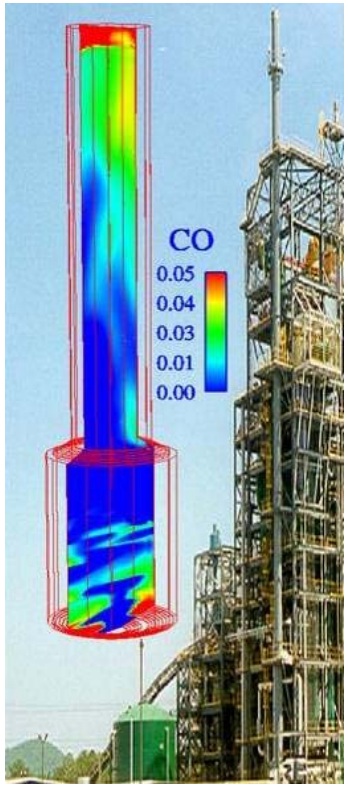
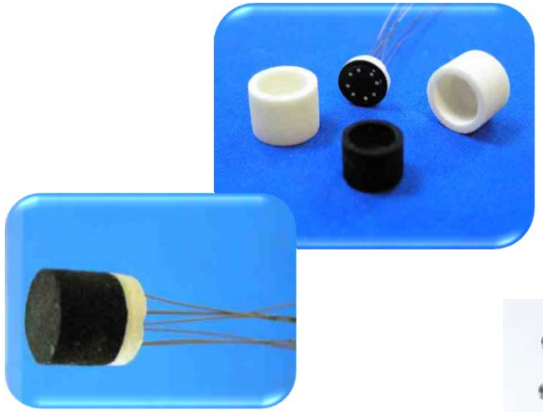
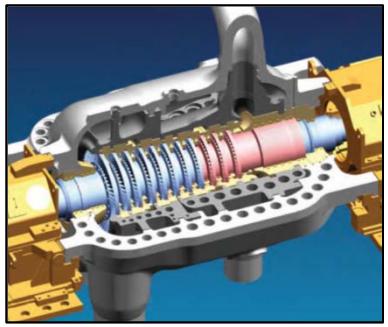
Driving Innovation ♦ Delivering Results







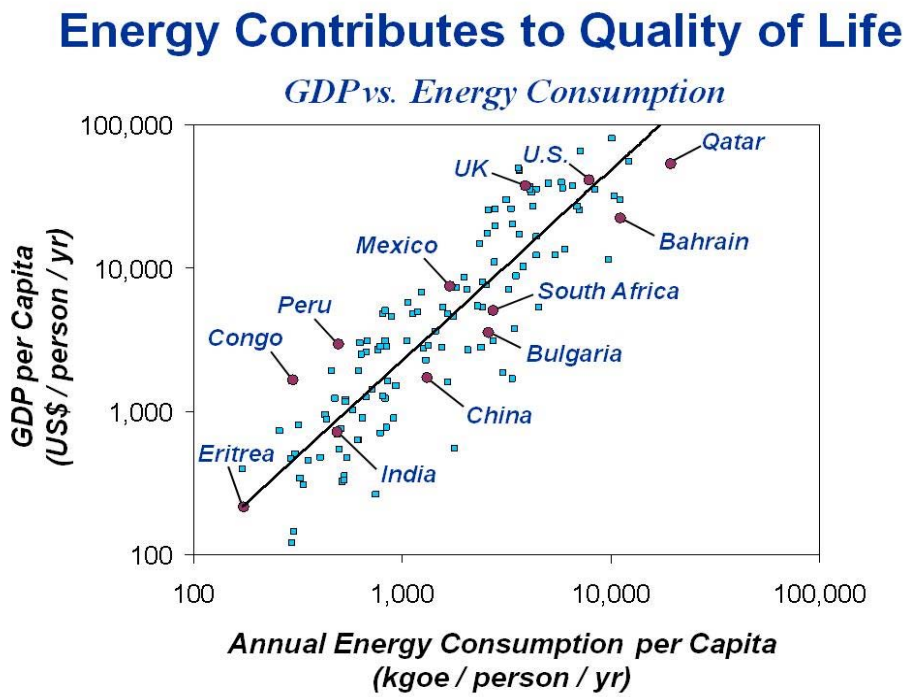
Seminar on NETL's Minority Serving Institutions Program

