Clean Coal Power Initiative

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This paper reviews the important aspects of the United States Department of Energy's Clean Coal Power Initiative (CCPI). CCPI, a multi-year program initiated by President Bush in 2002, will be conducted over four solicitations (Rounds 1 through 4) through 2010. The current status of Rounds 1 and 2 will be covered, along with highlights of the performance objectives and timeline of DOE's roadmap as is presents significant challenges and opportunities for advanced clean coal technology developments.

I. INTRODUCTION

The Clean Coal Power Initiative (CCPI), designed for implementation over ten years at a cost of two billion dollars, is an innovative technology demonstration program initiated to foster more efficient, advanced clean coal technologies for use in new and existing electric power generating facilities in the United States (U.S.) and abroad. The program, planned and managed by the Department of Energy's (DOE) Office of Fossil Energy (FE) and implemented by the National Energy Technology Laboratory (NETL), is a industry/government cost-shared partnership that accelerates commercial deployment of advanced technologies to ensure reliability of an affordable electric supply while simultaneously protecting the environment. Candidate technologies are demonstrated at significant scale to ensure proof-of-operation prior to widespread commercialization.

CCPI responds to President Bush's commitment to clean coal technology development as part of his National Energy Policy (NEP). Priorities covered by the NEP include increasing America's domestic energy supply, protecting America's environment, ensuring a comprehensive energy delivery system, and enhancing national energy security. His new environmental initiatives, the Clear Skies Initiative (CSI), Global Climate Change Initiative (GCCI), the CCPI and, most recently, FutureGen, commit America to an aggressive strategy for advancing pollution control and coal utilization, both here and abroad (see Figure 1).

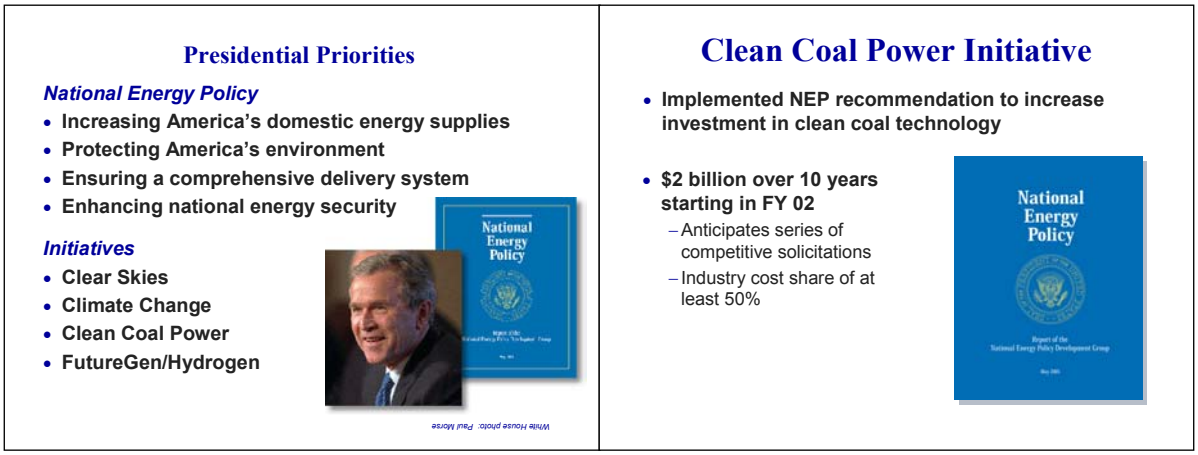

Figure 1. Presidential Priorities and CCPI

The government's investment in the CCPI program recognizes the crucial benefits to this country's economy, energy security, and environment that are associated with the use of clean coal technologies that can satisfy an important part of our energy supply needs now and well into the foreseeable future. CCPI will help to provide the nation with a reliable, affordable, secure, and sustainable energy supply by continuing to build on the major successes (such as acid rain control technologies) already achieved by DOE's earlier Clean Coal research, development, and demonstration (RD&D) program efforts.

II. INDUSTRY/GOVERNMENT PARTNERSHIPS

DOE's collaborative research effort with the private sector is broad and includes fundamental and applied research, process development, engineering, and full-scale demonstration programs. Since it may take up to 15 years to ready a technology for commercial deployment, these RD&D activities move technologies more quickly into the market place that may not ordinarily be developed by the private sector due to the risk involved, allowing substantial benefits to be realized. Risk-sharing partnerships provide the expertise and funding needed to ensure successful development of innovative technologies. Industry participation and cost-sharing increases as technologies approach commercial status (see Figure 2). The private sector cost-share in CCPI is required to be at least 50% and historically industry has provided cost-share in excess of 65%.

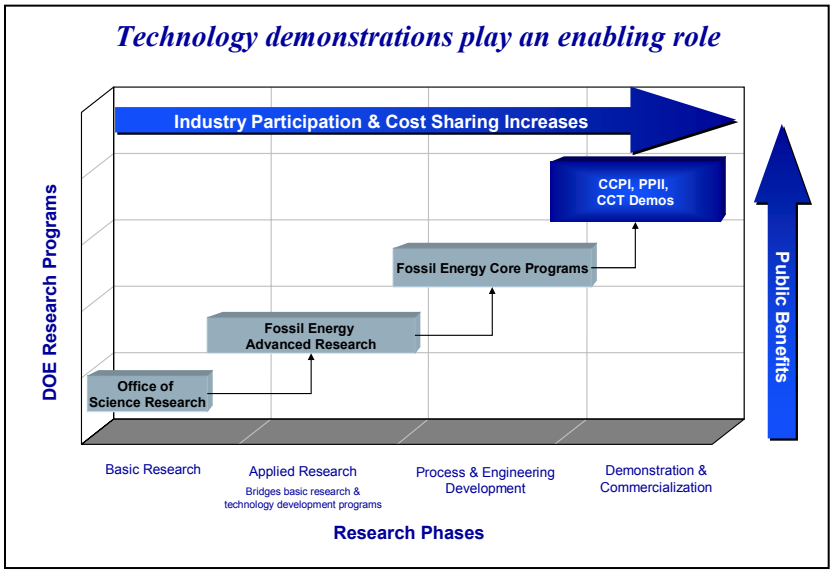

Figure 2. Stages of Energy RD&D

III. DOE's CLEAN COAL DEMONSTRATION PROGRAMS

DOE's Coal and Power Program comprise core R&D, full-scale demonstrations, and FutureGen. Demonstrations flow from DOE's core R&D, which develops innovative technologies for existing and future energy plants and provides comprehensive support for FutureGen.

