Illinois Clean Coal Institute
Center for Coal Technology Research
Advisory Meeting
June 5, 2007

Discover the Power
OCD Program Funding

Coal Technology Dev. Assistance Fund
- Coal Research & Development Program
- Coal Competitiveness Program
- Coal Education & Marketing Program

Coal and Energy Development Bond Fund
- Coal Technology Demonstration Program
- Coal Revival Program
<table>
<thead>
<tr>
<th>DCEO Program</th>
<th>$ Spent to Date</th>
<th>$ Leveraged to Date</th>
<th>FY2007 Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal Research and Development (ICCI)</td>
<td>$72.7 M</td>
<td>$9.2 M</td>
<td>$4.2 M</td>
</tr>
<tr>
<td>Coal Technology Demonstration</td>
<td>$146.3 M</td>
<td>$752.7 M</td>
<td>$4.9 M</td>
</tr>
<tr>
<td>Coal Competitiveness</td>
<td>$126.7 M</td>
<td>$837.2 M</td>
<td>$16.0 M</td>
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<tr>
<td>Coal Revival</td>
<td>$0</td>
<td>$0</td>
<td>$50.0 M</td>
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</tbody>
</table>
Funded R&D Projects

- FY01
- FY02
- FY03
- FY04
- FY05
- FY06
- FY07

$ million

- Total Funding
- ICCI Funding

FY01: $2
FY02: $2
FY03: $4
FY04: $8
FY05: $4
FY06: $16
FY07: $16
Research and Development Areas

- Coal Gasification, Hydrogen Production and other Coal Utilization Processes
- Carbon Management
- Coal Bed Methane Production
- Coal Residuals Management
- Advanced Coal Mining Technologies
- Coal Preparation and Other Production Business Practices
Coal Gasification, Hydrogen Production and other Coal Utilization Processes

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Coal Gasification, Hydrogen Production and other Coal Utilization Processes

Major Factors Affecting Program

- FutureGen siting
- Coal Fuels Alliance Program
- Freedom Car - Hydrogen
- Increased price of natural gas
- Mercury emissions limits
- Need for new power plants
- Flue gas cleaning for existing utilities
- Increased price of raw materials for chemical industry
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Carbon Management
Major Factors Affecting Program

- FutureGen emphasis on sequestration
- Future regulations on CO₂ emissions
Coal Bed Methane

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Major Factors Affecting Program

- High price of natural gas
- Advancing technology for methane recovery
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Coal Residuals Management
Major Factors Affecting Program

- ICCI program must focus on byproducts in Illinois from Illinois coal
- Utilities switching from Illinois coal to western coal
- CCB challenges shifting away from F-type fly ash to FBC and FGD residues
- Logistics
- Underground mine placement
- Ponds
- Regulatory drivers
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Energy Research for a Cleaner Environment

Advanced Coal Mining Technologies
## National Coal Industry Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Mines</th>
<th>Production (millions of tons)</th>
<th>Ave. Mine Size (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1976</td>
<td>6,553</td>
<td>685</td>
<td>105,000</td>
</tr>
<tr>
<td>1986</td>
<td>4,424</td>
<td>890</td>
<td>201,000</td>
</tr>
<tr>
<td>1996</td>
<td>1,903</td>
<td>1,064</td>
<td>559,000</td>
</tr>
<tr>
<td>2005</td>
<td>1,400</td>
<td>1,133</td>
<td>796,000</td>
</tr>
</tbody>
</table>

Sources:
- Energy Information Administration
- National Mining Association
# Economic Impact of Coal Mining in Illinois

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<thead>
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</thead>
<tbody>
<tr>
<td><strong>Employees</strong></td>
<td>18,284</td>
<td>10,129</td>
<td>3,461</td>
<td>3,252</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>62.5</td>
<td>61.7</td>
<td>33.5</td>
<td>32.3</td>
</tr>
<tr>
<td>(millions of tons)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average Salary</strong></td>
<td>22,000</td>
<td>35,000</td>
<td>45,000</td>
<td>50,000</td>
</tr>
<tr>
<td>($)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Payroll</strong></td>
<td>402</td>
<td>355</td>
<td>156</td>
<td>163</td>
</tr>
<tr>
<td>(millions of $)</td>
<td></td>
<td></td>
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</tbody>
</table>

**Sources:**
Bureau of Labor Statistics
ILDMM Annual Statistical Report
### The Critical Factor

#### Average Price of Coal ($/ton)

<table>
<thead>
<tr>
<th></th>
<th>1985</th>
<th>1994</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illinois</td>
<td>30.80</td>
<td>23.14</td>
<td>25.72</td>
</tr>
<tr>
<td>West Virginia</td>
<td>33.47</td>
<td>27.42</td>
<td>35.41</td>
</tr>
<tr>
<td>Wyoming</td>
<td>11.36</td>
<td>6.83</td>
<td>7.12</td>
</tr>
<tr>
<td>National</td>
<td>25.20</td>
<td>19.41</td>
<td>19.93</td>
</tr>
</tbody>
</table>

Source: Energy Information Administration
ICCI RESEARCH OBJECTIVES

A. Increase efficiencies
   • Extraction ratios, cycle times, battery use

B. Develop new mining technologies
   • High tech, automated, energy efficient

C. Training
   • Increase and strengthen labor pool, enhance productivity

D. Improve health and safety
   • Dust, noise and other environmental controls
   • Engineering optimization
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Energy Research for a Cleaner Environment

Coal Preparation and Other Production Business Practices
Major Factors Affecting Program

• 100% of coal mined in Illinois requires cleaning

• Cleaning or preparation adds $2 per ton to production costs

• 15 operating coal preparation plants in Illinois employing approximately 300 coal miners, usually the most experienced

• Tons per manhour for plant workers is 10 times greater than for underground miners due to automated processing systems

• Incremental improvements in efficiency can have a major impact on plant productivity and cost
5 Water-based cleaning plants
- Jigs, Water-only Cyclones, Spirals

9 Heavy media-based cleaning plants
- Vessels, Heavy Media Cyclones, Spirals

1 Air-based cleaning plant

Only 1 plant recovers fine coal below 100 mesh
- Flotation Cells are used

State-wide, plants reject 30% of tonnage processed

As much as 10 million tons of coal, mostly fine coal, are discarded annually in Illinois
ICCI RESEARCH OBJECTIVES

A. Improving product quality
   • Precombustion removal of sulfur, mercury, and other elements
   • Btu enhancement, including lowering inherent moisture

B. Increasing preparation plant efficiencies
   • Development and implementation of fine coal cleaning technologies and optimization of existing plant systems

C. Waste handling
   • Underground placement, water quality issues
   • Monitoring and control of reclamation projects

D. Creating additional markets for Illinois coal
   • Transportation, blending, emission credits
Respond to Annual Request for Proposals
- Issues each year in early March
- Posted on website www.icci.org each spring

Unsolicited
- Accepted throughout the year
- Best to submit a Statement of Interest first
Currently have representatives from each state on advisory boards.

Illinois, Indiana, and Kentucky - Coal Fuels Alliance

Possibility of issuing a joint Illinois/Indiana funded RFP – Would require specific research area.