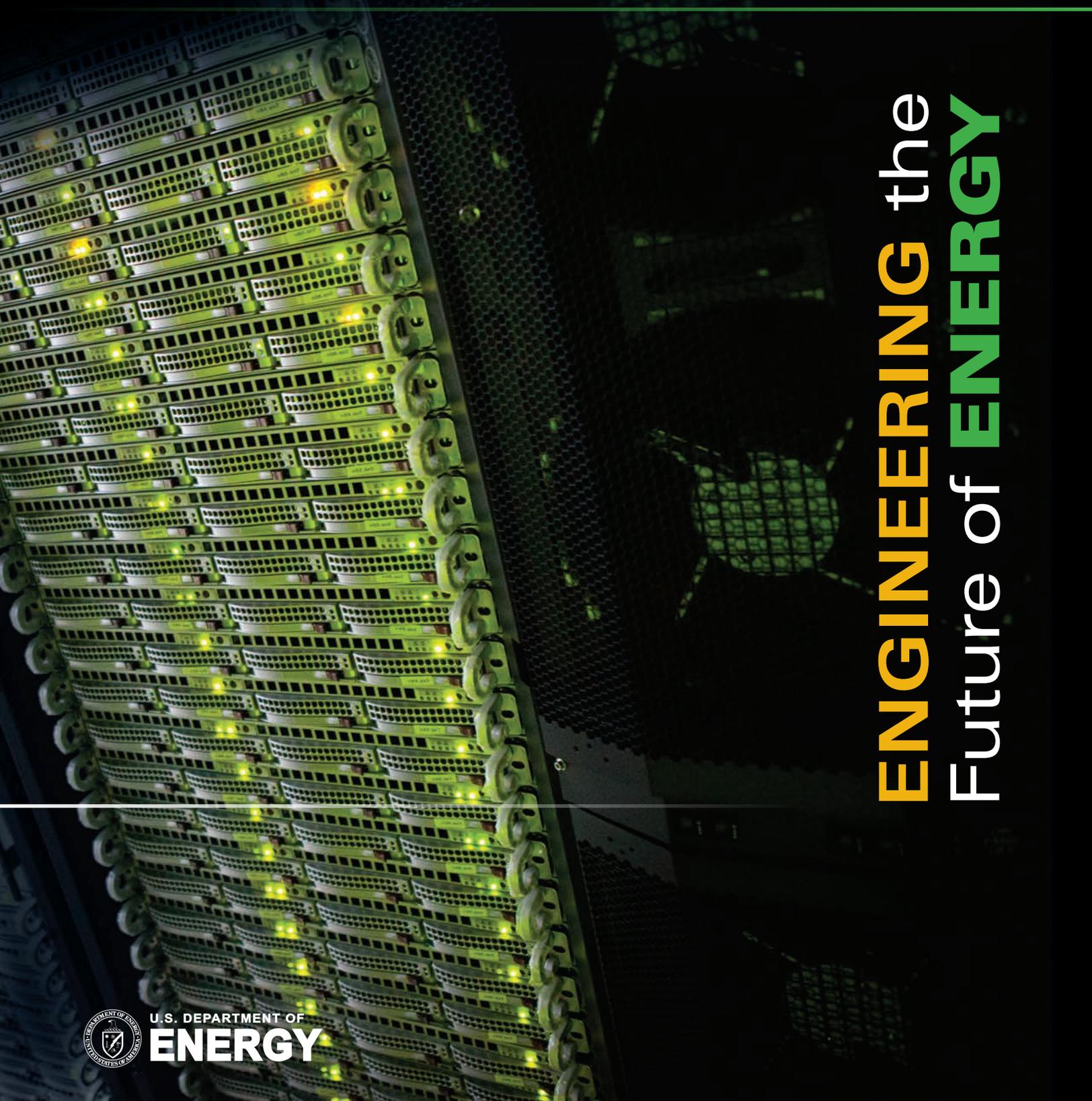


National Energy Technology Laboratory Office of Research and Development



ENGINEERING the
Future of **ENERGY**



U.S. DEPARTMENT OF
ENERGY

The Future of Energy

The time to redraw America's energy blueprint is now.

