# FROM GREY TO GREEN
# Make China's Rapid Urbanization Sustainable

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October 2010

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THE EARTH'S BEST DEFENSE

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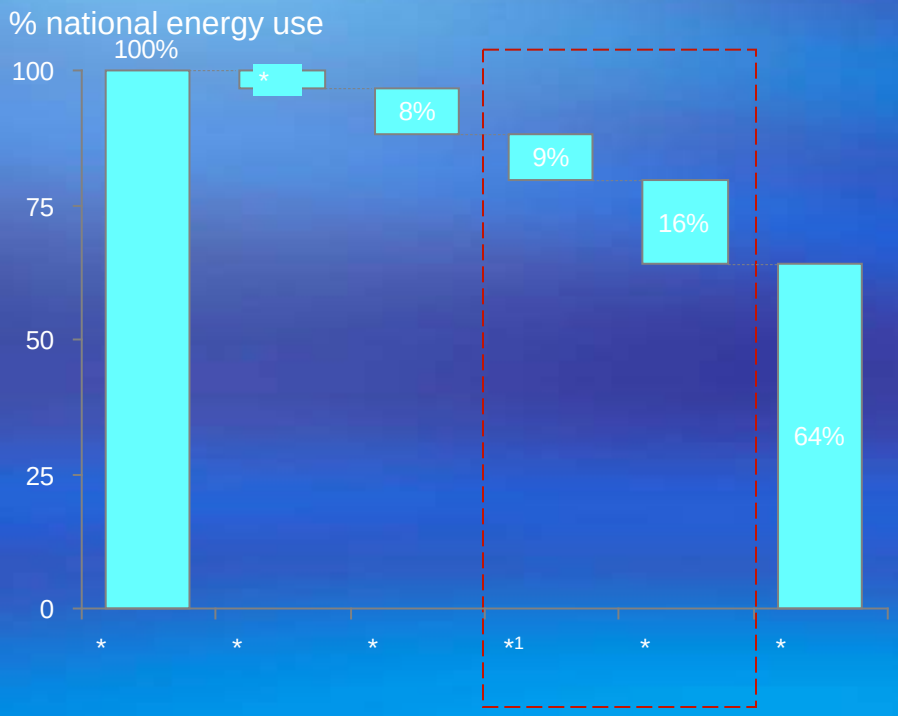
# Buildings are one of China's largest energy users – use more energy than cement, iron and steel industries combined

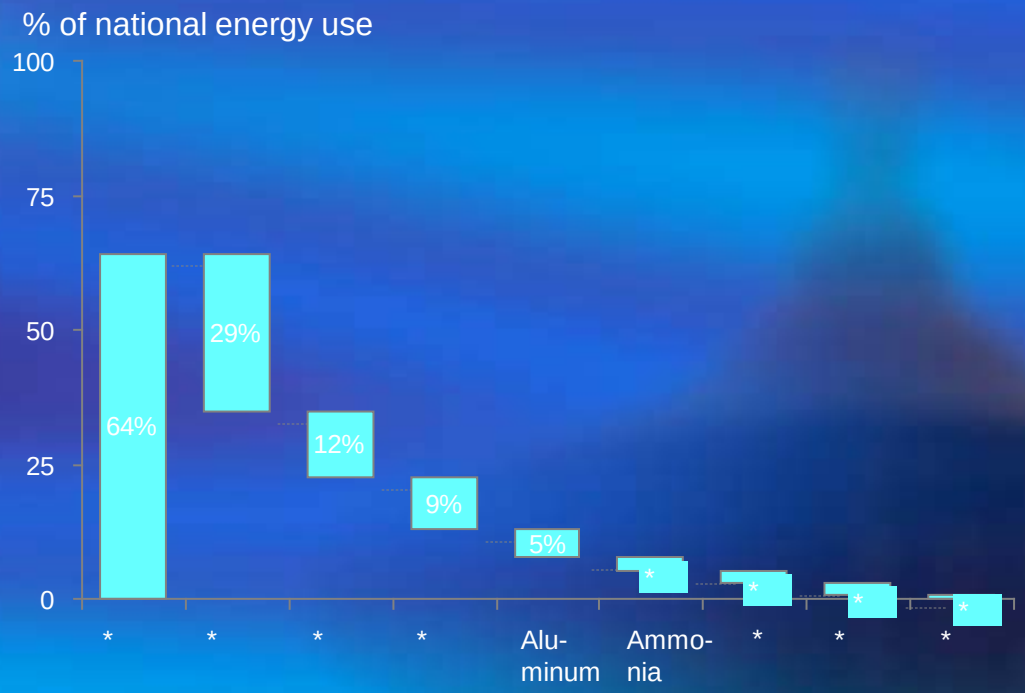
Industrial sector uses the most energy but…

...it is comprised of disparate sub-sectors with very different efficiency levers

2007 China Energy Use




2007 China Industrial Energy Use




Operational use of residential and commercial buildings in China accounts for ~25% of the nation's total energy usage

# Energy and $CO_2$ Reduction Opportunities in Buildings

Even a modest increase of energy efficiency in buildings could save 170 billion kWh, and reduce $CO_2$ emissions by 170 million metric tons by 2015.


