



# Efficient, Reliable & Sustainable Electricity Markets

## Market Design Issues

有效的、可靠的、可持续的电力市场  
—市场设计问题

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# Electricity market problems

## 电力市场的问题

- Generator market power
- 发电市场操纵力
- Peak shortages and price spikes
- 峰时电力短缺与价格暴涨
- Reliability – transmission congestion, shortages and blackouts
- 可靠性——输电拥堵、电力短缺与大停电
- Rules often biased against renewables
- 市场规则通常对可再生能源存有偏见
- Market rules often inconsistent with environmental goals
- 市场规则通常与环境目标不一致
- Market barriers to energy efficiency remain, and may worsen
- 能效的市场障碍依然存在，而且有可能恶化

# 5<sup>th</sup> Pillar of Market Design: Customer Based Resources

## 市场设计的第五个支柱：需求侧资源



The supply side (power company generation and delivery) is not enough – the market also needs customer-based resources

供应方（发输配）的力量是不足够的——市场需要需求侧资源的参与

- These include: End-use efficiency, short-term load response, distributed generation, and CHP
- 包括终端用电效率、短期负荷反应、分散式发电、热电联产等
- Can provide 30%+ of total electrical needs over time
- 长期来讲，可以节约30%以上的电力消费。

# 6<sup>th</sup> Pillar of Market Design: Support National Goals

## 市场设计的第六个支柱：支持国家目标



- Electricity markets alone will not address many electricity issues of concern to China:
- 市场本身不能解决所有的电力问题
  - Environmental quality 环境质量
  - Economic development 经济发展
  - Universal service 普遍服务
  - Energy security 能源安全
- Market design must be supplemented by compatible national policies for these goals
- 以上目标需要市场设计辅以相应的国家政策来实现



# SERC Role

## 电监会的角色

- Market operation (trading) and system operation (reliability) go together – single system operator is best
- 市场运营（交易）与系统运营（可靠性）的功能应由同一个机构承担——一个系统运营商是最佳选择
- DSM will improve the market AND reliability
- 需求侧管理将改善市场和系统可靠性
- Policies to support DSM, DG/CHP, and renewables must be built into the electricity law and market structure at the beginning
- 电力法和市场结构均应体现对需求侧管理、分散式发电、热电联产以及可再生能源的政策支持



