

# **21<sup>st</sup> Century Coal Program: Incentives to Reduce the Cost of CCUS from Coal-Fired Generation**

**2015 EOR Carbon Management Workshop**

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# CURC – Who Are We?

ADA-Environmental Solutions  
Air Products and Chemicals  
**Alstom Power, Inc.\*\*\***  
American Coal Council  
**American Coalition for Clean Coal  
Electricity (ACCCE)**  
**American Electric Power\***  
**Arch Coal, Inc.\***  
Battelle  
Basin Electric Power Cooperative  
**The Babcock & Wilcox  
Company\*\*\***  
**Caterpillar Global Mining**  
**Cloud Peak Energy**  
CONSOL Energy, Inc.  
**Duke Energy**  
**Edison Electric Institute (EEI)**  
**Electric Power Research Institute  
(EPRI)**  
Energy Industries of Ohio  
FutureGen Industrial Alliance  
Gas Technologies Institute  
(formerly Aerojet Rocketdyne)

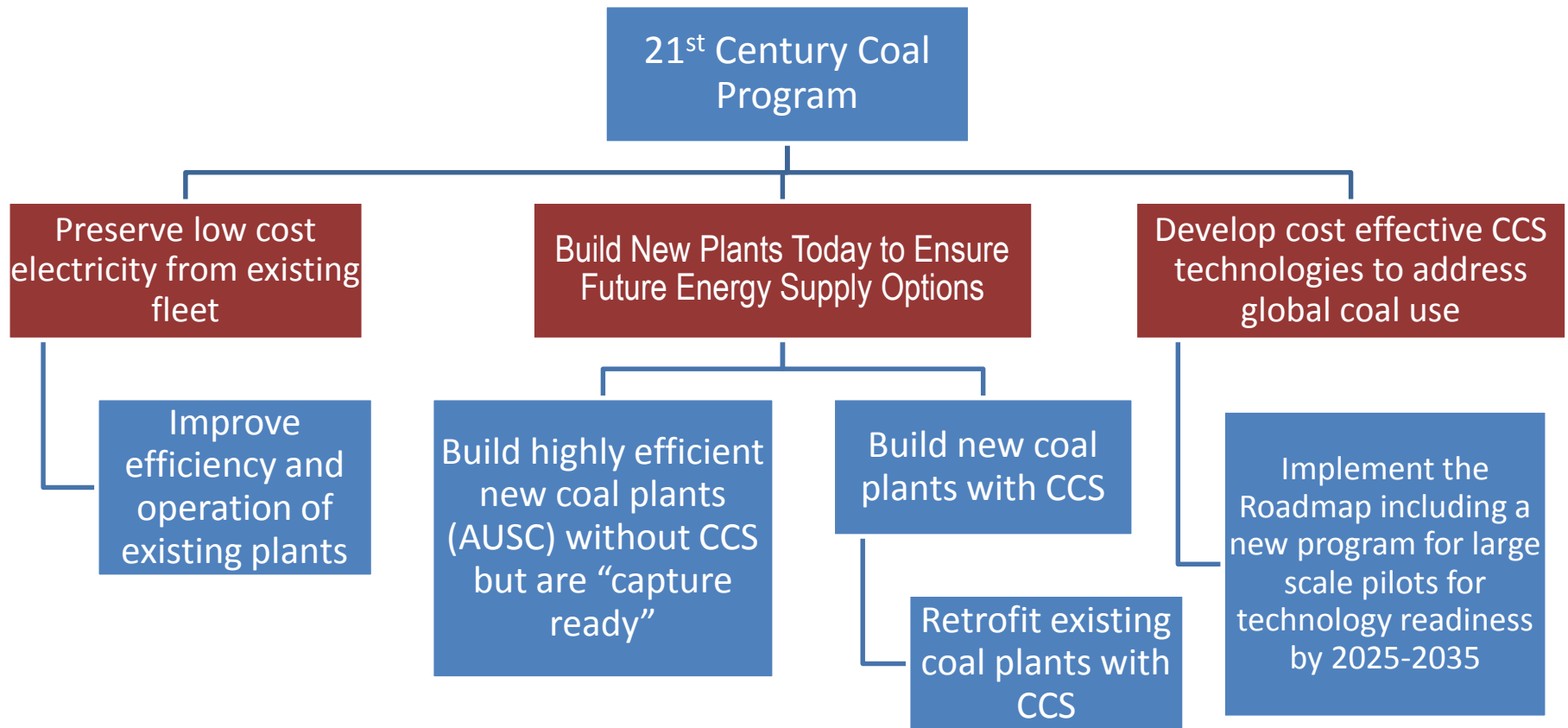
The Greater Pittsburgh Chamber of  
Commerce  
Illinois Coal Association  
Illinois Department of Commerce  
and Economic Opportunity  
Kentucky Energy and Environment  
Cabinet  
Lehigh University  
LG&E Energy  
Lignite Coal Council  
LP Amina  
The Linde Group  
Mitsubishi Heavy Industries America  
**National Rural Electric Cooperative  
Association (NRECA)**  
Ohio State University  
**Peabody Energy**  
Pennsylvania Coal Alliance  
Penn State University  
**Southern Company**

