

# National Energy Technology Laboratory



## *Office of Science and Engineering Research Overview*

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*Anthony Cugini*

[www.netl.doe.gov](http://www.netl.doe.gov)

Office of Fossil Energy



# National Energy Technology Laboratory

- **DOE's only national lab dedicated to fossil energy RD&D**
  - Government owned and operated
  - Full operations office capabilities
- **One lab, three R&D locations, five project management locations, one management structure**
- **1,100 Federal and support-contractor employees**
- **Conducts research spanning basic science through technology demonstrations**
- **Significance - fossil energy supplies 85% of Nation's energy needs**



*Pennsylvania*



*Oregon*



*West Virginia*



*Alaska*

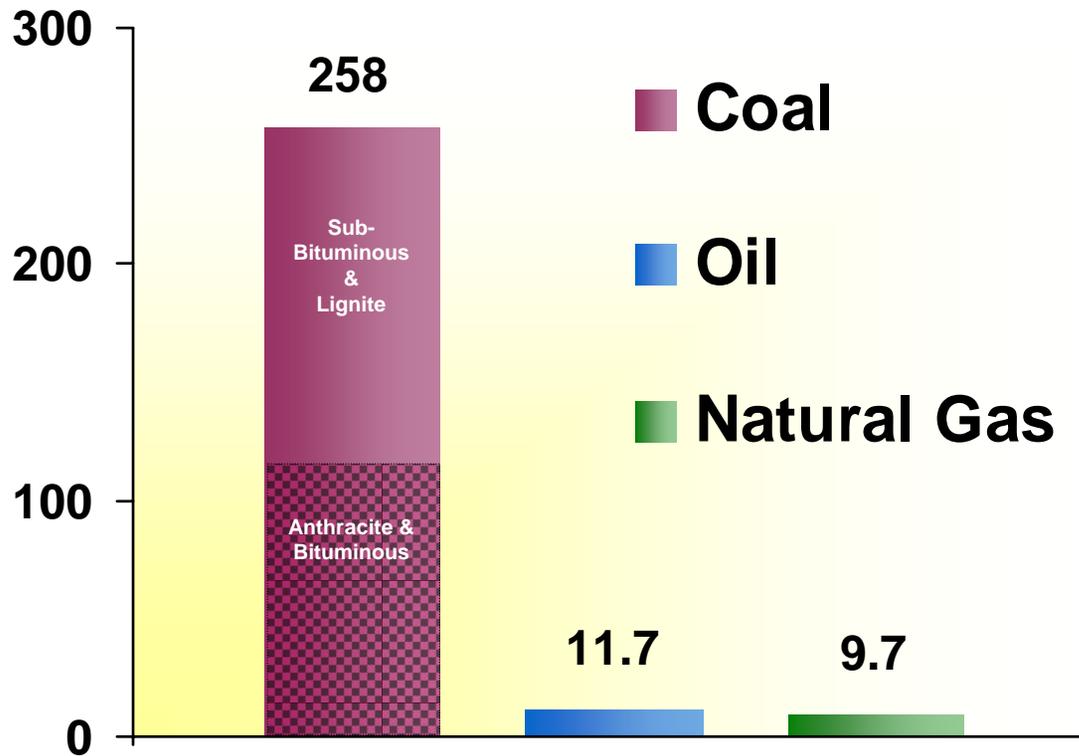


*Oklahoma*



# United States Reserves of Fossil Fuels

## U.S. Fossil Fuel Reserves / Production Ratio *Years Supply at Current Production*



Sources: BP Statistical Review, June 2004, - for coal reserves data - World Energy Council;  
EIA, Advance Summary U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Reserves, 2003 Annual Report, September 22, 2004 - for oil and gas reserves data



# NETL's Mission

**Implement a research, development, and demonstration program to resolve environmental, supply, and reliability constraints to producing and using fossil energy resources**



# How NETL Accomplishes Its Mission

- Shape, fund, and manage national extramural RD&D
- Conduct hands-on intramural science and engineering research and development
- Support energy policy development and implementation
- Expand the nation's options for utilizing fossil energy resources, thereby contributing to the Nation's economic and national security



