The Federal Role in Smart Grids

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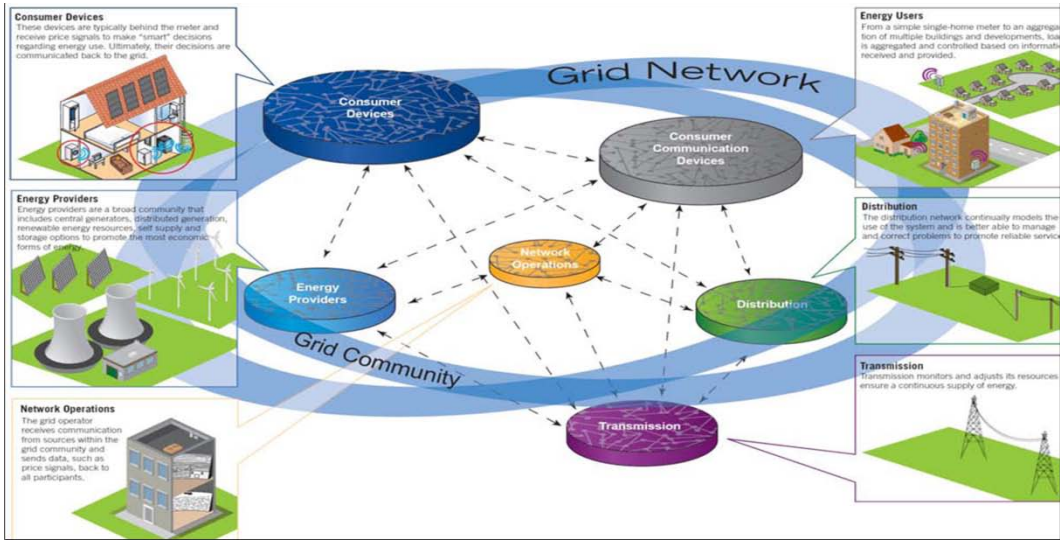
Demand Response and PHEVs
需求响应和插电式混合动力车

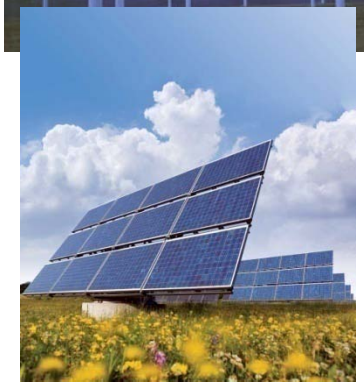
- Demand response could help integrate higher levels of wind generation at a lower cost than adding new generation or ancillary services
  - Particularly true for extreme wind events that may happen for only a few hours per year
- Introduction of Plug-In Electric Vehicles can also help with high levels of wind power
  - PHEV charging at night coincides with timing of higher levels of wind production

- 需求响应以比新增发电或辅助服务更低的成本，有助于更大程度将风电并网。
  - 对于极端的时段更是如此，该时段一年可能仅持续几个小时
- 引进插电式电动车也有助于大规模利用风能
  - 插电式混合动力车在晚间充电，刚好与风电产量高的时段吻合

