Coal & Power Systems

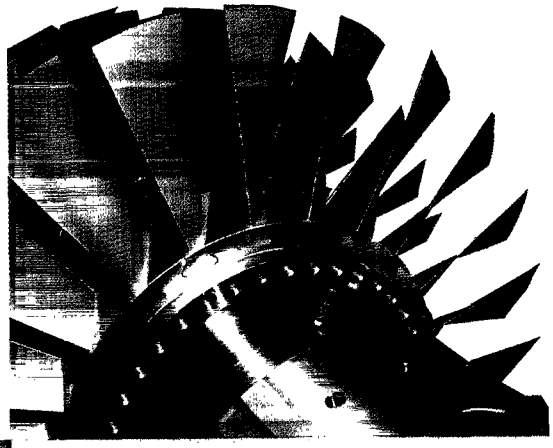
21st Century Energy Solutions

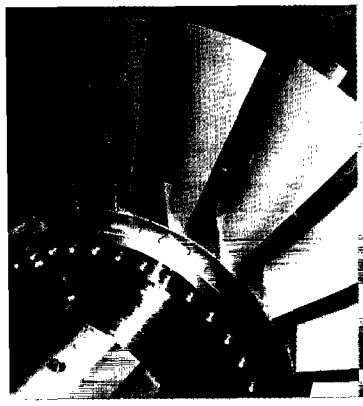
FY2001 Program Briefing

U.S. Department of Energy • Office of Fossil Energy

....fueling future prosperity

through technological innovation



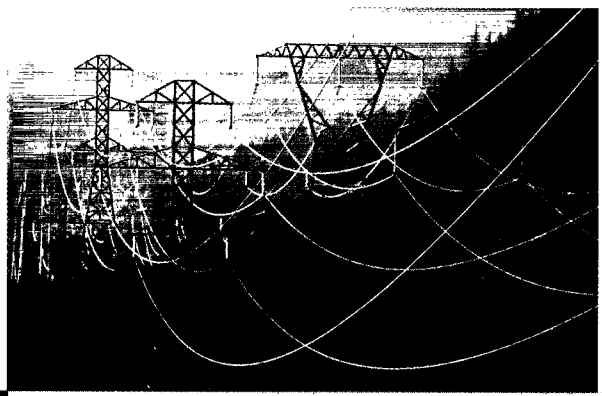


Introduction

The continued strength of America's economy depends on the availability of affordable energy, which has long been provided by the Nation's rich supplies of fossil fuels. Forecasts indicate that fossil fuels will continue to meet much of the demand for economical electricity and transportation fuels for decades to come. It is projected that natural gas, oil, and coal will supply nearly 90 percent of U.S. energy in 2020, with coal fueling around 50 percent of our electricity. It is essential to develop ways to achieve our objectives for a cleaner environment while using these low-cost, high-value fuels. A national commitment to improved technologies — for use in the United States and abroad — is the solution.

The Coal and Power Systems program is responding to this commitment by offering energy solutions to advance the clean, efficient, and affordable use of the Nation's abundant fossil fuel resources. These solutions include:

- **Vision 21.** A multi-product, pollution-free energy plant — producing electricity, fuels, and/or industrial heat — could extract 80 percent or more of the energy value of coal and 85 percent or more of the energy value of natural gas.
- **Central Power Systems.** Breakthrough turbines and revolutionary new gasification technologies that burn less coal and gas to obtain energy, while reducing emissions.
- **Distributed Generation.** Fuel cell technology providing highly efficient, clean modular power.
- **Fuels.** The coproduction of coal-derived transportation fuels and power from gasification-based technology.
- **Carbon Sequestration.** Capturing greenhouse gases from the exhaust gases of combustion or other sources, or from the atmosphere itself, and storing them for centuries or recycling them into useful products.
- **Advanced Research.** Going beyond conventional thinking in the areas of computational science, biotechnology, and advanced materials.



About the Office

DOE's Office of Fossil Energy (FE) manages research and development (R&D) programs in coal and power systems (C&PS) for an integrated portfolio of fossil fuel technologies needed to produce clean, efficient, and cost-competitive power. The program portfolio includes advanced central and distributed power systems, as well as coal-derived fuels, environmental control technologies, and carbon sequestration research. Further, the C&PS program facilitates the effective deployment of these technologies to maximize their benefits to the Nation.

By investing public funds in R&D for new coal and power systems technologies, the C&PS program helps protect the Nation against risks to its energy supplies, and eliminates any detrimental environmental effects of energy production and use — public benefits that are not necessarily the focus of private sector investment. By working in tandem with industry and academia, the C&PS program has repeatedly created effective technologies where none previously existed, and then reduced their costs by half or more. Advanced energy systems developed through such R&D partnerships aim to eliminate environmental issues as barriers to the use of fossil fuels, allowing us to produce clean power and transportation fuels while meeting post-2000 clean air standards at reasonable cost.

The Office of Fossil Energy, in conjunction with the National Energy Technology Laboratory, is leading the charge in providing energy solutions to meet the energy, environmental, and economic challenges of the 21st century.

As a result of technological innovation in the last 30 years, coal use has more than doubled while emissions of sulfur and nitrogen pollutants have declined by 70% and 45% respectively — all while keeping the cost of electricity to U.S. consumers the lowest of any industrialized nation.

