

***STATE CO<sub>2</sub>-EOR DEPLOYMENT  
WORK GROUP:  
CARBON CAPTURE IN  
WHOLESALE ELECTRICITY  
MARKETS***

Presentation to  
**NARUC Clean Coal Subcommittee**

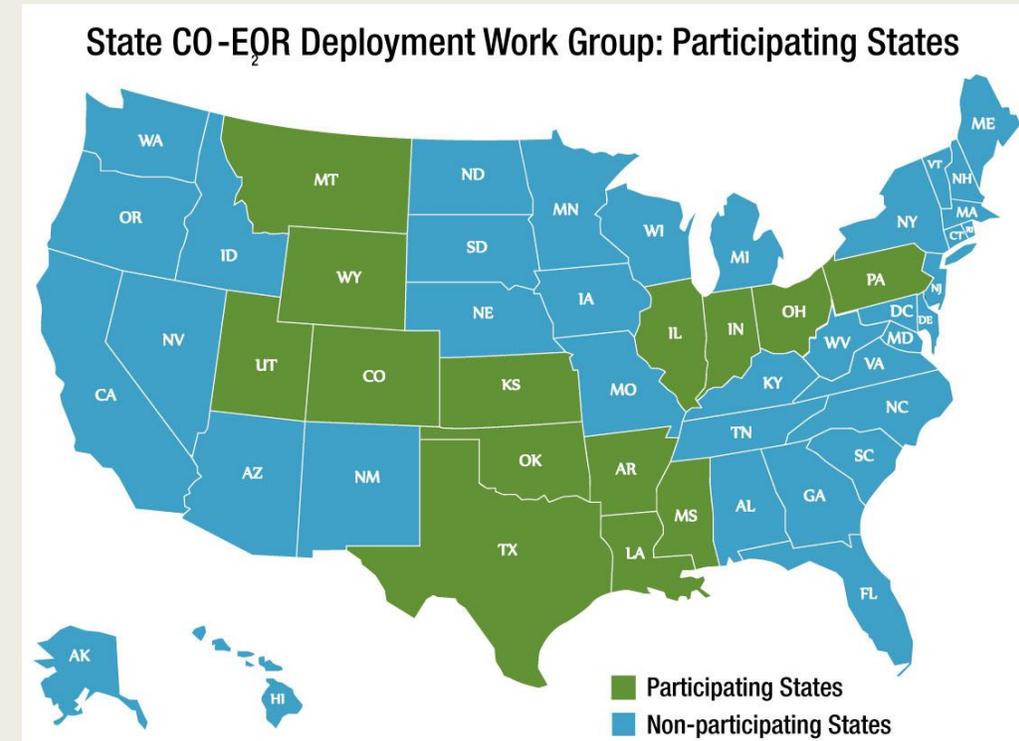
October 2, 2017

# Today's Topics

- Background on State CO<sub>2</sub>-EOR Deployment Work Group
- Review of Work Group Progress
- Power sector policy and market issues pertinent to carbon capture
- Policy options for carbon capture and other low-carbon resources
- Summary of work group recommendations

# Leadership at the U.S. State Level: State CO<sub>2</sub>-EOR Deployment Work Group

- Co-convened by Governor Matt Mead (R-WY) and Governor Steve Bullock (D-MT). Staffed by GPI.
- Launched in 3Q 2015:
  - *Officials from 14 states\**
  - *Leading industry and NGO stakeholders*
  - *CO<sub>2</sub>-EOR Experts*
- Objectives:
  - *Help policy-makers better understand states' potential for carbon capture and CO<sub>2</sub>-EOR;*
  - *Recommend strategies and policies to states and the federal government;*
  - *Support state policy-makers in implementing those recommendations; and*
  - *Encourage enactment of federal policies that complement state priorities.*



\*Map above does not include Kansas and Louisiana, which are now represented. State participation varies and includes governors' staff, cabinet secretaries, utility commissioners and agency and commission staff.

