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The Power Sector in China

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Problem

- Generation is unbundled from the wires
- Wholesale contracts are regulated:
 - Thermal units paid prices per MWh, based on technology and vintage, with contractual targets for minimum number of operating hours each year
 - Unit commitment and dispatch scheduled to achieve operating-hours target
 - Surpluses and shortages of hours shared equally among all generators
- Why was the system designed this way? Would you change it and, if so, what would you do?

Beijing, 12 October 2007, 2:33 PM



Context

- The world burns some 8.2 billion short tons of coal annually
- 25% of that goes to produce electricity in China
 - 80% of China's electricity comes from burning coal
- Another 25% of it goes to industrial processes and heating in China.
- That is, half of the coal that the world burns each year is burnt in China.
- Global CO₂ emissions totaled roughly 36 gigatons in 2013—2.5% higher than in 2012 and 61% higher than in 1990.
 - The lion's share of that jump came from increased energy consumption in Asia—in India and mostly China.
- China is the leading producer of CO₂ emissions, at roughly 28% of the world's annual total. The US is number two at 15%, although we still win when it comes to per capita emissions.

China's Power Sector

- Two grid companies: State Grid (85%) and China Southern Grid (15%), both state-owned
- Five major state-owned generating companies, which account for about 50% of installed capacity
 - The remainder belongs to provincial and municipal power companies, and to renewables developers (also mostly state-owned)
- Total capacity was 970 GW in 2010 and will top out at nearly 1,500 GW this year, a 53% increase in five years
- Regulatory jurisdiction (both energy and environmental) is split (opaquely) between the provincial and central governments, but the central government has the final say
 - Provinces are given freedom to experiment with reforms, which, if successful, can become national policy

China's Energy and Environmental Goals

- Carbon intensity reduction by 40-45% from 2005 levels by 2020
 - A 17% reduction by 2015, from 170.69 mtCO₂/RMB 10,000 (2005) in 2010 to 141.76 in 2015
- Energy intensity reduction by 16% from 2010 levels by 2015 .That is, a reduction from 0.81 to 0.68 mtce/RMB 10,000.
- By 2020, 15% of its primary energy needs will be served by renewable resources.
 - Wind from 31 GW in 2010 to 100 GW in 2015, 150 in 2017, and 200 by 2020
 - Solar from 0.86 GW in 2010 to over 35 in 2015 and 70 GW by 2017.
- China will reduce coal consumption as a percentage of primary energy to below 65% by 2017
 - As part of this, it has set absolute caps of coal consumption in the three most populated regions of the country: Beijing and environs (Jing-Jin-Ji), Shanghai and the Yangtze River area, and the Pearl River Delta (southern China surrounding Guangdong)

Air Quality

- Over the last three years the country has issued progressively more stringent regulations to deal with local air pollution
 - The regulations specifically allow for investment in renewable energy and end-use energy efficiency as means of avoiding emissions.
- The 12th Five-Year Plan called for reductions in SO₂ emissions of 12.4% and in NO_x emissions of 15.1% between 2010 and 2015.

