Saving Energy, Money, and Pollution with Building Standards in California
加利福尼亚建筑节能标准——节能、节支、减少污染

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http://www.energy.ca.gov/commission/commissioners/rosenfeld.html

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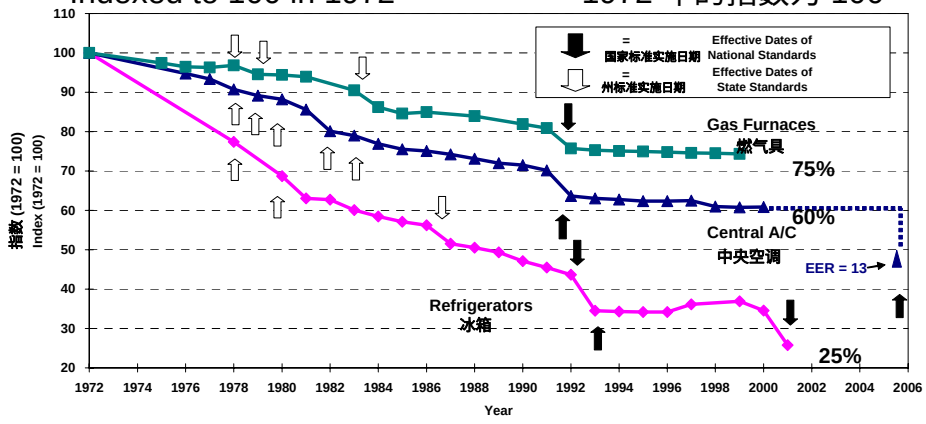
Impact of Standards on Efficiency of 3 Appliances
三种器具能效标准的影响

Indexed to 100 in 1972　　1972 年的指数为 100



Source: S. Nadel, ACEEE,
in ECEEE 2003 Summer Study, www.eceee.org

资料来源：S. Nadel, ACEEE
ECEEE 2003 夏季调查，www.eceee.org

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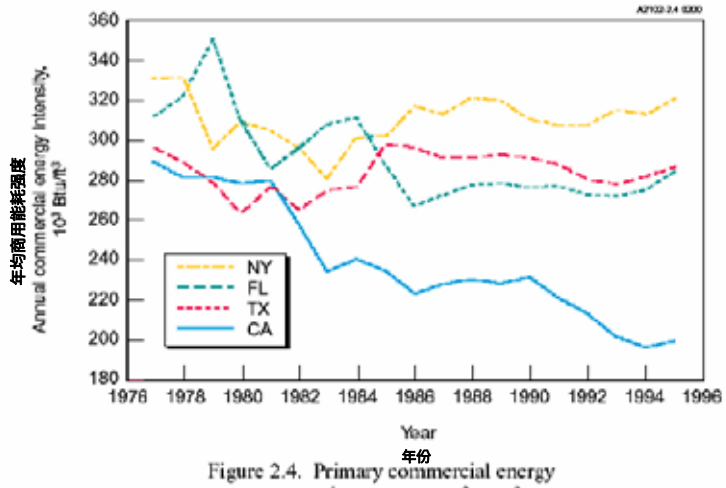

Figure 2.4. Primary commercial energy consumption per square foot of nonresidential floor space from 1977 to 1995 in California, Florida, New York and Texas (DOE/EIA; F.W. Dodge 1999).

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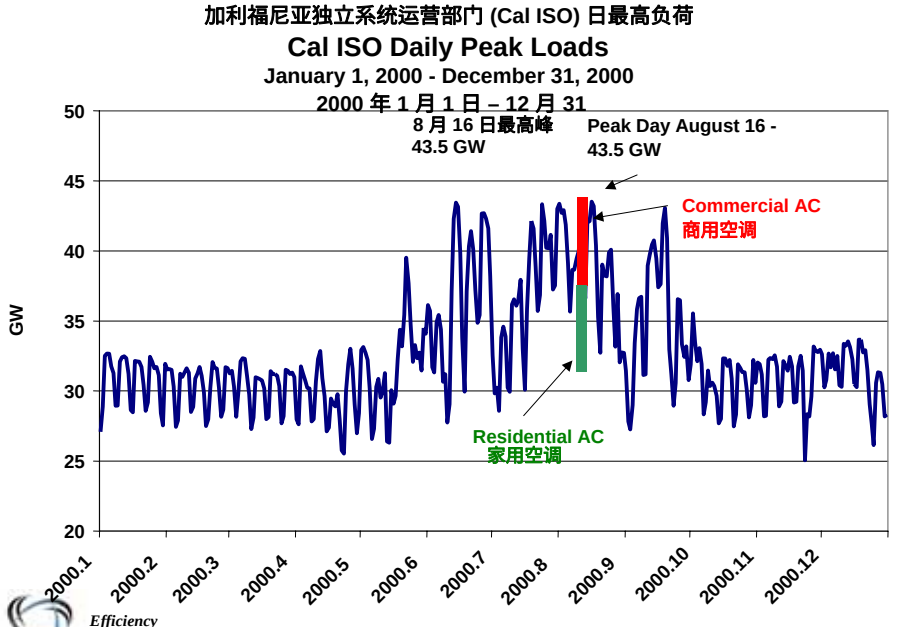
图 2.4 加利福尼亚、佛罗里达、纽约和德克萨斯 1977-1995 年每平方英尺非居住空间主要商用能耗 (DOE/EIA; F.W. Dodge 1999)

加利福尼亚独立系统运营部门 (Cal ISO) 日最高负荷



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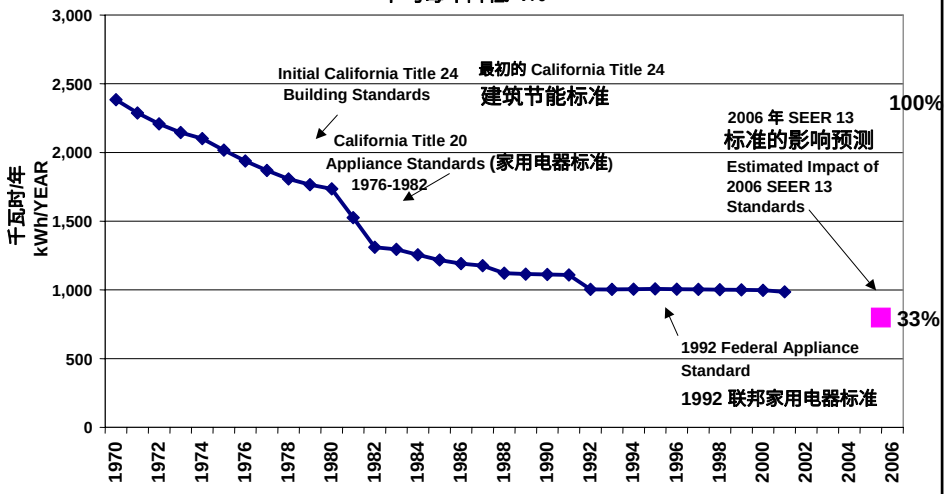
Annual Usage of Air Conditioning in New Homes in California

Annual drop averages 4% per year

加利福尼亚新家庭中空调年使用量

平均每年降低 4%



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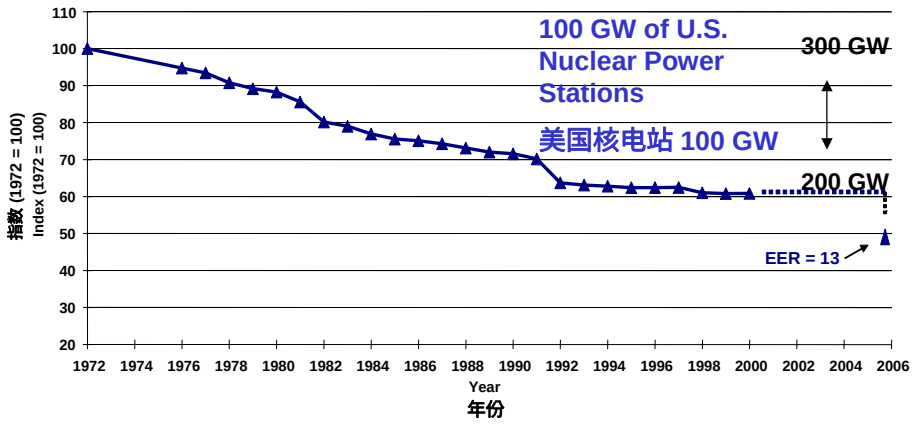
Source: CEC Demand Analysis Office

资料来源：CEC 需求分析办公室

After Saturation (16 years)
Impact of Standards on Residential Central A/C and Roof Top A/C Units in the United States

全面实施 (16 年)

美国家用中央空调与单元式空调标准的影响



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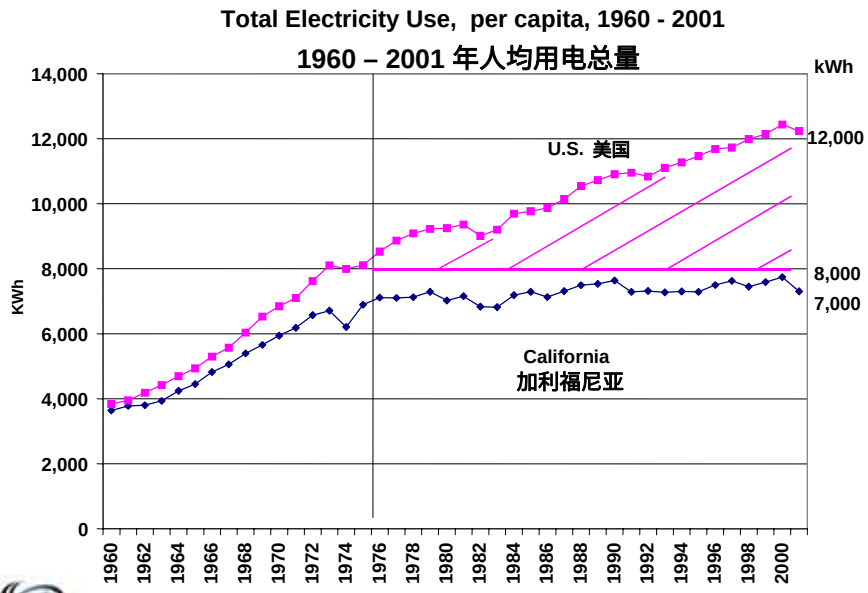

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Costs and Pollution saved by avoiding a 50% expansion of CA Electric system.

- Avoiding half of Calif electricity avoids 18 M tons/year of Carbon, equivalent the getting 12 million cars off the road, along with their NOx, CO, and particulate emissions. But Calif has only ~25 M motor vehicles, so we've avoided 50% more equivalent pollution. The Pavley bill, starting in model year '09, should start to reduce another 30%.
- Calif annual electric bill in 2004 ~ $32 B, so we've avoided ~$16 B of bills, but net saving is only ~$12B/year, i.e. **$1000/family.** Compare this with the $15B Mar.2004 multi-year bond issue to cover the deficit.

加利福尼亚电力系统避免了 50% 的需求增长，节约了成本，减少了污染

- **50% 的电力需求缩减每年减少二氧化碳排放 1800 万吨 - 相当于路面上少了 1200 万辆汽车 - 此外还减少了氮氧化物、一氧化碳以及粉尘的排放。加利福尼亚仅有 2500 万辆汽车，因此，我们相当于避免了 50% 的污染增长。到 2009 年，Pavley 计划的实施还将减少 30% 的污染。**
- **加利福尼亚 2004 年的电力消费约为 320 亿美元，因此我们避免了 160 亿美元的花费，但净节约成本约为 120 亿美元，即 1000 美元/户。请作如下对比，2004 年 3 月我们为弥补赤字而发行了 150 亿美元的多年期债券。**

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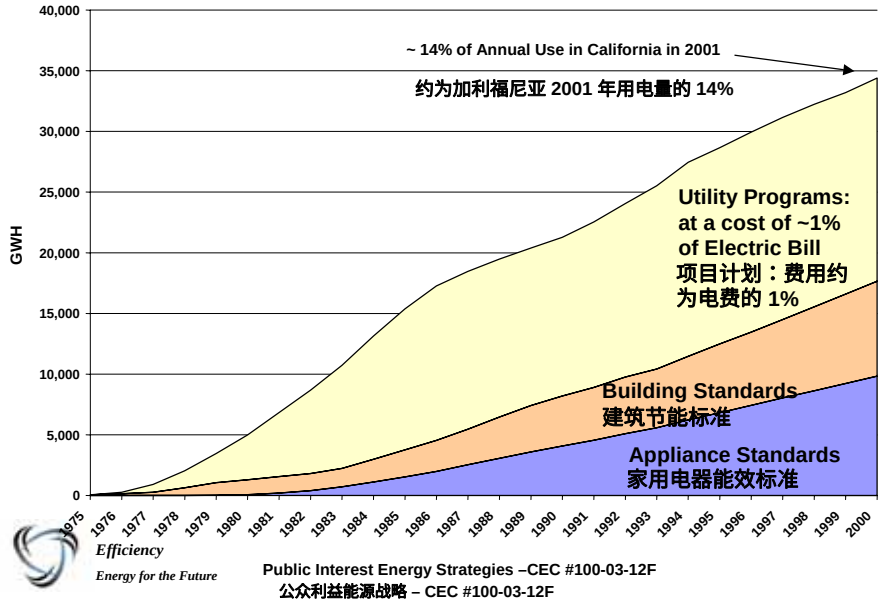
GWH Impacts from Programs Begun Prior to 2001
2001 年以前实施的计划的影响



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Public Interest Energy Strategies –CEC #100-03-12F
公众利益能源战略 – CEC #100-03-12F

The 2% Public Goods Charge (PGC) has grown to 2½% of our electricity bill.

