the ENERGY lab

PROGRAM FACTS

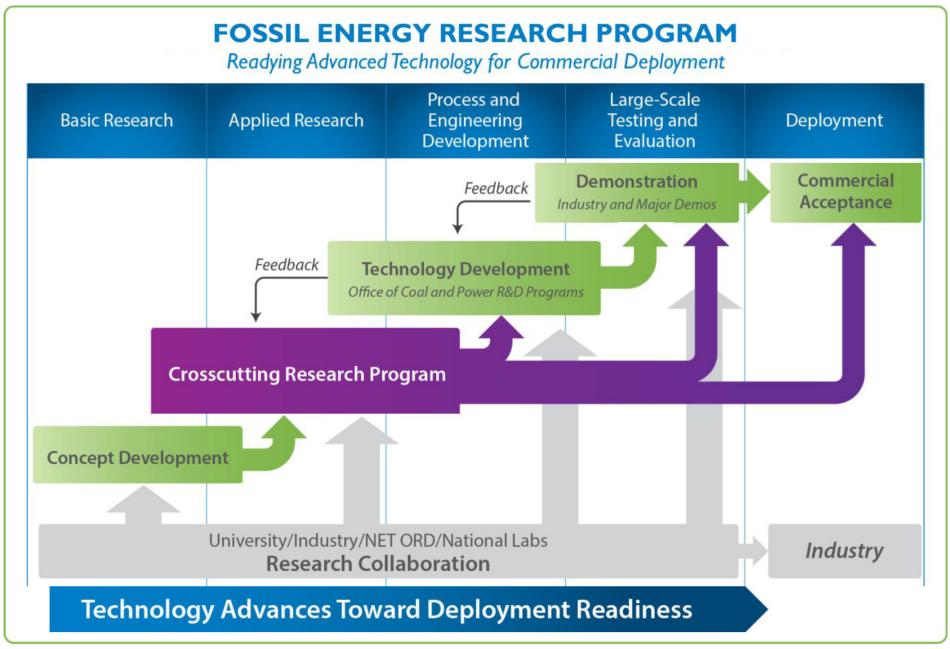
Strategic Center for Coal

Crosscutting Technology Research Program

The Crosscutting Technology Research Program (CTR) serves as an essential multi-disciplinary program providing technologies and tools that benefit existing power generation and advanced energy systems including carbon capture and storage. There are five Key technology areas within CTR:

- Sensors and Controls
- High Performance Materials
- Simulation-Based Engineering
- Water Management R&D
- Innovative Energy Concepts

When ready, successful technologies are transitioned to other FE Coal and Power R&D Programs: Advanced Energy Systems (Gasification Systems, Advanced Combustion Systems, Advanced Turbines, Solid Oxide Fuel Cells); Carbon Capture; and Carbon Storage. For some technologies, transition directly to industry for development and demonstration is possible without additional FE support.



These CTR technology areas benefit and provide value to FE programs and to relevant industrial programs. Consistent with this R&D path, CTR serves as the lead program to incubate novel concepts and to foster the growth of those concepts that hold the potential to advance fossil-fueled power systems and carbon capture and storage technologies.

CONTACTS

Robert Romanosky
Deputy Director,
Office of Coal and Power R&D
Acting–Technology Manager,
Crosscutting Technology Research Program
304-285-4721
robert.romanosky@netl.doe.gov

Robie Lewis
Program Manager,
Crosscutting Technology Research
301-903-6166
robie.lewis@hq.doe.gov

Regis Conrad
Director,
Division of Advanced Energy Systems
301-903-2827
regis.conrad@hq.doe.gov

John Wimer
Director,
Office of Coal and Power R&D
304-285-4124
john.wimer@netl.doe.gov

Sean Plasynski
Director,
Strategic Center for Coal
412-386-4867
sean.plasynski@netl.doe.gov

NATIONAL ENERGY TECHNOLOGY LABORATORY

Albany, OR • Anchorage, AK • Morgantown, WV • Pittsburgh, PA • Sugar Land, TX

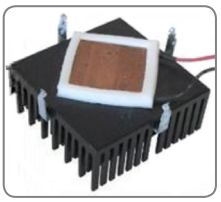
Website: www.netl.doe.gov

Customer Service: 1-800-553-7681

U.S. DEPARTMENT OF ENERGY

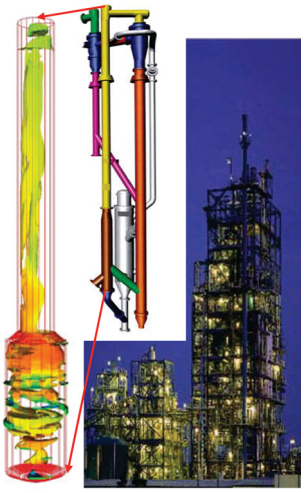
The CTR is currently funding the development of a broad portfolio of crosscutting technologies that have the potential to provide step-change improvements in both cost and performance as compared to current state-of-the-art systems. The execution of the program is primarily through cost-shared research and development in collaboration with universities, national laboratories, government, non-profits, and industry in the following Key Technology Areas.

