Notes on Carbon Finance

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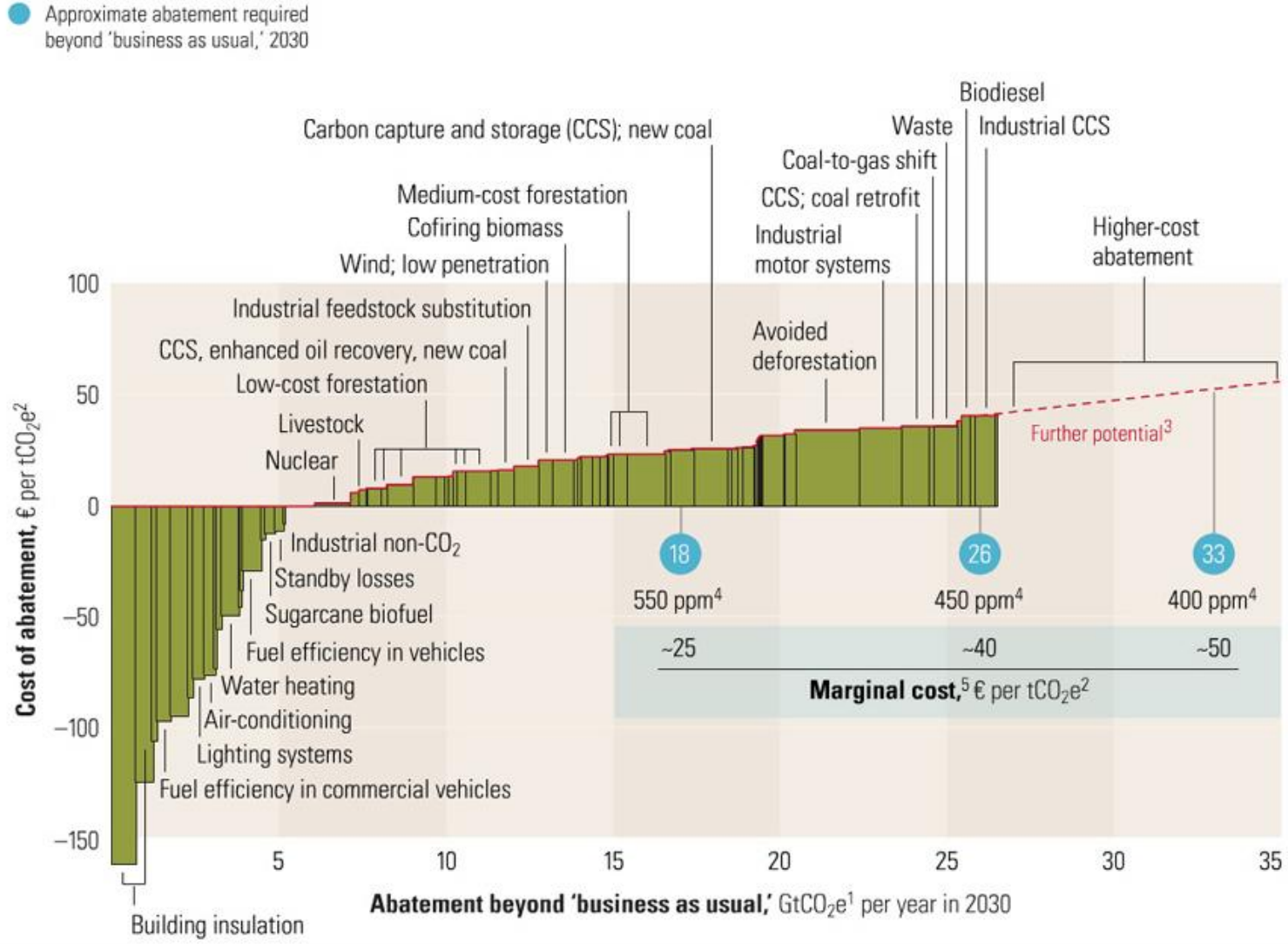
Copenhagen and Climate (3x3)x(4x4)