2%的公共事业费用已增长至电费的 2.5%

- **Current PGC**
  - Energy Efficiency (yellow wedge, previous slide) includes rebates, technical assistance, standards support (training code officials), …
  - Renewable Portfolio Standard (RPS) for wind, geothermal, PV
    - Renewables currently 12% of CA electricity
    - Will increase 1% per year to 20%
  - R&D: 50% spent to improve end-use efficiency and 50% for air quality and environmental issues
  - Low Income Assistance

  2003 Total
- **New Energy Efficiency acquisition thru Integrated Resource Planning (whenever efficiency is cheaper than supply)**

  2004 Total

- **目前公共效益基金**

	$M/yr
— 能效方面 (上一个幻灯片的黄色部分)，包括达标奖励、技术支持、标准支持（监管人员培训）	250
— 风力、地热、太阳能发电等可再生能源组合标准 • 可再生能源目前占加利福尼亚电力总量的 12% • 每年会以 1% 的速度递增，增至 20%	150
— 研发：50% 的费用用于提高终端使用能效，其余 50% 用于空气质量和环境问题的改善	80
— 低收入补助	180
2003 年总计	**660**
◆ 通过资源整合计划，采取了一些新的能效措施 (只要能效成本低于供应成本)	140
2004 年总计	**800**

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Note: California retail electric bill is ~ $30 billion/year. PRC adds 2% to retail bills. With new $ 140 million, this increases to 2.5% per year
注：加利福尼亚电费为 300 亿美元/年。公共事业费用使电费增长了 2% - 1.4 亿美元，现已增加为每年 2.5%

Title 24 and Compliance Training Videos

- http://www.energy.ca.gov/title24/
- Training Videos on Specific Aspects of Compliance
- Special Emphasis on Quality Construction, Field Verification and Diagnostic Testing
- Short Videos with Energy Experts Demonstrating How-to-do-it Techniques
- Also Videos About "Beyond The Code": Technologies and Initiatives

Title 24 达标课程视频培训

- http://www.energy.ca.gov/title24/
- 有关标准实施的具体问题的培训录像
- 对质量建设、实地验证和诊断测试的特别关注
- 能源专家技术示范短片
- 关于"高于标准要求"的技术和项目活动的录像

Efficiency
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John Hogan's Presentation

- Will come here, for about 20 minutes.
- Then, if there is any time left, I will continue.

John Hogan的演讲稿

- 20 分钟欢迎词
- 如果还有时间，我将继续。

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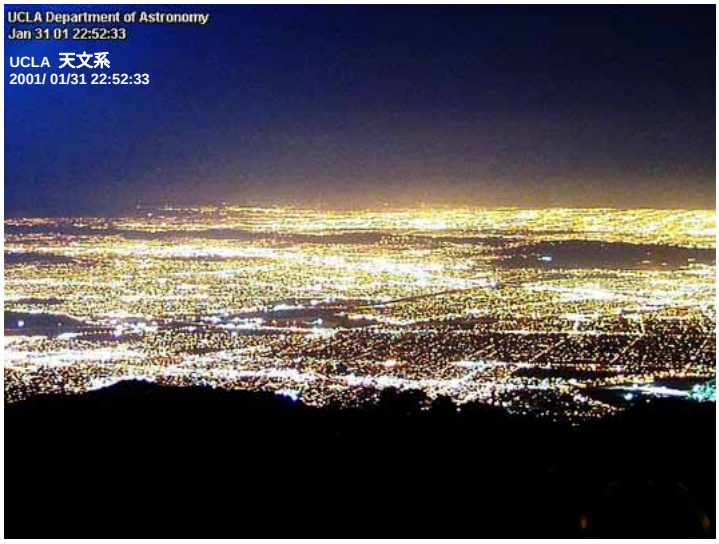

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Illuminating Space vs. the Street

照明与街道

Efficiency

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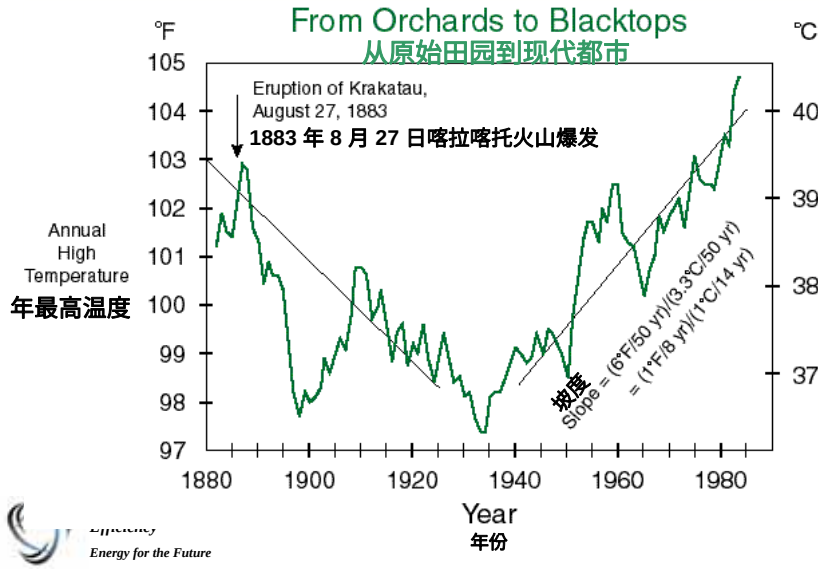
Temperature Trends in Downtown Los Angeles
洛杉矶市区气温趋势



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Cool Communities

- **The most lucrative way to:**
  - **Save air conditioning**
  - **Cool cities**
  - **Reduce Urban Ozone**
- **Involves 3 strategies:**
  - **White roofs (5,000 yr old idea) and cool colored roofs (a new idea)**
  - **Cooler pavements (concrete colored to avoid glare)**
  - **Shade trees (shade buildings and cool by evapo-transpiration)**
- **CEC spent $10 Million for white "re-roofs" and offers credits for cool roofs in meeting new building standards**
- **Benefits can be substantial:**
  - **In LA Basin, 3 strategies can save 1,500 MW and $ 200 million per year in A/C; Cool LA by 3-4 degrees Celsius; and reduce ozone by 4 – 8 %, worth another $ 250 million per year in reduced sickness and sick leave**

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凉爽的社区

- **实现以下目标最有利的方式：**
  - **节省空调使用**
  - **凉爽的城市**
  - **减少市区臭氧量**
- **包含 3 项策略**
  - **白色屋顶 (5000 年来的古老方式)、凉爽型彩色屋顶 (新理念)**
  - **树荫 (遮挡建筑、通过蒸发作用散热)**
- **CEC 花费了 1000 万美元用于白色屋顶改造，并为符合新建筑节能标准的凉爽型屋顶提供贷款**
- **成效明显**
  - **在拉斯韦加斯盆地，这 3 项策略每年在空调上节能 1500 MW，节支 2 亿美元，降温 3-4 摄氏度，减少 4-8% 的臭氧，每年减少医疗费用和病假损失 2.5 亿美元**

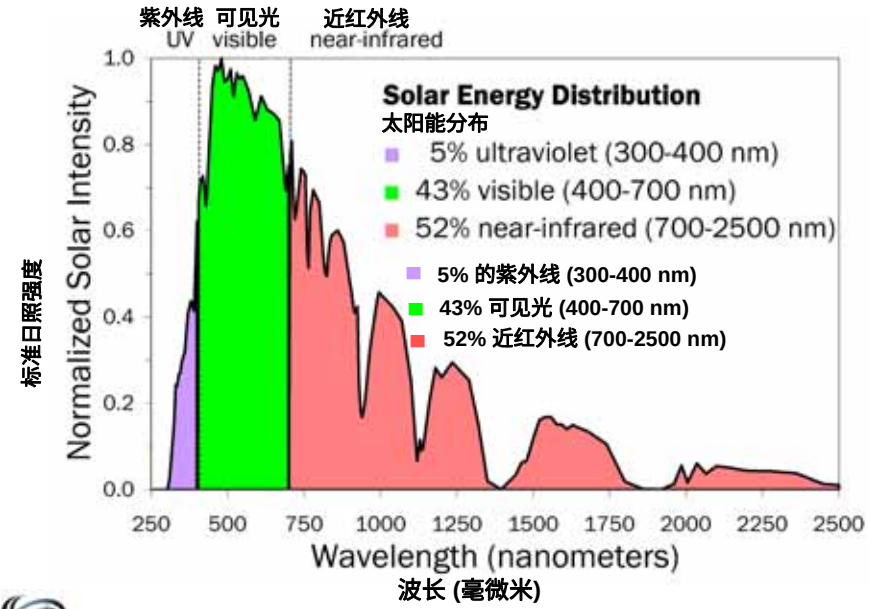
California Cool Roof Policies

- Annual Public Goods-funded Utility programs of $2 to $3 M/year, offer rebates of ~$1/square meter.
- 2005 Building Standards for flat roofs: White is required.
- 2008 Building Standards for sloped roofs: Cool required (any color).
- Most buses have white roofs
- White cars should be bought for public and private fleets

加利福尼亚凉爽型屋顶政策

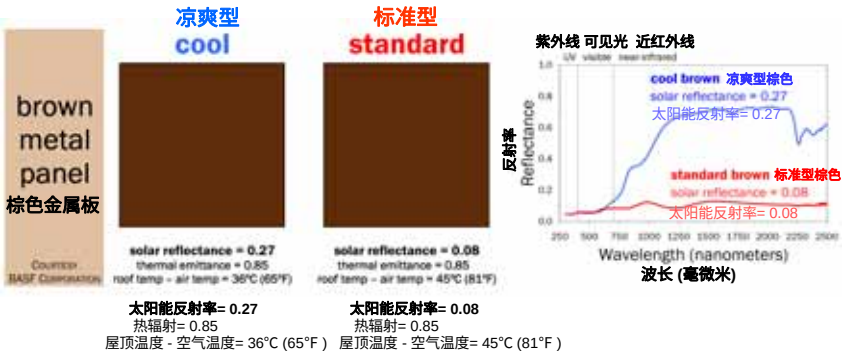
- 公共效益基金每年资助的项目达 200-300 万美元，每平方米奖励 1 美元
- 2005 年平屋顶建筑节能标准：要求使用白色
- 2008 年斜屋顶建筑节能标准：要求采用凉爽型屋顶 (颜色不限)
- 大多数公共汽车车顶采用白色
- 授予优先权以鼓励购买白色公车和私家车

Efficiency
Energy for the Future



Source **(资料来源)** : Hashem Akbari, LBNL

Efficiency
Energy for the Future

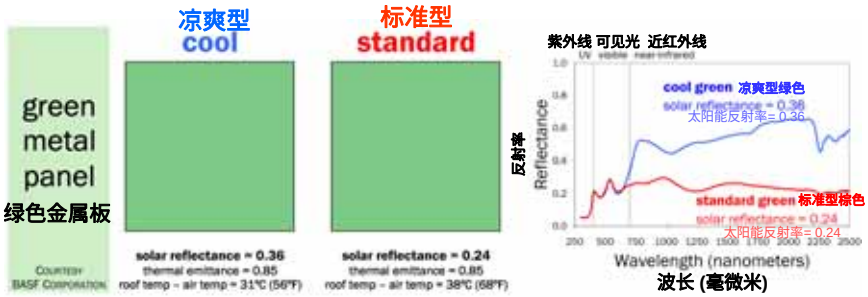


太阳能反射率= 0.27
热辐射= 0.85
屋顶温度 - 空气温度= 36°C (65°F)

太阳能反射率= 0.08
热辐射= 0.85
屋顶温度 - 空气温度= 45°C (81°F)

Source (资料来源) : Hashem Akbari, LBNL

Efficiency
Energy for the Future



太阳能反射率= 0.36
热辐射= 0.85
屋顶温度 - 空气温度= 31°C

太阳能反射率= 0.24
热辐射= 0.85
屋顶温度 - 空气温度= 38°C

Source **(资料来源)**: Hashem Akbari, LBNL

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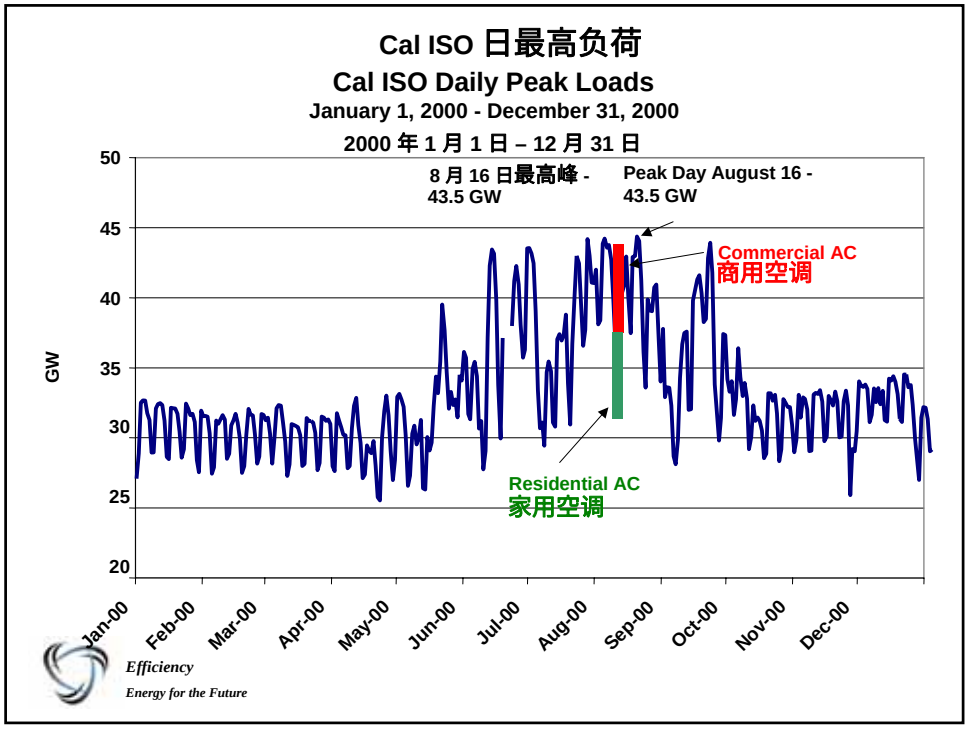

How to manage AC on hot afternoons when electric power is expensive?