# SERC Role

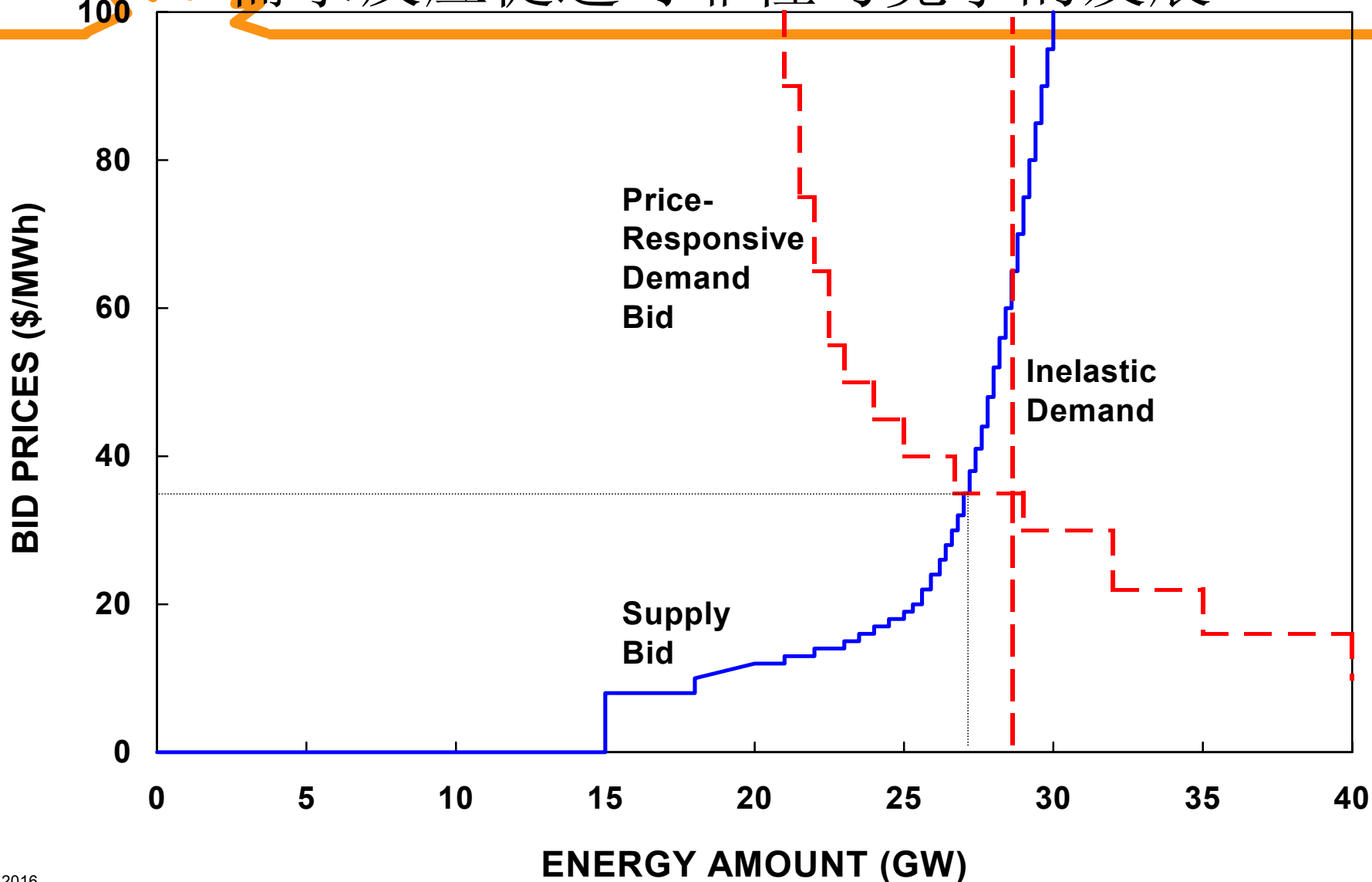
## 电监会的角色

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- Regulator should craft (1) reliability standards and (2) market structure to promote customer efficiency and demand response
- 监管者在制订系统可靠性标准和设计市场结构时，应将促进终端能效和需求反应的目标考虑在内
- Regulator should oversee system operator and utilities to ensure efficient operations, including DSM
- 监管者应该监督系统运营商和电力公司，保证其有效运营，其中包括需求侧管理

