The Chinese Coal Value Chain & Climate Change

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October 27th, 2011
Presentation Outline

• Background of China’s Energy Sector
• Chinese Coal Value Chain & Challenges
• Coal Project at Carnegie Endowment
China as a Hybrid Economy

- In 2010, China passed Japan as the 2\textsuperscript{nd} largest economy.
- Per capita GDP of China < half of world average & 10\% of US.
- Pattern of wealthy government vs. relative poor people will last.

Driver Underlying Global Energy Trend

- China & US are leading energy consumers.
- Energy mix of US is similar to the world average.
- China consumes too much coal, too little oil, gas, nuclear and renewables.
- Convergence of primary energy mix is a key global energy driving force.

Share of Global Energy Supply: China vs. US

Targeting Chinese Coal is Key to Climate Solutions

- In 2006, China passed US as the leading carbon emitter.
- In 2009, emissions from Chinese coal comprised 20% of global carbon emissions, an amount greater than total US emissions.

Nuclear: Aftermath of Fukushima Daiichi

Will China’s nuclear expansion be scaled back?

More pressure on coal in terms of carbon abatement?
Coal Resources

- **China’s Total Coal Resources**: 1,021 Gt, ranking 2\textsuperscript{nd} in the world after Russia.
- **Proven Coal Reserves**:

<table>
<thead>
<tr>
<th>Country</th>
<th>Gt</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>237</td>
<td>25.6</td>
</tr>
<tr>
<td>China</td>
<td>182</td>
<td>19.6</td>
</tr>
<tr>
<td>Russia</td>
<td>157</td>
<td>16.9</td>
</tr>
<tr>
<td>World</td>
<td>928</td>
<td>100.0</td>
</tr>
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Source: MLR, CNCA and BP (2010).

Characteristics of coal resource distribution determines pattern of coal transport in China.

Source: Tu (2011).
Coal Production in China

Coal Output (Gt)
- Under-reporting
- TVE Mines
- Local State Mines
- Key State Mines

Coal Transport Pattern

Coal Imports

- **Northwest China**: P 3.8% vs. C 3.2%
- **Jin-Shaan-Meng-Nin**: P 46% vs. C 19%
- **Central South**: P 11.5% vs. C 19.1%
- **Southwest + Tibet**: P 13.4% vs. C 10.2%
- **Northeast**: P 8.7% vs. C 10.5%
- **Jing-Jin-Ji**: P 3.8% vs. 9.7%
- **East China**: P 12.7% vs. C 28.3%

Exports

- **Domestic Marine Transport**
- **Coal Imports**

Source: Tu (2011).
Transport Deters CCS Deployment in China

- CCS can allow China to continue relying on coal to fuel economic development while retarding spiking carbon emissions.
- GreenGen & Shenhua CTL CCS are two examples of CCS demonstration in China.
- Carbon capture, utilization & storage is the recent trend in China.
- Energy penalty of CCS poses significant challenges for coal transport infrastructure in China.

Source: Jaccard & Tu (2011).
Coal Consumption by Sector in China

Source: NBS and CNCA.
Installed Power Capacity in China by 2030

Source: Tu (2011).
CTL in China

- Energy security was used as an excuse for coal-to-liquids, coal-to-chemicals development.
- Should CTL be positioned as a backup tech. instead of a energy security strategy?

Source: Shenhua.
Chinese Coal Imports by Country in 2010

Source: China Customs.
Coal Exports peaked in 2003.

China encouraged coal exports.

Source: NBS and China Customs.

Global coal trade is about one third of China’s domestic coal consumption level.

China became a net coal importer in 2009.

Chinese coal imports = carbon tax on global coal trade.

Economic and environmental implications of US coal exports to China.
MRV Challenge – Coal Statistical Distortion

Coal Output (Gt) vs. Discrepancy (%)

- Green: 2010 revision
- Red: 2006 Revision
- Grey: Original Output
- Blue: % of Discrepancy

Monthly Coal Output (Mt)

- Green: TVE Mines
- Red: Local State

Source: Tu (2011) & CNCA.
Safety Challenge

Death Toll (thousands)

Source: Tu (2011).
Coal Project at Carnegie Endowment

- Medium-to Long-term Energy & Climate Solutions - Phase I: Coal Value Chain and Climate Change.
- Focus: coal industry environmental issues, efficiency & safety.
Thank You!