Opportunities for Financing CCS Projects & the Impact of Oil Prices on CO$_2$-EOR

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• Independent, nonpartisan, nonprofit organization

• Working to advance strong policy and action to address the twin challenges of energy and climate change

• Founded in 1998 as the Pew Center on Global Climate Change

• Became C2ES in 2011

• Bob Perciasepe started as new President of C2ES in 2014
Co-convene broad stakeholder coalition called the National Enhanced Oil Recovery Initiative (NEORI)

NEORI issued consensus federal and state policy recommendations for advancing EOR with CO$_2$ captured from power plants and industrial facilities

Legislation based on NEORI recommendations introduced in last two Congresses
• CCS - why it’s needed and needed faster

• Closing the Cost Gap:
  1. CO₂-EOR - how it affects CCS economics
     – How does an era of lower oil prices impact CO₂-EOR?
  2. What role can financial incentives play in closing the remaining cost gap?
• CCS is an essential technology given our global continued reliance on fossil fuel

• IPCC, IEA, and others have estimated that CCS will play an important role in meeting climate objectives

• CCS is more than a power plant story
  • A number of industrial sources of CO$_2$ have successfully deployed CCS to date
  • For certain industrial sources, CCS may be only option to significantly reduce CO$_2$ emissions
IEA - Estimates of various technologies' share of meeting 2 degree goals

• Coal power is the largest opportunity to deploy CCS, but other power generation and industrial process account for large share of 2050 need.
• CCS deployment is not on track - need more commercial-scale deployments to bring the cost of the technology down

• Only one commercial-scale power plant with CCS is running, just a handful more are under construction

• Several industrial CCS projects are running, but many more needed and with industries where CCS not previously deployed

• Improving the economic case of individual CCS projects is essential

• How to cover incremental cost of investing in equipment to capture and transport CO$_2$

• Ability to sell captured CO$_2$ can create a revenue stream for a CCS project to overcome investment and financing challenges
Financing Carbon Capture Projects

• To date, best example of utilizing CO₂ and creating a value for CO₂ has been CO₂-EOR

• In some cases, EOR operators have been willing to pay up to $30 per tonne of CO₂, which could cover a significant percentage of the cost to capture and transport CO₂

Even after selling captured CO₂, a cost gap is likely:

Cost Gap =

(Cost to Capture and Transport CO₂ to EOR Project)

minus

(CO₂-EOR operator willingness to pay for CO₂)

How does one cover the remaining cost gap??
How Does CO₂-EOR work?

CO$_2$-EOR in the United States

• Practiced for over 40 years

• 300,000 barrels of production per day as of 2014

• 4,000 miles of CO$_2$ pipelines (some span hundreds of miles, cross state and Canadian border)

• 65 million tonnes of CO$_2$ injected annually (only around 13 million tonnes from man-made source)

• History suggests can permanent sequester large volumes of CO$_2$

• Significant potential to expand >> address domestic energy security and environmental challenges
Estimates of CO₂-EOR Potential

- Economically-recoverable - 21.4 to 63.3 billion barrels
- Technically-recoverable - 36.7 to 79.3 billion barrels
- Accessing these reserves would utilize billions of tonnes of CO₂

Map of Current CO$_2$-EOR projects

States with Active or Potential CO₂-EOR Projects
Oil price decline in recent months...

- Average monthly WTI price (July 2011- July 2014): $96.36 per barrel; on several occasions, monthly price > $105 per barrel

- Fall 2014 - Winter 2015: quick drop, prices ~$45 per barrel

- 2015-2016: Potential rebound to range of $55-$70 per barrel

Source: EIA Short-Term Energy Outlook - “Custom Table Builder” - Available at: http://www.eia.gov/forecasts/steo/
Production volumes have not fallen yet...

- EIA still estimates that U.S. oil production will increase slightly in 2015 before plateauing in 2016.

- General sense that period of lower prices will prevail; this could lead ultimately lead to production cutbacks.

- Geopolitical event could change current dynamics quickly.

![U.S. Crude Oil Production](source: Short-Term Energy Outlook)
How will CO$_2$-EOR fare under these circumstances?

- History suggests that CO$_2$-EOR production holds steady during periods of sharp oil price swings

Based on Oil & Gas Journal survey (http://www.ogj.com/articles/print/volume-112/issue-4/special-report-eor-heavy-oil-survey/co-sub-2-sub-eor-set-for-growth-as-new-co-sub-2-sub-supplies-emerge.html) and EIA STEO WTI data
Why does CO$_2$-EOR differ from other oil projects?