Overview of NETL's Mission and Activities

Dr. Robert Romanosky
Deputy Director, Office of Coal and Power Research
Strategic Center for Coal
October 29, 2015

Point of Reference

- **Competing demands for reliable, low-cost energy and climate change mitigation**
- **Uncertainty of regulatory outcomes and rising costs impact opportunities for capital investment, production capacity, and other factors in an integrated infrastructure**



- **Carry out research and development to foster new processes that address conflicting energy objectives**
- **Our laboratory's mission is to increase efficiency and mitigate CO_2 emissions in current plants and to develop novel carbon capture ready power generation processes**

National Energy Technology Laboratory

Where Energy Challenges Converge and Energy Solutions Emerge

- **Only government owned & operated DOE national lab**
- **Dedicated to energy RD&D, domestic energy resources**
- **Fundamental science through technology demonstration**
- **Unique industry–academia–government collaborations**

Oregon

Pennsylvania

West Virginia

The Big Technology Issues for Coal

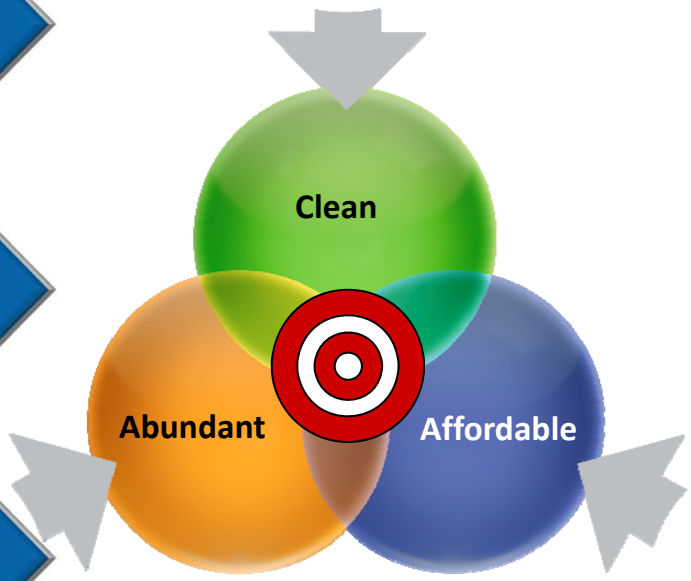
Manage CO_2 Emissions

Reduce Criteria Pollutants

Minimize Water Use

Control Costs

Balanced Solutions



Return on Investment from Fossil Energy R&D

FE Research — The Return on Investment

16 million tons of avoided NO_x emissions 2000–2020[1]	*1.2 million jobs created 2000–2020[1]*	*$111 billion in benefits 2000–2020[1]*	*650 U.S. fossil energy patents 1976–2013[4]*	*58 GW of mercury-control technology installed [2]*	*$1.9 trillion in health benefits[5]*
37 million tons of avoided SO_2 emissions 2000–2020[1]	*Thousands of scientists and engineers trained*	*$13 return for every $1 invested[1]*		*148 GW projected by 2015[3]*	*FE research contributes to EPA-estimated health benefits from reduced pollution 1990–2020*

[1]Bezdek, R., Wendling, R., The Return on Investment of the Clean Coal Technology Program in the USA. Energy Policy, Vol. 54, March 2013, pp. 104–112. [2]Institute of Clean Air Companies, http://www.icac.com/?page=Mercury_Controls, Updated Commercial Hg Control Technology Bookings (October 2011), accessed 08/21/13. [3]EPA Base Case, IPM analysis of EGU GHG NSPS, downloaded from http://www.epa.gov/airmarkets/progsregs/epa-ipm/proposedEGU_GHG_NSPS.html, 08/21/13. [4]USPTO online search 08/29/13 on ABST/("fossil fuel" OR coal OR oil OR petroleum OR "natural gas" OR methane OR hydrate) AND (electric* OR energy OR power OR generat* OR turbine) AND (AN/"department of energy" OR GOVT/"department of energy"). [5]The Benefits and Costs of the Clean Air Act from 1990 to 2020, U.S. EPA Office of Air and Radiation, March 2011.*