Over the years, DOE has developed numerous successful advanced coal-utilization technologies throughout the RD&D continuum. Commercial-scale demonstration programs, a necessary stage between R&D and commercialization, represent the last step in the technology development process supported by DOE. CCT demonstration programs historically conducted by DOE are shown on Figure 3.

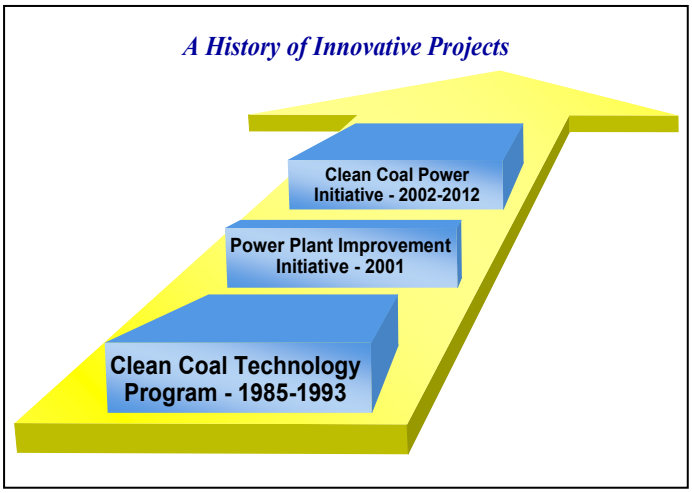

Figure 3. DOE's Coal Demonstration Programs

The Clean Coal Technology (CCT) Program, implemented by DOE in the 1980s and 1990s, made significant contributions toward the sharp decline in pollutant emissions from U.S. power plants (see Figure 4). The CCT Program successfully demonstrated a number of technologies, including advanced sulfur dioxide (SO_2) scrubbers, low-NOx burners (LNBs), selective catalytic reduction (SCR) technology for NOx removal, fluidized bed combustion, and integrated gasification combined cycle (IGCC) power production. Several CCT Program projects are still active and are continuing this positive impact on the environment and economy.

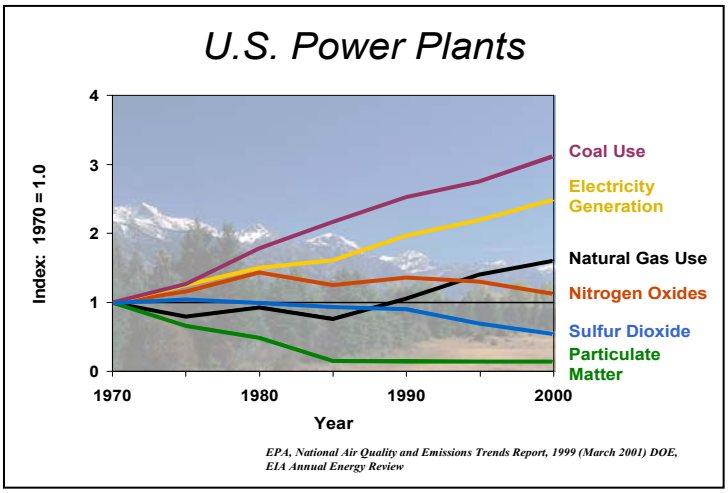

Figure 4. Emissions Down Sharply

The Power Plant Improvement Initiative (PPII), a precursor to the CCPI Program, is designed to establish commercial-scale demonstrations of coal technologies to assure energy supply reliability. The PPII program is poised to make near-term contributions to air quality improvements and focuses on technology that can be commercialized over the next few years.

Pollution control and power generating approaches demonstrated by both the CCT Program and PPII will continue to penetrate the market in the years ahead. CCPI, the newest program, bridges the "gap" following the CCT Program and PPII, ensuring the ongoing development of advanced

systems for commercial power production emerging from DOE's core fossil-fuel research programs. CCPI provides an important platform to implement the NEP recommendation to increase investment in clean coal technology.

IV. IMPORTANCE OF DEVELOPING ADVANCED CCPI TECHNOLOGIES THROUGH DEMONSTRATIONS

There is essentially one reason coal is mined in the United States; it is an important resource for electric power production and serves as a foundation of the nation's power supply. It is by far the most abundant energy resource, with domestic reserves that exceed the energy potential of the world's oil reserves. Reserves within America's borders represent about a 250-year supply of secure, low-cost energy at current use rates. Coal currently fuels power plants that supply more than half the nation's electricity, with about 90 percent of all coal consumed being used for electricity production. A primary reason the power supply in the U.S. is so affordable is because of the availability of low-cost coal as a fuel source (see Figure 5).

The strength and security of the U.S. economy is closely linked to the availability, reliability, and cost of electric power. Since 1970, real gross domestic product in the U.S. and electricity generation have been clearly linked (see Figure 5). Since economic growth is linked to reliable and affordable electric power, continued use of domestic coal resources will play a significant role in satisfying the energy needs of the U.S. This is likely to continue through the middle of the 21st century and beyond.

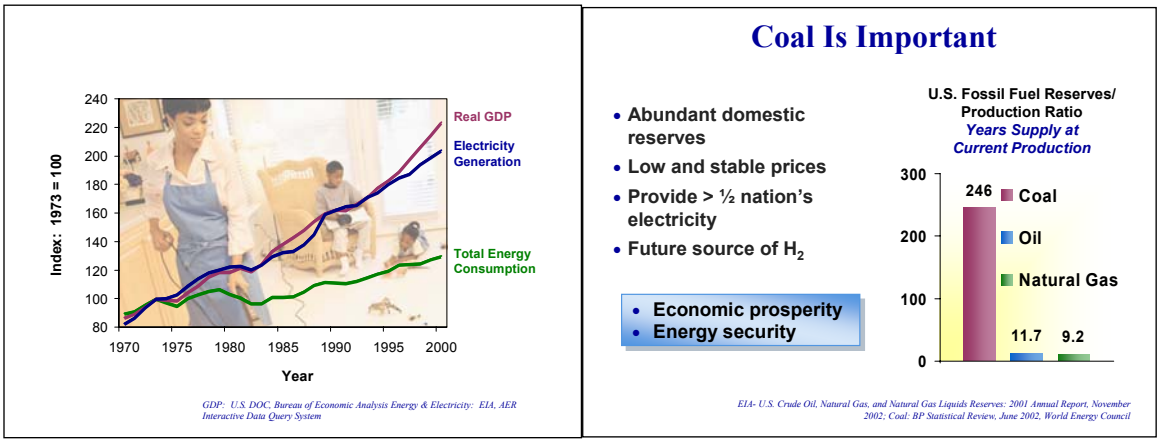

Figure 5. Economic Growth and Energy Security Linked to Electricity

Society, however, challenges us to meet the demands of a clean environment while providing electricity as an abundant commodity. Because of developing regulations aimed at preserving human health and improving the environment, such as CSI, coal-burning power plants face difficult environmental challenges. Development of new technologies is essential for meeting this challenge.

