Energy, Climate and Environmental Policy in China

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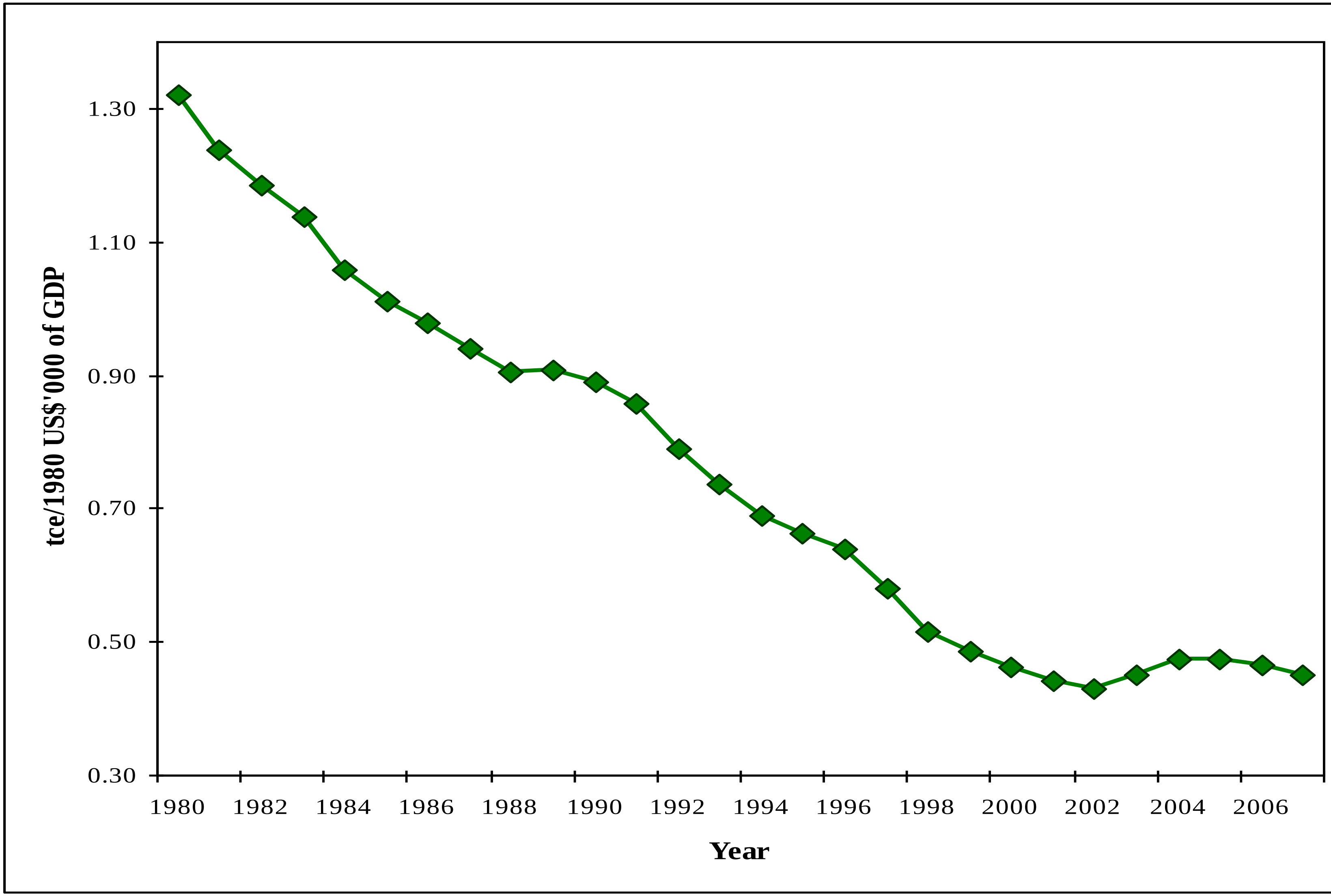
Overview

- China’s efforts towards increasing energy efficiency and RE use and cutting pollutants
- Energy prices and subsidy
- Resource taxes and reform in a broad context
- Implementation/compliance/reliability issues
- Concluding remarks

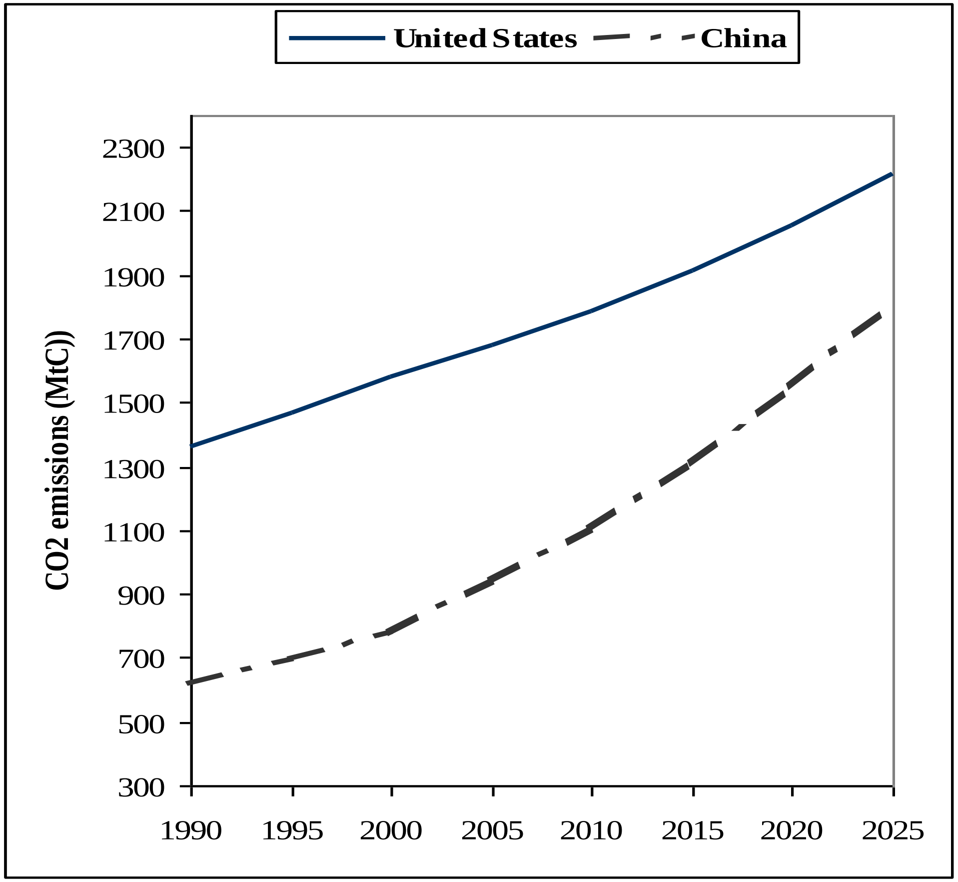
Energy intensity of China's GDP



Energy conservation in China: how important?