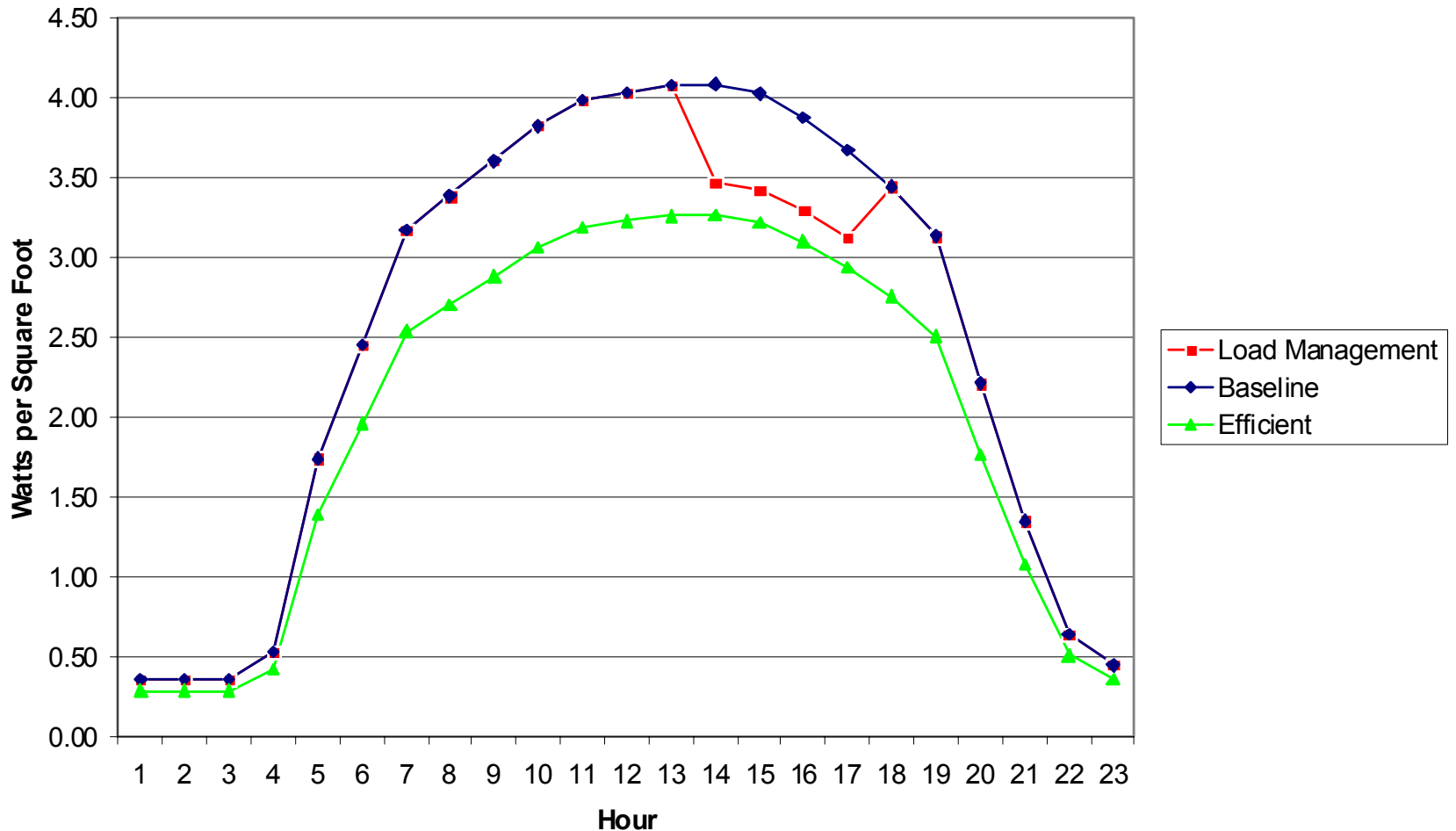
# Demand response promotes reliability and competition

需求反应促进可靠性与竞争的发展



# Energy Efficiency potential is large compared to short-term load response 与短期负荷反应相比，能效潜力巨大

Combined Commercial Cooling and Lighting Loadshape  
Baseline and Load Management Compared to Energy Efficiency

