The Emerging Chinese Market for Building Energy Efficiency

Government and industry insights based on years of U.S. – China collaboration

Webinar
October 29, 2014
Speakers

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**Context on China’s Buildings Sector**
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**China’s Building Standards and Incentives for Energy-Efficient Products**
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**Navigating China’s Market for High Performance Building Materials**
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**Navigating China’s Market for Building Retrofits**
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Vice President, Global Energy & Sustainability, Johnson Controls  
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DOE – China Collaboration on Building Efficiency

Building Energy Codes and Standards
• 1st energy code for rural buildings ~40% savings (2013)
• Commercial code revision (2015)
• Occupant behavior design standard; cool roof standard (2015)
• Commissioning protocol (2015)
• Roadmaps: building material standards; lighting controls (2015)

Energy Savings Performance Contracting
• Seeking to grow the $7B U.S. and $12B China ESPC markets through new collaboration
• In 2015: market analysis, practitioner toolkit, policy recommendations, and pilot project opportunity

Decision Tools
• Free resources / software for vendors and facility staff
• Optimize control and evaluate the performance of electrochromic windows and microgrid integration
• EnergyPlus updated to model occupant behavior
• Building Energy Performance Database, Rating System, and Policy/Program Framework Development
Sampling of DOE-Affiliated Resources On China’s Building Efficiency Market

Decision Tools and Guidance

- Commercial Building Analysis Tool for Energy-Efficiency Retrofit (COMBAT)
- Distributed Energy Resources Customer Adoption Model (DER-CAM)
- Global Change Assessment Model (GCAM)

Initiatives

- International Partnership for Energy Efficiency Cooperation – Building Energy Efficiency Task Group (IPEEC-BEET)
- U.S. – China Climate Change Working Group – Energy Efficiency (CCWG-EE)
- U.S. – China Clean Energy Research Center - Building Energy Efficiency Consortium (CERC-BEE)

Source: [http://dx.doi.org/10.1016/j.enpol.2013.11.009](http://dx.doi.org/10.1016/j.enpol.2013.11.009)
Sampling of DOE-Affiliated Resources On China’s Building Efficiency Market

Analysis and Case Studies

Advanced Building Technologies and the Role of Energy Efficiency Policies in Promoting their Development and Application
Analysis and case Studies of Residential Heat Metering and Energy-Efficiency Retrofits in China's Northern Heating Region
Analysis of the Chinese Market for Building Energy Efficiency
A long-term, integrated impact assessment of alternative building energy code scenarios in China
A Retrofit Tool for Improving Energy Efficiency of Commercial Buildings
Building Energy-Efficiency Best Practice Policies and Policy Packages
Building Energy Efficiency in Rural China
China Country Report
China Energy Databook Version 8.0
China’s R&D for Energy Efficient Buildings: Insights for U.S. Cooperation with China
China’s Building Energy Use: A Long-Term Perspective based on a Detailed Assessment
Comparative Policy Study for Green Buildings in U.S. and China
Country Report on Building Energy Codes in China
Data and Analytics to Inform Energy Retrofit of High Performance Buildings
Data Availability in Appliance Standards and Labeling Program Development and Evaluation
Development and implementation of energy efficiency standards and labeling programs in China: Progress and challenges
Energy Service Companies in the Building Sector - A review of International and Chinese Experience
Energy Code Enforcement and Compliance Evaluation: Comparative Lessons Learned from the U.S. and China
Enforcing Building Energy Codes in China: Progress and Comparative Lessons
Evaluation of China's local enforcement of energy efficiency standards and labeling programs for appliances and equipment
Feedbacks from Focus Group Meeting on Training and Implementation of Building Energy Codes in China
From Platinum to Three Stars: Comparative Analysis of U.S. and China Green Building Rating Programs
Introduction to U.S. Best Practices in Building Retro-Commissioning
Modeling China’s Building Floor-Area Growth and the Implications for Building Materials and Energy Demand
Optimal Deployment of Thermal Energy Storage Under Diverse Economic and Climate Conditions
Quantifying PM2.5 Emissions from China's Building Sector and Co-Benefits of Energy Efficiency
Scenarios of Building Energy Demand for China with a Detailed Regional Representation
Synthesis Report on the Implementation of Building Energy Codes in China
U.S. Trade Promotion Agencies: Supporting U.S. Businesses in China

