China’s Energy Challenge: Setting the Scene

David Victor
Director, Program on Energy and Sustainable Development, FSI
Professor, Stanford Law School
Affiliated Faculty, Woods Institute for the Environment
Senior Fellow, Council on Foreign Relations
China Dominates New Demand for Energy, Coal and Oil

Increase in World Primary Energy Demand, Imports & Energy-Related CO₂ Emissions in the Reference Scenario, 2000-2006

- Energy demand
- Coal demand
- Oil demand
- Oil imports
- CO₂ emissions

Source: IEA (2007)
China’s National Energy Profile

• Population: 1.3 billion (1.5 billion by 2020)
• 9% annual economic growth rate since 2000
• Urbanization reached 40.5% in 2007 from 17.9% in 1978 and will be 55% by 2020
• Car ownership growing 15% annually since 2000
• Forecasted 3.2 billion tons annual coal production by 2020
• 1000 GW increase in power generation capacity by 2020
• 60% of oil consumption will be imported by 2020
China’s Increasing Share of World GDP

Developing Asia will account for more than half of the GDP growth between now and 2030, China alone for one-third

Source: IEA, WEO 2006

http://pesd.stanford.edu • Stanford University
Change in oil demand by region in the Reference Scenario, 2007-2030

All of the growth in oil demand comes from non-OECD, with China contributing 43%, the Middle East & India each about 20% & other emerging Asian economies most of the rest.
Industrial Users Drive China’s Booming Energy Demand

China’s Primary Energy Demand

Source: IEA WEO2007 Reference Scenario
Global Recession Brings Unprecedented Declines In the Growth of Chinese Power Generation

Growth Rate of Chinese Power Generation

Year on Year Percentage Change by Month

Analysis by Program on Energy and Sustainable Development of data from the National Bureau of Statistics of China. Note: Data gaps are due to lack of official statistics.
China’s Primary Energy Consumption by Fuel

- Coal: 70%
- Oil: 20%
- Hydroelectric: 6%
- Nuclear Energy: 1%
- Natural Gas: 3%

Coal is the Dominant Source of Electricity in China

Source: 2008 data from China Energy Council, 2009
Capital cost of building a Coal-fired power plant in China vs. U. S.

Source: PESD’s interview with experts, not for citation.
Cheap Coal: Average Power Generating Cost of Different Energy Sources in China

Source: China Wind Net, 2008
Cheap Coal Compare to Other Energy Source in Guangdong Province of China

China’s Coal Production

China's Coal Production by Type of Mine

Source: 1967-2006 data from LBL China Energy Databook 2008 v.7

http://pesd.stanford.edu • Stanford University
Main Coal Production Regions of China

Source: Ministry of Land Resources of China
Coal Flow in 2000 of China

China is Increasingly Become a Net Importer

China's Coal Import-Export Balance

Million Metric Tons

Source: McCloskeys
China’s Coal Market Increasingly Linked with International Market

Spot price of Qinghuangdao (QHD) and Newcastle

Source: Newcastle data from Reuters; Qinghuangdao Data from CCTD converted with exchange rate data from NY Fed.
Newcastle coals are 6700 kc/kg, QHD coals are 5800 kc/kg
China Coal Industry and Air Pollution

Source: X. Shi, Can China’s Coal Industry be Reconciled with the Environment, China Dilemma, 2007
High Death Tolls in China’s Mines

Annual Energy-related Carbon Emissions in China have been Growing Rapidly since 2001

Source: Mark Levine, Myths and Realities, 2008.

http://pesd.stanford.edu • Stanford University
Projected Global CO₂ Emissions by Region

2005 Total (inner): 26.6 GtCO₂
2030 Total (outer): 41.9 GtCO₂

Source: IEA WEO 2007
CERs Issued by Host Party

CERs issued by host party. Total 249,764,597

China (42.36%)
Republic of Korea (14.51%)
India (22.64%)
Brazil (11.43%)
Others (5.25%)
Mexico (2.02%)
Viet Nam (1.80%)

Source: http://cdm.unfccc.int/Statistics
Per-capita, China is Still About Average; U.S. is >4x Average

Source: Mark Levine, Myths and Realities, 2008.
China’s CO2 Emission in Reference and High Growth Scenarios

Source: IEA WEO2007
What can the United States do to “engage” China?

• Trade and Technology: Engagement already very high
  – WTO; “clean tech” trade; power plant technologies
• China already single largest player in CDM
  – Yet practical impact appears to be very small
• Opportunities for more “deals” on carbon
  – Power plant efficiency; smarter grids; natural gas
• Faltering world economy is poor context for deeper engagement