

# Evaluation of Local Enforcement of Energy Efficiency Standards & Labeling Program in China

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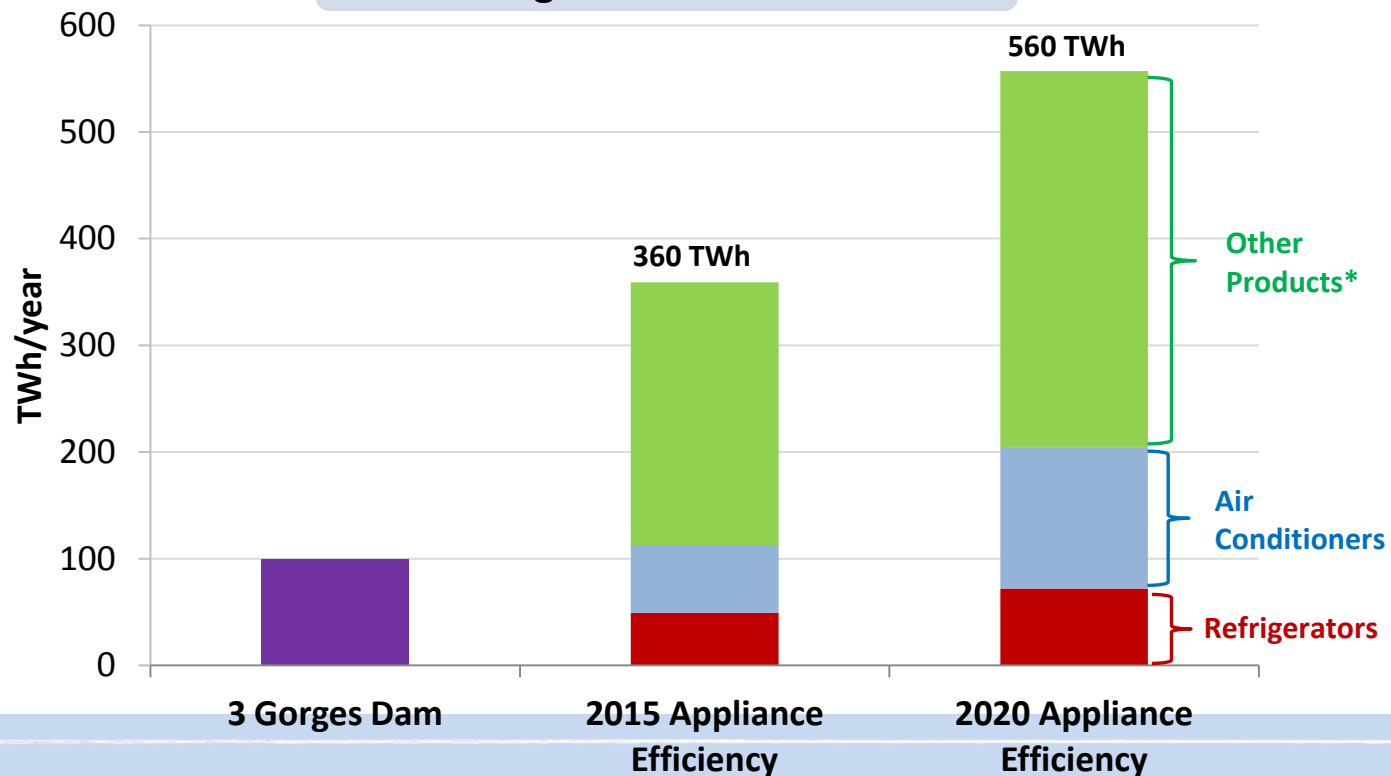
*Rome: 2012 International Energy Program Evaluation Conference*

# A Look Back at China: 1994 to 2012

Three Gorges Dam completed; will operate at full capacity by summer 2012 after estimated USD \$22.5 billion

300 million new urban consumers added with over 50% urbanization; residential electricity use growing by 13% per year

