

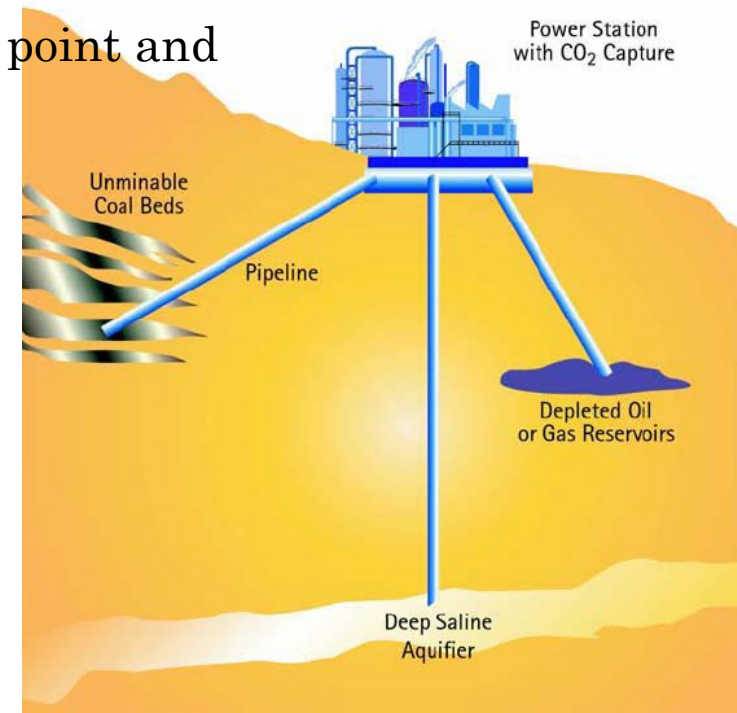
# **ECONOMICS OF CARBON CAPTURE AND STORAGE**

**Big Sky Carbon Sequestration  
Conference  
Gallatin Gateway  
September 23<sup>rd.</sup>, 2009.**

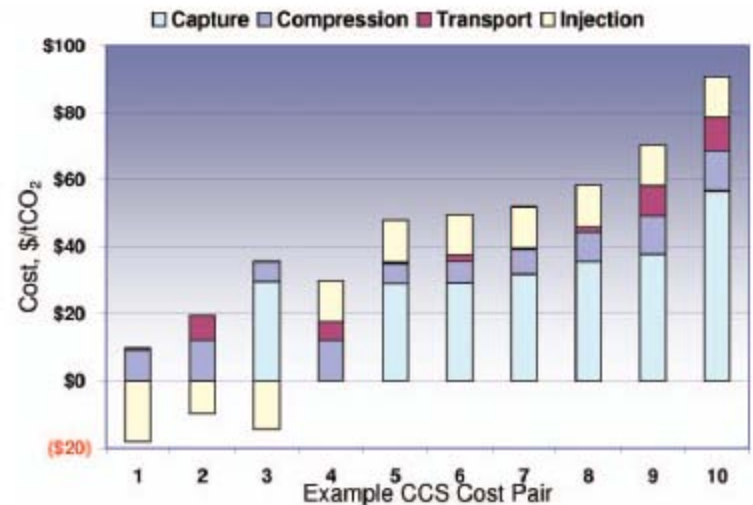
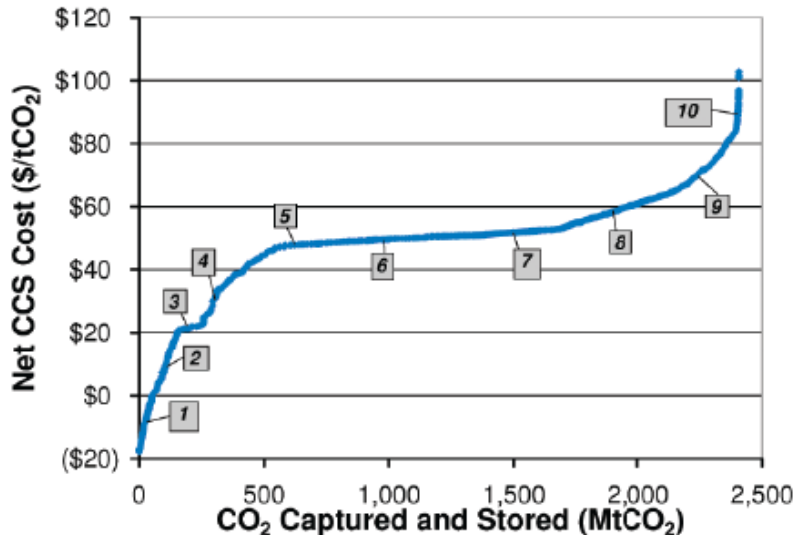
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# COMMONLY CONSIDERED COSTS OF CCS

- 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<sub>2</sub> 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



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

Source: Dooley, JJ (Lead Author), RT Dahowski, CL Davidson, MA Wise, N Gupta, SH Kim, EL Malone. 2006. Carbon Dioxide Capture and Geologic Storage: A core element of a Global Energy Technology Strategy to Address Climate Change. Global Energy Strategy Program.