Beijing, 25 October 2007, 12:30 PM



November 2014: Xi-Obama Agreement

- 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

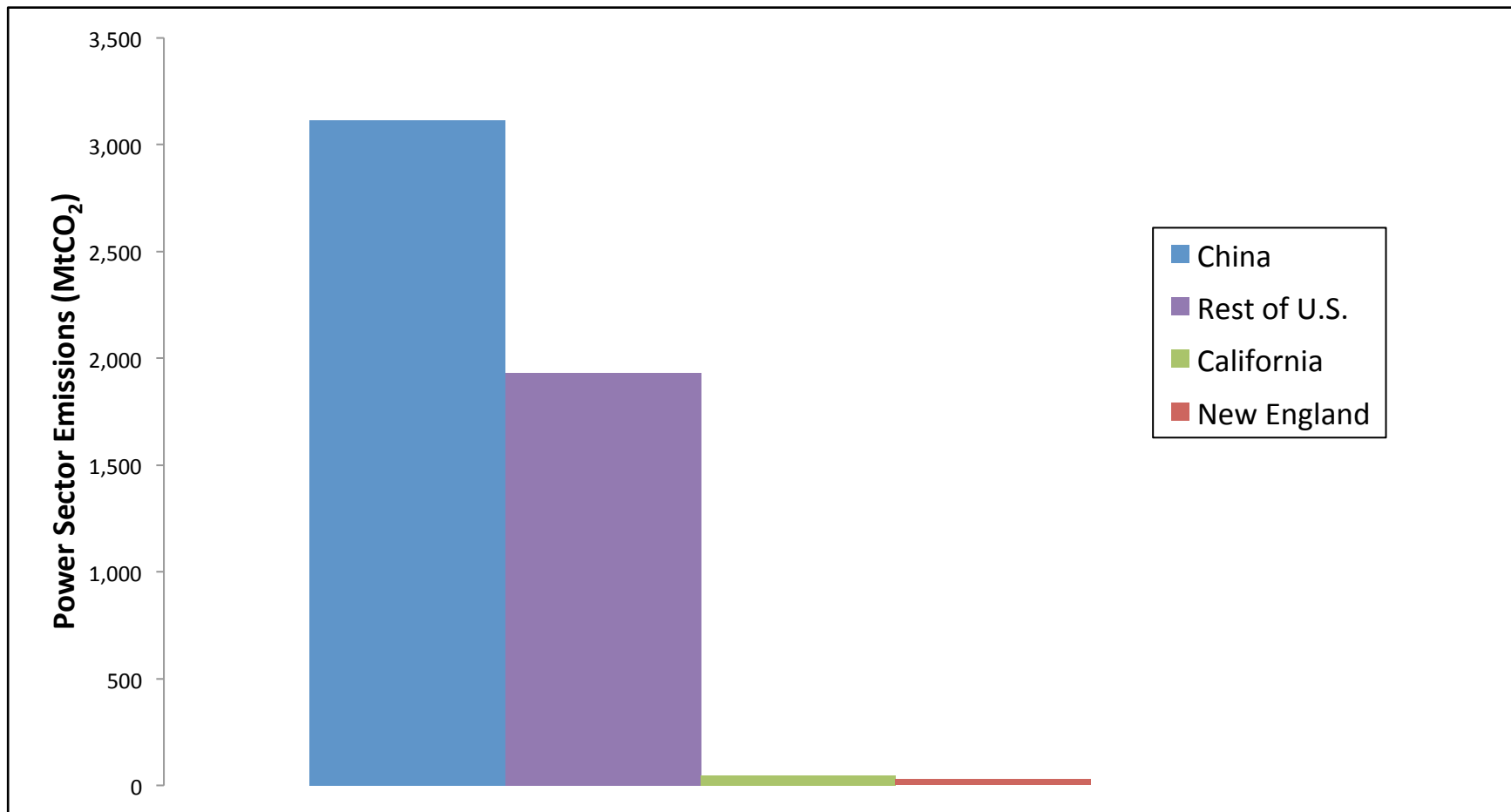
March 2015: Document #9

- State Council-Communist Party joint statement calls for reform, according to five principles:
 - The need for reliability;
 - Increased use of market mechanisms;
 - Protection of residential and agricultural consumers;
 - Energy savings, emissions reductions, and increased use of renewable and distributed generation; and
 - Better governance and regulation, including better planning and strengthened capacity in terms of regulatory agencies and approaches

March 2015: Document #9

- *Grid company reform:* Revenue-caps regulation piloted in Shenzhen to be extended nationally
- *Direct access:* Extension of provincial pilots that allow large users to bypass the grid companies and negotiate prices directly with generators
 - Buyers and sellers screened for efficiency environmental performance
- *Demand-side management:* Increased investment in DSM (demand response and end-use energy efficiency)
- *Improved generator dispatch:* Increased efficiency, lower costs, and reduced curtailment of renewables
- *Renewables integration:* Improved dispatch, new mechanisms for ancillary services, and improved inter-provincial, cross-regional power trading
- *Distributed generation:* Increased investment in DG
 - Removal of market access barriers
- *Power sector planning:* Improved planning
 - Also, "power planning should take full account of environmental carrying capacity"

