China’s Role in Global Emissions

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Outlines

1. What changes are happening in China?
   - Leadership, economy, environment, climate change, and energy policies
2. Overview of Chinese energy
3. Low carbon transition has started
4. Factors that may influence future emissions
5. China’s export and global emission peaking
New Leadership and Great Changes

- Vision: The Chinese Dream, to achieve the Chinese nation’s bright prospect on the road to revival
- Political theory-"four comprehensives": building a moderately prosperous society, deepening reform, advancing the rule of law and strictly governing the party
- Impressive anti-corruption movement
- Economic theory: "A new normal of China's economy has emerged with several notable features," the President said. International relations: ‘One Belt and One Road’ project and Asian Infrastructure Investment Bank
- Ecological civilization: beautiful China

President Xi Jinping
New Normal: Slowed Economy and GDP Growth Rate
A Chinese Couple Wears Protective Masks While Going around the Tiananmen Square on December 7, 2013 (Left)

Left: from EPA

Right: from internet
Energy Policy

“Energy supply and consumption revolution should be adopted a national strategy in the long run, focusing on

- energy savings and total amount control of energy consumption,
- developing a multiple energy supply system,
- upgrading the energy industry,
- reintroducing market mechanism,
- utilization of international energy resources based on more international collaboration.”

by Xi Jinping, in the 6th meeting of the central leading group in finance and economy, June 13, 2014
The signals are clear – but contradictory. China has embraced the concept of climate change and is allowing officials to discuss the risks openly. Two weeks ago Zheng Guogang, head of the Chinese metereological administration warned of droughts, rainstorms and the threat to major infrastructure projects. He could not have spoken without permission.

But at the same time economic growth remains the prime objective of Chinese policy and growth requires the consumption of ever greater volumes of primary energy, led by coal.

There are two key points on the agenda. The first is the challenge to corruption which has been embraced by President Xi Jinping. The crackdown that he has initiated continues and seems to be moving systematically through one state institution after another.

The second is the challenge over the environment, an issue long neglected by the Communist party. This is less about the high level debate on climate change and much more about the quality of the urban environment in which a majority of China’s 1.3bn people now live.

Mr Xi, who is clearly China’s strongest leader since Deng Tsiao Ping, is tackling the first challenge with harsh vigour, and I would not be surprised to see a similar approach to the second.
Can China Change Its Energy Policy?

Nick Butler

- China’s energy policy, now there is the prospect of a very significant shift that would have global implications.
- Shifting to a new energy mix takes time but the process has begun. Solar and wind, Nuclear power, shale gas, etc.
- The most likely short-term changes are a shift to gas, tighter regulations on low level emissions and some relocation of power generation and industrial activity away from the major cities.
- Regulation is the second obvious strand of policy, although in contrast to the President Barack Obama’s plans in the US, the aim will be to limit the emissions from coal-fired plants rather than driving them out of business.
- More intriguing is the possibility of relocating activity.
- Transmission projects that are now under construction. Up to 70 new coal-fired plants to be built in western China will be linked to the main cities in the east.
That is an important step but in itself will not lift the smog that hangs over the city. A more fundamental relocation of the energy intensive industries which still burn coal is necessary and may now be on the agenda.

China is now so central to the global energy market that whatever is done will send waves around the world. My bet is that we are about to see the Chinese government make a very serious move to limit coal use – with peak coal coming much sooner than the usual predictions suggest. Any advance in the technology of renewables anywhere in the world will be seized upon and applied. Gas imports will continue to grow. In each case global markets and prices will be affected. The policy will put great pressure on India which will soon inherit the unwanted title of the world’s largest single source of emissions.
Chinese Energy in the World Context

China share in world energy consumption

World Energy Mix in 2012

Energy mix: World vs. China
Oil and Coal Consumptions in China

Crude oil consumption in China / Mt

- **domestic**
- **import**

Coal Consumption in China / Gt

Coal import & export / Mt

- **Import**
- **Export**

Source: China National Statistical Bulletin 2013
Transportation Demand Drives Oil Demand

Source: China National Statistical Bulletins

### Passenger transport in China (100M person.km)

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### Freight transport in China (100M ton.km)

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### Annual Car Production / million

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### Car ownership / Million

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Source: China National Statistical Bulletins
2010 oil flow in China

© Tsinghua BP Clean Energy Center
Natural Gas Consumption in China

- Total NG supply: 400bcm @ 2020
- Tight gas: 30bcm @2012, 100bcm @2030
- Shale gas: 0.2bcm @2013; 6.5 bcm @2015; 30bcm@2020

In 2012: city gas 35%, industry fuel 26%, chemical production 23%, power/heat generation 16%
China Power Industry in 2014