# Goal of NETL's Intramural Research

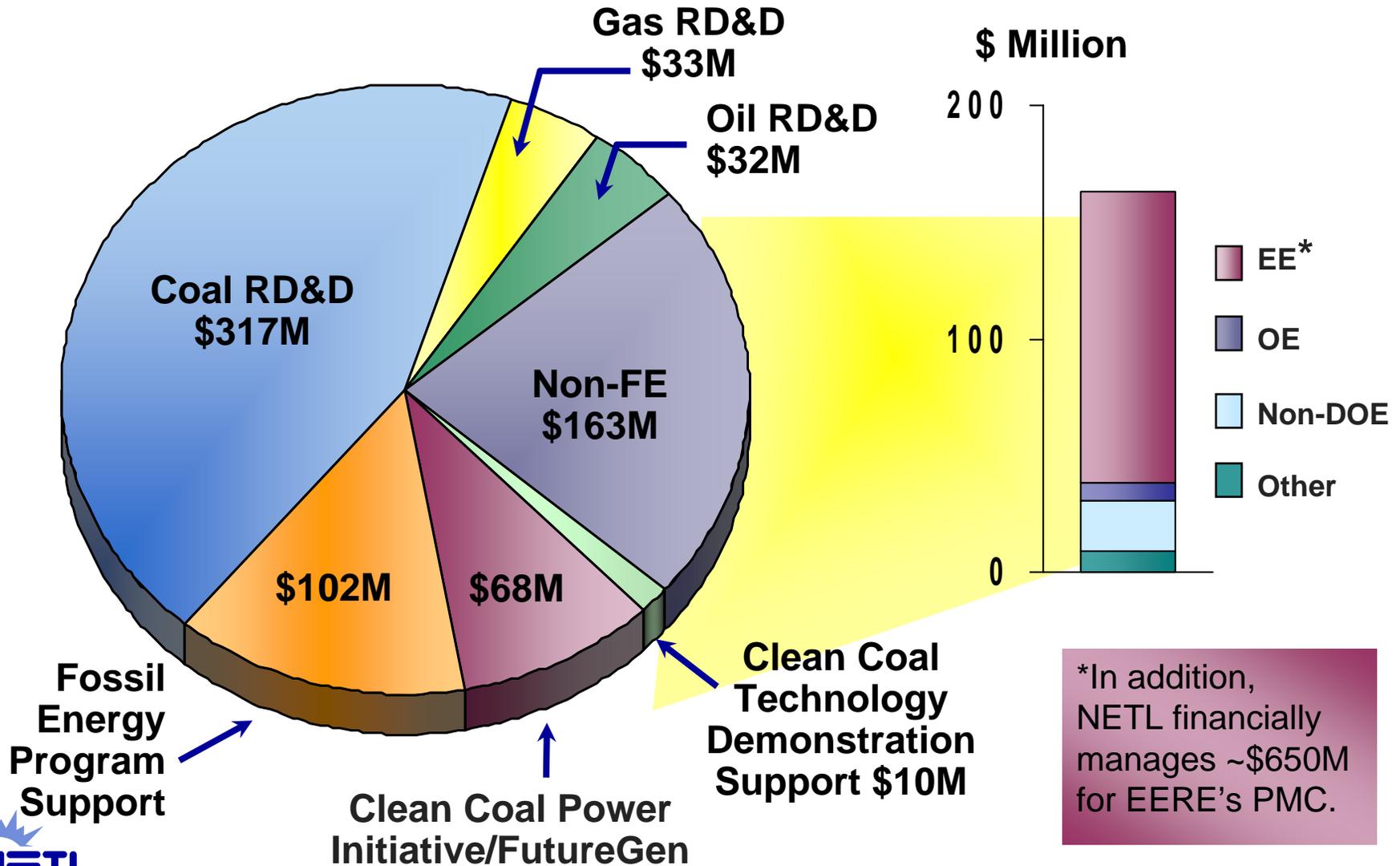
- **Promote high risk breakthrough science-** Hydrogen storage and separation, sulfur tolerant membranes for hydrogen production from syngas, fuel cells, zero-emissions combustion, sequestration mechanisms, laser ignition, gasifier refractories, extreme deep drilling
- **Continue NETL's history of technology successes** – Acid Rain Control Program (SO<sub>x</sub> and NO<sub>x</sub>), Fly ash removal, Clean Coal Power Program, Clean Power Plant Initiative, Liquid Phase Methanol from Coal, Coal Cleaning Program, Coal Derived Fuels, Enhance Oil Recovery, Oil and Gas Exploration,
- **Take on important national energy problems** -- Hydrogen technology, higher efficiency power systems, hybrid cycles, CO<sub>2</sub> and mercury capture, CO<sub>2</sub> sequestration
- **Establish unique partnership facilities and capabilities**



