

MGA Advanced Coal and Carbon Capture and Storage Platform Goals, Objectives, and Policy Options

Followed with ET2050 Forum Participant Input

MEASURABLE GOALS

- **By 2010:** A regional regulatory framework for carbon capture and storage (CCS) will have been implemented that enables permanent geologic storage of CO₂, provides regulators and industry clear direction with regards to CO₂ capture, injection, monitoring, verification and compliance, and addresses ultimate liability for stored CO₂.
- **By 2012:** A multi-jurisdictional pipelines will have been sited and permitted to transport CO₂ captured from one or more new advanced coal plants and potentially biofuels plants to an appropriate reservoir for use in enhanced oil and gas recovery (EOR).
- **By 2012:** The region will have operating at least one commercial-scale integrated gasification-combined cycle (IGCC) power plant with CCS that uses bituminous coal.
- **By 2015:** The region will have:
 - Three or more commercial-scale IGCC plants with CCS operating with bituminous coals;
 - Operating at commercial scale at least two IGCC plants with CCS that use sub-bituminous and lignite coals, respectively;
 - Commercial scale post-combustion capture of CO₂ emissions at one or more pulverized coal plants; and
- **By 2020:** All new coal gasification and coal combustion plants will capture and store CO₂ emissions.
- **By 2050:** The region's fleet of coal plants will have transitioned to CCS.

OBJECTIVES

- Support development of a CO₂ management infrastructure and demonstration and commercialization of large-scale geologic carbon storage projects that take advantage of our region's EOR potential.
- Support research, development, demonstration and deployment of carbon capture technologies at existing plants and re-powering of existing facilities, where appropriate, and at biorefineries to increase efficiency and reduce CO₂ emissions.

- Create a policy and regulatory environment that advances new coal plants with CCS.
- Develop the commercial manufacturing, technical and operational expertise in our region to operate and export these technologies globally.
- Support the development and eventual deployment of technologies that enable effective commercial utilization of captured CO₂ as a feedstock for energy and for the manufacture of advanced materials and other useful products.

POLICY OPTIONS

Commercializing advanced coal-based generation technologies and CCS presents a classic chicken-and-egg challenge. Without a pipeline infrastructure and appropriate policy and regulatory framework in place, it is very difficult to justify the extra capital and operate expense of building a power plant capable of CCS. It is similarly difficult to contemplate financing a CO₂ pipeline without guaranteed availability of captured CO₂ and of commercial EOR opportunities to market that CO₂. Therefore, captured-ready power plants and CO₂ pipelines and the development of commercial EOR opportunities must be pursued simultaneously.

MGA states should consider implementing the following menu the policy options so that integrated power generation and CCS operations can be deployed early in the next decade.

Establish a regional CCS infrastructure for management of captured CO₂ through EOR and deep saline aquifers.

MGA states should consider implementing the following menu of policy options so that integrated power generation and CCS operations can be deployed early in the next decade.

1. Establish a regional CCS infrastructure for management of captured CO₂ through EOR and deep saline aquifer storage. Safe, reliable and permanent injection of CO₂ into oil and gas formations for EOR is fully commercial practice in the United States today. DOE estimates of CO₂ storage capacity in oil and gas formations suggest the ability to store at least two decades worth of U.S. stationary source emissions, while extending oil production from depleted domestic oil reserves. Storage over a much longer time scale will require demonstration of the cost-effectiveness and reliability of CO₂ storage in deep saline aquifer formations, which has yet to be accomplished at commercial scale.
 - a. **Develop a legal and regulatory framework for geologic storage of CO₂.** In order to set the stage for geologic storage projects to move forward in a five to 10-year timeframe, states must establish the necessary legal and regulatory framework in partnership with federal government. State agencies should begin to develop the necessary permitting processes

for geologic storage, including guidance on pipelines, drilling, storage, measurement, monitoring, verification and long-term liability.

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Barriers	Opportunities
Statutes and regulations differ across jurisdictions, including state constitutional differences. This has broad impact on CCS projects, particularly on issues related to ultimate liability.	Federal rules may emerge (particularly from the EPA) on the injection of captured CO ₂ , that will dictate minimum requirements.
Public acceptance issues regarding CCS projects and the siting of CCS projects.	Regulatory development should involve the public in choosing sites, and the NEPA process may provide a mechanism for that.
	The Interstate Oil & Gas Commission (IOGCC) model rules and regulations could be a starting point for development of a regulatory framework.
Project developers do not have a comprehensive understanding of the steps needed in developing and deploying CCS projects.	A guidance document could help show developers the entire regulatory process of developing and operating a CCS project.