Sensors & Controls makes available new classes of sensor and measurement tools that lower costs and enable robust monitoring and real-time optimization of fully integrated, highly efficient power-generation systems. Controls research utilizes self-organizing information networks and distributed intelligence for process control and decision making, improving control over for inherently complex emerging power systems. The overall performance and reliability of plants is enhanced with the improved use of advanced sensor and controls technologies.

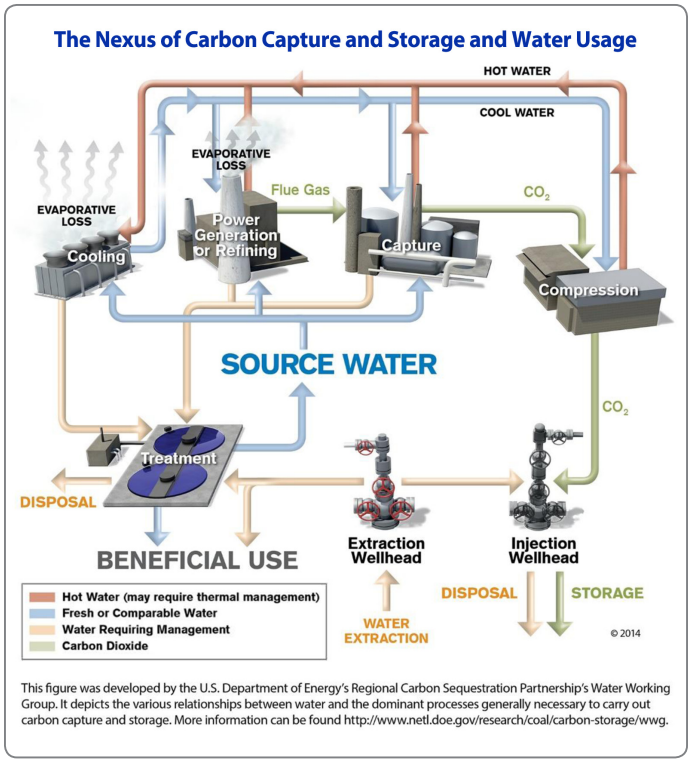


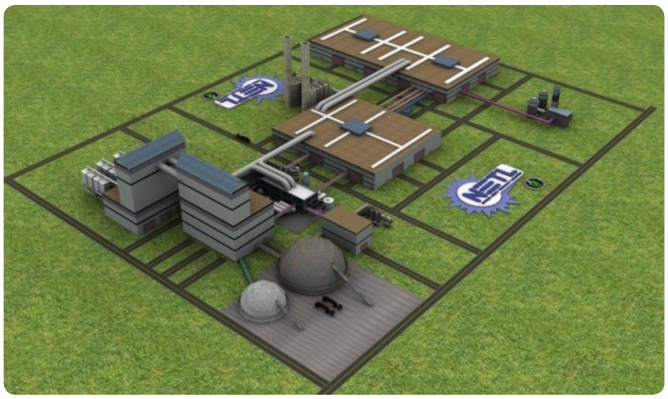
High Performance Materials focuses on structural and functional materials that will lower the cost and improve the performance of fossil-based power-generation systems. Superalloys can enable the operation at the pressures and temperatures and harsh environments associated with advanced ultrasupercritical boiler conditions and enable emerging technologies such as supercritical CO_2 (sCO_2), oxycombustion, chemical looping, and direct power extraction. Computational tools support predictive performance, identification of failure mechanisms, and molecular design of materials. Advanced manufacturing techno-logies are being developed to economically fabricate materials that cannot be made using conventional techniques.

Simulation-Based Engineering represents a vast amount of expertise and capability to computationally represent the full range of energy science from reactive and multiphase flows up to a full-scale virtual and interactive power plant. Science-based models of the physical phenomenon occurring in fossil fuel conversion processes and development of multi-scale, multi-physics simulation capabilities are just some of the tools and capabilities. Activities include: developing a framework to quantify uncertainties and assess the impact of their propagation in the models; providing quantitative error-bars on simulation data; creating simplified models to balance the needs of accuracy and time-to-solution; and model validation.



Water Management Research & Development encompasses the need to reduce the amount of freshwater used by power plants and to minimize any potential impacts of plant operations on water quality. CTR research is developing energy efficiency, water treatment, produced water treatment, waste heat utilization, low/no water cooling technologies, and conducting data analysis to foster improved FE based power generation technologies.



This figure was developed by the U.S. Department of Energy's Regional Carbon Sequestration Partnership's Water Working Group. It depicts the various relationships between water and the dominant processes generally necessary to carry out carbon capture and storage. More information can be found http://www.netl.doe.gov/research/coal/carbon-storage/wwg.

Innovative Energy Concepts is concerned with the development of innovative cost-effective transformational technologies that enhance the efficiency, environmental performance, and availability of advanced energy systems, as well as the creation of computational tools that shorten the development timelines of advanced energy systems. This area conducts fundamental and applied research in innovative concepts with a 10 to 25 year developmental horizon that offer the potential for technical breakthroughs and step change improvements in coal power systems with CCS and the removal of any environmental impacts from fossil energy-based power system.