- If China's energy use and the resulting carbon emissions had followed their trends between 1980 and 2000, rather than surged since 2002, then the position of China in international climate debate would be very different from what it is today.
- China achieved a quadrupling of its GDP with only a doubling of energy consumption between 1980 and 2000.
- On the trends of the 1980s and 1990s, U.S. EIA (2004) estimated that China's CO2 emissions were not expected to catch up with the world's largest carbon emitter by 2030. However, China's energy use had surged since the turn of this century, almost doubling between 2000 and 2007. Despite similar rates of economic growth, the rate of growth in China's energy use during this period (9.74% per year) has been more than twice that of the last two decades in the past century (4.25% per year).
- As a result, China became the world's no.1 carbon emitter in 2007, instead of **until 2030** as estimated as late as 2004.

CO_2 emissions in China and the United States, 1990-2025 (IEO 2004)



China’s commitments to increasing energy efficiency and cutting pollutants

- Cut energy use per unit of GDP by 20% (19.1% actually achieved) between 2006-10.
- Cut energy intensity by 16% (10-18% across provinces) and carbon intensity by 17% (10-19.5% across provinces) from 2011 to 2015 relative to its 2010 levels.
- Cut carbon intensity by 40-45% by 2020 relative to its 2005 levels.
- Cut SO_2 emissions by 8% and NO_x emissions by 10% between 2011-15.

Specific policies and programs for energy efficiency & conservation [3]

- Given that industry consumes about 70% of China's total energy consumption, this sector is crucial for China to meet its own set goal.
  - **Top 1000 Enterprises Energy Conservation Action Program established in April 2006**
  - The Top-1000 Program expanded to **the 10000 Program** announced by the NDRC and eleven other central government organizations in December 2011 in order to help to meet the goals of energy-saving and carbon intensity reduction for the 12th five-year plan.

Top 1000 Enterprises Energy Conservation Action Program

- Covers 1008 enterprises in nine key energy-supply and consuming industrial subsectors. Each of them on the list consumed at least 0.18 million tons of coal equivalent in 2004, and all together consumed 33% of the national total and 47% of industrial energy consumption in 2004. The program aims to save 100 million tce cumulatively during the period 2006-10.
- This program achieved the energy savings of 20 million tce in 2006 (NDRC and NBS, 2007). In 2007, the energy savings of 38.17 million tce were achieved, almost doubling the amount of energy savings in 2006 (NDRC, 2008c). In November 2009, NDRC (2009b) reported that the Top-1000 Program had realized energy savings of 106.2 million tce by the end of 2008, two years ahead of schedule to achieve its cumulative goal for the program over the whole five-year period. In September 2011, NDRC reported that the Top-1000 Program had estimated to achieve total energy savings of 150 million tce during the 11th five-year plan period (NDRC, 2011c).

The 10,000 Enterprises Energy Conservation Low Carbon Action Program [1]

- This enlarged program covered 16,078 enterprises. These enterprises include those industrial and transportation enterprises consuming energy of 0.10 million tce or more and other entities consuming energy of 0.05 million tce in 2010. All together these enterprises consumed at least 60% of the national total in 2010.
- Shandong province is set to have the highest energy-saving targets of 25.3 million tce while Jiangsu province comes second with an energy-saving target of 22 million tce and has the maximum number of enterprises (1221 enterprises) under the program.
- The program aims to save 250 million tce cumulatively during the period 2011–15 (NDRC, 2012).

The 10,000 Enterprises Energy Conservation Low Carbon Action Program [2]

- In December 2013, NDRC reported the program's performance results in 2012. Of 14,542 enterprises examined,
  - 3,760 enterprises **exceeded** their energy-saving targets, accounting for 25.9%;
  - 7,327 enterprises **fulfilled** their energy-saving goals, accounting for 50.4%;
  - 2,078 enterprises **basically fulfilled** their energy-saving goals, accounting for 14.34%;
  - 1,377 enterprises, or 9.5% of the program's enterprises, **failed** to meet their targets.
- The program had achieved total energy savings of 170 million tce over 2011-12, **meeting 69% of the total energy-saving goal** during the 12th five-year plan period (NDRC, 2013b).

Efficient coal use for power generation[1]

- As the largest coal consumer, power generation is currently consuming over half of the total coal use in China. This share is expected to rise well above 60% in 2020, given the rapid development of coal-fired power generation.
- Efficient coal combustion and power generation is of paramount importance.
- Accelerating the closure of thousands of small, inefficient coal- and oil-fired power plants. The total combined capacity that needs to be decommissioned is set at 50 GW during the period 2006-10.
- In addition to mandatory closures at many small power plants, NDRC instituted a series of incentives for small, less-efficient power plants to shut down. Feed-in tariffs for small plants were lowered, power companies were given the option to build new capacity to replace retired capacity, and plants designated for closure were given electricity generation quotas which could be used to continue operation for a limited time or sold to larger plants (Williams and Kahrl, 2008; Schreifels et al., 2012).

Efficient coal use for power generation[2]

- These incentive-based policies helped the government surpass the goal of closing 50 GW of small thermal power plants.
  - Total capacity of 8.3 GW decommissioned during the period 2001-05
  - By June 30, 2009, 7467 smaller and older unites decommissioned, with total capacity of 54.07 GW, having met the 2010 target of decommissioned 50 GW one and half years ahead of schedule.
  - By the end of 2010, the total capacity of decommissioned smaller and older unites had increased to 76.8 GW, more than the entire current power capacity of the Great Britain and almost ten times the total capacity decommissioned during the period 2001–05.