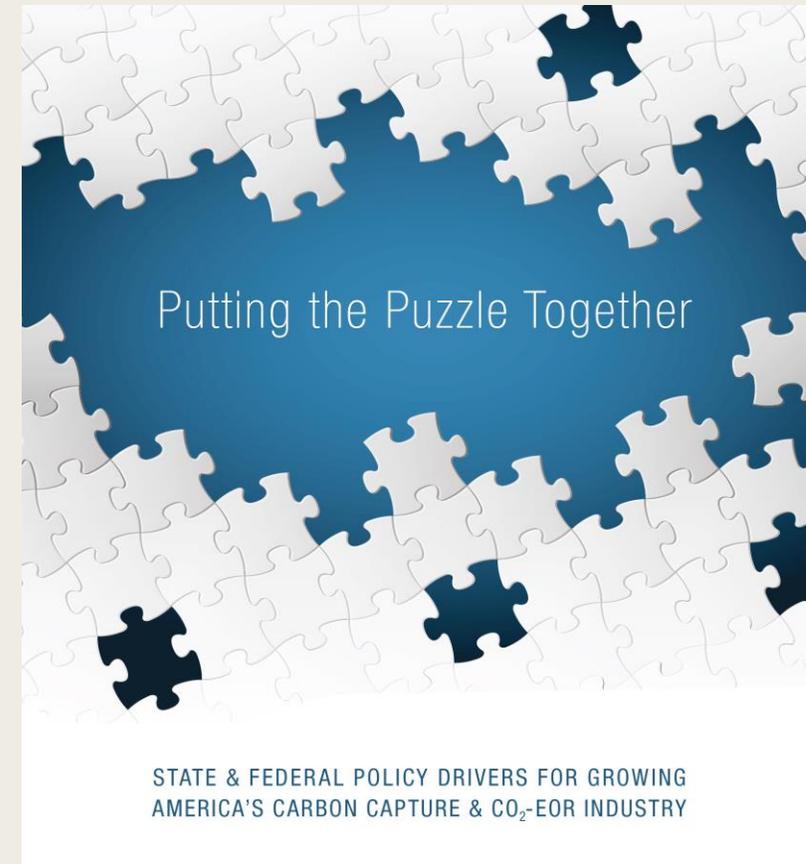
# Growing State Support for Carbon Capture & CO<sub>2</sub>-EOR

- In 2015, Great Plains Institute staff traveled to nine states to brief governors' staff and state officials and request support for federal and state policy resolutions and recruit Work Group participation.
- Since then, state officials from across the U.S. have signaled growing support for policies to foster commercial deployment of carbon capture and CO<sub>2</sub>-EOR. This has provided an important new base of support for the work of the federal coalition.

Year	Organization	Resolution Highlights
2015	<b>Western Governor's Association</b>	Recognized economic and environmental benefits of carbon capture and CO <sub>2</sub> -EOR; called on Congress to extend and strengthen the federal Sec. 45Q tax credit.
2015	<b>Southern States Energy Board</b>	Emphasized need for federal incentives and state policy measures.
2016	<b>National Association of Regulatory Utility Commissioners</b>	Highlighted economic, energy production and carbon mitigation benefits, and the importance of state and federal action.

# Putting the Puzzle Together: State & Federal Policy Drivers for Growing America's Carbon Capture & CO<sub>2</sub>-EOR Industry

- Major report (<http://www.betterenergy.org/EORpolicy>) released in December by participating state officials.
- Federal incentive recommendations:
  - **Extend, reform and expand the existing Section 45Q Tax Credit for Carbon Dioxide Sequestration** to increase its value, make it financially certain and provide for greater flexibility for carbon capture project developers;
  - **Establish federal price stabilization contracts, or contracts for differences (CfD), for the CO<sub>2</sub> sold from capture facilities to EOR operators** in order to eliminate the risk of price volatility that deters private investment in carbon capture projects; and
  - **Make carbon capture eligible for tax-exempt private activity bonds (PABs) and for master limited partnerships (MLPs)** in order to provide debt and equity, respectively, on more favorable terms.
- **Optimizing existing state taxes to support carbon capture and CO<sub>2</sub>-EOR deployment:**
  - Sales taxes on equipment purchased to build a carbon capture facility;
  - Property taxes on the carbon capture facility;
  - Sales taxes on equipment acquired to adapt an oilfield to CO<sub>2</sub>-EOR operations; and
  - Oil and gas taxes, such as production and severance taxes.



# State Work Group's U.S. Federal CO<sub>2</sub> Pipeline Infrastructure Recommendations

- In February, State CO<sub>2</sub>-EOR Deployment Work Group released *21<sup>st</sup> Century Energy Infrastructure: Policy Recommendations for Development of American CO<sub>2</sub> Pipeline Networks* ([http://www.betterenergy.org/American\\_CO2\\_Pipeline\\_Infrastructure](http://www.betterenergy.org/American_CO2_Pipeline_Infrastructure)) with three primary recommendations:
  1. Make CO<sub>2</sub> pipelines a priority component of a broader U.S. national infrastructure agenda;
  2. Leverage private capital with federal financing for large-volume, long-distance trunk CO<sub>2</sub> pipeline infrastructure; and
  3. Support CO<sub>2</sub> pipeline corridor planning and streamlined permitting.



