Clean Coal: Limitless Global Energy for our Future

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Fredrick D. Palmer
Senior Vice President Government Relations
Peabody Energy
Clean Coal: Limitless Global Energy for our Future

Key Themes

- The world’s current energy capacity is insufficient to support sustained economic growth
- Global coal reserves are ubiquitous and understated
- Coal reserves around the globe are sufficient to provide for centuries of expanded clean coal use to allow more people to live longer and live better
- Carbon capture and storage is the key to unlocking the full value of coal
Peabody is the Largest Private-Sector Coal Company

Source: Most recent company reports and websites, SEC filings and Peabody analysis. Values are on a short-ton basis. Peabody sales and reserves based on 2007 data.
New Demand from Emerging Nations Clash With Realities of Tight Supply

- 3 Billion People Awaken to Modern Energy Use

- 2008 energy supply shocks illustrate the need to more fully deploy clean coal technologies

*China Daily, May 28, 2007*
A Rising Tide as the World Awakens to Modern Energy

**Electricity Usage per Capita**

Electricity usage per capita varies significantly across countries. The graph illustrates the relationship between GDP per capita (in thousand US$) and Megawatt hours per capita. Countries like the USA, Australia, UK, Italy, South Korea, Malaysia, Brazil, Mexico, and China are plotted on the graph. India uses just 1/8th the electricity per capita compared to the USA, and 1/25th compared to India.

**Passenger Vehicles per Capita**

The number of passenger vehicles per 100 people also correlates with GDP per capita. Countries like the USA, Italy, Australia, and the UK are shown on the graph, with India and China having significantly lower numbers compared to these countries.

**Per Capita Electricity Use**

Per capita electricity use is just 1/8th of China and 1/25th of India compared to the U.S. level.

Global Population Growth Trends Require Enormous New Energy Supply

Current U.S. population ~ 300 million
U.S. population in 2040 ~ 400 million
Energy Use Improves U.N. Human Development Index

Life expectancy, educational attainment and income all correlate with per capita energy use.

Societies With Greater Access to Electricity Live Longer and Better

Out of Poverty Study: Energy & Social Progress Closely Linked

25%, 70% and 90% average percent of population with access to electricity.
Coal’s Contribution to China is Model for Developing World

Electrification in China ‘Remarkable Success Story’

– International Energy Agency

- Access to electricity increased 76%
- GDP increased 300%
- Irrigated land increased 9%
- U.N. Human Development Index increased 22%

- Food production index increased 88%
- Steel production increased over 300%
- Concrete production increased 250%

- Poverty decreased 45%
- Undernourished population decreased 25%
- No access to improved sanitation decreased 27%
- Infant mortality declined 39%

Coal accounted for 65% of the increase in energy production from 1990 – 2005

Enhancing Progress  
Strengthening the Backbone  
Creating Hope
The World is Consuming More Oil Than it is Finding

New Finds Less Prolific Than First Finds

Iran, Russia, Qatar, Algeria and Indonesia Have Announced an LNG Cartel

Most Gas Reserves are in the Middle East and Asia

LNG is a Global Commodity, Priced Off of Oil Benchmarks
The Long Run Price of NG/LNG in a Peak Oil World

"Oil prices are not going to come down to gas prices, but gas prices will get closer to oil."

– Dr. R. Bertani  
Former President Petrobas America

Source: Adapted from "The Relationship Between Crude Oil and Natural Gas Prices," Hartley et al, Rice University, 2007.
The World is Increasingly Turning to Clean Coal

It took the United States half a century to build its coal-fueled plant fleet… China will build half of U.S. capacity in just two years.
Coal Comprises 60% of Global Energy Resources

... And 85% of U.S. Fuel Resources

... And 50% of U.S. Electricity

Coal Has Been the World’s Fastest-Growing Fuel for Each of the Past Five Years

Global Coal Demand Grows 1.5+ Billion Tons in 6 Years

Compound Annual Growth Rate

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>2001-2007 Change</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear</td>
<td>4%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Oil</td>
<td>11%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Hydro</td>
<td>19%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>19%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Coal</td>
<td>35%</td>
<td>5.1%</td>
</tr>
</tbody>
</table>

How Does the World Add 250 Million Tons of Supply Per Year?

Future World Coal Demand Growth Likely to be Greater Than the Past

72% Growth in World Coal Consumption (Versus 48% 1980 – 2004)

Coal Gasification, Coal-to-Liquids and Power Demand Drive Global Coal Growth

EIA/IEA Expected Coal Demand Increase of 4.5 Billion TPY in 2030 to 11 Billion TPY

Platts: 660,000 MW of New Coal Plants in 75 Countries with Coal Use of 2.3 Billion TPY within 10 Years

Growth through 2030. Amounts in million short tons.
Clean Coal Technologies Provide the Path for Affordable & Adequate Energy Supplies

- **Coal-to-Liquids** – CTL with CCS can produce better fuels at the same rate of CO₂ emissions as imported oil. Adding biomass increases cost but improves CTL’s carbon footprint.

- **Coal-to-Gas** – Coal can be gasified to create NG for power plants and the CO₂ can be captured and stored. SNG from coal with CCS has better footprint than LNG.

- **Coal-to-Electricity** – New “supercritical” clean coal plants emit 15% less CO₂. FutureGen-type plants would have near-zero emissions.
The Technology Path to Near-Zero Emissions from Coal

New Supercritical Plants and CCS Demonstration Essential

- Advanced Supercritical Combustion Plants
- Demonstrating Carbon Capture/Storage
- Commercial CTG/CTL with CCS
- Commercial IGCC with CCS
- Retrofitting PC Plants with CCS

2007  2010  2020  2030
The Enabling Technology: Carbon Storage

Dozens of Carbon Capture and Storage Projects Planned Around the World

Source: Scottish Centre for Carbon Storage, School of Geosciences, University of Edinburgh.
GreenGen Recognized on the World Stage for Advancing Clean Coal With CCS

- Partner group led by China Huaneng Group, one of the world’s top 10 power companies
- Multi-phase commercial project includes IGCC plant with carbon capture for EOR
- Project quickly progressing and leads the world advancing clean coal solutions
“We’ll Invest in Technology That Will Allow Us to Use More Coal”

– President-Elect Barack Obama

Administration Pledges $150 Billion Over 10 Years for Clean Energy

- New Administration targets $15 billion in annual clean energy investments
- Five first-of-a-kind commercial coal plants with carbon capture and storage targeted with U.S. Department of Energy
- Greater use of coal has tremendous U.S. support: Nearly 70% of Americans believe coal is a fuel of the future

Image Courtesy: Transplanted Mountaineer

72% of Americans support using coal to fuel electricity… change we can believe in
Peabody is the Global Leader in Clean Coal Solutions

Advancing Signature Climate Projects in U.S., China and Australia

BTU is the only non-Chinese equity partner in GreenGen, China’s centerpiece commercial climate initiative.

BTU is a long-standing supporter of the Vision 21 and FutureGen clean coal projects.

BTU is a member of Australia’s COAL21 Fund to advance near-zero emissions through technologies such as oxyfuel.
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