- **We know what to do**
  - Capturing the energy efficiency opportunity
  - De-carbonizing energy sources
  - Accelerating the development and deployment of new energy technologies
  - Preserving and expanding the world's carbon sinks
  - Changing the attitudes and behaviors of managers and consumers
- **Three mistakes**
- **Three stages**

Copenhagen and Climate (3x3)

- **Three mistakes**
  - Inclusiveness vs. non-cooperative foundations
    - Self-interest action in international regimes
  - Marginal inputs that drive emissions not set by relative prices alone in regulated national markets
    - Multiple levels of regulation
  - Targeted mechanisms for varied gaming
- **Three stages**
  - Don't get it wrong: Copenhagen (2009→ 2012)
  - Widening and tightening: open institutions and learning (2012→2020)
  - Growing out of carbon: unstable systems without real margins (2020→)

Global cost curve for greenhouse gas abatement measures beyond 'business as usual'; greenhouse gases measured in G tCO_2e[1]



[1] $GtCO_2e$ = gigaton of carbon dioxide equivalent; "business as usual" based on emissions growth driven mainly by increasing demand for energy and transport around the world and by tropical deforestation.
[2] tCO_2e = ton of carbon dioxide equivalent.
[3] Measures costing more than €40 a ton were not the focus of this study.
[4] Atmospheric concentration of all greenhouse gases recalculated into CO_2 equivalents; ppm = parts per million.
[5] Marginal cost of avoiding emissions of 1 ton of CO_2 equivalents in each abatement demand scenario.

Key climate (negotiation) questions

- **What should all countries be doing for themselves?**
- **What can be done (in addition to national self-interest) with an international mechanism to pay for positive carbon values?**
- **What current costs can innovation bring down (and how are innovation gains shared)?**
- **How do we recognize the negative impacts of climate change on development?**
- ***How do we build (negotiate) institutions to advance these goals and prevent unproductive investment of scarce funds?***

National self-interest

- Implement negative cost measures (energy efficiency)
- Eliminate subsidies that distort incentives
- Reform other inefficient regulation or policy
- Recognize local (national) collective value
  - Environmental services beyond carbon
  - Ecosystem services and other capturable domestic economic gains
  - National carbon services (scale or politics)
- Country studies: National pathways (to a set goal) as informational: baselines and incremental costs

