

# Jinan, City of Springs, Welcomes Visitors and Businesses with Clean Air

“泉城” 济南，  
用清洁的空气欢迎游客和商务

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*The Regulatory Assistance Project*

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China ♦ India ♦ European Union ♦ Latin America ♦ United States



# Presentation Outline

## 提纲

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- Climate-Friendly Air Quality Management
- Possible Lessons for Jinan
- Detailed Suggestions for Consideration
- 气候友好的空气质量管理
- 对济南市可能会有益的经验教训
- 详细建议为思考

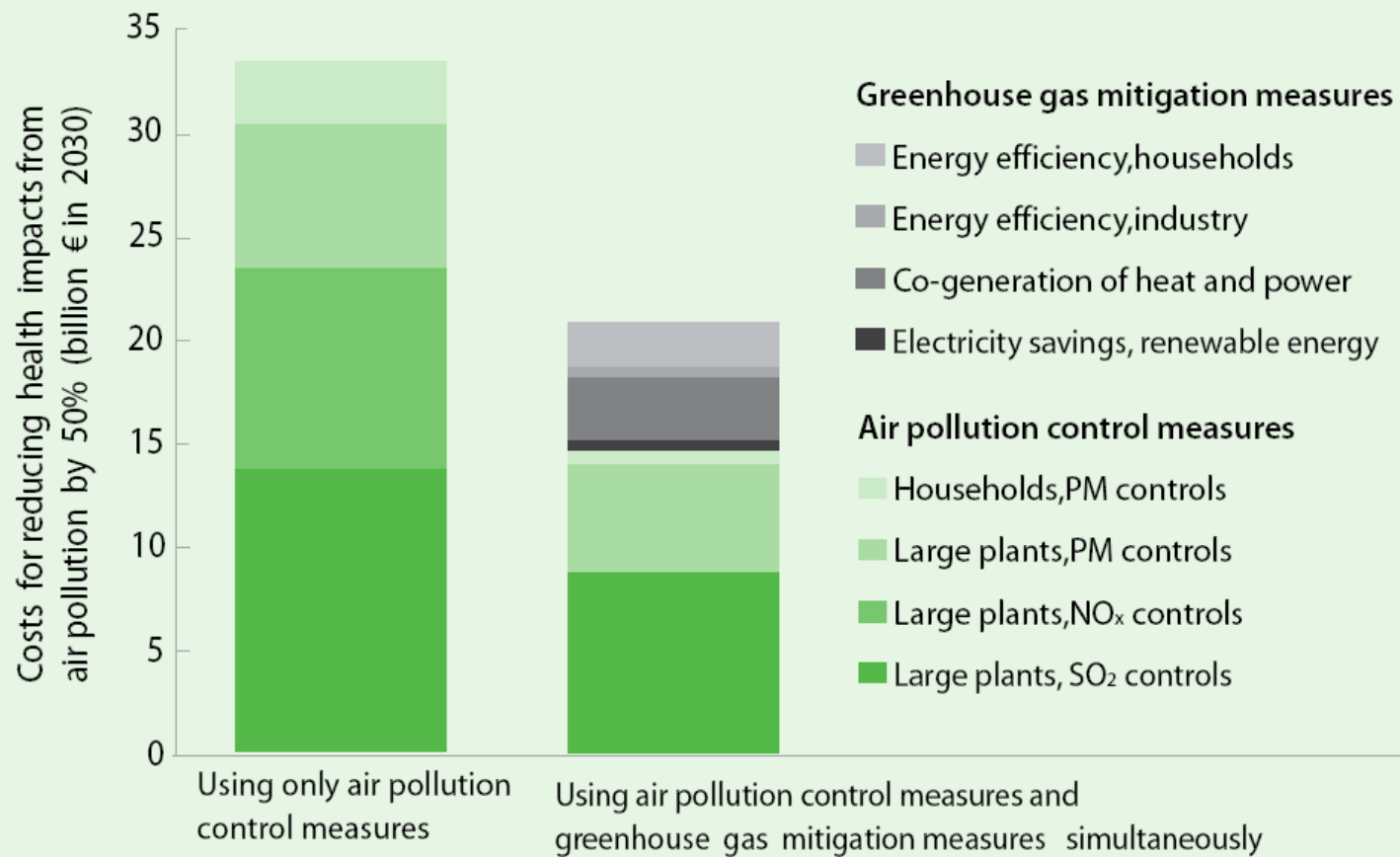
# Conclusions

## 结论

- Energy efficiency is pollution control
- PM is high priority reduction
- Economic signals are powerful
- Acting now reduces pollution and risk
- 能效是一种空气污染控制的措施
- 颗粒物是高优先级
- 经济信号很有影响力
- 现在采取行动要减少污染和风险

# GAINS-Asia Model Results for China 2030

## 中国2030年的GAINS-Asia模型结果



Source: Markus Amann, Jiang Kejun, et al., 2008, "GAINS-Asia scenarios for cost-effective control of air pollution and green house gases in China."