Efficient coal use for power generation[3]

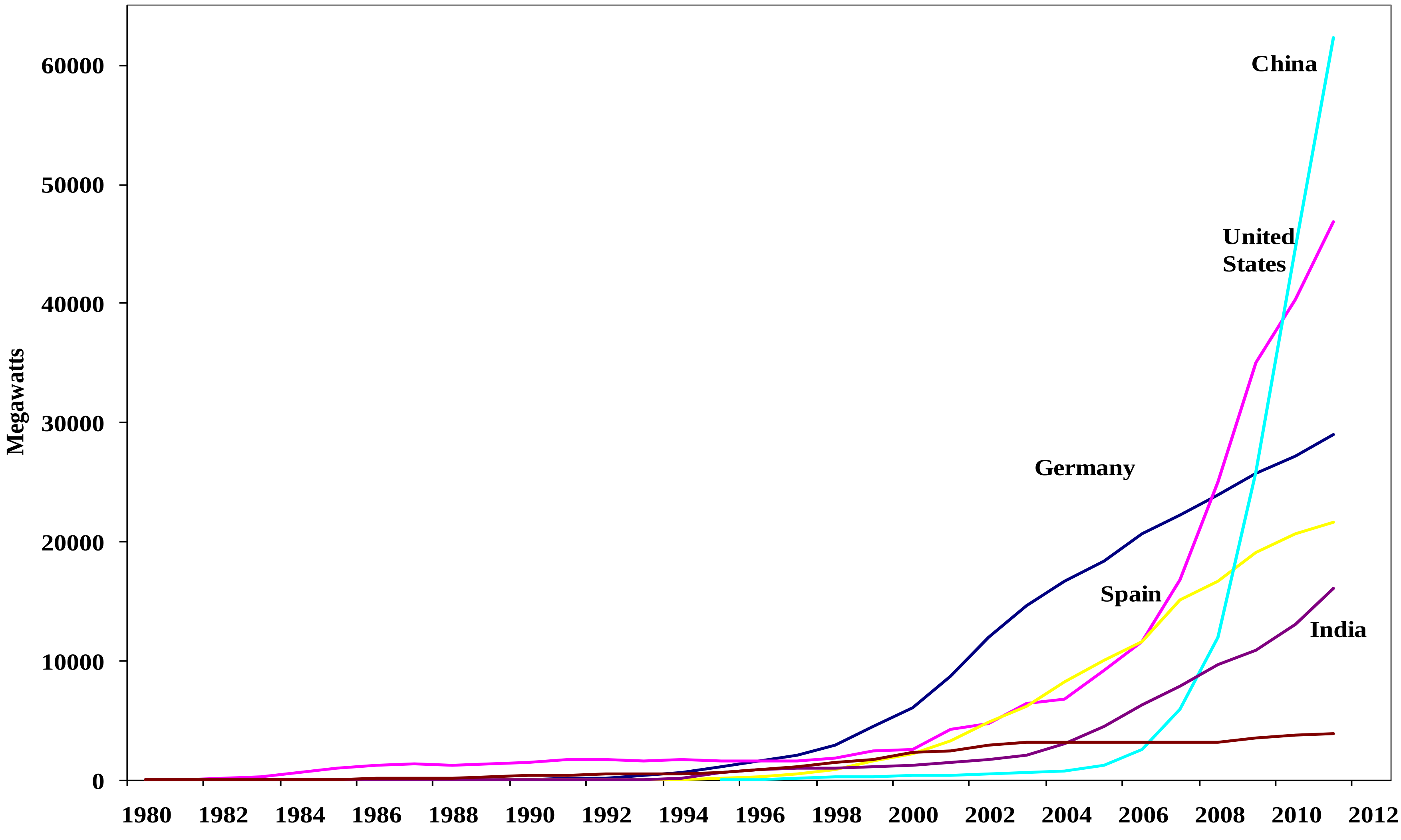
- Encouraging the construction of large, more efficient, cleaner units.
- China has completely mastered design and manufacturing technologies for subcritical units with the capacities of 300 MW and 600 MW. **By 2012, 75.6% comprised units of 300 MW and more**, relative to 42.7% in 2000.
- The combined effect of shutting down small, less-efficient power plants and building larger, more-efficient plants led the average coal consumed per kW h of electricity generated to decline to 326 gce/kWh by 2012, or a 12.8% reduction relative to its 2005 levels of 374 gce/kWh (CEC, 2011; CEC and EDF, 2012).

Mandating coal-fired units to equip with FGD facility and to pay pollution charges

