capacity Building
- Demonstration Projects
- Revision of Schedule of Rates
- Compliance tools
- Monitoring and Verification (M&V) system etc.
Notification and Gazette

• Notification of ECBC in the state gazette means that state government has adopted the Central Government code (with state specific adaptations) for its implementation and it gives legal framework as well as mandates respective state departments to implement the state ECBC.

• A Gazette is a public journal and an authorised legal document of the government. As a public journal, the Gazette prints official notices from the government. It is authentic in content, accurate and strictly in accordance with the Government policies and decisions.
ECBC Notification Status

States which have notified ECBC (10)
- Rajasthan
- Odisha
- Andhra Pradesh
- Telangana
- Uttarakhand
- West Bengal
- UT of Puducherry
- Karnataka
- Haryana
- Punjab

States which are in the process of notification (11)
- Arunachal Pradesh
- Himachal Pradesh
- Uttar Pradesh
- Bihar
- Madhya Pradesh
- Chhattisgarh
- Gujarat
- Maharashtra
- Kerala
- Tamil Nadu
- Delhi
1. Reference to Energy Conservation Act

- Karnataka notification was done by Department of Energy, Karnataka

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<tr>
<th>GOVERNMENT OF KARNATAKA</th>
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<tr>
<td>ENERGY SECRETARIAT</td>
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<td>NOTIFICATION</td>
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NO. EN41VSC2013, Date: 05.09.2014

Government of Karnataka gazette notification dated: 27th November 2014 (Part - IVA)

In exercise of the powers conferred by section 18 of the Energy Conservation Act 2001 (52 of 2001)

Section 18

The Central Government or the State Government may, in the exercise of its powers under this Act and for efficient use of energy and its conservation, issue such directions in writing as it deems fit for the purposes of this Act to any person, officer, authority or any designated consumer and such person, officer or authority or any designated consumer shall be bound to comply with such directions.

Explanation— For the avoidance of doubts, it is hereby declared that the power to issue directions under this section includes the power to direct

(a) regulation of norms for process and energy consumption standards in any industry or building or building complex; or

(b) Regulation of the energy consumption standards for equipment and appliances.

- In Andhra Pradesh the notification was facilitated by Municipal Administration & Urban Development (MA&UD) Department
2. Scope of the ECBC Notification

• Karnataka
  – The code is applicable to all buildings or building complexes in the urban area that have a connected load of 100 kW or greater or a contract demand of 120 kVA or greater, or having conditioned area of 500 m² or more and used for commercial purposes.

• Andhra Pradesh
  – The code shall be applicable to commercial buildings and other Non Residential Buildings that have a plot area of more than 1000 Square Meters or built up area of 2000 Square Meters and certain categories of buildings such as Multiplexes, Hospitals, Hotels, and Convention Centers irrespective of their built up area shall comply with the APECB Code as given in Annexure XIII.
2. Scope of the ECBC Notification

• Haryana
  – The provisions of Energy Conservation Building Code shall be applicable to all buildings of categories listed below having connected load of 100 KW or above or a contract demand of 120 KVA or above,
    (i) Commercial Complexes, Shopping Malls, Trade Buildings.
    (ii) Hotels, Motels, Restaurants, Transit-cum-Boarding Houses, Banquet Halls, Janj Ghars, Resorts.
    (iii) Cinema Halls, Auditoriums, Clubs, Convention Centers, Concert Halls.
    (iv) Office Buildings, Banks, Public Assistance Institutions.
3. Responsibilities of State Departments and ULBs

• Andhra Pradesh

– **At the time of plan approval**, the Owner and Builder/developer shall submit the AP* (AP ONE STAR) compliance, sealed and signed by AP Empanelled Architect with MAUD and NREDCAP or Bureau of Energy Efficiency Empanelled Architect against the mandatory requirement of compliance of APECBC to respective Urban Local Body.....

– **At the time of issuance of occupancy certificate**, the builder/owner/developer shall submit the professional statement by AP Empanelled Architect with MAUD and NREDCAP / BEE Empanelled Architect verifying that the building has been built in accordance with the approved design and plan approval.....