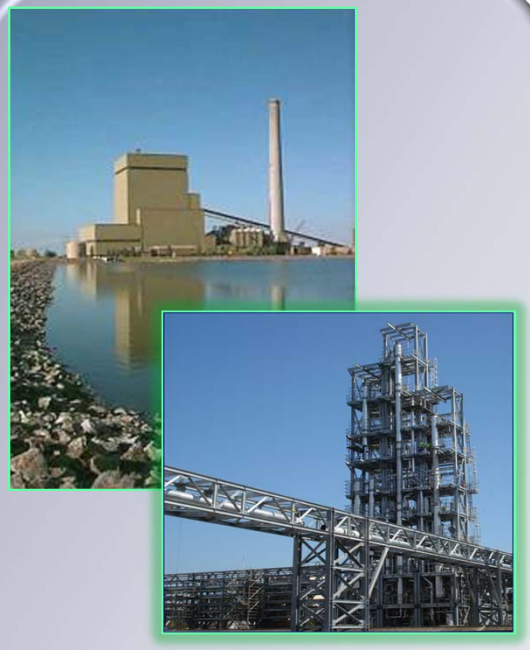
Strategic Center for Coal

Advancing Technologies in Power Generation Utilizing Coal

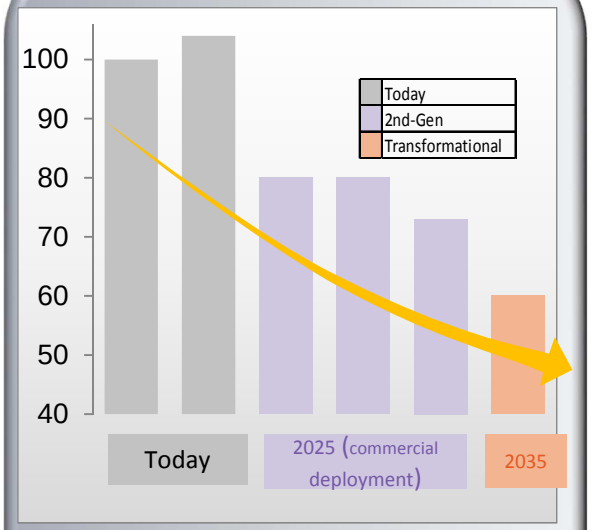
~400 projects $13.5B Total ($4.9B DOE) *

Relevance of R&D, Leverages, Promotes Commercialization

Office of Coal and Power R&D



Office of Major Demonstrations



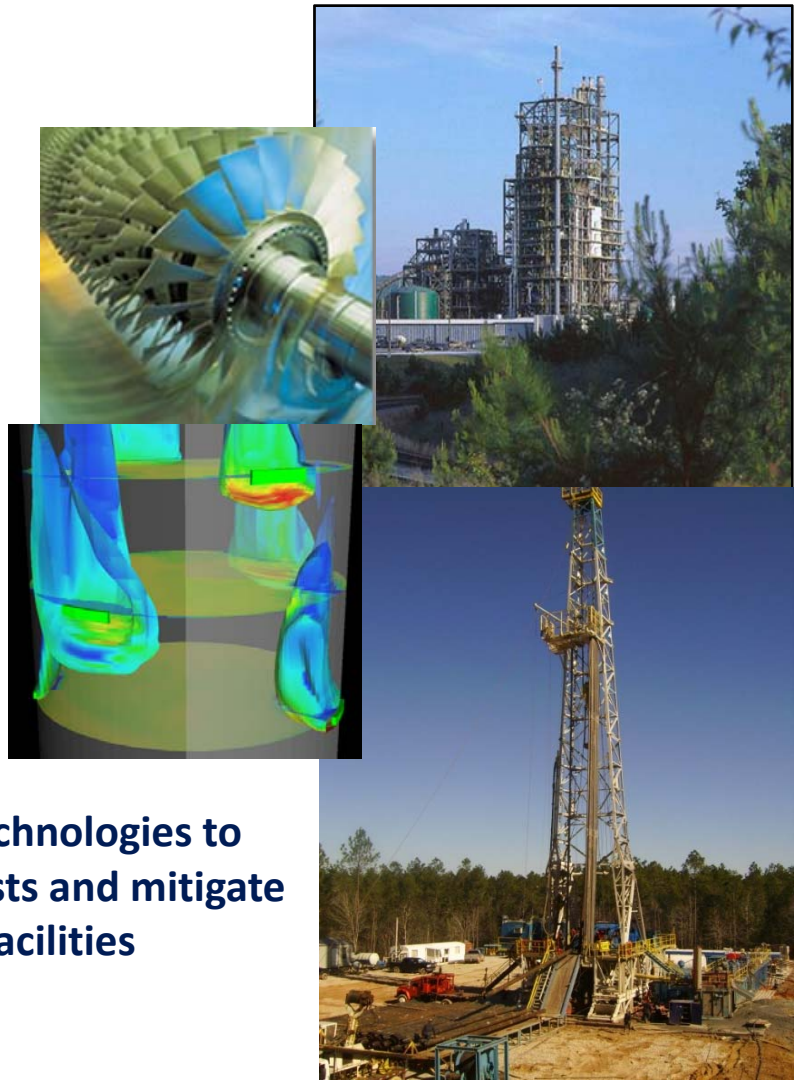
Office of Program Performance & Benefits