## **21st Century Energy Infrastructure: Policy Recommendations for Development of American CO<sub>2</sub> Pipeline Networks**

White paper prepared by the  
State CO<sub>2</sub>-EOR Deployment Work Group

February 2017

# State Work Group Paper on Carbon Capture in Wholesale Electricity Markets

- Carbon capture-equipped power plants face similar challenges to commercial viability in competitive wholesale markets as do nuclear and other dispatchable low and zero-carbon generation resources.
- In June, the Work Group released *Electricity Market Design and Carbon Capture Technology: The Opportunities and Challenges* (<http://www.betterenergy.org/publications/electricity-market-design-and-carbon-capture-technology>), a report on market design and measures the federal government, states, and regional grid operators can take to recognize the broader economic, reliability and environmental benefits that power plants with carbon capture contribute.



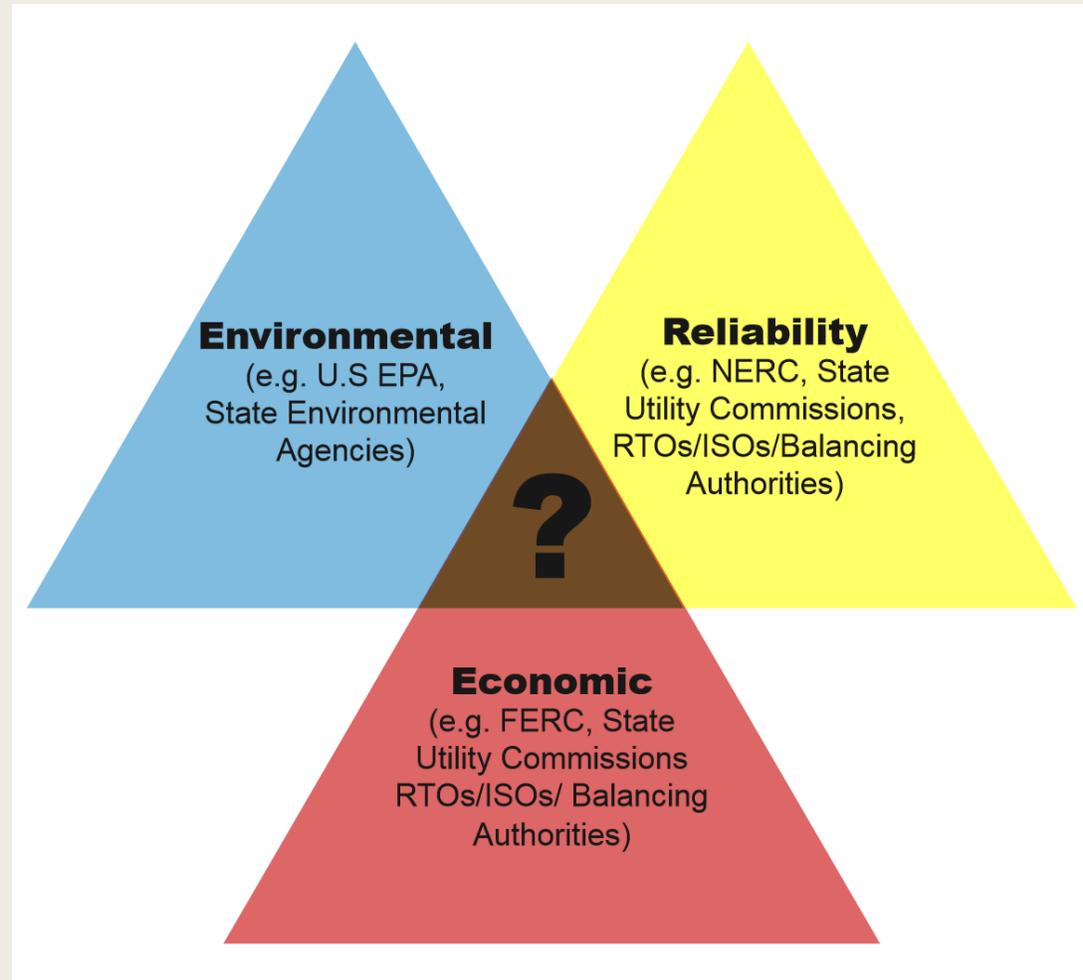
## Electricity Market Design and Carbon Capture Technology: The Opportunities and the Challenges

White paper prepared by the  
State CO<sub>2</sub>-EOR Deployment Work Group

# Power sector policy and market issues

- Policy objectives for managing our power system include:
  - *affordable and reasonable prices for consumers;*
  - *system reliability; and*
  - *environmental stewardship*
- Complex power system presents two-fold problem for carbon capture and other dispatchable low and zero-carbon technologies:
  - *a. carbon reduction benefits are neither valued in the market, nor explicitly addressed by public policy; and*
  - *b. No single actor or mechanism is responsible for accomplishing the objectives above*