Of the six criteria pollutants listed in Title I of the Clean Air Act Amendments of 1990, the most significant for coal burning electrical generating plants include sulfur dioxide (SO_2), nitrogen oxides (NOx), and particulate matter (PM). Mercury (Hg) emissions are also a concern to regulators and the public. Carbon dioxide (CO_2) is an emerging issue that is receiving increasing attention in the Coal RD&D Program. CSI sets major Phase I and II emissions reduction goals for sulfur, nitrogen, and mercury. In response, CCPI places early emphasis on reductions of SO_2,

NOx, and PM and focuses on cost-effective development of Hg controls to meet anticipated CSI performance objectives. DOE's Technology Roadmap, discussed in the following section, addresses criteria pollutants and CO_2 capture and sequestration to achieve Global Climate Change Goals. Deployment of advanced, highly efficient and cost-effective new clean coal technologies emerging from this program will also support policy development in this area.

Major energy challenges are on the horizon. These challenges include ensuring our national security, which is strongly linked to energy security; generation of cleaner electricity to meet upcoming environmental regulations; and developing supply technologies to help to define a clear path forward for coal to avoid future reliability mishaps such as the massive power blackout in August, 2003 in the Northeast (see Figure 6). Experiences with the California energy crisis and, more recently, with the Northeast, punctuate how dependent our economy and national security are on a reliable supply of affordable electricity. DOE, in consensus with industry, has established a clear path forward with the development of a Technology Roadmap.

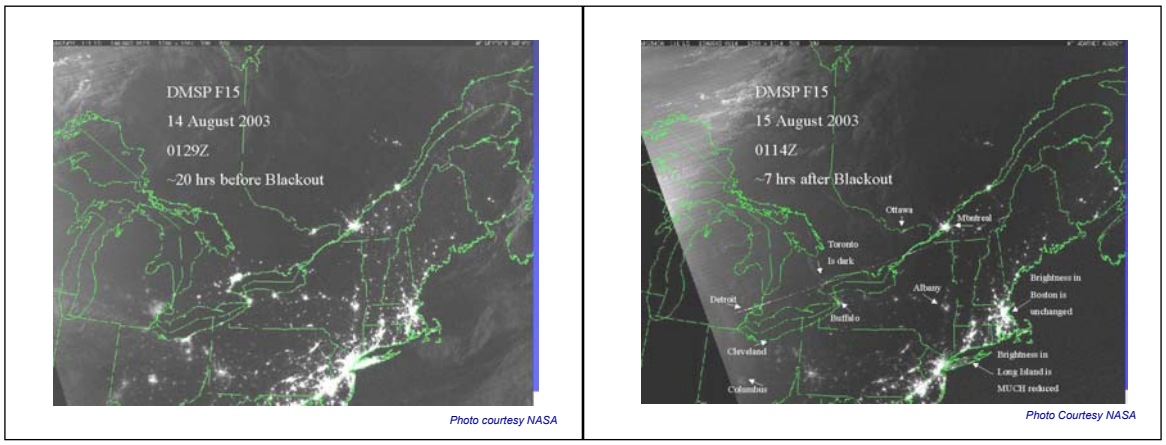

Figure 6. 2003 Electric Power Blackout: 20 Hours Before versus 7 Hours After

V. TECHNOLOGY ROADMAP

CCPI is closely linked with RD&D activities being carried out under Coal and Power Systems core R&D programs that are driving towards ultra-clean fossil fuel-based energy systems in the 21st century. CCPI technologies will address new and existing regulatory requirements, such as Clear Skies, and are commensurate with goals embodied in the FutureGen Project (see Figure 7). FutureGen is a one billion dollar, 10 year project to create the world's first coal based, zero emission electricity and hydrogen plant. The FutureGen concept and goals are given in Figure 8.