** Project Data as of September 2015*

Fiscal Year 2015

NETL Office of Coal and Power R&D Core Programs ~ $400 Million

- **Carbon Capture - $88 Million**
- **Carbon Storage - $100 Million**
- **Advanced Energy Systems- $103 Million**
  - Advanced Combustion - $28 Million
  - Gasification Systems - $25 Million
  - Hydrogen Turbines - $15 Million
  - Fuel Cells - $30 Million
  - Fuels - $5 Million
- **Crosscutting Research - $49 Million**

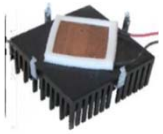


Working in synergy, these programs are developing technologies to increase power plant efficiency, lower electricity costs and mitigate GHG emissions in both existing and advanced power facilities

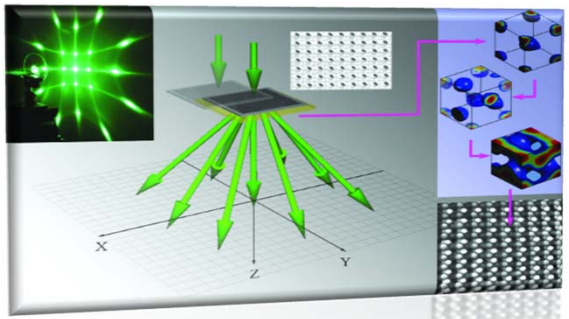
Overview

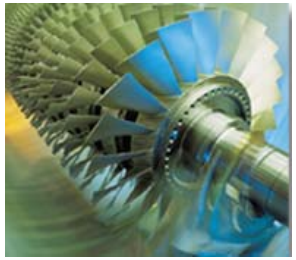
Areas of Research and Development and Key Technologies for Advanced Power Generation and Carbon Management