The Challenges of Tomorrow

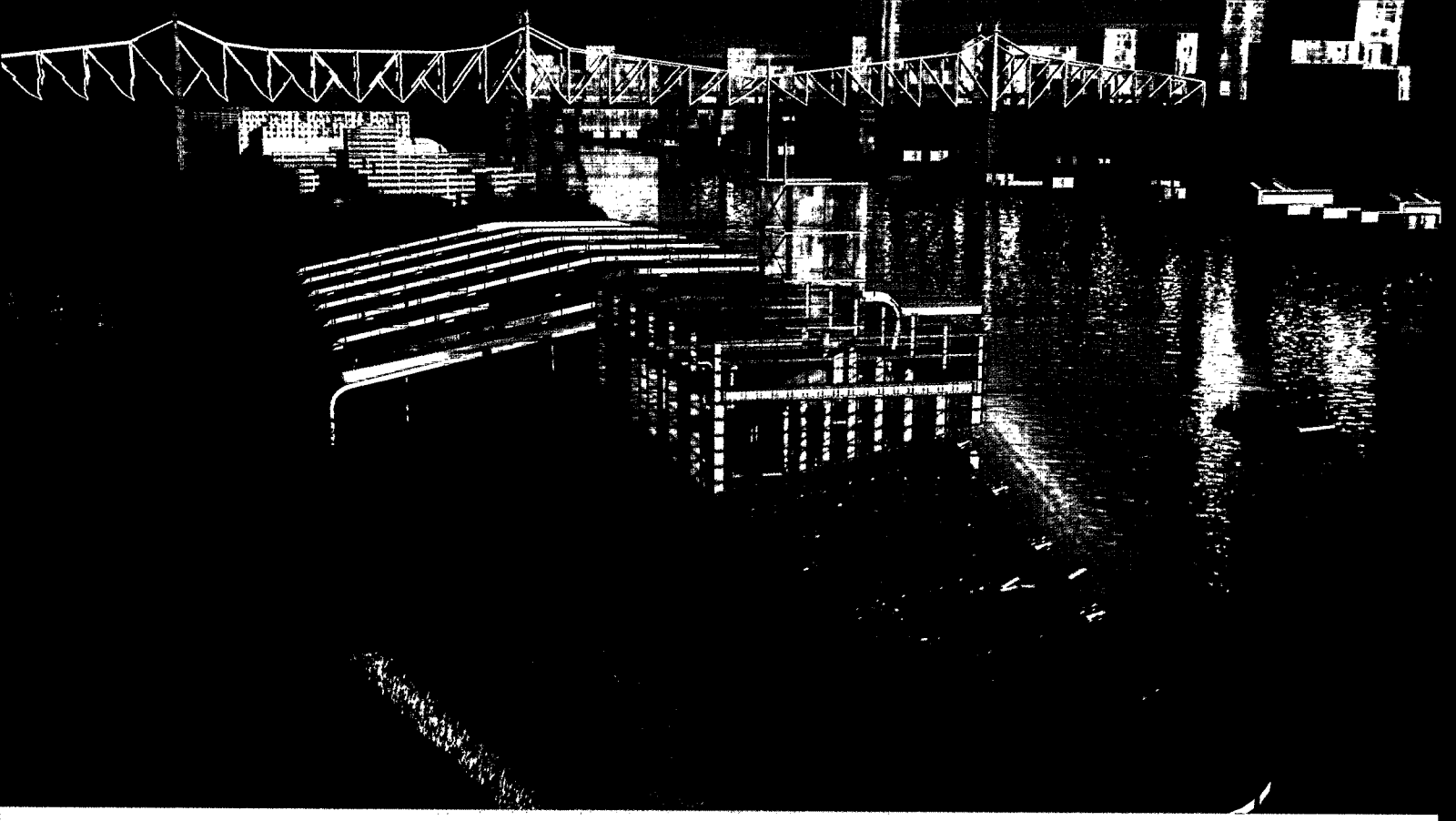
Coal is our Nation's most abundant domestic energy resource. Historically, it has been the least expensive fossil fuel available to the country, and in contrast to other primary fuels, its costs are likely to continue to decline.

However, challenges exist to using coal in an environmentally sound and cost-effective manner. Today's coal-fired power plants convert only about a third of the energy value of coal into electricity. The rest is typically discarded as waste heat. Likewise, despite huge advances in reducing the emission of local pollutants such as sulfur dioxide (SO_2), particulates (PM), and nitrogen oxides (NO_x), coal combustion is still regarded by many as "dirty" — emitting more carbon dioxide (CO_2), SO_2 and NO_x per unit of electrical output than any other fossil fuel.

Moreover, energy industries are facing the most serious environmental challenge of global climate change. With coal-powered technologies projected to grow rapidly in some parts of the world (notably China and India) sharp increases in carbon emissions in these developing areas are expected to grow more quickly than in the United States. Climate change and policies to address it may be the most influential consideration in energy use in coming years for both the United States and the world.

Finally, deregulation and restructuring in the electricity industry are forcing electric utilities to maximize the utilization, reduce operating costs, and extend the lifetimes of existing coal-fired power plants.

The C&PS program is taking the lead on meeting the energy, environmental and economic challenges of the next century by managing high-tech research and development in fossil fuel technologies. The following pages briefly outline the domestic and global solutions that the C&PS program is working toward.



Vision 21

Integrating emerging concepts

The Office of Fossil Energy has developed a long-term strategy, termed *Vision 21*, that meets the environmental challenges of both today and tomorrow. It focuses not on developing individual stand-alone technologies, but on achieving efficiency, environmental, and cost goals through innovative systems approaches designed to produce several energy products at once, thus maximizing the use of all input energy. These approaches will combine power and fuel modules in a flexible manner resulting in substantially more efficient, cleaner, and affordable advanced electricity generation technologies, transportation fuels, and chemicals, manufactured from natural gas and coal. Building on technology advances currently underway in various C&PS programs, the Vision 21 concept integrates emerging concepts to provide:

Flexibility in configuration to suit geographical and market needs. The size, components, feedstocks, and products of an individual plant will be tailored to the raw materials and markets at that site.

Zero discharge. Vision 21 plants will effectively remove the environmental constraints to fossil fuel use. Emissions of NO_x and SO_2 will be near-zero, and CO_2 will be reduced 40-50 percent by efficiency improvements, and near-zero with sequestration.

Varied coproduction options. The suite of optional high-value products will include electric power, hydrogen, clean and affordable transportation fuels, chemicals, and other commercial products. By-products will include high-quality heat and steam.

Multiple feedstocks. Natural gas, coal, and opportunity fuels such as petroleum residuals, wastes, biomass, or some combination of these can all be used as feedstocks.

Interconnected technology modules in Vision 21 allow for ultimate flexibility and efficiency. A Vision 21 plant might serve as the hub of an industrial complex, or as a supplier of chemicals or fuel gases to nearby manufacturing facilities. It could be configured as a combination of coal refinery and power plant, or as an oil refinery partner, burning oil wastes to provide power. It could supply a community with heat from steam, as well as electricity.

Vision 21 is building the foundation for a new generation of energy facilities capable of efficiently using our most abundant traditional fuels, while virtually eliminating environmental concerns. An artist's rendering of a Vision 21 plant is shown to the left.

The focus of the program will be on flexible components and subsystems to enable modular designs for plants that can use multiple feedstocks and/or produce multiple products in the 2010-2015 time frame. To establish a blueprint, the C&PS program is focusing Vision 21 on several elements that will be common to all of the facilities under consideration.

