Financing CCUS
How targeted policies can drive the industry

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Summit Power Group

Founded over two decades ago by former U.S. Secretary of Energy Donald Hodel and Chief Operating Officer of the Department of Energy Earl Gjelde

- Headquartered in Seattle, Washington
- Staff on the ground in Texas, Pacific NW, Desert SW, Midwest, and Washington DC

Development, Ownership, & Asset Management:
- Over 9,000 MW of electric power plants developed
- Total Summit-led projects in service or under contract represent over $10B of investment

Summit’s current principal business lines:
- High efficiency natural gas-fired power plants
- Renewable energy projects including wind power projects & utility scale photovoltaic solar projects
- Carbon capture including post-combustion capture and coal gasification for EOR

Summit Carbon Capture:
- Unique integration of market expertise around clean energy, CO₂, oil, and power
- Strong relationships with leading global firms – technology, financial, asset owners
- Deep knowledge of regulation, policy, and public engagement
Financing CCUS

• Status of CCUS in the United States power sector
• CCUS potential
• Energy policy frameworks
• Can targeted policies scale the CCUS industry?
Status of CCUS in the Power Sector

1. Real progress with large projects
2. EOR is the main driver for the US business model in the near-term
3. Challenging commercial and policy environment
Status of CCUS in the Power Sector

1. Real progress with large projects
   - Good demonstration, but all were subsidized
   - Some disappointing delays and cancellations
   - The real question is: what comes next?

<table>
<thead>
<tr>
<th>Project</th>
<th>Type</th>
<th>Status</th>
<th>CO₂ Captured</th>
<th>Public Support</th>
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<tbody>
<tr>
<td>SaskPower Boundary Dam</td>
<td>Retrofit PCC</td>
<td>Online 2014</td>
<td>1 million tpy</td>
<td>Grant &amp; Rate Recovery</td>
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<td>New IGCC</td>
<td>Under Development (2019)</td>
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<tr>
<td>Others</td>
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</table>
Status of CCUS in the Power Sector

2. EOR is the main driver for the US business model in the near-term
   - Large projects are targeting combined storage plus utilization model
   - Commercial projects follow markets – i.e. it is difficult to capture benefits of CO₂ reductions in current power markets, so CO₂ sales help close the gap
Status of CCUS in the Power Sector

3. Challenging commercial and policy environment
   • Uneven energy policies lead to lack of market
   • Lack of power industry enthusiasm
   • Lack of public understanding
   • Low oil prices
CCUS Potential

Important for Global Climate

- International Energy Agency concludes large contribution from CCS needed globally to meet climate targets
- Deployment of CCS must complement renewables, not substitute for them
- IPCC’s Fifth Assessment Report (AR5) concludes that the availability of CCS is the most significant driver of both
  1. The ability to stabilize emissions and
  2. The cost of doing so

Source: IEA Energy Technology Perspectives (2014)
CCUS Potential

Cost-Effective Domestic Compliance Option

• CATF explored potential of CCS to deploy under the EPA Clean Power Plan

• Adjusted modeling assumptions from EPA analysis, utilizing the CATF-Charles River Associates commercial information

• Conclude CCS can be a large and cost-effective option in certain regions

• 97 million tpy captured from 10 GWs of coal capacity by 2030

Clean Air Task Force – Charles River Associates CO₂ Reductions per year (in 2030)
CCUS Potential

**Strengthens US Domestic Energy Position**

- Maintains a strong role for US coal and natural gas resources well into the future
- CO₂ EOR can bring significant new US oil reserves to market
- CO₂ EOR extends the life of existing oil fields and delays the need to develop new areas of development
Energy Policy Frameworks

• Effective policy should aspire to meet simultaneous goals
  1. Clean $\rightarrow$ CO$_2$ reductions
  2. Affordable $\rightarrow$ for public budgets and consumers
  3. Reliable $\rightarrow$ predictable and diverse
  4. Parity $\rightarrow$ creating level playing field vs picking winners

• General policy levers
  1. RD&D Investments
  2. Fiscal Policy
  3. Standards
Energy Policy Frameworks

CCUS Public Policy Needs

• Carbon capture technologies are ready for commercial deployment
• But the business case is difficult when compared against conventional natural gas combined cycle plants or currently subsidized renewables
• How can policy help?