China's appliance efficiency standards grew from <10 to 40+



# Presentation Outline



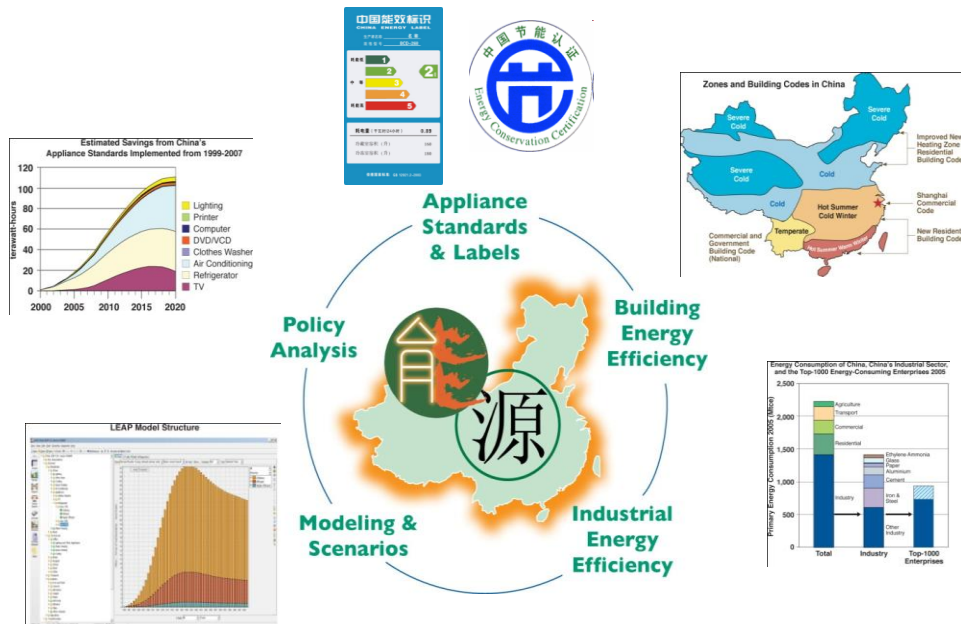
- **Why this study?** Background and context for study
- **What's already been done?** Review of 2006 and 2007 local enforcement efforts
- **What's new in 2009?** Overview of testing program, labeling and efficiency compliance results
- **What changed in 2009?** Progress and remaining challenges
- **What does it all mean?** Key findings and conclusions

# China Energy Group has worked collaboratively with China on appliance S&L program since 1990s



Lawrence Berkeley National Laboratory is a U.S. Department of Energy national laboratory, managed by the University of California

China Energy Group founded in 1988 to work collaboratively with groups in China and elsewhere to understand China's energy use, enhance capabilities of Chinese institutions, create international linkages, and promote energy efficiency.



## History of LBNL Appliance Work in China

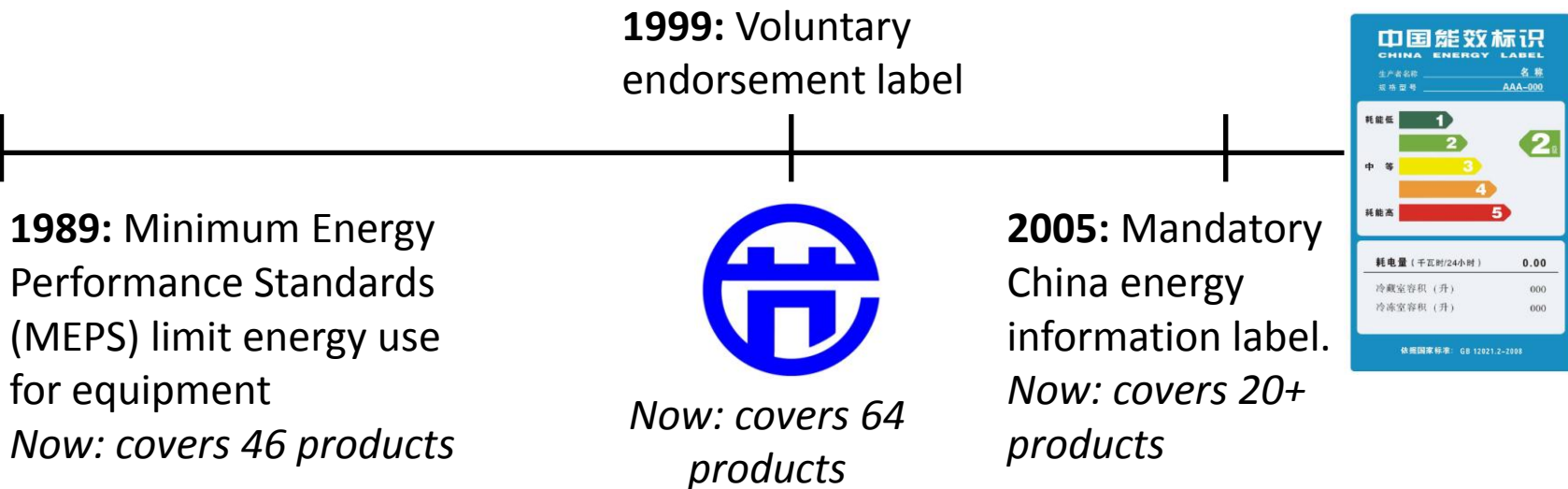
1998 – 2003: training and implementation of standards setting toolkit

