

# National Energy Technology Laboratory



*ASERTII 2006 Annual Meeting  
State and Local Energy  
Institution Collaboration*

*John Litynski*

*Project Director*

*October 18, 2006*

**National Energy Technology Laboratory**



**Office of Fossil Energy**



# National Energy Technology Laboratory

- **Only DOE national lab dedicated to fossil energy**
  - Fossil fuels provide 85% of U.S. energy supply
- **One lab, five locations, one management structure**
- **1,200 Federal and support-contractor employees**
- **Research spans fundamental science to technology demonstrations**



*Alaska*



*Oklahoma*



*Oregon*



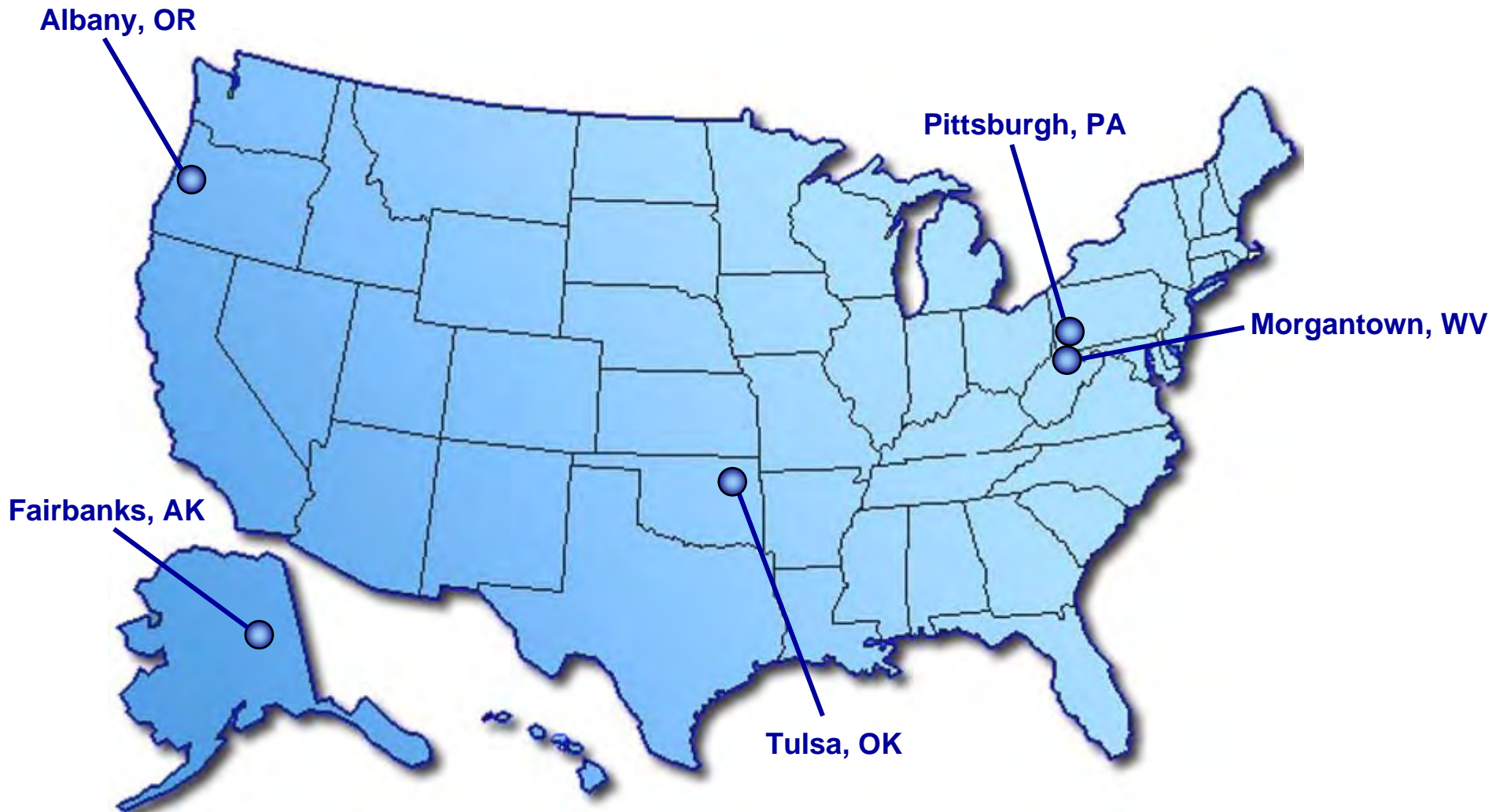
*Pennsylvania*



*West Virginia*



# NETL Locations



# NETL Facilities

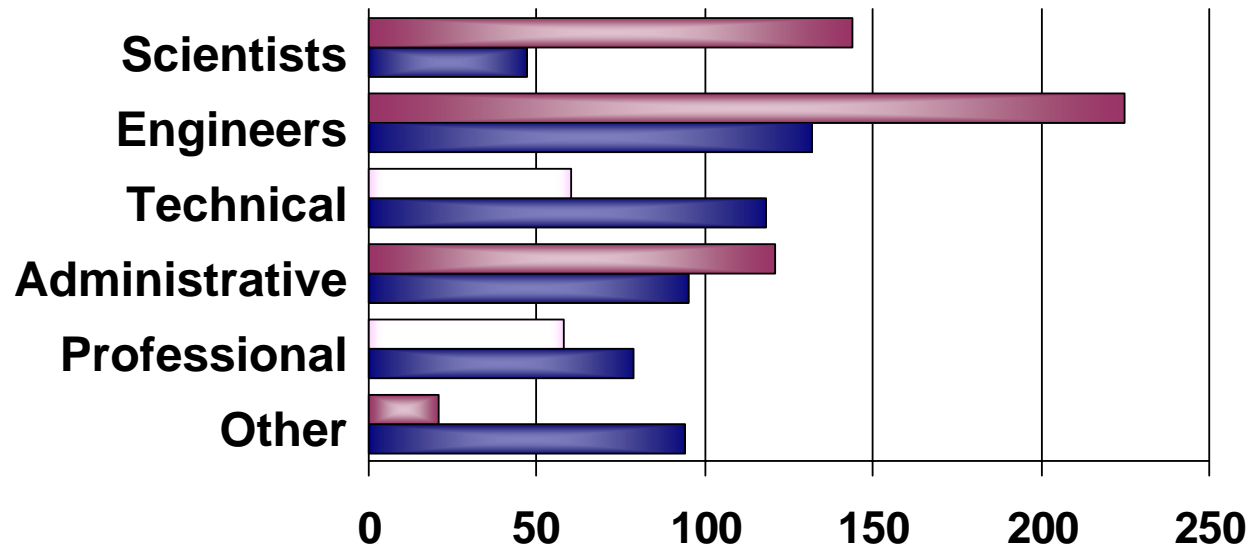
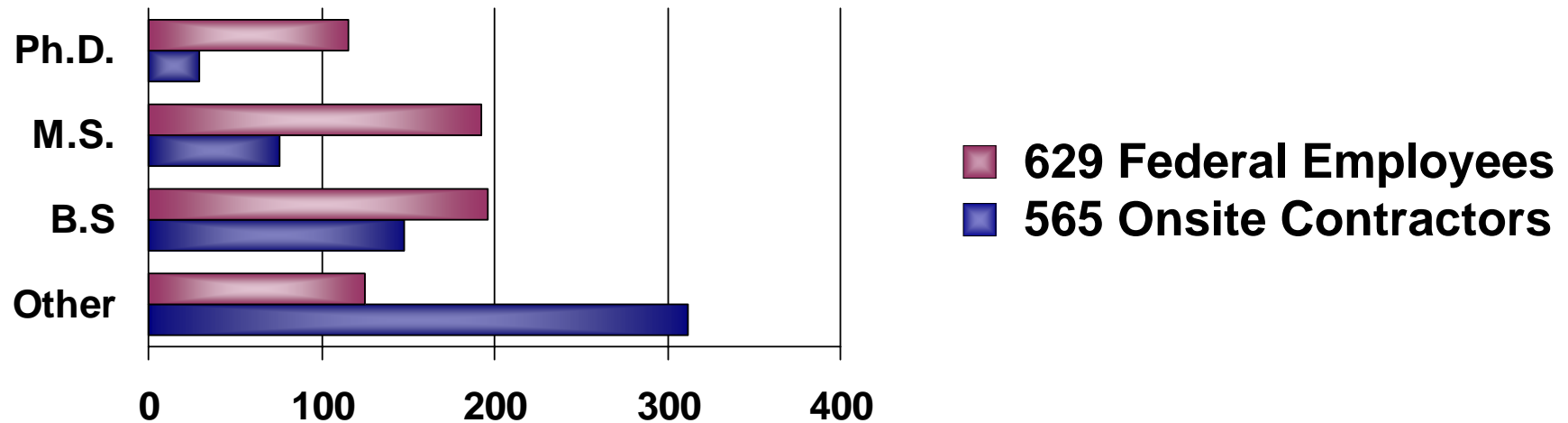
- **Morgantown & Pittsburgh**
  - Facilities 65 miles apart
  - 137 acres (Morgantown) & 61 acres (Pittsburgh)
  - 81 permanent & temporary buildings > 805,000 sq.ft.
  - Recent additions
    - Tech Support Bldg - Morgantown
    - Computational - Pittsburgh
- **Tulsa & Alaska**
  - Housed in leased space
    - Tulsa – 21,900 sq. ft.
    - Alaska – 405 sq. ft.
- **Albany, Oregon**
  - 44 acres



