Tracking Implementation of Building Energy Codes & Certification

Types of Code & Certification

July 29 2016
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Overview

• Building Energy Codes & Certification in Context
• Types of Codes & Compliance
• Types of Certification
# Building Energy Codes Context

<table>
<thead>
<tr>
<th>STRATEGY</th>
<th>SAVINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Building Energy Efficiency Codes</td>
<td>- &lt;30% - 70%</td>
</tr>
<tr>
<td>- Policy Targets: Low-zero &amp; positive energy buildings</td>
<td>- &lt;79%</td>
</tr>
<tr>
<td>- Integrated Planning &amp; Design, district heating-cooling</td>
<td>- &lt;30%</td>
</tr>
<tr>
<td>- Building Design: Bio-Climatic, Bio-Positive, Adaptive, Resilience &amp; integrated solar thermal &amp; P.V.</td>
<td>- &lt;30%</td>
</tr>
<tr>
<td>- High-Efficiency envelope, heating &amp; cooling technologies</td>
<td>- &lt;30-50%</td>
</tr>
<tr>
<td>- Compliance enforcement, monitoring and reporting</td>
<td>- &lt;50% of legally req.</td>
</tr>
<tr>
<td>- Life-cycle Approach to greening the Value-Chain, labeling &amp; MEPS</td>
<td>- US$+50 to -$250/MtCO₂</td>
</tr>
<tr>
<td>- Behavior Change</td>
<td>- &lt;40%</td>
</tr>
</tbody>
</table>

Source: IPCC AR5
Types of Code & Compliance

Prescriptive:

• Set specific energy performance requirements on individual building components (i.e. walls, ceiling, insulation, ventilation and windows)

• Compliance is predominantly checked through reviewing the building design against prescribed requirements.

Simple Trade-Off:

• Specific rules on overall performance values such as U-Value to typically to allow trade-offs between elements of the building envelope such as trading off less efficient insulation for more efficient windows.

• Compliance is predominantly checked through reviewing the building design against prescribed requirements or compliance tools that help to calculate the overall mandatory performance level is being achieved. Points systems are also sometimes used where points are assigned, depending on the components used.
Types of Code & Compliance

Performance-Based:

• Typically sets an energy performance requirement for the whole building such as kWh/m². A proposed design is run in building energy simulation software to simulate energy use, which is compared either to a reference building or to a specified target.

• Compliance is commonly checked by comparing the predicted energy performance of a design with a model of energy use in a reference building of a certain type.

Outcome-Based Code:

• Requires demonstration that the actual energy use of a building in operation meets the energy performance requirements of the code. Few full-scale examples of this as yet.

• Compliance could be recognized through the awarding of energy performance certificates, or through mandatory disclosure programs.
Implementation Process

**Design Review:** Ensures the proposed design meets code requirements

**On-site inspections:** Verifies building materials and labels with the proposed design, and checks installation quality

**Commissioning:** End-of-pipe tests check for proper installation & compliant operation

- Local governments play a key role in enforcing the building energy codes.
- Codes have become more stringent and complex over time, which can make implementation more difficult – important to keep it simple
- Compliance software can be an important tool to mainstream compliance.
- Building material testing, rating and labeling constitute an important component of any building energy code system.

- Blower-door tests (U.S. for commercial buildings; France)
- Commissioning of HVAC equipment
- Energy auditing requirements (Korea)

How comprehensive and frequent are the inspections?
Energy Performance Assessment & Certification

“...overarching frameworks which govern the evaluation, comparison, and labeling of a building’s energy efficiency are called “performance assessment systems”:

“Performance,” usually expressed as relative efficiency, refers to the responsible use of energy.

“Rating” refers to the methodology or tool used for the efficiency evaluation;

The result of such an evaluation is a “score”. The physical product relating this score is a building “label” – or Certificate.

No international consensus on terminology or methodology.

<table>
<thead>
<tr>
<th>Assessment system</th>
<th>Australia</th>
<th>Canada</th>
<th>China</th>
<th>E.U.</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rating</td>
<td>Labeling</td>
<td>Rating</td>
<td>Certification</td>
<td>Benchmarking; Rating</td>
</tr>
<tr>
<td>Evaluation methodology</td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
<td>Rating</td>
</tr>
<tr>
<td>Result of evaluation</td>
<td>Rating; Score</td>
<td>Rating; Score</td>
<td>Rating</td>
<td>Class; Rating</td>
<td>Rating; Score</td>
</tr>
<tr>
<td>Physical product of assessment</td>
<td>Label</td>
<td>Label</td>
<td>Label</td>
<td>Label; Certificate</td>
<td>Label; Rating; Statement</td>
</tr>
</tbody>
</table>

Source: IMT, 2013
All certification systems have 6 basic components:

1. **Quantification of Energy** consumption (Measured or Simulated)
2. **Energy Measurement Methodology** (Total, Delivered or Final Energy)
3. **Floor Area** (Conditioned or Conditioned + Unconditioned) – (Rentable, Gross or Net)
4. **Building Type** (New/Existing; Public/Private; Residential – SF or MF/Non-Residential)
5. **Comparability Metric** (Absolute Reference eg zero kWh/m² or Relative to code/average etc)
6. **End Uses** (HVAC, Lighting, Plug Loads, DHW etc)
Example Rating & Disclosure: Australia