- **Attracting world-class talent**
- **Producing high quality publications, licenses and patents**
- **Establish and grow solid national, international, and regional research collaborations**
- **Maintain U.S. technology competitiveness in the world's energy industry**
- **Maintain the Nation's energy and economic security**



# NETL FY 2006 Budget: \$725 Million



# NETL Plays Key Role in Fossil Energy Supply, Delivery, and Use Technologies

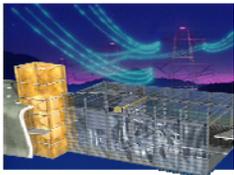
## Electric Power Using Coal



**Coal Production**



**Environmental Control**



**FutureGen Next Generation**



**Carbon Sequestration**

## Transportation Fuels



**Oil Production**



**Refining & Delivery**



**Coal-based Hydrogen**



**Hydrogen Infrastructure**

## Natural Gas



**Exploration & Production**



**Pipelines & Storage**



**Fuel Cells**

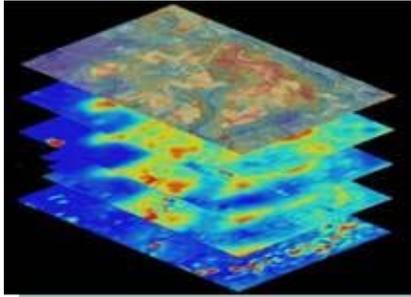


**Combustion Turbines**



*Photo of hydrogen fueled car: Warren Gretz, NREL*

# NETL Supports Non-Fossil Infrastructure and Energy Activities



## Energy Related Water

Growing issue in siting  
energy infrastructure

## Homeland Security

Systems analysis  
and pilot projects for  
infrastructure  
protection



## Energy Efficiency & Renewable Energy

Project Management Center  
FreedomCAR / vehicles  
Distributed Energy  
Building Technologies