- At least offer time-of-use (TOU) pricing
- Better, offer TOU 99% of the time, and add
- Critical Peak Pricing (CPP) for the hottest 1% of the summer.
- This requires interval meters, at least for large customers
- California has interval meters for customers >200kW
  - some utilities will install them for ALL customers
- CPP requires not only communicating electronic meters, but also communication between the meter and a thermostat
  - Or other programmable user interface
- Web site for recent workshop: http://www.ef.org/energyseries_dynamic.cfm

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在电费昂贵的炎炎夏日如何管理空调的使用

- 至少提供分时计价 (TOU)
- 在夏季，最好在 99% 的时间内提供 TOU，同时，
- 为最炎热的那 1% 时段提供特别高峰计价 (CPP)
- 这要求安装为用户安装计时器，至少为用电大户安装
- 加利福尼亚已经为用电超过 200 kW 的用户提供了计时器，并且
  - 某些公共事业单位将为所有用户安装这些计时器
- CPP 不仅要求安装通讯型电表，还需要在电表和恒温器之间通讯
  - 或者其他可调节的用户接口
- 最近召开的研讨会的网址 http://www.ef.org/energyseries_dynamic.cfm

Efficiency
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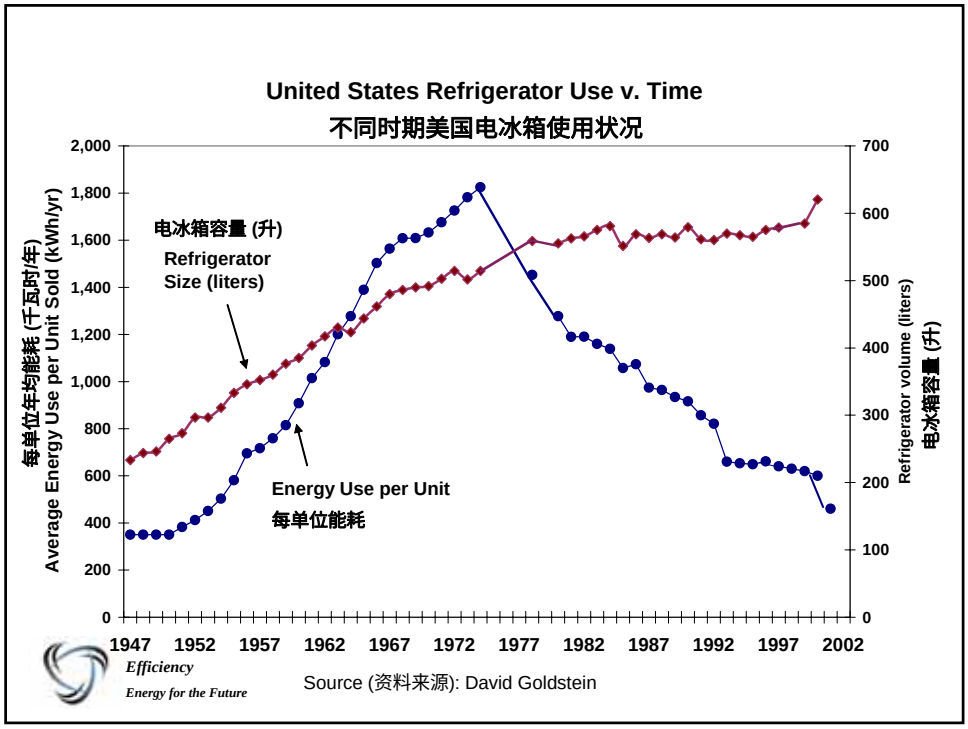
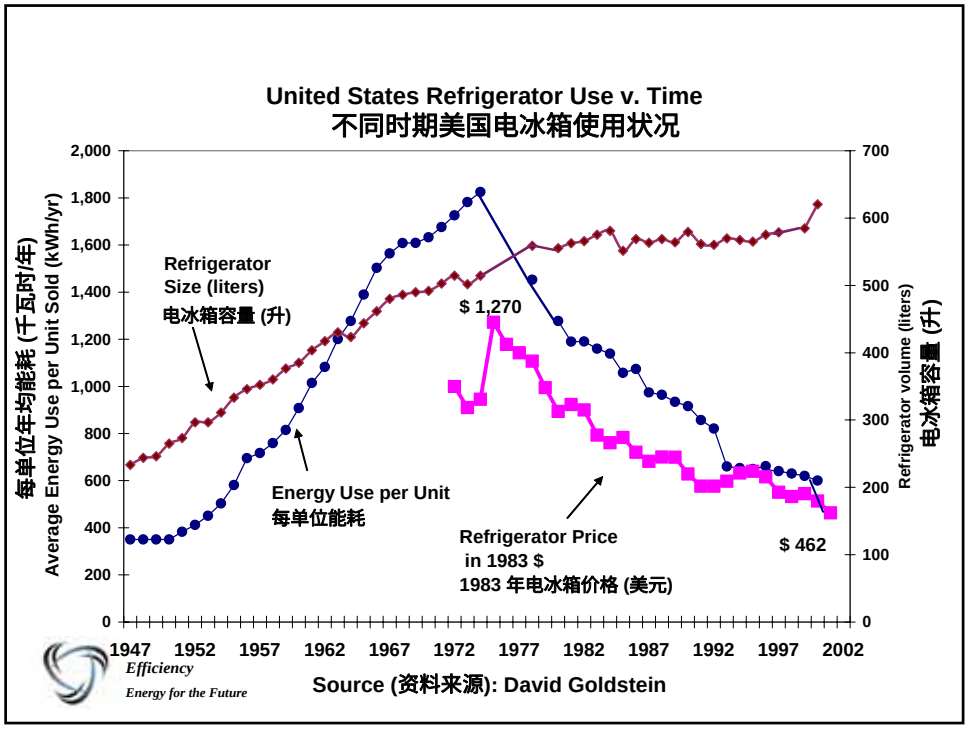

United States Refrigerator Use v. Time
不同时期美国电冰箱使用状况
每单位年均能耗 (千瓦时/年)
Average Energy Use per Unit Sold (kWh/yr)
Refrigerator volume (liters)
电冰箱容量 (升)
电冰箱容量 (升)
Refrigerator Size (liters)
Energy Use per Unit
每单位能耗
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
700
600
500
400
300
200
100
0
1947 1952 1957 1962 1967 1972 1977 1982 1987 1992 1997 2002
Efficiency
Energy for the Future
Source (资料来源): David Goldstein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Average Energy Use per Unit Sold (kWh/yr)
Refrigerator volume (liters)
电冰箱容量 (升)
Refrigerator Size (liters)
电冰箱容量 (升)
$ 1,270
Energy Use per Unit
每单位能耗
Refrigerator Price
in 1983 $
1983 年电冰箱价格 (美元)
$ 462
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
700
600
500
400
300
200
100
0
1947 1952 1957 1962 1967 1972 1977 1982 1987 1992 1997 2002
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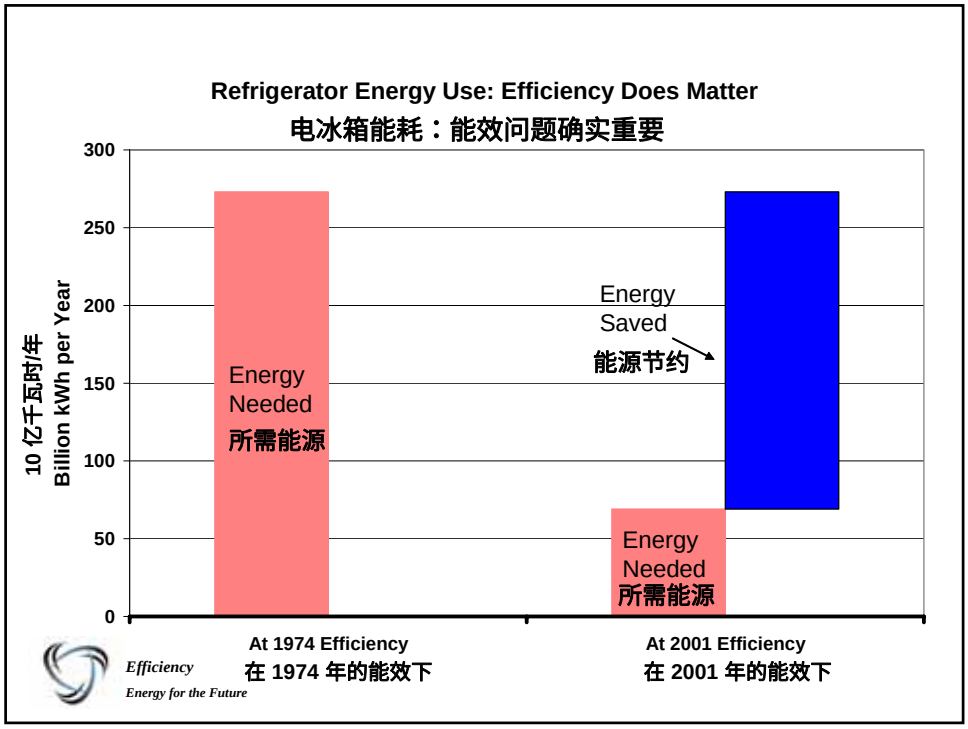
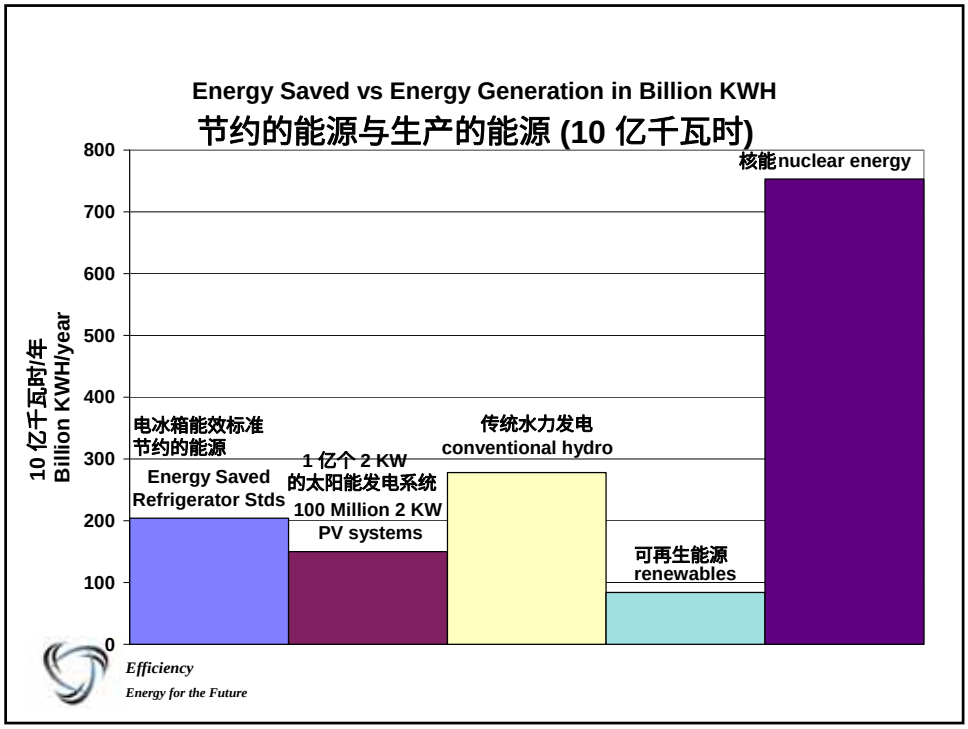
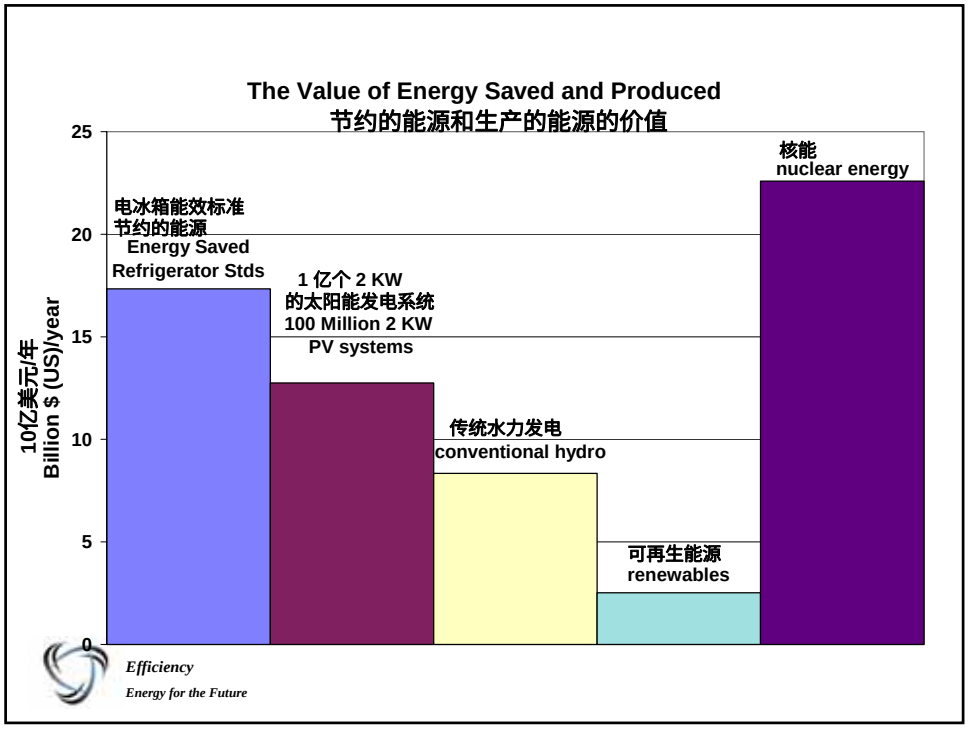
Energy for the Future
Source (资料来源): David Goldstein


Refrigerator Energy Use: Efficiency Does Matter
电冰箱能耗：能效问题确实重要
10 亿千瓦时/年
Billion kWh per Year
300
250
200
150
100
50
0
Energy Needed
所需能源
Energy Saved
能源节约
Energy Needed
所需能源
At 1974 Efficiency
在 1974 年的能效下
At 2001 Efficiency
在 2001 年的能效下
Efficiency
Energy for the Future


Energy Saved vs Energy Generation in Billion KWH
节约的能源与生产的能源 (10 亿千瓦时)
10 亿千瓦时/年
Billion KWH/year
800
700
600
500
400
300
200
100
0
核能nuclear energy
电冰箱能效标准
节约的能源
Energy Saved
Refrigerator Stds
1 亿个 2 KW
的太阳能发电系统
100 Million 2 KW
PV systems
传统水力发电
conventional hydro
可再生能源
renewables
Efficiency
Energy for the Future


The Value of Energy Saved and Produced
节约的能源和生产的能源的价值
10亿美元/年
Billion $ (US)/year
25
20
15
10
5
0
电冰箱能效标准
节约的能源
Energy Saved
Refrigerator Stds
1 亿个 2 KW
的太阳能发电系统
100 Million 2 KW
PV systems
传统水力发电
conventional hydro
可再生能源
renewables
核能
nuclear energy
Efficiency
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IMPLEMENTATION OF ENERGY CODES: TRAINING, PLAN REVIEW, & INSPECTION
节能规范的实施: 培训、规划审查与验收

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International Mayors Forum
国际市长论坛
Kunming China, November 11, 2004
中国昆明，2004年11月11日

OUTLINE

- **Context:** ***Seattle s location, population, peak electric load***
- **Seattle Energy Code history:** ***residential and nonresidential, regular updates***
- **Training:** ***enforcement staff, public (designers, contractors***
- **Plan Review:** ***building, mechanical, electrical, boiler, plumbing***
- **Inspection:** ***building, mechanical, electrical, boiler, plumbing***

提纲

- **背景：*西雅图的位置、人口、高峰电力负荷***
- **西雅图节能规范历史：*住宅与非住宅，定期修订***
- **培训：*强制职员和公众(设计师、承包商)进行培训***
- **规划审查：建筑物、机械、电气、锅炉、管道**
- **验收：建筑物、机械、电气、锅炉、管道**

CONTEXT: SEATTLE

- Location: *Northwest United States, 48° North latitude*
- Population: *500,000 (city), 2,000,000 (metropolitan area)*
- Area: *145 square kilometers*
- Electricity: *peak electrical load is 1800 MW*

背景：西雅图

- 位置：*位于美国北部，北纬48°*
- 人口：*500,000（市区），2,000,000（整个地区）*
- 面积：*145 平方公里*
- 电力：*高峰电力负荷为1800 MW*