# Green Buildings: A Vast Potential

**Reducing energy use by 50% in 5% of existing buildings and 60% of new buildings by 2015 equivalent to any one of the following every year...**

Not building an additional 50 500-megawatt coal-fired power plants

or

Filling an area the size of 4,000 Tian'anmen Squares with rainforest[2]

or

Shutting down current world steel production for 5 weeks[3]

Turning off all the lights in the United States for 1 month

or

Achieving a modest greening of China's buildings[4]

or

Reducing energy consumption by the amount of energy generated by 30,000 wind turbines[5]

Removing all cars from Sweden, Norway, and Denmark

or

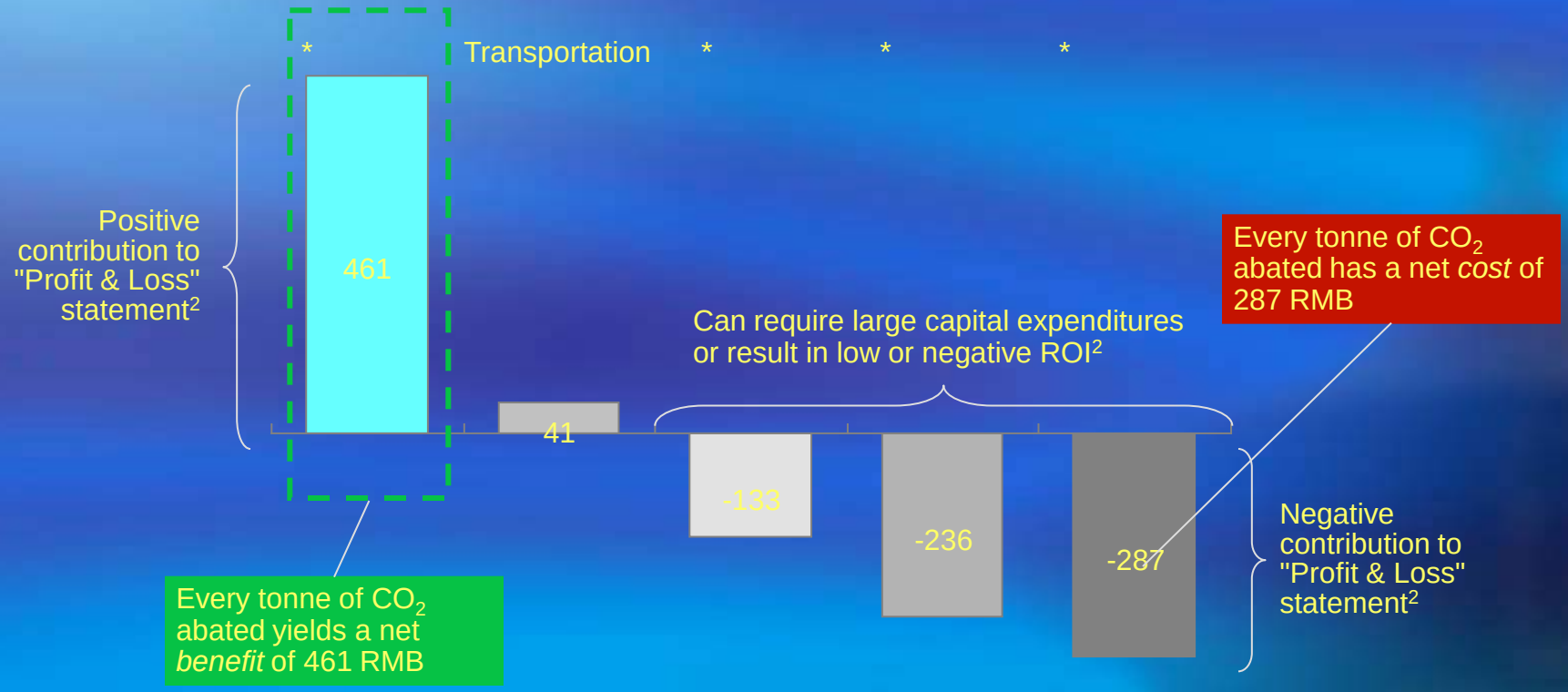
Reducing energy consumption by twice the amount of energy generated by China's Three Gorges Dam

or

Halting all air traffic globally for 4 months[6]