• Expertise on foreign industry
• Market access
• Trade promotion
• Anti-dumping and countervailing duties
• Tom Dycus thomas.dycus@trade.gov 202-482-2295

• Reverse trade missions
• Feasibility studies
• Conferences and workshops
• Pilot projects
• Technical assistance
• Verinda Fike vfike@ustda.gov 703-875-4278

• Commercial and political risk insurance
• Loan guarantees
• Working capital loans for U.S. companies to fulfill export orders
• Term financing for foreign buyers of U.S. goods
• Rich Pearson richard.pearson@exim.gov 202-565-3709
Chinese Market for Building Energy Efficiency

Meredydd Evans, Senior Staff Scientist

Joint Global Change Research Institute, Pacific Northwest National Laboratory

2014 Webinar on The Emerging Chinese Market for Building Energy Efficiency
October 29th, 2014
Overview

- Energy consumption trends and opportunities
- Building energy codes and energy efficiency policies
- Technologies for energy efficient buildings
- Energy performance contracts
- Conclusions
China has added 1.8-2.0 billion m² annually over the last several decades, establishing the world’s largest market for new construction.

According to the World Bank, half of the world’s new building construction will occur in China between now and 2030.

China’s building energy consumption will continue to increase by more than 40% by 2035.

Source: Eom et al., 2012; IEA, 2011; Yu et al., 2012; Yu et al., 2014
China has mandatory codes for commercial and residential buildings in cities, and new voluntary code for rural residential buildings.

To compare the latest building codes, the U.S. codes require roofs with U-value of 0.119 to 0.21 W/(K m²), and the Chinese standards range from 0.4 to 0.45 W/(K m²).

**Comparison of the Scope of Codes**

<table>
<thead>
<tr>
<th>Items</th>
<th>China</th>
<th>U.S.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Envelope</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>HVAC</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Service Hot Water and Pumping</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Lighting</td>
<td>X (in a separate code)</td>
<td>N.A.</td>
</tr>
<tr>
<td>Electric Power</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
<tr>
<td>Trade-offs and Building Performance Approach</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Renewable Energy</td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>
Beyond Codes: Other Building Energy Policies

- Green building rating system;
- Financial incentives tied to efficiency;
- Appliances standards;
- Phasing out of incandescent bulbs;
- Policies to encourage retrofits in existing buildings.
Green Buildings Incentives

**National Incentives**
- Subsidy: Two-Star: $7.4/m²; Three-Star: $13.2/m²;
- City-based incentives.

**Provincial Incentives**
- Three-Star rating system subsidy;
- Eco-district incentives;
- Low-interest loan, etc.

**Cities Incentives**
- Three-Star rating system subsidy;
- Green building certification fee exemption, etc.
# Green Buildings Investment Potential (12th Five Year Plan)

<table>
<thead>
<tr>
<th>Program/Sector</th>
<th>Expected Investments (2011-2015) (billion $)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>New buildings</td>
<td>16.5-24.8</td>
</tr>
<tr>
<td>Energy efficiency retrofits (residential)</td>
<td>1.5-3.6</td>
</tr>
<tr>
<td>Energy efficiency retrofits (public)</td>
<td>3.5-8.6</td>
</tr>
<tr>
<td>Renewable energy</td>
<td>1.1-1.2</td>
</tr>
<tr>
<td>Green buildings</td>
<td>7.9-13.2</td>
</tr>
<tr>
<td>Rural buildings</td>
<td>1.3-2.0</td>
</tr>
</tbody>
</table>


* This is based on estimates of CITIC Securities (2013) and Orient Securities (2013).
China’s insulation market: rapid growth since 2000; 4.1 million tons in 2010 with annual growth rate of 15.1% from 2006 to 2010 (MIIT, 2011);

Market demand to reach 10 million tons in 2015 (MIIT, optimistic scenario).