The challenges we face today are the most critical in decades—from the impact of energy use on global ecosystems to the difficulties of efficiently harnessing our natural resources. Because energy is fundamental to human welfare, we must develop sustainable systems that make clean, abundant, affordable supplies available to all.

Science and technology are the keys to developing these systems. Focused research that tackles today's challenges will lead to the energy solutions of the future.

Energy Research at NETL

At the National Energy Technology Laboratory, success is founded on public-private partnerships. Through an integrated mix of internal and external efforts, NETL applies scientific and engineering methods to address problems such as carbon emissions, petroleum supply constraints, and the complexities of designing advanced energy systems.

Programs conducted by NETL's Office of Research and Development coordinate the expertise and talents of hundreds of public- and private-sector scientists, engineers, technicians, and other professionals. ORD forms interdisciplinary teams of researchers experienced in taking innovative approaches to energy challenges that result in commercially viable solutions.

To strengthen its efforts, ORD established the NETL-Regional University Alliance in 2010. A unique partnership of seven academic, industry, and federal research organizations, NETL-RUA engages in a diverse R&D portfolio to answer America's tough energy questions.

Engineering Change Through NETL-RUA

NETL-RUA is a research collaboration that combines NETL's expertise in technology development and demonstration with the diverse capabilities of industry member URS Corporation and five nationally recognized universities: Carnegie Mellon University, Penn State, the University of Pittsburgh, Virginia Tech, and West Virginia University.

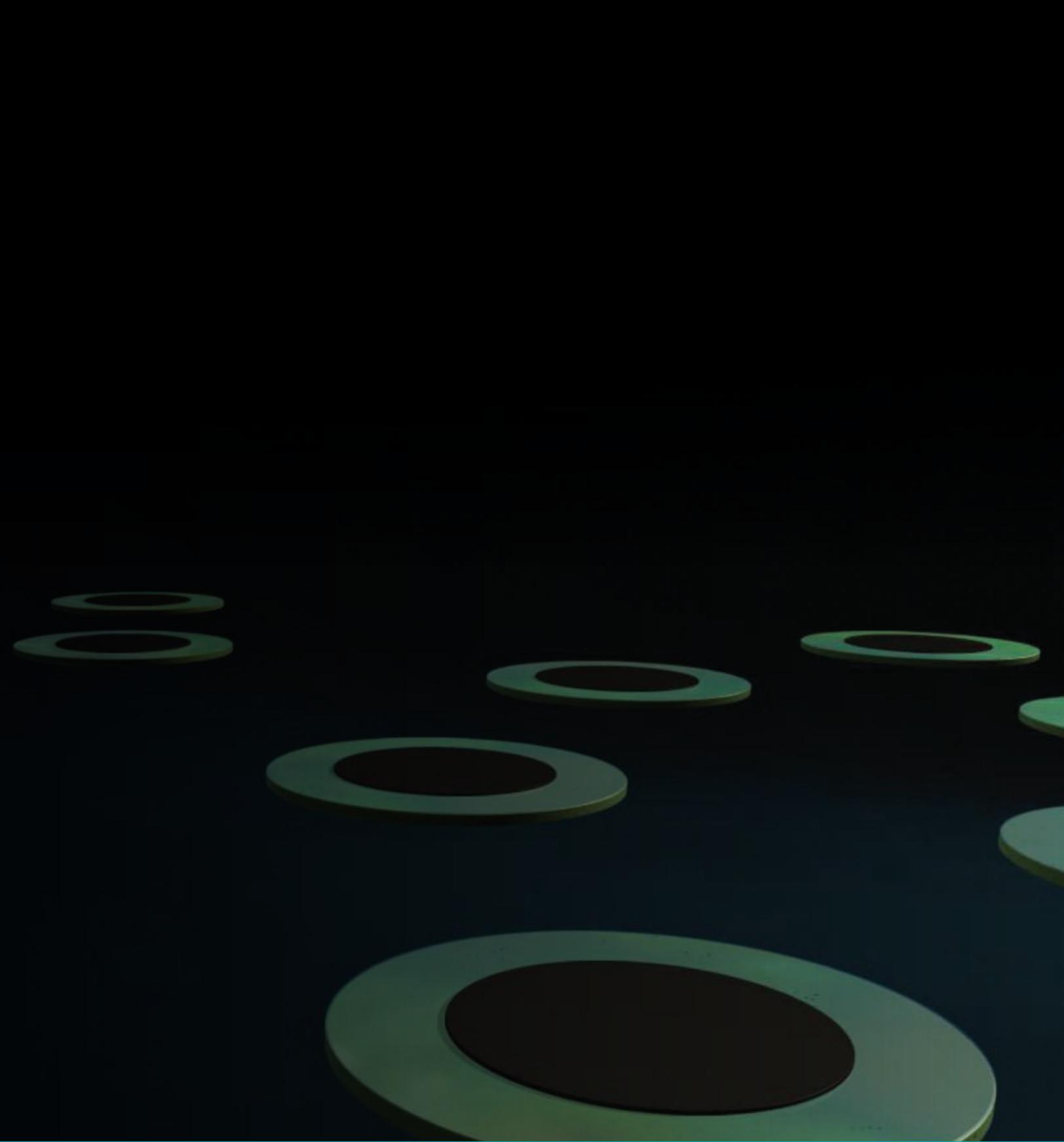
The efforts of our individual members and NETL-RUA as a whole are strengthened through shared ideas, strategies, talents, and facilities. The conceptual research perspectives of the universities complement NETL's applied research capabilities. URS Corporation adds its experience in bringing invention to market, providing the Alliance with an avenue to efficiently introduce its innovations to the public.