# Tackling building efficiency can also be highly cost-effective

## Cost-benefit estimates of $CO_2$ abatement for key sectors



# Matrix of Recommended Policy

| | Codes and standards | Enforcement | Incentives | Others |
|---|---|---|---|---|
| **New building** | ✓ 1 Laggards to implement 50% standards for all cities as soon as possible, while leaders pilot and develop implementation guidelines for more advanced standards<br><br>Develop clear roadmap and timeframe for industry to reference and develop | ✓ 2 Enforcement process to start with key check points, requiring proper reporting and auditing<br><br>Understand and pilot 3rd party certification and audit in the mid-long term | ✓ 5 Develop integrated incentive systems for building energy efficiency<br><br>Create incentives that induce greater consumer demand<br><br>Involve MOHURD, NDRC, MOF, CBRC and etc. to start research pilot on financing policies<br><br>Coordinate efforts from the Governor/Mayor's level | ✓ 6 Government to accelerate development as influential building end-user<br><br>Organizational improvement in government agencies<br><br>Education programs on general awareness<br><br>Launch education programs to fill industry capability gaps<br><br>Support EMC/ESCO industry and green building material industry<br><br>Launch DSM pilot |
| **Existing building** | ✓ 3 Accelerate energy efficiency quantification, audits & disclosure to government and large-scale public building<br><br>City or provincial level construction bureau to develop overall policy frameworks and technical specifications<br><br>Pilot Hong Kong model to form owners' cooperation to make decisions for the whole building | 4 Launch labeling system for existing buildings doing retrofitting<br><br>Adopt more channels to experience sharing | | |

✓ Top 5 to advocate

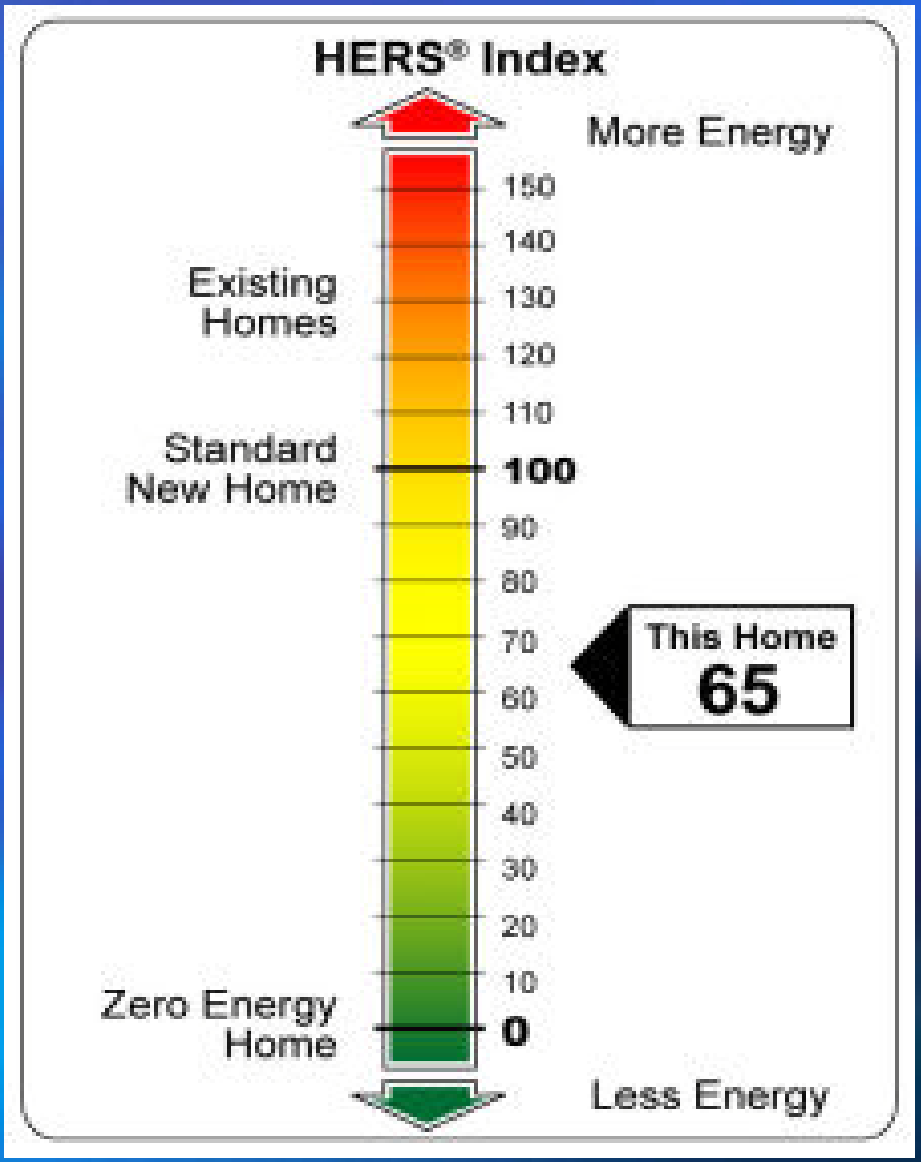
# Priorities for Improving Building Efficiency in China

1. Implement building labels at local levels for both commercial and residential buildings, existing and new, starting from government buildings.
2. Strengthen existing building codes, establish a revision cycle to make sure the codes continue, and strengthen enforcement and implementation.
3. Provide performance-based incentives and tax rebates to encourage new buildings go beyond building codes
4. Provide feasible financing mechanism to push existing building retrofits, including integration of building energy efficiency into demand-side management (DSM) programs

