US Coal: A Stranded Asset Ready for Export?

IEA Outlook for Coal Industry and Markets

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Agenda

• **Part 1:** Cheap gas and environmental regulation constrain coal’s growth in the US

• **Part 2:** Possible major expansion of US exports from the Powder River Basin
• **Part 1:** Cheap gas and environmental regulation constrain coal’s growth in the US

![US Shale Gas Production is Expanding Rapidly](image)

**US Shale Gas Production by Shale**

- Eagle Ford
- Marcellus
- Haynesville
- Woodford
- Fayetteville
- Barnett
- Antrim

Source: EIA, Howard Gruenspecht, Lippman Consulting
US Gas Production Will Continue to Grow

Historical and Projected US Gas Production by Source

- Net Imports
- Shale Gas
- Non-associated Onshore
- Non-associated Offshore
- Tight Gas
- Coalbed Methane
- Associated with Oil


Gas Production Growth Drives Lower Gas Prices

Henry Hub Natural Gas Prices
The Merit Order is Shifting: coal is losing market share to gas

Source: US EIA.

Regulatory Challenges Further Impede New Coal Build

- **Key non-GHG regulations add prohibitive costs**
  - Clean air transport rule
  - Title 3 mercury rules
  - Ash disposal requirements

- **New EPA regulation of GHGs under Clean Air Act**
  - Massachusetts v. EPA defined GHGs as an “air pollutant”, giving EPA authority to regulate carbon in 2007
  - New GHG rules for large emitters phase-in starting Jan. 2011
  - But Republicans in Congress are attempting to repeal EPA GHG authority
Result: US coal build is stagnant

US EIA projects that no new coal capacity will be built from 2015-2035 except CCS demonstrations

Footnote: 6.6 GW new coal capacity commissioned in 2010 – the most in 25 years. But this capacity was planned before the shale gas boom when gas prices were higher.
• **Part 2:** Possible major expansion of US exports from the Powder River Basin

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**Major New Plans for PRB Exports**

Arch and Peabody have proposed new ports to export up to 84 mt of coal from the US west coast

- Powder River Basin produced 455 million short tons in 2009
- Abundant, cheap reserves
- New ports could supply Asia with cheap, low-sulfur coal
Stanford Coal Trade Model: PRB Export Scenarios

- Stanford PESD has developed an economic model of the world steam coal trade
  - Key features:
    - 2009 data represents global demand, production, and infrastructure
    - Results show energy adjusted global trade flows and prices

- 3 PRB Export Scenarios
  - **Base Scenario**: models 2009 market conditions
  - **Proposed Port Scenario**: models impact of PRB exports with 84 mt new export port capacity
  - **Unconstrained PRB Exports Scenario**: models PRB exports with no port constraints

Note: Legal and permitting challenges may constrain port development below 84 mt. The first version of the model developed in collaboration with DIW Berlin.
Key Impacts of Proposed PRB Exports on Global Coal Markets

Net Change in Supply into Asian Market (Mt) (Base Freight Rate)

Indonesia: least impacted by new entry of PRB supply.
US_West: China imports more coal as domestic production falls.
Chinese Imports: PRB coal has lower heat content per ton.
Russia: Australian exports are steady but shift to other Asian consumers as PRB supplies Japan.
Japanese Imports: Japanese imports increase because PRB coal has lower heat content per ton.

Note: "Proposed E_cap" represents a port constraint of 84 mt from the US west coast.

PRB Exports Highly Sensitive to Freight

Exports From Western US in 2009 with No Export Constraint (Mt)

Cost of Freight from US West Coast to Guangzhou ($/metric ton)

Note: This model run allows the US to switch to gas as PRB prices escalate.

http://pesd.stanford.edu • Stanford University
US Prices Increase and Asian Prices Decrease

Thank you

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Stanford’s modeling team Michael Miller and Zhe Zhang also contributed to this presentation.