West Virginia 2008 Energy Summit
“Carbon Mitigation”

Susan Wood
December 9, 2008
Sindicatum Carbon Capital Americas

- US Climate Change and Clean Energy project developer (LFG, CMM, Agriculture, Biomass)
- End-to-end turnkey solutions to achieve greenhouse gas emission reduction at the least cost
  - Project origination
  - Project planning
  - Project management and execution
  - Climate change expertise
  - Funding
- A wholly owned subsidiary of Sindicatum Carbon Capital, an international CDM project developer
What is Carbon Mitigation?

Reducing the amount of greenhouse gas (GHG) emitted from a source, usually through implementation of a project, to comply with or create value in the global carbon markets.

- Regulated source (eg, coal fired power plant)
- Unregulated source (eg, coal mine)
What do all of Those Terms Mean?

- Kyoto Protocol
- EU ETS
- Allowances
- Offsets
  - CERs (Certified Emission Reductions)
  - VERs (Verified or Voluntary Emission Reductions)
- CDM (Clean Development Mechanism)
- JI (Joint Implementation)
- GWP (Global Warming Potential)
- RGGI
- CCAR
- WCI
- Midwestern MRP
What are the Markets for Carbon?

Compliance Market: Cap-and-trade

Voluntary Market
The Carbon Market – Simple...
Carbon markets have come a long way in a short period of time

Many limits imposed on trading between markets

Distinguish between offset credit and allowance

**Carbon schemes**
- Kyoto Annex 1
- Kyoto Supply (CDMI)
- Private Schemes
- Other

**Carbon commodities**
- AAU/GISs
- CERs
- ERUs
- EUAs
- VERS

Source: New Carbon Finance
## Compliance GHG Programs

<table>
<thead>
<tr>
<th><strong>International Offset Mechanisms</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Development Mechanism (CDM)</td>
<td>yes</td>
<td>CDM</td>
</tr>
<tr>
<td>Joint Implementation (JI)</td>
<td>yes</td>
<td>CDM</td>
</tr>
</tbody>
</table>

### Mandatory Cap and Trade Systems (Offset Features)

<table>
<thead>
<tr>
<th><strong>EU Emissions Trading System (EU-ETS)</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>under development</td>
<td>CDM/JI</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Australian Carbon Pollution Reduction Scheme</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Canada’s Offset System for Greenhouse Gases</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>New South Wales Greenhouse Gas Reduction Scheme</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Regional Greenhouse Gas Initiative</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Western Climate Initiative</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under development</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Other Mandatory Systems (Offset Features)

<table>
<thead>
<tr>
<th><strong>Alberta-Based Offset Credit System</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>State Power Plant Rules (OR, WA, MA)</strong></th>
<th><strong>Coal Methane</strong></th>
<th><strong>Methodology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Voluntary GHG Programs

<table>
<thead>
<tr>
<th>Carbon Offset Funds</th>
<th>Coal Methane</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank Carbon Finance Funds</td>
<td>No restrictions</td>
<td></td>
</tr>
</tbody>
</table>

### Voluntary Cap and Trade Systems (Offset Features)

| Chicago Climate Exchange (CCX)                         | Yes          | CCX         |

### Voluntary GHG Reduction Programs

| Climate Leaders (US)                                     | No           |             |
| California Climate Action Registry                       | No           |             |
| Climate Friendly (AU)                                    | No           |             |

### Voluntary GHG Accounting Protocols (entity-wide and offset-project-specific)

| WBSCD/WRI GHG Protocol for Project Accounting | N/A  |
| ISO 14064                                     | N/A  |

### Voluntary Standards for Offset Projects and Retailers

| Gold Standard                                     | No            |             |
| Voluntary Offset Standard (VOS)                   | Yes           | CDM         |
| Voluntary Carbon Standard 2007 (VCS 2007)         | Yes           | CDM         |
| VER+                                              | Yes           | CDM         |
| Green-e Climate Protocol for Renewable Energy     | No            |             |
| Green-e Climate Program (Yes)                     |               | CDM         |
| Climate, Community & Biodiversity Standards (CCB)  | No            |             |
| Plan Vivo                                         | No            |             |
| Social Carbon                                     | No            |             |
US GHG Programs

California will focus on the WCI for its cap-and-trade programme.

Midwest pure positioning?

RGGEI over-allocated or still significant?