2003 – 2007: expanding scope of standards & labeling (S&L) programs

2008 – Present: institutional strengthening

# China's S&L Programs include standards, voluntary and mandatory energy label

## Regulatory Standards & Labeling (S&L) Programs:

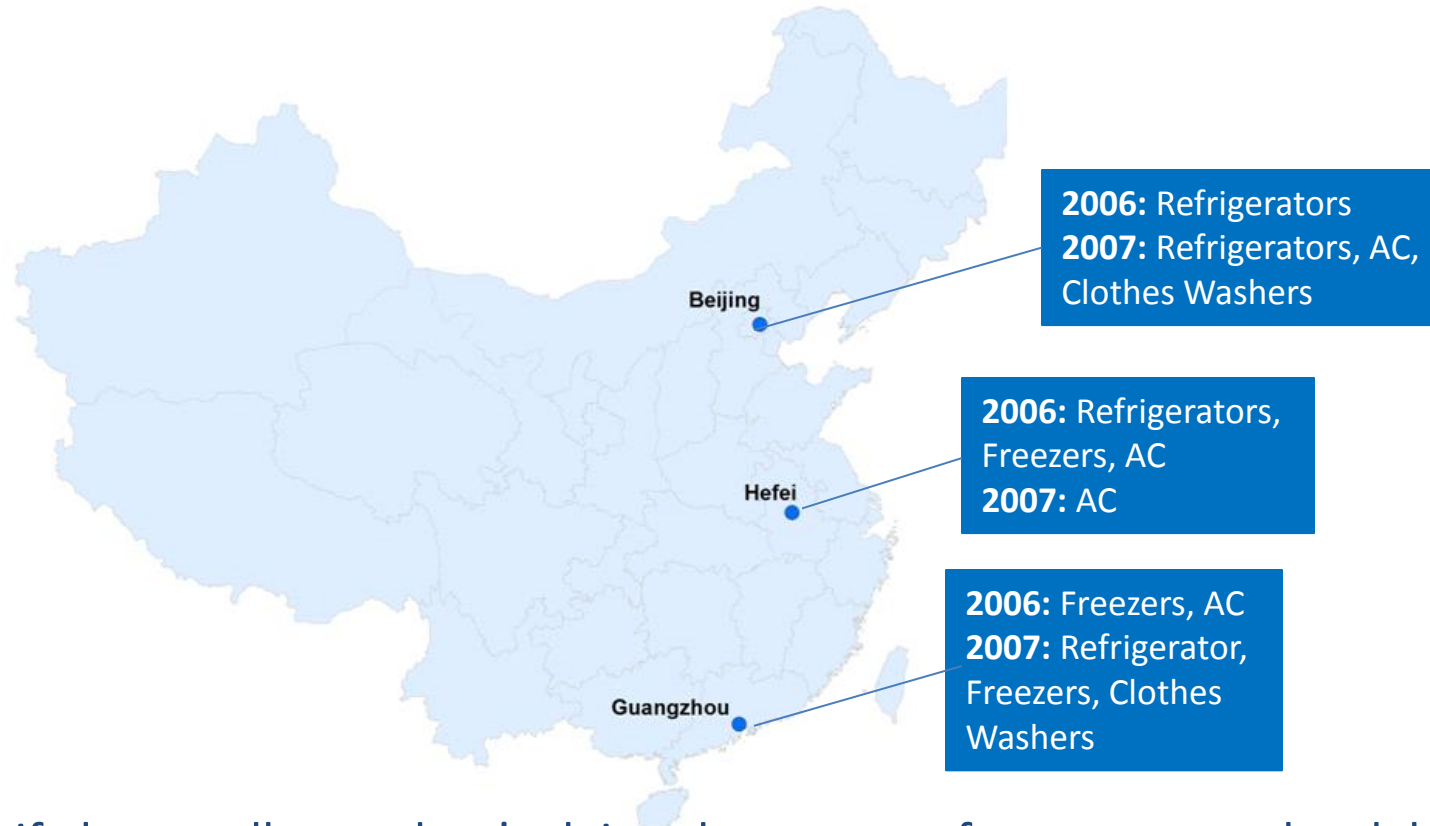


# Legal framework exists for S&L enforcement, but actual inspection and testing weak in China



- Legal framework sufficient: multiple laws and regulations define responsibilities, specify fines and penalties for non-compliance
- Organizational framework for monitoring and enforcement more complicated:
  - State Administration of Quality, Supervision, Inspection and Quarantine (AQSIQ) in charge, but also responsible for product quality supervision of all consumer products
  - Efficiency testing lower priority; major appliances tested only 1 – 3 times from 2001 to 2006
- In the absence of regular national testing, China National Institute of Standardization (CNIS) began conducting pilot local enforcement check-testing projects in 2006 with LBNL technical assistance