*Future Technology Support  
Facility Building  
Morgantown*

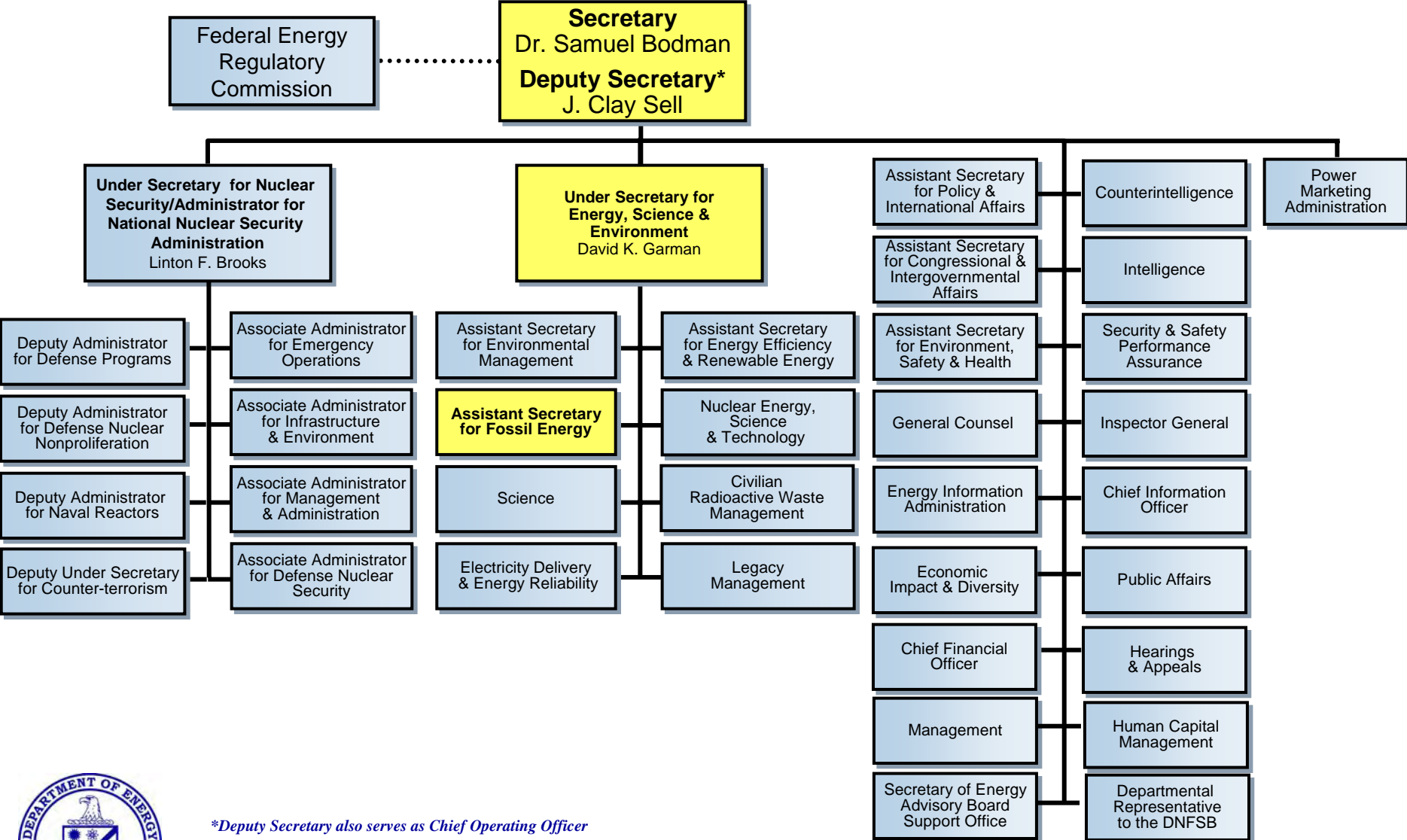


# A Well-Trained Workforce



12/31/05

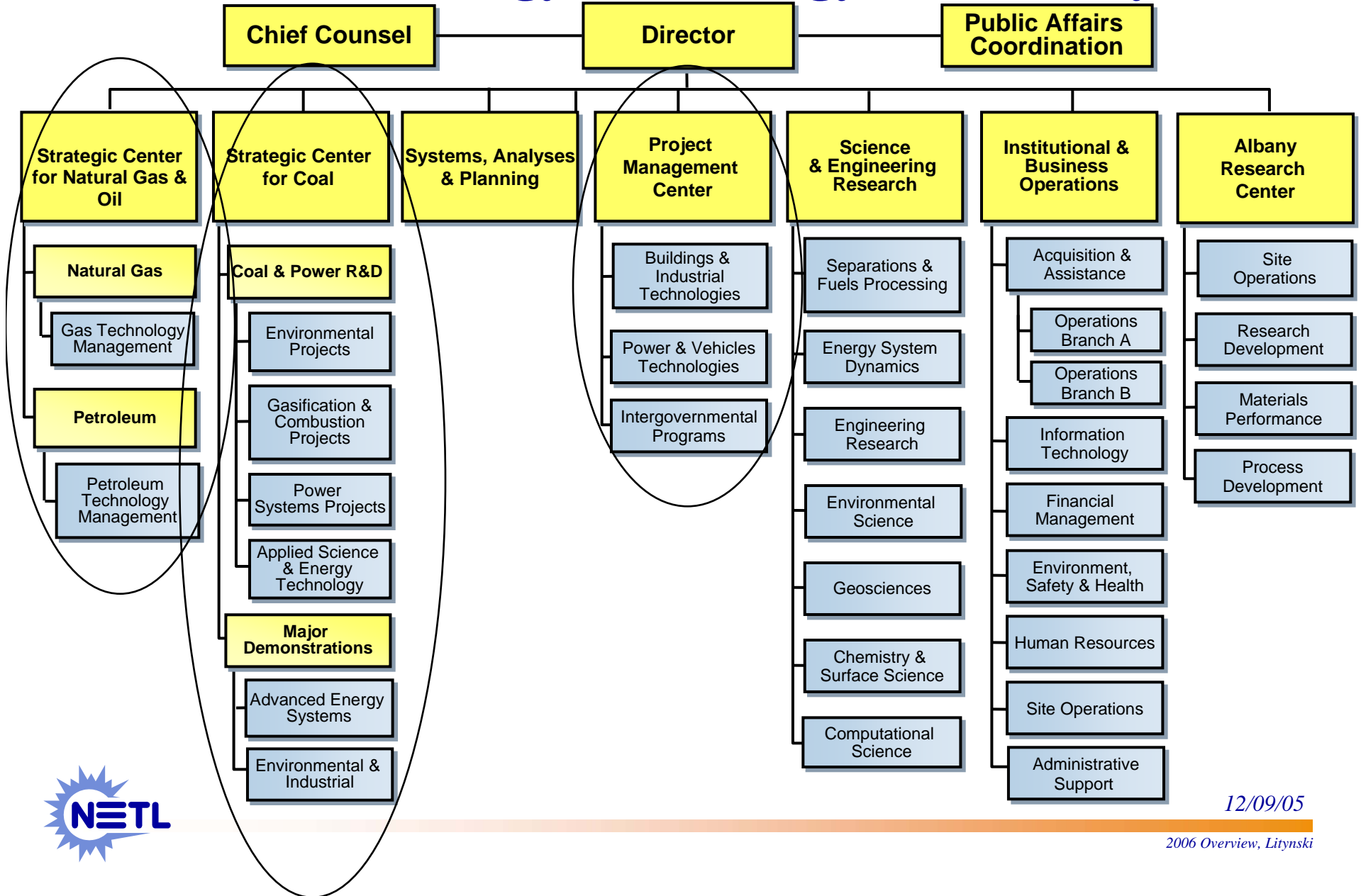
# Department of Energy



*\*Deputy Secretary also serves as Chief Operating Officer*



# National Energy Technology Laboratory

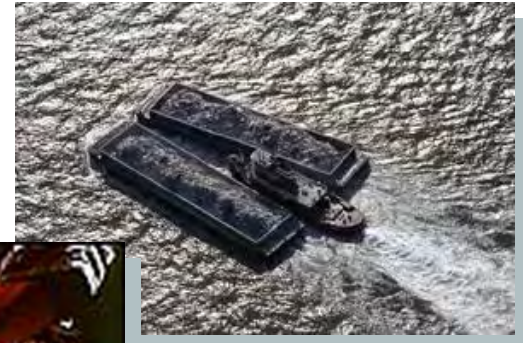


12/09/05

# Fossil Energy Mission Statement

*To enhance U.S. economic and energy security by:*

- Managing and performing energy-related research
- Supporting development of information and policy options that benefit the American public
- Ensuring that FE technology is used in market
- Operating our nation's petroleum reserves



