SIMULATION PROJECT

PRESENTED AT
US-India Coal Working Group
8th Annual Meeting
New Delhi, India March 24, 2011

COMPUTER SIMULATION TO EVALUATE THE BENEFITS OF CLEAN COAL FOR THERMAL POWER GENERATION

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OBJECTIVE:
MODEL THE PARAMETERS i.e.
1. RAW COAL QUALITY AND WASHABILITY CHARACTERISTICS,
2. SIMULATION OF COAL PREPARATION PROCESSES,
3. EVALUATE ECONOMIC ASPECTS OF WASHING COSTS, YIELD IMPACT, TRANSPORTATION, EFFICIENCY,
4. TO COMPARE THE COSTS AND BENEFITS OVER A RANGE OF CONDITIONS.
ANALYZING THE VALUE OF WASHED COAL

STEPS IN THE ANALYSIS:

• DATA COLLECTION
• DATA ANALYSIS AND EVALUATION
• PROCESS SELECTION
• DERIVING THE COST/BENEFITS OF CLEAN COAL
• WORKING WITH THE RESULTS
• SUMMARY
Clean Coal Process Simulator Project Schedule

- **Project Development Plan** - Completed
- **Coal Sample Data Collection** – Completed
- **Software Development**-Presented to CMPDI
- **Draft GUI & Logic Ladder**-Meeting with CMPDI for Acceptance March 25th
- **Development of Software** – JAVA : Underway
- **Working Prototype** – August 2011
- **Final Simulator Developed Using JAVA/SWING** – October 2011
Clean Coal Process Simulator

Graphical User Interface
Working JAVA Prototype
Clean Coal Process Simulator
GUI Prototype

- Presented to CMPDI for acceptance
- Software Development Program & Draft Logic Ladder and GUI Models
- DYNAMIC LOGIC MODEL-GR2.xlsx
- Working Prototype
- Final Simulator Developed Using JAVA/SWING
Clean Coal Process Simulator GUI

- The graphical user interface will run in standard platforms which support JAVA/SWING
- The interface with consist of a Menu Bar for global functions and general utilities
- Application specific functions will be accessed through tree structured gateways to various application functionality
Clean Coal Process Simulator GUI

- The file menu provides for creating, opening, saving, and closing of various mine databases.
- The ability to add additional features is provided.
Clean Coal Process Simulator GUI

- Preferences and application options will be provided to:
  - Support application display and other functions
  - Control printer and other operations
  - Allow or restrict certain simulator generated processes from the final simulations
Clean Coal Process Simulator GUI

- Help Documentation will be written in XHTML
- Contents, index ad search capabilities will be supported
- Help will appear in a separate window to allow the user to interface with the Simulator
- Standard print capabilities to be provided
Clean Coal Process Simulator GUI

- Simulated input/output typical for many tree interfaces
- All application capabilities to be written in JAVA and stored in XML format
# GUI - PROXIMATE DATA

<table>
<thead>
<tr>
<th>Test</th>
<th>Air dried basis</th>
<th>60%RH &amp; 40deg.C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>$M_{ADB}$</td>
<td>$M_{EQ}$</td>
</tr>
<tr>
<td>Ash %</td>
<td>$A_{ADB}$</td>
<td>$A_{EQ}$</td>
</tr>
<tr>
<td>VM%</td>
<td>$VM_{ADB}$</td>
<td>$VM_{EQ}$</td>
</tr>
<tr>
<td>FC%</td>
<td>$FC_{ADB}$</td>
<td>$FC_{EQ}$</td>
</tr>
<tr>
<td>GCV (Kcal/Kg.)</td>
<td>$GCV_{ADB}$</td>
<td>------</td>
</tr>
<tr>
<td>HGI</td>
<td>$HGI_{ADB}$</td>
<td>------</td>
</tr>
</tbody>
</table>

**Color & Text Style Coding**

- **Data Input** >> $M_{ADB}$

---

$M$ = Moisture  
$VM$ = Volatile Matter  
$GCV$ = Gross Calorific Value  
$A$ = Ash  
$FC$ = Fixed Carbon  
$HGI$ = Hard Grove Index
### GUI FOR ROM SIZE CUM ASH