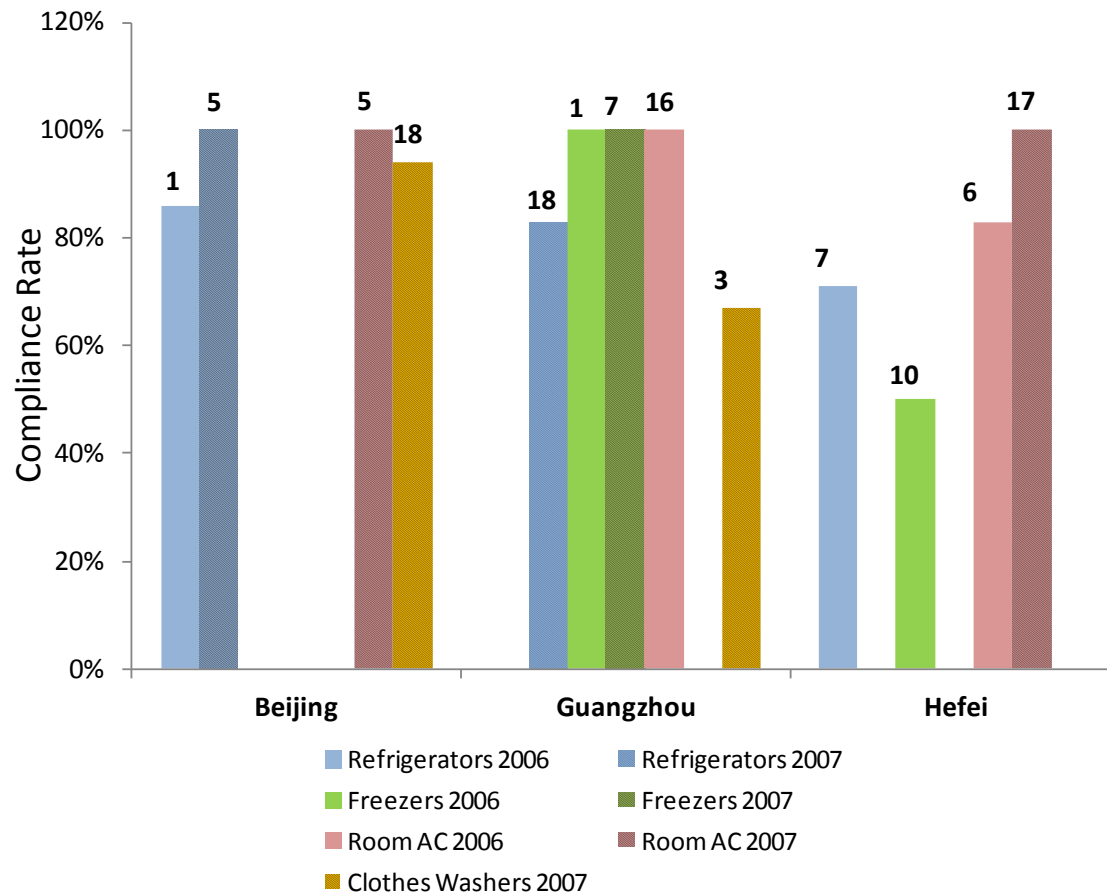
# Initial check-testing efforts started by CNIS in 2006, with 2007 follow-up



To verify how well a product's claimed energy performance matches label information, CNIS:

- Purchased product samples from retailers
- Sent to national test labs within each city for testing
- Manufacturers notified of results; re-testing offered at manufacturers' cost

# Compliance improved from 2006 to 2007...



- Significant improvements in 2007 across product types and regions
- Total non-compliant products decreased from 11/54 in 2006 to 3/73 in 2007
- Non-compliant products in 2007 had high efficiency ratings (compared to lower ratings for non-compliant products in 2006) → signify products on market at least meet MEPS