# NETL's Mission

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



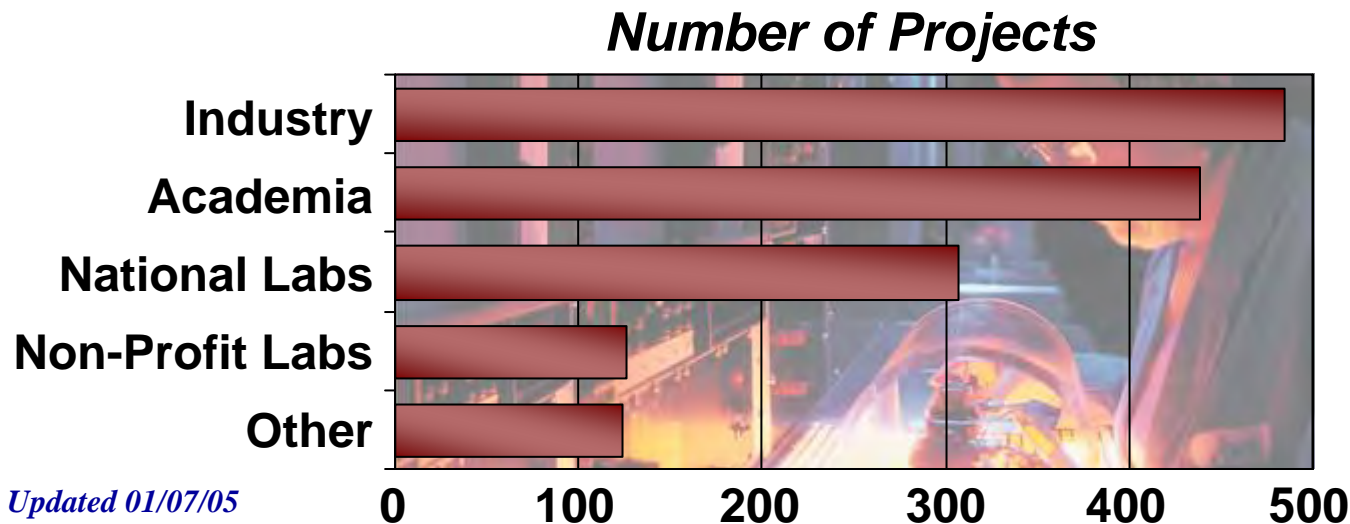
# Accomplishing Our Mission

- Implement and manage extramural RD&D
- Conduct onsite research
- Support energy policy development



# NETL Implements and Manages Extramural RD&D

- Over 1,400 research activities in 47 states and more than 40 foreign countries
- Total award value of nearly \$8 billion
- Private sector cost-sharing of almost \$4 billion
  - Leverages DOE funding
  - Ensures relevance
  - Accomplishes mission through commercialization



Updated 01/07/05

# NETL Conducts Onsite Research

## Energy System Dynamics

- Fuel Cells / Hybrids
- Gas Combustion
- Carbon Capture
- FutureGen



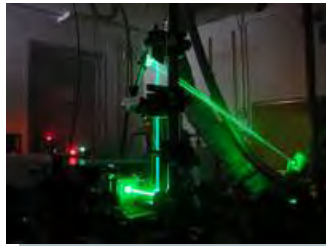
## Geological and Environmental Systems

- Carbon Sequestration
- Clean Air Technology
- Water & Coal Utilization Byproducts



## Computational and Basic Sciences

- Computational Chemistry
- Device Simulation
- Advanced Fuel Systems
- Gas Hydrates



## Albany Research Center

- Materials production
- Process development
  - Processing improved materials through to disposal and recycling