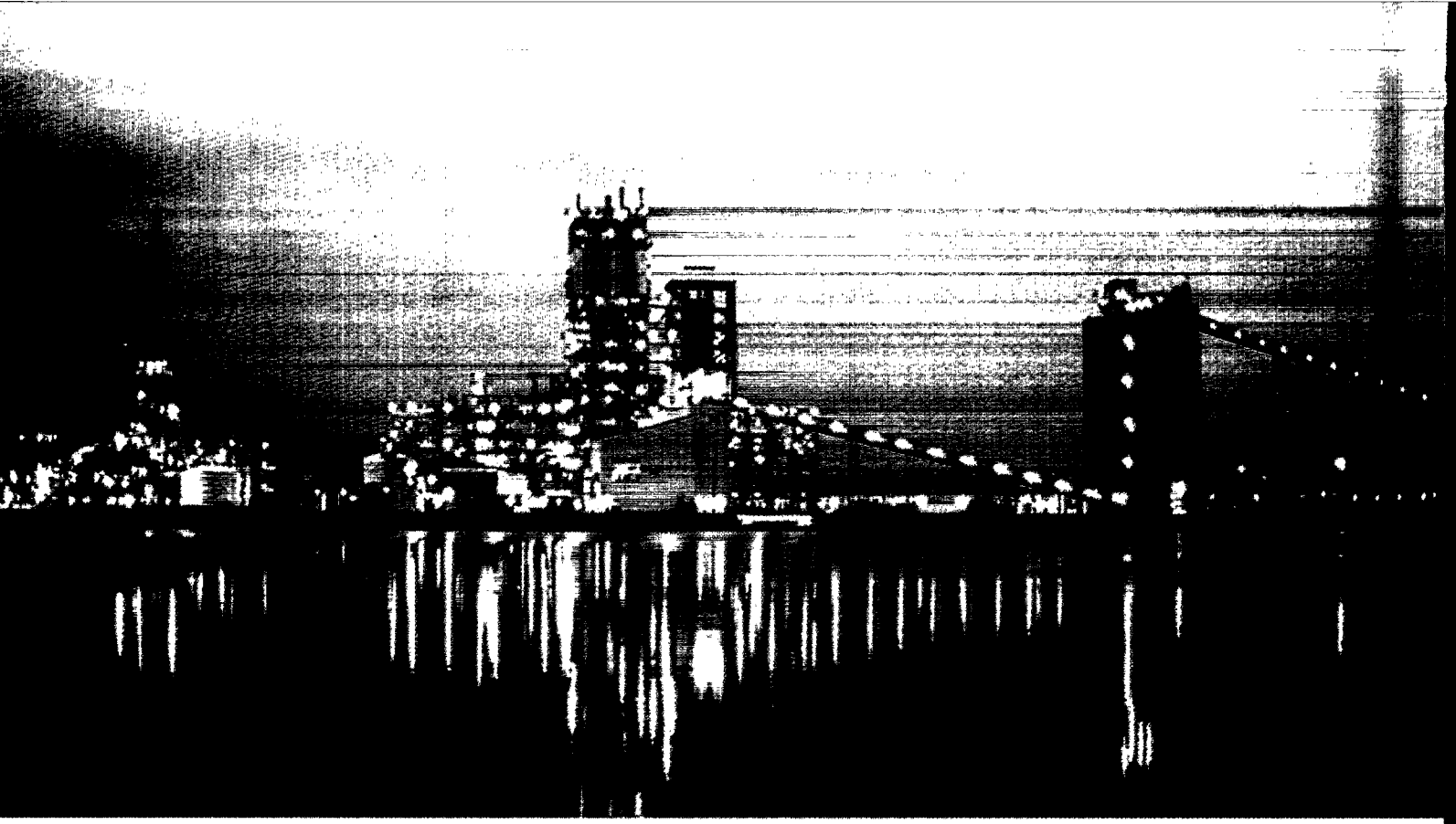
Systems analysis will be used to develop various system configurations that satisfy the program objectives, define the performance targets for individual subsystems, and identify supporting technology needs.

Enabling technologies form the building blocks of a Vision 21 plant. Examples of enabling technologies include gasification, advanced combustion, and gas separation.

Supporting technologies, such as higher-strength, more durable materials, improved catalysts, environmental control technologies, sensors and controls, and virtual demonstrations, are cross-cutting technologies that are necessary for multiple subsystems and components and are important for other applications.

Systems integration in a Vision 21 plant configuration will use "smart" systems integration techniques to combine high-performance subsystems into very clean and efficient low-cost plants.

Plant designs would serve as the basis for a new fleet of commercial-scale Vision 21 plants. Modeling, analysis, and experimental work of Vision 21 technologies will range from laboratory-, bench-, and pilot-scale, up to and including scales needed to obtain data for demonstrating feasibility for prototype and commercial-scale plants.



Central Power Systems

an invaluable energy asset

Coal-fired electric generating capacity is the cornerstone of the Nation's central power system. To maintain competitive energy rates and sustain economic growth requires that coal remain a mainstay in electric power generation. This requirement places importance on retaining existing coal-fired capacity and developing new capacity in the face of increased electric power demand and projected nuclear and hydroelectric plant retirements.

To address capacity constraints in the near-term, C&PS is actively carrying out the Power Plant Improvement Initiative (PPII). PPII, a Congressional action signed in October 2000, is a government/industry co-funded solution aimed at developing technologies that can extend the life of existing power plants, be applicable to new coal-based plants, squeeze out higher generating efficiencies (several more percentage points), enhance environmental performance, and ensure that we extract the full benefits of coal in meeting near-term power reliability concerns.

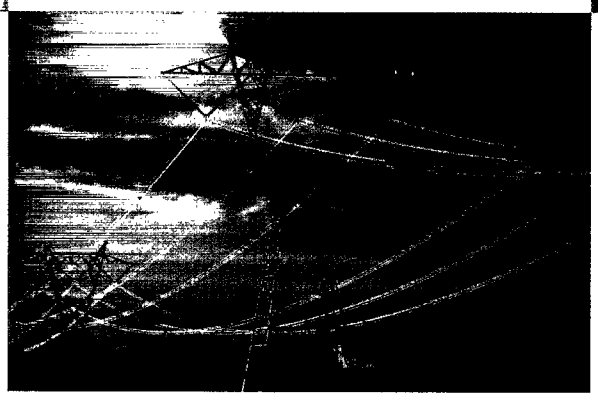
Ultimately, a new generation of Vision 21 technologies is needed to expand the fuel resource base to include wastes and renewables, provide a multiplicity of high-value products in lieu of wastes, realize quantum jumps in efficiency and emission reductions, and facilitate carbon dioxide capture and sequestration.

In partnership with its customers and stakeholders, the C&PS Central Power Systems program seeks to: (1) preserve the existing central power generation infrastructure while meeting environmental requirements at minimal cost; (2) provide the next generation of advanced fossil-fueled power systems capable of meeting projected energy and environmental demands both domestically and internationally; and (3) build toward achieving Vision 21 plants capable of eliminating environmental concerns associated with fossil-fueled power generation.

Innovations for existing plants allows existing coal-fired plants to comply with increasingly stringent source emission and ambient air standards. Enhancing the cost and performance of both environmental control retrofit and repowering technologies aimed at reducing emissions of sulfur dioxide, oxides of nitrogen, fine particulate matter, mercury, and solid wastes is needed.