Source: Sinolink Securities, 2013
Growing demand and higher profit margins (12% to 15%) for high-efficiency products (China Real Estate Business, 2012);

Low-emissivity glass industry: annual growth of 58% from 2006 to 2010; market share jumping from 1.3% to 7% during that period;

MIIT and MOHURD: rating system for green building products including windows and doors;

MOHURD: rating program for energy efficient doors and windows.

For details, please visit [http://www.windowlabel.cn/WebSiteW/Default.aspx](http://www.windowlabel.cn/WebSiteW/Default.aspx)

Picture Source: China Fenestration Energy Efficiency Performance Labeling
HVAC Market

- Largest HVAC market in the world; predicted to reach $18.3 billion in 2015

Source: Frost & Sullivan, 2012

Controls Market

- Forecasted to grow at 13.7% annually, reaching $344.5 million in 2017

Source: IMS Research
“Standard for Lighting Design of Buildings”: creating huge demand;
Other policy drivers: incentives and incandescent phase-out;
LED lighting: starting to penetrate the market (NDRC, 2012).

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2011</th>
<th>2012</th>
<th>2016</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Market</td>
<td>$ Billion</td>
<td>12.6</td>
<td>14.3</td>
<td>19.8</td>
<td>25.4</td>
</tr>
<tr>
<td>Incandescent</td>
<td>%</td>
<td>7</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>CFL</td>
<td>%</td>
<td>19</td>
<td>17</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>LED</td>
<td>%</td>
<td>12</td>
<td>18</td>
<td>46</td>
<td>69</td>
</tr>
<tr>
<td>Others</td>
<td>%</td>
<td>62</td>
<td>59</td>
<td>41</td>
<td>25</td>
</tr>
</tbody>
</table>

12th FYP: the importance of market mechanisms and EPC in energy efficiency retrofits of public buildings (GOA, 2011);

Annual EPC investment in China increasing from $100 million in 2003 to $12.75 billion in 2013 (EMCA, 2011; Sun et al., 2011; CESI, 2014);

Strong growth: expected to continue in the next few years, linked to financial incentives for ESCOs.

![Graph showing trend of EPC investment from 2005 to 2013.]

Share of Total Contracts, 2010-2011

- 82% Building
- 15% Industry
- 3% Transportation

Building energy codes are a key driver of the building energy efficiency market. Beyond codes, voluntary programs and incentives also have an impact.

There is rapid growth in demand for insulation, energy efficient windows, energy efficient lighting, and commercial HVAC system, as well as vast opportunities in buildings retrofits.
# Key Stakeholders

<table>
<thead>
<tr>
<th>Category</th>
<th>Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Government Entities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- National Development and Reform Commission (NDRC);</td>
</tr>
<tr>
<td></td>
<td>- Ministry of Housing and Urban-Rural Development (MOHURD);</td>
</tr>
<tr>
<td></td>
<td>- Ministry of Industry and Information Technology (MIIT);</td>
</tr>
<tr>
<td></td>
<td>- General Administration of Quality Supervision, Inspection &amp; Quarantine (AQSIQ);</td>
</tr>
<tr>
<td></td>
<td>Standardization Administration of the People's Republic of China (SAC);</td>
</tr>
<tr>
<td></td>
<td>Certification and Accreditation Administration of the People's Republic of China (CNCA);</td>
</tr>
<tr>
<td></td>
<td>- State Administration for Industry &amp; Commerce (SAIC), etc.</td>
</tr>
<tr>
<td>Industry Associations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- China Association of Building Energy Efficiency (CABEE);</td>
</tr>
<tr>
<td></td>
<td>- China Insulation &amp; Energy Efficiency Materials Association (CIEEMA);</td>
</tr>
<tr>
<td></td>
<td>- China Fenestration Energy Efficiency Performance Labeling;</td>
</tr>
<tr>
<td></td>
<td>- China Heating Ventilation and Air-Conditioning (CHVAC);</td>
</tr>
<tr>
<td></td>
<td>- China Illuminating Engineering Society (CIES);</td>
</tr>
<tr>
<td></td>
<td>- Architectural Society of China;</td>
</tr>
<tr>
<td></td>
<td>- U.S. China Energy Cooperation Program (ECP), etc.</td>
</tr>
<tr>
<td>Research Institutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- China Academy of Building Research (CABR);</td>
</tr>
<tr>
<td></td>
<td>- China Building Materials Academy (CBMA), etc.</td>
</tr>
</tbody>
</table>
Building Standards and Incentives for Energy-Efficient Products