# TRANSACTIONS COSTS

- Another set of costs are transactions costs – these are the costs associated “getting the deal done”. These will all vary between sites, projects, technologies e.g.
  - Measuring monitoring and verification of C credits
  - Legal/contracting costs
  - Costs of meeting other legal or regulatory requirements

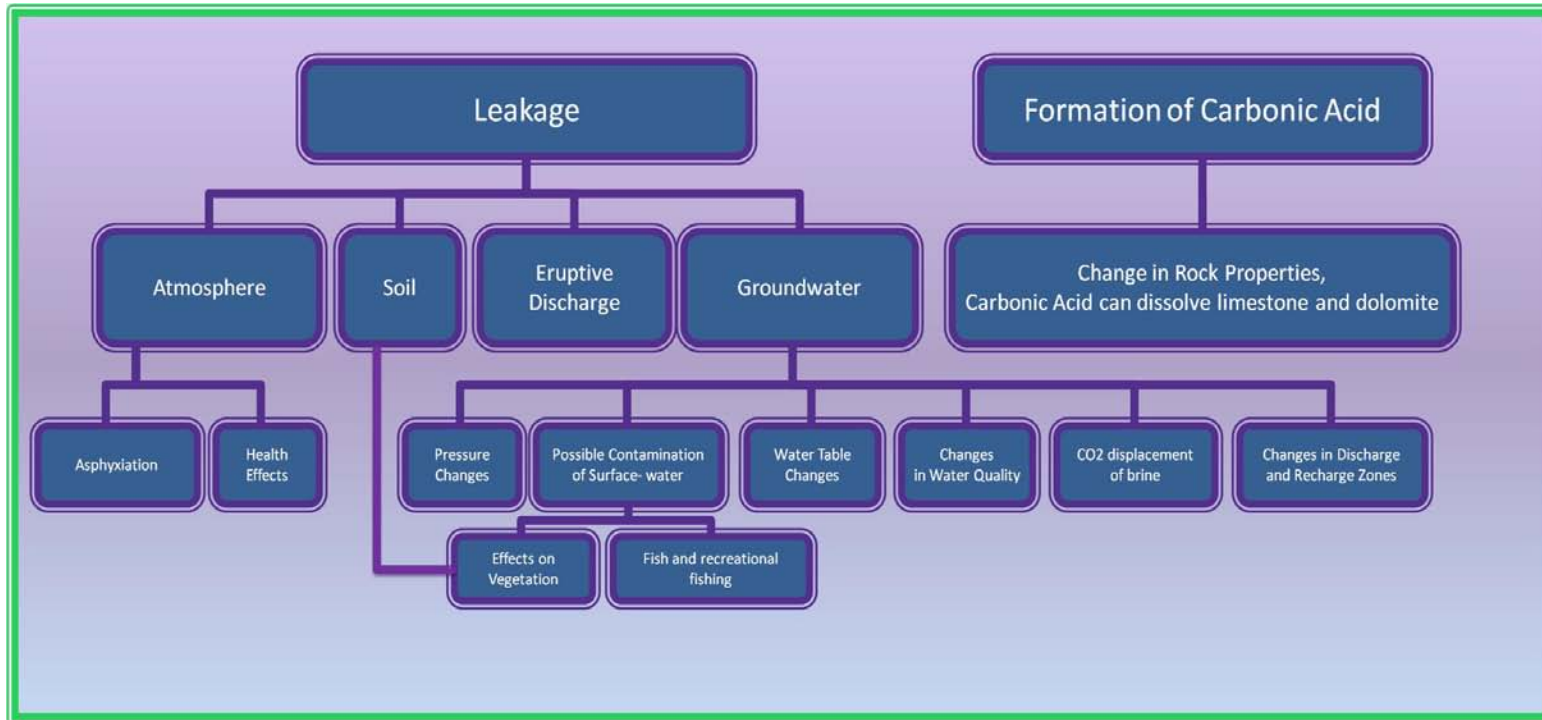


# COST OF EXTERNALITIES

- 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 CO<sub>2</sub>
- BUT must ALSO must compete on cost  
i.e.  $\$/\text{credit CCS} \leq \$/\text{credit from other sources}$   
(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 CO<sub>2</sub>e (September 2009)
- Prices on EU-ETS approx \$22/tonne CO<sub>2</sub>e (September 2009)
- Cost of each unit of CO<sub>2</sub> sequestered by CCS is **much higher** than currently prevailing market prices!
  - Regulatory environment can change
  - Market prices can change
  - Technology and costs can change



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