State of Ohio, Air Quality  
Development Authority  
**Tri-State Generation & Transmission  
Association\*\***  
United Mine Workers of America  
University of Kentucky  
University of North Dakota's Energy  
& Environmental Research  
Center University of Wyoming  
West Virginia Coal Association  
West Virginia University  
Wyoming Infrastructure Authority  
Wyoming Mining Association

Companies in red indicate 2015 Steering  
Committee Members

\* CURC 2015 Co-chairs  
\*\* CURC 2015 Vice-Chair  
\*\*\* CURC 2015 Leadership Council

# 21<sup>st</sup> Century Coal Program



# Implement RD&D to Develop Cost Effective CCS and Address Global Coal Use

## THE CURC-EPRI COAL TECHNOLOGY ROADMAP

Prepared by the Coal Utilization Research Council and the Electric Power Research Institute

- The Roadmap is a plan – to be undertaken in partnership with the federal government –
  - to improve the environmental performance of coal use and
  - to continue to deliver low-cost electricity, energy and other valuable coal-derived products to America
- The Roadmap defines a set of specific technology solutions in order to meet those goals with a recommended federal-industry cost share budget to develop those technologies
- The costs to implement the Roadmap:

Funding (\$M/year)		2016-20	2021-25	2026-35
R&D	<b>Total (Industry and Federal)</b>	346	241	97
	<b>Federal (80%)</b>	277	192	77
Pilots	<b>Total (Industry and Federal)</b>	279	322	89
	<b>Federal</b>	279	322	89
Demos	<b>Total (Industry and Federal)</b>	28	854	654
	<b>Federal (50%)</b>	14	427	327
<b>Total (Public/Private) Annual Funding</b>		<b>653</b>	<b>1,416</b>	<b>850</b>
<b>Annual Federal Budget</b>		<b>570</b>	<b>941</b>	<b>493</b>

# Build Coal and CCS Plants Today to Ensure Future Energy Supply Options

## What is Needed to Build Coal and CCS Plants Today?

**Accelerated Permitting**

**New Coal Plants without CCS (USC)**

**New Coal Plants with CCS**

**CO<sub>2</sub> Retrofits to Existing Plants**

## How Can We Support Coal and CCS Deployment?

**Consolidated permitting process and timing limitations to judicial challenges**

**Standards that encourage construction of highly efficient coal plants (USC)**

**Adequate and targeted Federal financial incentives to address CCS risks**

**and**

**Policy parity with other low carbon emission technologies**

# Risk Considerations that CCS Incentives Must Address

## ■ Financial Risks

- Significant costs and escalation experienced on recent projects
- Banks and private equity markets are unwilling to finance projects without guarantees that the technology works

## ■ Technical Risks

- Need to demonstrate performance of CO<sub>2</sub> technologies before manufacturers to guarantee performance
- Capture and sequestration availability, reliability, flexibility and end-use constraints
  - Operations and Maintenance unknowns
  - Power plants are required to operate 24x7 to meet demand for electricity.
  - Sequestration needs to be demonstrated in integrated operation.

## ■ Regulatory/Legal Risks

- Property rights, pore space access, and long-term liability/stewardship
- Permitting risk and delay due to permitting challenges

# Incentives for Minimizing Risk Today Fall Short

- DOE funding levels are insufficient and DOE cost share is not enough
- Investment and production tax credits at traditional levels will not cover the shortfall in capital and operating costs
  - Commissions fall back on comparative technology options like natural gas combined-cycle (NGCC) to minimize cost and risk.
  - A meaningful incentive would index the cost of a coal plant w/CCS against NGCC
- Additional incentives to cover technical risk should problems arise
  - O&M costs are unknown for any substantial duration

# CURC Recommendations for Adequate and Targeted Incentives

- To Address Financial/Operating Risks:
  - Refundable investment tax credits (grant in lieu of tax credit)
  - Refundable CO<sub>2</sub> sequestration credit or variable price support program
  - Loan guarantees or access to low cost financing
  - Price stabilization (contract for differences) on CO<sub>2</sub> or electricity prices
- Regulatory Incentives – Accelerated Permitting
- Policy parity with other forms of low carbon generating technologies recognizing that CCS is an immature technology when compared to other low carbon generating options



# What is Required to be Successful?

- Recognition that there is no one accepted “one size fits all” approach to minimizing the risks
  - Range of entities with different types of risk or business approaches
    - Cooperatives/G&Ts
    - Developers will little or no tax equity
    - IOUs
    - Merchants
- Support for adequate incentives targeted to appropriate risk
- Policy and regulatory parity with low carbon alternatives
- Active support and advocacy from all actors in the supply chain
- Nationally recognized business leaders expressly advocating for technology including CCS

# Questions?

## Thank you!

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[www.coal.org](http://www.coal.org)

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