Negotiation dynamics and goals: Going right at Copenhagen

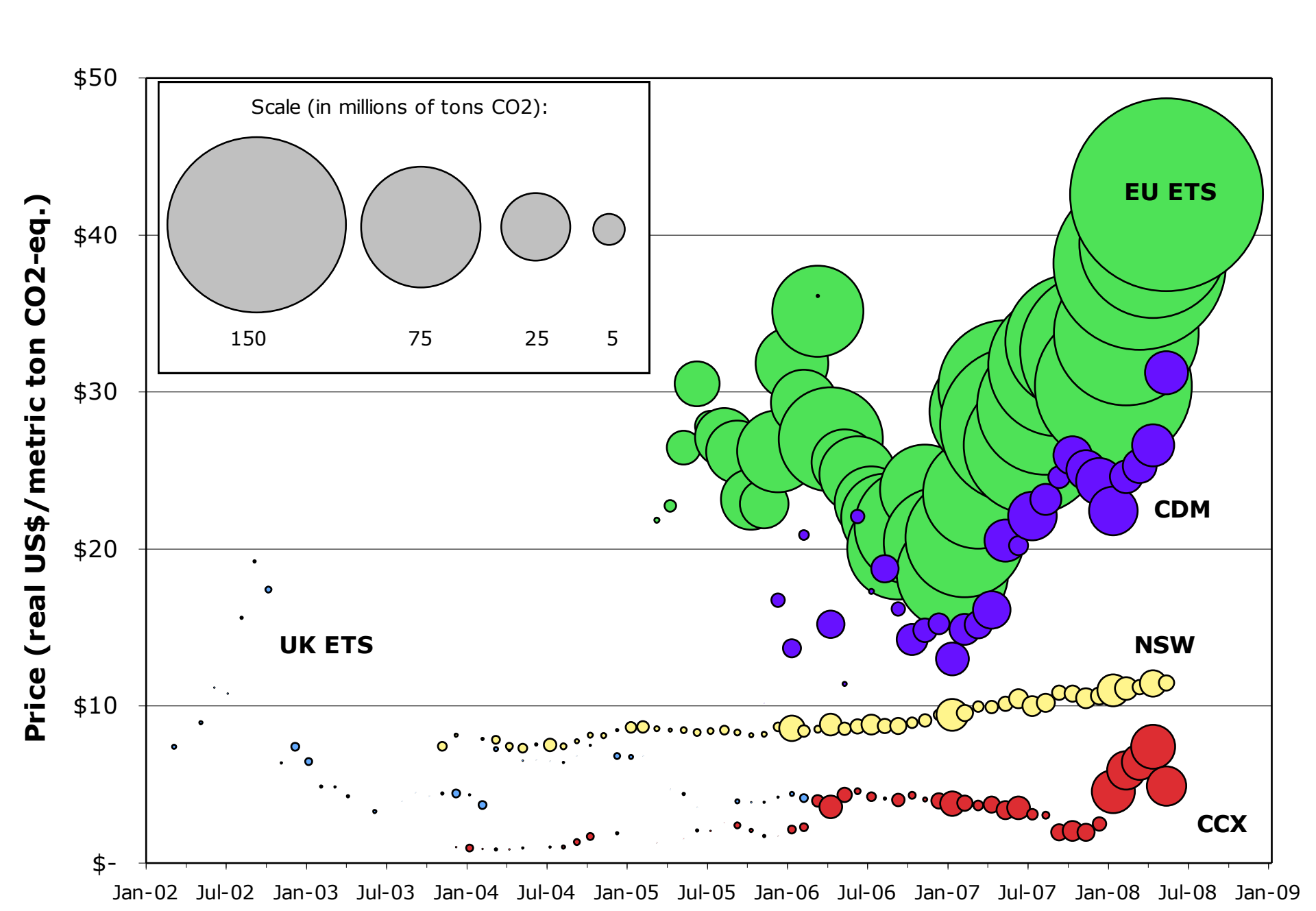
- National action plans to implement self-interested climate actions (policy baselines)
- Linked international support packages with incentives to mitigate beyond (do more than comply with) national climate baselines
- Deforestation and land use (incremental) emissions reduction mechanisms
- Innovation acceleration mechanisms

Reframing and Learning: Going wrong at Copenhagen?

- **Energy Efficiency: International Action?**
- **Technology support: IPRs? Sectoral measures (divide EE from costly)? Monitoring capacity?**
- **Deforestation: Agricultural market drivers?**
- **Innovation acceleration: Transforming downstream markets? Multilateral record?**
- **Adaptation: Ex post or ex ante ODA?**
- **Carbon finance: productive investments? tendering? Expertise?**

Copenhagen and Climate (4x4)