Smart Grid/
Strong Grid
智能电网/
坚强电网

Wind
and Solar
风能和太阳能





Smart
Response
智能响应

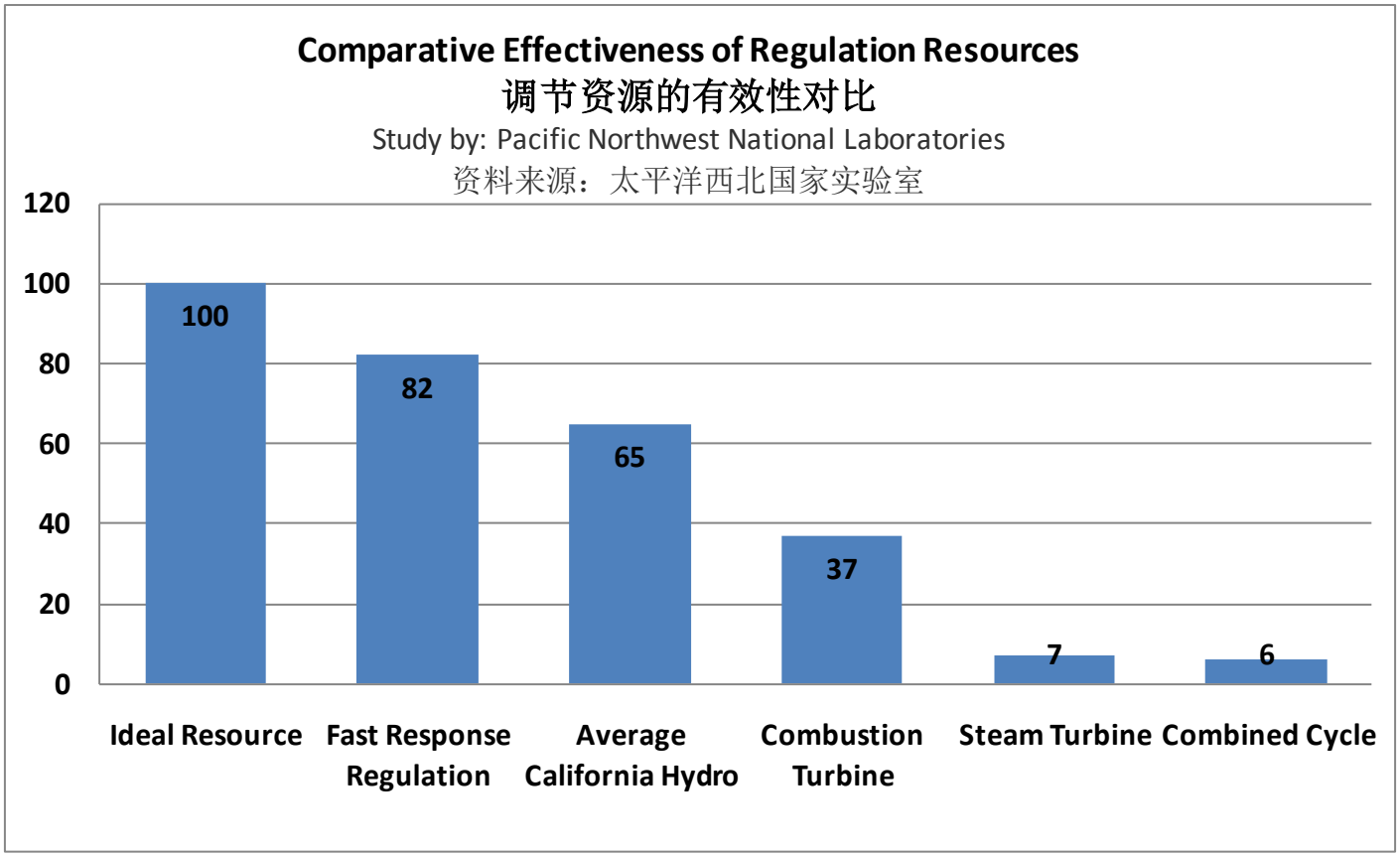
Energy
Efficiency
能源效率

Demand
