Regional Air Quality Planning: Energy and Air Quality Integration
区域空气质量规划：将能源和空气质量政策相结合

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Basics
背景

• 50% of the world’s coal consumption occurs in China
• 50% of China’s coal use is for generating electricity
• Solving China’s air quality and GHG challenges is, at heart, a question of energy policy

• 世界上50%的煤炭消耗来自中国；
• 中国50%的煤炭用于发电；
• 解决中国的空气质量和温室气体排放而面临的挑战，能源政策是核心问题。
China’s Energy Goals

中国的能源目标

• Carbon intensity reduction by 40-45% from 2005 levels by 2020
• By 2020, 15% of its primary energy needs will be served by renewable resources.
• China will reduce coal consumption as a percentage of primary energy to below 65% by 2017
  – Coal consumption caps in Jing-Jin-Ji, Shanghai and the Yangtze River area, and the Pearl River Delta

• 到2020年，碳排放强度在2005年基础上降低40-45%。
• 2020年，可再生能源占到一次能源需求的15%。
• 2017年，煤炭占一次能源消费总量比重降低到65%以下。
  – 煤炭消费总量控制目标：京津冀，长江三角洲，珠江三角洲。
Recent Policy Announcements

**Xi-Obama Agreement, November 2014**
- US to cut greenhouse gas emissions 26-28% below 2005 levels by 2025.
- China to hit a peak in its carbon dioxide emissions by 2030—possibly sooner—and to increase the non-fossil fuel share of energy to around 20% by 2030.
- Modeling shows that a peak in carbon emissions must be preceded at least five years earlier by a peak in coal consumption.

**Deepening Reform of the Power Sector released by CPC and State Council, 19 March 2015**
- Environmentally sustainable power sector development
- Grid company reform
- Improved generator dispatch/operations
- Demand-side management
- Developing market mechanisms
- Renewables integration
- Improved planning

**Air Quality Rules**
- Progressively more stringent regulations over the last three years, to address local air pollution.
- Regulations specifically allow for investment in renewable energy and end-use energy efficiency as means of avoiding emissions of pollutants.
- Amendments to the Air Law were adopted in August 2015, furthering these reforms.

**Xi-Obama Agreement on Climate Change, 25 September 2015**
- National CO₂ emissions trading
- Green dispatch
- Green buildings
Opportunities to Reduce Emissions through Power Sector Reform
电力行业改革带来的减排机遇

• Document #9, March 2015:
  – Economically efficient system operations ("green dispatch")
  – End-use energy efficiency and demand response
  – Integration generation from renewables into system operations
    • Reduced “curtailment”
  – Improved planning

• 2015年3月，电改9号文件：
  – 经济有效的系统运营（“绿色调度”）；
  – 终端能效和需求响应；
  – 可再生能源并网
    • 减少弃电
  – 完善规划
Barriers to Emissions Reductions in the Power Sector

电力行业减排遇到的壁垒

• Inefficient power system operations
  – Annual output plan for generation
  – Renewables (RE) are “curtailed” in favor of thermal generation
• Separate regulatory responsibilities
  – Energy and environmental policy are not well integrated
  – AQM planning and implementation
• Economics: relative costs of RE, coal generation, and other resources
  – Good news is that costs are changing
• Policies that favor investment in coal and in-province electricity production
  – Excess coal-fired generation capacity

• 缺乏高效的电力系统运行调度:
  – 年度发电量计划；
  – 通过对可再生能源弃电满足火电厂发电计划。
• 分离的监管职责:
  – 能源和环境政策并未良好的结合；
  – 空气质量管理规划和实施。
• 经济性: 可再生能源、煤炭发电和其他资源的相关成本；
  – 好消息是成本在变化。
• 对煤炭和省内发电投资的利好政策:
  – 对燃煤电厂过度建设。
Roadmap for Integrated Policy Must Be Created: Best Practices