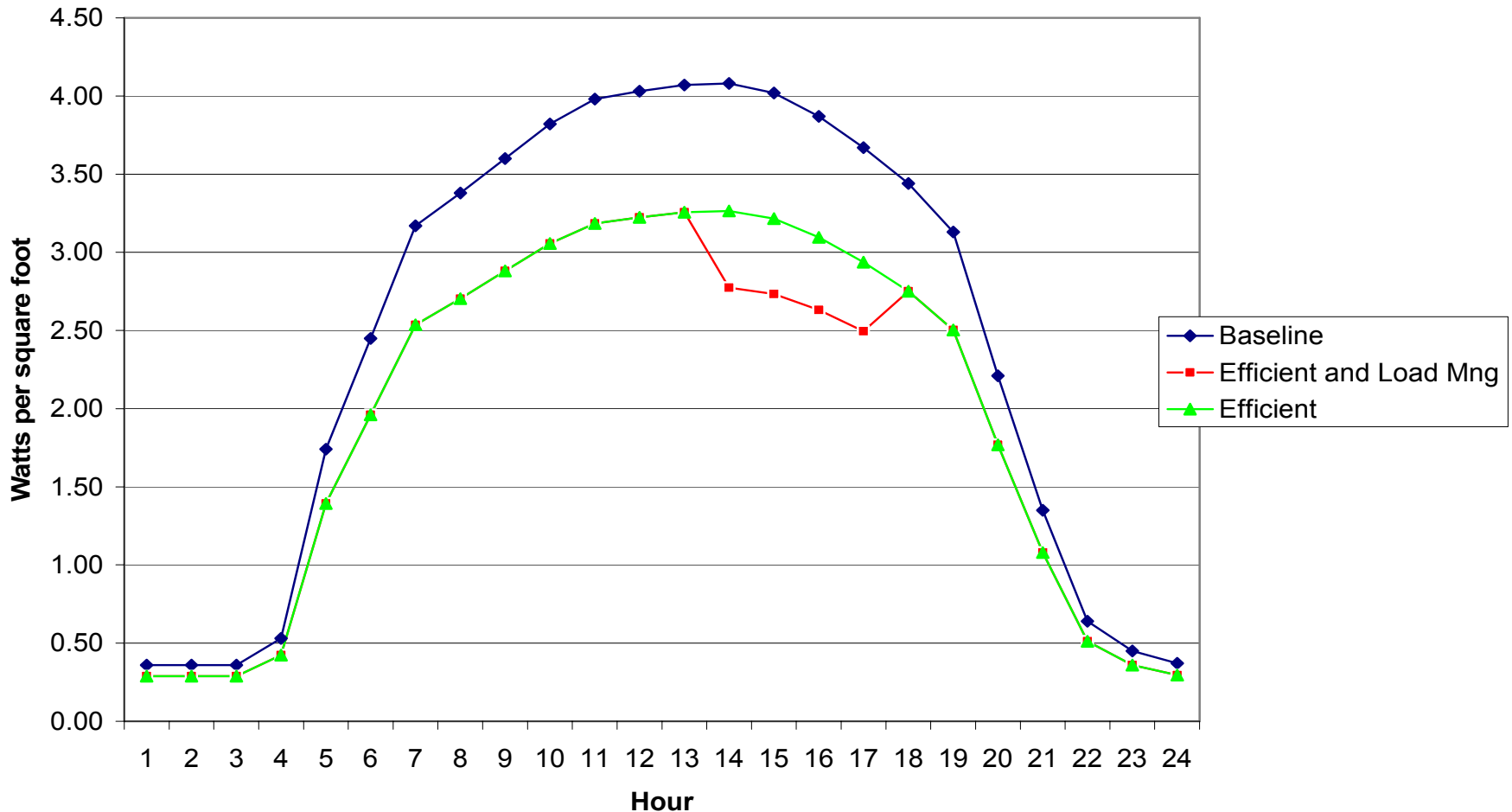




# Efficiency and load management working together

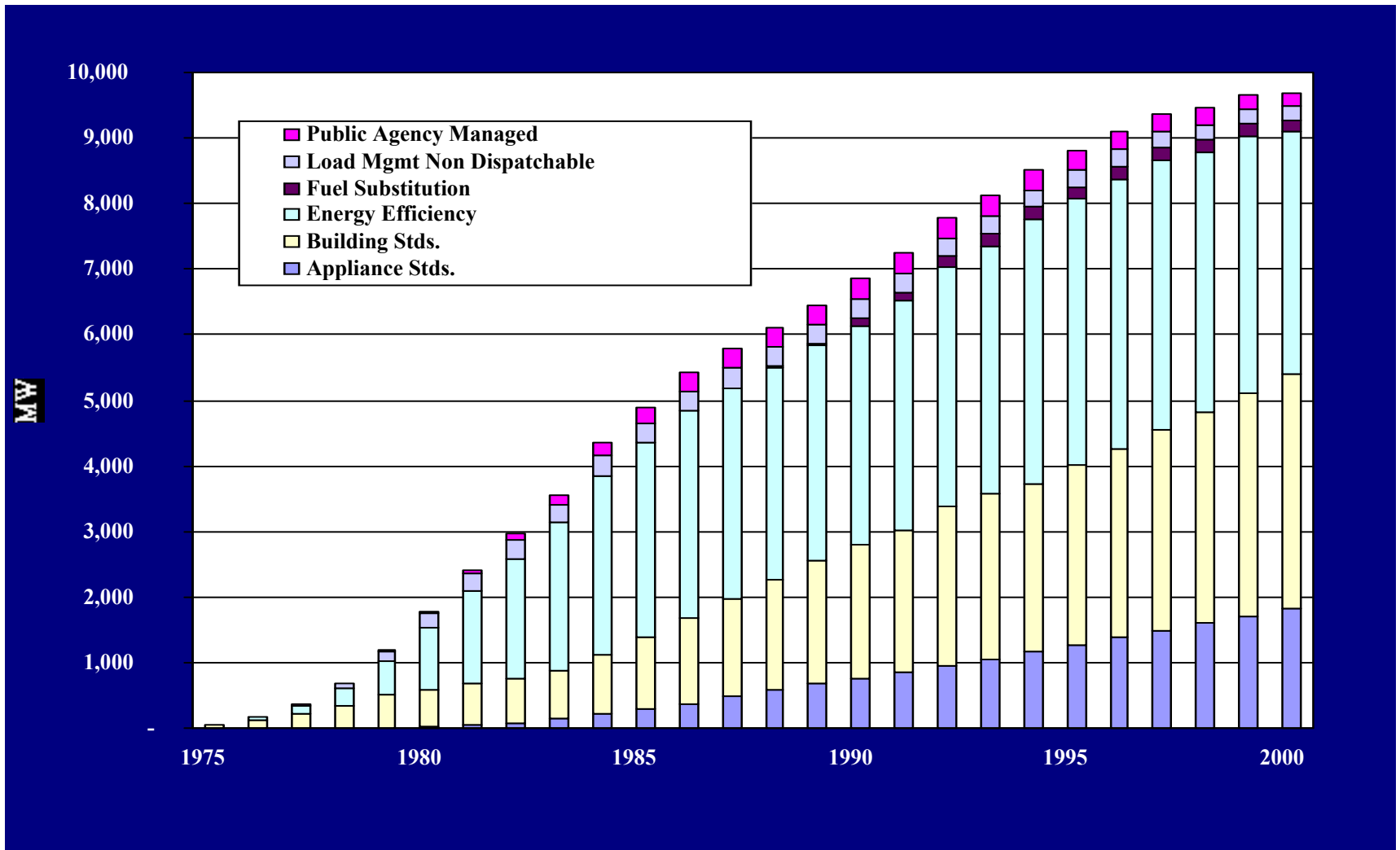
## 能效与负荷管理同时进行

Combined Commercial Cooling and Lighting Loadshape with  
Efficiency and Load Management (Four-Hour Curtailment by 15%)



# Efficiency resource grows over time (California example)

加州的长期能效增长情况



# Market Design for Sustainability (1)

## 可持续性的市场设计 (1)

- MAIN POINT: invest in long-term energy efficiency
  - **PBF, System benefit charges** for efficiency

要点： 投资长期能效—公共效益基金、系统效益收费
- Energy market :
- 能源市场：
  - **Locational pricing (LMP)** and time-sensitive prices to reveal the value of customer-based resources
  - 采取按地理位置的边际定价法 (LMP) 和分时段定价方式，以反应需求侧资源的价值
  - Permit “**demand response sales**” to the wholesale market
  - 允许批发市场采取“需求反应销售模式”
  - Positive policies for **DG and CHP**
  - 对热电联产及分散式发电的支持政策
  - Bidding and transmission rules to promote **renewables**
  - 竞标与输电规则应有利于可再生能源

# Market Design for Sustainability (2)

## 可持续性的市场设计 (2)

- **Transmission and distribution:**