Sha Yu, Scientist
Pacific Northwest National Laboratory, Joint Global Change Research Institute
2014 China Codes Webinar on The Emerging Chinese Market for Building Energy Efficiency
October 29th, 2014
Overview

- Standards for energy-efficient products
- Chinese testing and labeling systems
- Qualified lists, database and catalogs for energy-efficient products
- Conclusions
Buildings

- Building energy code
- Green building related policies
- Government incentives
- Government procurements
Roles of Government Agencies in Building Energy Policies Oversight

<table>
<thead>
<tr>
<th>Organizations</th>
<th>Roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOHURD</td>
<td>Develops regulations and policies of building materials</td>
</tr>
<tr>
<td></td>
<td>Issues building codes and standards that regulate construction</td>
</tr>
<tr>
<td></td>
<td>Issues energy efficiency labels for windows and doors</td>
</tr>
<tr>
<td>AQSIQ</td>
<td>Issues national standards for building materials, appliances and equipment</td>
</tr>
<tr>
<td></td>
<td>Certifies CNCA labs</td>
</tr>
<tr>
<td>MIIT</td>
<td>Issues industrial standards that regulate materials production</td>
</tr>
<tr>
<td>NDRC</td>
<td>Publishes catalogs of energy-efficient products</td>
</tr>
</tbody>
</table>

Source: (Yu et al., 2013).
Phases of Building Material Testing:

Product Manufacturing

AQSIQ’s local branch does quality testing on production batches of building material. Does not assess energy efficiency.

Building Construction

Developers send sample materials from each construction site to local testing labs to certify energy efficiency characteristics of the materials.

Appliance Labeling

Acceptance Check

Certified 3rd-parties and local quality supervision stations verify that building materials match code efficiency requirements per approved design.

Challenges in the Current Testing and Rating System

- Overloaded capacity;
- Fragmented management of the testing system;
- Potential to game the system;
- Limited coverage in quality control and annual inspection;
- Lack of material testing for rural buildings.
Database, Procurement Lists and Catalogs

1. Database of Code Compliance Resources: PKPM-Energy Database

2. Government Procurement Lists

3. Reference Catalogs of Energy-Efficient Products
Compliance Software and Building Products Database in China

- **PKPM-Energy**: leading energy efficiency analysis software for code compliance with around 70% market share in China, followed by Tangent-BEC and THS-BECS

- Includes building codes and design standards at the national, provincial and local levels, as well as technical specifications for technologies at the local level

- Application fee for adding products to the database: ~$5,000 (RMB 30,000)

- Processing time: 3-4 months
Getting products into PKPM-Energy Database

- Reach out to PKPM and fill out an application form,
  - E.g., product name, testing report, certification, atlas, and technical parameters (thermal conductivity, thermal storage coefficient, density, specific heat capacity, correction factors and fire retardancy), etc.

- Construction quality supervision stations or local building materials associations review the application
  - Varies by province and product
  - Takes around 3-4 months

- PKPM reviews and approves the application
  - Takes around 1 week
  - Requires annual renewal
Government Procurement Lists

Catalog of Energy-Efficient Products for Government Procurement

- Ministries in Charge: CQC, NDRC and MOF
- Areas Covered: Computers, printers, passenger vehicles, garbage truck, pump, HVAC, ballast, electric appliance, lighting equipment, video monitor system, windows, glass, etc.