Response
需求响应

System Benefits of Fast Regulation
快速调节的系统效益

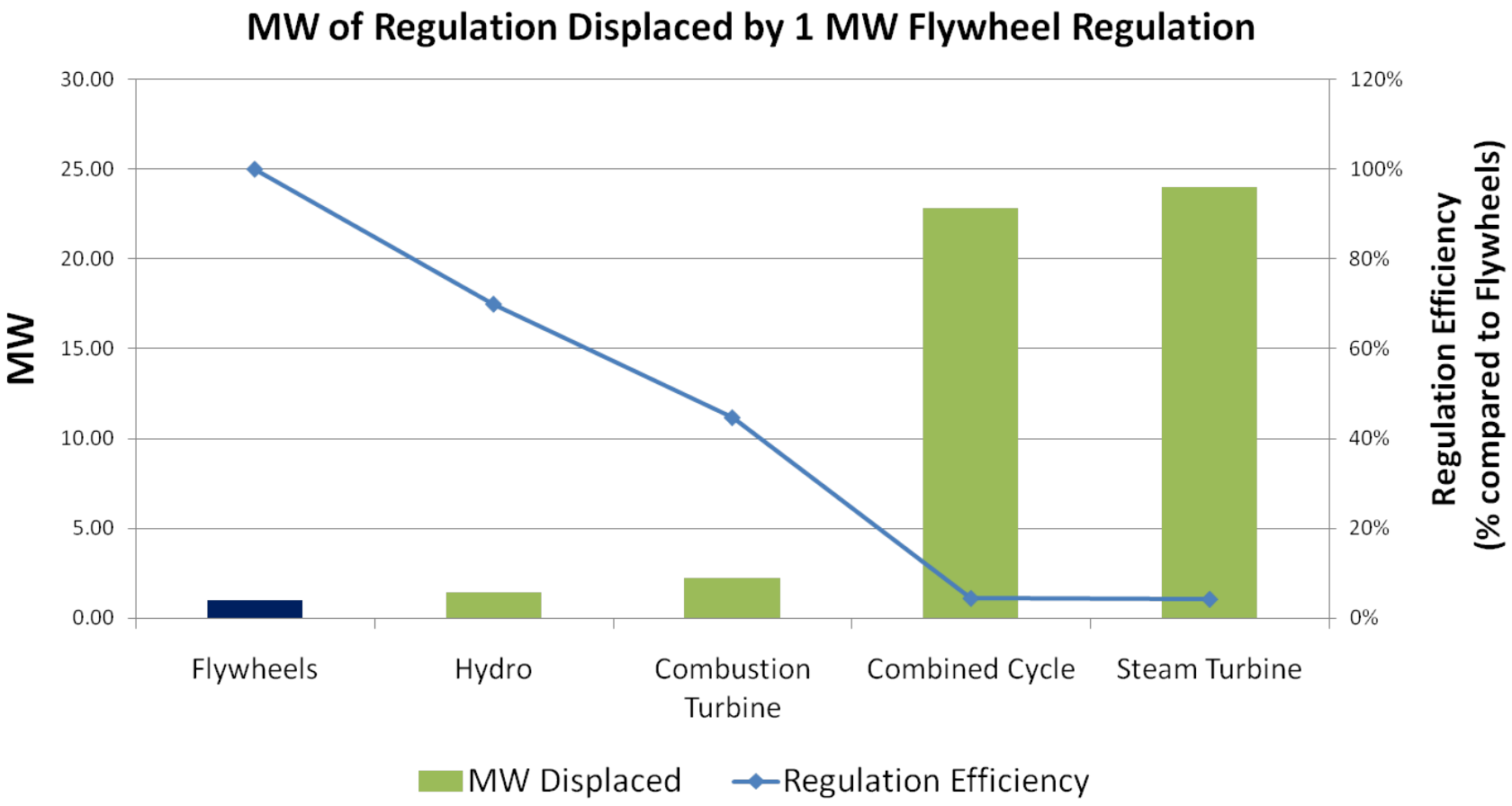
MW of Regulation Displaced by 1 MW Fast Response Resource