SEATTLE ENERGY CODE HISTORY

- 1974 - first residential insulation requirements:
  - *mandatory for all residential buildings*
- 1980 - first comprehensive Energy Code:
  - *mandatory for all residential and nonresidential buildings (office, retail, restaurant, assembly, school, hospital, etc.)*

西雅图节能规范历史

- 1974 - 第一项住宅绝缘要求：
  - *对所有住宅建筑物强制实行*
- 1980 - 第一部综合节能规范：
  - *对所有住宅和非住宅建筑物强制实行*
  - *(办公室、商店、餐馆、集会场所、学校、医院等)*

SEATTLE ENERGY CODE HISTORY

- **Updated in 1984, 1986, 1989, 1991, 1994, 1997, 2001, 2003**
  - need to review and update on a regular basis so as to incorporate changes in technology and to clarify the code language

西雅图节能规范历史

- **分别于 1984、1986、1989、1991、1994、1997、2001 以及 2003 年进行修订**
  -需要定期审查和修订从而纳入新的技术变化并阐明规范语言

SEATTLE ENERGY CODE: SCOPE

- **Applies to ALL Buildings**
  - All building types (so that energy is part of all designs)
  -All key energy enduses (building envelope, space heating, space cooling, ventilation, water heating, lighting)
  - Existing buildings (whatever is altered must comply)

西雅图节能规范：范围

- **适用于所有建筑物**
  - 所有类型的建筑物 (从而使节能问题成为所有设计中的一部分)
  -所有主要能源的最终用途 (建筑物外墙、空间加热、空间致冷、通风、供水加热、照明)
  -现有建筑物 (无论有什么变化都必须遵守)

KEY TO SUCCESSFUL ENERGY CODES

- **Training:** *need to train staff and public*
- **Review of the design:** ***need to*** *review plans for compliance with the Energy Code* *before* *construction begins*
- **Inspection of the construction:** *need to verify that construction is consistent with the approved plans*

节能规范成功执行的关键所在

- **培训：需要培训职员和公众**
- **对设计的审查：在开始施工之前需要审查规划是否符合节能规范**
- **对工程的验收：需要核实工程是否与已批准的规划相一致**

SEATTLE: TRAINING

- **Training for Building Department staff:**
  - staff need to understand requirements and intent
  - staff need to be able to answer questions from designers
- **Training for designers, manufacturers, contractors:**
  - designers need to update their specifications to the code
  - contractors need to know what techniques to change

西雅图：培训

- **对建设部职员进行培训：**
  - 职员必须了解要求和意图
  - 职员必须能够回答设计师提出的问题
- **对设计师、制造商和承包商的培训：**
  - 设计师需要按照规范更新他们的设计
  - 承包商需要知道更换什么技术

SEATTLE: REVIEW OF THE DESIGN

- Building Department reviews all project designs for compliance with the Energy Code BEFORE issuing a permit for construction to begin. This is important because:

(1) designers will often start with a design from a previous project (need to update them to the current code)

西雅图：设计的审查

- 在发放施工许可证之前，建设部要审查所有项目设计是否符合节能规范。这是至关重要的，因为：

(1) 设计师往往从以前项目的设计方案着手（需要按照现行规范进行修订）

SEATTLE: REVIEW OF THE DESIGN

(2) designers do not always know the code so they make mistakes (there are many codes, it is difficult to know all of them)

(3) it is easier to make a change to a drawing than to make a change after something has been installed

(4) if the correct information is in the construction documents, then designer and contractor have more legal responsibility

西雅图：设计的审查

(2) 设计师不可能对规范总是了如指掌，所以他们会犯错误（有许多规范，很难全部了解）

(3) 在图上进行更改远比建成后再更改容易得多

(4) 如果施工文件中列有正确的信息，则设计师和承包商就要承担更多的法律责任

SEATTLE: CONSTRUCTION INSPECTION

- **Building Department inspects all project designs for compliance with the Energy Code BEFORE issuing a permit for the building to be occupied. This is important because:**

(1) contractors make mistakes (they may use methods that they have used in the past, rather than following the drawings)

西雅图：建筑验收

- **建设部在发放建筑物验收许可证之前，将对所有项目设计进行审查，看其是否符合节能规范。这一点至关重要，因为：**

(1) 承包商会犯错误（他们可能会沿用过去所使用的方法，而不是遵守设计图纸）

SEATTLE: CONSTRUCTION INSPECTION

(2) frequently there are change orders (there may be substitutions, but they need to be of comparable energy efficiency)

(3) each phase of construction is approved before materials are covered, while changes can be made

- **Building Department responds to complaints so everyone knows that we are serious and to treat everyone fairly**

西雅图：建筑验收

(2) 经常会有更改指示（可能会有更换，但所更换材料的节能效果必须相当)

(3) 施工的任何阶段中，若要更换材料，必须先经过批准，之后才能更换

- **建设部负责接受投诉，这样可以使所有的人了解：我们是严肃的，对待每个人是公平的。**

SEATTLE: ENERGY STAFF

- **Code development (three-year cycle):**
  - code review, public hearings, and adoption, update forms, explanatory publications, website, provide training by 2 persons

西雅图：负责能源的职员

- **规范的修订 （每三年一次）：**
  - 规范的审查、公开听证、表格的采用与更新、解释性出版物、网站，由两人提供培训

SEATTLE: ENERGY STAFF

- **Review of the energy design:**
  - preliminary screening of application by 12 people
  - building envelope and mechanical systems for multifamily residential & commercial reviewed by 5 persons who are specialists and only do Energy/Mechanical plan review
  - lighting by 4 persons along with other electrical review

西雅图：负责能源的职员

- **对能源方面的设计进行审查：**
  - 由 12 个人对申请进行初步筛选
  -由 5 个人对多用户住宅和商用建筑物的外墙和机械系统进行审查，这 5 个人是专家，只负责对能源和机械规划的审查
  - 由 4 个人对照明以及其它电气方面一起进行审查

SEATTLE: ENERGY STAFF
西雅图：负责能源的职员

- **Inspection of the construction (staff checks energy features at same time as other code requirements):**
  - building envelope by 9 structural inspectors
  four separate inspections at different stages:
  (1) insulation of the foundation, (2) framing & windows, (3) roof, wall, and raised floor insulation, (4) final
- **工程验收（职员检查能源功能，同时按照其它规范的要求进行检查）：**
  - 由 9 位结构检验员在不同阶段对建筑外墙进行四次独立检查：
  (1) 基础结构的绝缘 (2) 框架与窗户 (3) 房顶、墙壁和活地板绝缘, (4) 最终审查

SEATTLE: ENERGY STAFF

- **Inspection of the construction:**
  - mechanical by 4 mechanical inspectors: (1) initial, (2) final
  - lighting by 9 electrical inspectors: (1) initial, (2) final
  - service water heating by 6 plumbing inspectors
  -boilers by 5 boiler inspectors

西雅图：负责能源的职员

- **工程验收：**
  - 由 4 名机械检验员进行机械检验：(1)初步检验, (2) 最终检验
  - 由 9 名电气检验员对照明情况进行检验: (1) 初步检验 (2) 最终检验
  - 由 6 名管道检验员对供水加热情况进行检验
  - 由 5 名锅炉检验员对锅炉进行检验

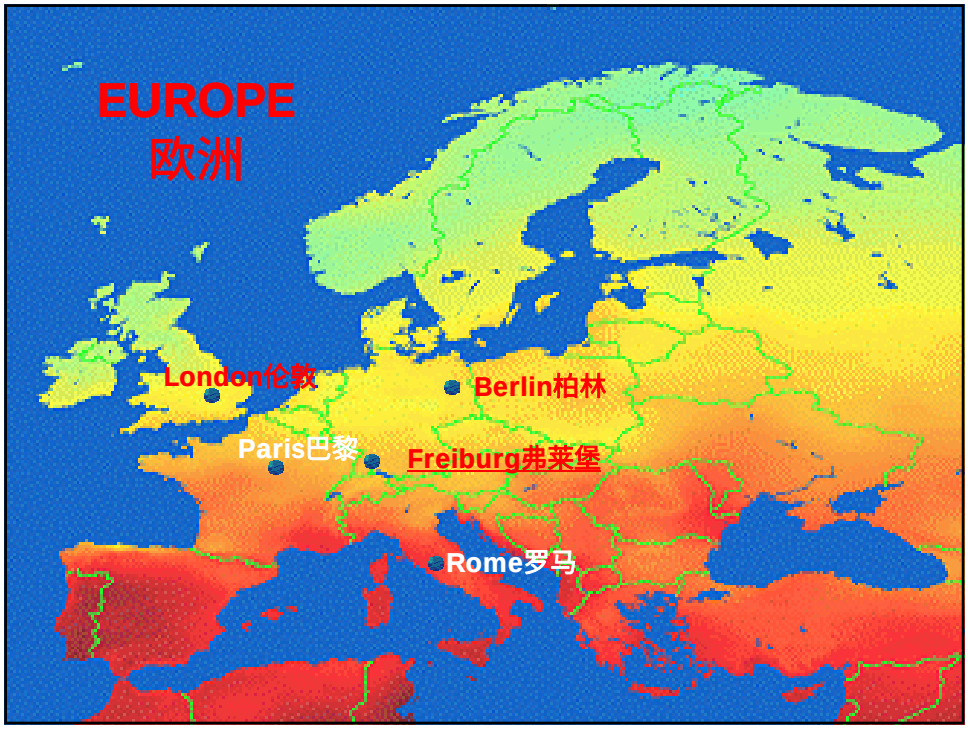
CONCLUSION

- Training will make plan review easier and save time.
- Plan review will make inspection easier and save time.
- Inspection will ensure that correct features are installed.
- It is important to use all three components to achieve the energy savings desired.

结论

- 培训可以使规划的审查更为简便并节省时间。
- 规划的审查可使验收更简便并节省时间。
- 验收将确保建筑物装备了正确的功能。
- 以上三个环节全部采纳（这一点至关重要），才能达到所要求的节能效果。


Influencing Energy Issues
Through
Urban Planning
利用城市规划影响能源问题
Examples from Freiburg/Germany
德国弗莱堡案例
International Mayors Forum on Sustainable Urban Energy
国际城市可持续能源发展市长论坛
Kunming, 10/11th Nov. 2004/China
昆明 2004年11月10-11日
Dr. Dieter Salomon – Lord Mayor of
Freiburg/Germany
黛特•萨尔蒙博士


EUROPE
欧洲
London伦敦
Berlin柏林
Paris巴黎
Freiburg弗莱堡
Rome罗马

Freiburg im Breisgau

210.000 Inhabitants

210000 人口

Surface area 150 km²

150平方公里面积

Picturesque Old-Town

Freiburg's Energy Policy
弗莱堡市的能源政策

Overriding energy-policy targets

- Conserving resources
- Reducing emissions
- Phasing out nuclear energy
- Contributing to climate protection worldwide

重要的能源政策目标

- 节约资源
- 减少排放
- 逐渐停止核能的使用
- 为世界气候保护作出贡献

Specific targets

- Climate protection concept: cutting back 25 % of Freiburg CO_2-emissions (status 1992) by 2010
- 10 % Concept: generating 10 % of Freiburg's electricity from renewable energy sources by 2010

具体目标

- 气候保护的概念: 使弗莱堡的二氧化碳排放到2010年在1992年的基础上减少25%.
- 10% 的概念: 到2010年使弗莱堡的可再生能源发电达到总量的10%.

City of Freiburg 04/2004

Freiburg's Energy Policy
弗莱堡市的能源政策

Fundamental technologies

1. Energy saving
2. Efficient energy generation (combined heat and power generation)
3. Renewable energy sources

基础技术

1. 节能
2. 高效发电 (热电联产)
3. 可再生能源资源

Implementation: selected examples
实施:选择的案例

City of Freiburg 04/2004

1. "Low-Energy-Housing"
"低耗能建筑"

Significance in terms of energy policy

- Restrictions on the heating energy index: max. 65 kWh per m²
- Ecological impact
  - 30 % lower emissions in comparison to national ordinance
  - 30 % lower fossil energy consumption

能源政策的重要性

- 供热能源指数的限制: 最高每平米65千瓦时
- 生态影响
  - 较国家一般排放标准低30 %
  - 较化石能源消费低30 %

City of Freiburg 04/2004

1. “Low-Energy-Housing”
“低耗能建筑”

- Two new districts (Rieselfeld and Vauban) built entirely with low-energy housing
- High innovation impact for the development of low-energy housing and other energy-saving construction methods in Germany
- 完全是低能耗建筑的两个新区(Rieselfeld 和 Vauban)
- 低能耗建筑发展的革新的重要影响以及德国其他的节能建设措施

1. “Low-Energy-Housing”
“低耗能建筑”

Implementation in Freiburg

- Through contractual obligations when municipal land is sold for housing construction

弗莱堡的实施

- 当城市土地被卖作建房基地时通过合同实施

2. Urban Development Contracts
城市发展合同

Significance in terms of energy policy

- Agreements on the compilation of an energy concept for a building area (such as low-energy housing, combined heat/power generation, use of solar energy, etc.)
- Implementation of the energy concept, insofar as cost-efficient

能源政策的重要性

- 某一建筑区能源概念集协议（如低耗能建筑，热电联产，太阳能的使用等）
- 能源概念的实施，到目前成本效益较好

2. Urban Development Contracts
城市发展合同

Implementation

- Contract between municipality and investor for major urban-development projects
- Investor charged for the associated consequential costs of a building-development plan (e.g. expert opinion and planning costs, infrastructure measures, agreement on an energy concept, housing construction)

实施

- 政府与投资上就主要城市发展项目签订合同
- 投资上承担建筑发展规划的相关成本（如专家意见及规划成本、基础设施方法、能源概念的协议、房屋建设）

3. Building Development Plans
建筑发展规划

Significance in terms of energy policy

- Fundamentally important source of information on construction projects, allowing influence on the energy supply

能源政策的重要性

- 建设项目的重要信息资源，可以影响能源供应

3. Building Development Plans
建筑发展规划

Implementation in Freiburg

- Early consideration of energy-related aspects during the planning process
- Planning “stipulations” on energy issues only possible in very few cases (e.g. freedom from shadows)
- New national building code of law valid since August 2004: allows further implementation models for renewable energies

弗莱堡的实施

- 规划过程中有关能源各方面的早期考虑
- 对个别的能源问题有具体规定。(如遮阳棚的问题)
- 从2004年8月实施新的国家建筑标准，使可再生能源进一步实施


4. Subsidy Programs
补贴项目
Significance in terms of energy policy
• Stimulus to make energy-saving investments (overcoming existing hurdles to investment)
• Support for innovations and new technologies
能源政策的重要性
• 为节能投资制定规章 (克服投资中存在的困难)
• 支持革新与新的技术
City of Freiburg 04/2004