# Who Regulates the Overlap?



# Power sector policy and market issues, cont'd.

- Other dispatchable low & zero-carbon power technologies face similar market challenges, including:
  - *Geothermal;*
  - *Combined heat and power (CHP);*
  - *Solar thermal power plants with extra heat storage reservoirs; and*
  - *New modular nuclear reactors and existing nuclear plants.*
- Problems and potential solutions for carbon capture in the power sector have relevance and applicability to other dispatchable low and zero-carbon power technologies

# Power sector policy and market issues, cont'd.

- Carbon capture plants can be built and operated in either regulated or competitive markets.
- However, regulated and competitive markets operate very differently in terms of how they:
  - *decide to build new power plants that will contribute to system reliability;*
  - *determine dispatch, or choose to run or not run various plants on the system;*
  - *make decisions to retire plants; and*
  - *are subject to control by federal regulators, system operators, and state regulators.*

# Power sector policy and market issues, cont'd.

## ■ Power plants with carbon capture provide multiple benefits:

- *Carbon capture produces pure CO<sub>2</sub>, which has commercial value for EOR, chemical production and other potential uses.*
- *A carbon capture-equipped power plant is dispatchable and can be called on to operate when needed, thereby enhancing grid reliability.*
- *Carbon capture can take advantage of the extensive public and private investment already made in CO<sub>2</sub>-EOR and fossil fuel infrastructure, while further decarbonizing the power sector.*
- *Plants with carbon capture have significant environmental benefit beyond carbon emissions reductions due to very low emissions of conventional air pollution, as those pollutants must be removed before CO<sub>2</sub> capture to avoid compromising carbon capture systems.*

# Policy options for carbon capture and other low-carbon resources

	Federal	ISO/RTO	States
<b>All Dispatchable Low and Zero-Carbon Resources</b>	Provide financial value for CO <sub>2</sub> reductions in generation dispatch; Develop financeable capacity payment structures; Research, development, demonstration and deployment (RDD&D) programs and support;	Develop a low-carbon capacity standard; Provide financial value for CO <sub>2</sub> reductions in generation dispatch	Modify or supplement existing renewable portfolio standard (RPS) policies to expand eligible resources
<b>Carbon Capture Specifically</b>	45Q CO <sub>2</sub> storage tax credits; tax-exempt private activity bonds (PABs); Master Limited Partnerships (MLPs); CO <sub>2</sub> pipeline infrastructure financing; Carbon capture RDD&D programs and support		Modify or supplement RPS to at least cover carbon capture (adjusted for percentage of capture)

# Work Group Recommendations

- Federal Level Actions:

- *Financial incentives:*

- the most important near-term federal action would be enactment of the previously referenced suite of financial incentives for carbon capture as recommended by the Work Group
    - federal financing and other policies to foster the buildout of CO<sub>2</sub> pipeline infrastructure would provide an important complement to federal carbon capture incentives

- *FERC initiatives:*

- FERC could affirmatively encourage the development of dispatchable low-carbon capacity, either by RTOs/ISOs that are FERC-jurisdictional, or by states whose utilities are part of RTOs/ISOs

- *RDD&D programs:*

- Sustain and expand DOE RDD&D portfolio to improve performance and lower the cost of all major low and zero-carbon generation options.
      - *A robust RDD&D program to improve the performance and lower the cost of carbon capture is needed.*

# Work Group Recommendations, cont.

- RTO/ISO Level Actions:

- *Beneficial changes could be implemented at the dispatch level and at the capacity contract level.*
- *ISOs/RTOs could help address the need for long-term financing of such resources by supporting long-term (i.e., 20+ year) cost-of service based contractual mechanisms to maintain long-term dispatchable capacity.*

- State Level Actions:

- *Expand renewable portfolio standard (RPS) policies to include energy from low and zero-carbon nonrenewable generation.*
- *States could also develop separate low-carbon generation standards or credits.*

# Summary

- Redouble efforts to implement the carbon capture incentives and CO<sub>2</sub> pipeline infrastructure financing recommendations to assist the development of CO<sub>2</sub>-EOR projects.
- Sustain and ultimately expand the federal energy RDD&D portfolio to improve the performance and lower the cost of all major low and zero-carbon power options.
- Work toward more comprehensive policies that encompass all low and zero-carbon generation options, including market rules, incentives, portfolio standards and other measures, that optimize system benefits effectively for affordability, reliability, and emissions reductions.
- Improve energy and capacity markets to increase system flexibility, including rewarding low-carbon dispatchable resources and their carbon reduction benefits and making it easier to finance them.



THANK YOU!  
QUESTIONS?

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