- **CO$_2$-EOR project lifecycle:**
  - 0-1 year: CO$_2$ injection that eventually leads to oil production
  - 1-5 years: production ramps up
  - 5-15 years: sustained peak production
  - 15-30+ years: slowly declining production

- **Returns to an EOR project are not immediate; EOR operators have long-term perspectives**

- **Given expected decades of production for an individual EOR project, oil price volatility expected**
How could CO₂-EOR fare with period of lower oil prices?

• Given relatively low operating costs, existing projects will maintain production volumes
  • If supplied CO₂ tied to oil price, cost of CO₂ decreases
  • Potential for other operating costs to decrease

• Ability to initiate new projects challenged
  • Very low oil price makes difficult, but slight rebound to $55-$70 range could make possible
  • Low prices constrain capital budgets
  • EOR expansion already limited by constraints on supplies of natural and man-made CO₂
Implications for CO\textsubscript{2} capture projects and policy

• **Energy security benefits of CO\textsubscript{2}-EOR can have value to federal and state policymakers in face of global instability**
  
  • Projects maintain production during oil price swings and over long periods of time

• **CO\textsubscript{2} capture projects likely to receive decreased revenue from selling CO\textsubscript{2}; but extent of impact on individual project economics not clear**
  
  • Variability of revenue derived from selling captured CO\textsubscript{2} is an inherent economic risk
Bridge the cost gap:

Cost Gap =

\[(\text{Cost to Capture and Transport CO}_2 \text{ to EOR Project}) \quad \text{minus} \quad (\text{CO}_2\text{-EOR operator willingness to pay for CO}_2)\]

In some cases, EOR operators have been willing to pay up to $30 per tonne of CO\(_2\), which could cover a significant percentage of the cost to capture and transport CO\(_2\).

How can potential incentives for CO\(_2\) capture cover the remaining cost gap?
Federal economic incentives for CO₂ capture to date

• Grants for commercial-scale projects:
  – Available through Clean Coal Power Initiative, Industrial Carbon Capture and Storage Initiative, Recovery Act of 2009
  – Will similar levels of funding become available in the future?

• Tax incentives – 48A and 48B ITCs, 45Q PTC
  – ITCs allocated, but projects awarded credits still in process of moving forward
  – 45Q has limited allocation, could run out in the future without enabling broad deployment of capture projects
  – How can these or similar incentives be improved in the future?

• Loan Guarantee Program
  – No known awards by DOE to date
Federal tax credits – experience to date

• **45Q Production Tax Credit**

  • Likely running out
    – Only authorized for 75 million tonnes of CO$_2$
    – As of 2014, 27 million tonnes had been claimed per IRS
    – Existing pool exhausted in next 3-6 years without really getting critical mass of innovative projects under way

  • Limited certainty for private sector
    – No process to reserve credits for future claiming
    – Taxpayer must own facility where CO$_2$ capture occurs

  • Credit value potentially insufficient to attract private sector investment
    – $10/tonne of CO$_2$ used in EOR
    – $20/tonne of CO$_2$ injected in saline formations
Recent efforts to expand existing or create new incentives for CO₂ capture

• **Rockefeller/Heitkamp expansion and reform of 45Q**
  – Legislation (S. 2288) introduced in 2014
  – Based on NEORI consensus approach
  – Extend 45Q beyond existing limitation to support broader deployment of power plant and industrial CO₂ capture

• **Heitkamp ITC and competitively-awarded subsidy for CO₂ capture at coal-based projects**
  – Legislation introduced in 2014 and again in 2015

• **Bipartisan Master Limited Partnership (MLP) bills in Senate and House**
  – Would authorize MLP company structure for CO₂ capture projects

• **Baucus/Wyden comprehensive energy tax reform proposal**
  – CO₂ capture projects would qualify for ITC or PTC along with other clean energy sources

• **President Obama’s FY 2016 budget**
  – Would authorize new ITCs and Sequestration Tax Credits (STCs) for CCS projects
Potential improvements for incentive designs

• How can incentives better address CO₂ capture project economics?
  • Credits may not offer sufficient value to cover cost gap
  • Credits may not necessarily address high up-front investment costs
  • Ability to utilize tax credits depends on tax appetite (which may not exist for many debt-financed projects)
    ▪ Can credits be refunded in exchange for cash grant? This provision has been available to other energy sources.