4. Subsidy Programs
补贴项目
Implementation in Freiburg
• Municipal subsidy programme “Thermal Insulation in Old Buildings”:
- 500,000 Euro during pilot phase in 2002/2003; to be continued as of 2005
- around 115 projects subsidised with investments of some 4.5 million € (important economical aspect)
弗莱堡的实施
• 政府补贴项目 --“老建筑的热保温”:
- 2002-2003年试点项目期间补贴500,000欧元，2005年将继续此项目
- 用450万欧元左右的投资为约115个项目提供了补贴 (重要的经济因素)
City of Freiburg 04/2004

4. Subsidy Programs
补贴项目

- badenova (regional energy utility)
  - subsidy programs for solar thermal and photovoltaic energy since 1993
- badenova (区能源电力)
  - 自1993年为光伏太阳能提供补贴的项目

5. New “Rieselfeld” District
“Rieselfeld”新区

Key data

- New district occupying 78 hectares in the West of Freiburg
- Final capacity: 10,000 – 12,000 inhabitants

关键数字

- 新区位于弗莱堡西部，占地78公顷
- 最大容量: 10,000 – 12,000 居住人口

5. New “Rieselfeld” District
“Rieselfeld”新区

Energy-policy measures put into practice

- Entire district built with “Low-Energy-Housing”; specified in the purchase contract for the building land
- Connected up to a district heating system (highly efficient combined heat / power generation)

实践中的能源政策措施

- 全区均为低耗能建筑，在建设用地的购买合同中有特别标注
- 连接区域供暖系统 (十分高效的热电联产)

City of Freiburg 04/2004

5. New “Rieselfeld” District
“Rieselfeld”新区

- Obligation to use district heating specified in the purchase contract for the building land
- Installation of a large number of solar thermal and photovoltaic systems

- 在建房土地购买合同中注明使用区域供暖的义务
- 大量安装太阳能热利用和光伏系统

City of Freiburg 04/2004

6. New „Vauban“ District
„ Vauban“新区

Key data

- New district occupying 38 hectares
- Final capacity: 5000 inhabitants

关键数字

- 新区占地38公顷
- 最大容量: 5000居住人口

City of Freiburg 04/2004

6. New „Vauban“ District
„ Vauban“新区

Energy-policy measures put into practice

- Built entirely as “Low-Energy-Housing” plus a number of voluntary passive-energy houses
- Connected up to district heating from a wood-fired cogeneration plant
- Installation of a large number of solar thermal and photovoltaic systems (esp. on the roof of district garage)

实践中的能源政策措施

- 全区均为低耗能建筑，并有大量自愿性的太阳能房屋
- 连接分散式供暖系统，热源为燃木的热电联产厂
- 大量安装太阳能热利用和光伏系统(如安装在分散的车库屋顶)

City of Freiburg 04/2004

7. Special: Solar Region Freiburg
特殊的：太阳能区域弗莱堡市

Significance in terms of energy policy

- Pilot projects throughout the town
- Development of the solar-energy sector as part of a municipal business development program
- Stimulus to develop solar technologies

能源政策的重要性

- 到处都是试点项目
- 将太阳能领域的发展纳入城市经济发展规划
- 制定规章发展太阳能技术

City of Freiburg 04/2004

7. Special: Solar Region Freiburg
特殊的：太阳能区域弗莱堡市

Solar City – Solar Region Freiburg

- The solar capital of Germany (Champion of the German Solar League in Spring 2004)
- Current status for photovoltaic: around 4 MW; still to improve
- Located in Freiburg solar construction companies, research and science institutes
- Number of employees in regional solar-energy sector: 4 times the German average

太阳能城市 – 太阳能区域 弗莱堡

- 德国的太阳能之都 (2004年春获得德国太阳能联盟冠军)
- 光伏现状: 约4个兆瓦, 仍在提高
- 坐落在弗莱堡的太阳能建设公司, 科研机构等
- 本区太阳能领域的雇员数：是德国平均水平的4倍

City of Freiburg 04/2004

Freiburg's Energy Policy
(Selected Successes)
弗莱堡市的能源政策（选择的成功案例）

Energy-saving

- **"Low-Energy-Housing"**
- **Subsidy programme "Thermal Insulation in Old Buildings"**

节能

- **"低耗能建筑"**
- **政府补贴项目 --"老建筑的热保温":**

City of Freiburg 04/2004

Freiburg's Energy Policy
(Selected Successes)
弗莱堡市的能源政策（选择的成功案例）

Efficient energy generation

- **Combined heat/power station Freiburg (approx. 60 MW; approx. 350 MWh/a)**
- **Some 10 big and small combined heat/power generation units (approx. 10.7 MW; approx. 62 MWh/a) constructed; 10 at the planning stage**

高效发电

- **弗莱堡热电站 (approx. 60 MW; approx. 350 MWh/a)**
- **已建大大小小约10个热电站 (approx. 10.7 MW; approx. 62 MWh/a)，另有10个尚在规划中。**

City of Freiburg 04/2004

Energy policy of the City of Freiburg
(Selected Successes)
弗莱堡市的能源政策（选择的成功案例）

- Percentage of own power generated from combined heat/power plants increased to approx. 50 %
- Share of nuclear power reduced from more than 60 % to 30 %

- 来自热电厂的电力提高到50 %
- 核电应用由高于60 %降至30 %

City of Freiburg 04/2004

Freiburg's Energy Policy
(Selected Successes)
弗莱堡市的能源政策（选择的成功案例）

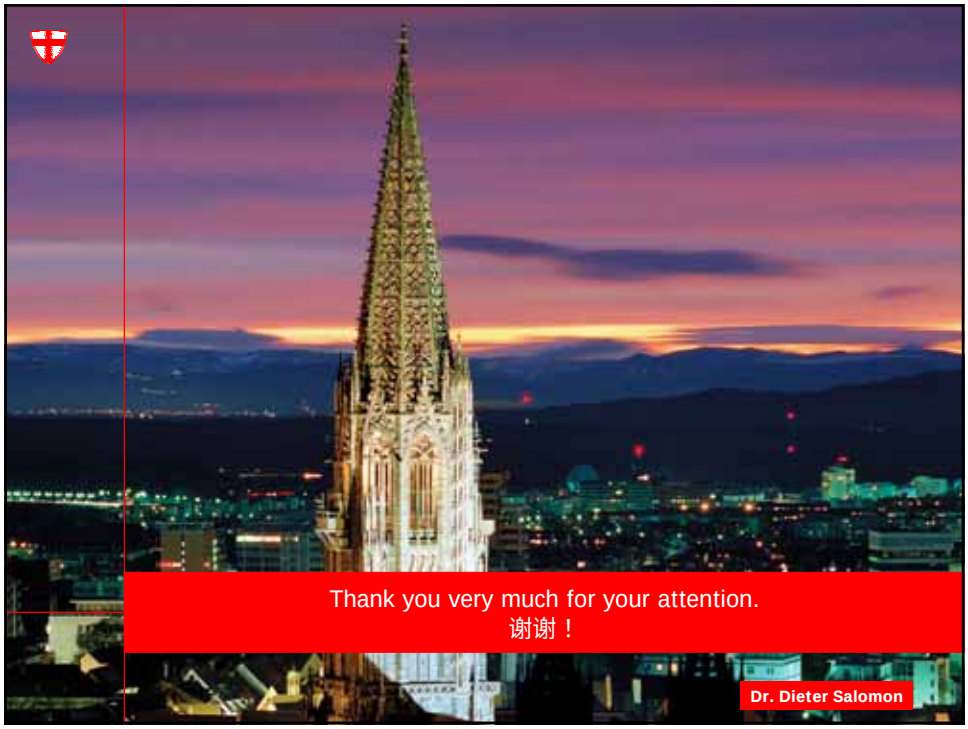
Renewable energy sources for electricity generation

- Use of all renewable energy sources: wind, biomass, solar, water, and in future also: geothermal sources
- Current status 2003: 34.1 million kWh/a (3.7 %), Target: 10 % by 2010

可再生能源资源的发电应用

- 所有可再生能源资源的应用：风能、生物质能、太阳能、水，未来还有地热资源
- 2003年的状况：3410万kWh/a
  目标：到2010年达到10 %

City of Freiburg 04/2004


Thank you very much for your attention.
谢谢！
Dr. Dieter Salomon

广州作为华南地区的中心城市，近年来，随着经济的飞速发展，能源相对紧缺问题已成为广州经济飞速发展的瓶颈问题。广州市地处夏热冬暖地区，持续高温的时间长，全年约有6个月时间需要采用空调来降温，然而广州现有建筑的总体热工性能较差，使得空调能耗长时期处于高位。

Guangzhou, a key city in southern China, has experienced fast-paced economic development in recent years and, consequently, is facing an energy shortage that has become a bottleneck for maintaining growth. Guangzhou is hot in the summer and warm in the winter, with high temperatures lasting much of the year. For about six months per year, air conditioning is needed to reduce heat. Since most of the urban buildings do not have good thermal engineering, air conditioners continue to consume a lot of energy.

据统计，近年来，我市的建筑能耗占全市总能耗的比例约30%，特别是在夏季的6至9月，全市建筑空调耗电量占全市总用电量的比例高达40%。我们思考下列问题；

- 如何结合广州城市的地理特点进行建筑节能
- 实施建筑节能与继承岭南建筑形式注重气候特征的传统风格
- 降低建筑能耗，特别是降低建筑空调能耗
- 政府主导与市场调节的关系

Statistics show that energy consumption in buildings accounts for 30% of the city's total energy consumption. In the summer (from June to September), air conditioning for buildings consumes 40% of city's total electricity. Therefore, we should consider the following:

- geographic features of Guangzhou and
- learn from the Lingnan style architecture, which takes into account local climate features.
- adequate building energy efficiency measures to reduce energy consumption in buildings (particularly for air conditioning).
- balance government guidance and market leverage

一、广州市建筑节能工作的现状

广州市的建筑节能工作相对经济的发展起步较晚，基础较弱。近几年来，我市为加快建筑节能工作的步伐，主要做了以下几方面的工作：

（一）政府重视，各部门共同推动建筑节能工作的开展

I. The current situation of building energy efficiency in Guangzhou

We are quite new to building energy efficiency work and lack experience in this field. In recent years, the municipal government has made the following efforts to enhance building energy efficiency.

1. The government has attached great importance to building energy efficiency

（二）积极宣传和培训，提高全民建筑节能意识

2. We have actively conducted publicity and training to raise the awareness of citizens on building energy efficiency.

（三）开展科研攻关，解决建筑节能应用技术问题

3. We have carried out joint research to address technology application problems on building energy efficiency

（四）建立示范工程，促进建筑节能的推广应用

4. We have established some demonstration projects to boost application of building energy efficiency

二、广州市下一步开展建筑节能工作的思路

通过几年来对建筑节能工作的不断探索和研究，我们认为广州市建筑节能工作必须从基础抓起，分阶段、分地域、分步骤进行实施。下一步，广州市政府将主要从以下几个方面加强对建筑节能工作的领导和推动：

II. Some thoughts on carrying out building energy efficiency initiative in the future

Based on years of research on building energy efficiency, we believe that building energy efficiency work must be done from the beginning, and should be carried out in a multi-phased, region-by-region, and step-by-step manner. The Guangzhou municipal government will intensify its leadership and promotion in the following aspects:

（一） 创建具有广州地方特色的建筑节能体系

全国各地的建筑节能工作存在着不平衡，气候条件、生活习惯、价值取向也存在差异。

- 建筑节能与全市的城市节能体系溶合起来

一是在城市发展规划及建设中体现节约能源的观念，改善城市结构，保护城市自然生态体系，创造良好的微气候环境，从城市结构入手减少能耗。

二是积极考虑地下空间的开发和利用在节能体系的作用，把建设地下空间作为建筑节能有机的一部分，充分利用地下空间，如加快建设地铁、地下交通、地下商业街、停车场等。

1. Establish a building energy efficiency system with Guangzhou characteristics

The situation on energy conservation across the country is unbalanced. Each region has a different climate, lifestyle, and values. We should try to integrate building energy efficiency efforts with the municipal energy efficiency system. First, we should integrate the concept of energy conservation in urban development planning and construction, protect the urban environment, foster a favorable microenvironment, and reduce energy consumption by improving urban construction. Second, underground construction can be part of the energy conservation system, i.e., subways, underground transportation systems, underground commercial streets, and parking lots.

- 将建筑节能与创造具有岭南特色的城市环境相结合

一个城市的特色来自于建设行为对自然环境的尊重，对气候环境的适应，来自于对城市的文脉、文化、历史的继承，对城市的特色起最根本的决定性作用。

广州60～70年代的不少建筑对气候条件是非常尊重的，从而涌现出一批独具特色的“岭南建筑”，广州将在今后的建设中，结合广州的城市环境特点，从场地到单体形成有机整体，倡导建设更多具有亚热带和岭南的特色节能建筑。

Additionally, we should combine building energy efficiency with nurturing an urban environment with Lingnan characteristics. The special features of a city come from respecting the natural environment, adapting to local climate, and protecting the local culture and historical traditions. Many buildings in the 1960s and 1970s in Guangzhou have shown high respect for climate and were called "Lingnan Style Buildings." In future construction, we should advocate for more energy-efficient buildings of a subtropical and Lingnan style that suit Guangzhou's urban environment.

（二） 建立完善建筑节能的政策法规体系

政策法规是开展建筑节能工作的基础。我市今后将逐步建立系统的政策法规，主要包括三个方面的内容：

一是要制定并出台本市的建筑节能管理法规。根据实际情况，在国家、省、市已有政策法规的基础上，通过人大立法或政府令的形式，出台建筑节能地方性管理法规和相关的配套政策；

2. Establish a complete policy and regulatory system in building energy efficiency

Policies and regulations are fundamental to building energy efficiency. The municipal government will gradually establish a policy and regulatory system that includes three aspects: 1) Formulate and promulgate management regulations for building energy efficiency. We will promulgate regional regulations and relevant supplementary policies in line with local conditions through legislation of the local People's Congress or administrative ordinances based on existing policies and regulations at the national, provincial and municipal level.

二是要完善建筑节能监督管理机制。在现行管理体系的基础上，明确相关行政管理部门在建筑节能管理方面的职责，以系统工程的方式，强化建筑节能的监督管理；

三是要建立建筑节能的激励约束机制。对严格执行建筑节能标准的单位和个人给予奖励，并根据我市空调用电量大的特点，探讨阶梯电价等约束机制，促使建筑节能工作从政府推动到业主主动实施转变。

2) Improve supervision and management on building energy efficiency. Based on the current management system, we will clarify responsibilities of relevant administrative offices, strengthen supervision and management, and carry it out as a systematic project.
3) Establish an incentive and restriction system. We will reward organizations and individuals that fully comply with building energy efficiency standards. We will study multi-stage electricity pricing, aiming to change the task of building energy efficiency from government-driven into self-driven.