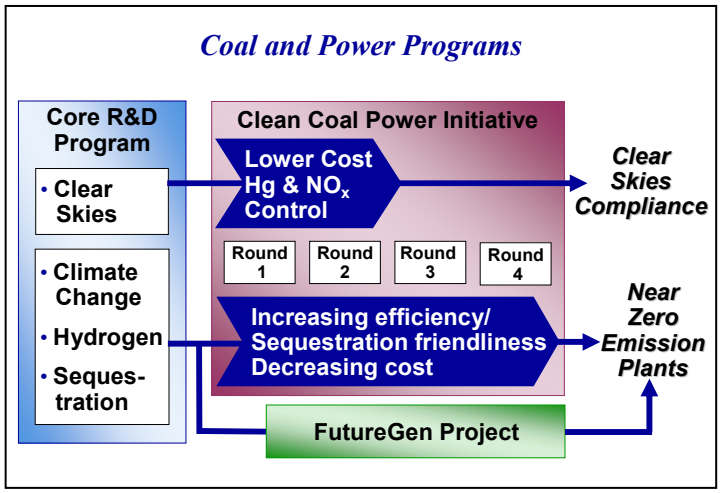

Figure 7. CCPI Linkages with RD&D

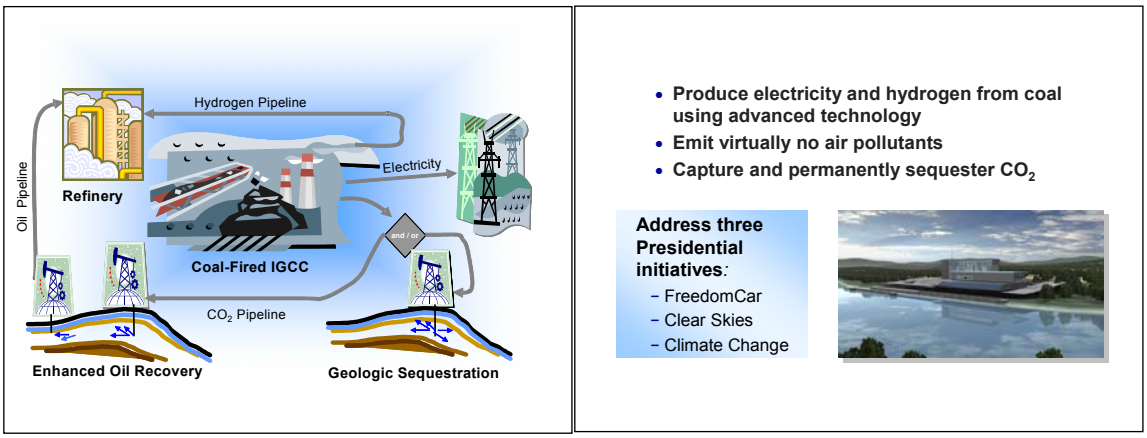

Figure 8. FutureGen Concept and Goals

DOE's Coal Power Program Roadmap, developed through consensus with industry, addresses both short and long-term needs (see Figure 9). It is integrated, setting forth unified performance goals for DOE and industry. It has been developed to address two separate targets, one for existing plants and one for new plants. Existing plants must meet current and emerging environmental regulations at the lowest possible cost, while future energy plants are aimed at achieving near zero emissions (NZE). Coal power plant performance criteria considered include air emissions, by-product utilization, water use and discharge, plant thermal efficiency, reliability/availability, capital and product costs, and CO_2 management. CCPI fits within FE's coal and power systems strategic direction for fostering economic growth while protecting the environment, and supports efficient and sustainable use of domestic energy resources. When integrated with other DOE leading-edge initiatives, CCPI will help the nation achieve improved power plant performance, and near zero emissions. DOE Roadmaps for new and existing plants are described on the following page.

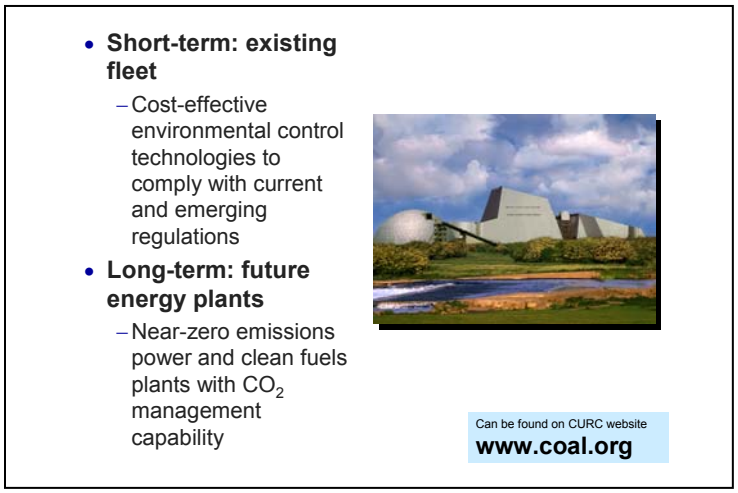

Figure 9. Roadmap Short and Long-Term Needs

Roadmap For Existing Energy Plants

Cost-effective technologies to comply with current and emerging environmental regulations are needed in the short- and mid-term. Existing Plant Roadmap performance objectives include:

- Reduced cost for NOx control
- Reduced cost for high-efficiency Hg control
- Achieving PM targets in 2010: 99.99% capture of 0.1-10 micron particulates

The existing plant roadmap is given in Figure 10.

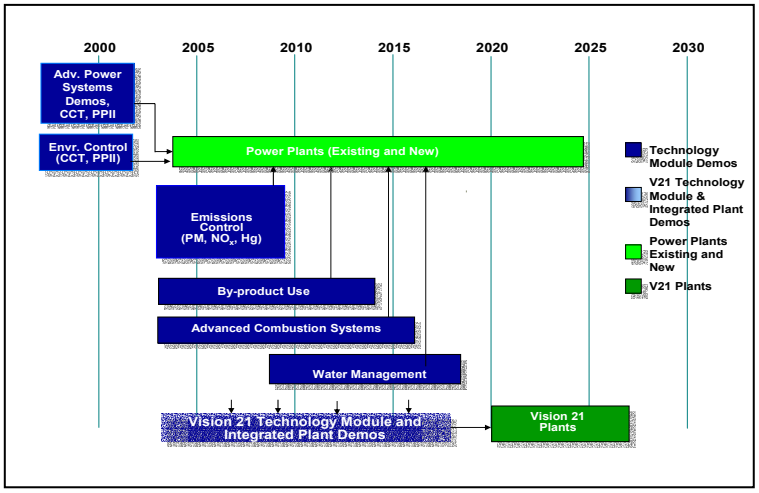

Figure 10. Technology Roadmap-Existing Plants

Roadmap For Future Energy Plants

The long-term Roadmap goals are aimed at achieving near-zero emissions power and clean fuels plants with CO_2 management capability. The President's GCCI commits the U.S. to reduce greenhouse gas intensity (the ratio of greenhouse emissions to economic output) by 18 percent over the next decade. Improving power plant efficiency is an effective way of reducing carbon

emissions. Since coal use is so important to the production of electric power, CCPI technologies offer the potential to substantially reduce the carbon intensity of our economy.

The long-term Roadmap and new plant performance targets are presented in Figure 11 and Table 1.

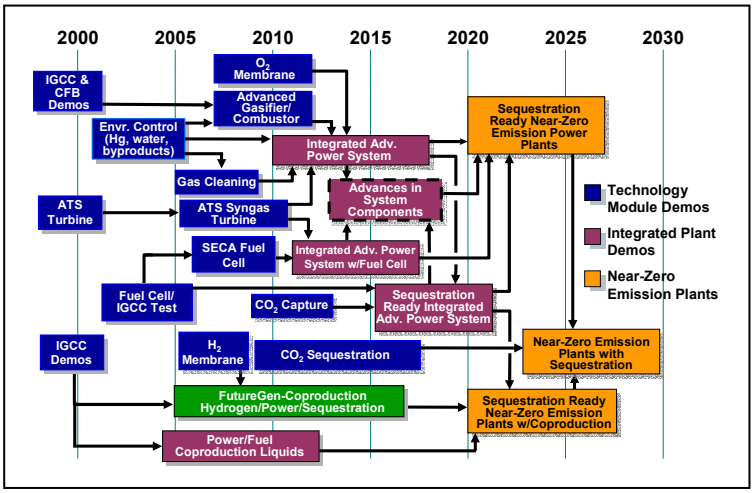

Figure 11. Technology Roadmap-Future Energy Plants

Table 1. Coal Power Program Roadmap

New Plant Performance Targets *(Represents best integrated plant technology capability)*			
	Reference Plant	**2010**	**2020**
Air Emissions	98% SO_2 removal	99%	>99%
	0.15 lb/10^6 Btu NOx	0.05 lb/10^6 Btu NOx	<0.01lb/10^6 Btu
	0.01lb/10^6 Btu Particulate Matter	0.005 lb/10^6 Btu NOx	0.002 lb/10^6 Btu
	Mercury (Hg)	90% removal	95% removal
By-Produce Utilization	30%	50%	Near 100%
Plant Efficiency (HHV)	40%	45-50%	50 – 60%
Availability [3]	>80%	>85%	≥90%
Plant Capital Cost [2] $/kW	900 – 1300	900 – 1000	800 – 900
Cost of Electricity [4] ¢/kWh	3.5	3.0 – 3.2	<3.0