Source: New Carbon Finance
## Cap-and-Trade Legislation

<table>
<thead>
<tr>
<th>Country</th>
<th>Scope of Coverage</th>
<th>2010-2019 Cap</th>
<th>2020-2029 Cap</th>
<th>2030-2050 Cap</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>All 6 GHGs – upstream for transport fuels &amp; natural gas; downstream for large coal users; separate cap for HFC consumption</td>
<td>4% below 2006 level in 2012</td>
<td>10% below 2006 level in 2020</td>
<td>71% below 2005 level in 2050</td>
</tr>
<tr>
<td>(Carbon Cap)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>China</td>
<td>All 6 GHGs – upstream for natural gas &amp; petroleum; downstream for coal</td>
<td>2012 level in 2012</td>
<td>2006 level in 2020</td>
<td>1390 level in 2030</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td></td>
<td></td>
<td>President may set long-term target ≥80% below 2006 level by 2050 contingent upon international effort</td>
</tr>
<tr>
<td>Australia</td>
<td>All 6 GHGs – upstream for transportation sector; downstream for electric utilities &amp; large sources</td>
<td>2004 level in 2012</td>
<td>1990 level in 2020</td>
<td>23% below 1990 level in 2030</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td></td>
<td></td>
<td>63% below 1990 level in 2050</td>
</tr>
<tr>
<td>India</td>
<td>All 6 GHGs – upstream for transportation sector; downstream for electric utilities &amp; large sources</td>
<td>2010 level in 2010</td>
<td>1990 level in 2010</td>
<td>27% below 1990 level in 2030</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td>2% per year reduction from 2012-2020</td>
<td></td>
<td>53% below 1990 level in 2040</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td></td>
<td></td>
<td>83% below 1990 level in 2050</td>
</tr>
<tr>
<td>Brazil</td>
<td>All 6 GHGs – upstream for transportation sector; downstream for electric utilities &amp; large sources</td>
<td>2004 level in 2012</td>
<td>1990 level in 2020</td>
<td>3.5% per year reduction from 2030-2050</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>All 6 GHGs – upstream for transportation sector; downstream for electric utilities &amp; large sources</td>
<td>2010 level in 2010</td>
<td>1990 level in 2020</td>
<td>22% below 1990 level in 2030</td>
</tr>
<tr>
<td>(Pilot Program)</td>
<td></td>
<td>2.5% per year reduction from 2020-2029</td>
<td></td>
<td>73% below 1990 level in 2050</td>
</tr>
<tr>
<td>EU</td>
<td>All 6 GHGs – upstream for transportation sector; downstream for electric utilities &amp; large sources</td>
<td>2004 level in 2012</td>
<td>1990 level in 2020</td>
<td>5% per year reduction from 2030-2050</td>
</tr>
<tr>
<td>(DDR Proposal)</td>
<td></td>
<td></td>
<td></td>
<td>83% below 1990 level in 2050</td>
</tr>
</tbody>
</table>

Modified from Pew Center on Global Climate Change, *Comparison of Economy-Wide Cap-and-Trade Proposals in the 110th Congress* (January 2008) [www.pewclimate.org](http://www.pewclimate.org)
Size of the Carbon Markets

**Kyoto Projects (CDM and JI)**
Total Volume in 2006: 466 MtCO2e

- 45%
- 17%
- 10%
- 13%
- 2%
- 1%
- 1%

**Voluntary Offset Projects (CDM and JI)**
Total Volume in 2006: 13 MtCO2e
(excluding CCX transactions of 10.3 MtCO2e)

- Industrial Gases: 5%
- Energy Efficiency: 3%
- Renewable Energy: 20%
- Forestry: 33%
- Methane from Coal Mining: 5%
- Methane Emissions: 31%
- Methane from Livestock: 12%
- Other: 0.5%

(Source: Capoor, 2007 & Hamilton, 2007)
“Offsets” – GHG Market Value

✓ Is it real?
✓ Is it surplus/additional?
✓ Is it verifiable?
✓ Is it permanent?
✓ Is it enforceable?
US Offset Supply by Project Type

Source: GAO analysis of Point Carbon data.

Notes: CCBS refers to carbon capture and biological storage. Totals may not equal 100 because of rounding.
Coal and Climate Change

- 20% of global GHG emissions.
- Highest per BTU carbon emissions of all fossil fuels.
- 50% of the electricity generated in the US is from coal.
- 27% of total U.S. GHG emissions,
- Projected to grow by a third by 2025.

- Coal is cheap.
- U.S. coal reserves last well over 250 years.
GHG mitigation projects offer real benefits to a coal mining business

- Prepare for more stringent climate change regulatory environment
- Maintain a viable coal business in a carbon sensitive world
- Demonstrate corporate social responsibility
- Protect and enhance reputation
- Reduce business risk
- Add value to the business
US 2006 Mine Methane Inventory

202 Bcf/81.7 mtCO2e Liberated

- **Surface Mines**
  - Post-Mining Emissions
    - 21 Bcf/595 mil m3/8.5 mil tCO2e
  - Active Mines
    - CH4 Drained & Used
      - 14 mines
      - 46 Bcf/1.3 bil m3/18.6 mil tCO2e
    - Drainage Remaining
      - 6 mines
      - 22% of 17%
      - 6 Bcf/170 mil m3/2.4 mil tCO2e
  - Abandoned Mines
    - AMM Used
      - 3.4 Bcf/96 mil m3/1.4 mil tCO2e
    - VAM
      - 81 Bcf/2.3 mil m3/32.8 mil tCO2e
    - Remaining
      - 377 mil m3/5.4 mil tCO2e
Destruction of methane that is emitted in ventilation air.
Technology is developing to achieve the most cost-effective solution.
Carbon Capture & Sequestration

GAO investigators cited underdeveloped and costly emissions-capture technology and legal uncertainties about the permitting and liability for CO2 that would be stored underground.

"GAO officials also concluded that widespread deployment of CCS is unlikely to happen unless Congress passes binding limits on carbon dioxide emissions."

McKinsey: Cost of capturing and storing carbon emissions from power plants and industrial installations could become commercially viable by 2030, according to a report published today from consultants.
Climate Mitigation Policies

- Carbon Tax
- Cap and Trade
- Regulation
- Efficiency Standards
- Building Codes
- Tax Incentives
- Subsidies
- Offsetting

...
In Conclusion

US carbon legislation is coming
International carbon markets have shown there is significant value to be extracted from the market
Coal will be a major player in the market
Coal is well positioned to be a leader in the market
Coal projects that reduce GHG are available
Technology is the key:
   “He who builds the better mousetrap wins”
Susan Wood

Susan.wood@sccamericas.com

(713) 425-4955