1兆瓦的快速响应资源替代的调节资源



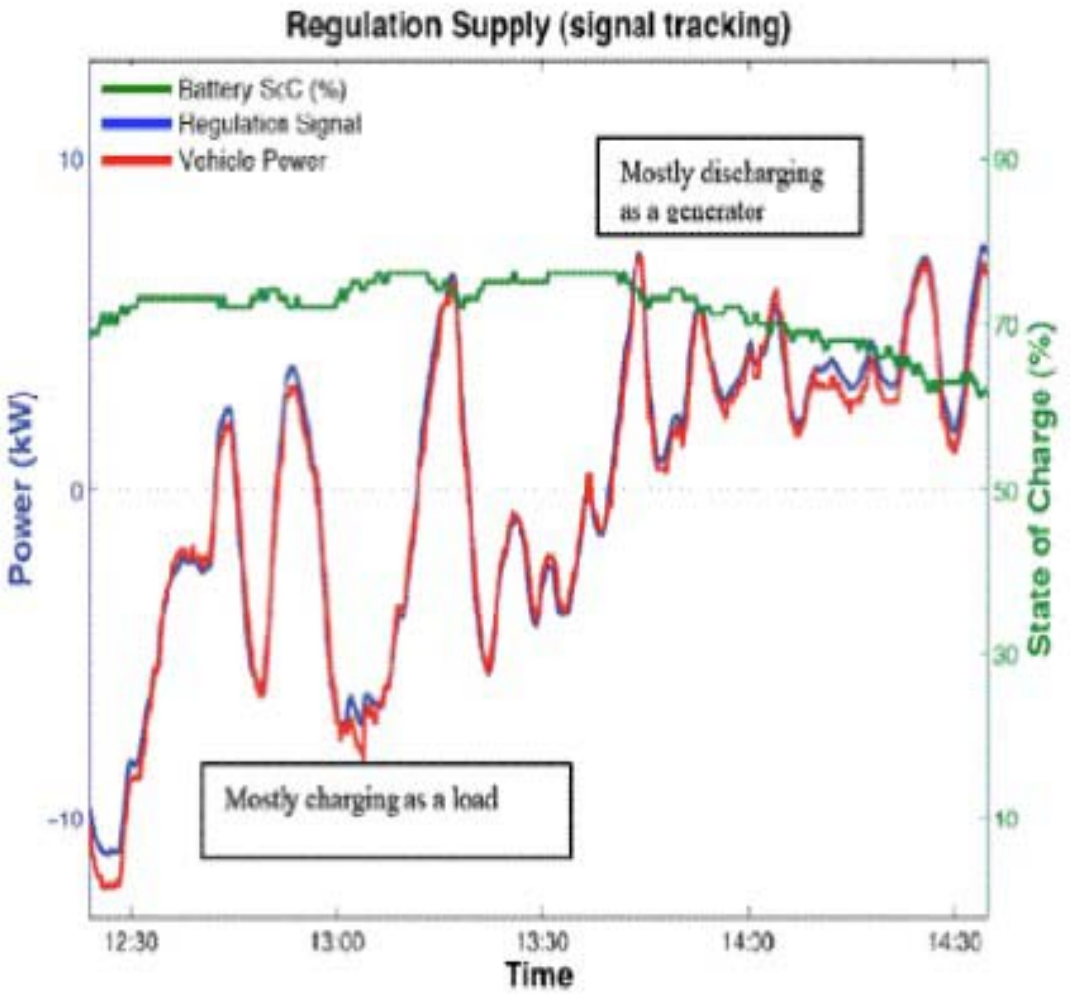
Fast Response resources reduce the amount of necessary Regulation
快速响应资源减少了必要的调节资源

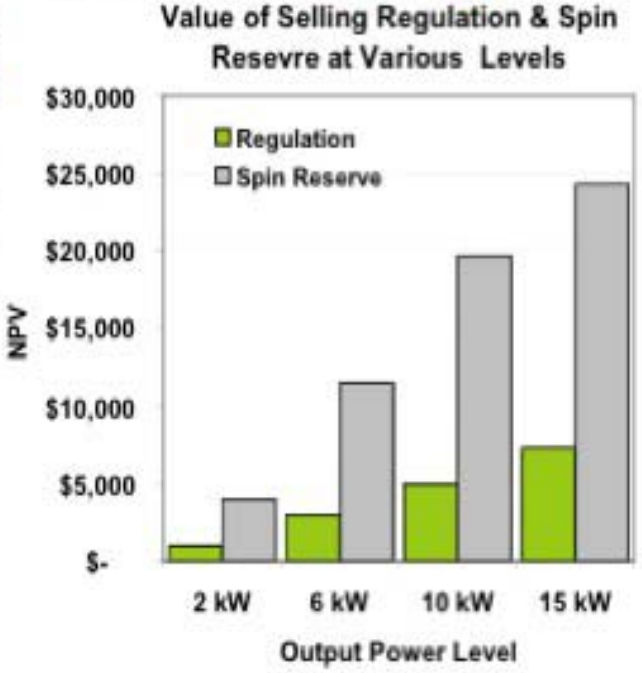
System Benefits of Fast Regulation
快速调节的系统效益