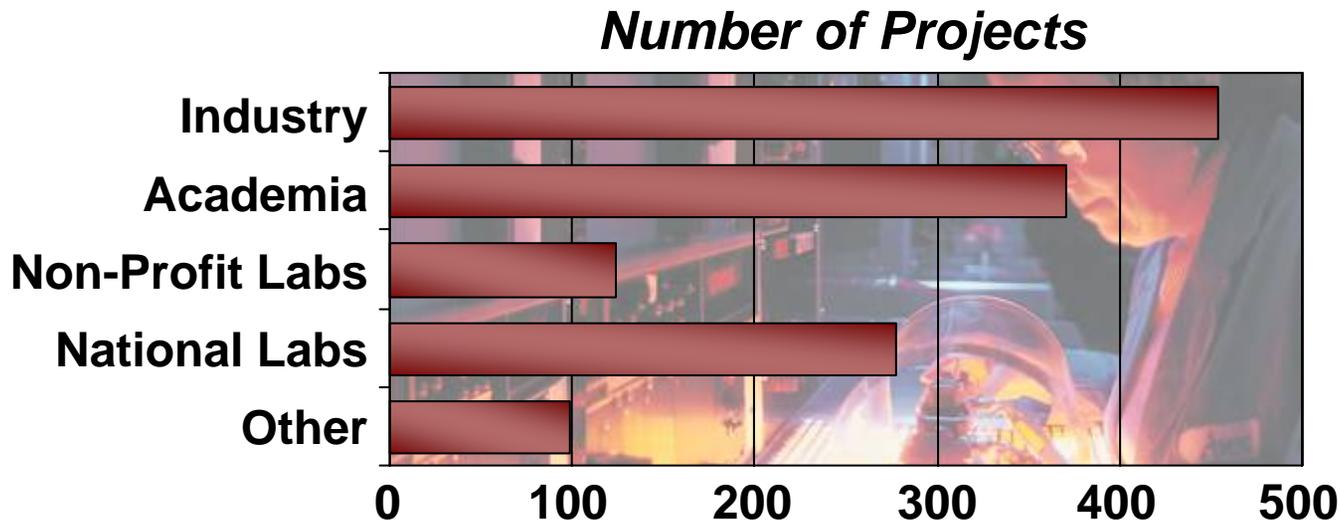
## Energy Assurance

Reliable domestic  
energy supply

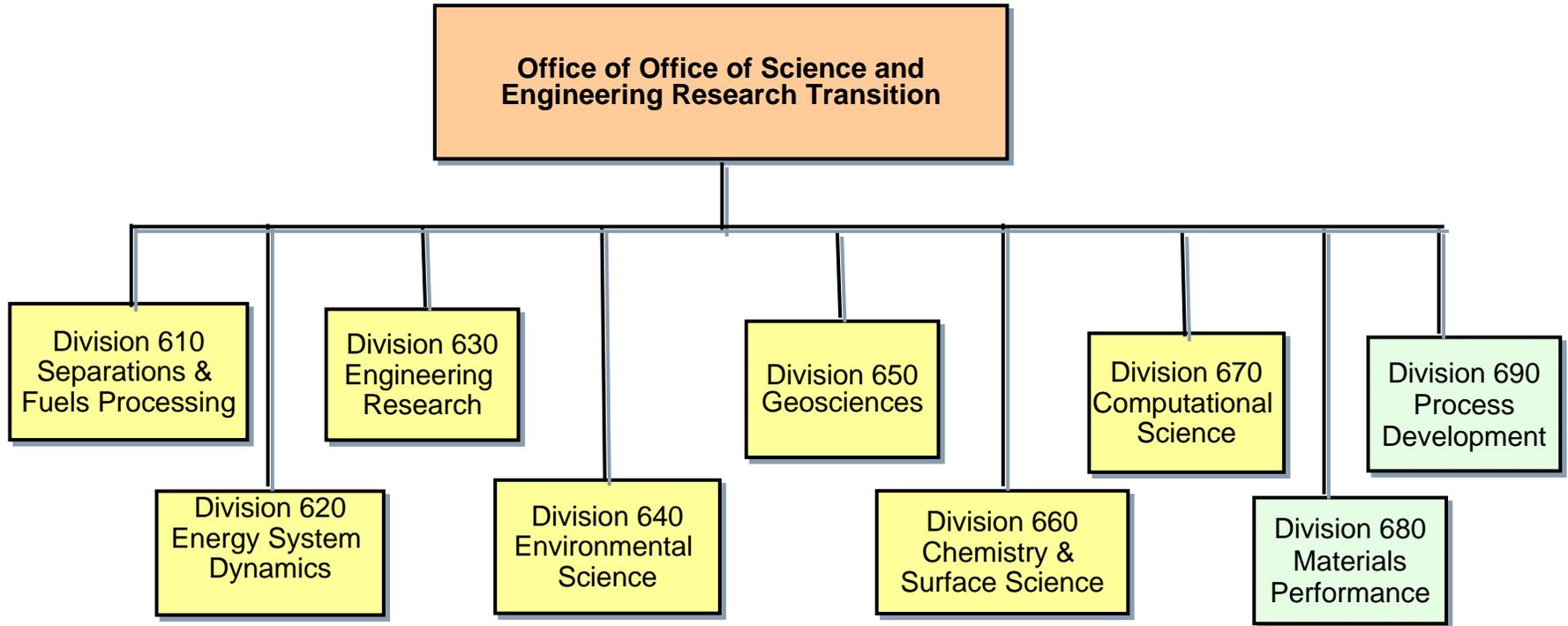


# NETL's Extramural RD&D

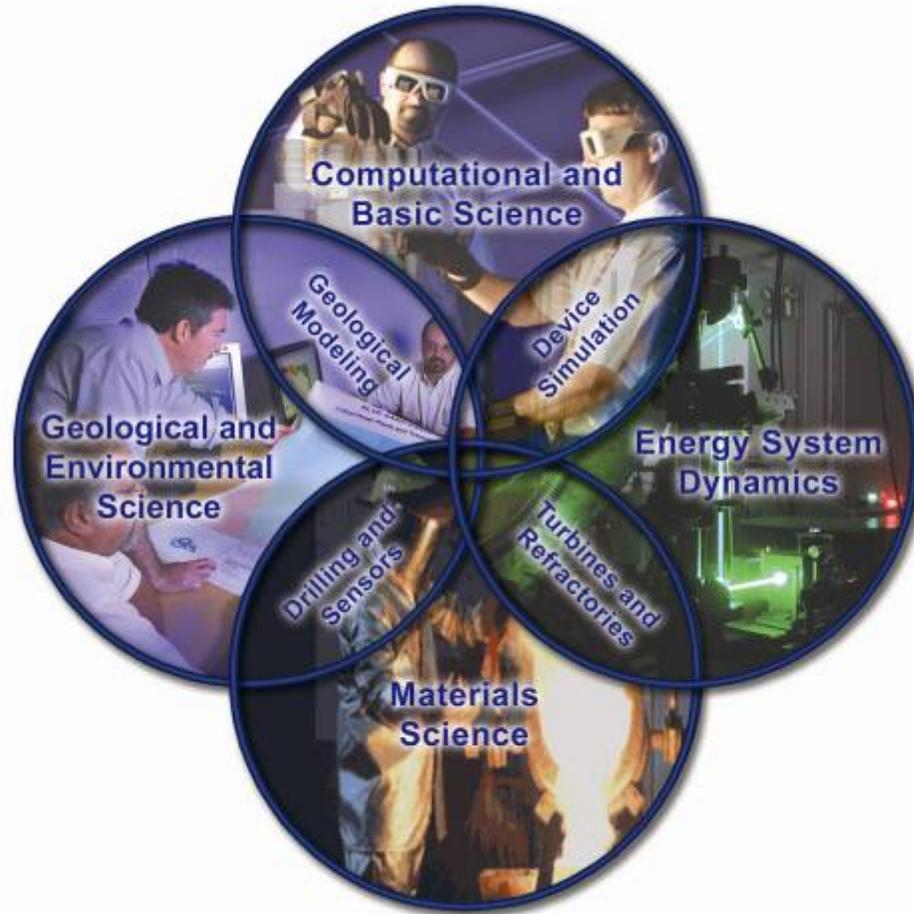
- 1,300 research activities in all 50 states and more than 40 foreign countries
- Total award value of \$8 billion
- Private sector cost-sharing of over \$4 billion
  - Leverages DOE funding
  - Ensures relevance