#### Table 1 – ROM (UNCRUshed) TYPICAL SIZE CUM ASH INPUT DATA FIELDS

<table>
<thead>
<tr>
<th>Size, mm</th>
<th>Wt%</th>
<th>Ash%</th>
<th>Moisture%</th>
</tr>
</thead>
<tbody>
<tr>
<td>+200</td>
<td>$W_{+200}$</td>
<td>$A_{+200}$</td>
<td>$M_{+200}$</td>
</tr>
<tr>
<td>200-100</td>
<td>$W_{200-100}$</td>
<td>$A_{200-100}$</td>
<td>$M_{200-100}$</td>
</tr>
<tr>
<td>150-100</td>
<td>$W_{150-100}$</td>
<td>$A_{150-100}$</td>
<td>$M_{150-100}$</td>
</tr>
<tr>
<td>100-50</td>
<td>$W_{100-50}$</td>
<td>$A_{100-50}$</td>
<td>$M_{100-50}$</td>
</tr>
<tr>
<td>50-25</td>
<td>$W_{50-25}$</td>
<td>$A_{50-25}$</td>
<td>$M_{50-25}$</td>
</tr>
<tr>
<td>25-13</td>
<td>$W_{25-13}$</td>
<td>$A_{25-13}$</td>
<td>$M_{25-13}$</td>
</tr>
<tr>
<td>13-6</td>
<td>$W_{13-6}$</td>
<td>$A_{13-6}$</td>
<td>$M_{13-6}$</td>
</tr>
<tr>
<td>6-3</td>
<td>$W_{6-3}$</td>
<td>$A_{6-3}$</td>
<td>$M_{6-3}$</td>
</tr>
<tr>
<td>3-0.5</td>
<td>$W_{3-0.5}$</td>
<td>$A_{3-0.5}$</td>
<td>$M_{3-0.5}$</td>
</tr>
<tr>
<td>-0.5</td>
<td>$W_{-0.5}$</td>
<td>$A_{-0.5}$</td>
<td>$M_{-0.5}$</td>
</tr>
<tr>
<td>Totals</td>
<td>$W_T$</td>
<td>$A_T$</td>
<td>$M_T$</td>
</tr>
</tbody>
</table>

**Color & Text Style Coding**
- **Headings >> Size, mm**
- **Data Input >> Wt**
- **Calculated Values >> Wt, AT, MT**
## GUI - CRUSHED SAMPLE SIZE CUM ASH

### Table 2 – (CRUSHED) TYPICAL SIZE CUM ASH INPUT DATA FIELDS

<table>
<thead>
<tr>
<th>Size, mm</th>
<th>Wt%</th>
<th>Ash%</th>
<th>Moisture%</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-25</td>
<td>$W_{50-25}$</td>
<td>$A_{50-25}$</td>
<td>$M_{50-25}$</td>
</tr>
<tr>
<td>25-13</td>
<td>$W_{25-13}$</td>
<td>$A_{25-13}$</td>
<td>$M_{25-13}$</td>
</tr>
<tr>
<td>13-6</td>
<td>$W_{13-6}$</td>
<td>$A_{13-6}$</td>
<td>$M_{13-6}$</td>
</tr>
<tr>
<td>6-3</td>
<td>$W_{6-3}$</td>
<td>$A_{6-3}$</td>
<td>$M_{6-3}$</td>
</tr>
<tr>
<td>3-0.5</td>
<td>$W_{3-0.5}$</td>
<td>$A_{3-0.5}$</td>
<td>$M_{3-0.5}$</td>
</tr>
<tr>
<td>-0.5</td>
<td>$W_{-0.5}$</td>
<td>$A_{-0.5}$</td>
<td>$M_{-0.5}$</td>
</tr>
<tr>
<td>Totals</td>
<td>$W_{T}$</td>
<td>$A_{T}$</td>
<td>$M_{T}$</td>
</tr>
</tbody>
</table>

**Color & Text Style Coding**
- **Headings**: Size, mm
- **Data Input**: $W_{x}$
- **Calculated Values**: $W_{T}$, $A_{T}$, $M_{T}$
## GUI - FLOTO - SINK RESULTS