- 输配电
  - Use **Revenue Caps PBR** (not price caps) to give incentives for lower costs and better performance, and demand-side resources
  - 采用收入上限法（而不是价格上限），鼓励电力企业降低成本、提高效率、利用需求侧资源
  - Allow DSM and DG to provide congestion relief and reliability support through tariffs (**Efficient Reliability Rule**)
  - 定价方法应该使需求侧管理和分散式发电帮助缓解输电拥堵和提高系统可靠性
- **Capacity requirements:**
- 容量要求
  - Allow efficiency resources to provide **Resource Adequacy** (long term) and demand response to provide **Operating Reserves** (short term)
  - 允许高效资源弥补供应短缺（长期），允许需求反应提供运营储备（短期）

# Conclusion: Demand-Side Management



## 结论：需求侧管理

- DSM -- long-term tool for reliability, control of market power, economic efficiency, and sustainability
- 需求侧管理——保证系统可靠性、控制市场操纵力、提高经济效率、保证可持续发展的长期工具
- Not just a tool for crisis management
- 不只是危机管理的工具
- SERC should have authority to ensure that DSM, DG/CHP, renewables are used well.
- 电监会应该有权保证需求侧管理、分散式发电/热电联产和可再生能源的充分利用
- Build Sustainability in at the beginning
- 在改革初期，将可持续发展的机制纳入电力系统