  - Accomplishes mission through commercialization



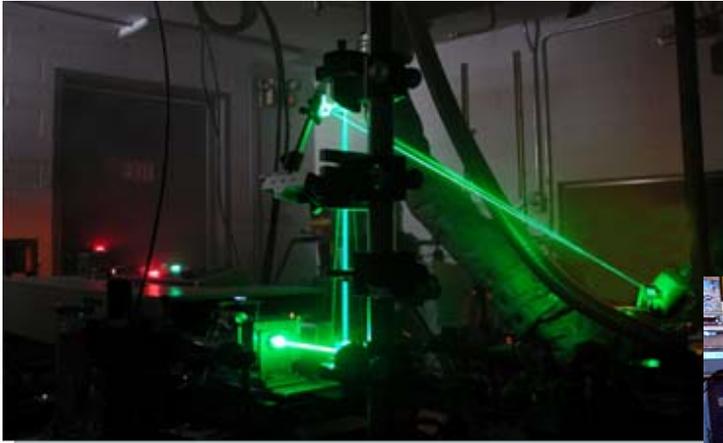
# National Energy Technology Laboratory – Office of Research & Development



# NETL's Office of Research and Development (ORD) Engineering and Science Focus Areas



# Energy System Dynamics Focus Areas



## Programs Supported:

- Fuel Cells / Hybrids
- Gas Combustion
- Carbon Capture
- Reciprocating Engines & Laser Ignitions
- FutureGen
- Zero Emission Strategies