<table>
<thead>
<tr>
<th>Size (mm)</th>
<th>50 – 25</th>
<th>25 – 10</th>
<th>10 – 6</th>
<th>6 – 3</th>
<th>3 – 0.5</th>
<th>0.5 – 0.05</th>
<th>0.5 – 0.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Wt</td>
<td>56.0</td>
<td>16.6</td>
<td>11.2</td>
<td>5.2</td>
<td>6.2</td>
<td>95.2</td>
<td></td>
</tr>
<tr>
<td>Wt %</td>
<td>58.8</td>
<td>17.4</td>
<td>11.8</td>
<td>5.5</td>
<td>6.5</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wt %</td>
<td>Ash %</td>
<td>Wt %</td>
<td>Ash %</td>
<td>Wt %</td>
<td>Ash %</td>
<td>Wt %</td>
</tr>
<tr>
<td>&lt; 1.4</td>
<td>0.5</td>
<td>14.2</td>
<td>3.3</td>
<td>13.7</td>
<td>3.6</td>
<td>9.2</td>
<td>9.2</td>
</tr>
<tr>
<td>1.4 – 1.5</td>
<td>6.4</td>
<td>21.8</td>
<td>12.6</td>
<td>21.9</td>
<td>10.5</td>
<td>17.7</td>
<td>11.6</td>
</tr>
<tr>
<td>1.5 – 1.6</td>
<td>19.4</td>
<td>30.1</td>
<td>20.0</td>
<td>30.7</td>
<td>16.3</td>
<td>26.4</td>
<td>15.8</td>
</tr>
<tr>
<td>1.6 – 1.7</td>
<td>18.7</td>
<td>38.7</td>
<td>17.9</td>
<td>39.2</td>
<td>17.1</td>
<td>34.6</td>
<td>15.1</td>
</tr>
<tr>
<td>1.7 – 1.8</td>
<td>8.8</td>
<td>44.1</td>
<td>5.5</td>
<td>44.8</td>
<td>15.2</td>
<td>42.2</td>
<td>12.8</td>
</tr>
<tr>
<td>1.8 – 1.9</td>
<td>10.3</td>
<td>49.8</td>
<td>11.0</td>
<td>49.9</td>
<td>10.8</td>
<td>49.9</td>
<td>11.0</td>
</tr>
<tr>
<td>+ 1.9</td>
<td>35.9</td>
<td>69.8</td>
<td>29.7</td>
<td>68.8</td>
<td>26.5</td>
<td>68.6</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td><strong>166.0</strong></td>
<td><strong>48.6</strong></td>
<td><strong>100.0</strong></td>
<td><strong>44.8</strong></td>
<td><strong>166.0</strong></td>
<td><strong>42.4</strong></td>
<td><strong>166.0</strong></td>
</tr>
</tbody>
</table>

**Color & Text Style Coding**
- **Headings >> Size, mm**
- **Data Input >> Wt%**
- **Calculated Value >> Totals & Ash**

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## RAW COAL QUALITY AND WASHABILITY

### GUI - WASHABILITY DATA ANALYSIS

<table>
<thead>
<tr>
<th>Relative density - r-d fraction</th>
<th>Wt %</th>
<th>Ash %</th>
<th>Wt% of Ash of Total</th>
<th>Cum Wt% of Ash %</th>
<th>Wt %</th>
<th>Ash %</th>
<th>Sink Wt% of Ash %</th>
<th>Wt %</th>
<th>Ash %</th>
<th>Ch. Wt%</th>
<th>Mayer’s Pt. Value</th>
<th>r-d</th>
<th>Wt%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.4</td>
<td>3.1</td>
<td>8.9</td>
<td>0.3</td>
<td>0.3</td>
<td>3.1</td>
<td>8.9</td>
<td>45.4</td>
<td>96.9</td>
<td>46.8</td>
<td>1.6</td>
<td>0.3</td>
<td>1.4</td>
<td>11.8</td>
</tr>
<tr>
<td>1.4 1.5</td>
<td>8.7</td>
<td>20.4</td>
<td>1.8</td>
<td>2.1</td>
<td>11.8</td>
<td>17.4</td>
<td>43.6</td>
<td>88.2</td>
<td>49.4</td>
<td>7.5</td>
<td>2.1</td>
<td>1.5</td>
<td>27.4</td>
</tr>
<tr>
<td>1.5 1.6</td>
<td>18.7</td>
<td>29.4</td>
<td>5.5</td>
<td>7.6</td>
<td>30.5</td>
<td>24.8</td>
<td>38.1</td>
<td>69.5</td>
<td>54.8</td>
<td>21.2</td>
<td>7.6</td>
<td>1.6</td>
<td>36.6</td>
</tr>
<tr>
<td>1.6 1.7</td>
<td>17.9</td>
<td>37.9</td>
<td>6.8</td>
<td>14.4</td>
<td>48.4</td>
<td>29.6</td>
<td>31.3</td>
<td>51.4</td>
<td>66.7</td>
<td>39.5</td>
<td>14.4</td>
<td>1.7</td>
<td>27.3</td>
</tr>
<tr>
<td>1.7 1.8</td>
<td>9.5</td>
<td>43.5</td>
<td>4.1</td>
<td>18.5</td>
<td>57.9</td>
<td>31.9</td>
<td>27.2</td>
<td>42.1</td>
<td>64.6</td>
<td>53.2</td>
<td>18.5</td>
<td>1.8</td>
<td>18.9</td>
</tr>
<tr>
<td>1.8 1.9</td>
<td>10.4</td>
<td>49.8</td>
<td>5.2</td>
<td>23.7</td>
<td>68.3</td>
<td>34.6</td>
<td>22.0</td>
<td>31.7</td>
<td>69.4</td>
<td>63.1</td>
<td>23.7</td>
<td>1.9</td>
<td>42.1</td>
</tr>
<tr>
<td>&gt; 1.9</td>
<td>31.7</td>
<td>69.4</td>
<td>22.0</td>
<td>45.7</td>
<td>100.0</td>
<td>45.7</td>
<td>94.2</td>
<td>45.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 5 – TYPICAL WASHABILITY DATA DEVELOPED FROM FLOAT-SINK TESTS