# Efficiency First

## 能效优先

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### ➤ Energy Hierarchy:

- Energy efficiency
- Waste heat recovery and polygeneration
- Renewable energy
- Other non-fossil fuel energy
- Cleaner fossil-fuels, such as natural gas and ultra-low sulfur diesel
- Cleaner coal: advanced emissions controls and IGCC

### ➤ 层级结构:

- 电力节能, 能效
- 余热回收和多联产
- 可再生能源
- 其他非化石燃料能源
- 更清洁的化石燃料, 例如天然气和超低硫柴油
- 清洁煤: 高级的污染排放控制技术以及体煤气化联合循环发电系统 (IGCC)

# End-of-Pipe Control Costs

## 管道末端控制的花费

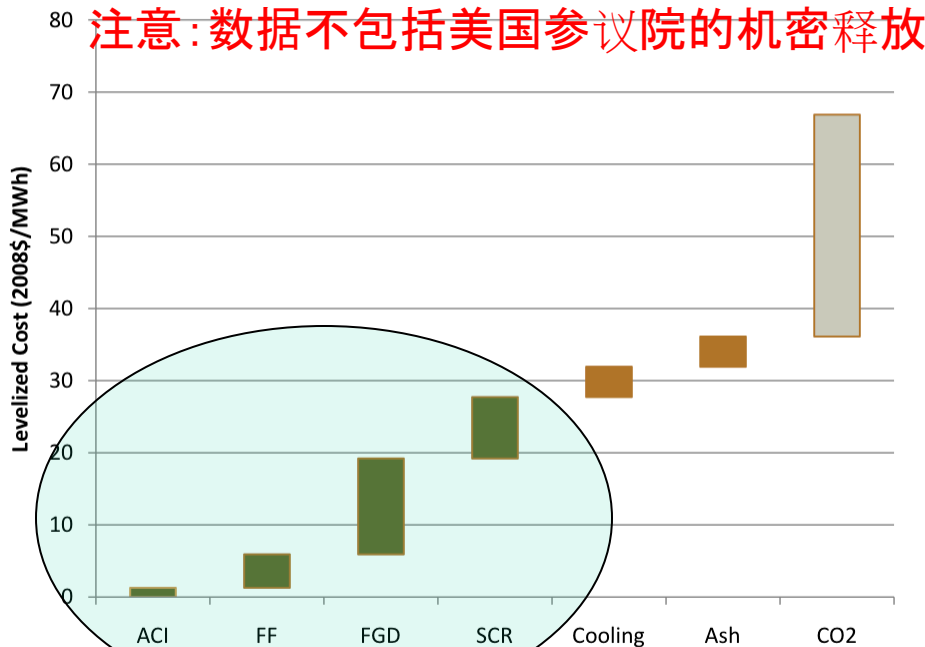
RETIREMENTS

### Levelized Regulated Coal Unit Compliance Costs



Note: data NOT confidential - released to US Senate

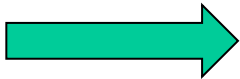
Levelized Cost



Key Assumptions:

- Capacity – 500 MW
- Heat Rate – 10,000 Btu/kWh
- CO<sub>2</sub> Price - \$30/ton
- Regulated Unit

\$30/MWh



# Efficiency Power Plants (EPP)

## 能效电厂

- An Energy Efficiency Power (EPP) is a carefully selected bundle of energy efficiency programs that can be integrated into power sector planning and financing, designed to deliver the energy and capacity equivalent of a large conventional power plant
- 能效电厂是一系列经精心挑选的能效项目。这些项目能被整合入电力规划和财政部门，被设计来传输等同于一个大型的常规电厂容量的能量。