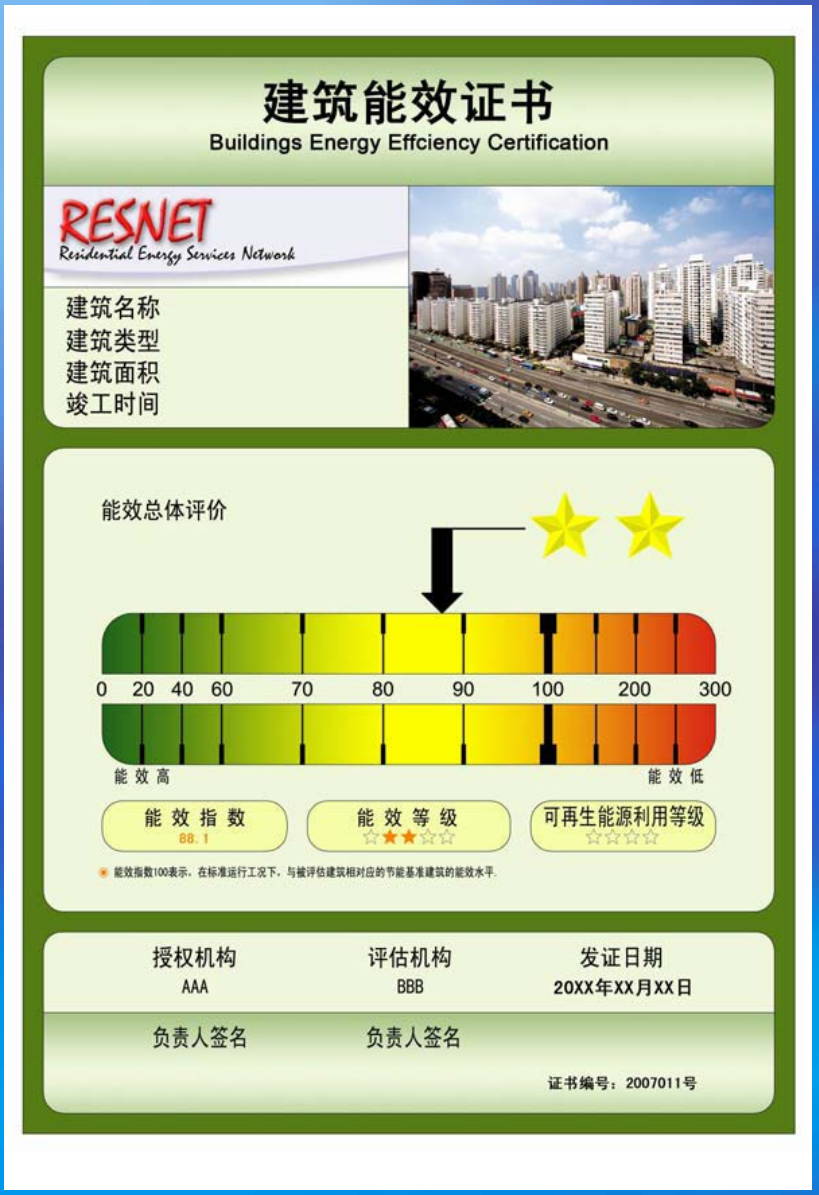
# 1. Implement Building Energy Labels

- **RESNET**: well established and recognized energy rating program for residential buildings
  - ENERGY STAR, USGBC, more than a dozen states
  - Accepted by IRS and DOE as a basis for tax credits for home energy efficiency

- COMNET: envisioned as a commercial-sector equivalent of RESNET
  - Establish a standard rule set for defining hypothetical reference buildings or systems against which the subject building or systems will be compared
  - Asset ratings: energy features built into the building, potential or "designed" energy performance rating of the building
  - Focus on the design-rating approach
  - Complement EPA's ENERGY STAR for commercial buildings (metered value)