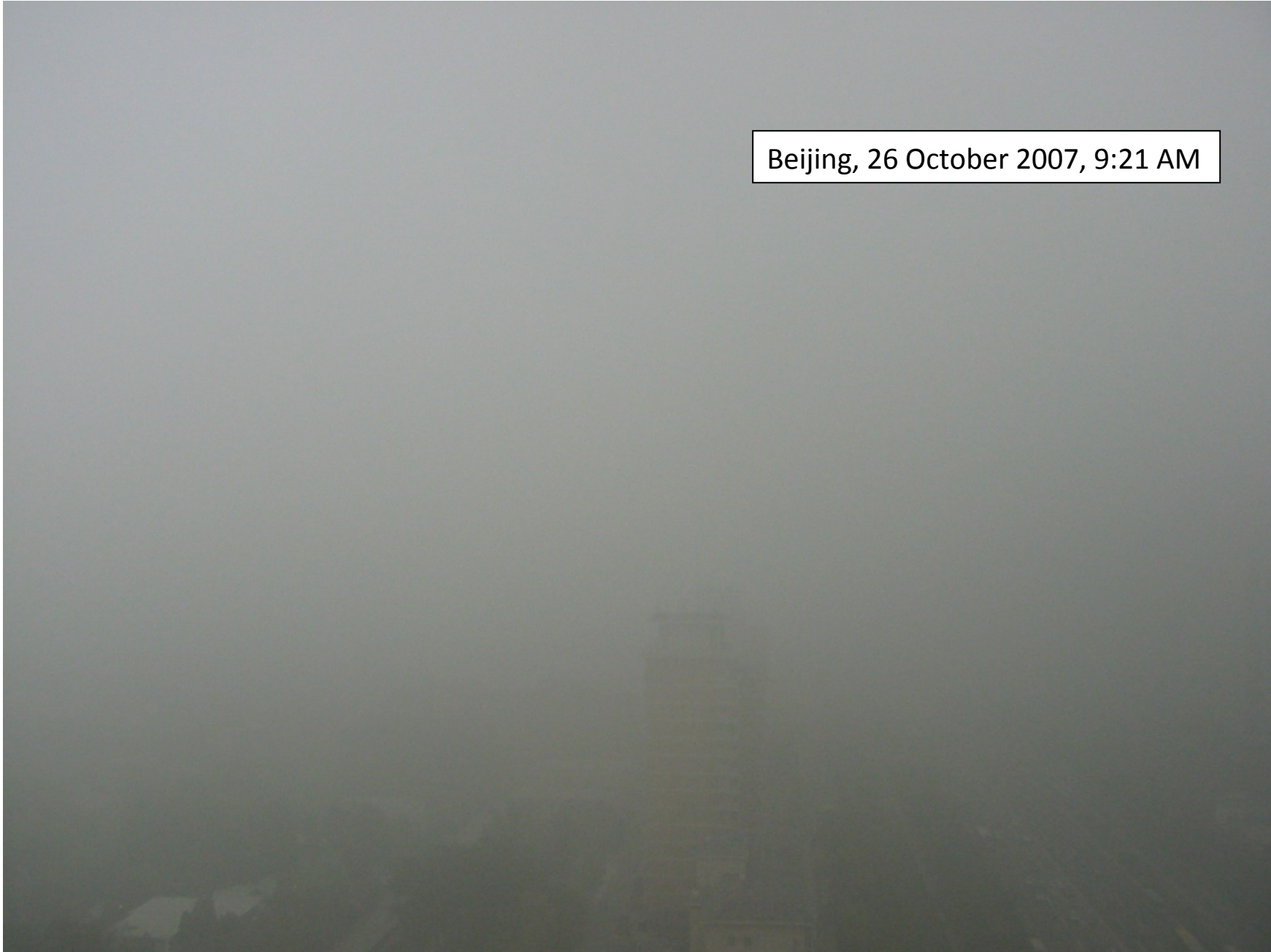
There are Two Ways to Look at This Graphic



In Conclusion

- Continue to reform your markets:
 - Design them to favor desired outcomes and capabilities: e.g., no-carbon and flexibility
 - Integrate environmental policymaking with energy
- Expand investment in end-use efficiency and renewables
- If you have the opportunity, engage with China
 - Fashion solutions that work for China
- Be a threat of a good example

Beijing, 26 October 2007, 9:21 AM





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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