[1] w/o carbon capture and sequestration: reflect current cooling tower technology or water use
[2] Range reflects projection for different plant technologies that will achieve environmental performance and energy cost targets
[3] Percent of time capable of generating power (ref. North American Electric Reliability Council)
[4] Bus-bar cost-of-electricity in today's dollars; Reference plant based on $1000/kW capital cost, $1.20/$10^6$ Btu coal cost

There is no question that the aggressive environmental performance objective in the Roadmap, when coupled with reducing the target cost of electricity by over 15%, represents a challenging path ahead. It is estimated to require a nominal $10 billion investment shared by industry and the government in the next 15 – 20 years. However, the potential rewards can be substantial as discussed later in this paper.

VI. THE CCPI PROGRAM: STATUS AND PROJECTIONS

CCPI early demonstrations will emphasize advanced technologies that are applicable to existing power plants but will also include construction of new, advanced, clean coal power plants. Later demonstrations will include, among others, systems comprising advanced turbines, membrane separation systems, fuel cells, gasification technologies, and hydrogen production. CCPI drivers and technology demonstration opportunities are given in Figure 12.

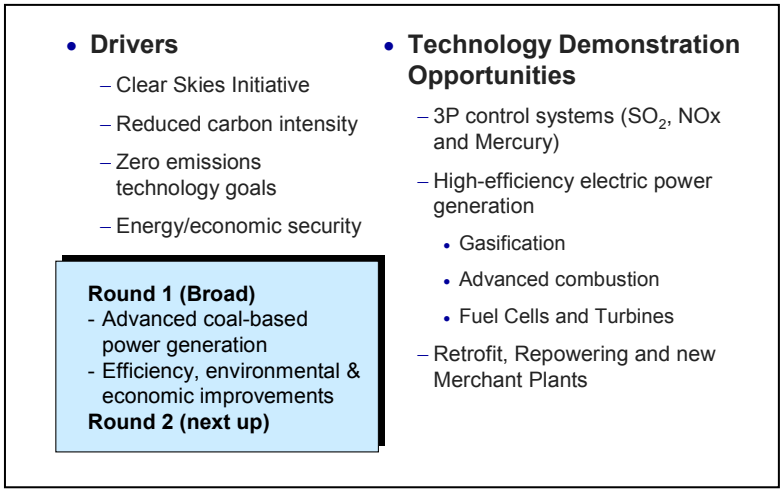

Figure 12. Clean Coal Power Initiative (CCPI)

CCPI Round 1 Projects

CCPI Project selection was made on January 16, 2003. The selected projects totaled $1,348,500. DOE's cost share totaled $317,000 or 24 percent, about one dollar of federal funding for each three dollars of industry funding. Round 1 of the CCPI Demonstration Program includes a portfolio of technologies that will provide flexibility and increase options for ensuring that coal can continue to be relied on for producing electric power in the United States. These benefits will occur mainly because of increased electrical generating efficiencies, allowing more affordable energy to be produced; by attainment of cleaner air, water, and terrestrial resources resulting from lower pollutant emissions; and by achieving greater energy security through sustainable use of our resources. Two of the projects are directed at new ways to comply with the Clear Skies Initiative, which calls for dramatic reductions in air pollutants from power plants over the next decade-and-a-half. Three other projects are expected to contribute to the Climate Change Initiative to reduce greenhouse gases. The remaining two projects will use abundant waste materials that resulted from earlier coal mining activities while reducing air pollution through coal gasification and multi-pollutant control systems. For more specific information on these projects visit http://www.netl.doe.gov/coalpower/ccpi/index.html. The locations of Round 1 projects, along with an overview and schematic for each project are shown on Figures 13–20.

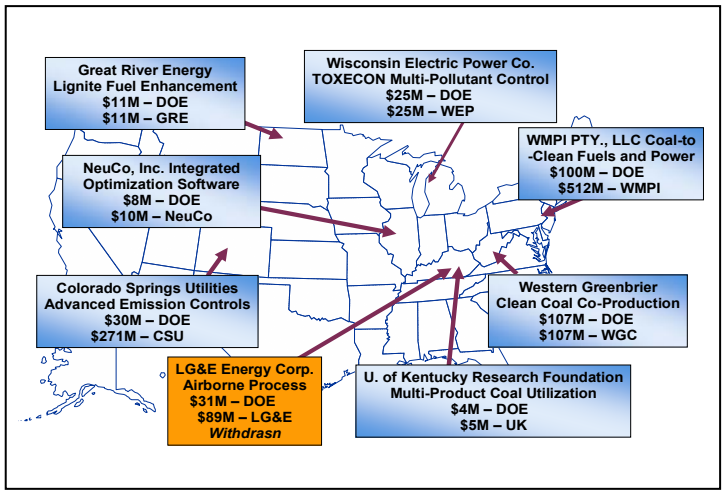

Figure 13. CCPI Round 1Projects

Integration of Advanced Emissions Controls to Produce Next-Generation Circulating Fluid Bed Coal Generating Unit

Colorado Springs Utilities (Springs Utilities) and Foster Wheeler (FW) are joining together to demonstrate an advanced coal-fired electric power plant having exceedingly low emissions using advanced low-cost emission control systems. Fully integrated, multi-layered emission controls are being combined with Circulating Fluidized Bed (CFB) combustion to produce what is predicted to be the cleanest coal unit in the world. The plant is expected to be cost-competitive and reliable. Springs Utilities and FW will demonstrate this new technology at full-scale using a 150 megawatt commercial generating unit at the Ray D. Nixon Power Plant, located south of Colorado Springs.