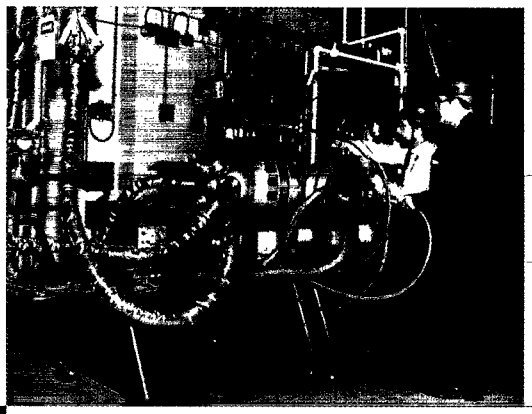
Gasification technologies represent the next generation of solid feedstock-based energy production systems. At the heart of these systems is the gasifier, which can convert any carbon-based feedstock into synthesis gas. Converting coal into a combustible gas before producing electricity allows the gas to be cleaned of 99 percent of its SO_2 and 90 percent of its NO_x at present. Efficiencies will increase from about 35 percent in currently operating plants to over 52 percent by 2008.

Pressurized fluidized-bed combustion combusts coal at elevated pressures of 6 to 16 times atmospheric pressure to yield a high-pressure exhaust gas stream, producing electricity using both gas and conventional steam turbines. The result is very low NO_x emissions and efficient SO_2 capture. Current systems currently realize 40 percent efficiency with the aim of achieving efficiencies greater than 50 percent by 2008.



Conventional coal-fired power plants operate at only 33-35% efficiency, but power plants in the Clean Coal Technology Demonstration Program have already demonstrated up to 42% efficiency, and their performance will improve up to 50% in the mid-term. Long-term, Vision 21 systems will produce power at efficiencies of up to 75%.

A ***gas turbine*** produces a high-temperature, high-pressure gas working fluid, through combustion, to induce shaft rotation by impingement of the gas upon a series of specially designed blades. The shaft rotation drives an electric generator and a compressor for the air used by the gas turbine. The gas turbines of today are limited by the inability of their metal alloys to withstand gas temperatures over 2,350 °F. ***Advanced gas turbines*** under development will reach temperatures of 2,600 °F while achieving ultra-low emissions and allowing dramatically higher efficiencies. Advanced turbine systems will likely supply two-thirds of all new U.S. generating capacity in the next decade.



As a follow-on to advanced turbine systems, ***next generation turbines*** include flexible turbine systems and turbine/fuel cell hybrids greater than 30 MW in output rating. These systems will respond to stakeholder needs by providing highly efficient, reliable, and ultra-clean performance and by offering flexibility to perform effectively independent of duty cycle or fuel used.

Incorporating integral state-of-the-art environmental controls into a super-critical coal boiler, ***low-emissions boiler systems*** push current coal-fired power generation efficiencies — now only 33-35 percent — into the mid-40 percent range, while reducing emissions well below federal standards.

Indirect fired cycle concepts (applicable to existing and Vision 21 plants) involve advanced combustion and gasification to produce a clean coal-based gas for combustion. Heating air for gas turbines indirectly protects the turbine and improves efficiency to well over 50 percent.

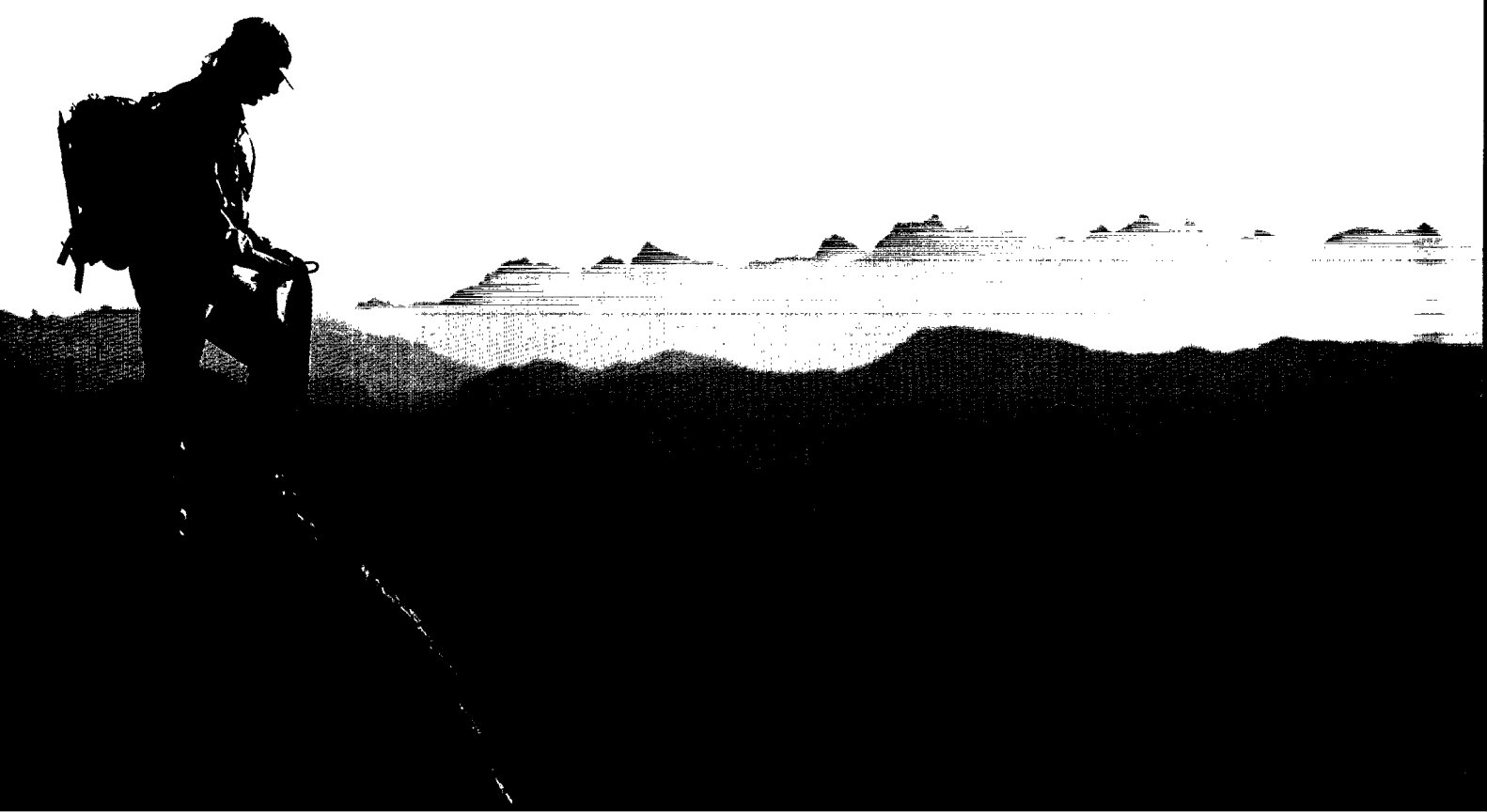
Because central power is composed of large, capital-intensive plants and a transmission and distribution (T&D) grid to disperse electricity, significant investments of time and money are required to increase capacity. Distributed generation, on the other hand, complements central power by: (1) providing a relatively low capital cost response to incremental increases in power demand; (2) avoiding T&D capacity upgrades by locating power where it is most needed; and (3) providing the flexibility to put surplus power back into the grid at user sites.