Action plans

What	Who
On a state-by-state basis, identify existing statutes and regulations related to the life cycle of the CCS process; this would include gaps and overlapping or conflicting statutes and regulations.	MGA, states
Provide a guidance document that details comprehensively the elements needed in a legal and regulatory framework that could be used by both policymakers and project developers. Look at the Regional Greenhouse Gas Initiative (RGGI) process as a potential model.	MGA
Develop legislation to address the gaps and overlaps, while building upon existing legislation/regulations where appropriate.	MGA, States
Develop a legislative model or blueprint for addressing long-term	MGA, states, federal

liability. This may be informed by the state inventory of statutes/regulations affecting liability.	government
As a tool for states to use, create regional or state templates or guidance that is cognizant of differences in states' current framework	MGA
Incorporate workforce development into site selection, including best-value contracting and local hiring practices. This would be a means of incorporating the local community in a site-selected area to improve the local workforce.	
Synchronize the planning process for choosing sites within the region, while being mindful of issues across state lines, such as risk and liability.	MGA
Develop a process to incorporate public comment and input. Examine how multiple storage sites would affect the public review process.	MGA, states, federal agencies (EPA, PUCs)

- b. **Provide state-based incentives for CCS, including projects that use captured CO2 for EOR.** A number of states have made such credits available, and others should consider offering similar incentives.
- c. **Provide EOR project development assistance.** The Midwest has a mature oil and gas industry with many small oil and gas producers that have not traditionally used EOR, in part because they are not large enough to develop projects. The public sector, companies and trade associations can play a useful role in helping to identify the specific mechanisms by which producers can band together to leverage cost-effective projects.
- d. **Support comprehensive assessment of geologic reservoirs at the state and federal levels to determine the CO2 storage potential and feasibility.** Governments should build on work of the U.S. DOE-funded regional sequestration partnerships to complete comprehensive, basin-level, geologic assessments of storage potential and Co2 injection rates. Regions with a history of oil and gas exploration tend to have better data available on geologic formations, making such assessments easier and less expensive. Detailed, accurate mapping of lesser known potential reservoirs for CCS will require continued federal and state investment.
- e. **Fund sufficient large-scale geologic storage tests to prepare for future storage on a widespread commercial basis.** Congress and the president should support sufficient

federal funding for the U.S. DOE to ensure a robust program of large-scale tests to demonstrate to the private sector, policymakers and the public the viability, efficacy, and safety of widespread commercial geologic storage of CO₂. These tests should focus on a variety of geologic formation types, including reservoirs other than oil and gas bearing formations, and produce guidelines for appropriate measuring, monitoring and verification.

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Barriers	Opportunities
The federal government effort in this area is not coordinated and the funding is limited, while other sources of funds have not been identified. Project funding was eliminated for FutureGen even after site selection had gone through.	The DOE Regional Partnerships can complete inventories using industry partners to promote and coordinate for consistency. If FutureGen is reconstituted, the Midwest is a good place for CCS testing.
	Enhanced oil recovery locations should be targeted first, due to revenue possibility
Regional partnerships have split up the Midwest, leaving some states, such as Wisconsin, Minnesota, and Iowa, with little assessment of potential resources.	The MGA could “reel in” regional partnerships on assessments and testing of sequestration sites.
Testing must be done for water availability at storage sites if plants are to be built on-site.	
Without an inventory of sites, planning cannot move forward; the Department of Energy is “flailing” and not making progress.	Ex: Kansas has a huge inventory of EOR/storage sites that would be an asset to siting projects.
Landowner opposition to testing and assessment must be overcome.	
The government is able to change the process for exploring or assessing sites ex post, as occurred with the FutureGen project.	A mechanism could be created to provide developers with more certainty in advance of investment in exploration and assessments of sites.

Action plans

What	Who
The MGA should ask the DOE regional partnership groups and state geological offices to meet to discuss coordinated	MGA, DOE Regional Partnerships,

efforts and to share information within six months in order to revamp FY2009.	State Geological Surveys
The MGA and the DOE regional carbon sequestration partnerships should prioritize sites to be assessed and tested to ensure that efforts are consistent and coordinated.	MGA
Develop a gap analysis with respect to inventories and facilitate high priorities with regional partnerships and should ask the DOE to increase funding for assessment and testing.	MGA