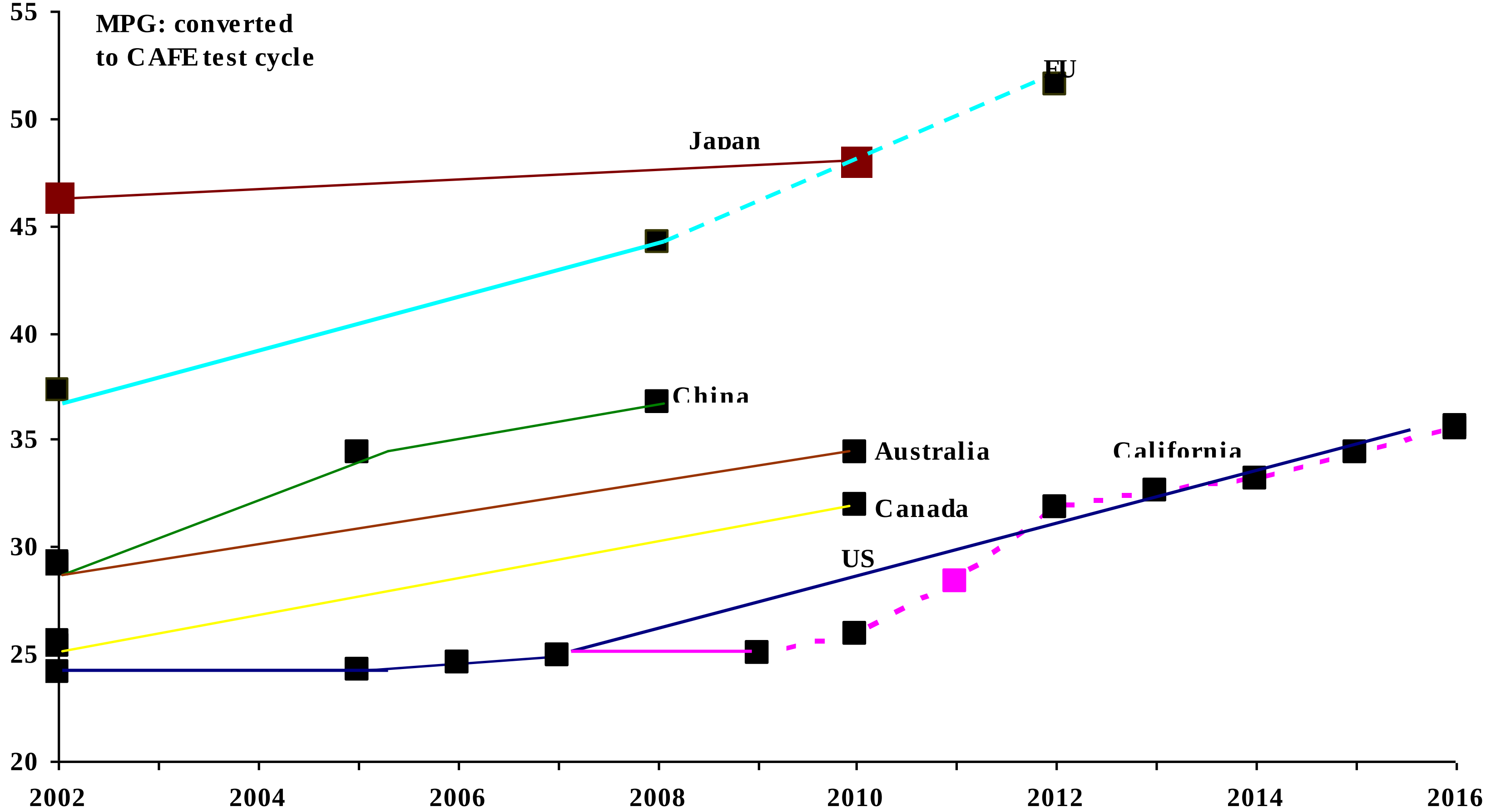
- With one-third of China's territory widely reported to be affected by acid rain and with coal-fired power generation accounting for half of the national total SO2 emissions, the central government mandates that new coal-fired units must be synchronously equipped with FGD facility and that plants built after 1997 must have begun to be retrofitted with FGD facility before 2010.
- SEPA signed SO2-cutting responsibility agreements with 7 provincial governments and 6 top national power-generating groups, accounting for two-third of total SO2 emissions in China. And policies favorable to desulfurized power plants are being implemented, e.g., the on-grid tariff incorporating desulphurization cost, priority given to being connected to grids, and allowance to operate longer than those plants that don't install desulphurization capacity. Some provisional governments provide even favorable policies, demanding priority dispatching of power from units with FGD in Shangdong and Shanxi provinces.
- As a result, newly installed desulphurization capacity in 2006 was more than the combined total over the past 10 years, accounting for 30% of the total installed thermal (mostly coal-fired) capacity.

	2005	**2007**	**2008**	**2011**
The coal-fired units installed with FGD:	53 GW	266 GW	379 GW	630GW
The portion of coal-fired units with FGD:	13.5%	51%	66%	90%

Cumulative Installed Wind Power Capacity by Country, 1980-2011 (Global Wind Energy Council, 2010 and 2012; Earth Policy Institute, 2008).



Comparison of Fuel Economy Standards (adapted from An and Sauer (2004))



Low carbon development pilot program

- In China, cities are responsible for more than 60% of total energy consumption (CAS, 2009), and their contribution continues to increase given the expected urbanization rate of 65% in 2030 (DRC, 2014).
- LC pilot program: 10 provinces and 32 cities
- Carbon intensity reduction in 2012 relative to 2010 level (NDRC, 2014)
  - 10 pilot provinces: 9.2%
  - China as a whole: 6.6%
- All pilot provinces and cities set CO_2 emissions peak in 2030 or early
  - CO_2 emissions in 15 pilot provinces and cities peak in 2020 or early.
  - Shanghai: 2020; Suzhou, 2020; Ningbo, 2015

Climate commitments for China: A roadmap to 2050 (Zhang, 2009)

- I propose that at current international climate talks China should negotiate a requirement that
  - greenhouse gas emissions in industrialized countries be cut at least by 80% by 2050 relative to their 1990 levels &
  - per capita emissions for all major countries by 2050 no more than the world's average at that time.
- At a right time (e.g., at a time when the U.S. Senate is going to debate and ratify any global deal that would emerge from current international climate negotiations), China signals well ahead that it will take on binding absolute emission caps around 2030.

Why does China turn to market forces?

- Lessons from missing 11th five-year energy efficiency targets
  - Cooperation with local governments crucial (Zhang, 2011 and 2012)
  - Relies mainly on administrative measures: effective but not efficient
    - For example, during the Eleventh FYP, the total amount of CO_2 reduction reached 1.25 billion tCO_2e through mandatory regulations and auxiliary financial stimuli, while only 0.035 billion tCO_2e were reduced as a result of market-based instruments (Qi, 2011).
- To honor the 40-45% carbon intensity reduction commitments cannot continue to rely on costly administrative measures
  - call for increasing use of market-based instruments
- Environmental tax reforms and greenhouse gas emissions trading schemes in the OECD work (Andersen et al., 2007; Andersen and Ekins, 2009; Ellerman et al., 2000 and 2010).

