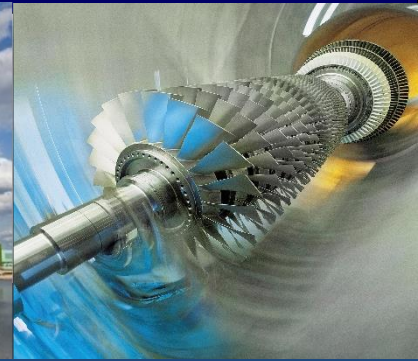
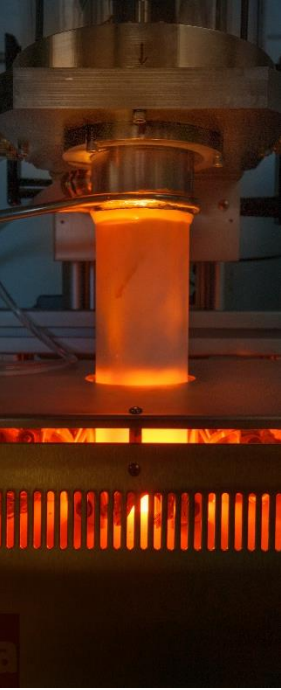




U.S. DEPARTMENT OF
ENERGY

Office of
Fossil Energy



Research and Development, Federal and State Partnership with Industry

Identifying Synergies Among Federal and State Research and Development Agendas for Advanced Coal Technology including CCUS and Forecasting Future R&D Programs

John Litynski
Deputy Director

Advanced Fossil Technology
Systems

Western States Coal Strategies Forum | November 2019 | Moab, Utah

CLEAN COAL AND CARBON MANAGEMENT BUDGET OVERVIEW

(SUBJECT TO APPROPRIATION)

Discover and develop advanced coal technologies that ensure America’s access to resilient, affordable, reliable, and near-zero emitting coal energy resources.

Coal R&D Budget Priorities

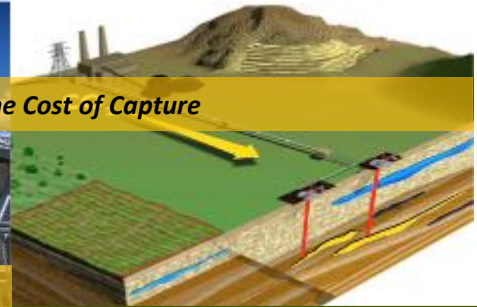
- Implementing the **Coal FIRST** (Flexible, Integrated, Resilient, Small, Transformative) initiative: R&D on first-of-a-kind small-scale modular coal plants of the future, which are highly efficient and flexible, with near-zero emissions
- Improving the performance, reliability, and efficiency of the existing coal-fired fleet
- Reducing the cost and risk of carbon capture for commercial deployment
- Creating new market opportunities for coal



CCS and Power Systems (\$ in thousands)	FY 2019 Enacted	FY 2020 House	FY 2020 Senate	Future Plants	Existing Plants	Cost of Capture	New Markets
Carbon Capture	100,671	125,000	113,000	✓	✓	✓	
Carbon Storage	98,096	102,000	103,000	✓	✓		✓
Advanced Energy Systems	129,683	107,000	139,000	✓	✓	✓	✓
Crosscutting Research*	56,350	65,255	64,300	✓	✓		
Rare Earth Elements*	18,000	23,000	25,000				✓
STEP (Supercritical CO2)	22,430	24,000	14,000	✓	✓		
Transformational Coal Pilots	25,000	20,000	17,000	✓	✓	✓	
NETL Coal R&D*	36,000	38,000	42,000	✓	✓	✓	✓
TOTAL CCS & Power Systems	486,230	504,255	517,300				

COAL R&D OVERVIEW

Advancing R&D for the Existing Coal Fleet and Plants of the Future



Reducing the Cost of Capture

Creating New Markets for Coal

Advanced Energy Systems

Crosscutting Research

CO₂ Capture and Utilization

CO₂ Storage

Efficiency improvements for new and existing units

- Advanced energy materials
- Advanced gasification
- Solid oxide fuel cells
- Advanced coal processing
- Advanced turbines
- Advanced combustion
- Sensors and controls