Building Material Procurement Platform for Low-Income Housing

- Ministry in Charge: MOHURD
- Areas Covered: Insulation systems, doors and windows, roofs, shadings, solar systems, ventilation systems, heat pumps, building automation systems, etc.
# Reference Catalogs of Energy-Efficient Products

## Catalog of Green Building Materials and Products
- Ministries in Charge: MOHURD and MIIT
- Areas Covered: resource-intensive products (concrete, insulation materials and glass)
- Methodology: Life cycle analysis (i.e. energy consumption during manufacturing and operation)
- Still under development
- Free

## Catalog of Energy-Efficient and Water-Saving Products for Public Institutions
- Ministries in Charge: GOA and CQC
- Areas Covered: Insulation materials, lighting, HVAC, renewable energy, office equipment, energy monitoring, power supply and distribution, heating boiler, elevator, etc.
- Methodology: ROI, costs, energy consumption during operation, case studies
- Free

## Catalog of Energy-Efficient Equipment and Technology Services for Business
- Ministries in Charge: CQC and CGCC
- Areas Covered: Electric appliance, lighting, office equipment, energy storage, transportation, air conditioning, elevator, heating boiler, power supply and distribution, water-saving products, etc.
- Methodology: Energy efficiency of the product, case studies
- Free

*Most catalogs require that products are manufactured in China, produced by a joint venture or have been used in China.*
Conclusions

- China has a comprehensive system of building energy codes that companies have to comply with in order to sell in China, but building materials testing still has room to improve.

- Companies can expand their market access by getting their products into existing databases, procurement lists and catalogs.

- Establishing a national testing and rating system for building materials and equipment can help create market opportunities for energy-efficient products in China.
## Contact Information

### PKPM-Energy
- **PKPM建築節能設計分析軟件**
- **PMPM Shanghai Subsidiary**
- 19th Floor Haili Building, No. 88 Dapu Road, Shanghai 200023, China
- Tel: +86-21-53964807; +86-21-53964550
- Fax: +86-21-53964839
- E-mail: pub@pkpm.cn

PKPM Database Contact Person: Mr. Cao Yudong; Tel: +86-18701809280

### Catalog of Energy-Efficient Products for Government Procurement
- **節能產品政府採購清單**
- Ministry of Finance (Tel: +86-10-68552051; E-mail: hejingyan@mof.gov.cn)
- National Development and Reform Commission (Tel: +86-10-68505824; E-mail: jnchu@ndrc.gov.cn)
- China Quality Certification Center (3th Floor No.4 Building, District 9, No. 188 South 4th Ring West Road, Beijing 100070, China; Tel: +86-10-83886193; E-mail: jnqd@cqc.com.cn)

### Building Material Procurement Platform for Low-Income Housing
- 保障性住房建設材料部品採購信息平臺
- Center for Housing Industrialization, MOHURD
- Room 210, No. 9 Sanlihe Road, Beijing 100835, China
- Tel: +86-10-58934680; +86-10-58934599
# Contact Information

## Catalog of Energy-Efficient and Water-Saving Products for Public Institutions
- 公共机构节能节水技术产品参考目录
- [http://ecpi.ggj.gov.cn/tzgg/20140722_286118.htm](http://ecpi.ggj.gov.cn/tzgg/20140722_286118.htm)
- Government Offices Administration (Tel: +86-10-83084201)
- China Quality Certification Center (3th Floor No.4 Building, District 9, No. 188 South 4th Ring West Road, Beijing 100070, China; Tel: +86-10-83886214; +86-10-83886379)

## Catalog of Energy-Efficient Equipment and Technology Services for Business
- 商务领域节能产品设备/技术服务推荐目录
- China General Chamber of Commerce (No. 25 Yuetan North Street, Beijing 100834, China, Tel: +86-10-68391816)
- China Quality Certification Center (3th Floor No.4 Building, District 9, No. 188 South 4th Ring West Road, Beijing 100070, China; Tel: +86-10-83886193)

## Green Building Material Catalog
- 绿色建材产品名录
- Department of Raw Materials, MIIT
  - No. 13 West Chang’an Street, Beijing 100084, China
  - Tel: +86-10-66012138
- Department of Building Energy Efficiency and Technology, MOHURD
  - No. 9 Sanlihe Road, Beijing 100835, China
  - Tel: +86-10-58933043
Navigating China’s Market for High Performance Building Materials

Catherine Zhou
Kalmatron Corporation
Topics

• A culture of regulation
• The market we entered
• Who did we have to reach for?
• Break-through point: U.S. China Initiative
• Examples from working in China on behalf of U.S. companies
• Experience sharing: Participating China Green Building Assessment Standard as a revisal committee member
• Conclusion
China’s Culture of Regulation