– In accordance with rules 25 and 26 of the AP Building rules 2012, the Urban Local Body may conduct random unscheduled progress inspections throughout the construction phase of a building for any new building, addition or alteration project, to ensure that the building complies with the APECBC. “
3. Responsibilities of State Departments and ULBs

• Karnataka
  – Urban Local Bodies will be responsible for enforcement of ECBC in respect to private buildings and
  – Public Works Department (PWD) Architectural Department Of PWD will be responsible in respect to state government buildings.
  – Department Of Electrical Inspectorate, Government of Karnataka is to inspect electrical installation in the buildings, which are ECBC compliant.
  – Karnataka Renewable Energy Development Limited, as the nodal agency to monitor the implementation of the Code at the State level and also to create the awareness of the ECBC
Timeline of ECBC Implementation

2001

EC Act

2007

EC Act (Amendment)

2010

ECBC Published

2011

ECBC Notification Odisha

2012

ECBC Notification Rajasthan

2013

ECBC Notification Uttarakhand

2014

ECBC Notification Andhra Pradesh

2016

ECBC Notification Haryana

Civil SoR Published by Karnataka

Online ECBC approval system

GHMC

ECBC Notification Karnataka

GHMC

Online ECBC approval system

Online System

Karnataka

Published

EC Act

ECBC

Notification

Andhra

Pradesh

2011

2012

2013

2014

2016
KARNATAKA ECBC INITIATIVES
Case Study: Kumar Kruppa Guest House
Organizational Structure of ECBC Cell in Karnataka

Bureau of Energy Efficiency (BEE)

ECBC CELL:
2 Architects and 2 Engineers

Technical Backstopping from AllILSG Delhi Office

Based in the office of Principal Chief Architect, Karnataka PWD

MOU

Karnataka Renewable Energy Development Limited (KREDL)

All India Institute of Local Self Government
ECBC Cell Activities

**Revising Schedule of Rates for Karnataka**
To include energy efficient materials and products in SoR

**Energy efficient building design**
Use Integrated Design Process to make 10 of the PWD’s buildings ECBC compliant

**Updating Building Bye Laws**
To include ECBC provisions in the State GDCR and Bye Laws

**Organizing ECBC Awareness Workshops**
Capacity building of building sector stakeholders and government officials to make them aware about the ECBC provisions and compliance mechanisms.
Revision of Karnataka PWD Schedule of Rates

SoR is a reference document followed by PWD and some Public Sector Undertakings (PSUs) for providing material and technology specifications and for cost estimation of buildings.
## Civil Schedule of Rates

### 35 Items in Civil SoR

#### BUILDING ENVELOPE

<table>
<thead>
<tr>
<th>WALL INSULATIONS &amp; INSULATED WALLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>External wall insulation with Polyurethane Foam (PUF) slab</td>
</tr>
<tr>
<td>External wall insulation with Polyurethane Foam (PUF) spray</td>
</tr>
<tr>
<td>External wall insulation with Extruded Polystyrene (XPS)</td>
</tr>
<tr>
<td>Cavity wall insulation with Polyurethane Foam (PUF) spray</td>
</tr>
<tr>
<td>Cavity wall insulation with Polyurethane Foam (PUF) slab</td>
</tr>
<tr>
<td>Cavity wall insulation with glass wool slab</td>
</tr>
<tr>
<td>Cavity wall insulation with rock wool slab</td>
</tr>
<tr>
<td>Cavity wall with Extruded Polystyrene (XPS)</td>
</tr>
<tr>
<td>Autoclaved Aerated Concrete Block</td>
</tr>
<tr>
<td>Hollow Burnt Clay Block</td>
</tr>
<tr>
<td>Insulated Burnt Clay Block</td>
</tr>
<tr>
<td>Hollow Concrete Block</td>
</tr>
<tr>
<td>Hollow Concrete Block</td>
</tr>
<tr>
<td>Truss Reinforced Insulated Concrete (TRIC) Wall</td>
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#### ROOF INSULATIONS

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<table>
<thead>
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<tbody>
<tr>
<td>Over deck insulation with Polyurethane Foam (PUF) spray</td>
</tr>
<tr>
<td>Under deck insulation with Expanded Polystyrene (EPS)</td>
</tr>
<tr>
<td>Over deck insulation with Extruded Polystyrene (XPS)</td>
</tr>
<tr>
<td>Over deck insulation with vermiculite</td>
</tr>
<tr>
<td>Over deck insulation with glass wool</td>
</tr>
<tr>
<td>Over deck insulation with rock wool</td>
</tr>
<tr>
<td>Under Deck Insulation with glass wool</td>
</tr>
<tr>
<td>Under Deck Insulation with rock wool</td>
</tr>
</tbody>
</table>
Civil Schedule of Rates

**COOL ROOFS**
- Heat Reflective Paint on roof
- Heat Resistant Tile on Roof
- Green Roof

**GLAZINGS**
- Single Glazing with High Performance Coating
- Double Clear Glazing
- Double High Performance Glazing

**FRAMES**
- UPVC Frame
- Aluminium Frame with Thermal Break

**SOLAR WATER HEATERS**
- Flat Plate Collector
- Evacuated Tube Collector
Electrical Schedule of Rates

HEATING VENTILATION AIR CONDITIONING

Fans
Air Conditioners:
• Fixed Speed Direct Expansion Unitary Systems
• Variable Speed Direct Expansion Unitary Systems
• Variable Refrigerant Flow (VRF) System
• Central Chilled Water System: Air-cooled, water cooled, evaporative cooled