需要制定出整合的政策路线图：最佳实践

EU Directives: LCD, P2
欧盟方针

EPA Clean Power Plan
美国环保署
清洁电力计划
Best Approaches: Technologies and Techniques

最佳实践：技术和技巧

- **End-of-pipe:** emissions controls
- **Root-of-pipe:** Actions to avoid dirty and wasteful energy use
  - EU approach: “efficiency first”
    - Energy efficiency on-site
  - Clean energy alternatives
- **终端:** 排放治理控制;
- **源头:** 避免使用不清洁的能源，避免浪费能源:
  - 欧盟措施：能效第一
    • 在工厂实施能效
  - 清洁能源替代方案
Integrated Energy and Environmental Policy
整合能源与环境政策

• Energy policy designed to meet environmental goals
• US approach: Clean Power Plan
  – Emissions performance standards that drive investment in clean alternatives and end-use efficiency at lowest long-term cost

• 制定可以满足环境目标的能源政策；
• 美国的措施：清洁电力计划；
  – “排放性能标准”（EPS）带动了对最低长期成本的清洁能源替代方案和终端能效的投资。
End-use energy efficiency reduces demand for electricity, and therefore reduces emissions.

终端能效降低对电力的需求，以此实现减排目标。

Source: Regulatory Assistance Project
Industrial Energy Projects
Save Coal and Reduce Emissions

Average Net Project Benefits per ton of Lifecycle SO2 and NOx Reduction in Different Types of Industrial Projects (RMB per Ton Saved)

- On-site coal savings
- Off-site coal savings
- Mixed Projects

District heating improvements, Industrial boiler upgrades, Waste heat or gas for electricity generation, Waste heat or gas for process use, Industrial kiln upgrades, Natural gas substitution in industrial kilns, Thermal power plant upgrades, System optimization, Electric motor system upgrades, Industrial lighting efficiency
China needs to reduce PM2.5 by 80-90% from 2013 levels

This won’t happen unless air and energy policies are integrated

End-of-pipe-only approach leads to higher GHGs

– Smokestack controls use energy (“parasitic” load)
– Root-of-pipe actions address this problem

中国需要在2013年基础上降低80-90%的PM2.5浓度；

只有将空气和环境政策有效结合才能实现该目标；

单纯的使用终端能效措施会导致更高的温室气体排放：

– 烟囱控制设备会使用能源；
– 源头控制可以解决该问题。
Some Observations
现状分析

• Recognize AQ and CO₂ benefits from renewables and end-use efficiency (e.g., Top 10,000 Enterprises Program)

• Coordinate environmental and energy policy and planning
  – Adopt power sector reforms that advance environmental goals
    • End-use efficiency, renewables, market designs that favor clean energy investments, etc.

• 从可再生能源和终端能效中项目中识别出提高空气质量和减排效益（比如，“万家企业节能低碳行动实施方案”）；

• 协调环境、能源政策及规划：
  – 实施电力行业改革以推动实现环境目标：
    • 终端能效，可再生能源，市场设计等有利于清洁能源投资的政策。
Some Observations
现状分析

- China has adopted strong energy and air laws and regulations, but the “devil is in the details”
- Implementation matters:
  - Document #9
  - “Green dispatch,” reduced RE curtailment
  - Clean energy policies as AQM control tool, as required by the Air Law
- This is where the challenges lie

- 中国颁布了强有力的能源和空气法规，但是“细节决定成败”；
- 实施方面：
  - 电改9号文；
  - 绿色调度，减少可再生能源弃电；
  - 诸如空气质量管理控制工具等清洁能源政策，大气法对此提出了规定。
- 这些也是存在挑战的地方
关于睿博能源智库

睿博能源智库（RAP）是一个全球性专家咨询机构，主要关注全球能源政策下经济和环境的可持续发展。RAP 在能源政策方面有资深的经验，致力于促进经济效率、保护环境，确保电力系统的可靠性和扩大社会效益。

RAP 帮助中国政策制定者制定和实施相关政策，来促进可持续经济发展、增加能源系统可靠性、改善空气质量和公众健康，从而为中国大量和长期地减少温室气体排放作出贡献。

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