- Chinese culture & tradition greatly influence business norms
  - “Gui” and “Ju” - behavior regulation
  - Everyone in the family tree has his/her place

- Unless a technology or practice is explicitly approved, don’t try it

- In the buildings industry, the implications are everywhere:
  - Standards
  - Codes
  - Testing
  - Rating
  - Certification
Personal Experience with U.S. Businesses Entering The Chinese Market

❖ High demand & fierce competition
  ❖ Urbanization at unprecedented scale
  ❖ Energy shortage & environmental deterioration
  ❖ Gov. policies and public outcry
  ❖ Local players, int’l players, and hybrids

❖ Industry challenges
  ❖ Entrenched existing firms vs. an array of new entrants
  ❖ Determining whether to follow or be a leader
  ❖ Tradeoffs on price vs. quality / safety
  ❖ Fair competition vs. protective processes
Which Key Players in the Chinese Government Did We Have to Contact?

- China Academy of Building Research (CABR)
- China Institute of Building Standard Design & Research (CIBSDR)
- China Building Material Test & Certification Group (CTC)
- China Quality Certification Centre (CQC)
Achieving Breakthroughs By Leveraging U.S. – China Initiatives

- **U.S. DOE:**
  - Mayors exchange program
  - Energy Efficiency Forum
  - Eco-city
  - Clean Energy Research Center
  - Codes and Standards work w. CABR

- **U.S. Department of Commerce:**
  - China Green Buildings OV trip
  - USTDA: Training program
  - Energy Cooperation Program
Previous Experience With Introducing U.S. Daylighting Systems

❖ Challenge:
  ❖ Catch 22 situation: architects loved the technology but were hesitant to incorporate it since:
    ❖ There was no Chinese standard for it
    ❖ Culture conformity: No one wants to be the first “crab-eater”
    ❖ Technical challenges: CABR did not have an appropriate testing process or equipment

❖ Solution:
  ❖ Solatube worked with the government to develop an acceptable industry standard
  ❖ Unlocked the opportunity to bid for public projects
Previous Experience With Introducing U.S. Electrochromic Windows

❖ Challenge:
  ❖ No China Compulsory Certificate (CCC) for Insulated Glass Units
  ❖ Burdensome annual inspection requirement

❖ Solution:
  ❖ Developed a viable strength test for electrochromic windows
  ❖ Received CCC
Previous Experience Participating in the Revision of China’s Green Building Assessment Standard

❖ Frequency
❖ Committee
❖ A set of standards:
   ❖ China Green Building Assessment Standard
   ❖ Green Building Material Standard
   ❖ Green Building Construction Standard
   ❖ Difference between CGBC and USGBC process

UDC

中华人民共和国国家标准

GB/T 50378—201×

绿色建筑评价标准
Assessment standard for green building
（送审稿）

中华人民共和国住房和城乡建设部
国家质量监督检验检疫总局
联合发布

201×—××—××发布  201×—××—××实施
Conclusions

- By influencing the regulatory market, you can gain a competitive advantage
- Be proactive in contacting key ministries and associations
- Share processes and procedures with your peers so you can address challenges together
- Leverage incentives and programs
Navigating China’s Market for Building Efficiency Retrofits

Clay Nesler
Vice President, Corporate Sustainability
Johnson Controls
Milwaukee, WI USA
clay.g.nesler@jci.com
The seventh annual Energy Efficiency Indicator survey drew over 3,000 respondents from 10 countries, 352 in China.
In 2013, 54% of Chinese organizations say energy management is EXTREMELY important to their company.

How important is energy management to your company/organization?
Barriers to efficiency in China shifting as market awareness rises, technical capacity grows - financial criteria emerge as top challenge

<table>
<thead>
<tr>
<th>Year</th>
<th>Awareness</th>
<th>Technical expertise</th>
<th>Certainty of savings</th>
<th>Financial criteria</th>
<th>Available capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>7%</td>
<td>17%</td>
<td>17%</td>
<td>24%</td>
<td>17%</td>
</tr>
<tr>
<td>2012</td>
<td>8%</td>
<td>23%</td>
<td>16%</td>
<td>14%</td>
<td>14%</td>
</tr>
<tr>
<td>2011</td>
<td>13%</td>
<td>17%</td>
<td>17%</td>
<td>17%</td>
<td>17%</td>
</tr>
<tr>
<td>US/Canada</td>
<td>7%</td>
<td>7%</td>
<td>17%</td>
<td>20%</td>
<td>31%</td>
</tr>
</tbody>
</table>
There are differences between ESCO building retrofit models in the US and China that impact project scope, size and the ability to finance.