Crosscutting technology development program

- Power generation efficiency
- Supercritical transformational electric power
- Critical minerals
- Coal utilization science
- Transformational coal pilots
- University research
- SBIR/STTR*
- Technology Commercialization Fund (TCF)*

Reducing the cost of CO₂ capture for new and existing units

- Post-combustion capture
- Pre-combustion capture
- New pathways to utilize captured CO₂

Safely and permanently storing CO₂

- Safe use and permanent storage of CO₂ from power generation and industry
- Minimizing subsurface risks (coordinated with other subsurface offices, e.g., Office of Oil and Natural Gas)
- CO₂ infrastructure analysis

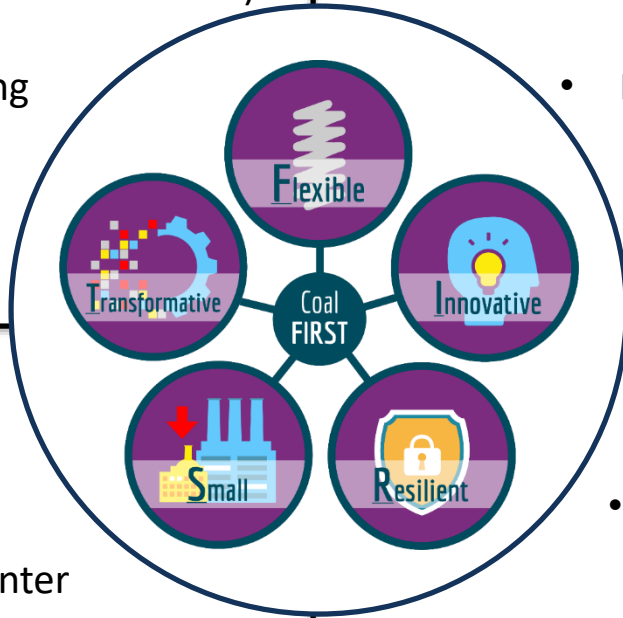
Note: Programmatic not necessarily budgetary groupings

*SBIR/STTR and TCF are managed under the Crosscutting Program but funded by all R&D programs



FY 2020 COAL R&D PRIORITIES

Advanced Energy Systems	Crosscutting
<ul style="list-style-type: none"> Coal FIRST FEED & Components Advanced Turbines (Steam, Pressure Gain) Coal recovery and processing 	<ul style="list-style-type: none"> Coal FIRST FEED & Components Pilots for REEs/CM and advanced products Energy storage Supercritical CO2 power Advanced computational
<ul style="list-style-type: none"> Coal FIRST FEED Scaling Capture Technology National Carbon Capture Center Direct Air and Industrial Capture Utilization materials/ process intensification 	<ul style="list-style-type: none"> CarbonSAFE Regional Initiative to Accelerate CCUS Artificial Intelligence & Visualization for the subsurface
Carbon Capture & Utilization	Carbon Storage



2020 DOE COAL R&D STAKEHOLDER WORKSHOPS

- **Western Coal Strategies Workshop**
Moab, Utah
- **Rare Earth Element and Critical Mineral Production from Domestic Coal-Based Resources**
October 31, 2019 - Golden, CO
December 11, 2019 – Washington, DC
- **Coal Extraction, Processing, and Conversion to Advanced Products**
February – Pittsburgh, PA
- **Energy Storage from the Fossil Fleet**
February - Pittsburgh, PA
- **CCUS and Markets Roundtables - 2020**



