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Prepared for the Renewable Electricity & Advanced Coal with Carbon Capture and Storage Advisory Group (REACCS)

## Commercial Demonstration and Deployment of Co-Utilization of Coal and Biomass with CO<sub>2</sub> Capture and Storage

Combustion and gasification of coal with biomass has been demonstrated at commercial scale in multiple locations around the world. The combustion of switchgrass with coal in Iowa or the gasification of a range of biomass feedstocks with coal in the Netherlands are prominent examples. The Dutch IGGC plant is now taking the additional step of installing CO<sub>2</sub> capture with coal and biomass co-gasification. The incorporation of CO<sub>2</sub> capture and storage (CCS) has the potential to achieve very low and even net-carbon negative emissions profiles because the carbon stored in the biomass through photosynthesis can be captured, rather than released back to the atmosphere. Challenges include sustainable and affordable biomass feedstock supply, including potentially adverse agricultural and land use impacts; cost and performance guarantees for key conversion technologies suitable for biomass feedstocks; and the cost of CCS and lack of a policy framework to reward potential emissions reductions.

The Midwest is uniquely positioned to deploy these technologies in a region with significant biomass, coal, and geologic storage resources. There is a need to address the potential challenges and to identify mechanisms to foster wider deployment of technologies that take advantage of coal and biomass synergies and the resource strengths of the Midwest. The co-utilization of these resources presents an economic opportunity to harness resources that the region has in abundance, an environmental opportunity to reduce the carbon footprint of energy production, and a political opportunity to align important industries and constituencies behind a common and mutually beneficial strategy.

### Importance in the Midwestern context

- Environmental benefits – significantly reduced criteria pollutants and a potentially negative carbon footprint.
- Economic development potential.
- Strategic use of the resources that converge in the Midwest – coal, biomass, and geologic storage potential.

### Key issues to address

- Life-cycle greenhouse gas accounting.
- Examine potential impacts to water resources.
- Evaluate different types of biomass that may be used in co-utilization projects.
- Evaluate the cost of biomass from various sources, including such factors as production, on-field handling and baling (for grass biomass), loading, transportation, and on-site handling.
- Evaluate options for co-firing and co-gasifying with different types of boilers, gasifiers and other conversion technologies.
- Examine co-location options in the region.

Note: It is important to evaluate these issues through technology demonstration and integration at both small and large scales.

### Implementation needs

- Support for small-scale demonstration projects that can effectively test different scenarios (acknowledging that access to feedstock and geologic storage sites varies by geography). Synergies and lower O&M costs may be created more easily with smaller scale projects utilizing these technologies.
- Identify economic development opportunities in the Midwest through deployment of these technologies.
- Identify specific policies that would support commercial deployment.
- Development of commercial business models for best practice biomass production and utilization.
- Development of tools to assess and model the direct and indirect environmental impacts of projects that co-utilize coal and biomass with carbon capture and storage including, but not limited to:
  - Life-cycle analysis of GHG impacts.
- Develop a project in the Midwest to demonstrate the integration of the technology and feedstock that also conducts a life-cycle accounting process.
  - Development of an integrated project is key for obtaining project financing.
  - Identify a project site with both a high potential for biomass feedstock and with suitable geology for CO<sub>2</sub> storage.

### Key stakeholders

- Industry
- Agricultural interests
- Environmental and wildlife conservation groups
- Forestry interests
- Financial community

### Key jurisdictions for demonstration projects

- Opportunities in Iowa, Michigan, North Dakota and Ohio have been discussed. For the REACCS advisory group, proposing one or more demonstration projects in these jurisdictions would provide geographic balance with the group's proposal for a CO<sub>2</sub> pipeline serving several commercial CO<sub>2</sub> capture plants (IGGC and SNG) in the Illinois Basin.

### Proposed next steps

- Identify specific additional policies needed, if any, to advance biomass and coal co-utilization with CCS beyond what REACCS is already recommending for advanced coal and CCS and include those recommendations in a sidebar feature in the MGA roadmap devoted to this opportunity.
- Staff to work with interested advisory group participants and observers to identify a potential demonstration project or projects that could be featured in the MGA Roadmap as practical examples of opportunities to jumpstart both biomass and coal co-utilization and CCS deployment.