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Shared Savings Building Retrofit Case Study - Shanghai Hongta Hotel

Background
5-star Hotel in Shanghai, with approximately 59,000 square meter, Constructed in 2001 with 328 guest rooms. Annual energy expenditure approximately 9 million RMB

Energy Conservation Measures
• Lighting Retrofits
• Centrifugal Chiller VSD Retrofit
• Chiller Plant Optimization
• Smoke Heat Recovery From Boiler
• Heat Recovery from Laundry
• Lighting control system upgrade
• Cooling tower filler replacement
• Cooking Appliance retrofit
• Fan Coil Unit Condensate Water Recovery
• Window Films for the Lobby
• Energy Management system

Shared Savings Model
• Contracted period of 6 years, 734,000 RMB in incentives from the central and city government.
• Annual savings about 1.5 RMB equivalent to 700 tons of standard coal.
Background

A five-story comprehensive shopping mall that includes department stores and supermarket, opened in April 2004, with the building area of about 30000 m². Energy-saving project started at the beginning of 2010, and completed in March of 2011.

Facilities Improvement Measures:

- Chiller Plant replacement
- Ice storage system
- AHU control system optimization
- Building Automation System
- Energy Measurement and Verification system

Guaranteed Cost Savings Model:

- Contracted period of 5 years
- Guaranteed annual energy savings of more than 1.45 million RMB and a guaranteed project cost not to exceed 6.39 million RMB
- Takes advantage of 4x on-peak/off-peak electricity price differential in Shenzhen area
- The owners can claim credit from bank letter of insurance if the verified savings fall short of guaranteed savings
An alternative ESCO building retrofit model combines elements of the Guaranteed Energy Savings and Shared Savings models

**China Hybrid Model**

Guaranteed Energy Savings (15-20% of project cost at risk)

Third-party or Owner Financed

One Year Contract with Shorter Project Paybacks (2-5 years)

One-time Savings Verification (after first year)

Small Bundle of Efficiency Measures (HVAC and Lighting)

EE, RE and DG in different projects

Non-Standard, but Simpler Contracts
**Background**

An office owned by China Sino-Chemical Corp group. Occupancy area 200000 m\(^2\), located on BJ financial street. Building has achieved LEED Platinum and Three Star Green Certification.

**Facilities Improvement Measures**

- Retrofit chiller with VSD
- VSD on water pump and cooling tower fan
- AHU (VSD and backward curve fans)
- Fresh air AHU retrofit
- Heat recovery for Fresh Air Unit
- Chilled and Hot water reset
- Air balancing
- LED lighting
- VAV retrofit
- BAS system upgrade replacement
- Energy management system

**Guaranteed Energy Savings Model**

- Contracted period of 1 year
- Customers pay 85% of project fee after project completion and the remaining 15% when the actual savings is verified to exceed 616 tons standard coal as confirmed by an independent third party
- Customer invests 14 million RMB and JCI Guarantee energy savings of 616 tons of standard coal
Scaling the building efficiency retrofit market in China can deliver significant energy savings and carbon reductions while protecting the environment.

- Allow national, provincial and city incentives to apply to a variety of energy savings models subject to independent savings measurement and verification using standard international protocols.
- Provide increasing incentives for comprehensive retrofits which deliver greater energy efficiency savings and integrate multiple technologies into a single contract.
- Encourage third-party financing by providing government support for guaranteed energy savings models, standard contracts and measurement and verification protocols, and credit enhancement from government or multi-lateral development banks.
Thank you!

- The webinar presentation will be available later today at http://www.globalchange.umd.edu/events/doe-webinar-2014-10-29/

- **Please send feedback on the webinar to brian.holuj@ee.doe.gov!!**

- Q&A Session