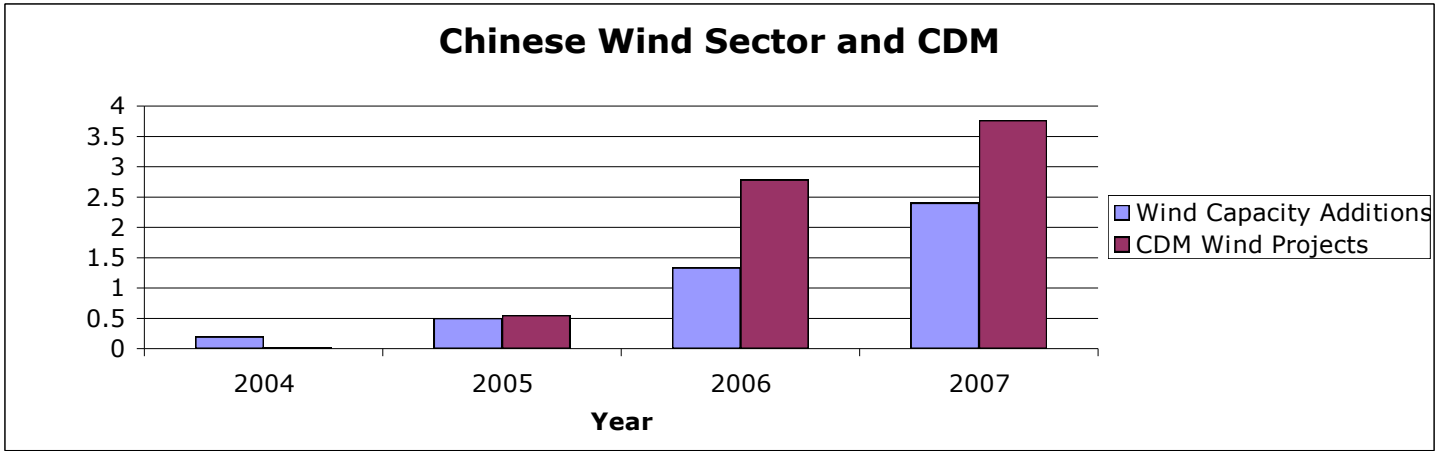
- **Key questions**
  - **Clarity of concepts and facts**
    - **Input markets and institutions: varied gravity forces**
    - **First margin: energy efficiency as global good?**
    - **Second margin: technology transfer & deep deforestation**
    - **Third margin: technology development upstream?**
  - **Multi-level interventions**
    - **Dynamics of political gravity frame climate policy**
    - **National development (and security) first**
  - **Counter-gaming (over optimality)**
    - **TEAPS & symmetric knowledge; thieves catch thieves**
    - **Barriers and first of a kind subject to manipulation; prices ex post; offsetting subsidies and distortions**
  - **Game plans**
    - **SD-PAMS, national actions (baselines) + supports: WTO offers**
    - **Limiting the scope of the CDM?**
    - **Indirect measures (global dynamics)**