# Shanghai Building Energy Label



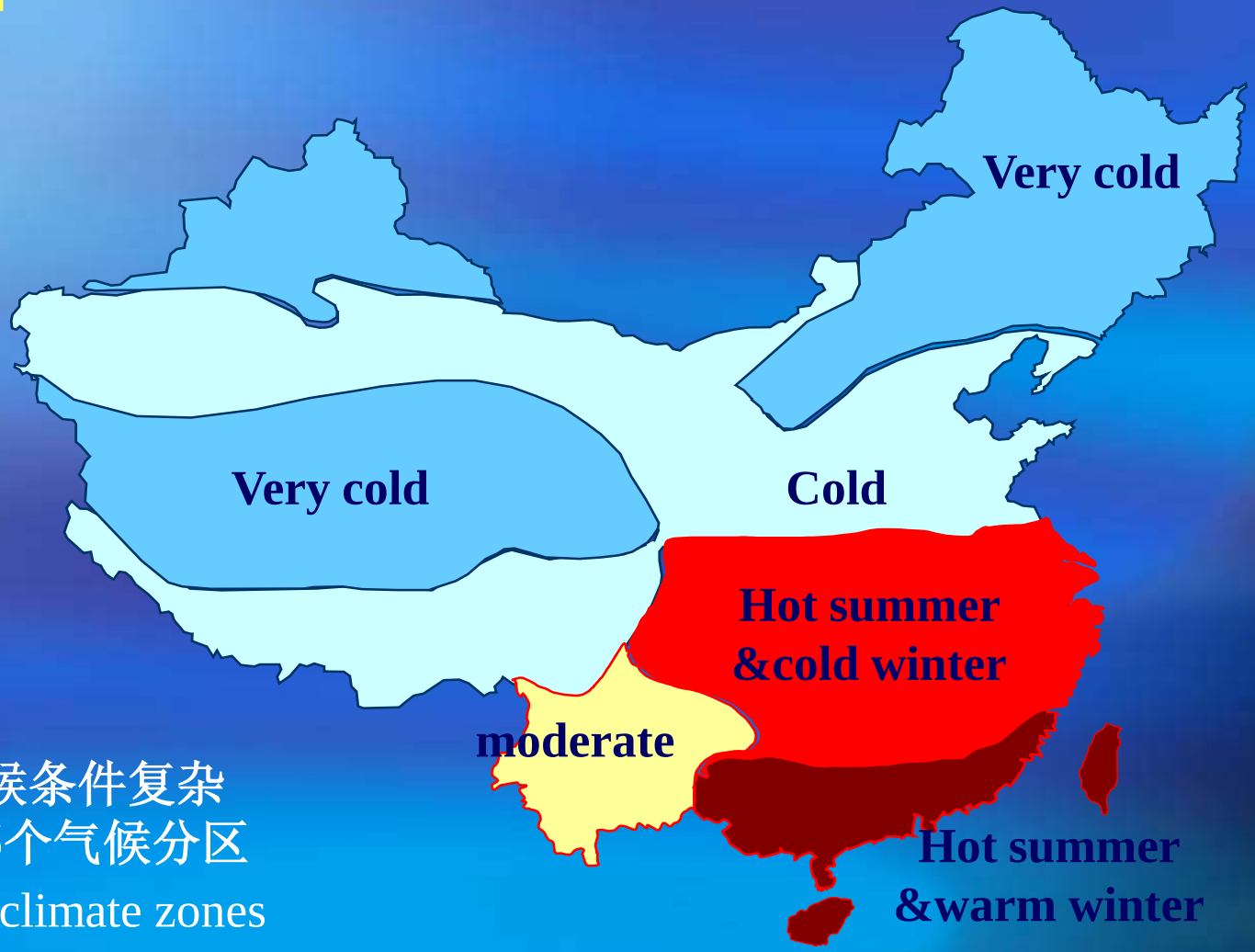

# China’s National Building Energy Rating Guideline


Source: National Building Energy Rating Guideline, MOC

# Current Status

- Eight pilot cities
  - Shanghai, Shenzhen, Guangzhou, Fuzhou, Xiamen, Chongqing, Wuhan, Changsha
- Four Provinces
  - Jiangsu, Shandong, Hebei, Shanxi
- No definition of the 1980 baseline building
- Only prescriptive language, no performance-based standard
- Primarily focus on space heating/cooling in the residential and HVAC+Lighting in the public buildings
  - No water heating, plug load, appliances, etc.
- Launched real-time energy auditing for government buildings in many cities
  - Evaluate local officials' performance
  - Part of government information disclosure
  - Set an example to promote energy efficiency
- Lack of government incentives and subsidies and R&D

