ECONOMICS OF CARBON CAPTURE AND STORAGE

Big Sky Carbon Sequestration Conference
Gallatin Gateway
September 23rd., 2009.

Dr. Siân Mooney
Dept. Economics
Boise State University
 COMMONLY CONSIDERED COSTS OF CCS

- Most commonly considered costs are “engineering” or direct costs from undertaking a project e.g.
  - Capture and compression costs
    - Vary depending on source and technology
  - CO$_2$ transportation/pipeline development
    - Obviously long distances between capture point and sequestration point increase this cost
  - Sinking shaft/well
    - Cost will vary depending on geologic characteristics of area/availability of natural formations
  - Injection costs
## Cost Estimates

![Graph showing cost estimates for CO2 capture and storage](image)

<table>
<thead>
<tr>
<th>Case</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High purity ammonia plant / nearby (&lt;10 miles) EOR opportunity</td>
</tr>
<tr>
<td>2</td>
<td>High purity natural gas processing facility / moderately distant (~60 miles) EOR opportunity</td>
</tr>
<tr>
<td>3</td>
<td>Large, coal-fired power plant / nearby (&lt;10 miles) ECBM opportunity</td>
</tr>
<tr>
<td>4</td>
<td>High purity hydrogen production facility / nearby (&lt;25 miles) depleted gas field</td>
</tr>
<tr>
<td>5</td>
<td>Large, coal-fired power plant / nearby (&lt;25 miles) deep saline formation</td>
</tr>
<tr>
<td>6</td>
<td>Coal-fired power plant / moderately distant (&lt;50 miles) depleted gas field</td>
</tr>
<tr>
<td>7</td>
<td>Iron &amp; steel plant / nearby (&lt;10 miles) deep saline formation</td>
</tr>
<tr>
<td>8</td>
<td>Smaller coal-fired power plant / nearby (&lt;25 miles) deep saline basalt formation</td>
</tr>
<tr>
<td>9</td>
<td>Cement plant / distant (&gt;50 miles) deep saline formation</td>
</tr>
<tr>
<td>10</td>
<td>Gas-fired power plant / distant (&gt;50 miles) deep saline formation</td>
</tr>
</tbody>
</table>

**Transactions Costs**

Another set of costs are transactions costs – these are the costs associated “getting the deal done”. These will all very between sites, projects, technologies e.g.

- Measuring monitoring and verification of C credits
- Legal/contracting costs
- Costs of meeting other legal or regulatory requirements
COST OF EXTERNALITIES

 Externality is a cost that is borne by a third party/an unintended consequence.
 Not often thought about
 In some locations these costs could be large
  • Environmental damage e.g. reductions in water quality, habitat destruction for aquatic or terrestrial species
  • Human health impacts
  • Property value impacts
Externalities Commonly Reported in Scientific Literature

- Sites will have different externalities
- Different probabilities of specific externalities occurring
- Different magnitudes of externalities
- Different costs associated with externalities
ECONOMIC COMPETITIVENESS OF CCS

- Market for C credits will have credits from many sources e.g.
  - CCS
  - Agriculture and forestry
  - Methane capture
  - Many other possibilities

- CCS has large physical potential to store CO2
- BUT must ALSO must compete on cost
  i.e. $/credit CCS ≤ $/credit from other sources
  (If much more expensive than other options it will not be the “technology of choice” within a market for carbon credits)
How do estimated costs stack up at present?

- Prices on CCX less than $1/tonne CO2e (September 2009)
- Prices on EU-ETS approx $22/tonne CO2e (September 2009)
- Cost of each unit of CO2 sequestered by CCS is much higher than currently prevailing market prices!
  - Regulatory environment can change
  - Market prices can change
  - Technology and costs can change
Acknowledgements:
This work was supported by grants from the Center for Advanced Energy Research award # INL-080G106014 and by the NSF Idaho EPSCoR Program and by the National Science Foundation under award number EPS-0814387. All errors and omissions are the authors'.