- **Relative density - r-d fraction:** The density range for each fraction.
- **Wt %:** Weight percentage of coal.
- **Ash %:** Ash percentage of coal.
- **Wt% of Ash of Total:** Weight percentage of total ash.
- **Cum Wt% of Ash %:** Cumulative weight percentage of ash.
- **Sink Wt% of Ash %:** Weight percentage of ash in the sink.
- **Ch. Wt%:** Charcoal weight percentage.
- **Mayer’s Pt. Value:** Mayer’s point value.
- **r-d:** R-δ value.
- **Wt%:** Weight percentage.

Color & Text Style Coding:
- **Data Input >> Wt%**
- **Calculated Value >> A_r**

Headings >> Size, mm
RAW COAL QUALITY AND WASHABILITY

TYPICAL WASHABILITY CURVES
Clean Coal Process Simulator GUI

- Worksheets are displayed here to provide for review of intermediate data used in generating the final plant design.
DESHALING

• THE SAMPLE ANALYSES DATA IS EVALUATED FOR DESHALING POTENTIAL BY TWO METHODS
  1. REMOVAL OF TOP SIZE BY DRY SCALPING SCREEN AND/OR,
  2. WET HIGH GRAVITY (FLOAT AT SPECIFIC GRAVITY GREATER THAN 1.9) SEPARATION
DRY BYPASSING OF FINES

• THE SAMPLE ANALYSES DATA IS EVALUATED FOR FINE COAL BYPASS POTENTIAL USING THEORETICAL YIELDS OF WASHABILITY TESTS

1. BYPASS SIZE FOR DRY SCREENING AT 13, 6 OR 3 mm CAN BE SELECTED
THE COMPUTER MODEL WILL SIMULATE CLEAN AND REJECT PERFORMANCE OF GENERIC FLOWSHEETS AT FIVE LEVELS

• LEVEL 1
  – ROUGH SCALPING AND CRUSHING
• LEVEL 2
  – COARSE COAL (+13 MM) CLEANING ONLY
• LEVEL 3
  – COARSE AND FINE COAL CLEANING
• LEVEL 4
  – COARSE, FINE, AND ULTRA FINE COAL CLEANING
• LEVEL 5
  – LEVEL 4 CLEANING PLUS MIDDLENINGS CRUSHING AND REWASH
PROCESS SELECTION

Based on input from the user such as:
- Required clean coal ash
- Minimum yield
- Minimum ash in reject
- Maximum washing cost

The program will select a recommended level of washing and representative flowsheet. Users can then manually modify the final flowsheet.
FOR DETAILED SIMULATION, FINITE CURVE MODELING IS BEING USED

USE POLYNOMIAL CURVE GENERATORS SUCH AS MATLAB® OR KALEIDAGRAPH®.

\[(Y=M+M^1+M^2 + \ldots+M^X)\] TO REPRESENT THE CHARACTERISTICS OF THE SIZE RANGE TYPICAL OF THE FEED DISTRIBUTION TO A SPECIFIC CLEANING DEVICE.
THE CURVES ARE APPROXIMATED FOR THE TOTAL RANGE OF COAL SIZES AND ALSO FOR THE COARSE, FINE AND SMALL COAL RANGES.
• EXAMPLE

