NETL, Strategic Partnerships, and the Regional Workforce Initiative (RWFI)

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Core Competencies & Areas of Research

- Computational Science & Engineering
- Materials Engineering & Manufacturing
- Geological & Environmental Systems
- Energy Conversion Engineering
- Systems Engineering & Analysis
- Program Execution & Integration

- Coal
  - Carbon Storage
  - Carbon Capture
  - Sensors & Controls
  - Advanced Materials
  - Advanced Computing
  - Advanced Energy Systems
  - Water Management
  - Rare Earth Elements

- Oil & Gas
  - Enhanced Resource Production
  - Environmentally Prudent Development
  - Methane Hydrates
  - Offshore
  - Natural Gas Infrastructure
  - Unconventional
Delivering Public Value

**SECURE & REVITALIZE the Energy Infrastructure**
- Develop, implement, and manage public-private partnerships focused on infrastructure enhancements
- Assess, analyze, and resolve infrastructure needs and challenges

**REALIZE Full Value of Domestic Energy Resource**
- Analysis to inform energy policy
- Technical solutions to enable full resource utilization (e.g., *Stranded Methane*)

**ATTAIN Energy Independence**
- Support expanded oil, gas, and/or coal exploration and production
- Unlock future resources (e.g., *Methane Hydrates*)

**REINVIGORATE Jobs & Manufacturing**
- Improve manufacturing competitiveness
- Implement workforce development programs (e.g., *Energy and Manufacturing Workforce Development*)
Converting Coal Into High-Value Added Products

Current and Potential Stakeholders for NETL

Consortium with Leading Coal-Producing States, Community Colleges, & Economic Development Programs

SMART TEXTILES
- Stain/Water Resistant Clothing

PLASTIC COMPOSITES
- Enhanced Plastics

STRUCTURAL & BUILDING MATERIALS
- Structural Cements

CARBON NANOMATERIALS
- Graphene
- Graphene Oxide
- Carbon Quantum

3D PRINTING MATERIALS
- Fluids
- Filaments
- Plastics
- Devices

ENERGY STORAGE MATERIALS
- Supercapacitor
- Electrode Materials
Fossil-focus in Advanced Manufacturing

Advanced manufacturing to improve the performance and economics of energy and materials systems

Expand materials and advanced manufacturing to extreme operational environments

Develop carbon-based source materials

Synthesize inter-disciplinary approaches to manufacturing
Appalachian Coal Country: Major Stakeholders

Initiating & Enhancing Collaborative Partnerships

INDUSTRY PARTNERSHIPS

GOVERNMENTAL PARTNERSHIPS

ACADEMIC PARTNERSHIPS

NONGOVERNMENT PARTNERSHIPS

Tri-State University Energy (TrUE) Alliance

Frostburg State University

Virginia Tech

The Ohio State University

Penn State

Claude Worthington Benedum Foundation

ShaleNET

Rapid Manufacturing Institute

MARCELLUS Shale Coalition

RCBI

ADVANCING MANUFACTURING TECHNOLOGIES

U.S. DEPARTMENT OF

ENERGY
The NETL Regional Workforce Initiative (RWFI) creates a platform for:

- communication and collaboration with stakeholders and partners
- connect public investment in energy and advanced manufacturing NETL R&D to national and regional economic development, education, and jobs.
- coordinating across economic development and workforce initiatives with NETL, and its federal agency partners, and national labs
Connect with NETL

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FOAs: Sean Plasynski
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Energy Systems Analysis

Teams and Scope

Energy Process Analysis

- Plant-level modeling, performance assessment
- Cost estimation for plant-level systems
- General plant-level technology evaluation and support

Energy Systems Analysis

Resource Availability and Cost Modeling
- CO₂ storage (saline and EOR)
- Fossil fuel extraction
- Rare earth elements
- General subsurface technology evaluation and support
- Grid modeling and analysis

Environmental Life Cycle Analysis

Energy Markets Analysis

Energy Economy Modeling and Impact Assessment
- Enhanced fossil energy representation
- Multi-model scenario/policy analysis
- Infrastructure, energy-water

- Economic impact assessment
- General regulatory, market and financial expertise

Process Systems Engineering Research

- Process synthesis, design, optimization, intensification
- Steady state and dynamic process model development
- Uncertainty quantification
- Advanced process control

Design, optimization, and modeling framework to be expanded to all SEA "systems"
Assessing Program Portfolio Impacts:

Coal Program Example

**Baseline Data & Model Development**
- Set R&D Goals and Evaluate Progress
- Project deployment of Technologies
- Estimate Potential Benefits of RD&D

**NETL Cost and Performance Baseline for Fossil Energy Plants**
- Detailed, transparent account of plant information
- Key resource for government, academia and industry

**NETL CO₂ Saline Storage Cost Model (onshore and offshore)**

**NETL CO₂ Capture, Transport, Storag and Utilization - National Energy Modeling System (CTUS-NEMS)**
- Adopted by EIA; used in AEO’s 2014/15/16
- Facilitates and encourages EPSA interactions

**NETL CO₂ Prophet Model**
- Borehole bottom locations mapped by play name

**U.S. DEPARTMENT OF ENERGY**
Assessing Program Portfolio Impacts:

Baseline Data & Model Development
Set and Evaluate Progress to R&D Goals
Project Deployment of Technologies
Estimate Potential Benefits of RD&D

New CCS Capacity and Associated Captured CO₂

2025
2040

U.S. Benefits of the Program, Cumulative through 2040

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<th>Metric</th>
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NG Retrofits
New Gas CCS
Coal Retrofits
New Coal CCS

No Captured CO₂
57 MM tonnes/year CO₂ Captured
114 MM tonnes/year CO₂ Captured
291 MM tonnes/year CO₂ Captured

No RD&D
RD&D
No RD&D
RD&D

No RD&D
RD&D
No RD&D
RD&D

30
20
10
0

Gigawatts

57 MM tonnes/year CO₂ Captured
114 MM tonnes/year CO₂ Captured
291 MM tonnes/year CO₂ Captured

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