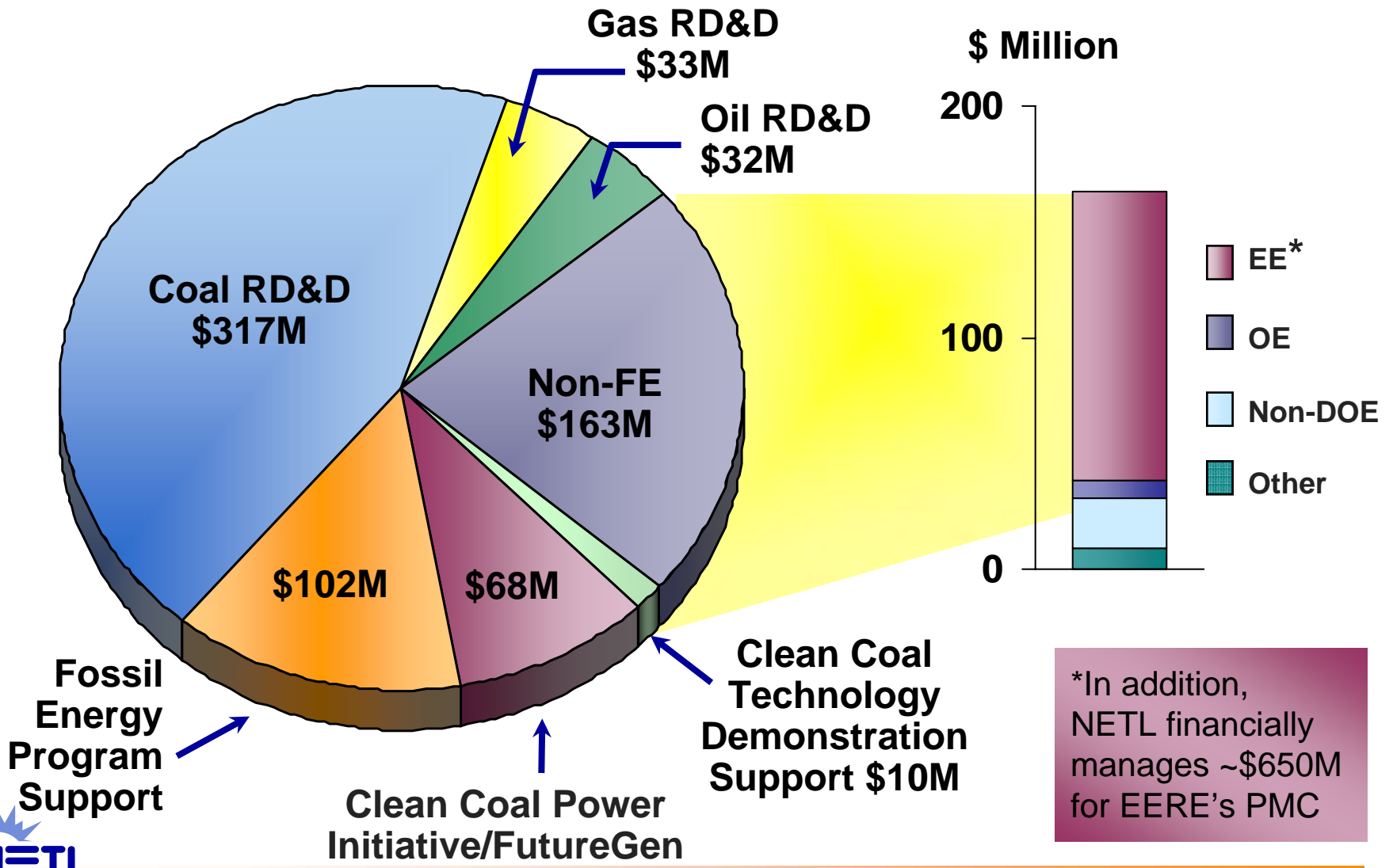
# Support Energy Policy Development

## Studies

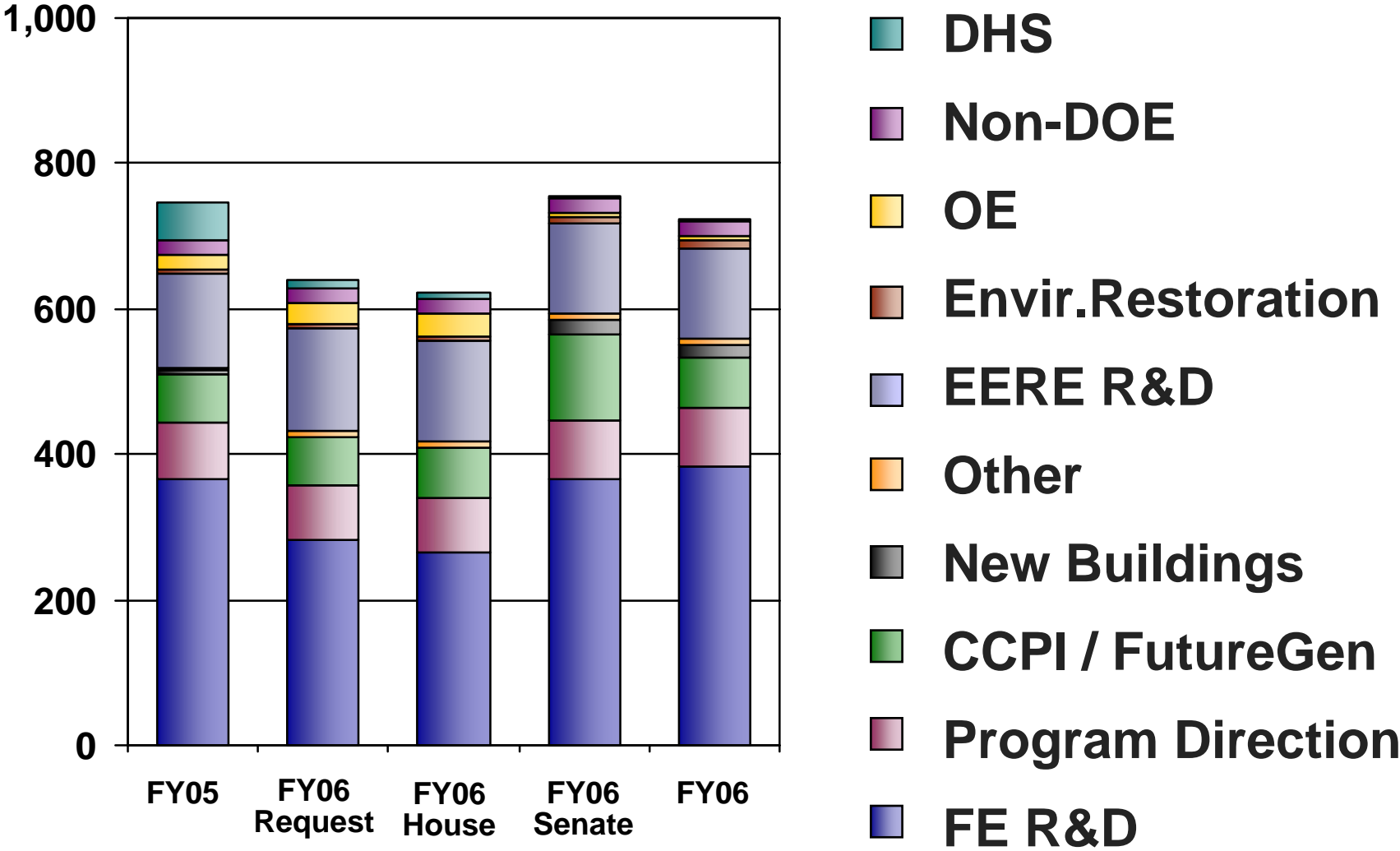
- System and sectoral analyses
  - Assess benefits of technology deployment
  - Impact and mitigation of climate change within energy sector
  - International collaboration on energy R&D
- CO<sub>2</sub> reduction through power plant efficiency improvements (USAID India Greenhouse Gas Reduction Project)
  - Voluntary GHG reporting guidelines – carbon sequestration
  - Advanced environmental control technology for China (FE China Protocol, Annex IV)
    - Hg control workshop
  - Technology and Policy Analyses
    - Hg regulations
    - IGCC
    - Carbon sequestration systems studies
    - Coalbed Methane in Wyoming
    - Pathways to H<sub>2</sub> economy