# 2. Building Code Development and Implementation

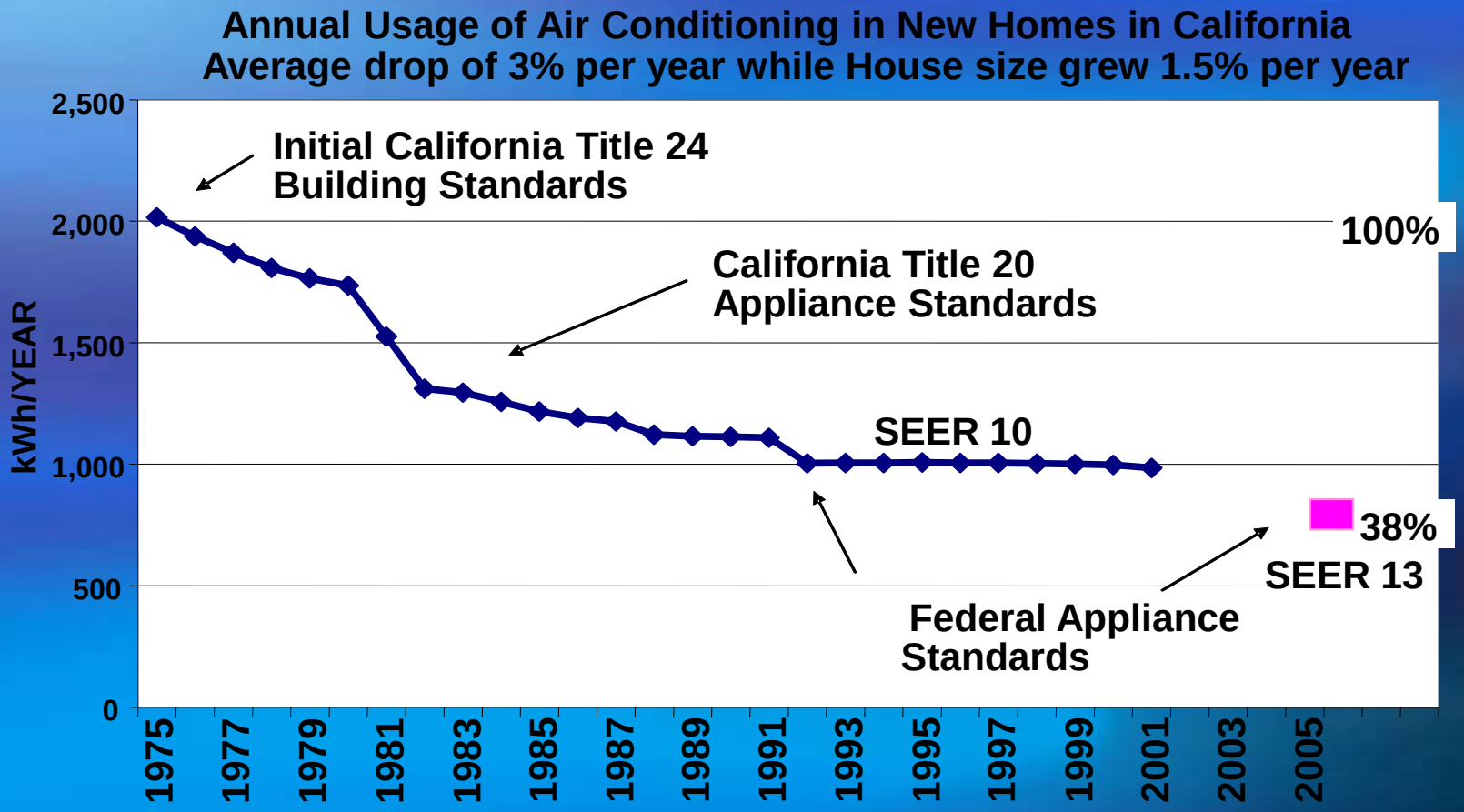



中国气候条件复杂
全国分5个气候分区

5 different climate zones

# Continuous Improvement

- Codes should be updated on a regular basis to account for technological progress



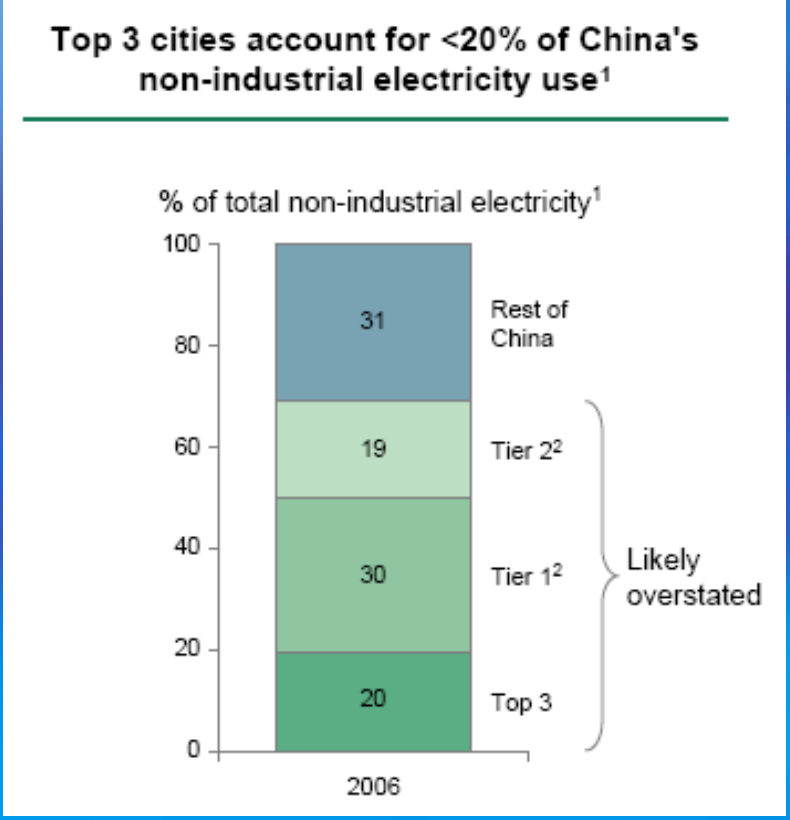

Source: CEC Demand Analysis Office

# Compliance With an Energy Code Requires More Than Just Adoption

- Good information must be provided to building designers, the construction industry, and code enforcement officials
  - Updated versions of standards and supporting information
  - Updated compilation of interpretations
  - Design manuals showing how to construct buildings or building details that comply
  - Service providing immediate email or telephone responses to questions
- Information should also motivate the designers and enforcement officials on the importance of codes