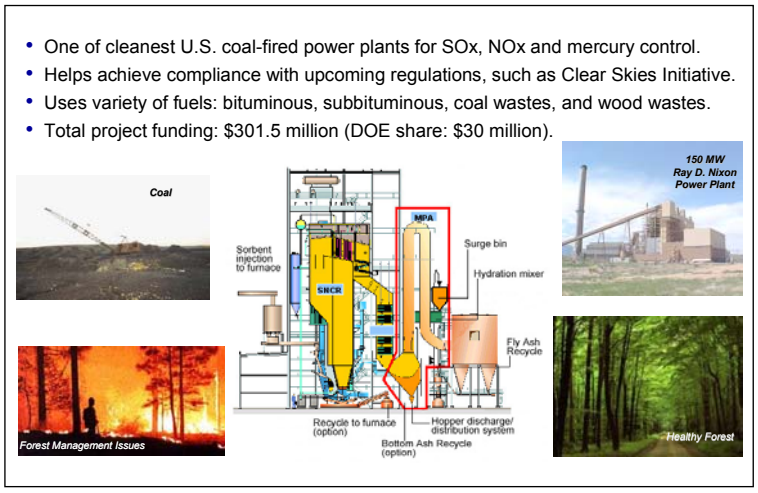

Figure 14. Colorado Springs Utilities

TOXECON Retrofit for Mercury and Multi-Pollutant Control on Three 90 MW Coal-Fired Boilers

Wisconsin Electric Power Company will design, install, operate, and evaluate the TOXECON process as an integrated mercury, particulate matter, SO_2, and NOx emissions control system. The Presque Isle plant burns low-sulfur, Powder River Basin subbituminous coal, and the TOXECON unit will be installed on the combined flue gas stream of Units 7, 8, and 9, which total 270 MW. TOXECON is a process in which sorbents, including powdered activated carbon for mercury and other air toxic emissions control, are injected into a pulse-jet baghouse that is installed downstream of the existing particulate control device. The TOXECON configuration allows for separate treatment or disposal of the ash collected in the primary particulate control device. The key objectives of the project are to achieve very high levels of mercury removal, increase collection efficiency of particulate matter, and determine viability of sorbent injection for SO_2 and NOx control, while maximizing the use of coal combustion by-products.

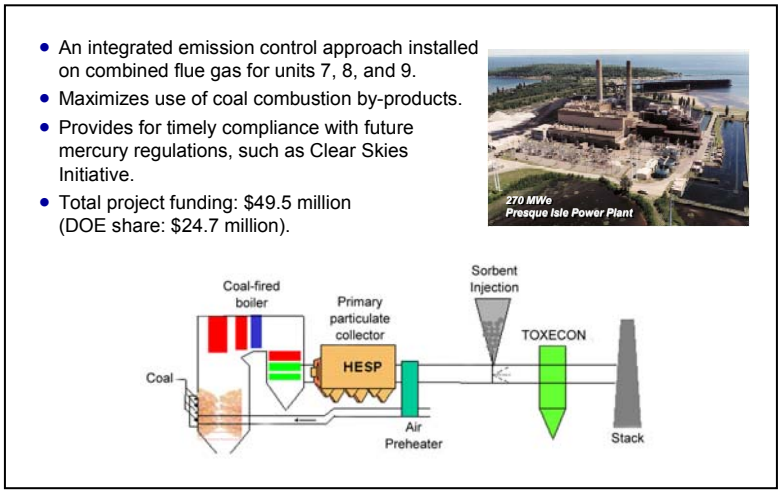

Figure 15. Wisconsin Electric Power Company

Increasing Power Plant Efficiency--Lignite Fuel Enhancement

The objective of this project is to demonstrate a means for reducing the moisture content of lignite coal and, thereby, increasing its value as a fuel in electrical generation power plants. The project will be conducted at Great River Energy's Coal Creek Station in Underwood, North Dakota. Demonstration activities will focus on using waste heat from the plant to lower the moisture content of the coal by at least 10 percentage points. A phased implementation approach is planned; in the first phase, a full-scale prototype dryer module will be designed for full-power operation on one of the 546 MW units at the Coal Creek Station. Following successful demonstration in the first phase, Great River Energy will design, construct, and perform full-scale long-term operation testing of the complete set of dryer modules needed for full power operation of the unit. The coal will be dried to a number of different levels of moisture content. The effect of coal drying on plant operational performance will be measured, and optimum operating conditions will be determined.

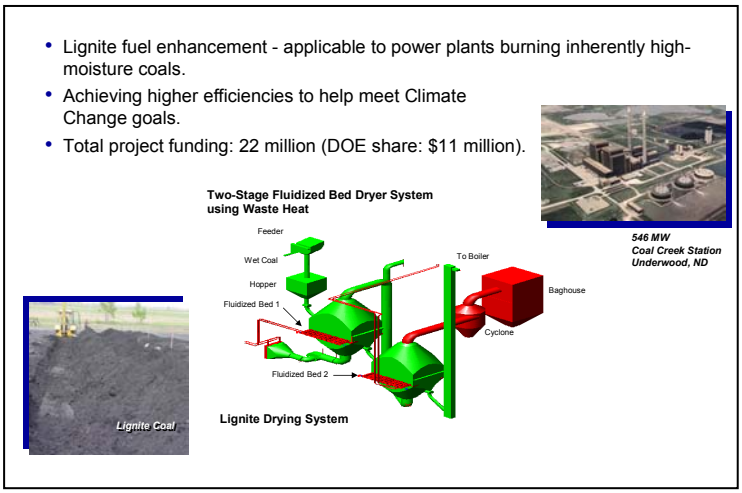

Figure 16. Great River Energy

<u>Demonstration of Integrated Optimization Software at the Baldwin Energy Complex</u>

Building on its ProcessLink™ technology platform that includes neural networks, genetic algorithms, and fuzzy logic techniques, NeuCo, Inc. of Boston, Massachusetts plans to design and demonstrate integrated on-line optimization systems at Dynegy Midwest Generation's Baldwin Energy Complex; the complex contains three 600 MW coal-fired units and is located in Baldwin, Illinois. The control modules to be developed will address sootblowing, SCR operations, overall unit thermal performance, and plant-wide economic optimization. These capabilities will be used to comprehensively apply optimization techniques to a variety of systems within coal power plants using existing control technologies and then link these systems to each other. The project will provide solutions that use system-specific optimization applications as data sources and actuators. The overall architecture of this control platform is designed to permit flexible deployment strategies. Rather than requiring that all data and logic be resident on a single computer, the service model allows applications to leverage networked computational resources. This, core to the design principles planned for the project, is an application architecture built around interoperable services for the provision of high-value process management and business logic, resulting in more efficient plant operations.