• Potential volatility of CO₂ revenue an issue
  ▪ Can incentives increase during periods of low oil prices? When oil prices are high, can incentives adjust down to avoid windfalls?

• How to provide certainty to CO₂ capture projects?
  – Complexity and uncertainties have limited private sector interest and ability to utilize available incentives

• How can new federal tax revenue from new CO₂-EOR production cover the cost of potential incentives?
  – Under existing tax treatment, oil produced via EOR generates federal revenue
**Expanded and reformed 45Q**

- **Expansion would:**
  - Create a separate new pool of credits, enough available to broadly support long-term development of CO\textsubscript{2} capture technologies
  - Reserve credits for different sources of CO\textsubscript{2}
  - Allocate new credits through competitive bidding
  - Adjust tax credit values on an annual basis to reflect oil price changes

- **Reform would:**
  - Address uncertainties in current 45Q statute (req. to own facility and capture equipment)
  - Allow CO\textsubscript{2} capture projects to reserve credits for future claiming
  - Establish requirements to begin operations
  - Require Treasury to estimate sum of federal tax revenue derived from new EOR production
Private Activity Bonds (PABs)

• Concept of applying PABs to CO$_2$ capture projects developed by Stanford University and Summit Power

• Federally-authorized for certain private sector projects

• State agencies authorize on behalf of private sector project; states subject to volume cap in terms of how many PABs can be issued annually

• Long-available for environmental technologies
  • Had been available for power plant investments in scrubber technology, but tax reform of 1986 eliminated

• Could enable much more favorable financial structures for CO$_2$ capture projects
  • Private sector has familiarity with PABs, more and different finds of investors could purchase bonds
  • Bonds could enable more favorable borrowing terms >> longer debt repayment periods at lower rates
  • Address barrier of high upfront investment costs for CO$_2$ capture projects
Master Limited Partnerships (MLPs)

• MLPs allow companies to register as partnerships
  • Shares of MLPs on markets to investors
  • Income not subject to corporate income tax >> disbursed to shareholders (who pay capital gains taxes)

• This innovative corporate structure has been available to different natural resource projects
  • CO₂ capture project would be added to list of eligible MLPs (EOR projects and CO₂ pipelines already qualify)

• Bipartisan teams in Senate and House introduced legislation authorizing RE and CE projects for MLP status
• Even during periods of oil price volatility, experience suggests that CO₂-EOR projects will maintain production volumes

• CO₂ capture projects can be enabled by combination of revenue derived from monetizing CO₂ and taking advantage of available incentives

• There is significant political interest in addressing economic barriers to getting more CO₂ capture projects under development
BACKUP SLIDES
National Enhanced Oil Recovery Initiative (NEORI)

Coal and Coal-Based Generation
- Arch Coal
- Basin Electric Power Cooperative
- Cloud Peak
- Great River Energy
- Summit Power Group
- Tenaska Energy

Industrial Suppliers of CO₂/Technology Vendors
- Air Products
- Alstom
- Archer Daniels Midland
- C12
- GE Oil & Gas
- Jupiter Oxygen
- LI-COR Biosciences
- Linde
- Praxair

Project Developers
- Leucadia Energy

Labor
- AFL-CIO
- United Transportation Union

State Officials
- California, Kentucky, Maryland, Michigan, New Mexico, and Texas

Academic Institutions
- Enhanced Oil Recovery Institute (University of WY)

Oil and Gas
- Breitling Energy

Observers
- Oil and Gas
  - Chaparral Energy
  - Core Energy
  - Tellus Operating Group
- Associations
  - Interstate Oil and Gas Compact Commission

Environmental NGOs
- Clean Air Task Force
- Natural Resources Defense Council
- Wyoming Outdoor Council
• Consensus approach of National Enhanced Oil Recovery Initiative (NEORI)

• Adopted into legislation by Sen. Jay Rockefeller (S. 2288) in 2014; Sen. Heidi Heitkamp later co-sponsored
More anthropogenic CO$_2$ can become available at higher prices . . .

(Illustration with EIA 2011 data, prices differ from previous slide)

CO$_2$ Supply Curve by Source

Power plant CO$_2$ supply potentially larger

- Natural Gas Processing
- Hydrogen
- Amonia
- Ethanol
- Cement
- Power Plants