# Local Government is the Key

- Incentive: local government = 3 x central government
- EEB: Incentives for EE from local government is far less than central government




- Building energy consumption in the top 3 cities accounts for less than 20% of national total building energy consumption
  - Shanghai
  - Beijing
  - Chongqing
- The top 3 lead the way in building energy efficiency efforts
  - Higher compliance level
  - Stronger enforcement with building code
  - Set up examples and test new policies
  - More international cooperation
- Other large cities (Tier 1) are typically a couple of years behind Top 3 in policy adoption
- To claim building efficiency “prize”, much broader geographic “penetration” is needed

# Implementation Issues

- Frequent training of code officials, building designers in the construction industry has proven important in the U.S.
- Adequate budgets are needed for inspection: 100% inspection of all plans and of actual building construction are necessary. Labels can assist in implementation
- Labeling could be used as a compliance method, especially if the label is incorporated into financing rules

# 3. DSM Programs
# 需求侧管理计划
# A Focus on Buildings

- DSM programs can make an immense contribution to energy balance, peak reliability, and high quality buildings.
- 需求侧管理计划对维持电力供应平衡，高峰期供电可靠性和高质量的建筑供电做出了很大贡献
- California Energy Commission projects savings of 7% in energy and 14% in peak power by 2013.
- 加州能源委员会预测，到2013年节能7%，峰值功率节能14%

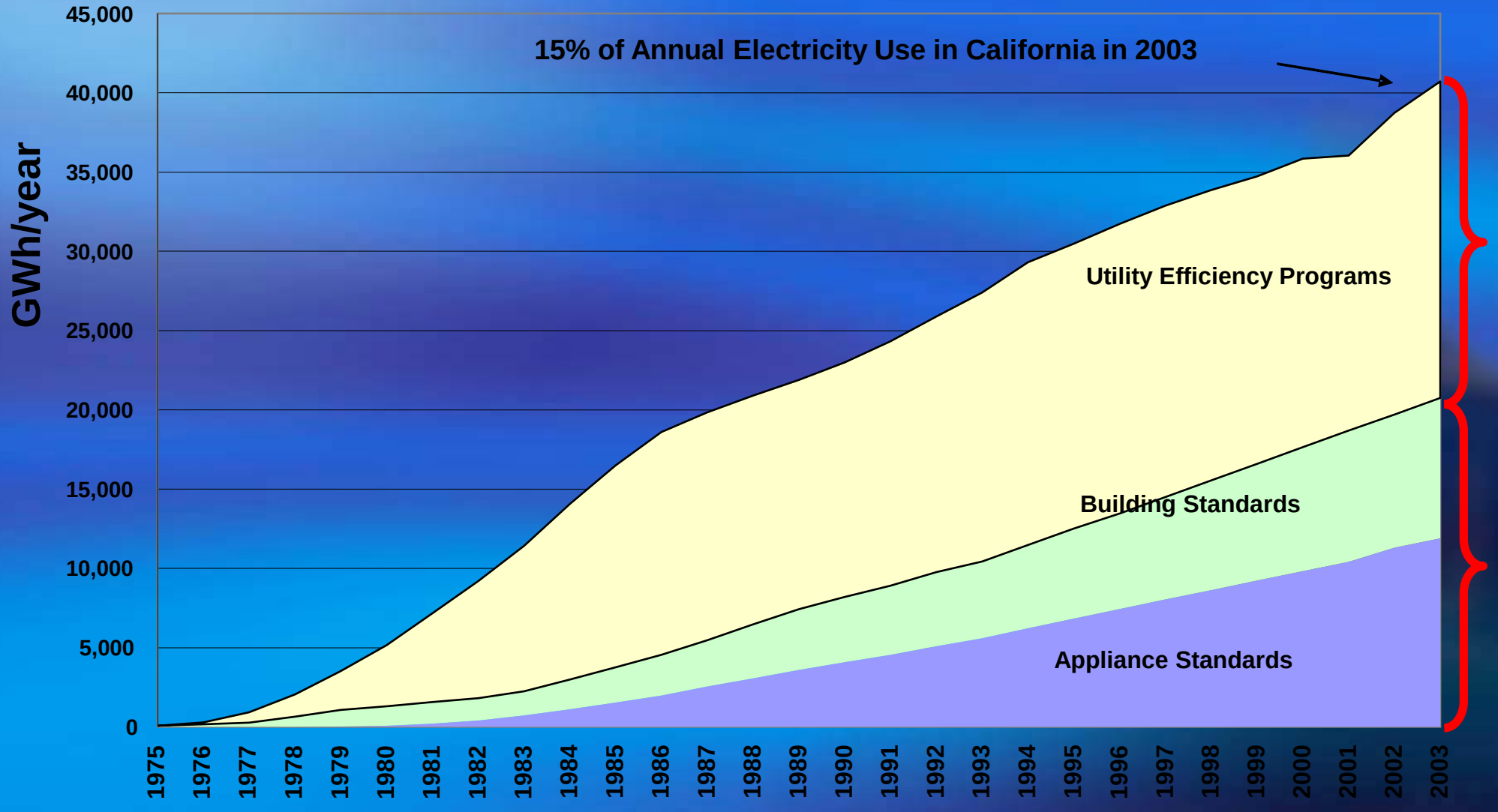
# DSM Efficiency Programs Complement Energy Codes