E-vehicle Regulation
电动车调节

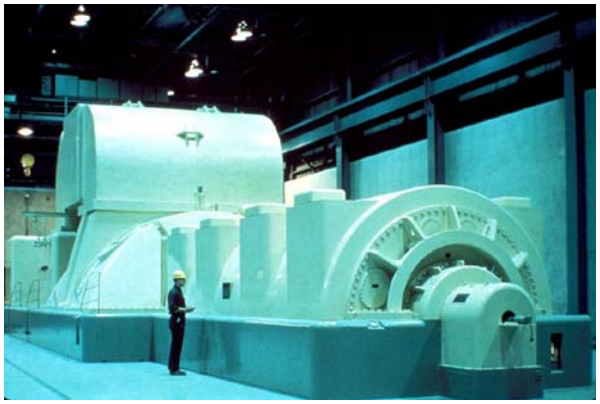
Regulation Services
管制服务





Source: W. Kempton, Victor Udo, Ken Huber, Kevin Komara, Steve Letendre, Scott Baker, Doug Brunner & Nat Pearre – A Test of V2G for energy storage & Frequency Regulation in the PJM System - August 2008

Wind Integration/Frequency Control
风电并网/频率控制



Combustion Turbine Generator
燃烧轮机发电机

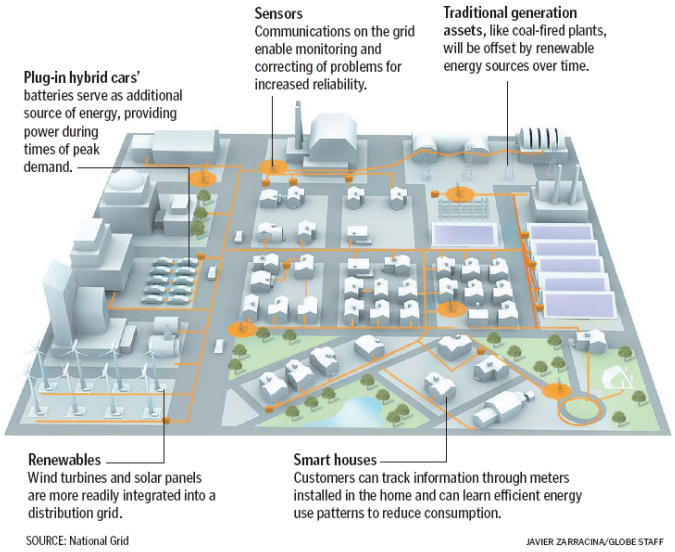
Flywheels
飞轮

E-vehicle电动车

Ice Bear Unit冰熊储存设备

Regulatory Policy 监管政策

Smart Grid/Strong Grid
智能电网/坚强电网



Regulatory Structure
监管结构

Smart Response
智能响应

Energy Efficiency
能源效率

- Build end-use energy efficiency into power sector
- FERC has limited authority to do this, but we have pressed hard to build energy efficiency into markets (e.g., FCM)
- China is investing more in energy efficiency than the US
  - But very little energy efficiency investment in China is made by grid companies
  - This is a huge opportunity for China
  - Design markets to acquire EEPs and impose the obligation to buy EPPs on grid companies

- 在电力产业提高终端能源效率
- 联邦能源管理委员会的权威有限，但是我们努力在市场设计中融入能源效率（如FCM）
- 中国在能效投资超过美国
  - 但中国能效投资中来自电网企业的很少
  - 中国面临着巨大的机会
  - 设计市场，建设能效电厂，规定电网企业承担收购能效电厂的义务。

Illustrative Comparison – CPP & EPP
案例比较 —— CPP 和 EPP

CHARACTERISTICS特性	CONVENTIONAL POWER PLANT常规电厂	ENERGY EFFICIENCY POWER PLANT能效电厂
SIZE规模	500 MW	500 MW
ANNUAL PRODUCTION/SAVINGS年产量/年节能量	2500 GWH	2500 GWH
CAPITAL COST资金成本	$ 500 Million 5亿美元	$ 250 Million 2.5亿美元
OPERATING COST运营成本	$0.020/ KwH	$0.005/ KwH
TOTAL ANNUAL COST年度总成本	$0.052/kWh	$0.021/kWh
FUEL USE (COAL)燃料使用（煤）	500-800 g/kWh	0 g/kWh
GHG EMISSIONS温室气体排放	0.5-0.8 kg/kWh	0 kg/kWh
ANNUAL GHG EMISSIONS 全年温室气体排放	1.25-2.00 Million Tons 125-200万吨	0 Tons 0吨

