Meeting China’s Climate Goals

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China-U.S. climate agreement (Nov. 2014) and China’s INDC (June 2015).

China is shifting to a new normal, with slower, more sustainable growth.

Air quality remains a major problem, affecting human health and the economy.
How to balance?

Human Development

Industrial Development & Resource Needs

Global Climate Change

Local Pollution

www.china.org.cn

www.flickr.com

www.wikimedia.org

www.globalchange.mit.edu
China’s energy system: A snapshot

By primary energy type

By end-use sector

Coal use by sector

Role in Asian energy demand

Peak coal?

Million tons of coal consumption - China total

Source: China Energy Statistical Yearbooks.
Electricity demand growth is slowing

China's electricity consumption - TWh

12%/yr  3.8%/yr

Source: China Energy Statistical Yearbooks.
Objective:

Assess future energy use and CO₂ emissions under new assumptions...

- Emissions trading (carbon pricing)
- New efforts to control coal use
- Non-fossil energy subsidies (FIT)
- Energy price reform
- “New normal” economic growth

Used CECP China-in-Global Energy Model (C-GEM).

Source: Zhang, Karplus et al., 2015.
For this analysis we use the China-in-Global Energy Model: C-GEM

A new model for assessing the domestic and global impact of energy and climate policy in China

- 18 sectors from GTAP database & China national input-output and energy balance tables.
- Detailed representation of energy-intensive sectors.
- 19 countries and regions

Basic model structure:

Primary Factors – Capital, Labor, Resources

Income

Goods and Services

Expenditures

Key features:

- Detailed representation of the energy-intensive sectors (iron & steel, non-ferrous metals, non-metallic minerals, chemicals & rubber, and other ferrous manufactured products).
- China data: combined domestic economic and energy data source for China.
The size of China’s economy (GDP) is projected to grow around six times in real terms between 2010 and 2050.
### Three policy scenarios analyzed in the *Outlook*

<table>
<thead>
<tr>
<th>Measures</th>
<th>No Policy</th>
<th>Continued Effort</th>
<th>Accelerated Effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions trading system (reduce carbon intensity)</td>
<td>Carbon price required to achieve CI reduction (~3%/year, $30/ton in 2035 and $73/ton in 2050)</td>
<td>Carbon price rises to achieve CI reduction (~4%/year, $55/ton in 2035 and $126/ton in 2050).</td>
<td></td>
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<tr>
<td>Fossil resource tax</td>
<td>Crude oil/natural gas: 5% Coal: 8 CNY/ton (~$1.2/ton)</td>
<td></td>
<td>Crude oil &amp; Nature gas: 8% Coal: 10%</td>
</tr>
<tr>
<td>Feed-in tariff for wind, solar and biomass electricity</td>
<td>FIT at current rates (wind: 0.51–0.61 CNY/KWh, solar: 0.90–1.00 CNY/KWh, biomass: 0.75 CNY/KWh)</td>
<td>FIT at current rates, scaling costs are lower than <em>Continued Effort</em> assumption</td>
<td></td>
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<tr>
<td>Hydro resource development</td>
<td>Achieve the existing target of 350 GW in 2020 and slowly increase to its economic potential of 400 GW by 2050.</td>
<td></td>
<td>Same as the <em>Continued Effort</em> assumption.</td>
</tr>
<tr>
<td>Nuclear power development policy</td>
<td>1) 40 GW in 2015 and 58 GW in 2020. 2) Assumes site availability of 160 GW.</td>
<td></td>
<td>1) Same as the <em>Continued Effort</em> assumption. 2) Assumes site availability of 400 GW.</td>
</tr>
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</table>

*Continued Effort* and *Accelerated Effort* scenarios represent alternative levels of policy stringency.
The **Accelerated Effort** scenario shifts away from coal toward cleaner low carbon energy sources.
## Peak Years and Amounts

<table>
<thead>
<tr>
<th>Quantity</th>
<th>No Policy</th>
<th>Current Policy</th>
<th>Accelerated Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak Year</td>
<td>Amount</td>
<td>Peak Year</td>
</tr>
<tr>
<td>Coal consumption</td>
<td>&gt;2050</td>
<td>&gt;189 EJ</td>
<td>2030</td>
</tr>
<tr>
<td>Energy-related CO$_2$ emissions</td>
<td>&gt;2050</td>
<td>&gt;21 bmt</td>
<td>2040</td>
</tr>
</tbody>
</table>
Major uncertainties

- Economic growth – slower growth will lead to an earlier peak.
- Cost and availability of low carbon technology.
- Policy decision to develop coal-to-gas and coal-to-liquids technology.
- Natural gas price – depends on regional integration of natural gas markets.
- Energy intensity of rising household consumption.
Thank you
谢谢!