

# Climate Change Initiatives in the Chinese Power Sector

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# The Chinese Power Sector

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- Approximately 800 GW, world's second largest (after US, 1,032 GW in 2007)
- 15% growth per year since 2005
  - 105 GW in 2006, 90% coal-fired
  - 95 GW in 2007, >80% coal-fired
  - 90 GW in 2008, 73% coal-fired
- Projected need of 1,300 GW additional capacity by 2030
- China is the world's largest emitter of GHGs
  - >6 billion metric tons CO<sub>2</sub>, with emissions expected to double 2002 levels by 2030
- China's total annual spending on energy efficiency amounts to approximately 3.5% of electric revenues
  - Sources: direct gov't investment, SBCs, utility surcharges, loans
  - More than that of the US



# Eight Policies

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- Energy intensity and emissions reduction targets
- Renewable energy mandatory market share
- Modernization of the coal generation fleet
- Efficiency benchmarks for industries and the Top 1000 Enterprises Program
- Differential pricing for energy-intensive industries
- Industry-specific energy consumption standards including coal-fired power generation
- Demand-side management and the Efficiency Power Plant (EPP)
- Environmental dispatch



# First Five in Brief

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- Energy intensity and emissions reduction targets
  - Current Five-Year Plan (the 11<sup>th</sup>) adopted nationwide goals to improve energy intensity (energy consumption/GDP), by 20% and to reduce absolute emissions (SO<sub>2</sub> and CO<sub>2</sub>) by 10% by 2010.
    - Disaggregated by sector, province, and, in some cases, individual firms. Gov't officials' career advancement linked to performance. 2010 energy target within reach.
- Renewable energy mandatory market share
  - An RPS of 15% by 2020, expected to be raised to 20%
- Modernization of the coal generation fleet
  - >50 GW of small, inefficient power plants (≤50MW) closed down
- Efficiency benchmarks for industries and the Top 1000 Enterprises Program
  - Top 1000 aims to cut 240 million tons GHG between 2005 and 2010.
- Differential pricing for energy-intensive industries
  - Electricity prices linked to the efficiency with which electricity is used
  - Applies to the eight largest energy-consuming industries
  - Surcharges as high as 2¢ per kWh



# Three in More Detail

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- Industry-specific energy consumption standards
  - Applies to 22 major industries, including electric generation
  - Output-based efficiency standards
    - Energy consumption/unit of output
      - E.g., MWh/ton of cement or, for coal-fired generators, gce/kWh
    - Standards for new and existing facilities, broken down by plant size, type, and, in some cases, location



## In More Detail (2)

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- Efficiency Power Plant (EPP)
  - An EPP is a bundled set of energy efficiency programs designed to deliver the energy and capacity equivalent of a large conventional power plant (CPP)
  - Deployed in 300 MW blocks, easily replicated and transferred
  - Four models, differing in funding approaches
    - Grid company obligation, least-cost procurement
    - SBC and third-party administration
    - Government-financing
    - Loan programs with on-bill repayment
  - Pilots in five provinces under development



# In More Detail (3)

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## ➤ Environmental Dispatch

- Current method: according to average total cost
  - Thus a 5¢/kWh unit with a 3¢/kWh variable cost is dispatched before a 6¢/kWh unit with a 2¢/kWh variable cost
- Merit order, or economic dispatch, would have immediate economic and environmental benefits
- In 2007, China announced that it would adopt environmental (or “efficiency”) dispatch
  - Loading order determined by SO<sub>2</sub> emissions/MWh output
    - Clean first: renewables, hydro, nuclear
    - CHP, then gas, coal last
    - Ties broken by thermal efficiency, i.e., merit order dispatch
  - CEM data used by system operator to assure compliance
  - Six provinces now developing operational rules, including compensation mechanism



# Next?

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- China's steps are only a start, but its local problems more acute
  - First-order consequences of these policies are improved environmental and economic performance
- What policies will we adopt, to reduce our GHG emissions by 80% over the next 40 years?



# Questions

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