**Installed power capacity / GW**

- 1,359 GW @ 2014

**Wind, solar and nuclear power / GW**

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<th>Year</th>
<th>Solar</th>
<th>Wind</th>
<th>Nuclear</th>
<th>Thermal</th>
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<td>2009</td>
<td>0.02</td>
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<td>9.08</td>
<td>16.13</td>
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<td>2010</td>
<td>0.45</td>
<td></td>
<td>10.82</td>
<td>31.07</td>
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<tr>
<td>2011</td>
<td>2.14</td>
<td></td>
<td>10.82</td>
<td>46.92</td>
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<td>2012</td>
<td>3.28</td>
<td></td>
<td>12.57</td>
<td>60.83</td>
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<td>2013</td>
<td>14.79</td>
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<td>14.61</td>
<td>75.48</td>
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<td>2014</td>
<td>26.52</td>
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<td>19.88</td>
<td>95.81</td>
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**Coal power fleet efficiency / LHV%**

- Linear increase from 2001 to 2014

**Annual coal power generation utilization hours**

- Linear decrease from 2004 to 2016
Low Carbon Transition Has Started, though Slowly

**CO2 emissions of China / Mt**

- **Source:** BP World Energy Statistical Review 2013

**Carbon intensity change relative to 1990**

- **CN:** 0.429321341
- **US:** 0.620378103
- **World:** 0.848668967

**Change of energy mix / %**

- **Share in total primary energy**

**growth rate: coal/gas/non-fossil power**

- **Coal**
- **Gas**
- **Non-fossil**
China’s economic growth has come on the back of unparalleled coal use, unbreathable air and the unenviable title of being the world’s biggest greenhouse gas emitter.

So as it prepares to launch its first pilot carbon market on Tuesday, there is intense speculation about the scheme’s likely impact, both domestically and whether it boosts China’s support for a binding global treaty to lower carbon emissions.

The pilot is in the economically thrusting city of Shenzhen, across the border from Hong Kong, one of seven testing grounds Beijing picked in 2011 to try out emissions trading before deciding whether to launch a national system from 2015.

Source: Financial Times, 13-06-17
Yanshan Petrochemical paid a power plant **RMB one million** for a **20,000 ton quota of carbon dioxide emissions**, on November 28, 2013. This marked the official launch of the Beijing Carbon Trading Market. What's more, it signaled that "energy conservation and emission reduction" has moved on from being just a slogan to become a key issue, encompassing profits, cash flow and investment.

The Beijing Carbon Trading Market is one of seven pilot markets in China. In June 2013, China's first carbon market was officially launched in Shenzhen, followed by Shanghai, Beijing, Guangdong Province, and Tianjin – all in the last quarter of 2013. They started a carbon-emission trading system in China from scratch.

Su Wei told China Today that the central government is studying the experience of the seven pilot markets to establish a national market, striving for completion in the 13th Five-year Plan period (2016-2020).
Great Efforts for Emission Peak around 2030

- National Energy Administration of China estimates an average energy growth rate of 3.4% before 2020 and 2.3% before 2030.

- Accordingly, total primary energy demand will be ~4500 Mtoe by 2030 (20% of total energy demand will be 900 Mtoe).

- 20% of non-fossil energy reduction promise by 2030 could mean the addition of 800-1000GW power generation capacities with

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<th>nuclear</th>
<th>hydro</th>
<th>wind</th>
<th>solar</th>
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<tr>
<td>Capacity/GW</td>
<td>140-160</td>
<td>100</td>
<td>300-320</td>
<td>200-400</td>
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Coal Flow in Chinese Economy

Simplified Coal Flow Diagram, China, 2010
Unit: 100 million tce

Power, Metallurgy, Building Material, Chemicals
电力，冶金，建材，化工
Mineral Resources per capita: 550kg steel, 1700kg cement
Peaking of Metal Demand will Reduce Coal Need Significantly

- In 2014, coal consumption decreased by 2.9%, compared to 2013.
- The main task of coal development is to make coal use more efficient and cleaner within a controlled total amount.

Trends of China’s mineral resources demand

- Crude steel: peak ~ 2015
- Copper: peak ~ 2025
- Aluminum: peak ~ 2020

Source: 王安健等, 2010. 矿产资源需求理论与模型预测, 地球学报 31(2):137-147
**Installed capacity from 2011 to 2050**

**Inter-region power transmission by 2050**

![Graph showing installed capacity from 2011 to 2050](image1)

- pv
- bm
- wd
- hd
- nu
- ngcc
- igccc
- igcc
- pcc
- pc

![Map showing inter-region power transmission by 2050](image2)
From Coal to Liquid Fuels and Chemicals

Ethylene Production / Mt

Planned coal to chemical capacity up to 2020

- Synthetic Natural Gas: 50bcm
- Coal To Liquid: 30Mt
- Methanol To Olefin: ??
- Concerns: CO\textsubscript{2}, smog, coal resources
- Coal gasification technologies needed
China Exports Renewable Power and Steam Power Equipment

- In the past four years, China did export 60GW of steam turbines and generators, and 46GW of coal boilers.
- But, they are more efficient compared with local small and low efficiency equipment that could otherwise be used. Carbon emissions are actually reduced.

- Furthermore, besides steam power equipment, 17GW hydro-, nuclear, and wind power equipment were also exported.
China Also Exports High-speed Rail Technologies
Thanks!