- f. **Evaluate the feasibility of CO₂ transport and “advanced sequestration” options for jurisdictions without documented geologic storage potential, such as Minnesota and Wisconsin.** This includes evaluating the cost and feasibility of CO₂ pipelines to geologically appropriate areas in neighboring states, CO₂ storage in nontraditional geologic formations and advanced sequestration options, such as mineralization, the use of carbon nano-fibers or algae.
2. Provide financial and regulatory incentives to build advanced coal generation projects with CCS, using bituminous, sub-bituminous and lignite coals.
- a. **Provide state support for front-end engineering and design (FEED).** FEED studies provide the cost estimates needed to secure private investment in power plant projects. State tax credits or grants can help offset FEED study costs and allow utilities and developers to recoup those initial engineering costs that are most difficult to finance. This approach has been effective in Illinois, North Dakota and Wyoming in spurring project development, and is under consideration in other parts of the Midwest.
 - b. **Provide direct state financial investment (grants, tax credits, loan guarantees and performance wrap engineering/procurement/construction or EPC coverage).** States should establish the same or complementary incentives to those in the federal Energy Policy Act of 2005 to help reduce the financial cost of the overall project once engineering and cost studies are completed.

- c. **Allow regulated utilities cost recovery for appropriate commercial projects.** Utilities committed to developing advanced technology coal plants with CCS should be ensured cost recovery, as long as they meet a state commission’s standards for proper spending decisions. States should also consider a comparable process for merchant and independent power producers involved in request for proposed bidding processes.
- d. **Enhance integrated resource planning (IRP) policies, where applicable, by using them to encourage low-CO2 coal technologies.** Regional leaders should adopt well-designed IRP rules to weigh the full costs, benefits and risk characteristics of various resource options. Doing so would improve the accuracy of “least cost” planning for generation options, which currently penalizes advanced coal and CCS proposals because it does not fully address future regulatory and environmental costs. Future risks to be factored in should include fuel price fluctuation, carbon constraints, emission limits of criteria pollutants and mercury, and technology uncertainty.

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Barriers	Opportunities
Balancing the interests of different stakeholders in including low-carbon technologies in IRPs.	Elevate the emphasis of low-carbon technologies in IRPs.
How do you factor carbon into an IRP? What are the values and costs of low-carbon technologies?	
There are many unknowns: emerging federal policy, international policy, and new technologies.	

Action plans

What	Who
Integrate low-carbon technologies into IRP rules and develop a model rule or guidance document that includes principles for evaluating costs, benefits, and risks.	
Develop a mechanism for determining the regulatory costs and the environmental costs and benefits of CCS (e.g., GHG emission increase/reduction).	Public Utility Commissions/Service Commissions

e. **Modify state policies and regulatory programs to favor advanced CO₂-limiting generation technologies with CCS over conventional pulverized coal units.** These policies could include:

- 1) A low-carbon electricity portfolio standard or objective that combines fossil electricity generation resources (such as IGCC with CCS) with traditional renewable resources;
- 2) A CCS portfolio standard for electricity providers;
- 3) A CO₂ performance standard for all new electric power plants;
- 4) Innovative, long-term power purchase agreements to provide developers with higher rates of return and reduced risk in exchange for price stability that benefits ratepayers (allowing regulators to qualify more stable prices as a benefit);
- 5) Specific incentives and financing assistance to replace or re-power existing coal plants in favor of advanced generation technologies with CCS;
- 6) Market-based environmental regulatory programs to provide incentives to invest in low CO₂ emission technologies with flexibility and certainty for achieving reductions; and
- 7) Three-party covenants in which the federal government provides credit, the state regulatory commission provides an assured revenue stream from the syngas to protect the federal credit, and a project developer provides equity and initiative to build the project.

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Barriers	Opportunities
<p>Cost of proposed CO₂ performance standards such as the California standard (meet combined cycle natural gas CO₂ emissions to enter into greater than 5-yr contracts, or about 2/3 capture from a coal plant) are difficult to finance, leading to lack of CCS projects moving through the development pipeline.</p>	<p>Proven technologies exist to capture CO₂ and to inject CO₂ geologically. Their deployment could, given the right incentives, be accelerated.</p>
<p>Project developers contemplating CCS must somehow finance projects well in advance of government implementation of enabling CCS regulatory framework, actual emissions</p>	<p>Before approving new plants, stakeholders/policy-makers want greater certainty than “capture ready” that a</p>

reduction requirements and, in some cases, financial incentives that are anticipated in the future, but not yet certain.	developer will eventually capture CO2.
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Action plans

What	Who
Define what constitutes acceptable, best practice CO2 capture and storage design and procedures that a project developer can follow and certify CCS compliance needed to finance project up front and to receive public incentive support. In return, states create the means by which developer can proceed with plant construction without operational CCS, <i>if</i> state fails to implement enabling regulatory framework and other measures in time to deploy CCS component.	MGA develops criteria and guidelines for consideration by PUCs, other relevant state agencies, and state legislatures as appropriate.