– FOR THE 100 X 13mm SIZE RANGE, THE THEORETICAL SPECIFIC GRAVITY DETERMINED BY THE CLEAN PRODUCT CUMULATIVE ASH CAN BE REPRESENTED BY THE FORMULA

\[
SG = M_0 + M_1 + M_2 + M_3
\]

\[
SG = 1.2975 + 0.0006493*A^1 + 0.00019622*A^2 + -0.0000009393*A^3
\]

EXAMPLE: USING ASH (A) = 34; \(SG_{A=34} = 1.5095\)
• PROCESS EQUIPMENT PARTITION CURVES

THE PERFORMANCE AND EFFICIENCY OF THE CLEANING DEVICES ARE REPRESENTED BY PARTITION CURVES.

(TYPICAL EXAMPLE IS WHITEN FORMULA)

\[ P = \frac{1}{1 + \exp\left(\frac{SG_{50} - SG}{0.91}\right)} \]

- \( P \) = PROBABILITY OF REPORTING TO REFUSE
- \( SG_{50} \) = CUTPOINT SG AT \( P = 0.5 \)
- \( Ep \) = PROBABLE ERROR BEING STEEPNESS OF CURVE
Clean Coal Process Simulator GUI

- Library Interfaces for Equipment and Costs
- Libraries will be supported with Tree Structures for data editing and input
- Library data to be the primary source for
  - Plant Design Generation
  - Resulting Cost Analysis
DERIVING THE COST AND BENEFITS ECONOMICS

CAPITAL COSTS – PLANT CAPITAL COST IS ESTIMATED USING ROUTINELY UPDATED COST DATA FOR PLANT PHYSICAL SIZE AND CAPACITY AND EQUIPMENT COSTS. EQUITY AND LOAN VALUES CAN BE INPUT AND ANALYSIS FOR ROI PERFORMED
ECONOMIC ANALYSES OF WASHED COAL

DERIVING THE COST AND BENEFITS

ECONOMICS (CONT.)

OPERATING COSTS - HISTORIC AND CURRENT LABOR AND SUPPLY DATA, ADJUSTED FOR INFLATION OR UPDATED IS USED TO ESTIMATE THE OPERATING COST PER TON.
DERIVING THE COST AND BENEFITS

ECONOMICS (CONT.)

ECONOMIC ANALYSES OF WASHED COAL

VALUES ADDED FROM USING WASHED COAL

• **TRANSPORTATION SAVINGS** – MAXIMUM HEAT CONTENT SHOULD BE TRANSPORTED PER TON/KM

• **POWER PLANT BENEFITS** - LOWER O&M COSTS PER KWH AND IMPROVED EFFICIENCIES.

• **REDUCED CARBON EMISSIONS** -

• **INTEGRATED GENERATION** - MICRO POWER PLANT AT THE WASHERY SITE

• **RECLAMATION** – RETURN TO MINE AREA OF WASHERY REJECTS AND FLY ASH
OPTIMIZING THE COAL CYCLE

• HIGH CAPACITY, LOW PER TON COST MINES
• EFFICIENT LEVEL 3 WASHERIES (HEAVY MEDIA AND FINE CLEANING CIRCUITS) FOR MAKING TERTIARY PRODUCTS (LOW ASH, MIDDLING, REJECTS)
• ASH CONTENT OF WASHED COAL SHOULD BE AS LOW AS POSSIBLE WHILE MAINTAINING 95% ORGANIC EFFICIENCY (MARKET DRIVEN ELSEWHERE)
• MIDDLINGS FOR CONSISTENT QUALITY TO PIT HEAD AND MICRO GENERATION POWER STATIONS
• PLACEMENT OF REJECTS AND ASH FROM PROCESS BACK IN THE MINE PIT
ECONOMIC ANALYSES OF WASHED COAL

AN OPTIMUM COAL USE CYCLE

Mine

Pit Head or Micro FCB Plant

Washery

Distant Power Plant

Lowest Ash Clean Coal

Reduced Flyash Disposal

Electric to mines

Electric to Washery and Trade

Flyash

Rejects

Raw Coal

Middlings

-Rail ways
-Trade
-Grid

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ECONOMIC ANALYSES OF WASHED COAL