（三）建立健全建筑节能的科技保障体系

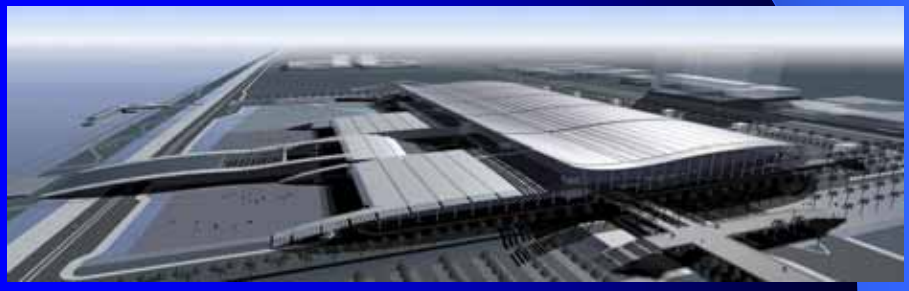
完善的科技保障体系是开展建筑节能工作的重要环节。为此，我市下一步主要从以下四个方面开展工作：一是要建立和完善建筑节能标准的配套技术规范。根据建设部颁布实施的《夏热冬暖地区居住建筑节能设计标准》，制定本地的实施细则和标准图集，并根据具体情况，逐步制定其他建筑的节能技术措施；二是要完善建筑节能工程应用的技术基础。通过调研、测试和科研攻关，解决工程应用遇到的技术难题，推出适合本市工程应用的节能产品、技术、建筑构造类型等；

3. Establish and improve a scientific and technological guarantee system for building energy efficiency

A complete scientific and technological guarantee system is an important aspect for building energy efficiency. We will work on four aspects: 1) Establish and improve supporting technical specifications for building energy efficiency standards. Based on "Residential Building Energy Code for the Hot-Summer Warm-Winter Region" promulgated by the Ministry of Construction, we will formulate detailed local implementation rules and standard drawings, and establish energy efficiency measures for other buildings. 2) Improve technical skills in handling building energy efficiency projects, solve technical problems through research, testing and jointly tackling difficulties, and produce energy conservation products, technologies, and architectural structures suitable for Guangzhou.

三是要构筑建筑节能的科技活动平台。通过开展各种建筑节能科技活动，充分发挥建筑节能专家及相关技术人才的作用，形成一个高效的沟通平台，为政府相关决策提供参考。四是要加速科研成果的转化。要把科研成果尽快转化到规划者的规划思路中去，转化到设计人员的设计方案中去，转化到建设单位的建设行为中去。

3) Build a platform for scientific and technological research on building energy efficiency, give full play to the initiative of experts and technical personnel and provide an efficient communication platform to provide consultation to decision makers. 4) Speed up transformation of scientific and technological breakthroughs into urban planning, project designs, and actual construction.



（四）加强对建筑节能的宣传和培训

宣传和培训是开展建筑节能工作的重要内容。在宣传方面，以实施建筑节能的现实意义为重点，通过电视、报纸、网站等媒体以及建筑节能研讨会、展览会等多种形式进行宣传，根据人们不断追求高质量居住环境的趋势，大力宣传和推广高性能的节能建筑，向广大市民阐明建筑节能的经济效益和社会效益，强化全民的建筑节能意识。在培训方面，根据建筑节能技术性较强的特点，采取培训、讲座、研讨等方式，结合建筑应用过程中不同的对象进行有针对性的强化培训，全面普及建筑节能技术。

4. Strengthen publicity and training on building energy efficiency

Publicity and training are important aspects in building energy efficiency. We will educate the public on the significance of building energy efficiency through television, newspapers, Internet, seminars, and exhibitions. We will advocate high-performance energy-efficient buildings, educating people on their economic and social benefits, raise public awareness, and meet their demands for better living conditions. Considering the technical nature of building energy efficiency, we will conduct specialized and intensive training to different stakeholders through training, lectures, seminars, to popularize technologies on building energy efficiency.

（五）引导和培育有序的建筑节能产品市场

通过政策和有效的市场引导，使建筑节能潜在的需求变为现实的市场需求。政府通过发布推荐或限制、淘汰使用相关建筑技术、产品、设备的目录，并对建筑节能材料、产品进行认证备案等方式，加强对建筑节能市场的宏观调控，正确引导技术研究和产品生产等相关方面的投资方向，实现资源的优化配置，促进建筑节能相关产业和市场健康有序的发展。

5. Guide and nurture an orderly market for building energy efficiency products

We will transform potential needs into real market demands through policy and effective market guidance. We will strengthen macro-control over the market, guide investment on technological research and production, optimize distribution of natural resources, and facilitate the healthy and orderly development of building energy efficiency related industry. These can be done by publicizing catalogues of recommended, restrictive, or phased-out technologies, products, and equipment, or by certifying energy-efficient materials and products.

（六） 强化建筑节能工作的政府推动作用

市政府将不断加强对建筑节能工作的领导和推动，把推进建筑节能工作为我市贯彻科学发展观的战略性问题来定位，纳入政府的目标管理，并作为一项长期任务和重要工作。下一步，将充分发挥各有关职能部门的作用，特别是建设行政主管部门在规划、设计、施工、监理、竣工验收等环节中的作用，加强对建筑节能的监督管理。

6. Strengthen the role of the government in promoting building energy efficiency

The municipal government will further enhance its role in leading and promoting building energy efficiency. We will incorporate it into our target management plan and regard it as an important long-term task. We will give full play to initiatives of relevant government functionaries, especially those responsible for planning, design, construction, supervision, inspection, and approval. We will enhance supervision and control over building energy efficiency.

小结：

- 建筑节能必须溶入城市节能总体框架中
- 建筑形式是建筑节能的基础
- 创造适应气候特征的节能建筑，有利于显现城市个性和继承传统文化
- 政府的引导不应该扼杀市场经济运作的规律

Conclusions:

- **Building Energy Efficiency should be integrated into the overall system of urban energy conservation.**
- **Building energy efficiency depends on building design.**
- **Energy-efficient buildings should suit local climate characteristics, and reflect the historical and cultural features of the city**
- **Government guidance should not interfere with the market system.**


谢 谢 大 家 !


加强政策引导，依靠科技进步
稳步推进建筑节能工作
Advancing building energy efficiency through policy guidance and science and technology development
—北京市建筑节能工作开展情况的汇报
-- Work report on Beijing building energy saving
张 兴 野
Zhang Xingye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(3) Compiled “Examination and Acceptance Standard for the Construction Quality of Energy-saving and Insulation Project of Residential Buildings”

二、政府推动建筑节能的主要做法

（一）制定法规标准，加强政策引导

（二）依靠技术进步，以创新求提高

（三）淘汰落后产品，大力发展新型建筑材料

（四）加强部门配合，全面系统推进

（五）加强舆论宣传，创造发展环境

2. Main measures adopted by the government to promote building energy efficiency

(1) Formulate regulations and standard, strengthen policy guidance

(2) Utilize technical progress and seek innovation

(3) Supersede outdated products and develop new construction materials

(4) Improve departmental coordination in a comprehensive and systematic way.

(5) Increase publicity and foster an environment of development

三、存在的问题和今后的工作重点

（一）建筑节能工作存在的问题

（二）下一步的工作重点

3. Existing problems and next steps

(1) Existing problems of the work on building energy efficiency

(2) Next steps

一、北京市建筑节能工作的进展情况

1. Progress of building energy efficiency in Beijing

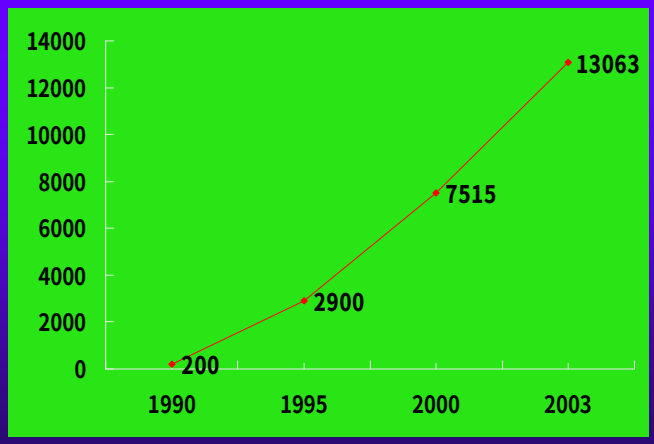
(一）基本普及了“节能50%”的居住建筑节能设计标准

(1) Basically disseminated ‘50% energy-saving’ standard for residential buildings

节能住宅数量（万平方米）

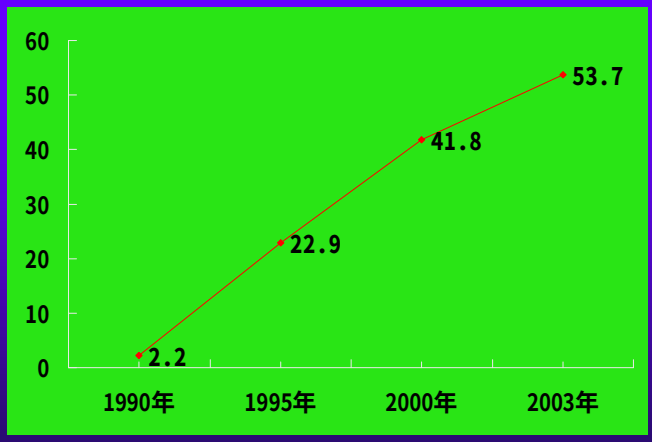
The number of energy-efficient buildings

(10,000 square meters)



节能住宅占全部住宅比重（%）

Ratio of energy-efficient residential buildings to existing residential buildings (%)



北京市城八区居住建筑统计表　　（单位：万平米）

名称	住宅建筑面积	非节能住宅	节能30%住宅	节能50%住宅
合计	10862.78	4819.98	3178.57	3059.48
东城	482.53	225.47	127	133.58
西城	616.54	449.60	103.82	105.88
崇文	471.96	195.67	97.89	186.22
宣武	353.98	201.15	95.67	58.16
朝阳	2855.50	1176	702.95	979.51
丰台	2804.70	1083.33	1076.97	675.55
石景山	556.27	227.46	232.80	122.61
海淀	2721.31	1261.30	741.51	797.98

Residential Building Statistics of Eight Central Districts (10,000 square meters)

Name	Area of Residential Buildings	Non Energy-Efficient Buildings	30% Energy-Efficient Buildings	50% Energy-Efficient Buildings
Sum	10862.78	4819.98	3178.57	3059.48
Dong Cheng District	482.53	225.47	127	133.58
Xi Cheng District	616.54	449.60	103.82	105.88
Chong Wen District	471.96	195.67	97.89	186.22
Xuan Wu District	353.98	201.15	95.67	58.16
Chao Yang District	2855.50	1176	702.95	979.51
Feng Tai District	2804.70	1083.33	1076.97	675.55
Shi Jing Shan District	556.27	227.46	232.80	122.61
Hai Dian District	2721.31	1261.30	741.51	797.98

（二）发布实施了“节能65%”的居住建筑节能设计标准

2003年住宅围护结构传热系数设计标准对比

（单位：w/m².k）

地　区	外　墙	外　窗	屋　面
中国北京	1.16-0.82	3.5	0.80-0.60
瑞典南部	0.17	2.5	0.12
德国柏林	0.5	1.5	0.22
美国气候与北京相近地区	0.32-0.45	2.04	0.19
加拿大	0.36	2.86	0.23-0.4
日本北海道	0.42	2.33	0.23
俄罗斯气候与北京相近地区	0.77-0.44	2.75	0.57-0.33

(2) Issued and implemented '65% energy-saving' standard for residential buildings.

Comparison of the heat-conducting index of maintenance structure of construction in different areas 2003（w/m².k）

Area	Exterior Wall	Exterior Window	Rooftop
Beijing, China	1.16-0.82	3.5	0.80-0.60
Southern Sweden	0.17	2.5	0.12
Berlin, Germany	0.5	1.5	0.22
Areas with similar climate as in Beijing, U.S.A.	0.32-0.45	2.04	0.19
Canada	0.36	2.86	0.23-0.4
Hokkaido, Japan	0.42	2.33	0.23
Areas with similar climate as in Beijing, Russia	0.77-0.44	2.75	0.57-0.33

现住宅实际耗能水平对比

	欧　洲	北　京
2002年平均耗能水平	每平方米6升油	每平方米16升油
2002年先进住宅耗能水平	3升油以下	8.75升油
		实施节能65％设计标准后6.125升油

Comparison of energy consumption level of existing residential buildings

	European	Beijing
Average energy consumption level 2002	6 liters gasoline per square meter	16 liters gasoline per square meter
Advanced energy consumption level 2002	Less than 3 liters gasoline per square meter	8.75 liters gasoline per square meter
		6.125 liters gasoline per square meter (with implementation of the 65% energy saving design standard)

北京市建筑维护结构传热系数的限值与国外相比的差距

（单位：w/m2.k）

地区	外墙	外窗	屋顶
北京JGJ26-95标准	1.16-0.82	4.0-4.7（实为3.5）	0.80-0.60
北京节能65%标准（2004年）	0.60（5层以上）	2.8	0.60
	0.45（4层及以下）	2.8	0.45
美国标准 ASHRAE(2001年)	0.59（重质墙）	3.80（窗墙比0-40%） 2.67（窗墙比40.1%-50%	0.36（无阁楼）
德国（2001年）	0.20-0.3	1.5	0.2
英国（2002年）	0.35	2.0	0.16

Differences between Beijing and other countries in limitations of heat-conducting index of building maintenance structure （w/m².k）

Area	Exterior Wall	Exterior Window	Rooftop
Beijing Local Standard JGJ26-95	1.16-0.82	4.0-4.7 (Practical 3.5)	0.80-0.60
Beijing '65% energy saving design' standard (2004)	0.60 (over 5 stores)	2.8	0.60
	0.45 (4 or less than 4 stores)	2.8	0.45
American Standard ASHRAE (2001)	0.59(Heavy wall)	3.80 (window to wall ratio 0-40%)	0. 36 (without loft)
		2.67 (window to wall ratio 40.1%-50%)	
German (2001)	0.20-0.3	1.5	0.2
U.K.(2002)	0.35	2.0	0.16

（三）编制《居住建筑节能保温工程施工质量验收规程》

2004年编制《居住建筑节能保温工程施工质量验收规范》该规程要对建筑节能保温施工中涉及的材料性能、施工工艺、质量监理、监督检查、验收等提出明确要求体现以过程控制为主，辅助实体检测的原则。这个规程目前正在组织专家审查，力争在年底前发布。

(3) Compiled "Examination and Acceptance Standard for the Construction Quality of Energy-efficiency and Insulation Project of Residential Buildings"

Beijing Construction Committee compiled this Standard in 2004. The Standard lists clear requirements on material quality, construction technology, quality inspection and management, supervision, and inspection and approval. It gives priority to process control with respect to product examination. Experts are now examining the Standard and we will do our best to make sure that it is released by the end of this year.