Carbon/environmental tax versus emissions trading

- Debates in the US, the EU, Australia in the different context
- Inside China
  - From legislation point of view, it takes time to impose carbon/environmental taxes
  - Carbon trading schemes will be initially implemented in few regions
  - But carbon trading and carbon/environmental taxes are not substitute—China needs both to level the playing filed

China's pilot carbon trading

- **Shenzhen**: trading started 18 June 2013 at about Yuan 28/t, currently about Yuan 75/t, peak at Yuan140/t, leads in total volume traded: 0.21 mt
- **Shanghai**: trading started 26 November 2013 at Yuan 25-27/t, currently about Yuan 30/t
- **Beijing**: trading started 28 November 2013 at Yuan 50/t, currently about Yuan 55/t
- **Guangdong**: trading started 20 December 2013 at Yuan 61/t, currently about Yuan 61/t
- **Tianjin**: trading started 26 December 2013 at about Yuan 27/t, currently about Yuan 26/t, 3rd place in total volume traded: 0.11 mt

Assigning the market a decisive role in allocating resources

- A key decision by Last November’s Third Plenum of the 18th CPC Central Committee
- Getting energy prices right

Energy prices

- Petroleum products
- Coal (market coal, power coal)
- Natural gas
- Electricity
  - Differentiated power tariffs
  - Tier-tariffs for household use (since July 2012) and aluminum production (since Jan 2014)
  - Power price premium for desulfurization and denitrification
- Renewable energy

Energy prices: Petroleum products [1]

- Crude oil prices have been linked directly to international prices since 1998 and thus have been allowed to rise, but refined oil prices have not.
- To address this disconnect, the government has implemented since May 2009 the pricing mechanism whereby domestic petroleum product prices would be adjusted upward if the moving average of international crude oil prices based on Brent, Dubai and Cinta crude oil price rose by more than 4% within 22 consecutive working days.
- However, this 22-working-day cycle of price adjustments has triggered wide complaints, as it often failed to reflect fluctuations in the international market.

Energy prices: Petroleum products [2]

- To better reflect refiners' costs and adapt to fluctuations in global crude oil prices, NDRC launched in March 2013 a more market-oriented petroleum product pricing mechanism.
- This new **automatic pricing mechanism** will shorten the current 22-working-day adjustment period to 10-working-day and remove the 4% threshold. The composition of the basket of crudes to which oil prices are linked will also be adjusted.

Energy prices: Coal [1]

- Coal dominates in China's energy mix, accounting for 65.7% of total energy use in 2013. Its price has been set differently since 1993, depending on its use.
- Under a two track system for coal prices, the price of coal for non-utility use, the so-called "**market coal**", has been determined by the market; whereas the price of coal for utility use, the so-called "**power coal**", is based on "guiding price" that has been set by the NDRC substantially below market prices.
- Coal producers are required to sell to large power producers at the controlled prices for utility coal. However, as the increasing portion of coal is used for utility and coal prices have risen over the years while power tariffs remained fixed, electricity generators found it increasingly difficult to obtain coal and cover the cost of generation.

Energy prices: Coal [2]

- In 2004, NDRC abolished its guiding price for power coal and set price bands for negotiations between coal producers and electricity generators. NDRC widened those bands in 2005; in 2006 it scrapped them altogether.
- NDRC proposed in May 2005 a **coal-electricity price “co-movement” mechanism** that would raise electricity tariffs if coal prices rose by 5% or more in no less than six months and allowed electricity generators to pass up to 70% of increased fuel costs on to grid companies. However, because of fears of inflation, the co-movement policy has hardly been implemented, and power tariffs continue to remain flat while coal prices rise.

Energy prices: Coal [3]

- In December 2012, the State Council announced to abolish the two track system for coal prices. The price of coal for utility use will also be determined by the market just as the price of coal for non-utility use does.
- Moreover, it revises the coal-electricity price "co-movement" mechanism. Under the revised mechanism, electricity tariffs would be adjusted if fluctuations in coal prices go beyond by 5% or more in 12 months and electricity generators are allowed to pass up to 90% of increased fuel costs on to grid companies instead of the existing 70% threshold (The State Council, 2012).
- Pricing for annual contract for utility coal in 2014 between two sides of coal supply and demand has been very flexible, taking a multiple form on a yearly, quarterly or monthly pricing basis, which did experience before (Hu, 2014).

Energy prices: Natural gas [1]

- Given coal-dominated energy mix, increasing a share of cleaner fuel, like natural gas, has been considered as the key option to meet the twin goal of meeting energy needs while improving environmental quality.
- However, natural gas price has long been set below the producers' production costs, and does not reflect the relationship between its supply and demand, or alternative fuel prices. This has not only led Chinese domestic gas producers to be reluctant to increase investments in production, but also has constrained the imports of more costly natural gas.
- On December 26, 2011, China carried out the pilot reform of natural gas pricing mechanism in Guangdong and Guangxi, changing the existing cost-plus pricing method to the "**netback market value pricing**" approach. Under this new pricing mechanism, pricing benchmarks are selected and are pegged to prices of alternative fuels that are formed through market forces to establish price linkage mechanism between natural gas and its alternative fuels. Gas prices at various stages will then be adjusted accordingly on this basis (NDRC, 2011d).

Energy prices: Natural gas [2]

- This new mechanism will better trace and reflect market demand and resource supplies, as well as guiding reasonable allocations.
- Gao et al. (2013) argue that it is feasible to implement the Guangdong and Guangxi pilot reform program to the entire country, with some adjustments and improvements regarding the choice of alternative fuels, the selection of the pricing reference point and the creation of netback market value pricing formula.
- Jiangsu, Henan and Hunan have implemented tier-tariffs for household use of natural gas, and China plan to implement this pricing mechanism in 2014. The levels of such tier-tariffs are differentiated across provinces, and are set significantly higher for non-basic use.

Power prices

- The price of power has been regulated by the central government.
- Since July 1, 2012 China has implemented three-tier-tariffs for household electricity use. The levels of such tier-tariffs are differentiated across provinces, and are set significantly higher for non-basic electricity use.
- On July 1, 2012, 29 provinces in China abolished single-block, low prices and set up the new, three-tier tariffs for household electricity use. Under this new tariff system, the tier-one maintains the old quota price that applies to, on average, 89% of households of 29 provinces and the tier-two shifts to slightly higher electricity price for those electricity use exceeding the amount of basic use, which is differentiated across regions, with the tier-three set much higher tariffs for the amount of electricity for luxury use.