ACTIVE DOE SPONSORED COAL R&D IN THE WESTERN STATES

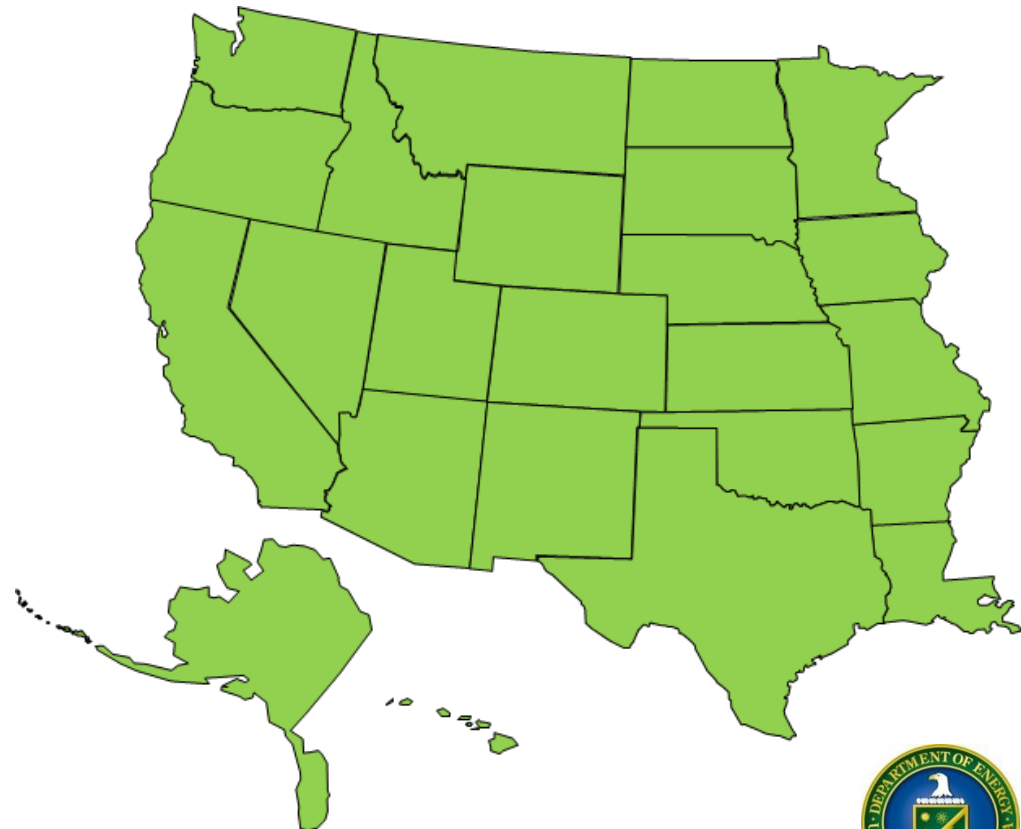
17 of 22 states leading R&D projects

5 remaining states partners in R&D

198 Active R&D projects

- Over \$1,300M total value,
- >\$800M DOE investment
- Across all R&D pillars
- Industry, Academia, National Laboratories and other R&D institutions

>60% of the Coal Produced in the US



PARTNERING WITH DOE COAL R&D PROGRAM

FE (HQ and NETL) Procurement

- Funding opportunity announcement
- Contracting
- University Partnerships (NETL)
- Unsolicited Proposals

Leverage Existing Opportunities

- National Laboratories
- International Agreements
- Technical Assistance
- Regional Initiatives



Search



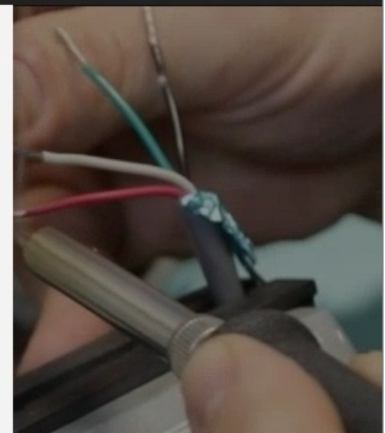
About Research and Programs Business Education Library News and Events



- Solicitations and Funding Opportunities
- Prizes and Challenges
- Careers
- Business Forms
- Site Support Electronic Reading Room
- Unsolicited Proposals
- Available Property

- ### Partnering with NETL
- Regional Workforce Initiative
 - City of Pittsburgh MOU

- ### Technology Transfer
- About NETL Technology Transfer
 - Agreements and Licensing
 - Success Stories
 - Available Technologies



<https://www.netl.doe.gov/>



Thank You