# NETL FY 2006 Budget: \$725 Million



# NETL Budget (\$M)



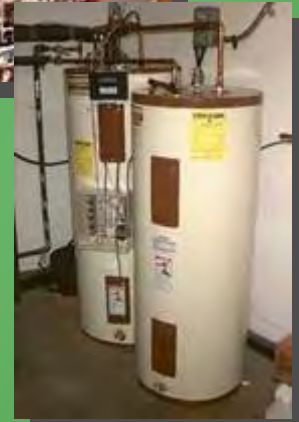
# NETL Mission Areas



**Strategic Center  
for Coal**



**Strategic Center  
for Natural Gas  
and Oil**



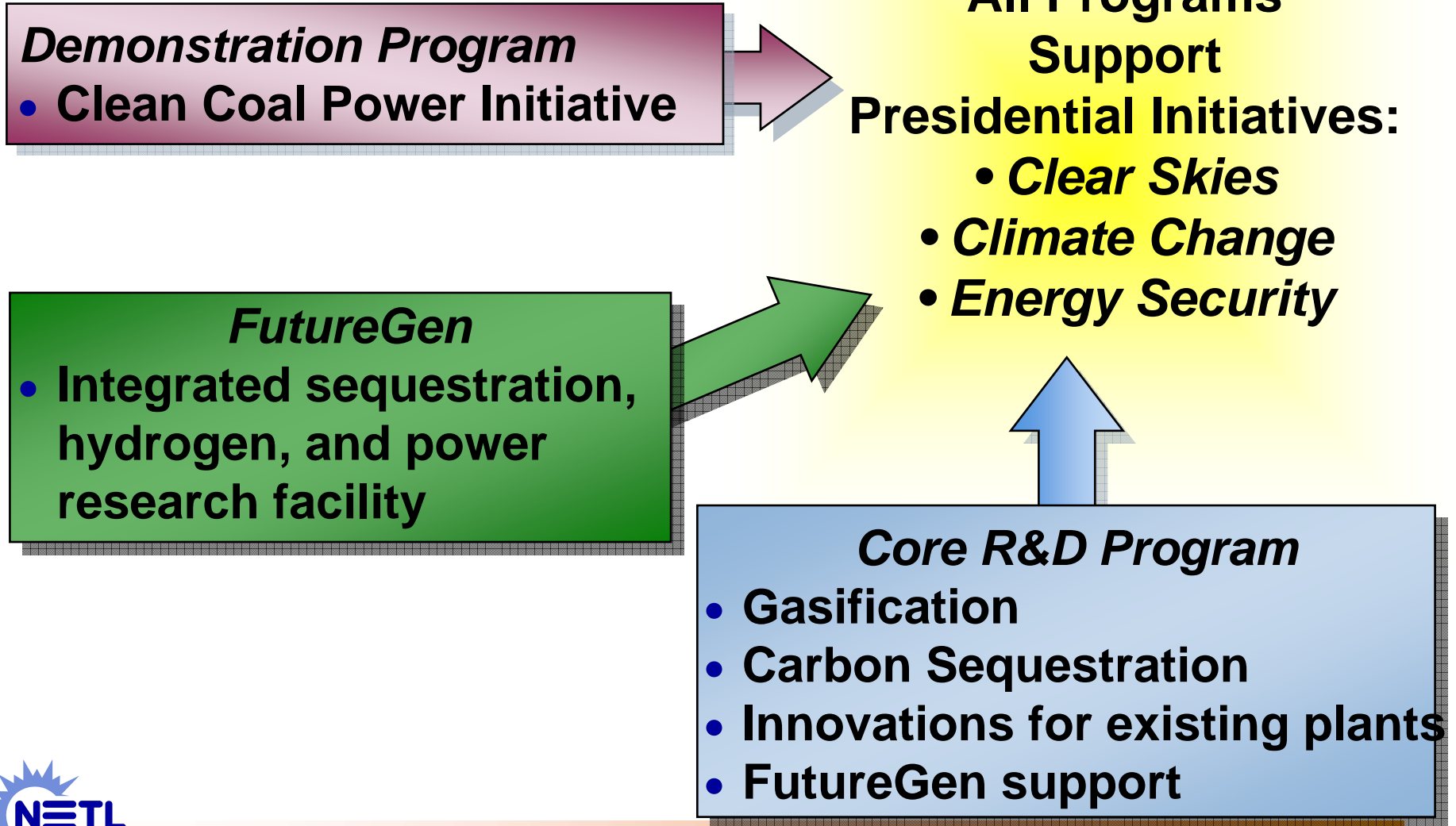
**Advanced  
Initiatives**



*Permian Basin oil well - Texas BEG website  
Hot water tank - NIST website*

*2006 Overview, Litynski*

# Strategic Center for Coal



# Gasification

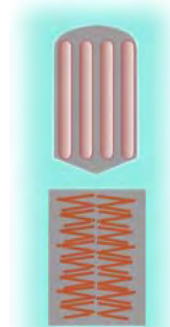
## Major Technology Issues

### Oxygen Membrane



Oxygen

### Gas Cleaning



Fuel Gas

Cost-Effective Multi-Contaminant Control to Ultra-Clean Specifications  
 Moderate Temperatures (S, NH<sub>3</sub>, Cl)  
 Hg, As, Se, Cd Removal at Elevated Temperatures  
 Integrated Specifications with Downstream Process Requirements  
 Integration with NO<sub>x</sub> Reduction Processes  
 Process Intensification