Distributed generation strategically applies relatively small generating units (typically less than 30 MW) at or near consumer sites to meet specific customer needs, to support economic operation of the existing power distribution grid, or both. Reliability of service and power quality are enhanced by proximity to the customer, and efficiency is improved in on-site applications by using the heat from power generation.

Fuel cells offer a distributed generation option with the potential to revolutionize power generation. Fuel cells operate without combustion, converting natural gas or other hydrogen-rich fuels electrochemically to power. Fuel cell systems have few moving parts, making them reliable and quiet. No solid wastes are produced and pollutant emissions are negligible. The potential electrical efficiencies can reduce carbon dioxide emissions by nearly 50 percent relative to existing power plants. Moreover, their modular construction and electrochemical processing allow suppliers to match demand and maintain efficiency independent of size. Fuel cells are beginning to enter the market but require additional research and development to realize widespread deployment.

Distributed Generation

a new view on energy use



While central power systems remain critical to the Nation's energy supply, their flexibility to adjust to changing energy needs is limited.

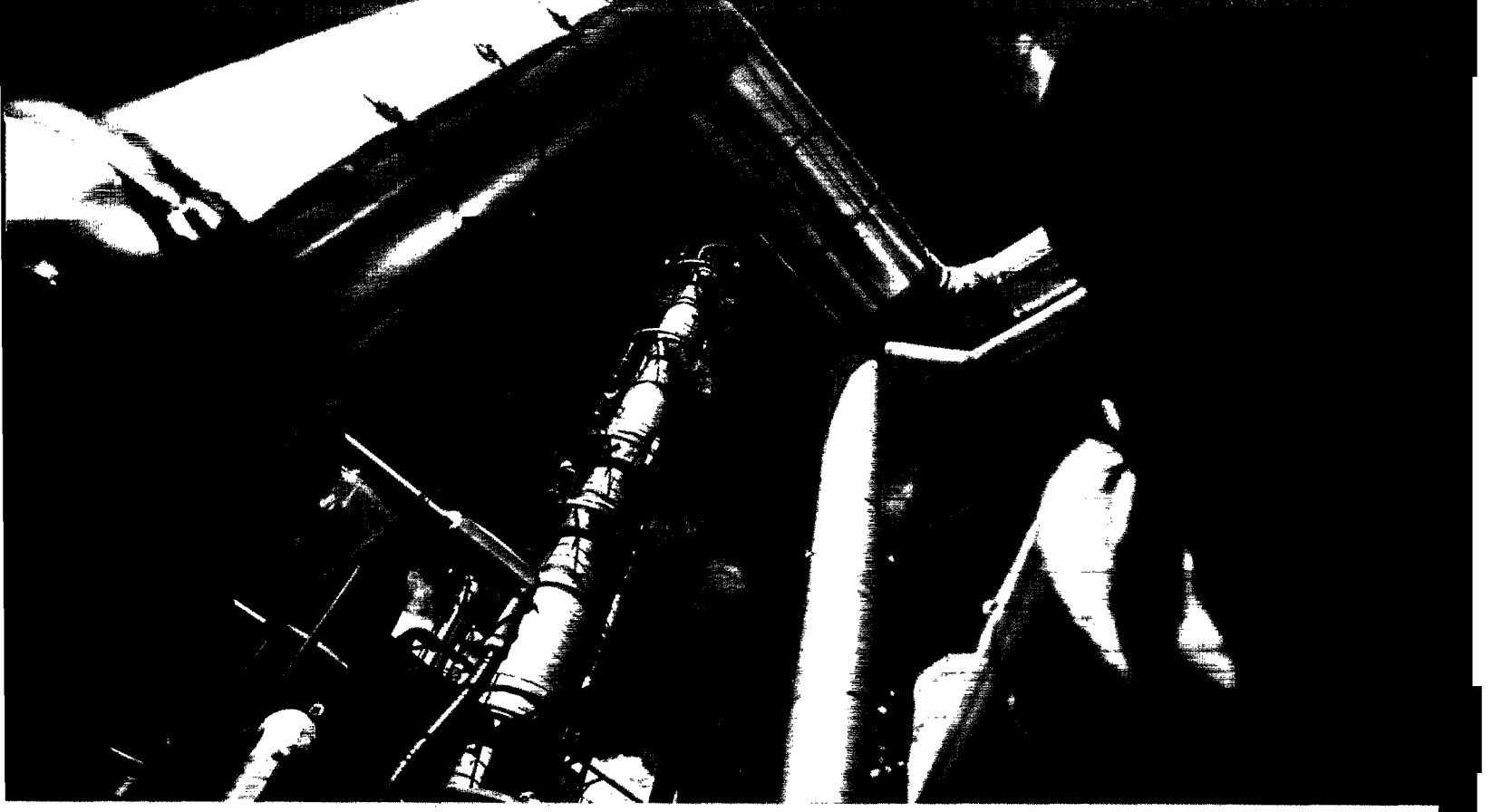
Second generation fuel cells focus on operating at higher temperatures than current fuel cell technology resulting in increased thermal efficiencies. Two second generation, high-temperature fuel cells are in the final stages of development — molten carbonate fuel cells (MCFCs) and solid oxide fuel cells (SOFCs). These systems offer both major improvements in stand-alone fuel-to-electricity efficiency and overall thermal efficiency.

Conducted in coordination with the Next Generation Turbine research program, ***Vision 21 fuel cell/turbine hybrids*** focus on integration of fuel cell and gas turbines into a single system that can achieve 70 percent efficiency (LHV) at a cost of 20-25 percent less than comparably-sized fuel cells.

Research in the ***Solid State Energy Conversion Alliance (SECA)*** intends to develop a next generation of fuel cell offering not only characteristically high efficiency, but low capital cost on the order of $400/kW.

SECA comprises government agencies, commercial developers, universities, and national laboratories committed to the development of low-cost, high power density, solid state fuel cells for a broad range of applications. A mass customization approach is being taken that involves development of standard fuel cell components for use in multiple market applications.

The essence of the SECA organization is integration of a core cross-cutting technology program (involving universities, national laboratories, and other research-oriented organizations) with industry development team efforts to design and produce commercial systems.



Fuels

expanding clean fuel and feedstock resources

The need for liquid fuels is forecast to be a critical element of America's energy future in the 21st century. The Energy Information Administration predicts that by 2020, U.S. petroleum imports (already representing over 50 percent of consumption) will rise to 65 percent. The use of abundant, domestic coal resources instead of imported petroleum, to produce fuels and chemicals, can act as a cushion against future oil price increases and reduce America's reliance on imported oil.