# Recent Policy Developments

## 近来乐观的政策发展

- EU: Integrated Pollution Prevention & Control Directive (2008/1/EC)
- US: Energy efficiency is treated as comparable capacity resource in two power pools
- China:
  - Efficiency power plants >5 underway
  - Compensating FGD through electricity tariffs
  - Industrial energy efficiency standards
  - Regional Air Quality Management rule \*\*
- 欧洲：综合污染防治指令（2008/1/EC）
- 美国：在两个电力库，能效被作为有可比性的资源容量
- 中国：
  - 正在修建的能效电厂 > 5
  - 通过电费补助 FGD
  - 工业能效标准
  - 区域空气质量管理条例



# California Bay Area Clean Air Plan

## 加利福利亚湾地区清洁空气法案

- Designed to address the **root causes** of pollution, not just end-of-pipe
- Examples:
  - Air quality permits include GHGs
  - Transport measures: zero emissions vehicles, plug-in-hybrids, improved local commercial & public transport, etc.
  - Energy efficiency, renewable energy, urban heat island mitigation
  - Indirect source review to set standards for construction, operations, and vehicle/traffic-use related to industrial, commercial residential property development

- 设计解决污染的根本问题，而不只是末段管道
- 例子：
  - 允许的最大温室气体排放量
  - 交通运输政策：零排放的机动车，混合动力车，改进的局部商业和公共交通等
  - 能效，可再生能源，缓解城市热岛效应
  - 通过对间接源综述，为工业和商业住宅的建设，运营和机动车/交通情况设立标准

# Shandong Leadership in Energy Efficiency and Clean Energy

## 山东省领导在能源效率和清洁能源

### ➤ Examples:

- Industrial differential pricing – applied to more industries and greater price differential in Shandong
- Success in Top 1000 program (energy efficiency contracts) as national model
- Ranks as 6<sup>th</sup> province in installed wind capacity; feed-in tariff for solar PV pilot

### ➤ 例子:

- 工业差别定价 – 应用到更多的行业和山东的价格差距更大
- 千家企业节能行动的成功代表国家的模仿
- 作为第六届省在风电装机容量排名; 太阳能光伏上网电价

# Sample of Climate-Friendly Air Quality Measures

## 气候友好的大气质量控制措施清单样本

- End-use energy efficiency
  - Coal Washing
  - Fuel switching
  - Waste heat recovery
  - Poly-generation and advanced industrial ecology policies
  - Cleaner and more efficient coal technologies
  - Reasonable control of growth in fossil-fuel consumption
  - Urban methane/bio-gas utilization
  - Cleaner vehicles and fuels
  - Urban planning and public transport, including BRT
- 能效
  - 煤炭清洗
  - 燃料替换
  - 废热回收
  - 多联产和高级的工业化生态政策
  - 更加清洁高效的煤技术；
  - 合理的燃煤和其他化石燃料的消费总量控制
  - 城市的甲烷/生物气体的利用
  - 清洁车辆和燃料
  - 城市规划以及公共交通系统，快速公交

# PM Measures

## 颗粒物的控制措施 (1)

- Strong correlation with sulfur and black carbon
- Seasonal controls:
  - Require ultra low sulfur diesel and low sulfur coal to be burned during the winter;
- 硫与炭黑之间巨大的关联性
- 季节性的控制措施:
  - 需要在冬季使用超低硫柴油和低硫煤;

# PM Measures

## 颗粒物的控制措施 (2)

### ➤ Year-round

- Enforce ban on agricultural waste burning
- Low sulfur fuel for all sources
- Increased coal washing
- Additional source categories switched from coal to natural gas
- Particulate filters on off-road heavy duty diesel engines
- Improved fuel quality for cars and light duty trucks

### ➤ 全年的控制措施:

- 强化禁止农业垃圾燃烧的措施
- 船航运输使用低硫燃料
- 加强燃煤的清洗
- 增设将煤转化为天然气的渠道
- 对于重型越野柴油发动机增设颗粒物过滤器和催化氧化设施
- 对于小轿车和轻型卡车提供改进质量的燃料.