NETL-RUA also teams with other national laboratories, universities, and private organizations. By bringing together diverse viewpoints and resources, we are developing the next generation of energy technologies that will invigorate the economy, create high-tech jobs, and transform the energy sector.



University of Pittsburgh

Carnegie Mellon



Bridge to a Sustainable Future

Fossil fuels underpin economic growth around the world. Coal is abundant. Gas and oil supplies are rapidly growing. Utilization of these resources is familiar and relatively inexpensive.

Yet the benefits come with a price. Conventional systems for extracting and using fossil resources affect our climate, air, land, and waterways, and, consequently, human health. Collectively, these impacts make up the primary driver for conducting NETL-RUA research: to discover the means by which fossil fuels can help build a bridge to a sustainable energy future.

The Alliance looks to fossil energy to contribute in two important ways. In the shorter term, using fossil fuels in an environmentally responsible manner will give us the time we need to smoothly transition into using renewable resources on a large scale. In the longer term, transformative strategies can introduce novel approaches to fossil fuel use and create a system that integrates fossil, renewable, and nuclear power. By optimizing the strengths of every energy resource, we will reduce the footprint of power production while maintaining reliable supplies at affordable costs.



The Architecture of Our Efforts

What is our blueprint for discovery? Developing technologies that minimize CO₂ emissions, safety risks, and hazardous by-products while increasing domestic energy resources and enhancing power distribution systems.