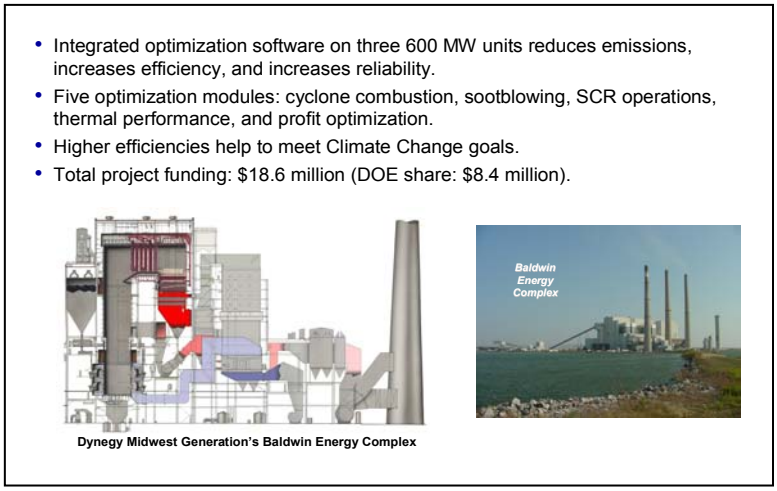

Figure 17. NeuCo, Inc.

Advanced Multi-Product Coal Utilization By-Product Processing Plant

The University of Kentucky Research Foundation of Lexington, Kentucky, in partnership with LG&E Energy Corporation of Louisville, Kentucky, will design, construct, and demonstrate an advanced coal-ash beneficiation processing plant at the 2,200 MW Ghent Power Plant in Ghent, Kentucky. This plant represents the next generation in coal utilization by-product (CUB) beneficiation in that it addresses the entire CUB stream and generates a variety of useful products. The process, based on hydraulic classification and froth flotation technology developed at the University of Kentucky Center for Applied Energy Research, will use coal by-products to make a product that can reduce CO_2 emissions from cement-making operations. The process produces pozzolan, a material that can be used to replace a portion (up to 30%) of the Portland cement used to make concrete while achieving better strength and performance than that achieved from using unprocessed ash. In addition, this project will also use a beneficiated coarse ash to produce lightweight aggregate suitable for use in concrete masonry units such as building blocks or used as graded full-sand for construction applications. Also, the unburned carbon product will be concentrated and reused as a supplemental fuel. Lastly, this process generates very fine-size material (~3 to 4 μm median particle size) suitable for use as a polymer filler or specialized pozzolan.

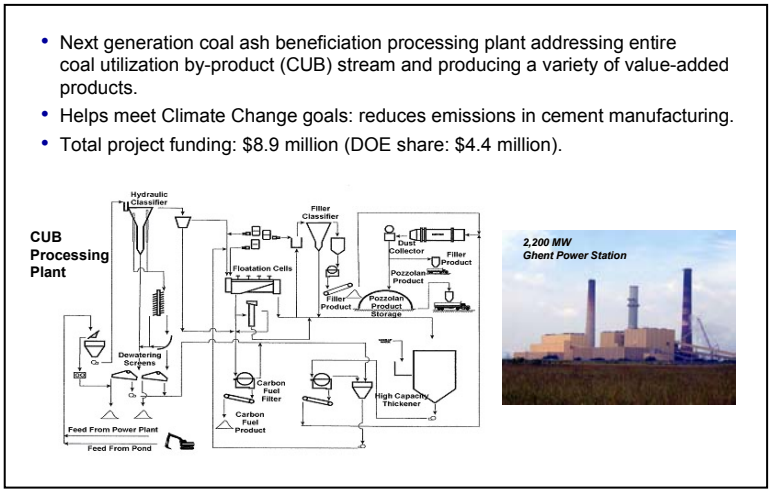

Figure 18. University of Kentucky Research Foundation

Western Greenbrier Co-Production Demonstration Project

Western Greenbier Co-Production, LLC proposes to demonstrate an 85 MW clean coal, co-production demonstration project in Rainelle, West Virginia. The power plant will use waste coal contained in a four million ton refuse site located in Anjean, West Virginia as its primary fuel while addressing environmental issues associated with coal refuse sites. The project will bring together a highly qualified team to provide an innovative circulating fluidized-bed (CFB) boiler system incorporating an advanced multi-pollutant control system for SOx, NOx, particulate, and mercury. An integrated co-production facility will use ash from the boiler and green wood-waste in a process developed by Midway Environmental Associates (Arvada, Colorado) and Hazen Research to produce structural bricks. This novel power plant will serve as the "anchor tenant" in a new environmentally balanced industrial park. This "Eco-Park" will use hot water from the power plant to provide district heating and steam from the power plant's turbine exhaust for industrial uses including drying hardwood in a steam kiln.

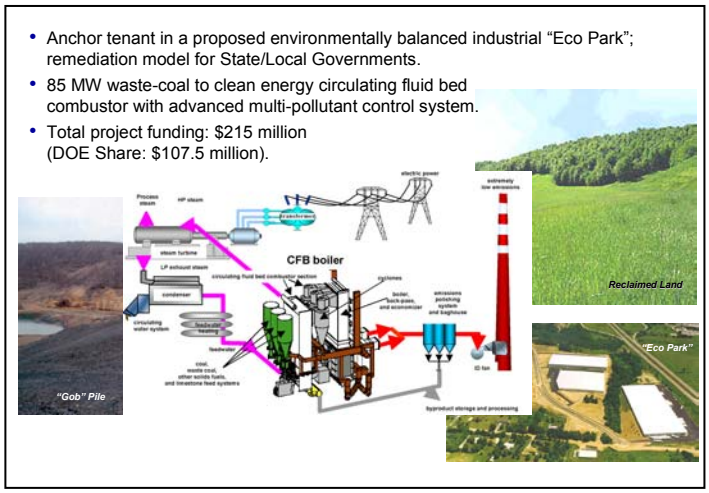

Figure 19. Western Greenbrier Co-Generation, LLC

Gilberton Coal-to-Clean Fuels and Power Project

WMPI PTY, LLC of Gilberton, Pennsylvania has assembled a leading technology and engineering team to design, engineer, construct, and demonstrate the first clean coal power facility in the United States using coal waste gasification as the basis for clean power, thermal energy and clean liquid fuels production. The Gilberton plant will gasify the coal wastes to produce a synthesis gas of hydrogen and carbon monoxide. As with other processes employing high-pressure "oxygen-blown" gasifiers, this system offers potential for sequestering CO_2. Along with electric power and steam to be produced, a portion of the synthesis gas will be converted into synthetic hydrocarbon liquids via a catalytic chemical process known as Fischer-Tropsch (FT) synthesis.