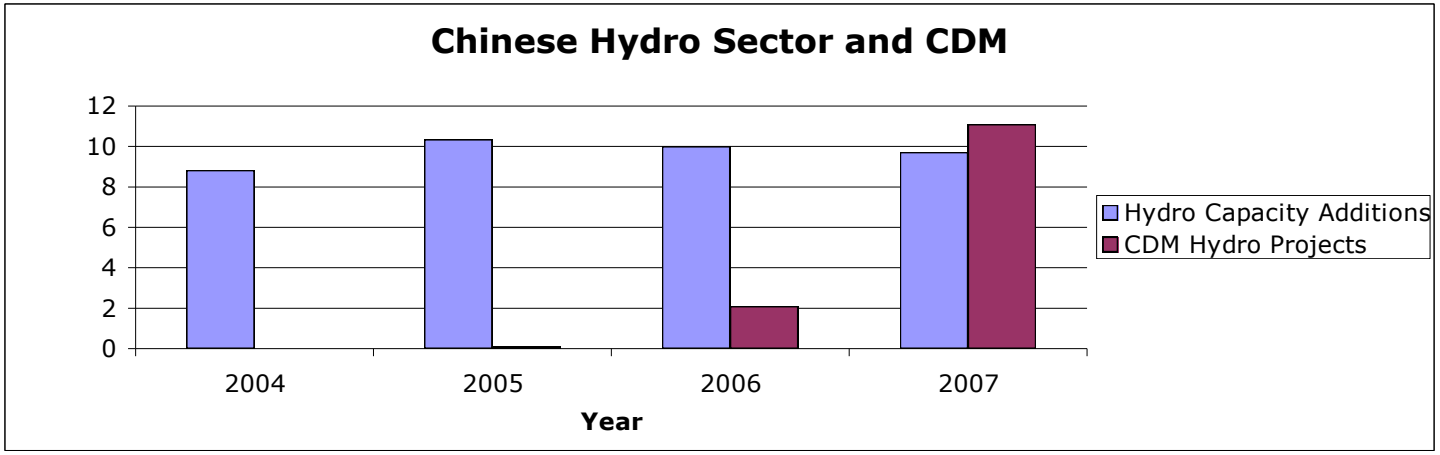

Scale (in millions of tons CO2):
150
75
25
5
EU ETS
CDM
NSW
CCX
UK ETS
Price (real US$/metric ton CO2-eq.)
$50
$40
$30
$20
$10
$-
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Jan-08
Jul-08
Jan-09

Chinese CDM inventories

- **1003 Projects since 2005**
  - **152 registered (of 895 globally at end 2007); 22 awaiting registration; 803 at validation stage (of 2800 global)**
- **Current pipeline:246MegatonsCO_{2e} (91.5 registered)**
  - **Global totals are 1150 registered (~455 China); 2600 promised (~1200 China)**
  - **By volume, 1/3 of total HFC-23 destruction and N_20 capture**
- **Projects (by number) in pipeline**
  - **Hydropower: 48.5%**
  - **Wind: 16% (36.8% of registered)**
  - **Waste heat 16.5% (industrial energy efficiency)**
  - **Landfill gas, biomass, CBM at 3-4%**
  - **Growing: fossil fuel switch, cement (materials), supply side energy efficiency (more efficient coal)**