Cooling Towers
Plumbing
Condenser Water Pipe
Valves Without Insulation
Ducting, Grills, Diffuser And Insulation
Air Handling Units
Fan Coil Units
Treated Fresh Air Unit
Heat Recovery Wheel

Direct, Indirect and Indirect-Direct
Evaporative Cooling
Indirect Direct Hybrid Cooling Unit
Chilled Beams
Radiant Cooling
Variable Frequency Drives

ELECTRICAL WORK

LIGHTING
LED Lamp/Luminaire: Indoor & Outdoor
Lighting Control: Occupancy Sensor & Daylight sensor

SOLAR PHOTO VOLTAIC
Solar PV: Grid Connected
Solar PV: Off Grid

111 Items in Civil SoR
Use of Integrated Design Process for Evaluating Energy Efficient Strategies
Auditorium Building Analysis

Energy Sufficiency > Energy Efficiency > Onsite Renewable
Auditorium Building Analysis
Auditorium Building Analysis

Solution: Balcony level windows with two equidistant overhangs of 600 mm

VLT: 0.80 with effective shading
## Summary of Karnataka PWD Demonstration Projects

<table>
<thead>
<tr>
<th>S.no</th>
<th>Building</th>
<th>Location</th>
<th>Climatic Zone</th>
<th>Category</th>
<th>Area (m²)</th>
<th>EPI Existing Design to EPI ECBC Case in kWh/m².year (savings %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Government Engineering College</td>
<td>Yelburga</td>
<td>Warm and Humid</td>
<td>Institute</td>
<td>34,220</td>
<td>107 to 63 [42%]</td>
</tr>
<tr>
<td>2</td>
<td>500 Bed Mysore Hospital</td>
<td>Mysuru</td>
<td>Warm and Humid</td>
<td>Hospital</td>
<td>39,715</td>
<td>227 to 110 [52%]</td>
</tr>
<tr>
<td>3</td>
<td>Multi-Purpose Parking Lot</td>
<td>Mysuru</td>
<td>Warm and Humid</td>
<td>Parking</td>
<td>27,390</td>
<td>29 to 22 [26%]</td>
</tr>
<tr>
<td>4</td>
<td>Lokopayogi Bhavana</td>
<td>Kalaburagi</td>
<td>Hot and Dry</td>
<td>Office</td>
<td>14,770</td>
<td>141 to 80 [44%]</td>
</tr>
<tr>
<td>5</td>
<td>Teacher’s Academy</td>
<td>Dharwad</td>
<td>Warm and Humid</td>
<td>Institute</td>
<td>18,650</td>
<td>96 to 75 [22%]</td>
</tr>
<tr>
<td>6</td>
<td>DC Office</td>
<td>Mysuru</td>
<td>Warm and Humid</td>
<td>Office</td>
<td>29,010</td>
<td>123 to 89 [32%]</td>
</tr>
<tr>
<td>7</td>
<td>Mini-Vidhan Soudha</td>
<td>Shimoga</td>
<td>Warm and Humid</td>
<td>Office</td>
<td>2,925</td>
<td>60 to 34 [43%]</td>
</tr>
<tr>
<td>8</td>
<td>Yadgir Insitute of Medical Sciences</td>
<td>Yadgir</td>
<td>Hot and Dry</td>
<td>Institute</td>
<td>31,300</td>
<td>93 to 75 [20%]</td>
</tr>
<tr>
<td>9</td>
<td>Auditorium Template</td>
<td>Bengaluru</td>
<td>Moderate</td>
<td>Recreational</td>
<td>10,150</td>
<td>154 to 91 [41%]</td>
</tr>
<tr>
<td>10</td>
<td>Multi-Purpose Hall</td>
<td>Chitradurga</td>
<td>Warm and Humid</td>
<td>Assembly</td>
<td>1,736</td>
<td>120 to 104 [14%]</td>
</tr>
<tr>
<td>11</td>
<td>Multi-Purpose Hall</td>
<td>Bidar</td>
<td>Hot and Dry</td>
<td>Assembly</td>
<td>1,736</td>
<td>124 to 107 [14%]</td>
</tr>
</tbody>
</table>

Calculated Incremental Cost:  **0.8 – 4.0% of construction cost**  
Simple Payback Period:  **1 - 4 years**  
Cumulative Expected Annual Energy Saving:  **7,117 MWh**  
Cumulative Annual CO₂ emission reduction:  **5,840 T CO₂**
Way Forward for Karnataka State

• Notification of ECBC Rules

• Updating Building Bye-Laws

• Inclusion of ECBC compliance checks in building approval system

• Implementation of compliance tools for ECBC enforcement

• Implementation monitoring and verification tools for ECBC compliance

• Training and awareness campaign of building sector stakeholders
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THANK YOU!