- f. **Increase federal funding of incentives to accelerate deployment of advanced coal technologies with CCS at commercial scale.** Current federal funding is completely inadequate given the scale of the task and urgency of commercializing advanced coal technologies with CCS. Midwestern governors call on the region’s congressional delegation to expand significantly the federal commitment of resources in this area.
- g. **Provide incentives for deployment of innovative coal gasification technologies, including co-gasification of biomass and underground coal gasification, and the utilization of captured CO2.** Co-gasification of biomass feed stocks with coal has been commercialization demonstrated in Europe and, when combined with CCS, could provide CO2-neutral or even CO2-negative energy production. Underground coal gasification has entered commercial operation overseas and has the potential to bring the capital costs of CCS with coal to at or below that of conventional pulverized coal generation. Finally, research is underway to convert captured CO2 into useful and advanced materials and other products.
- h. **Update workforce training, with a focus on the gasification and carbon storage industries.** A major barrier to development of IGCC technologies is the lack of trained personnel in the power industry familiar with the design, construction and operation of gasifiers and associated systems, which are operationally more closely associated with petroleum refining than traditional power generation. Similarly, the development of EOR

operations is constrained by a lack of commercial experience in much of the oil and gas industry, especially among the smaller-scale companies that dominate production in the Midwest. The utility and oil and gas industries will need expanded workforce training in order to adopt IGCC and CCS on the scale required.

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Energy companies' participation in CCS initiatives will be a key to the success of MGA goals.

Barriers	Opportunities
The length of time to create a process for putting incentive funding in place.	
The identification of a revenue source for incentive funding.	An inventory of existing programs showing a roadmap of potential incentives.
A lack of education about the value of CCS, which results in a lack of funding.	
A lack of understanding in the investment community regarding the economic development potential of CCS.	
Uncertainty among government officials regarding jurisdiction over CCS programs, including the division between state and federal.	
Double carbon taxation is a risk because of federal government cap and trade rules.	
Political risk for officials exists because any funding provided to energy companies for CCS assessment could be used for more voter-friendly initiatives and because consumer rates may have to rise in the short term to fund initiatives.	
	Energy incentives specifically tied to CCS may speed assessment and development.

Action plans

What	Who
Offer workforce training to show stakeholders such as labor unions the benefits of supporting CCS.	States
Develop university cooperative initiatives to promote research into development of better technology and commercial use for the by-products of CCS.	States and universities
Consider the bonding authority of states as a financial resource.	MGA, states
Offset CCS project costs by including CCS in a cap and trade system. Discussions about cap and trade should be structured to compare a 100% auction system to a mixed system of auction and other incentives.	MGA

3. Develop incentives targeted at biorefineries that appropriately parallel those targeted power plants.

Additional ET2050 Feedback

Goal: An integrated information strategy

Information needs to be more widely shared among all stakeholders (public, government, industry, etc.).

Barriers	Opportunities
Lack of education among decision makers	Connect policymakers with technical resources (such as state geologists)
No centralized coordination of information and resources (not even on state level)	Reduce time of learning curve by connecting and sharing. Embrace “outside” resources.
	Local and community leaders could become advocates if involved in learning about resources
No one knows who is doing what	

Action plans

What	Who
Identify credible, neutral source of information or create source with funding to provide a vetted site (neither pro nor anti).	Examples: Wikipedia model, NARUC, University Research Center, gasification.org (w/CCS)
Identify people/scientists who are credible to speak or testify to key stakeholders	
Catalog a process in each state or project including model legislation or regulation	
Encourage peer to peer information sharing	
Create a network of state non-governmental organizations to promote information clearinghouse and add information to the site should be created.	
Identify target audiences such as insurers and lenders.	

Further Discussion

A few other implementation priorities identified but not discussed in depth include:

- The trade-off of locating CCS plants near sequestration sites versus closer to transmission facilities. A study is needed on the cost of transporting CO₂ to sequestration sites versus the cost of moving power from sequestration site via transmission lines.
- Taking advantage of near-term opportunities to produce substitute natural gas from coal gasification with CCS and fully utilize existing natural gas combined cycle (NGCC) capacity as baseload (displacing more CO₂-intensive baseload generation).
- The need to agree on what constitutes “doing CCS” at the plant level—what percentage qualifies.
- The need to agree on an appropriate measure of investment/rate recovery for utilities.
- The need to recognize and avoid conflict between cap and trade initiatives and CCS objectives.
- The need to assure fairness of standards in both regulated and non-regulated jurisdictions, as well as between publically-owned and private utility companies.