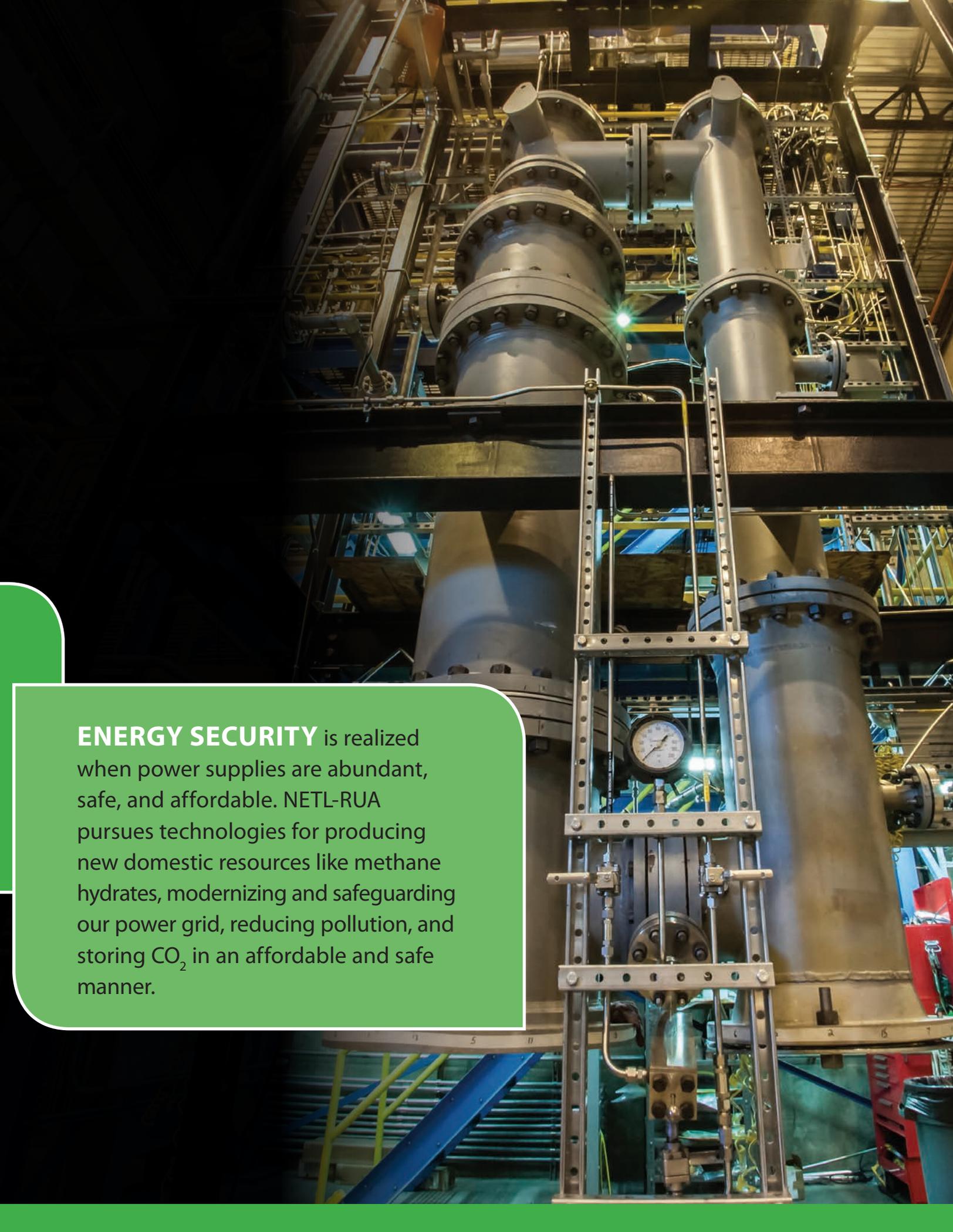
REDUCING THE CO₂ FOOTPRINT

of fossil-based power generation and industrial facilities is vital to reining in manmade carbon emissions. NETL-RUA is providing the means to reduce, or capture and utilize, CO₂ produced in power plants and other industrial systems.

PROTECTING HUMAN HEALTH AND THE ENVIRONMENT

is a fundamental objective of NETL-RUA. We are working to understand and eliminate the risks of developing unconventional energy resources, such as shale gas, and to create advanced systems for producing and transmitting clean electric power.

To realize these goals, NETL-RUA conducts innovative research that creates solutions to barriers faced by the energy industry. We work hard to shorten the product development cycle from concept to commercialization. We empower economic development in our region and across the nation. And we inspire the next generation of energy leaders.