Durability of the Membrane  
 Integration with Overall Process

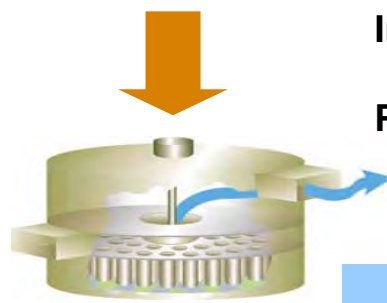
Low-rank Coal

Coal

Injector Reliability  
 Single Train Availability  
 Durability of Refractory Material  
 Durability and Accuracy of Monitoring Devices  
 Alternative Feedstocks  
 Feed System Reliability  
 Heat Removal  
 Temperature Measurement & Control



Gasification



Hydrogen

### Water-Gas Shift H<sub>2</sub> – CO<sub>2</sub> Gas Separation

Durability of the Membrane  
 Low Flux  
 Contaminant Sensitivity  
 Heat Removal

CO<sub>2</sub>



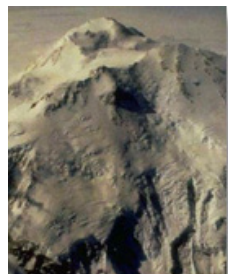
# Innovations for Existing Plants

- **Develop affordable environmental control technologies for existing coal plants**
  - Mercury control
  - NO<sub>x</sub> control
  - Particulate control
  - Air quality research
  - Coal by-products
  - Water management
- **Provide quality technical data for policy makers**



# Sequestration Project Areas

## Direct Sequestration



Unmineable  
Coal Seams



Depleted Oil /  
Gas Wells,  
Saline Reservoirs



Mineral  
Carbonation

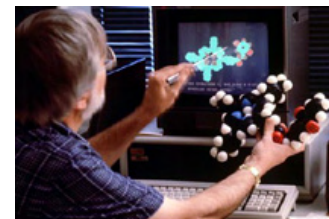


Ocean  
Sequestration

## Indirect Sequestration



Forestation



Enhanced  
Photosynthesis



# FutureGen: A Global Partnership Effort

One billion dollar, 10-year project to create  
world's first coal-based, zero-emission  
electricity and hydrogen plant

*President Bush, February 27, 2003*

- **Broad U.S. participation**
  - DOE contemplates implementation by consortium
- **International collaboration**
  - Desired & mechanisms being sought



# Clean Coal Power Initiative

- **\$2 billion demonstration program over 10 years**
- **Industry cost share of at least 50%**
- **Government industry partnership**
- **Anticipate four rounds of solicitations**
- **Round 1**
  - Eight projects selected January 2003; two withdrawn
  - \$315M DOE / \$1B industry cost share
- **Round 2**
  - Four projects selected and currently in negotiation



# Strategic Center for Gas and Oil

## *Future Resource Development*

- Ensuring reliable supplies for future generations

## *Domestic Oil & Gas Resource Conservation*

- Making the most of what we have

## *Security & Global Supply*

- Ensuring adequate supplies in a global market



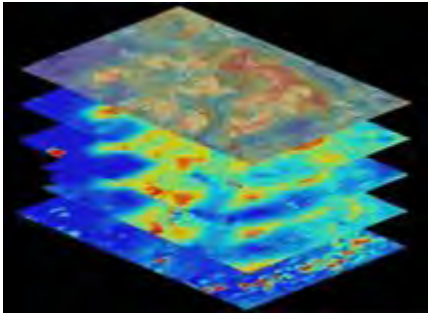
# Future Oil & Natural Gas Resource Development

## *Ensuring Reliable Supplies for Future Generations*

- **Methane hydrates**
  - Potential huge supplies of natural gas trapped in ice-like structures
- **Deep trek & other drilling R&D**
  - Drilling techniques for 20,000-foot-deep wells
- **Enhanced oil recovery / CO<sub>2</sub> injection**
  - Increase oil production
  - Simultaneously sequester carbon
- **Hydrogen from gas**
  - Low cost conversion of natural gas into H<sub>2</sub> for future fuel cell vehicles



# NETL Supports Non-Fossil Infrastructure and Energy Activities



## Energy-Related Water

Growing issue in siting energy infrastructure

## Homeland Security

Systems analysis and projects for infrastructure protection



## Energy Efficiency & Renewable Energy

Project Management Center  
FreedomCAR  
Distributed Energy Building Technologies  
Weatherization & Intergovernmental Program



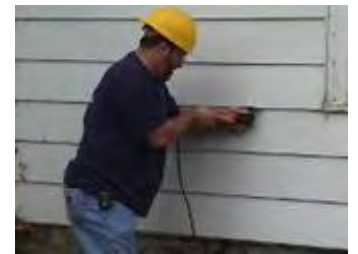
## Energy Assurance

Reliable and secure domestic energy supply



# EERE Project Management Center

- **Dedicated field capability to provide common management services for all EERE Programs**
  - Project
  - Procurement
  - Financial
  - Legal
- **Key functions at Golden Field Office / NETL, regional offices**
- **NETL's Responsibilities**
  - Distributed Energy Resources
  - FreedomCAR Technology
  - Weatherization / Intergovernmental Programs
  - Building Technologies
  - Industries of Future (e.g., mining)
  - Biomass (e.g., black liquor)
  - FEMP / Biomass Alternate Methane Fuel (BAMF)



# DOE Office of Energy Assurance

- Simulation and analysis of energy infrastructure
- Energy infrastructure training
- Technology development / demonstration
- Emergency response (Emergency Support Function, ESF-12)

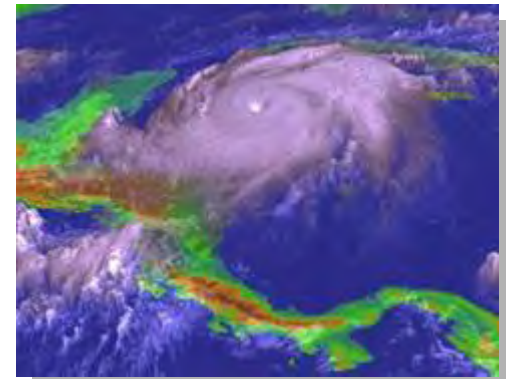


*Electric Towers: NREL Website  
Photos: Explosion: ATF Website:  
Hurricane: NASA Website: Hurricane Mitch approaching Honduras on 1998 October 26*