Power price premium for desulfurization and denitrification [1]

- By 2015, all flue gas desulfurization and denitrification facility installed needs to achieve the overall desulfurization rate of 95% and the denitrification rate of at least 75% in order for the power industry to cut SO_2 emissions by 16% and NOx emissions by 29% by 2015 relative to 2010 levels.
- Offer since 2006 a 0.015 RMB/kWh premium for electricity generated by power plants with FGD facility.
- Offer since November 2011 a 0.008 RMB/kWh premium for electricity generated with flue gas denitrification facility in 14 provinces or equivalent. By the end of 2012, 27.6% of coal-fired units were installed with denitrification facility, with the average rate of denitrification facility of 48%. Since January 2013, the price premium for denitrification was extended to all coal-fired power plants equipped with denitrification facility (NDRC, 2013d), and was further increased to 0.01 RMB/kWh since September 2013 (NDRC, 2013f).

Power price premium for desulfurization and denitrification [2]

- Based on estimates by China Electricity Council, the average cost of denitrification is estimated to be 0.012 RMB/kWh for new plants and 0.015 RMB/kWh for plants already in operation. This cost can go beyond 0.020 RMB/kWh for some specially designated plants.
- To comply with the new NOx emissions standards of 100 mg/m^3 by July 1, 2014, retrofit costs for existing coal-fired units of 707 GW are estimated to be Yuan 200-250 billion. Factoring in new addition of coal-fired units of 250 GW over the period 2006-10, the yearly operation costs of denitrification facility to meet the new stringent standards are estimated to increase by Yuan 90-110 billion. This will significantly increase the generation cost of coal-fired units, which is estimated to increase by 20% in the short term (Li, 2013).
- Given the current level of price premium for denitrification, this raises the issue of whether all coal-fired units will install denitrification facility, and if installed, whether it will run continuously and reliably. Given that it is much more costly to install and run denitrification facility than FGD facility, and that field inspections reported that the installed FGD facilities are not in use or do not run continuously and reliably, this can merit a great concern.

Differentiated power tariffs [1]

- NDRC ordered provincial governments to implement the differentiated tariffs that charge more for companies classified as ‘eliminated types’ or ‘restrained types’ in eight energy-guzzling industries including cement, aluminum, iron and steel, and ferroalloy from October 1, 2006 onwards.

		Existing additional charge (Yuan/kWh)	Additional charge since 1 October 2006 (Yuan/kWh)	Additional charge since 1 January 2007 (Yuan/kWh)	Additional charge since 1 January 2008 (Yuan/kWh)
Eight energy-guzzling industries	Eliminated types	0.05	0.10	0.15	0.20
	Restrained types	0.02	0.03	0.04	0.05

Differentiated power tariffs [2]

- Partly for strengthening China's longstanding efforts to restructure its inefficient heavy industries, and partly faced with the prospect for the failure to meet the ambitious energy intensity target set for 2010, NDRC and other five ministries and agencies jointly ordered utilities to stop offering preferential power tariffs to energy-intensive industries by June 10, 2010.
- Such industries will be charged with the punitive, differentiated tariffs. Those utilities that fail to implement the differentiated tariffs will have to pay a fine that is five times that of differentiated tariffs multiplied by the volume of sold electricity (J. Zhu, 2010).

Feed-in tariffs for wind power

- China now aims to have at least 200 GW of wind power capacity in operation by 2020.
  - This revised target is 170 GW more than (or almost seven times) the 30 GW target as set as late as September 2007.
- In company with this, on July 22, 2009, NDRC enacted feed-in tariffs for wind power, which took effect on August 1, 2009.
  - This means the ending of the controversial bidding-based program that had been in place since 2003.
  - According to the quality of wind energy resources and the conditions of engineering construction, four wind energy areas are classified throughout China. Accordingly, wind power tariffs are set 0.51, 0.54, 0.58 and 0.61 Yuan/kWh.
- China is likely to cut feed-in tariffs.

Energy subsidy [1]

- Even if the aforementioned "market coal" has been determined by the market, it does not fully reflect the cost of production.
- Mao et al. (2008) estimate that if the government's controlled costs and the distorted prices in other production factors, such as land and resources are factored in, the cost of coal would increase by 54%. If externalities such as conventional environmental and health impacts are added, the cost of coal would go up by 70%. The negative externalities do not include damage costs of global climate change, and are therefore underestimated.
- Even if the conservative estimate puts the economic costs of coal exploration, transportation and use at Yuan 1745 bn in 2007, or 7.1% of that year's GDP (Mao et al., 2008).

Energy subsidy [2]

- IMF factors in damage costs of global climate change. Assuming the costs of US$25 per ton of CO_2 equivalent, post-tax coal subsidies, namely the sum of pre-tax and tax subsidies, are estimated to be US$ 236 bn in 2011 in China, or 3.82% of that year's GDP.
- Compared with the amount of post-tax subsidies for petroleum products, natural gas and electricity, which amounted to 0.20%, 0.09%, and 0.30% of GDP in 2011 respectively, post-tax coal subsidies are substantial (Clements et al., 2013).
- This is mainly because coal dominates in China's energy mix, accounting for accounting for 65.7% of total energy use in 2013 and because coal prices are far below the levels needed to address negative environmental and health externalities.

Energy subsidy [3]

- Measured on a tax-inclusive basis, virtually all of the world's economies provide energy subsidies of some kind (IEA, 2006a; Zhang, 2008; Clements et al., 2013).
- Such subsidies differ by energy type across countries. In absolute terms, the US, China and Russia are the top three subsidizers across the world, providing subsidies of US$ 502 bn, US$279 bn, and US$116 bn in 2011, respectively (Clements et al., 2013).
- Clearly, removing these subsidies is essential to provide incentives for investment and production of cleaner energy on the supply side and efficient energy use and adoption of clean technologies on the demand side that reduce emissions at sources. This helps the economic recovery in the short term and serves the driver of sustainable and balanced economic growth in the long run.