1. CCS needs to transition from policy framework of technology “push” to market “pull”
   - Simple
   - Scalable / Replicable
   - Effective
   - Refundable
   - Automatic
   - Appropriate value

2. Tailor policies to address the specific challenges facing CCUS projects
   - Lack of differentiation in power markets
   - High end of cost/learning curve
   - Perceived risks in technology performance
   - Oil price volatility
Energy Policy Frameworks

Current Public Policy Snapshot
• DOE / NETL technology research program
• Clean Coal Power Initiative demonstration program
• DOE Advanced Fossil Loan Program
• 45Q Sequestration Tax Credits
• US EPA clarification on storage (UIC Class II v Class VI)
• American Carbon Registry voluntary methodology for CCUS
• Pending Clean Power Plan from US EPA
Energy Policy Frameworks

Important Development: EPA Clarification on UIC Transition

• In April 2015, US EPA officially released a statement of “key principles” regarding issue of transition from Class II EOR wells to Class VI storage wells

• Very significant development for commercial CCUS which mitigates a major uncertainty

• Framework for CCUS as compliance option in Clean Power Plan now exists:
  o Class II with GHG emissions reporting under Subpart RR

EPA clarification highlights:
✓ Geologic storage of CO₂ occurs as part of EOR and can be permitted in Class II wells
✓ Anthropogenic CO₂ does not necessitate Class VI wells
✓ Class VI site closure not required for Class II wells
Energy Policy Frameworks

Federal CCS “Fiscal Policies” Under Consideration

• Investment Tax Credit (refundable)
• Sequestration Tax Credit (refundable)
• Private Activity Bonds
• Price Stabilization Support
• Master Limited Partnership (including the power plant)
Obama Administration Proposal

• Creating a Carbon Dioxide Investment and Sequestration Tax Credit
  o ITC – Lowers the amount of total money a project needs to raise
    ▪ 30% credit
    ▪ Refundable
    ▪ $2B Authority
    ▪ Application Based
    ▪ Mix of new and retrofit, variety of technologies
  o STC – Creates an additional revenue stream
    ▪ Refundable
    ▪ Simple eligibility and claiming
    ▪ $50/ton for CO₂ sequestered and not beneficially used
    ▪ $10/ton for CO₂ sequestered and beneficially used
    ▪ 20 years, indexed to inflation

• Suggested Improvements:
  • ITC: simplify eligibility, self-executing, and encourage similar projects not one-offs
  • STC: increase value of EOR CCUS (by reducing sequestration credit value or payout time)
Private Activity Bond Proposal

• Expand PAB availability to CCS equipment
  o Well understood financing tool with deep existing market
  o Tax-exempt bonds are long term investments for mutual funds and individuals
  o Cheaper interest rates and longer tenors mean projects have more favorable hurdle rates
  o Expanding PAB’s to CCS would cost taxpayers little
    ▪ States already have volume caps for their PAB markets, CCS would simply be included as a new option
Price Stabilization Support

• Senator Heitkamp S.1285, Coal with Carbon Capture and Sequestration Act – introduced May 2015

• Authorizes the Department of Energy to enter into binding 25 year contracts with CCUS projects to provide price stabilization support for electricity or CO₂ sold for commercial utilization

• Price stabilization can help mitigate the volatility in energy markets, reduce CCUS project risk, and lower project hurdle rates
Master Limited Partnership Parity Act

• Straightforward adjustment to federal tax code that permits renewable energy and a CCUS power project to access the same tax-efficient equity funding that pipelines, oil companies, and timber producers have

• MLP markets are large and well-understood

• Could allow for lower cost of equity and lower hurdle rates for projects
Other Options – Establish the Markets

• EPA Clean Power Plan
  o Ensure CCS is included in State Implementation Plans
  o Reward early action
  o Allow new CCS plants to support existing rule compliance (as renewables can)

• Refine Electricity Portfolio Standards
  o Create National Clean Energy Standard
  o Transition State RPS programs from Renewable to Low-Carbon
  o Distinguish procurement in programs between intermittent and baseload and include requirements for both

• Refine Fuel Standards
  o Transition Federal RFS from Renewable to Low-Carbon
  o Include CCS EOR in state “clean fuels” programs
  o Consider CCUS EOR crudes as options for future Aviation and Shipping commitments
  o Standardize life cycle calculations to ensure consistent treatment of alternatives

• Support standardized designs and FEED work
Energy Policy Frameworks

• **Systems Analysis**

• It is critical to evaluate the overall pathway of low-carbon choices when making planning and procurement decisions
  - This is especially true in world of “a la carte” policies

• For example, how to compare intermittent against baseload options?
  - Levelized cost of energy is insufficient
  - Time of day and dispatchability drive value

• Backup costs + emissions must eventually be paired with intermittents

• Case studies: California & Germany
Energy Policy Frameworks
California RPS Planning (from Energy and Environmental Economics, Inc, 2014)

• Major utility study explored the impacts of increasing RPS requirements in CA
• Diminishing returns on CO₂ reductions from increased investments in renewables
Energy Policy Frameworks

Germany Capacity Today (courtesy CATF data)
Can Targeted Policies Scale the CCUS Industry?

- Can we achieve long-term energy goals without baseload low-carbon options?
- Significant body of work suggests we can and should support CCUS deployment
- Cost competitiveness of CCUS is compelling when compared against appropriate alternatives
- Cost effectiveness over time can be greatly improved by targeted support for initial standardized commercial projects
  - As has been well demonstrated by success in wind and solar
  - Significant deployment and major decrease in solar PV costs as a result
  - Inclusion in standards won’t raise costs, just potentially redirect investments