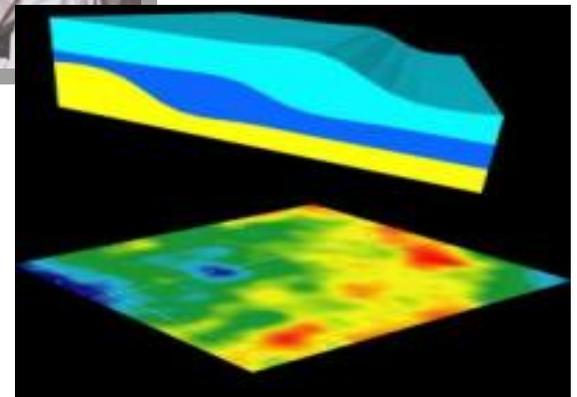


# Geological and Environmental Sciences (GES) Focus Area

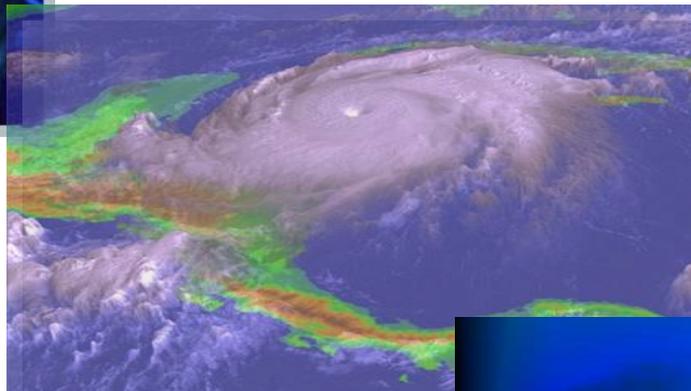


## Programs Supported:

- Carbon Sequestration
- Clean Air Technology
- Water & Coal Utilization
- Byproducts
- Monitoring, Measuring, & Verification

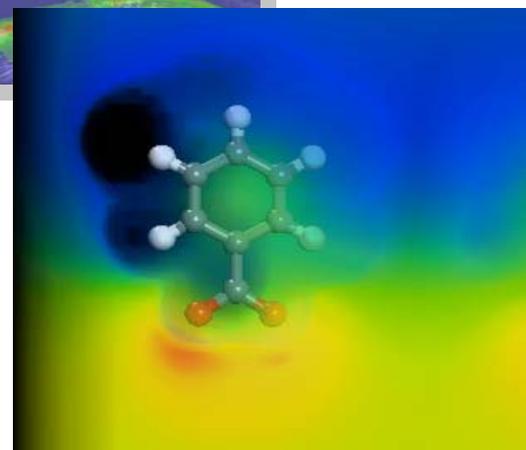


# Computational and Basic Sciences Focus Area



## Programs Supported:

- Computational Chemistry
- Device Simulation
- Advanced Fuel Systems
- Gas Hydrates
- Hydrogen production, storage, and separation studies
- Energy Security

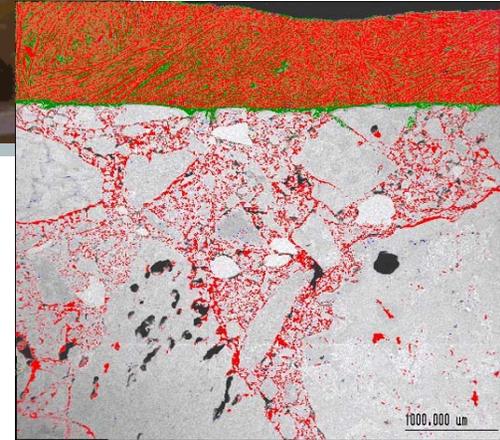


# Material Sciences Focus Area



## Programs Supported:

- Refractories for Gasification
- Advance metallurgical processes
- Materials for severe environment sensors and actuators
- Fuel cell interconnect materials



# Promoting Science and Engineering

**Establish and grow solid regional University-based research collaborations.**

**Significance: Attracting world-class talent, maintaining U.S. technology competitiveness in the world energy industry**



# Summary

- **We at NETL find ourselves in exciting times**
  - Involved in shaping and participating in the management of a National Lab, key to the Nation's energy, economic, and national security
  - Fossil Energy science and engineering research continues to be needed and significant
  - We continue to look to develop and expand quid-pro-quo strategic relationships and collaborations with
    - Other National Labs
    - Stakeholder
    - Industry
    - Universities
    - Other Government Agencies
    - Other Nations
  - In the end, NETL's over-arching departmental goal is to develop new technology and programs which will allow the Nation to:
    - Reduce its dependence on foreign energy, and
    - Assure the Nation's continued economic and national security



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**Welcome and have an enjoyable  
and productive meeting!**