Alternative EPP Models
可供选择的能效电厂模式

- Model 1 – Utility delivery cost recovery (“California” Model)
- Model 2 – Public Benefit Fund administered by Independent Agency (“New York” Model)
- Model 3 – Government Funding (“Korea” Model)
- Model 4 – Direct Consumer Funding, including Energy Savings Fee, or ESF (“Guangdong” Model)
- Model 5 – Public-Private Partnership (“Hebei” Model)
- Model 6 – Procurement of DSM resources (“DSM Resource Acquisition” Model)

- 模式一——输电成本回收（加州模式）
- 模式二——由独立机构管理公共效益基金（纽约模式）
- 模式三——政府出资（韩国模式）
- 模式四——直接消费者基金，包括节能费或ESF（广东模式）
- 模式五——公私合作（河北模式）
- 模式六——需求侧管理资源采购（需求侧管理资源并购模式）

Regulatory and Policy Initiatives
监管和政策方案

MODEL 模式	REGULATORY INITIATIVES 监管方案	GOVERNMENT ACTIONS 政府行动
Utility Implementation 电力公司实施	Establish utility responsibilities and targets, define funding levels 规定电力公司的责任、目标和出资程度	None无
Public Benefit Charge 公共效益收费	Establish levy and procedures to transfer funds to implementing agency 建立征税和采购机制，注资实施机构	Establish implementing agency 设立实施机构
Government Funding 政府出资	Cooperate with government agency 与政府机构合作	Establish government fund and implementing organization 建立政府基金和实施机构
Energy Savings Fee 节能费	Establish fee mechanism and utility collection procedure 建立收费体制和电费征收程序	Establish project management organization (PMO) 建立项目管理机构（PMO）
Public-Private Partnership 公私合作	Define incentives for the PPP 为公私合作制定激励机制	Establish public agency partner 设立公共机构合作伙伴
DSM Resource Acquisition 需求侧管理资源获取	Define payment level and criteria for resource acquisition 界定支付水平和资源获取标准	None无

Examples of Energy Efficiency Funds – U.S.
美国能源效率资金案例

- State-level initiatives
- Examples of funding sources
  - Regulators using electricity tariff mechanism
  - State energy agencies using taxes or general revenues
  - State bonds
  - Petroleum taxes
- Funding levels historically have been in the range of 1% to 3% of electricity sales revenues

- 各州的节能计划
- 资金来源
  - 监管机构利用电价机制
  - 州能源机构利用税收或一般收入
  - 州债券
  - 汽油税
- 历年来资金比例占电力销售收入的1%到3%。

Total EE Funding by U.S. State
美国各州的能源效率资金总额

STATE 州	EE Spending as % of Annual Utility Revenues能效支出占年度占事业收入的比例 （%）
Vermont佛蒙特州	3.0%
Massachusetts马萨诸塞州	2.4%
Washington华盛顿州	2.0%
Rhode Island罗德岛州	1.9%
New Hampshire新罕布什尔州	1.8%
Oregon俄勒冈州	1.7%
Wisconsin威斯康新州	1.4%
New Jersey 新泽西州	1.4%
Montana 蒙大拿州	1.3%
California 加州	1.2%
New York 纽约州	1.0%

Clean First 清洁为先

- Meeting climate and environmental challenges requires integrating energy and environmental regulation
- China and US both have Clean First studies underway
- China’s new State Council Rule on Regional Air Quality is a great step forward

- 应对气候和环境的挑战需要节能监管与环境监管相结合
- 中美两国都在进行清洁能源研究
- 中国国务院新颁发的关于改善区域空气质量指导意见使节能工作迈进了一大步。


Thank you
谢谢大家！