二、 政府推动建筑节能的主要做法

（一）制定法规标准，加强政策引导

2. Main measures adopted by the government to promote building energy saving

(1) Formulate regulations and standard, strengthen policy guidance

北京市人民政府令

第 80 号

市长 刘淇

2001年8月14日，北京市发布了《北京市建筑节能管理规定》（市政府第80号令）

On August 14 2001 , Beijing released Beijing Building Energy-Efficiency Regulations (No.80 order of the municipal government)

北京市人民政府办公厅文件

京政办发〔2004〕49 号

北京市人民政府办公厅关于本市禁止生产粘土砖有关工作的通知

各区、县人民政府，市政府各委、办、局，各市属机构：

为贯彻落实科学发展观和《国务院办公厅关于开展资源节约活动的通知》（国办发〔2004〕30 号）精神，实行基本农田耕地保护制度，减少环境污染，实现绿色奥运，依据《北京市建筑节能管理规定》（市政府令第 80 号）有关规定，市政府决定在本市行政区域内全面禁止生产粘土或掺分以粘土为原料的实心砖、多孔砖、空心砖以及粘土瓦（以下简称粘土制品），经市政府同意，现就有关事项通知如下：

一、自 2004 年 10 月 1 日起，本市行政区域内所有生产粘土制

— 1 —

市政府办公厅2004年8月21日下发《关于禁止生产粘土砖有关工作的通知》

On August 21 2004, the General Office of People's Government of Beijing Municipality released The Circular of Prohibition of Production of Clay Bricks

（二）依靠技术进步，以创新求提高

(2) Utilize technical progress and seek innovation

承重保温装饰砌块

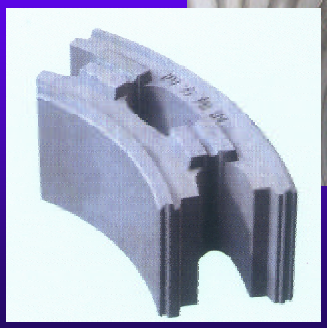
Insulation bearing ornamental block

保温砌模现浇承重墙体系

Insulation mould cast-in-situ bearing wall system

踢脚板式散热器

baseboard radiator



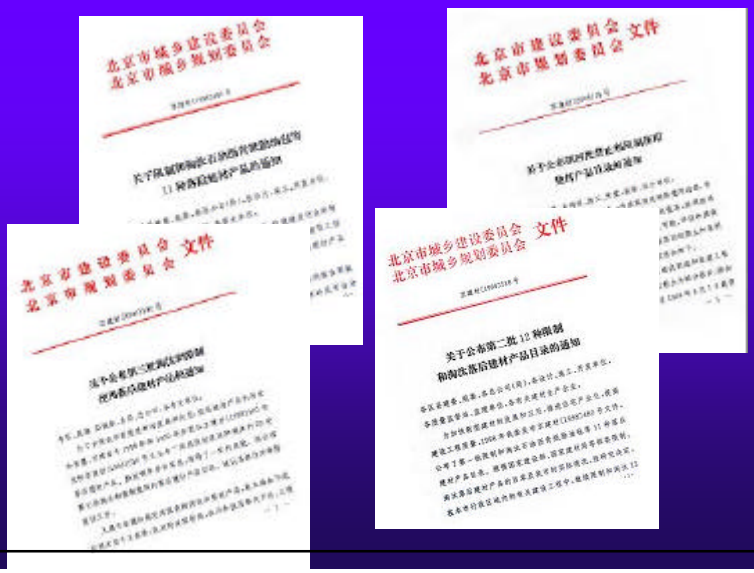
装配式混凝土检查井
assembling concrete examination well

青塔小区9层混凝土承重砌块结构体系试点工程
Pilot project of the concrete bearing block structure system in the 9-story Qingta Neighborhood

锋尚国际公寓
Fengshang Apartment House

（三） 淘汰落后产品，大力发展新型建筑材料

(3) Supersede outdated products and develop new construction materials



禁止使用或限制使用产品目录

时间	禁止使用产品	限制使用产品
1998年		32系列实腹钢窗
1999年	粘土珍珠岩保温砖；充气石膏板；菱镁类复合保温板；菱镁类复合隔墙板	墙体内保温浆料（海泡石，聚苯粒，膨胀珍珠岩等）；普通实腹、空腹钢窗（彩板窗除外）
2001年	圆翼型、长翼型、813型灰铸铁散热器；手工成型的GRC轻质隔墙板；未用玻纤网布增强的水泥（石膏）聚苯保温板； 改性聚氯乙烯（PVC）弹性密封胶条	厚度为60毫米的隔墙板；铝合金、塑料（塑钢）外平开窗；单层普通铝合金窗；水泥聚苯板（聚苯颗粒与水泥混合成型）
2004年	粘土砖，包括掺加其它原材料，但粘土用量超过20％的实心砖、多孔砖、空心砖	建筑用普通单层玻璃和简易双层玻璃外窗；80系列以下（含80系列）普通推拉塑料外窗； 钢制闭式串片散热器；水泥聚苯板（聚苯颗粒与水泥混合成型）；以膨胀珍珠岩、海泡石、有机硅复合的墙体保温浆（涂）料

新型建筑材料生产能力

建材品种	新建成生产线	生产能力
煤矸石页岩多孔砖	20条	14亿块
混凝土承重砌块	18条	120万立方米
非承重建筑砌块	34条	432万立方米
建筑轻板	207条	2000万平方米
节能门窗	500条	1500万立方米

Production capability of new construction materials

Type of materials	Newly set up production line	Production capability
Coal-waste rock & shale multi-hollow brick	20	1.4 billion pieces
Concrete bearing block	18	1.2 million square meters
Non bearing construction block	34	4.32 million square meters
Light construction board	207	20 million square meters
Energy-efficient door and window	500	15 million square meters

（四 ）加强部门配合，全面系统推进

建委：负责全市建筑节能工作的法规建设、发展规划、政策调研和宣传，负责科研、试点工程的组织，新材料、新技术、新工艺、新体系的推广，负责建筑工程实施节能设计的过程监督和验收

发改委：由市发展与改革委员会在建设项目的立项审查时，加强节能的评估

规划委：由市规划委在施工图设计审查组织工作中，严格把好建筑节能关

市政管委：由市市政管委会同有关部门组织全市的供热体制改革

(4) Increase government supervision and improve departmental coordination

Beijing Construction Committee ：

Responsible for building energy-efficiency on legal construction, development planning, policy investigation and research and propaganda, scientific research and pilot projects, dissemination of new materials, technologies, techniques and systems, supervision and inspection of energy-efficient design.

Beijing Municipal Commission of Development and Reform:

Responsible for evaluation during project determination.

Beijing Municipal Commission of Urban Planning:

Responsible for inspection of building energy efficiency during the examination and organization of construction drawings.

Beijing Municipal Administration Commission:

Responsible for citywide reform of heating system.

（五）加强舆论宣传，创造发展环境

(5) Increase publicity and create an environment of development

新闻媒体

The press

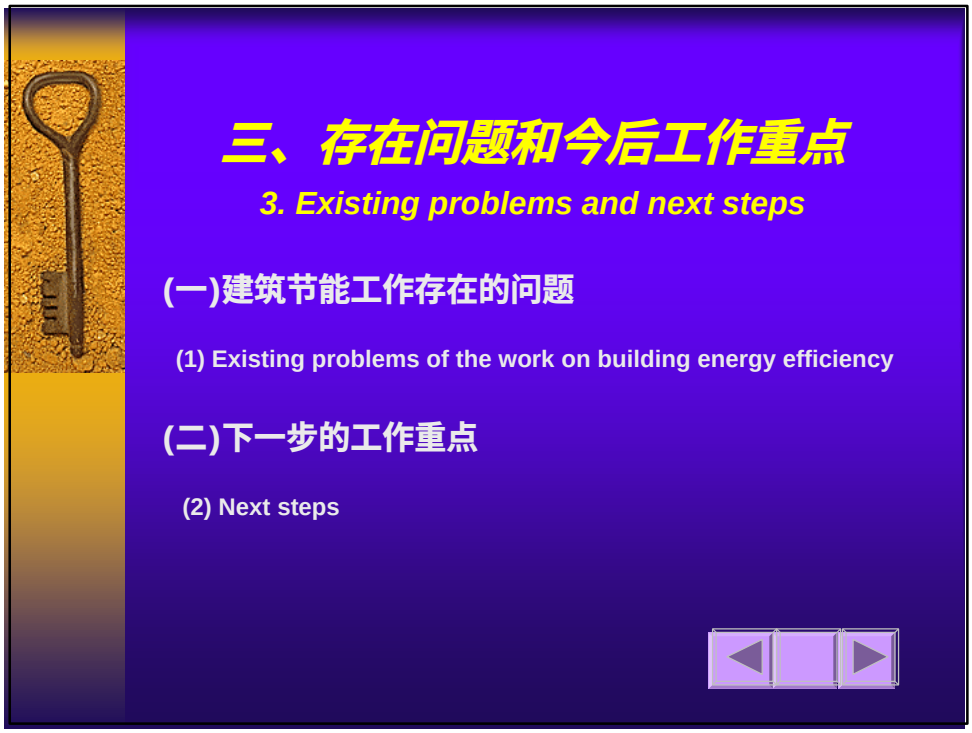
专题展览

Subject exhibition

专业期刊
Specialized periodicals

发放资料
Distributing publicity materials

宣传品
Propaganda materials


三、存在问题和今后工作重点
3. Existing problems and next steps
(一)建筑节能工作存在的问题
(1) Existing problems of the work on building energy efficiency
(二)下一步的工作重点
(2) Next steps


谢　谢！
Thank You！

标准水平	实施时间	每平方米耗标准煤	建筑维护结构特点	
			外墙	外窗
非节能标准	88年以前	25kg	不做保温	单玻窗
节能30%标准	1988年	17.5kg	以保温浆料做内保温	双玻钢窗
节能50%标准	1998年	12.5kg	以聚苯板、保温浆料做外保温	双玻塑窗
节能65%标准	2004年	8.75kg	以聚苯板、聚氨酯做外保温	断桥铝合金、塑钢中空玻璃窗

Raised the energy-saving design standard twice

Level of standard	Date of issuance	Coal consume per square meter	Characteristics of building maintenance structure	
			Exterior wall	Exterior window
Non energy efficient standard	Before 1988	25kg	Non insulation	Single glazed window
30% energy-saving standard	1988	17.5kg	Interior insulation using heat-preservation paste	Double glazed Steel window
50% energy-saving standard	1998	12.5kg	Exterior insulation using poly benzene boards and heat-preservation paste	Double glazed Plastic window
65% energy-saving standard	2004	8.75kg	Exterior insulation using poly benzene boards and polyurethane	Thermal break aluminum alloy casement window and plastic-steel casement double-sheet window

发挥政府的主导作用，积极推广建筑节能技术——天津市建委节能技术工作综述

Leveraging the Pivotal Role of Government, Actively Promoting Energy Efficiency Technologies in Buildings

--Tianjin's Experiences in Building Energy Efficiency Technology

（天津市建委副主任兼总工程师 严定中）

Yan Dingzhong, Vice Director,Chief Engineer of Tianjin Construction Administrative Committee

背景 Background

天津市位于华北平原东部,是中国北方重要的出海口之一，属于大陆性季风气候，全市年平均气温11.1—12.5℃。每年的12月份到转年的1、2月份是天津市最冷的时期，这三个月的月平均气温都在0℃以下。天津属寒冷地区，冬季采暖119天，冬季采暖耗能为25kg标煤/m2，能耗较为严重。

城市常住人口为1011万人，居民住宅面积总和为12757万平方米。城市人均住房建筑面积23平方米，住宅集中供热面积达到7500万平方米（75,00 million m2），城市集中供热普及率达到80%，建筑和供热能耗相当可观。

Tianjin:

- Annual average temperature of 11.1--12.5℃
- Heating period of 119 days in winter
- Energy consumption is 25kg coal equivalent/m^2 for winter heating
- Population of 10.11 million permanent urban residents
- Total residential building area of 230 million m^2
- Average per capita of which is 23 m^2
- Centralized residential heating area of 74 million m^2.
- Urban centralized heating coverage of 77%.

一、发挥政府主导作用，积极推广建筑节能技术
Leveraging the Pivotal Role of Government, Actively Promoting Energy Efficiency Technologies in Buildings

1、天津市建筑节能技术的发展经历了三个阶段

1993—1997年，是建筑节能的起步阶段,在建筑设计工程中注重了建筑节能的效果，推广了建筑节能材料，采取了必要的措施

Tianjin's energy efficiency work went through three stages
Stage I: Adopted building energy efficiency codes

1998—2003年，是建筑节能的第二阶段，建筑节能技术无论是从理论上还是实践中，都由定性措施上升到定量的（节能50%）的飞跃

Phase II: 1998-2003: 50% energy savings standard

2004--，是总结经验、加速推广和提高标准的阶段 ，住宅建筑的耗热量指标为14.4wm2以下，各部分围护结构的指标如下：

Phase III: 2004 Summarized code experience. The residential building heat consumption target should be below 14.4wm² in the future.