COMPARING DELIVERED COST IN HEAT UNITS INDIAN COAL

• ASSUMPTIONS USED FOR COMPARISON:
  – AVERAGE ASH CONTENT ROM IS 40.5% AT AIR-DRIED MOISTURE OF 8%
  – GCV ROM COAL IS 3540 KCAL/KG
  – RAIL TRANSPORT COST IS RS 0.90/TON/KM
  – COST OF ROM FOBT IS RS 550
  – YIELDS SHOWN ARE BASED ON TYPICAL RESULTS FROM WASHING DIPKA COAL AT BILASPUR WASHERY
ECONOMIC ANALYSES OF WASHED COAL

BENEFITS OF WASHED COAL

TRANSPORTATION
ECONOMIC ANALYSES OF WASHED COAL

Comparative Costs of Supplying Washed Coal of Various Ash Contents at Quantities Required to Provide Equivalent Heat of Base Raw Coal to Varying Distances from the Pithead

VARYING CLEAN PRODUCT ASH CONTENT RANGE 34% - 25%

- **Raw Coal AR Ash % 40.48**
  - Moisture % 8 For both raw and washed coals
- **Washed AR Ash% 25.1**
  - Yield % 64.8 Washing fee Rs/ton 130
- **Washed AR Ash% 30.0**
  - Yield % 80.98 Washing fee Rs/ton 130
- **Washed AR Ash% 34.0**
  - Yield % 90 Washing fee Rs/ton 130

**Distance in Kilometers/Data Table**
ECONOMIC ANALYSES OF WASHED COAL

BENEFITS OF WASHED COAL

COST REDUCTIONS AND IMPROVEMENTS AT POWER STATION
ECONOMIC ANALYSES OF WASHED COAL

Comparative Costs of Supplying Washed Coal of Various Ash Contents at Quantities Required to Provide Equivalent Heat of Base Raw Coal to Varying Distances from the Pithead. VARYING CLEAN PRODUCT ASH CONTENT RANGE 34% - 25%

30 ASH WITH POWER PLANT SAVINGS
ECONOMIC ANALYSES OF WASHED COAL

BENEFITS OF WASHED COAL

MICRO GENERATION OF POWER FROM WASHERY REJECTS
Comparative Costs of Supplying Washed Coal of Various Ash Contents at Quantities Required to Provide Equivalent Heat of Base Raw Coal to Varying Distances from the Pithead
CLEAN PRODUCT ASH CONTENT RANGE 30%

30 ASH WITH PLANT SAVINGS AND MICRO GEN
Combined Benefits

- USING A 500 MW POWER PLANT AT 1400 KM DISTANCE AS A MODEL, THE COMBINED BENEFIT FOR USING BENEFICIATED 30% ASH OVER A 40.5% RAW COAL WILL BE:
  - RS 0.020 FOR TRANSPORTATION
  - RS 0.031 FOR PLANT IMPROVEMENT
  - RS 0.008 FOR REJECT BASED GENERATION

TOTAL RS 0.059 PER K-KCAL BURNED

ANNUAL BENEFIT IS OVER 50 CRORES SAVINGS
ECONOMIC ANALYSES OF WASHED COAL

WASHED VS IMPORTS

Comparative Costs of Supplying Washed Coal of Various Ash Contents at Quantities Required to Provide Equivalent Heat of Base Raw Coal to Varying Distances from the Pithead

VARYING CLEAN PRODUCT ASH CONTENT RANGE 25% - 34%

ECONOMIC ANALYSES
Clean Coal Process Simulator GUI

- Expect approval of the draft Logic and GUI design by April 1, 2011 which will support the current delivery schedules

- Minor changes in the content of the current interfaces and lower level interfaces are expected during the development cycle

- Any major changes to the overall look and feel of the user interface will be submitted for approval during the development cycle
CLOSING COMMENTS

• USING WASHED COAL MUST BE CONSIDERED IN AN INTEGRATED SCHEME, TRANSPORT ALONE IS SIGNIFICANT BUT OTHER BENEFITS ARE GREATER,

• CURRENT DISTANT POWER PLANT OPERATORS SHOULD CONSIDER OPTIMUM SCHEME FOR DELIVERY OF LOWEST ASH TO THEIR PLANT WHILE SHARING IN THE BENEFITS OF MICRO POWER GENERATION,

• COMPETITION BY IMPORTED COALS
  – Cont.
CLOSING COMMENTS CONT.

- Washed coal has proven to be competitive with imported coals for coastal plants with greater than 1000 km transport distances,
- Computer modeling of the coal-use cycle will improve the understanding of the benefits of using washed Indian coals,
- India has an abundant natural source of energy in its coal reserves, plan its use-use it wisely.
Thank You