Mandatory disclosure of EE performance at sale or lease for commercial office space >2000m² (Building EE Disclosure Act 2010). Issuance of a Building EE Certificate before sale, lease or sub-lease.
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On-Line Tools to Support Policy Development

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Online Policy Tools

Hosted by:

www.gbpn.org

DATABASES & TOOLS

POLICY TOOL FOR RENOVATION

POLICY TOOL FOR NEW BUILDINGS

BUILDING ENERGY PERFORMANCE SCENARIOS

GLOSSARY

LABORATORY: PROJECTS

BUILDING ENERGY CODES PORTAL

The Building Energy Codes Portal supports efficient international knowledge exchange on building energy code implementation by... Read more

Get involved in the Laboratory

BLOG

BUILDING THE PATH TO 1.5°C: WHAT THE PARIS AGREEMENT MEANS FOR BUILDINGS & CONSTRUCTION
13-12-2015 | PETER GRAHAM | GLOBAL

The Paris Agreement on Climate Change is a historic achievement for humanity and for the Building...
Read more

THE BUILDING SECTOR’S CONTINUOUS VOLKSWAGEN’ MOMENT
14-10-2015 | PETER GRAHAM | GLOBAL

A couple of weeks ago I had the privilege of catching up with one of the hero’s of the VW...
Implementing Actions

1. Stock Taking
2. Scenario analysis & Goal setting
3. Implementation Support & Capacity Building
Stock-Taking

EU – Building Stock & Code Data

International Rating & Disclosure Policy Database
Scenario Analysis & Goal Setting

Coming Soon:

MRV Base-Line & Scenario Tool for Building Energy Related GHG emissions
Thank you!
Let’s stay in touch ...

Consult our web site: www.gbpn.org
Follow us on Twitter: @GBPNetwork
Send us an email: pg@gbpn.org

Towards a Global Alliance for Buildings and Construction
BUILDINGS DAY
At COP 21
3 December 2015
Welcome to the Building Energy Codes Portal

A project of the IPEEC Building Energy Efficiency Taskgroup (BEET)
Best Codes still struggle to Implement

- Define a clear governance structure and institutional arrangement
- Define funding mechanisms to secure financial resources
- Decide on compliance and evaluation methodologies and indicators
- Involve stakeholders and market-actors
Best Codes are revised toward targets

Best performing jurisdictions set Long-term targets, implementation road-maps and scheduled revisions – this requires consensus building and stakeholder involvement.
Best Codes take a Holistic Approach

Integrated design can increase savings potential by about 30% compared with incremental approaches ... but requires supporting tools and data.
Best Practice Residential Renovation Policy Packages

Consumption per dwelling

Europe, France, Germany, Massachusetts, New York, United States
Best Renovation Policy Packages

Regulatory Measures
- Overall National Targets
- Residential Buildings
- Public Buildings

Building Assessment
- Code Requirements
- Labelling Schemes

Financial Instruments
- Incentive Schemes
- Taxation Mechanisms

Economic Instruments
- Utility-Funded Programmes
- Market Instruments

Capacity Building
- Training and Education
- One Stop Shop

Overall Performance
- Consumption/Capita
- Consumption/Unit
- Total Consumption

Sort alphabetically | By score
6 Basic Components

1. Quantifying Consumption
   - Measured
   - Calculated
   - Normalized
   - Not normalized
   - Standard values
   - Tailored values

2. Energy Measurement
   - Total
   - Delivered
   - Final

3. Floor Area
   - Conditioned
   - Conditioned & Unconditioned
   - Rentable
   - Gross
   - Net

4. Building Type
   - New
   - Existing
   - Private
   - Public
   - Non-Residential
   - Residential
   - MF
   - SF

5. Comparability Metric
   - Absolute Reference
   - Relative Reference
   - Statistical
   - Simulated
   - Compared to code
   - Compared to average
   - Compared to other

6. Energy End Uses
   - Cooling
   - DHW
   - Heating
   - Lighting
   - Plug Loads
   - Process Loads

Comparing Building Energy Performance Measurement

Detailed flowchart showing categories and subcategories related to energy measurement, floor area, building type, and comparability metrics.
Key Observations

- Countries increasingly recognize the need to strengthen implementation to achieve goals

- Codes have become more stringent and complex over time, which can make implementation more difficult – **important to keep it simple**

- Most jurisdictions require the review of building designs for compliance with the building energy code; some also inspect buildings to ensure code compliance; Post occupancy or ‘outcomes-based’ assessment is rarely practiced.
Common Elements of Implementation Systems

1. Capacity Building and Education

2. Compliance Checking Systems: Design, Construction and Commissioning (Note: many jurisdictions only check building design, but growing understanding of need for more extensive, yet cost-effective checks to produce energy efficient buildings)

3. Compliance Checking Tools: Mainstreaming Compliance
   Compliance-checking software, clear rules for simulation-based compliance
   User guides

4. Building Material Testing and Labelling
   Test protocols: tailor to local conditions (e.g. India)
   Independent labs
   Clear labels to make compliance easier

5. Evaluation of the Overall Process