Environmental Credibility



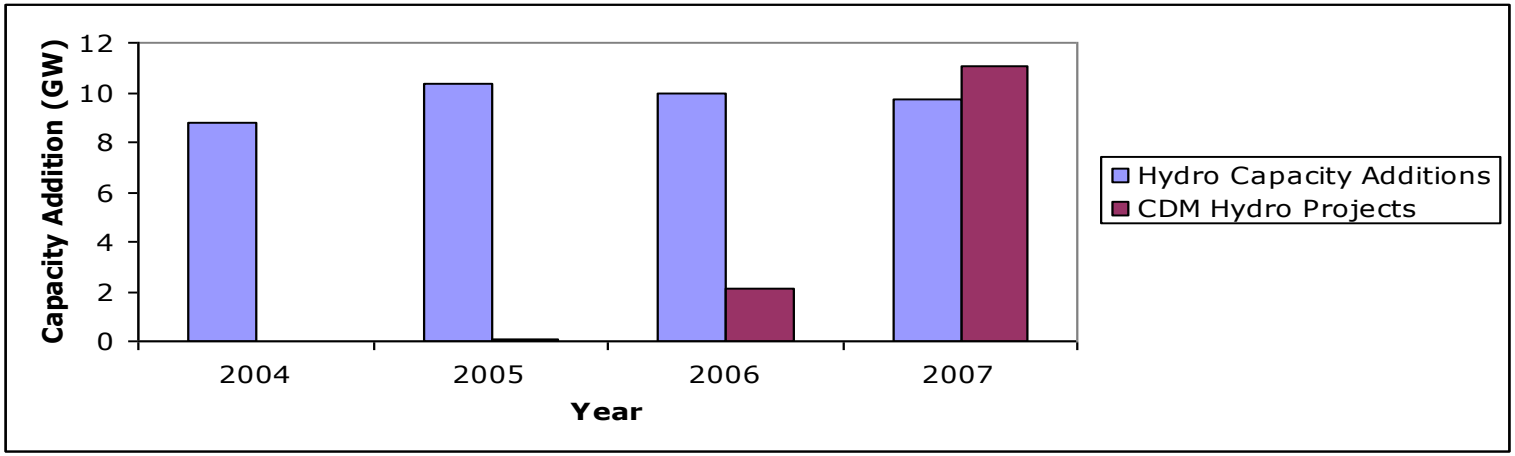


Environmental Credibility: Renewables Example: Hydro

Strong push for exploitation of hydro resources in China

~10 GW per year added to Chinese nameplate capacity

In 2007, 10 GW of proposed hydro projects in the CDM

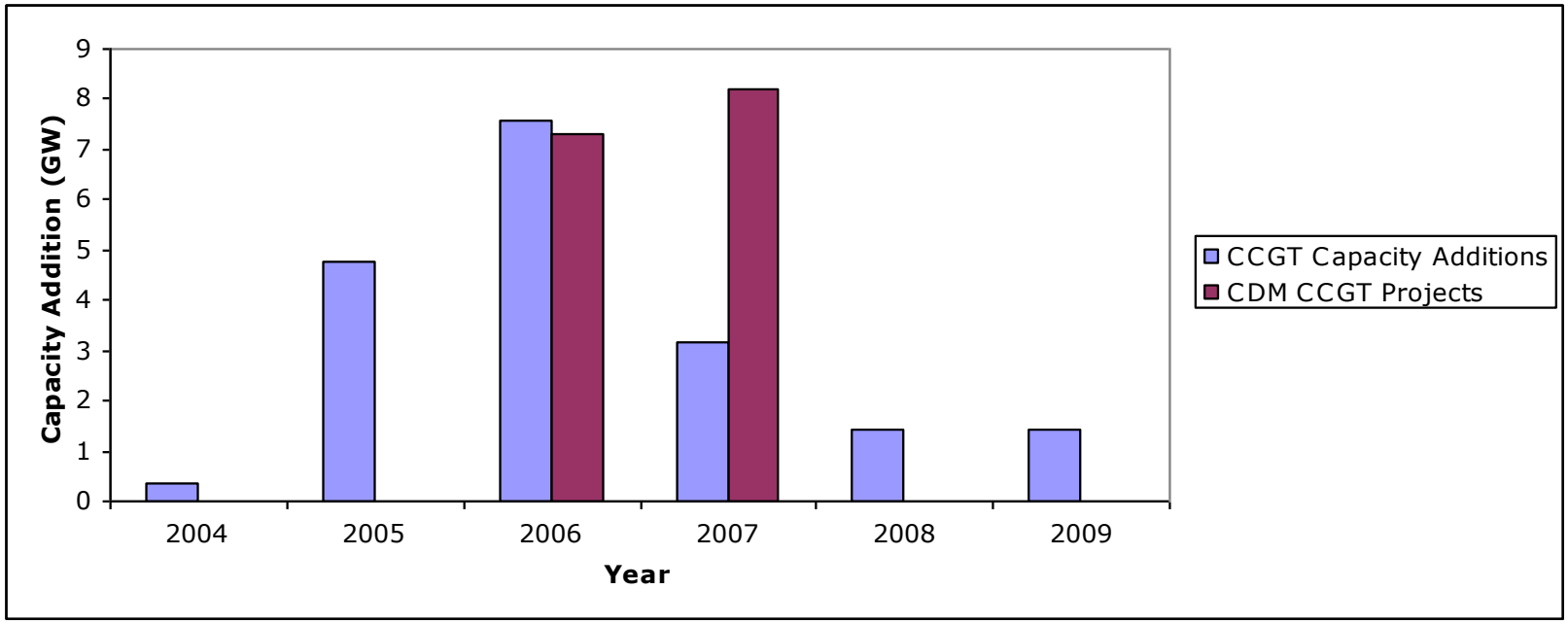


Data: IEA

Next: CCGT and Supercritical Coal

18.4 GW of CCGT planned between 2004 and 2009

15.5 GW of CCGT currently in CDM pipeline



Data: International Gas Union, Gas to Power – China (2005)