# ...but limitations still exist, leading to broader 2009 local enforcement efforts



## 2006 & 2007 Limitations

**Geographic scope:**  
testing only in top-  
tier, economically  
developed cities



**Sample size:**  
very small, represent  
1% of models on  
market



**Sampling origin:**  
retailers only,  
primarily high-end



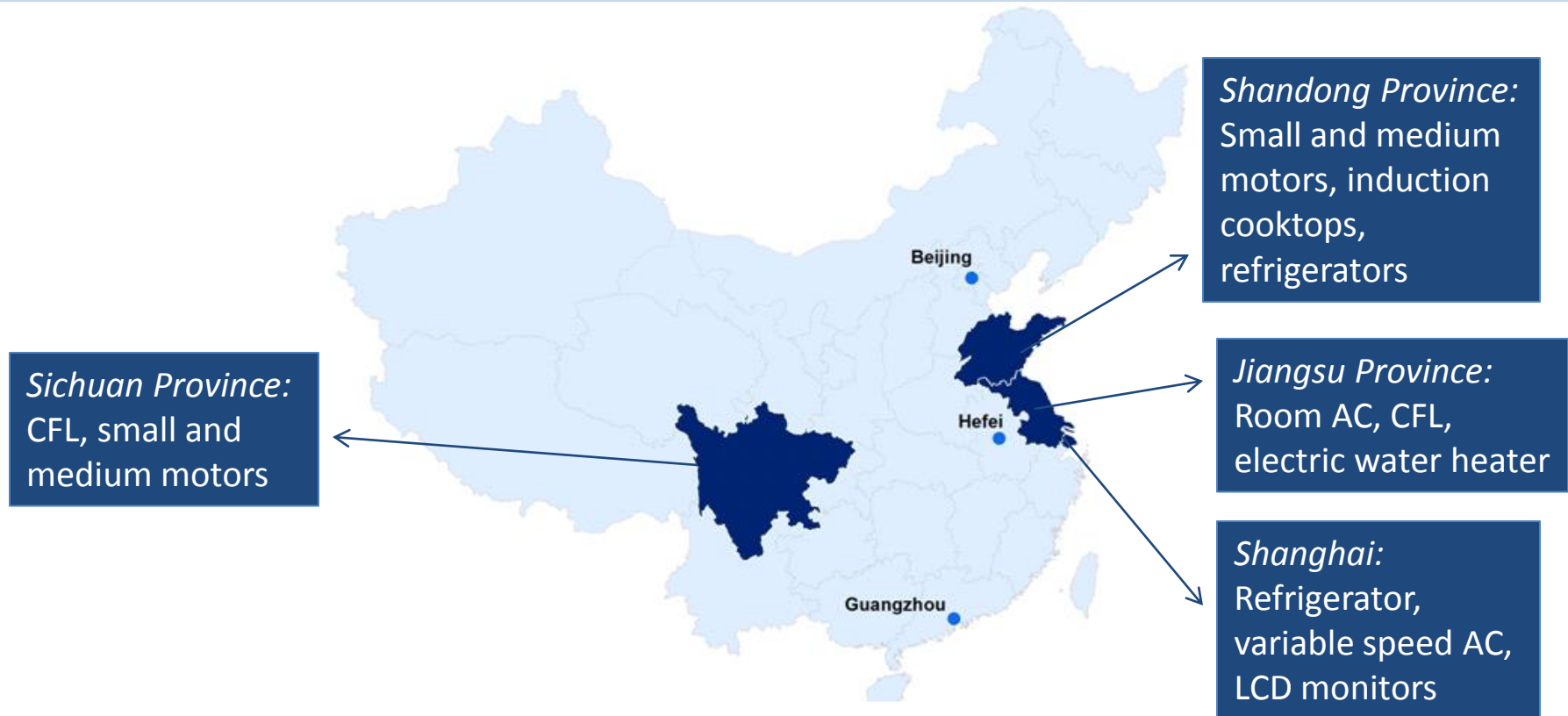
## 2009 Improvements

**Geographic scope:**  
testing expanded to  
less developed, inland  
Sichuan province

**Sample size:**  
expanded to 110 units  
representing 62  
manufacturers

**Sampling origin:**  
added  
manufacturers'  
warehouses

# 2009 local enforcement efforts covered broader geographic, product and evaluation scope



## 2009 Project involved:

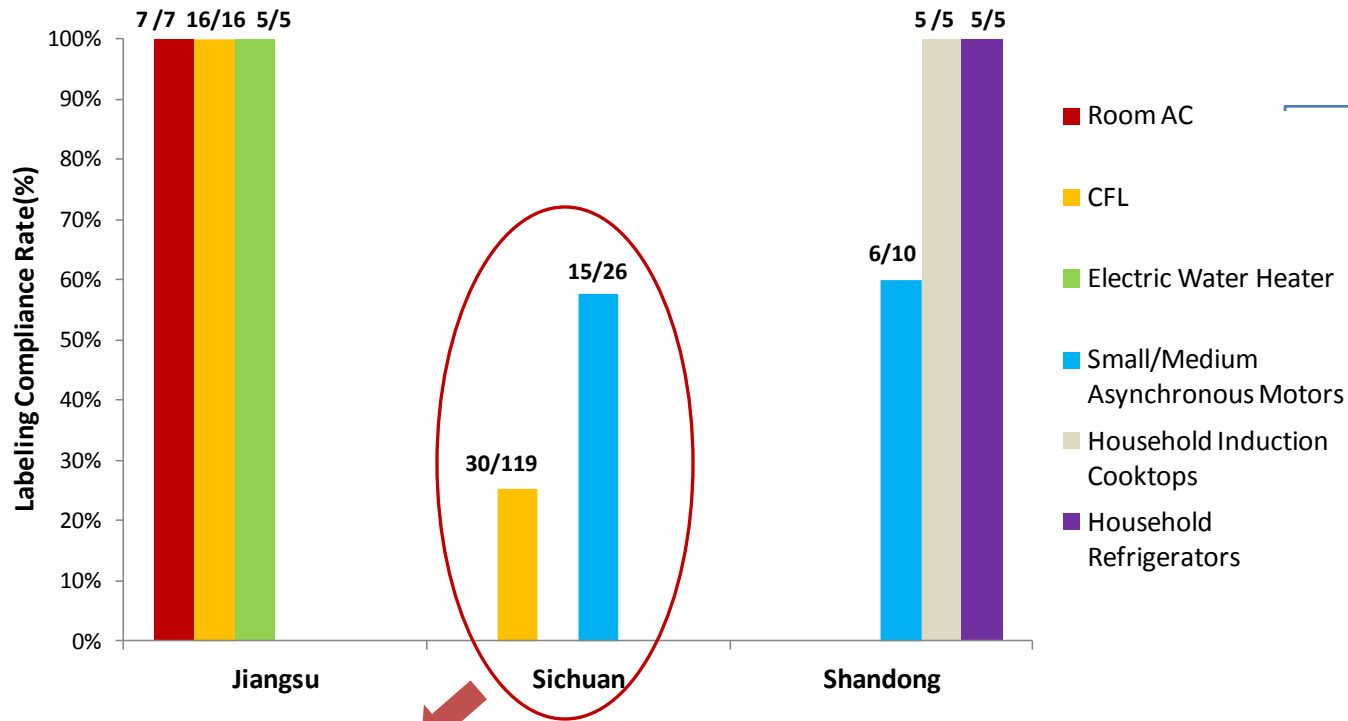
1. Conducting on-site inspections of product's compliance with labeling requirements
2. Selecting, purchasing and testing sample units for compliance with efficiency criteria