ENERGY SECURITY is realized when power supplies are abundant, safe, and affordable. NETL-RUA pursues technologies for producing new domestic resources like methane hydrates, modernizing and safeguarding our power grid, reducing pollution, and storing CO₂ in an affordable and safe manner.

Innovative Research



NETL-RUA has designed a portable monitoring system to help ensure that shale drilling sites comply with environmental regulations. Volatile organic compounds, dust, light, and sound coming from remote well pads can be monitored via cell phone signal from an operator's office computer. The system is small enough to be installed by a single technician and is designed as a low-cost, off-the-shelf unit for a variety of drilling operations.



NETL-RUA implements an aggressive research agenda across the U.S. energy sector. We design advanced systems for power production and unconventional natural gas and oil resources. We develop and use science-based computational models to speed the process of discovery, and we create the materials needed to make next-generation systems a reality.

The interdependent nature of our power infrastructure compels us to examine every opportunity for innovation. From smart grid technologies to hybrid systems that integrate fossil, nuclear, and renewable resources, the groundbreaking R&D underway at our shared laboratories will provide essential answers to ensure our energy future.

Accelerated Technology Development



The Carbon Capture Simulation Initiative, led by NETL and supported by NETL-RUA, has released its first CCSI Toolset. This suite of computational tools and models is designed to speed the development and deployment of technologies for carbon capture, chemical production, and natural gas and oil production and refining. The use of these tools could dramatically reduce the 20–30 years of development time usually required for commercial technology deployment.

A close-up photograph of a glowing green power button. The button is circular and has a bright green light emanating from it. Above the button is a small rectangular label with the words "POWER ON" written in black capital letters. The background is a light-colored, textured surface.

POWER ON

NETL-RUA researchers create modeling and simulation software that screens potential concepts; optimizes system performance; and eliminates costly, time-intensive steps in scaleup design and testing. These tools are instrumental in reducing risks and speeding commercialization of new technologies.

Commercial adoption is also accelerated by the connections NETL-RUA fosters between our research teams and private-sector organizations. We work with end users to identify challenges facing the energy industry and frame our investigations to resolve them. This ensures that our technologies directly address market needs and can move quickly from idea to implementation.

Economic Stimulus



Start-up company Pyrochem Catalyst Corporation is commercializing an NETL-RUA catalyst system that turns diesel fuel into synthesis gas. This technology promises to make low-emission solid oxide fuel cells available for everyday power—initially in recreational vehicles and long-haul trucking auxiliary power units and eventually in full-scale power-generation systems.