Driving accounts for more than 30 percent of the air pollution in the United States. Today, there exist a host of current and potential regulatory actions that will require major additional reductions in energy-related emissions during the next decade, and some are expected to be very expensive if compliance must depend on conventional fuels. Likewise, restructuring in the electric utility industry will place market pressures on utilities to find low-cost approaches to meeting stringent environmental regulations for potentially hazardous air pollutants.

Ultimately, the Nation will depend on a balanced mixture of energy sources including gas, coal, biomass, opportunity fuels, wastes, and oil. Without new and better technology however, the ability to lower emissions will be limited and the costs of energy will increase.

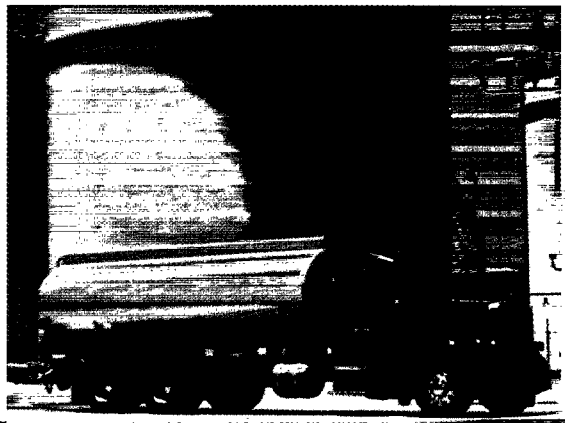
Fuels R&D seeks to ensure the development and demonstration of environmentally responsible coal-based technologies that produce ultra-clean transportation fuels, utility and boiler fuels, chemicals, and carbon products for metallurgical and industrial applications. By conducting research in advanced fuel science — hydrogen separation and storage technologies, catalyst development, and conversion processes for converting solids (coal and waste products) and gases to gasoline and diesel fuels — the C&PS Fuels program, in conjunction with industry and other federal agencies, is providing affordable conversion technologies to exploit coal's potential for producing a wide array of valuable fuels and other products.

The *Early Entrance Coproduction Plant* initiative examines the feasibility of multiple-product technology where transportation fuels, chemicals, electric power, process heat, etc. are coproduced in one facility from various feedstocks. In coproduction studies, teams will pursue industry/government cost-shared research and engineering studies that will be directed toward privately funded design, construction, and operation by 2007 of first-of-a-kind commercial facilities that coproduce multiple products. These activities will help industry teams refine their strategies, reduce technical risk, and define economic and environmental requirements.

Energy coproduction, a cornerstone of Vision 21, is a concept already in use today. Its core technology is gasification. Allowing significant increases in efficiency and productivity, fossil fuel gasification can produce not only power but also transportation fuels, chemicals and a slate of high-value carbon products from synthesis gas. Coproduction typically increases system efficiencies to more than 50 percent when transportation fuels are coproduced and to 80 percent when a portion of the steam is used directly in industrial applications.

The goal of the *Ultra Clean Transportation Fuels Initiative* (UCTFI) is to develop and deploy technologies that will produce ultra-clean burning transportation fuels for the 21st century from both petroleum and non-petroleum resources.

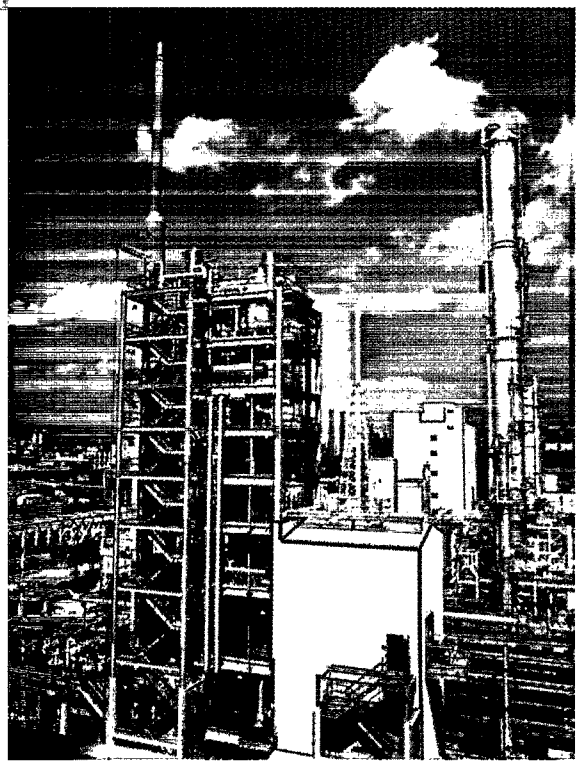
Core research in the UCTFI is directed toward systems-oriented R&D projects that lead to the production of sufficient quantities of fuel to validate vehicle performance and emissions. Fuels testing will be done in collaboration with the DOE Office of Energy Efficiency and Renewable Energy's Office of Transportation Technologies. Another R&D focus is on development of advanced unit operations/ processes for producing ultra-clean transportation fuels. A third area emphasizes the development of