# 2009 Labeling Compliance Inspections



- Product types selected by each pilot region based on local lab testing capabilities and potential impact of products
- Inspections conducted at manufacturer warehouses and retailers for:
  - ✓ Registration with label registration database
  - ✓ Product properly labeled according to requirements
  - ✓ Design of product label conforms to specifications
  - ✓ Information on label is consistent with product nameplate
- Non-compliant manufacturers subjected to fines and penalties, publicized online and through media

# 2009 labeling inspections reveal mixed compliance results



Possible explanations for Sichuan's low compliance:

- Less economic development → low awareness
- Less resources for enforcement, weak standardization
- Less consolidated manufacturing industry for products (CFLs)

100% overall compliance but only from 1 region and small sample size

# Efficiency check-testing sampling methodology formulated locally, with variations in sample sizes and origins

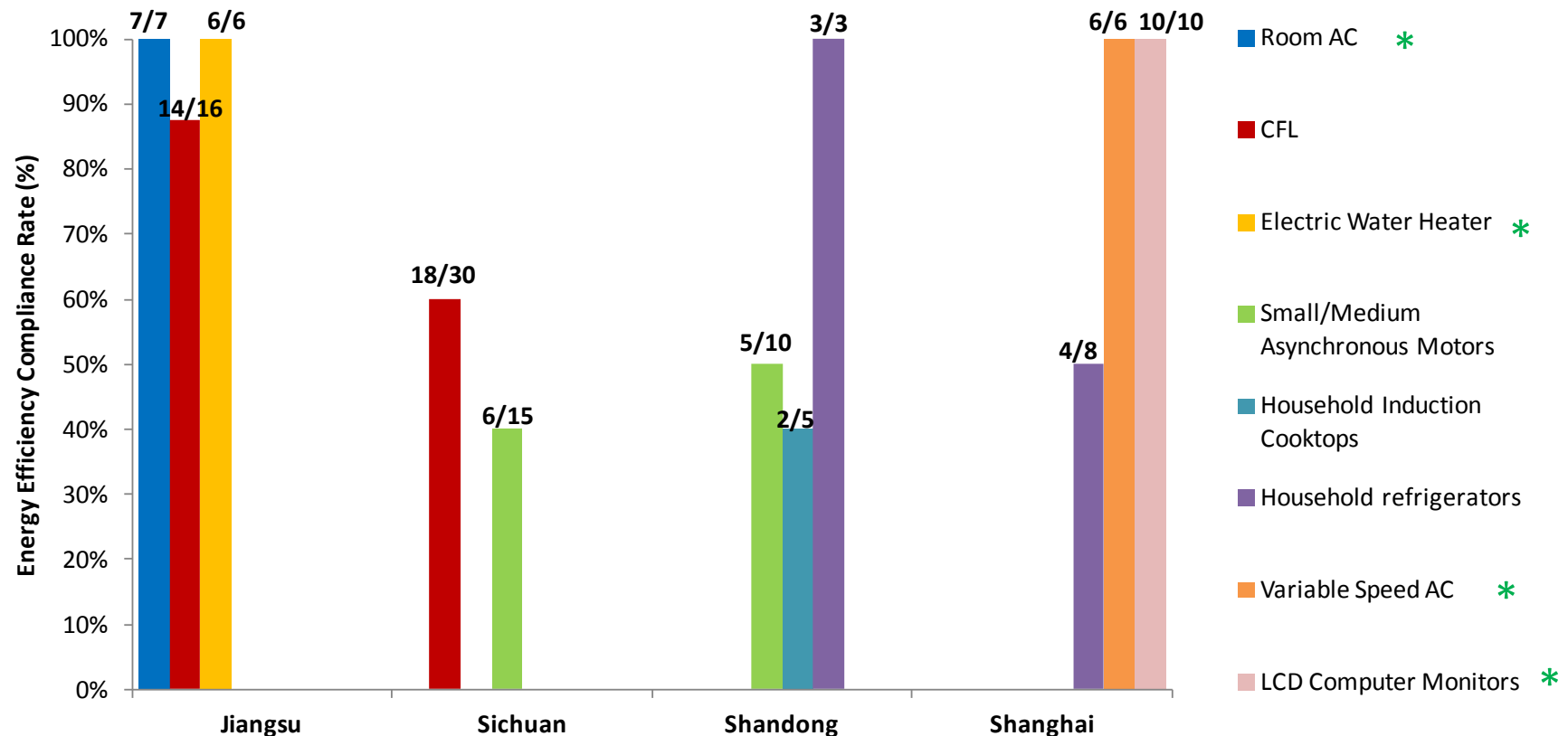


- Product type and sampling methodology determined by pilot location
- Sampling team randomly selects test samples → sent to labs for testing
- Samples tested in batches, re-testing offered