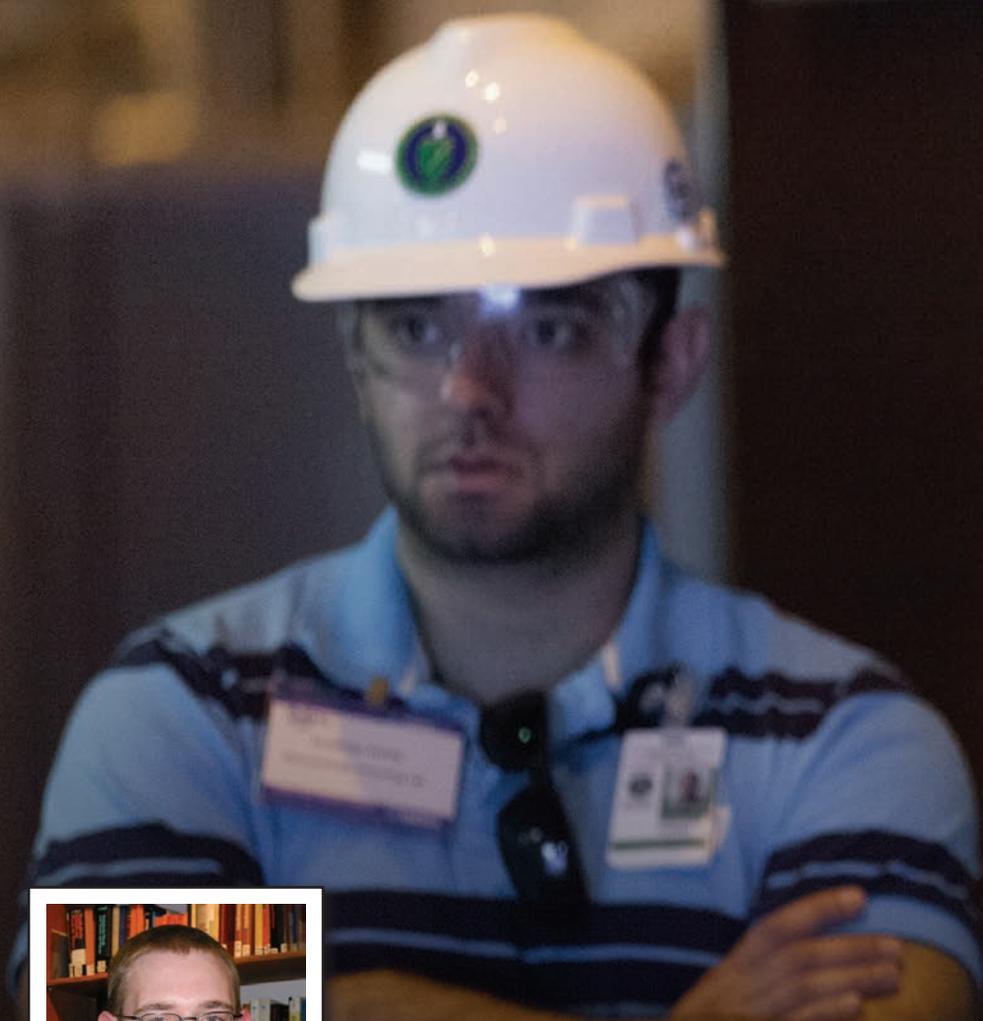


Inventions and innovations can make a fundamental impact on our nation's economy. That's why, in 2011, the White House directed federal laboratories to more effectively commercialize technologies arising from publicly funded research.

Each member of NETL-RUA has a long history of bringing important technologies to market. Enhanced oil recovery, power plant scrubbers, unmanned vehicles, specialized metal alloys, and a foundational precursor to wireless networking have all resulted from our individual programs.

Building on hundreds of such successes, NETL-RUA is conducting research and forming partnerships meant to transform our newest ideas into products, businesses, and livelihoods.

The Next Generation



Dr. John Kitchin

NETL-RUA researcher John Kitchin is a recipient of the Presidential Early Career Award for Scientists and Engineers, or PECASE. Dr. Kitchin was honored by the White House for his work in electrochemical oxygen separation, CO₂ capture, and metal catalyst reactivity, and also for excellence in teaching, mentoring, and curriculum design.



NETL-RUA fills an increasingly critical need by sponsoring mentorships that provide guidance and financial support to educate the next generation of energy leaders.

Postdoctoral researchers, graduate students, and undergraduates are conducting important work with NETL-RUA. The Alliance provides these young scientists and engineers with hands-on experience conducting basic research, scaling up technologies, and laying the groundwork for new businesses.

Through its research and educational programs, NETL-RUA inspires students and early career researchers to conceive and realize our energy future.

Building the Future Together

The case for developing a sustainable energy infrastructure is compelling. We must find the means to use fossil resources responsibly while we create and prove the technologies that will transform our global economy into one powered by clean, reliable, affordable energy supplies.

Science and engineering have given us solutions to grand challenges in the past, and we are confident they will help us engineer a clean, sustainable energy future. NETL-RUA is connecting with fellow research agencies, energy providers and users, regulators, investors, and other stakeholders to build that future and contribute to the growth of our partners, our region, and the world.

Contact Us

All connections begin with a conversation. If you would like to learn about the specific capabilities of NETL-RUA, discuss partnership opportunities, review technologies ready for license, or hear more about the impact of our research, contact us. We look forward to hearing from you.

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NETL-RUA is a collaborative initiative of NETL's
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