Energy subsidy [4]

- Thus, in 2009, the G20 advanced and emerging market economies called for a phase out of inefficient fossil fuel subsidies in all countries, and reaffirmed this again in 2012.
- Eliminating energy subsidies would generate substantial environmental benefits. IMF estimates that raising energy prices to levels would eliminate tax-inclusive subsidies for petroleum products, natural gas and coal would reduce 4.5 billion tons of CO_2 emissions, representing a 13% cut in global energy-related CO_2 emissions (Clements et al., 2013).

Resource tax reform in broad context

- On average, coal production increased yearly by 200 mt over the past 10 years, but increased by 50 mt in 2013; coal use increased yearly by 9% over the past 10 years, but increased by 2.6% in 2013.
- Coal consumption is estimated to peak in 2015-2020, with CO_2 emissions estimated to peak in 2025-2030, and coal's share in the total energy mix is estimated to be below 50% in 2030.
- From legislation point of view, it takes time to impose carbon/environmental taxes
- Urgent need to alleviate the financial burden of local governments
- Need to overhaul resources taxes
  - The way of levying taxes on resources
  - Broadening their coverage.

Resource tax reform [1]

- Since 1984, resource taxes had been levied. While the prices of coal and oil have since significantly increased, the levels of their resource taxes have remained unchanged over the past 25 years.
- As a result, the resource taxes raised amounted to only Yuan 33.8 bn, accounting for about 0.57% of China's total tax revenues and about 17.5% of the national government expenditure for environmental protection that amounted to Yuan 193.4 bn in 2009 (NBS, 2010).
- The way of levying taxes on resources in China should be changed. Such taxation should be levied based on revenues.

Resource tax reform [2]

- In addition, current resource taxes are only levied on seven types of resources including coal, oil and natural gas. This coverage is too narrow, falling far short of the purposes of both preserving resources and protecting the environment. Thus, overhauling resource taxes also includes broadening their coverage so that more resources will be subject to resource taxation.
- China started a pilot reform on resource taxation in Xinjiang. Since June 1, 2010, crude oil and natural gas are taxed by revenues rather than volume in Xinjiang. This new resource tax will help to significantly increase the revenues for Xinjiang. It is estimated that the new resource tax levied at a rate of 5% will generate additional annual revenues of Yuan 4–5 bn for Xinjiang (Dai, 2010). This is a significant increase, in comparison with the total resource tax revenues of Yuan 1.23 bn in 2009, inclusive of those from other resources than crude oil and natural gas (NBS, 2010). This will contribute to 17–21% of the total tax revenues for Xinjiang, in comparison with the contribution level of about 4.1% in 2009.

Resource tax reform [3]

- The new resource tax levied on crude oil and natural gas by revenues rather than by existing extracted volume was applied nationwide since November 1, 2011.
- Since then there have been intensified discussions on levying resource tax on coal by revenues. China is most likely to overhaul the current practice and levy on coal by revenues in 2014. The tax rates are proposed to be 2-10%, depending on the extent to which current fees and charges are cut or abolished.
  - Shanxi Option 1: at coal price of Yuan 465/t, levying at 2.2% if the charge for coal sustainable development fund remains; 7.4% if that charge is abolished;
  - Shanxi Option 2: at coal price of Yuan 440/t, levying at 2.4% if the charge for coal sustainable development fund remains; 7.6% if that charge is abolished.

Implementation/compliance /reliability issues

- Implementation/compliance holds the key
- Reliability issues both at national and local levels

Implementation holds the key [1]

- 习总书记说法律的尊严在于执行.为什么说这句话，因为很多政策法律法规没执行。中央其实对国家环境上的问题很清楚，就看企业和地方领导怎么落实.
- Enacting the aforementioned policies and measures targeted for energy saving and pollution cutting just presents a goodwill and determination of China. Whether to achieve the desired outcomes depends on whether they are strictly implemented.
- Achieving the goals of energy efficiency improvements and pollution reductions has become a key component of job performance evaluations for local governments. But no senior officials have been reported to take the responsibility for failing to meet these targets, not to mention to step down from their positions on these grounds.

Implementation holds the key [2]

- China needs to strengthen the enforcement of FGD operation to ensure that those generation units with FGD facility always use it.
  - The government offered a 0.015 RMB/kWh premium for electricity generated by power plants with FGD facility installed to encourage the installation and operation of FGD facility.
  - However, this price premium was provided for FGD-equipped power plants regardless of FGD performance, creating an incentive for power plants to install low-cost, poor-quality FGDs in order to obtain the price premium, but not to operate the FGD (Schreifels et al., 2012).
  - When NDRC conducted field inspections in July 2006,"up to 40% of those generation units with FGD facility did not use it".
  - Even if the installed FGD facilities were running, they do not run continuously and reliably. MEP field inspections in early 2007 found that less than 40% of the installed FGD were running continuously and reliably (Xu et al., 2009).

Implementation holds the key [3]

- This does not apply to power generation alone. MEP field inspections in early 2013 found 70% of the desulphurization facility installed in iron and steel plants in Hebei province were not running continuously and reliably. Some plants stopped running the desulphurization facility at 8 pm and then started its operation at 8 am, illegally discharging SO emissions in the evening (Wang and Wei, 2013).
- Even more alarming is that coal-fired plants were supposed to emit 1.44 million tons of SO_2 emissions in 2012 if they complied with the new emissions standards that took into effect in the beginning of 2012, but they actually emitted 8.83 million tons of SO_2 emissions, based on the data released from the MEP.
- With more than 90% of coal-fired generation capacity already equipped with FGD, the government desulphurization policy should switch from mandating the installation of FGD to focusing on enforcing units with FGD in operation through on-line monitoring and control.

Implementation holds the key [4]

- There are encouraging signs that the Chinese government is taking efforts towards this direction.
  - When requiring CEMS at coal-fired power plants in May 2007, NDRC and MEP modified the price premium to address FGD performance, basing the electricity price premium on FGD operation and performance.
  - The revised policy continued to provide a price premium for power plants operating FGDs, but a penalty of 0.015 RMB/kWh is imposed for plants operating FGDs between 80-90% of total generation, and a penalty of 0.075 RMB/kWh for plants operating FGDs less than 80% of the time. Regardless of the duration of FGD operation, all plants were ordered to return the compensation for their desulphurization costs in proportion to the time when their FGD facilities were not in operation (NDRC and MEP, 2007; Xu, 2011).