## Sampling Criteria by Product and Region

		Manufacturers Represented	Origin: Warehouse	Origin: Retailer	Total Sample Batches
Room AC	Jiangsu	7	-	100%	7
CFL	Jiangsu	16	50%	50%	16
	Sichuan	30	-	100%	30
Electric Water Heater	Jiangsu	6	-	100%	6
Motors	Sichuan	15	-	100%	15
	Shandong	10	100%	-	10
Cooktop	Shandong	5	60%	40%	5
Refrigerators	Shanghai	-	-	-	8
Variable speed AC	Shanghai	-	-	-	6
LCD Monitors	Shanghai	-	-	-	10

# Efficiency check-testing compliance results shows similar trends as labeling compliance



Highest compliance rates for products tested

Lowest compliance rates, but relatively larger sample sizes

\*Products with 100% compliance only tested in 1 region

# 2009 sampling and testing methodology improved, but greater variation in results



- Improved sampling and testing methodologies
  - involved local government agencies, media
  - greater geographic and product coverage
  - sample sizes and origin
- But greater variations in compliance rates
  - Product type variations: wide range from 40% - 100%, weighted average compliance rate of refrigerators dropped from 96% in 2007 to 63% in 2009  
*Possible explanation: more stringent refrigerator standards effective in May 2009, testing standardization and enforcement challenges*
  - Regional variations: Sichuan's compliance rates significantly lower, wide variability in Shandong and Shanghai  
*Possible explanation: different/localized sampling methods, previous testing did not focus on nuances in local conditions*

# 2009 efforts have important implications for improving S&L enforcement in China and other regions



- In the absence of national testing, local efforts to build capacity for S&L enforcement and evaluation are very important
- Economic development of a region impacts level of awareness, staff expertise and resources for enforcement
  - Inclusion of less developed regions in national check-testing crucial to understanding “real” picture of S&L compliance
  - More financial and technical support needed to bolster enforcement and compliance in less developed regions
- Consolidation of manufacturing industry affects compliance
  - Diversity and representativeness of sampled manufacturers important
  - Targeted efforts needed to improve compliance for products with unconsolidated production



# Looking ahead for China's appliance S&L enforcement



- China through efforts by CNIS has come a long way in **establishing and improving local S&L enforcement efforts**
- But 2009 round of inspections and check-testing identified remaining challenges:
  - Manufacturers **failing to register** products and **retailer resistance** to inspections
  - **Testing inconsistencies** amongst labs
  - Higher compliance for products by large manufacturers, **insufficient attention to enforcement of small manufacturers**
- International experiences suggest possible improvements:
  - Greater national and local **awareness** and educational campaigns
  - Set aside **specific national and local funding** and staff for local enforcement
  - Pursue **targeted testing and enforcement**
  - Greater emphasis on implementing **standardized testing** tools and procedures
- Despite these challenges and areas for improvement, local regions in China have come far in learning by doing and building up much-needed capacity for S&L enforcement

# More information and next steps



- Final report of 2009 efforts, co-authored by Nan Zhou, David Fridley and Cecilia Fino-Chen, available at <http://china.lbl.gov/publications>
- Current work focused on developing framework for S&L program development and impact evaluation based on international experiences (EU, Australia, U.S.)

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# ADDITIONAL REFERENCE SLIDES

# Detailed 2006 and 2007 Testing Results

**Table 1: Tested Product Samples by City and Type in 2006 and 2007**

	Beijing		Guangzhou		Hefei		Total by Product	
	2006	2007	2006	2007	2006	2007	2006	2007
Refrigerators	14	5	0	18	7	0	<b>21</b>	<b>23</b>
Freezers	0	0	1	7	10	0	<b>11</b>	<b>7</b>
Air Conditioners	0	5	16	0	6	17	<b>22</b>	<b>22</b>
Clothes Washers (2007 only)	-	18	-	3	-	0	-	<b>21</b>
<b>Total by City</b>	<b>14</b>	<b>28</b>	<b>17</b>	<b>28</b>	<b>23</b>	<b>17</b>	<b>54</b>	<b>73</b>

