Market Opportunities for Coal Preparation

National Commission on Energy Policy
-Coal Study-

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Market Sectors for Coal Preparation

- Environment
- Operations
- Advanced Fuels
The Domain of Coal Preparation

- Selective mining
- Crushing
- Sorting & blending (quality control)
- Cleaning
- Milling
- Drying
- Fuel preparation (slurry)
Environment Driven Markets

- Pre-combustion Treatment
  - $SO_2$ reduction
  - $NO_X$ reduction
  - Mercury reduction
  - $CO_2$ reduction
  - IGCC
Operations Driven Markets

- Selective Mining
- Thin-seam and Waste Coal Recovery
  - Dry Cleaning
  - Wet cleaning
Advanced Coal-Based Fuels

- Utility Fuels
  - Optimized Fuels - Clean and Dry
- Industrial Fuels
  - Natural Gas Replacement
  - Slurry Fuels
  - Micronized Fuels
- Transportation Fuels - Advanced Coal Slurry
  - Marine & Locomotive
  - Light Transport
  - Automotive
SO$_2$ & NO$_X$ Reduction

Good Progress over the last 2 decades
SO$_2$ & NO$_X$ Reduction

- SO$_2$ can be reduced by cleaning and fuel switching, but future reductions will be attributable to more scrubbing.
- Cleaning, switching, and fuel preparation (milling) can reduce NO$_X$ somewhat, and cleaning can reduce catalyst poisoning, but post-combustion treatment is more important.
Mercury Reduction

• Cleaning can reduce mercury by more than 50% in many eastern and western coals and lignites, excluding southern PRB coals
• Thermal Processing (K-Fuel) can achieve high (70%) mercury reductions in many western coals, including southern PRB coals
• Most attention focused on post-combustion methods
CO$_2$ Reduction

- Cleaning, drying and fuel preparation can reduce CO$_2$/MWh through improved efficiency, but sequestration or enhanced oil recovery can provide major reductions in CO$_2$ emissions
- High auxiliary power for processing and compressing CO$_2$ for injection
  - Reduced generation efficiency
  - Higher power costs
  - Unproven technology
IGCC

IGCC is seen as a more environmentally friendly coal generation technology, especially when combined with CO$_2$ sequestration

- Coal cleaning and drying can improve gasifier performance
- Feed slurry preparation to maximize energy content of slurries
  - Milling to optimize particle packing, rheology, combustibility
  - Additives to improve solids content and rheology
  - Drying to improve slurry energy content with high inherent moisture coals
Selective Mining

- Mining companies employ selective mining routinely
  - Bypass thin or low quality seams
  - Selectively remove low quality top and bottom coal
- 5% to 20% of coal resources are lost due to the limitations of mining technology
Thin-seam and Waste Coal Recovery

- Wet and dry cleaning technology is being employed in the west to recover thin seams and waste coals
- Dry (pneumatic) cleaning is being used where water is unavailable, or would offset energy gains from ash reduction
Advanced Utility Fuels

• Utilities that have traditionally burned raw coal are looking at cleaning and drying coal to increase generation and reduce emissions

• Payback
  – Increased generating revenues
  – Increased availability
  – Value of emissions allowances
Advanced Industrial Fuels

- Natural Gas: $7.00/MBtu
- Coal: <$2.00/MBtu
- Kilns, dryers, boilers
- Extra-clean micronized fuel
- Extra-clean slurry fuel
  - Milling technology
  - Fine particle cleaning & drying technology
  - Fuel distribution technology
Advanced Transportation Fuels

- Diesel: $20/MBtu
- Slurry-based fuels
  - Advanced milling technology
  - Ultra-clean coal
  - Additive technology
  - Engine development
  - Fuel distribution
  - Development underway