*2006 Overview, Litynski*

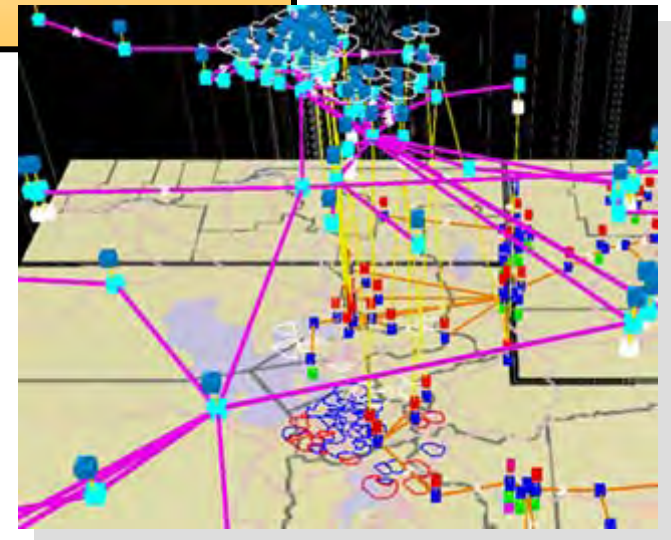
# ESF-12 Support from NETL

- NETL Federal staff deployed to FEMA HQ, FEMA regional offices, state EOCs and state DFOs during hurricanes
- NETL provided 24 / 7 coverage of hurricanes and manned contact call-in number for analysis-related questions
- NETL OSTA Federal and contractor staff provided visualization and analysis of energy outages of impacted states



# National Lab Responses

<b>ANL</b>	<b>Natural gas and oil</b>
<b>LANL</b>	<b>Electric grid</b>
<b>ORNL</b>	<b>Transportation / commodities</b>
<b>SNL</b>	<b>Infrastructure interdependency</b>
<b>NETL</b>	<b>Coordination of responses GIS data</b>

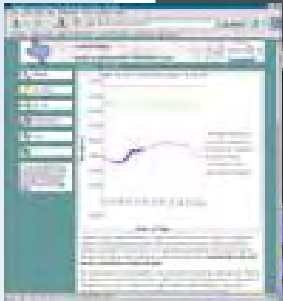
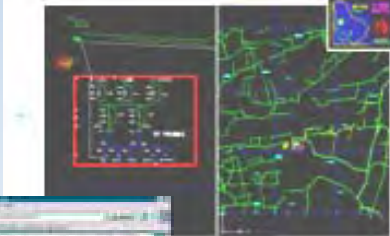


*Electric Grid  
Interdependency Model*

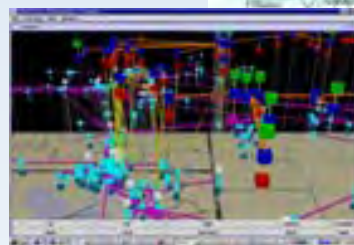
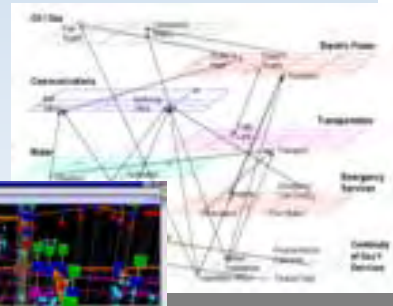


# Analysis Supporting EITAC

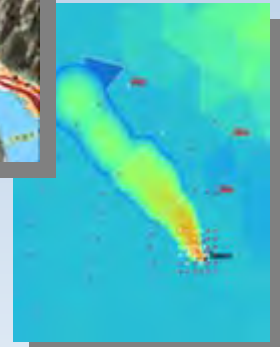
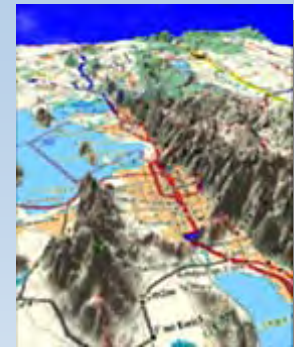
## Pre-Event



## Trans-Event



## Post-Event



## Focus on Education

- Nearly 500 extramural projects with academic institutions
- Almost 50 research associates
- Community initiatives
  - Speakers' bureau
  - Visiting professor program
  - Adopt-a-School Program
  - Donation of computers and equipment
  - Science Bowl & “Cool Science” webpage
  - Job shadowing for high school students
  - Lab tours
  - Training in science for K-12 teachers
  - Minority mentoring
  - Co-op program with local university



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# Funding Opportunities

- **21 Competitive Funding Opportunities in 2006**
  - Coal and Power R&D
  - Natural Gas and Oil
  - Building Technologies
  - FreedomCar
- **Loan Guarantee Program**
- **Tax Credit Program**



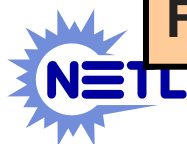
<http://www.netl.doe.gov/business/solicitations/index.html>



## Collaboration Contact Information

- **Unsolicited Proposals:** John Augustine  
412-386-4524
- **Solicited Proposals:** Available thru website
- **Cooperative R&D Agreements:** R. Diane Newlon  
304-285-4086

Technology Area	Technology Manager	Phone No.
Gasification	G. Stiegel	412-386-4499
Advanced Research	R. Romanosky	304-285-4721
H <sub>2</sub> and Synfuels	D. Cicero	304-285-4826
Turbines	R. Dennis	304-285-4515
Sequestration	S. Plasynski	412-386-4867
Innovations for EP	T. Feeley	412-386-6134
Future Gen	S. Klara	412-386-4864



# Visit Our Websites

Office of Fossil Energy's website: [www.fe.doe.gov](http://www.fe.doe.gov)

NETL's website: [www.netl.doe.gov](http://www.netl.doe.gov)