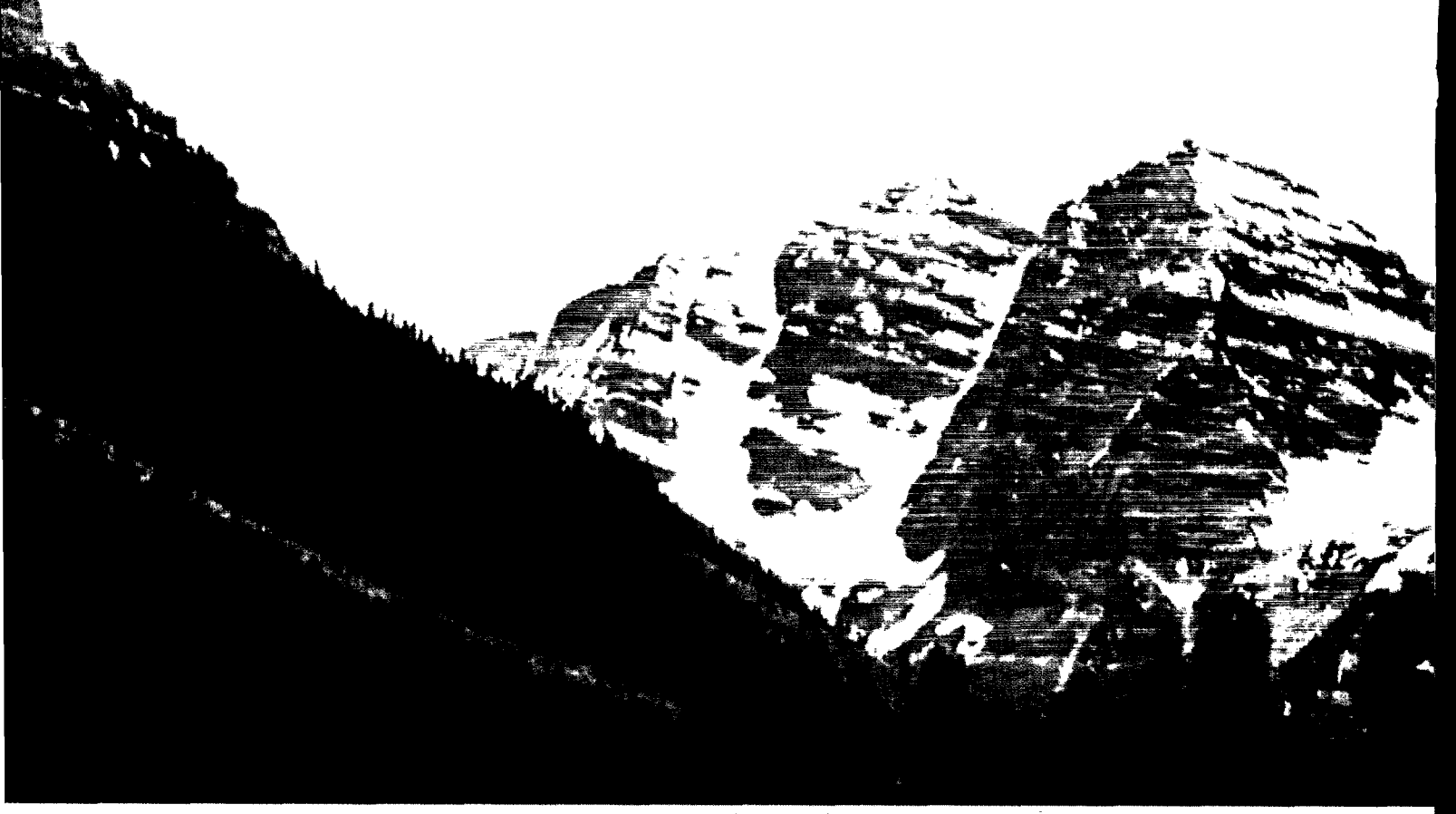


new and innovative emission control systems. In addition, an aggressive supporting research program is being set aside for a National Laboratory partnership that will focus on examining some of the key scientific issues (reaction chemistry, materials, etc.) associated with the conversion of natural gas, petroleum, and coal to ultra-clean transportation fuels.

Strategic investments in ***high-value products*** research is yet another focus of the Fuels program. Building on the successes of the Liquid Phase Methanol™ Process, advanced coal liquefaction technologies are being actively pursued. Methanol, higher alcohols, acetic acid, and Fischer-Tropsch liquids are being produced by shifting synthesis gas to increase the H_2/CO ratio. Some of these chemicals can be used for transportation fuels. Fischer-Tropsch fuels, with zero aromatic content, high cetane number, and zero sulfur and nitrogen content, are valuable as blending stock for diesel fuel to meet environmental standards.

The C&PS Fuels program is developing and commercializing advanced technologies for carbon-based solid materials and fuels that will maintain U.S. industrial competitiveness, contribute to efficient power production, and promote environmental quality.





Carbon Sequestration

addressing global climate change

The Industrial Revolution formed the basis of today's fossil energy system. For more than 200 years, advances in energy technology have been focused on lowering costs through increased efficiency to support economic growth. Because of their abundance, availability, and high energy content, coal, oil, and natural gas have proven to be attractive energy sources to produce electricity, run industrial processes, power transportation vehicles, and provide energy for residential and commercial operations. As fossil energy use increased and adverse environmental effects became apparent, energy technology also evolved to minimize them. However, all of this enormous technology development has assumed that the free discharge of CO_2 to the atmosphere was environmentally benign. Only recently has the increasing concentration of CO_2 in the atmosphere been considered to represent a serious environmental problem. The consequence is that we have developed an intricate, tightly coupled energy system that has been maximized over 200 years for economy, efficiency, and environmental performance, but not for the capture and sequestration of its largest material effluent, CO_2.

In order to stabilize and ultimately reduce concentrations of this greenhouse gas, it will be necessary to employ carbon sequestration — carbon capture, and storage or reuse. Carbon sequestration, along with reduced carbon content of fuels and improved efficiency of energy production and use, must play major roles if the Nation is to enjoy the economic and energy security benefits which fossil fuels bring to the energy mix.

The carbon sequestration program portfolio covers the entire carbon sequestration "life cycle" of capture, separation, transportation, and storage or reuse.

Enhancing nature's own CO_2 uptake. The earth's ability to store additional carbon is huge. We can enhance this by preserving forests and planting trees. We can also augment natural ocean processes to soak up larger quantities of carbon, although studies must be conducted to ensure that this will not introduce new environmental risks.

Capturing and storing CO_2. Depleted oil and gas reservoirs and deep saline reservoirs worldwide could hold trillions of tonnes of CO_2. A Norwegian company is already separating CO_2 from natural gas and demonstrating its disposal this way. Storage in deep unmineable coal beds, releasing methane gas for sale, is another option.

Using CO_2 from power plants in industry. Oil producers are already injecting CO_2 into wells to recover additional crude oil. A variety of intriguing novel concepts are being explored as responses to DOE solicitations have been overwhelming.

Sequestration research is gaining momentum

Three years ago, skepticism over carbon sequestration abounded. Today, that has changed. There is a growing belief among scientists and policymakers that sequestration is a viable climate change option. One of the important reasons for this new optimism has been the response of industry. The private sector has come forward — not just with innovative ideas, but with a commitment of resources.

In the most recent major industry competition for sequestration research, private sector cost-sharing of the 13 winners averaged 40 percent of total research costs — a full 100 percent greater than the minimum threshold for industry cost-sharing.

The challenge now is to channel the effort — identify the most productive avenues of research, develop and test the most promising concepts, and build a solid scientific and technical foundation — for the development of long-term sequestration technologies.

The Advanced Research program serves as a bridge between basic research and the development of innovative systems capable of improving efficiency and environmental performance while reducing costs of fossil energy systems, both for electric power and liquid fuels production.

As we enter the 21st century, the Nation's economic progress will be dependent upon continued advances in fossil energy science and engineering. The challenge is to extend the state of knowledge of fossil fuel technology to assure that the U.S. maintains its energy security, even in the context of electricity deregulation, ever more stringent environmental regulations, and requirements for the control of carbon dioxide and other greenhouse gases responsible for global climate change.