Crosscutting Technologies
for Design, Construction, & Operation

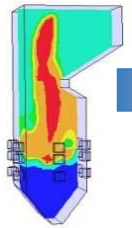


Optimized Turbines

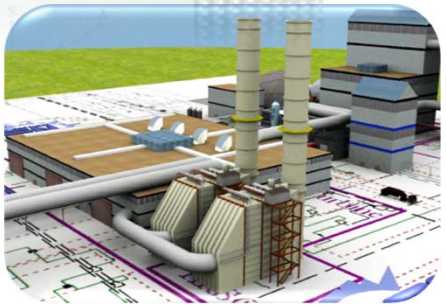




Oxy Combustion

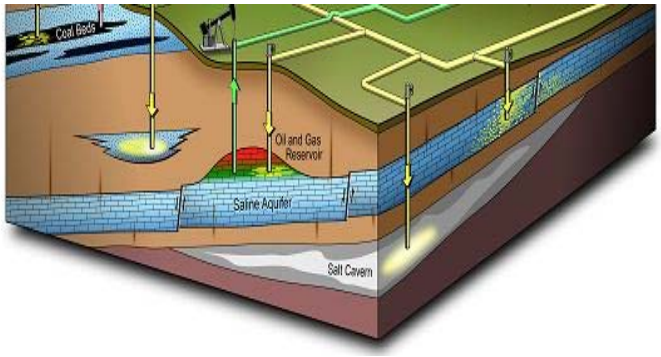


Computational Modeling



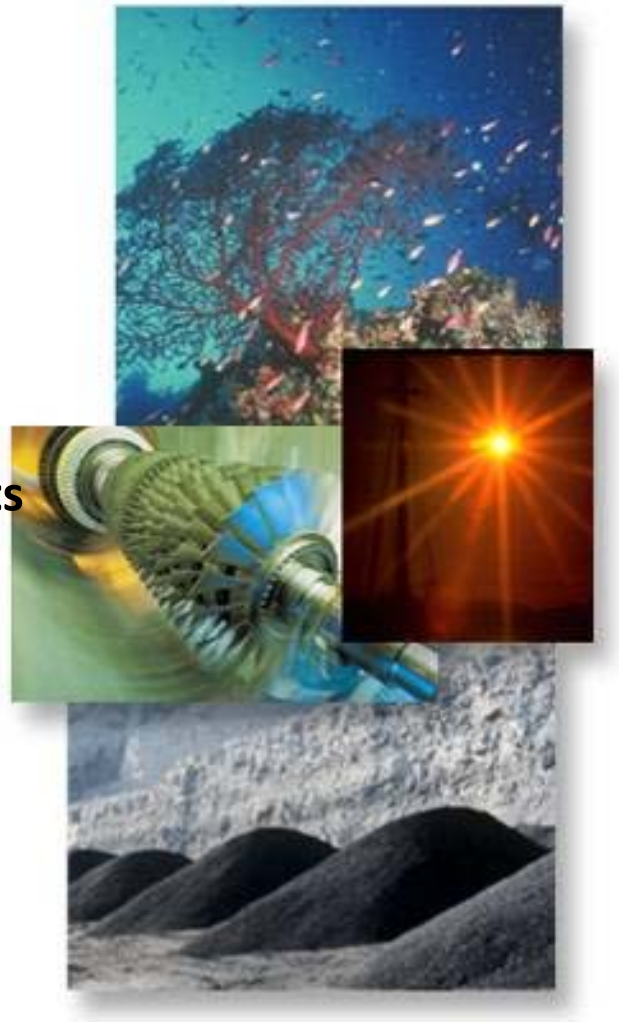
Gasification with Cleanup Separation

Carbon Capture, Utilization, & Sequestration



Conclusions

- **The U.S. power generation industry is at a critical juncture**
  - Demand, resources, workforce, reliability, regulation, grid integrity, transmission, etc.
- **Competing demands for reliable, low-cost energy and climate change mitigation appear incongruent**
- **Uncertainty of regulatory outcomes and rising costs impact industry's willingness to commit capital investment, endangering near-term production capacity**
- **The U.S. must foster new processes that address conflicting energy objectives simultaneously**

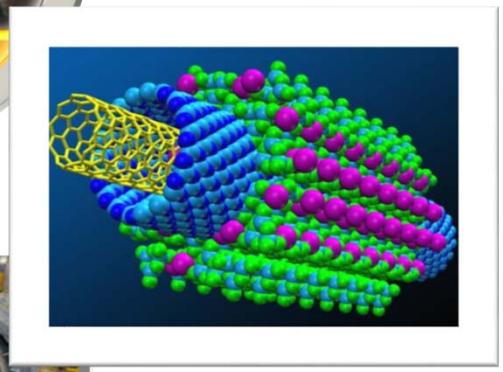


Working with NETL

Competitive Solicitations (Open, University, Small Business)

Cooperative Research and Development Agreements (CRADAs)

Partnering with NETL and Industry for testing of sensors on full scale systems



NETL & Minority Serving Institutions

- **For over 30 years Minority Serving Institutions have been an important contributors to the NETL R&D mission**
- **The presentations that follow are designed to assist you and your institution in developing and submitting competitive proposals based on your potential contributions to NETL R&D**
  - It is our hope that today's discussions will foster ongoing engagement and dialogue with NETL
  - We invite you to talk with us and let us know what you see as your potential contributions
- **Check the NETL website regularly for funding opportunities that may be available, within our Minority Serving Institutions program or other FOA.**