# Measures to Reduce Pollution During Air Pollution Episodes (1)

## 在大气质量较差的时期降低大气污染

- Adapt AirNow to Jinan to improve forecasting
- Require enterprises to submit plans in advance to identify what extra steps they will implement
- 应用类似于美国所采用的 AirNow 模式以提高对大气质量的预测；
- 要求企业提前提交计划以识别他们需要实施哪些额外的步骤；

# Measures to Reduce Pollution During Air Pollution Episodes (2)

## 在大气质量较差的时期降低大气污染

- Specific short-term measures to quickly reduce peak pollutant concentration and exposure:
  - Ban diesel trucks
  - Restrict coal burning
  - Cessation of construction activity
  - Media announcements

- 能够在短期内降低污染物浓度峰值，并提高大气空气质量的措施包括：
  - 禁止使用柴油卡车
  - 限制工业企业燃烧煤炭
  - 暂停相应的建筑活动
  - 通过媒体发布信息

# Economic Structure

## 经济结构

- 
- Closing backward production plants will improve air quality and save energy
  - New and relocated facilities should incorporate the **best possible technology**
    - Including requirements on multi-pollutant and multi-media emissions, water and **energy consumption**, end-of-pipe control measures, and industrial process techniques.
    - Tomorrow's air quality and energy profile will depend on the projects being approved and built today.
  - 关闭落后的生产设施可以提高空气质量并且节约能源；
  - 新建企业以及搬迁企业应在生产中采用**最好的可以获得的技术**：
    - 包括针对多重污染物以及多种传播媒介的排放，水和**能源消耗**，终端控制措施，以及工业过程控制技术。
    - 未来的大气质量以及能源状况是由已经批准的和在建的项目所决定的。



# Emissions Offsets and Environmental Impact Assessment (EIA)

## 排放抵销和环境影响评价 (EIA)

- EIA is a powerful tool for improving the **performance of new construction**
- In Chongqing, a new facility must offset its SO<sub>2</sub> and COD emissions by purchasing pollution offset credits. **NO<sub>x</sub> could readily be incorporated into this scheme.**
  - Total emissions control of NO<sub>x</sub> in the 12<sup>th</sup> FYP
- Could Jinan also do this?
- 针对新建项目环境绩效的改进，环境影响评价 (EIA) 是一个非常有力的工具。
- 重庆已经设立了针对SO<sub>2</sub>与COD的排污收费制度。可以考虑将NO<sub>x</sub>也纳入这个体系进行管理
  - 在十二五规划中设立的NO<sub>x</sub>总量控制要求
- 济南可以做同样的事情？

# Financial Incentives and Penalties

## 财务激励和处罚措施

- Pricing practices can help internalize environmental externalities and reward good behavior
  - Experience with coal-fired boilers: CEMS, plus daily penalties, pollution fees led to enterprises' decisions to switch fuels to natural gas;
  - Ideas to build upon this experience are (next slide):
- 定价措施可以有效的将环境资源的外部性内部化并且鼓励表现好的行为：
  - 燃煤锅炉的经验：污染持续监控系统（CEMS），加上每日处罚。排污的费用会引导企业家决定将燃料更换为天然气；
  - 基于此经验，可以提出的措施包括（下一张PPT）：

# Suggested Financial Incentives to Consider

## 建议的财务激励措施 (1)

- **1. Differential electricity pricing:** enhance implementation, and increase the differential rates for inefficient operations of polluting industries.
- **2. Environmental / efficiency dispatch:** can reward more efficient generation units, and those which better implement pollution control measures (beyond standard requirements), and potentially IGCC. (IGCC needs subsidy as well)
- **1. 实施差异化电价:** 加强实施, 并且加大电价的差异, 尤其针对污染行业低效的生产活动.
- **2. 环保 / 效率电力调度:** 可以鼓励对于污染控制做的好的企业 (超过标准的要求, 潜在的IGCC), 生产更多的**高效的能源**。(IGCC同样需要补贴)

# Suggested Financial Incentives to Consider

## 建议的财务激励措施 (2)

➤ **3. Green credit for loan decisions at financial institutions:** create an evaluation system to grade enterprises, to provide commercial banks for reference when making loan decisions

➤ 3. 金融机构在进行贷款决定时需要考虑绿色信用：建立一个评估企业环境绩效的体系，并且将这些信息提供给商业银行作为贷款决策的参照信息。



# Future Steps

## 未来的步骤

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- Air Quality Planning Process is Iterative
- Science and technology make us smarter.  
Anticipate more protective air standards over time
- Work with other Shandong cities and nearby provinces to improve regional air quality
- 空气质量策划过程是迭代。
- 科学技术使我们更聪明。预计随着时间的推移更具保护空气标准。
- 与其他城市和周边省份山东工作，以改善区域空气质素。



# Thank You For Your Attention

## 谢谢

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