Implementation holds the key [5]

- There are encouraging signs that the Chinese government is taking efforts towards this direction.
  - In its 2008 assessment of the total volume reduction of major pollutants, MEP (2009) found that FGD facilities of 5 coal-fired power plants are either in improper operation or their on-line monitoring and control data are false. They were ordered to return the compensation to their desulphurization costs in proportion to the time of their FGD facilities not in operation and to make necessary adjustments in the specified period.
  - Based on its 2012 assessment of the total volume reduction of major pollutants in all provinces and eight central SOEs, MEP issued the penalty on 15 enterprises involving improper operation of their desulfurization facilities and monitoring desulfurization data falsification. These enterprises were ordered not only to return the compensation for their desulphurization costs in proportion to the time when their desulfurization facilities were not in operation, but also had to pay a fine up to five times that the compensation amount they received (Qin and Qi, 2013).

China's energy and GDP revisions: Implications for its existing energy-saving goal in 2010 and proposed carbon intensity target in 2020

- China's proposed carbon intensity target not only needs to be seen as ambitious, but more importantly it needs to be credible.
- Ascertaining this credibility needs to know whether the claimed carbon emissions reductions are real.
- As long as China's pledges are in the form of carbon intensity, the reliability of both emissions and GDP data matters.
- With the fixed CO2 emissions coefficients, the reliability of emissions data depends very much on energy use data.
- The preliminary figures for total energy use in 1999-2001 were revised upwards by 8-10%, driven by upward revisions of 8-13% made to the coal consumption figures. In recent years, preliminary figures for energy use are almost the same as the final reported ones.
- GDP figures are even more crucial to the impacts on the energy or carbon intensity than are energy and emissions data.

Preliminary and Final Values for Total Primary Energy Consumption and Coal Consumption in China, 1990-2008

Year	Total primary energy consumption			Total coal consumption		
	Preliminary value (Mtce)	Final value (Mtce)	Adjustment (%)	Preliminary value (Mtce)	Final value (Mtce)	Adjustment (%)
1990	980.00	987.03	0.7	740.88	752.12	1.5
1991	1023.00	1037.83	1.4	777.48	789.79	1.6
1992	1089.00	1091.70	0.2	815.66	826.42	1.3
1993	1117.68	1159.93	3.8	813.67	866.47	6.5
1994	1227.37	1227.37	0.0	920.53	920.53	0.0
1995	1290.00	1311.76	1.7	967.50	978.57	1.1
1996	1388.11	1389.48	0.1	1041.08	1037.94	-0.3
1997	1420.00	1377.98	-3.0	1043.70	988.01	-5.3
1998	1360.00	1322.14	-2.8	973.76	920.21	-5.5
1999	1220.00	1338.31	**9.7**	818.62	924.77	**13.0**
2000	1280.00	1385.53	**8.2**	857.60	939.39	**9.5**
2001	1320.00	1431.99	**8.5**	884.40	955.14	**8.0**
2002	1480.00	1517.97	2.6	978.28	1006.41	2.9
2003	1678.00	1749.90	4.3	1125.94	1196.93	6.3
2004	1970.00	2032.27	3.2	1333.69	1381.94	3.6
2005	2233.19	2246.82	**0.6**	1538.67	1552.55	**0.9**
2006	2462.70	2462.70	**0.0**	1709.11	1709.11	**0.0**
2007	2655.83	2655.83	**0.0**	1845.80	1845.80	**0.0**
2008	2850.00*			1957.95*		

A reduction in China's energy intensity: preliminary value versus final value (%) (Zhang 2010)

Year	Preliminary value (%)	Revised value (%)	Re-revised value (%)	Final value (%)	**Differential between preliminary and final values (%)**
2006	1.23 (March 2007)	1.33 (12 July 2007)	1.79 (14 July 2008)	2.74 (15 July 2010)	**122.8**
2007	3.27 (March 2008)	3.66 (14 July 2008)	4.04 (30 June2009)	5.04 (15 July 2010)	**54.1**
2008	4.59 (30 June 2009)	5.20[b] (25 Dec.2009)		5.20 (15 July 2010)	**13.3**
2009	3.98 (March 2010)	3.23 (15 July 2010)	3.61 (15 July 2010)		

The reliability of local energy data

- Concern about the reliability of energy data does not only occur at national level. In fact, it is even a big issue at local levels. The limited capacity and rampant data manipulation have turned the compilation of local energy statistics into a numbers game. Also, local governments overstate their GDP.
- NDRC reported that from 2011 to 2012, national energy intensity declined by 5.5% according to data from the NBS. By contrast, national energy intensity declined by 7.7% based on aggregated local statistics during the same period (NDRC, 2013a). Local governments have overstated their achievement in energy conservation by 40%.
- Because of the mismatch between local and national statistics, even if each region claims to have met its energy saving goal, China would still fail to meet the national target. Local governments based on unreliable local energy statistics perceive to have a better perspective for the attainment of their energy saving goals. Therefore, they do not feel the same level of urgency and pressure as the central government. This is seriously undermining the attainment of the national energy saving target.

Concluding remarks [1]: Is China's current rush to lunch CT prudent?

- Harmonization of design to help linkages across Chinese provinces and countries
  - all existing emissions trading schemes are operating under the given condition of a mature market economy.
  - China is expected to be the world's largest carbon market.
  - Underestimates of potential challenges

Concluding remarks [2]: China does need carbon/environmental taxes to level the playing field

- CTS will be initially implemented in few regions. Even in the regions where CTS are to be implemented, they will not cover all the sectors.
- The differing timing provides an impetus for introduction of environmental taxes to level the playing filed
  - between the sectors covered and those sectors not covered in the regions of operating CT and
  - between the regions with and without the operation of CT-- environmental taxes can be imposed on those sectors that are not covered by emissions trading and are implemented in the regions that don’t implement emissions trading.
- As such, environmental taxes will integrate regions of no CT and sectors not covered by CT together.
- Given that China has not levied environmental taxes yet, it is better to introduce environmental taxes first, followed by carbon taxes, not least because such a distinction will enable China to disentangle additional efforts towards carbon abatement from those broad energy-saving and pollution-cutting ones.