Source: Zhou et al. 2008

**Table 2: Comparison of Compliance Rates by Product Type, City and Year**

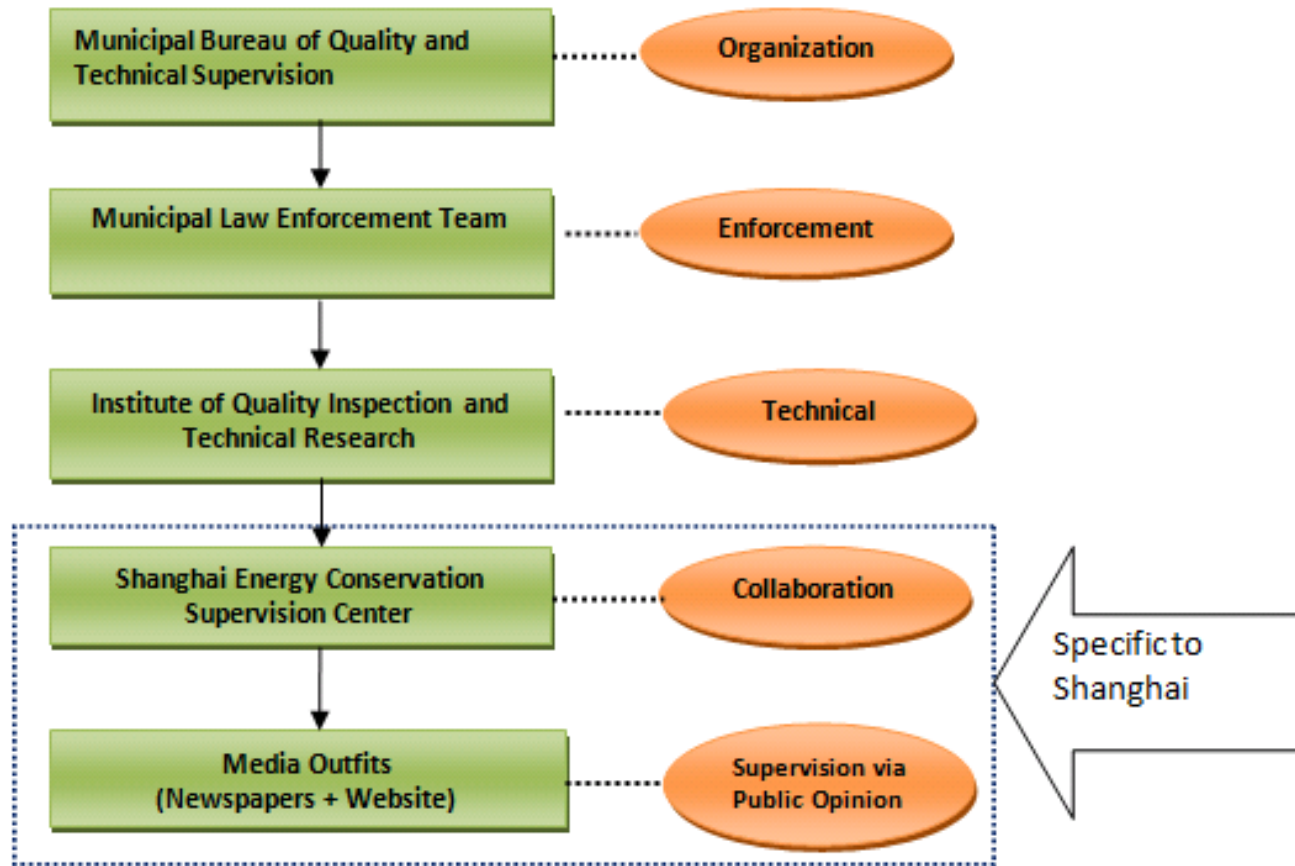
	Beijing		Guangzhou		Hefei		Overall	
	2006	2007	2006	2007	2006	2007	2006	2007
Refrigerators	86%	100%	-	83%	71%	-	81%	96%
Freezers	-	-	100%	100%	50%	-	55%	100%
Room ACs	-	100%	94%	-	83%	100%	91%	100%
Clothes washers	-	94%	-	67%	-	-	-	91%

Note: the compliance rates shown above include second stage re-testing outcomes.

Source: Zhou et al. 2008

# 2009 Local Enforcement Organizational Structure

**Figure 1 Organizational Structure for Local Enforcement Programs in Shanghai City**



# Efficiency Check-testing Criteria



Product	Efficiency Check-testing Criteria
Room air conditioners	Cooling capacity; Cooling power consumption; Energy efficiency ratio
Self-ballasted fluorescent lamps	Lamp power; Chromaticity tolerance; Minimum allowable value of energy efficiency; Initial luminous efficacy
Electric storage water heaters	Inherent energy factor for 24 hours; Hot water output ratio
Small and medium three-phase asynchronous motors	Efficiency
Household induction cooktops	Heating efficiency; Standby power consumption
Household refrigerators	Power consumption; Internal volume; Efficiency indicators
Variable speed room air conditioners	Cooling capacity; Cooling energy consumption; Intermediate cooling capacity; Intermediate cooling energy consumption; Seasonal energy efficiency ratio
LCD computer monitors	Energy efficiency; Energy consumption in off mode