表4.3.1 各部分围护结构传热系数的限值 *Ki* [W/(m2·K)]

Heat Transfer Cap for Each Envelope Structure K_i [W/(m²·K)]

围护结构部位 / 层数	屋顶	外墙	不供暖楼梯间		窗户(含阳台门透明部分)	阳台门门芯板	楼板	
			隔墙	户门			接触室外空气楼板	不供暖空间上部楼板
大于等于 5 层	0.50	0.60	1.50	1.50	2.70	1.50	0.50	0.55
小于等于 4 层	0.40	0.45	1.50	1.50	2.50	1.50	0.50	0.55

实施建筑节能10年来，全市共建设节能住宅建筑面积为4590万m2，占全市住宅建筑面积总和的26.7%。

45.9 million m² energy efficient residential buildings have been constructed, accounting for 26.7% of the total residential building area

2、发挥政府主导作用，推进建筑节能技术的几项措施

Measures adopted to push forward energy efficiency technology in buildings by bringing the leading role of the government into full play

（1）制定和出台了一系列有关建筑节能工作的政策法规

Formulated and issued a set of policies and code concerning energy efficiency in buildings

《天津市节约能源条例》
《天津市墙体材料革新和建筑节能管理规定》
《天津市民用建筑节能管理实施细则》

（2）加速完善建筑节能技术法规体系

Sped up the pace of improving technical specification system

《制第三阶段建筑节能设计标准（节能65%）》
《天津市居住建筑节能施工技术规程》
《天津市居住建筑节能验收标准》
《天津市居住建筑节能检测标准》

（3）带头做好试点工程，积极推动全面实施

Took the lead in pilot projects, furthered overall implementation of energy-efficiency in buildings

1998年，实施了龙潭路和华苑绮华里两个试点项目

（4）加强国际合作，促进三步节能的实施

Strengthening international cooperation,promoting implementation of 65% energy-savings standard

计划开展建筑节能示范项目的合作。该项目建筑面积近100万平方米，要求全部达到65%节能的要求。仅今年就将实施三个三步节能试点项目，开工面积达20万平方米。

（5）牢牢抓住设计关，通过管理推动建筑节能工作

Strict with design, promote energy efficiency in buildings through management

我们通过设计培训，提高了设计人员应用节能技术水平；实施设计图纸的抽查，落实节能技术应用的情况；将建筑节能作为施工图审查的重点，作为开工许可证的前提条件；在全市范围内实施节能技术应用专项的工程检查，查处违规行为，我市二步节能的执行情况（市内六区）为93%，达标情况为全国中上等水平。

（6）以应用节能技术为前提，积极开发新型结构体系和应用技术

Develop new structural systems and application technologies for energy -efficiency technologies

《中高层保温砌块住宅建筑体系的研究》
《钢结构住宅建筑体系的研究》
《砼多空砖试验建筑体系的应用研究》
《RBS建筑体系的研究》
《CS板式结构住宅体系研究》
《多层承重砌块复合外墙保温技术的研究及标准的编制》
《页岩模数砖节能技术标准的编制》

二、在政府的主导下，改革供热体制是供热节能的有效途径

Under the guidance of government, reforming the heating system is an effective way to save energy

1、在政府主导下，为改革供热体制采取了几项重大的措施

（1）实施供热收费机制改革

-- 明确交费主体和供热企业主体。取消供热采暖由单位报销的办法，采取由用户与供热单位签定“供用合同”，明确了供热单位的企业化行为和市场主体地位，实现了“谁用热，谁交费”。

-- 下调了供热费价格并发放供热补贴(将供热价格由原来的每平方米建筑面积18.5元，下调为15.4元。

-- 制定优惠政策。对享受最低生活保障的居民、重点优抚对象、领取下岗职工基本生活费、失业保险金的居民，给予减免采暖费的照顾。

1. Guided by the government,main measures adopted to reform heating system

- Implement reform of billing mechanism
- Main body of bill-paying and heating companies are defined
- Reduce heating price and provide heating subsidy
- Formulate preferential policies

（2）改变供热运行方式，推广供热计量措施

Change heating operation method, spread heat metering

-- 特别是6年抄表算账的探索,确定了我市平均平米耗热指标,我们积极推广供热单户计量，一室一户分户供热系统等便于计量的供热方式。

（3）积极制定各项法规政策，规范供热管理行为

Formulate various regulations and policies, standardize the action of heating management

《关于天津市室内采暖系统设计管理暂行办法的通知》，
《关于实施“天津市室内采暖系统设计管理暂行办法”的技术规定》
《关于新建住宅室内采暖系统一律安装热计量装置的通知》
《集中供热住宅计量供热设计规程》
《集中供热住宅计量供热设计规程》
《集中供热住宅计量供热施工质量验收规程》

(4)积极推进试点工作 Push forward pilot work

一是开辟了5个试点小区，总面积达47.86万平方米，5068套住宅，分别采用室内单管顺流跨跃式系统，一户一环分户系统；采用德国费特拉蒸发式热分配表、丹佛斯温控阀、机械式进口热量表，每组散热器上安装国产调节阀等不同的设备式，开展了大量的试点工作 。
二是在试点基础上，再次扩大60万平方米的实验区域。

2、几年来，我市供热节能工作的初步成果

(1)促进了我市供热事业的蓬勃发展。供热投资主体的多元化使供热建设真正进入了市场，改变了原来由于市财政包办的被动局面。

(2)促使供热企业树立起强烈的市场意识，几年来，全市供热合格率始终保持在98%以上，维修及时率保持在95%以上。

(3)促进了供热企业的结构调整，加快了科技兴热的步伐。

(4)收费率明显提高)。由于措施得当，改革以来全市平均收费率始终保持在90%以上。

2. Initials results of energy efficiency work in heating

(1) Promoted the development of heating in Tianjin

(2) Encouraged heating companies to become more market consciousness

(3) Expedited the structural adjustment of heating companies

(4) Collection rate of heating fees increased dramatically

三、在节能技术中需要进一步解决的问题

Problems that urgently need to be solved in energy efficiency technologies

⑴进一步提高对节能工作必要性的认识

Further enhance the importance of energy efficiency work

⑵进一步完善建筑节能的法规体系

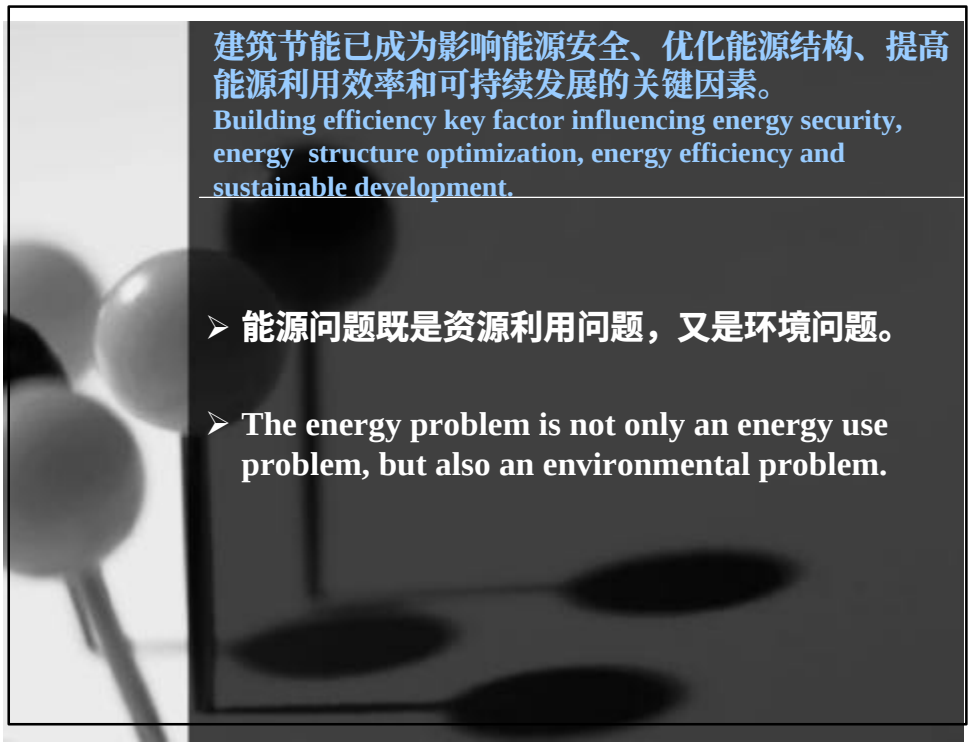
Further improve laws and regulation system of energy efficiency in buildings

⑶采用新技术降低供热成本是当务之急

Reducing the cost of heating through new technologies is a top priority.

谢 谢


实施建筑节能
建设美好家园
Improving Building Efficiency for a Better Living Environment
乔明佳
重庆市建委副主任
Qiao Mingjia, Vice Director
Chongqing Construction Commission


建筑节能已成为影响能源安全、优化能源结构、提高能源利用效率和可持续发展的关键因素。
Building efficiency key factor influencing energy security, energy structure optimization, energy efficiency and sustainable development.
能源问题既是资源利用问题，又是环境问题。
The energy problem is not only an energy use problem, but also an environmental problem.

建筑节能已成为影响能源安全、优化能源结构、提高能源利用效率和可持续发展的关键因素。

Building efficiency key factor influencing energy security, energy structure optimization, energy efficiency and sustainable development.

- **人均能源占有量过低、国民生产总值能源消耗过高是我国长期以来国民经济和社会发展中的突出问题。**
- **Too low per capita energy availability and too high energy consumption per unit GNP cause significant problems for China's development.**

建筑节能已成为影响能源安全、优化能源结构、提高能源利用效率和可持续发展的关键因素。

Building efficiency key factor influencing energy security, energy structure optimization, energy efficiency and sustainable development.

- **建筑能耗占社会总能耗的比例已从1978年的约10%上升到目前近30%，随着人民生活水平的提高，这个比例还将上升，将达到35%～40%，届时，建筑将超越工业、交通、农业等其他行业成为能耗的首位。**
- **Building energy consumption has increased from 10% to 30% of total consumption since 1978. Proportion is expected to increase to 35%~40%, exceeding industry, transportation and agriculture.**

建筑节能已成为影响能源安全、优化能源结构、提高能源利用效率和可持续发展的关键因素。

Building efficiency key factor influencing energy security, energy structure optimization, energy efficiency and sustainable development.

- **我国建筑物的设计寿命50年，建筑物在全寿命周期内将直接或间接地消耗大量的能源，从而对能源造成重负对环境造成严重污染。**
- **Chinese buildings generally last 50 years. During the entire life cycle, energy will be consumed directly and indirectly, which will result in heavy pollution to surrounding environment.**

建筑节能已成为影响能源安全、优化能源结构、提高能源利用效率和可持续发展的关键因素。

Building efficiency key factor influencing energy security, energy structure optimization, energy efficiency and sustainable development.

- **实施建筑节能无疑将保护我们有限的自然资源，减少环境污染，实现国民经济和社会的可持续发展及人们生活水平的极大提高。**
- **Improving building energy efficiency will protect limited natural resources, abate environmental pollution, and improve residential environments. It will eventually enhance sustainable development and people's standard of living.**

一、提倡资源节约，把建筑节能上升到社会责任感的高度来认识

Advocate energy conservation, elevate building energy efficiency to a social responsibility

- 资源节约是政府、企业、社会公众各个层面乃至全社会的工作，因此提升每个公民的忧患意识和社会责任感有助于节约资源，有助于建筑节能工作的开展。
- Resource conservation needs the support of the government, enterprises, and general public. To increase public awareness and social responsibility, it is necessary to strengthen the implementation of building energy efficiency.

一、提倡资源节约，把建筑节能上升到社会责任感的高度来认识

Advocate energy conservation, elevate building energy efficiency to a social responsibility

- 重庆直辖以来，新建民用建筑从1997年的700余万m2，到今年近1500万m2，直辖七年累计近1亿 m2新建民用建筑投入使用，多数房屋建造标准（指节能方面）还停留在上世纪80年代。
- Since Chongqing became a municipality, about 10 billion m^2 buildings have been constructed and put into use, up from 7 million m^2 in 1997 to 15 million this year. Yet, the energy efficiency standard still remains at 1980s level.

一、提倡资源节约，把建筑节能上升到社会责任感的高度来认识

Advocate energy conservation, elevate building energy efficiency to a social responsibility

- 重庆夏季炎热、冬季阴冷潮湿的气候特征，城市空调器的拥有量和使用率远高于其他城市，夏冬两季建筑用能巨大，建筑节能形势不容乐观。
- Chongqing is in the Hot-Summer, Cold Winter zone. The quantity and usage of air conditioners are higher than other cities in China. Energy consumption is huge in these two seasons; improving energy efficiency is a daunting task.

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- 党的“十六大”提出全面建设小康社会的奋斗目标，可以预见我国未来20年经济高速发展，人们生活水平将发生显著改变。
- To achieve the goal of “Building a Well-Off Society,” people’s standard of living will undergo significant changes in the next 20 years.

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- 作为拉动我国经济发展的重要内需市场，建筑物能源消费的迅速增长和CO2排放量的大幅增加，又对我国能源可持续发展和能源安全形成了挑战。
- As a key driving force of the Chinese economy, the construction industry will experience rapid development, huge energy consumption, and a significant increase in CO2 emissions. This will challenge sustainable energy development and energy security.

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- 让人们从“要我节能”中体验到节能带来的实际好处，进而转变为“我要节能”。
- Make people aware of energy conservation benefits. Change their thinking from “I must save energy” to “I want to save energy.”

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- 尽快实施高舒适度低能耗的建筑战略，重新审视“建筑节能”的概念，使其与我国当前的经济社会发展水平和趋势相适应。
- Implement high-comfort and low-energy consumption building strategy as soon as possible and re-evaluate the concept of building efficiency to bring it in line with current economic development and future trends.

二、坚持以科学发展观为指导，建立合理的建筑节能机制

Establish a sensible building efficiency mechanism

- 建筑节能已不仅是节能和提高能效的驱动力的问题，而是最大限度地解决人与自然和谐相处的问题。
- Building efficiency is not solely a problem of energy saving or energy efficiency improvement, but also how people view the environment and nature.

二、坚持以科学发展观为指导，建立合理的建筑节能机制

Establish a sensible building efficiency mechanism

- 刺激消费与可持续发展相结合。
- 能源供需机制与管理机制变革相结合。
- 坚持长效机制，激励机制相结合。
- 坚持能效与节能并重相结合。
- 坚持宣传教育和养成良好节能习惯相结合

- Integrate consumption stimulus with sustainable development.
- Integrate energy supply-demand mechanism with management system reform.
- Integrate long term efficiency with incentive mechanisms.
- Emphasize energy efficiency and energy conservations.
- Integrate public awareness and good energy saving habits.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 建筑节能难以依靠市场机制推动。因此，必须通过以下方面强制推动建筑节能工作的进行。

- Improving building energy efficiency cannot rely solely on the market. The following measures are needed:

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 一是要建立健全相应的政策法规对建筑节能进行推动、引导、规范。
- Establish policies, laws and regulations to push, guide, and regulate building energy efficiency improvement.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 二是要政府在建筑节能方面强化市场监管、市场引导，有效培育、规范新兴的节能建筑市场。
- Strengthen government role in market supervision and guidance to foster the emerging energy efficient building market .

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 三是要把握重点，不失时机地推进建筑节能工作的开展。
- Focus on priorities and promptly implement energy efficiency measures.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 四是要通过行政立法及推行强制性标准双管齐下，把新建建筑执行建筑节能设计标准，作为行政强制性行为，从而把建筑节能的潜在需求，转变为现实有效需求。
- Establish energy efficiency standards and laws for new buildings to ensure real building energy efficiency improvements.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 五是要实施鼓励建筑节能的经济激励政策，推动建筑节能的进程。
- Implement economic incentives for building energy efficiency.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 六是要加强建筑节能技术创新力度，实行认证、认可和评定制度，规范引导市场健康有序地发展。
- Enhance innovations and establish a sound authentication, certification and appraisal system, to regulate and guide the market.

三、抓住可持续发展的核心观念，把建筑节能引向深入

Use building efficiency to achieve sustainable development

- 七是要充分利用国际资源和技术，加大国际合作，促进居住建筑节能实现跨越式发展。
- Enhance international cooperation and make full use of available international resources and technologies to achieve a leap frog in residential building energy efficiency improvements.