Enforcing Building Energy Codes in China: Progress and Comparative Lessons

Meredydd Evans and Sha Yu

Third U.S.-China Energy Efficiency Forum
Beijing, June 13, 2012
Overview

- Introduction: building energy use and codes
- Building codes enforcement
  - Enforcement system in China and the U.S.
  - Analysis on long-term impact of Chinese codes
- Lessons learned
- Market opportunities
Buildings matter for energy and climate: in most countries today, buildings account for 30-40% of final energy demand.
Intensity of Building Energy Consumption by Service in 2005 [GJ/m²]

- Service share profile varies widely across the sectors, due to the differences in climate conditions, socioeconomic status, and service preferences.
- The energy intensity of rural residential buildings is the highest because of its heavy reliance on traditional biomass with inefficient combustion.

2005 Energy Consumption Per Unit Floorspace (by Service)

Source: China Energy Databook (2008); China Energy Statistical Yearbook (2006); IEA Energy Balances (2007); 2008 Annual Report on China Building Energy Efficiency (2008); Brockett et al.(2004). Urban energy services are calculated based on a variety of survey and statistical data; Rural and commercial services are calibrated based on fuel share of services in urban residential buildings in the same climate zone and with our reasoned judgment.
Building Energy Codes in China

- China began to adopt building energy codes in the 1980s.
- Now there is one code for commercial buildings.
- Three other codes cover large residential buildings in different climate zones: severe cold/cold, hot summer-cold winter and hot summer-warm winter.
Enforcement System

Key code enforcement steps in Chinese building construction
Construction site inspection roles

**Construction Company**
- Quality control system

**Construction Supervision Company**
- Checks work onsite; orders tests; prepares documentation on compliance

**Testing Labs**
- Tests components from construction site

**Quality Control and Testing Station**
- Collects and reviews documentation; conducts periodic site inspections; prepares completion report

**Developer**
- Takes completion report to Construction Administration Dept.

**Construction Administration Dept.**
- Accepts and files documents; issues occupancy permit
# Summary of Code of Acceptance

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>General Provisions, Terms and Basic Requirements</td>
</tr>
<tr>
<td>4-13</td>
<td>Energy Efficiency Checks/Specifications of 10 Items (e.g., Roofing)</td>
</tr>
<tr>
<td>14</td>
<td>Site Inspection of Energy Efficiency Work</td>
</tr>
<tr>
<td>15</td>
<td>Quality Acceptance of Divisional Work of Building Energy Efficiency</td>
</tr>
</tbody>
</table>

**Appendices A-C**

- **Appendix A** Reinspection Items of Materials & Equipments on Construction Site of Building Energy Efficiency Work
- **Appendix B** Forms for Quality Acceptance of Building Energy Efficient Divisional, Sub-divisional Works & Inspection Lots
- **Appendix C** Inspection of Energy Efficiency of External Wall with Core

**Explanation of Wording in the Code**
Comparison: U.S. Codes and the Building Process

- Local Government
- State Government
- Local Code
- State Code
- Architects
- Builders and Engineers
- Building Construction
- Save Energy and Money
- Reduce Carbon Emissions

COMPLIANCE

- Review Plans
- Review products, materials, equipment specifications
- Review tests, certification reports, product listings
- Inspect building and its systems during construction
- Evaluate materials substituted in the field
- Inspect prior to occupancy

Source: The U.S. Building Energy Codes Program
U.S. Building Energy Code Goals

Model Energy Codes

• **50% Goal—**for Increased Energy Savings
  – Need to go beyond prescriptive approaches
  – Exploring performance-based options and alternative paths to compliance
  – Submitted outcome and performance-based proposals to IgCC

• **70% Initiative for Increased Adoption**
  – Comprehensive adoption strategy
  – Goal: 40 states to adopt ARRA target codes or most current model codes by 2015
  – Goal: 10 states to adopt the ARRA target codes or more efficient in FY2011

• **90% Compliance by 2017**
  – Continue technical and financial support to the states
  – Increase the number and availability of compliance guides and field measurement tools

---

50% Better Codes
Proposed by 2015

70% Code Adoption
By 2015

90% Compliance
by 2017
Impacts of building codes and climate policy in China

Energy codes could significantly reduce building energy use; alternative building energy code scenarios may help reduce the sector's energy consumption and its CO₂ emissions by 14-21% by the century-end. The reduction comes from the major decrease in the demand for carbon-intensive heating fuels (e.g., coal, district heat, and gas) and the modest decrease in demand for A/C electricity.
Lessons Learned (For China)

- Enforcement in smaller towns and rural areas.
- Test ratings.
- Consistency of software results.
- Easier access to training and more user-friendly information.
- Increasingly rigorous codes.
Lessons Learned (For the United States)

- The extensive use of third parties in code compliance.
- The “industrialization” of the construction and code compliance processes.
- An example of integrating design and code compliance software.
Market Opportunities

- Codes help build demand for a range of building energy efficiency products like insulation, efficient windows and lighting.
- New post-occupancy and ‘stretch’ code requirements are also building the market for services like building commissioning, energy audits, and performance contracting.
- Because of their large impact on market deployment, codes can also make it easier for companies to obtain value from innovation and R&D.