Advanced research provides the means by which advanced concepts are transformed into future working technologies. Improvement of our energy infrastructure — power plants, power transmission systems, fuel production and transportation systems, co-production of higher value products (such as chemicals), and environmental protection and remediation efforts — is dependent on research. This research must produce technologies that meet the performance specifications for hostile operating conditions, economic constraints of advanced industrial applications, and public demands for a cleaner environment. These constraints require the C&PS Advanced Research program to develop fundamental understandings of relationships among energy processes, their performance requirements, and the environment. The result is the development of a knowledge base which supports reliable, cost-effective, next generation fossil fuel technologies.

Advanced research is developing the underlying technology base for more effective use of our resources. Efforts are focused on novel materials, bioprocessing, coal utilization science, university research, international partnering, advanced hybrid processes, and smart systems.

Advanced Research

opening new frontiers in power

Coal utilization science focuses on understanding the fundamental chemical and physical mechanisms and processes that influence and control advanced fossil energy systems. Research activities are heavily involved in modeling efforts to develop the advanced designs and visualization software necessary to configure, evaluate, and optimize the performance of next generation power systems.

High performance ***computer simulation*** may be one of the most powerful tools applied in the power industry in the 21st century. Using state-of-the-art computing systems to design, model, and simulate the operation of futuristic power plants could save millions of dollars and years of development. DOE intends to be the leader in this computing frontier, not only assisting industry in developing "virtual demonstrations" but also saving taxpayers significant amounts of money by using the new computer processes in the Vision 21 and other development programs.

The Advanced Research program identifies and nurtures innovative concepts, and facilitates the transition of research to the appropriate C&PS programs for further development and marketing.

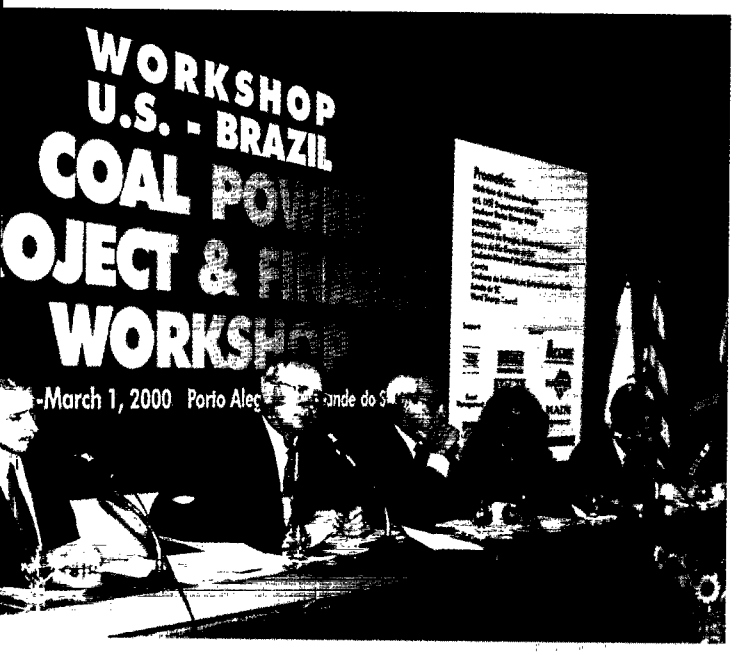
Materials and advanced metallurgical processes research focuses on developing a technology base in the synthesis, processing, life-cycle analysis, and performance characterization of advanced materials. Exploratory research is conducted to develop new materials that have the potential to improve the performance or reduce the cost of existing fossil fuel technologies, along with advanced materials research for new power systems and capabilities.

Bioprocessing research aims to: (1) develop innovative uses for coal byproducts including developing alternative fuels; (2) identify biomass sources of potential value in burning or co-burning technologies; (3) develop biological processes to sequester and/or recycle greenhouse gases; and, (4) biologically mitigate fossil fuel mining and utilization issues.

Through ***international partnerships***, and providing ***grants to U.S. universities*** in support of fundamental research to develop improved fossil energy technologies, the Advanced Research program is able to garner novel, innovative approaches to solving national and global environmental and energy-related issues.

Since its inception in 1979, the ***university coal research*** program has trained over 1,385 students. Continually providing the Nation with its next generation of coal scientists, the university program supports studies in advanced coal science and technology and provides students with invaluable "hands-on" research experience.

Together, university research and international partnering help sustain U.S. global preeminence in the areas of fossil fuel science and engineering.



Global Opportunities

With worldwide demand for power increasing exponentially, and the energy sectors of many countries undergoing major transformations, the need to promote the export of environmentally sound U.S. power technologies and enhance electricity trade worldwide is paramount. To address these opportunities, FE's Office of Coal & Power Import and Export (C&P-ImEx) crosscuts all C&PS program activities by fostering environmental cooperation and facilitating global transfers and sales of U.S. energy and environmental protection technologies. Specifically, C&P-ImEx:

Provides leadership in international organizations. FE holds leadership roles in several international organizations including the International Energy Agency, the World Energy Council, and the United Nations.

Maximizes export opportunities. The U.S. is the world leader in the development of clean fossil-powered technologies. C&P-ImEx works to ensure that U.S. companies get a share of the global market for clean power systems, thereby securing jobs, driving economic growth for the U.S., and contributing to global environmental protection.

Establishes effective partnerships. Partnerships play an important role in overcoming barriers facing U.S. companies pursuing export opportunities, such as inadequate understanding of U.S. clean power systems. Through its partnerships, C&P-ImEx promotes business solutions to remove these barriers.

Facilitates electricity transactions across international borders. C&P-ImEx ensures reliability and open access transmission through international border systems. The Office authorizes exports of electricity, collects and analyzes information on international electricity trade, conducts country-specific studies on electric power systems and the construction of international transmission lines, and provides electric power regulatory assistance.

Through these actions, C&PS capitalizes on global market opportunities and improves the quality of life worldwide by promoting environmentally responsible use of the world's energy resources.

C&PS program technologies...
...demonstrating a legacy of success

A multitude of successes have been generated from the C&PS programs including, but not limited to: (1) low-cost flue gas scrubbers saving American ratepayers more than $40 billion since 1975; (2) integrated gasification combined-cycle technology exhibiting 10-20 percent improvement in efficiency with proportional reductions in carbon emissions, 98 percent reduction in SO_2 emissions, and NO_x emissions well below federal standards; (3) commercial success in fluidized-bed technology both at home and abroad; and (4) marketable liquid chemicals from coal.

Perhaps the greatest program achievement to-date has been administration of the Clean Coal Technology (CCT) Demonstration Program. Representing the single largest federal and industry cooperative investment in environmental technology, the CCT program demonstrates full-scale technology to reduce environmental impacts and increase the efficiency of coal-fired electric generators. With 26 of the 38 active projects having completed operations, the CCT program has yielded clean coal technologies that are capable of meeting existing and emerging regulations and competing in a deregulated marketplace.

Thanks in part to the CCT program, coal — abundant, secure, and economical — can continue its role as a key component in the U.S. and world energy markets.

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