- **Programs can encourage compliance with the code by motivating designers.**项目可以通过对设计者的激励鼓励遵守法令的行为
- **Programs can encourage production of efficient equipment locally.**项目能够鼓励当地高能效设备的生产
- **Programs can encourage compliance with China's codes and standards and efficiencies beyond the minimum in the code.** 项目能够鼓励中国新照明节能标准和超过最低能效标准的早期执行

# Energy Efficiency DSM

- Utility-sponsored programs that use ratepayer funds to help customers upgrade to more efficient technologies such as commercial lighting, industrial motors and commercial and residential air conditioners.
- Uses tools such as rebates, investment incentives and energy audits
- Stringent monitoring and verification of energy savings

# Efficiency Incentive Programs Can Greatly Increase Energy Savings



# Major Efficiency Program Markets
# 能效项目的主要市场

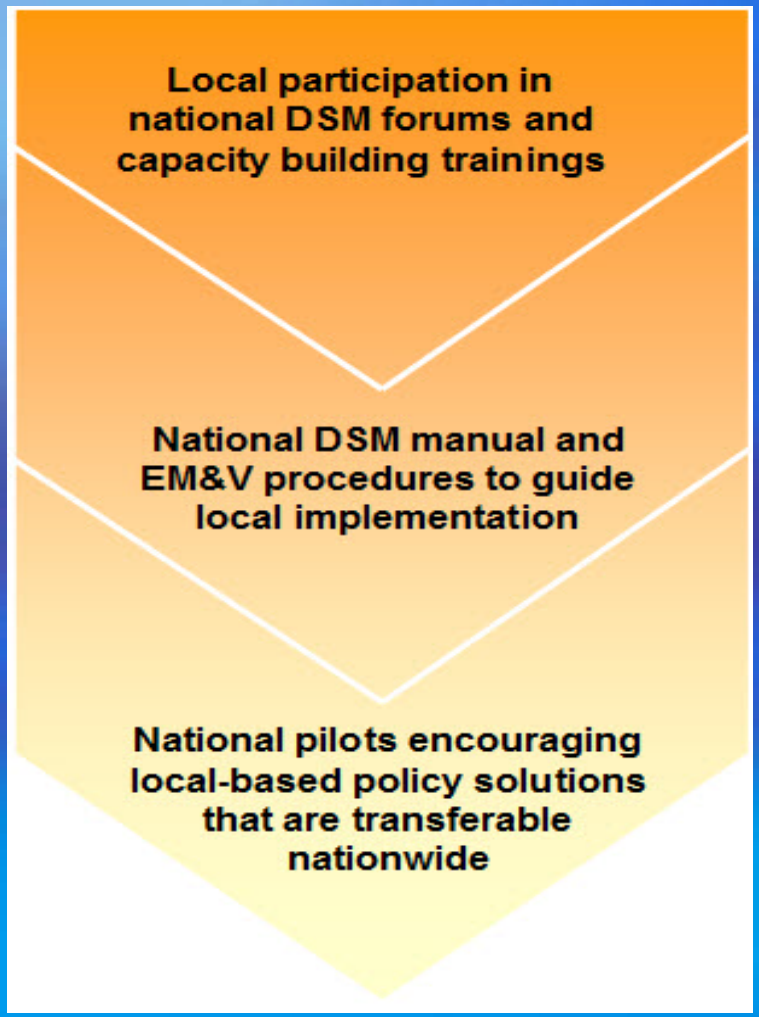
- Greatest program opportunities and achievements in U.S. have been in:美国已经在下面领域获得很大的项目机遇和成就:
  - C&I and Residential New construction商业、工业和住宅新建筑
  - Existing commercial lighting, cooling and ventilation现存商业照明、空调和通风系统
  - Small commercial direct install lighting小的商业直接安装的照明设备
  - Industrial compressed air and drive power工业压缩空气和拖动动力
  - Residential appliances and lighting民用电器和照明

# Successful Program Strategies
# 成功的项目策略

- Best programs use multi-pronged approach — no one strategy sufficient最好的项目使用多种途径— 单一的策略是不够的
  - Aggressive marketing and outreach (personal contact to all market actors)积极的营销和市场开拓 (与各个行业面对面接触)
  - Detailed and customized technical assistance详细的、定制的技术支持
  - Financial strategies including cash incentives and financing经济策略包括现金激励和融资
  - Upstream efforts to manufacturers, distributors, vendors, contractors不断努力与制造商、发行商、卖主和承包商合作

# Best Practices for Developing Energy Efficiency Resources in China:

## Central Government





## Local Partners

# THANK YOU

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