Productive Carbon Finance

- **Overlay problems: multiple regulation levels**
  - **Markets that operate on top of distorted prices and subsidies do not yield efficient solutions**
  - **Endogenous market factors set up PDD additionality**
  - **Displacement: Non-enforcement or non-enactment of national local regulation (national values)**
- **Asymmetric institutional skills & knowledge**
  - **Expertise in underlying market drivers (national)**
  - **Varied expectable regulatory problems (gaming) in different mechanisms**
  - **Thieves catch thieves**

Endogenous market prices set up PDD marginality (beyond industrial gases)

- **Gas flaring**
  - Perfectly commercial at post-2001 prices
  - Gas prices paid domestically lower than int'l price
  - Sales to public off-takers (utilities) are uncertain
  - Transmission costs not compensated
- **Renewables (wind)**
  - 10% RPS (2010); 20% 2020; but not enforced
  - Uncertain feed-in tariffs set case by case; vary by owners of assets
- **Hydropower**
  - Low tariff for hydro power supplied to grid
  - Built under business as usual

Endogenous market prices set up PDD marginality (beyond industrial gases)

- **Coal and gas power**
  - New vintages supplied for efficiency against rising coal prices, local environment; diversification of energy supplies
- **Energy efficiency**
  - Why not pure local good on IRR? (systemic know how?)
  - Commercial energy prices low through subsidies
  - Banks will not lend on EE raising capital costs
  - VAT & Local content rules drive up costs
- **Landfill gases**
  - Price of domestic natural gas low
  - Displacement of local environmental value
  - Prices of electricity vary at wholesale and retail for electricity generation
- **Subsidies and virtual baselines**
  - Integrated oil firms retail losses offset by upstream subsidies; capital subsidies; lump-sum payments; dividend policy

CDM issues & remedies

- **Infra-marginal rents**
  - **HFC-23 reductions: 4.7 B euro paid > 100 M costs (incentives?)**
  - **Auctions (supply) and administered prices (demand side)**
- **Environmental productivity**
  - **Dynamic baselines (HFC-23 additionality); expert (private) funds (TEAPS or carbon trust) with targeted counter-gaming versus regulatory problems**
  - **National programs versus leakage (programmatic crediting?)**
- **Time bias**
  - **Prices (opportunity costs) and quantities (supplementarity)**
- **Market transformation vs. ongoing subsidy**
  - **Positive list; infrastructure investment**
- **Endogenous safety valve less reliable/transparent than explicit price cap**
- **Weakest margin**
  - **Only at edges of existing projects; energy efficiency? CCS?**

Targeted financial mechanisms

- **Existing projects margin: poor targets and dynamic baselines**
  - **Fuel switching: NG market development**
    - **Upstream growth and security; local environment; policy & infrastructure**
  - **Renewables**
    - **Cap price; national subsidies and portfolio standards**
    - **Inefficient over carbon price in quantity mandates?**
  - **Transportation fuels & hybrids**
    - **National caps, national mandates, oil prices**
    - **Carbon efficiency in first generation beyond wastes?**
  - **Forestry**
    - **International leakage**
    - **Excessive payments**
    - **Agricultural drivers**

Carbon Finance Design

- Self-revelation of baseline (incentives to win bids)
  - Self-interest separated from added value
    - Self-interest split between private and national
- 2 part evaluation
  - Country risk (Costa Rica problem)
  - Project carbon productivity
- Auction structure for funds
  - Minimize infra-marginal rent transfers
  - Fund contributions at national market price of permits
- Private expertise at operational level
  - Public trusteeship or oversight boards
- Differentiated by regulatory problems
  - Counter-gaming against displacement
- Automatic link to national development goals
- Voluntary actions; preparation for cap baselines