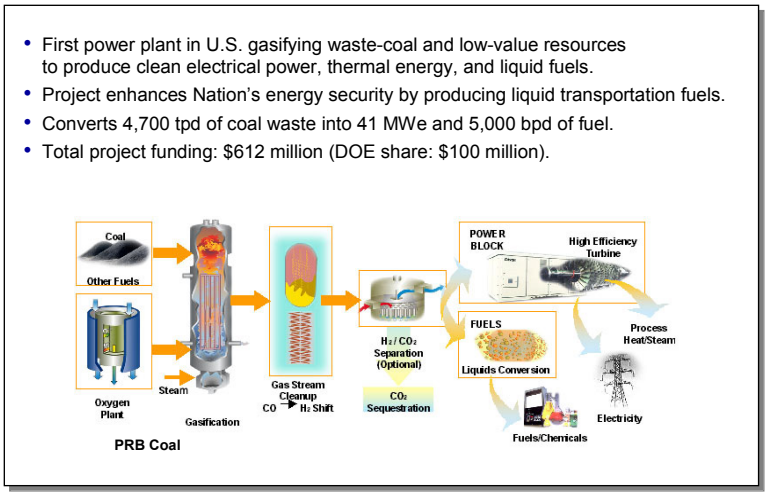

Figure 20. Waste Management and Processors Inc. (WMPI PTY, LLC)

CCPI Round 2

Round 2 planning efforts are well underway, and the draft solicitation is expected to be available before the end of 2003. The tentative schedule for future CCPI rounds and priorities for technologies is projected in Figure 21.

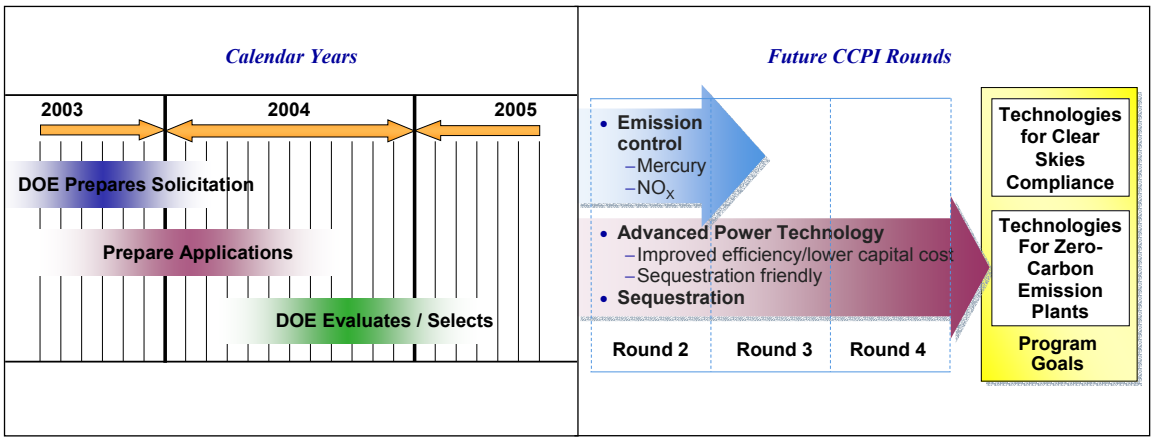

Figure 21. CCPI Round 2 Schedule and Future Rounds

VII. BENEFITS

DOE's Clean Coal Technology Demonstrations enable benefits to be realized that far exceed demonstration expenditures (see Figure 22).

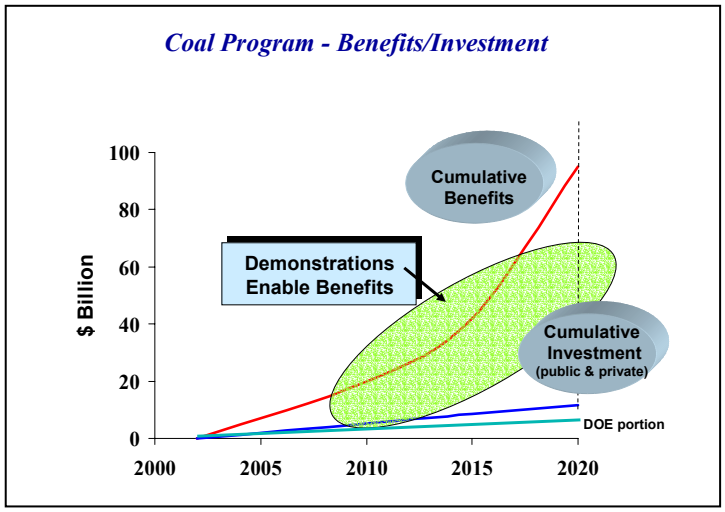

Figure 22. Demonstration Initiatives-Key Pathway to Benefits

The CCPI Demonstration Program includes a portfolio of technologies that will provide flexibility and increase options for achieving clean and affordable use of coal in the United States and abroad. These benefits will occur mainly because of increased electrical generating efficiencies, allowing more affordable energy to be produced; by attainment of cleaner air, water, and terrestrial resources resulting from lower pollutant emissions; and by achieving greater energy security through sustainable use.

The benefits of CCPI fit within the broader context of FE's Coal Power Program Roadmap. CCPI, as a key facilitator, plays an enabling role to the realization of these benefits. Benefits stemming from achieving the Roadmap goals are given below:

- Provides competitive near-zero emission coal-based plants
- Cumulative $100 billion projected direct economic benefit through 2020 (fuel cost, capital cost, technology export)
- Security benefits include:
  - Maintaining diversity of energy resources
  - Retaining domestic manufacturing capabilities
  - Reducing dependence on imported energy resources, e.g. oil and gas (transportation fuel production capability)

The savings categories for economic benefits are given in Table 2, based on the following key assumptions:

- Costs and benefits in constant 2002 dollars
- No credit taken for prior DOE investments in technology currently in use (e.g., FGD)
- Cost savings relative to state-of-art coal plants
- Benefits to 2010 primarily from existing plants
- Benefits 2010-2020 primarily from new plants
- Added capacity in 2020 includes replacement of >60-year old plants (53 GW) plus new capacity (31-64 GW)
- Benefits from emissions trading cost credits not considered

Table 2. Coal Power Program (RD&D) Economic Benefits

Savings Category	Cumulative Benefits ($ billions, thru 2020)
Fuel Cost	10
Capital Cost	12
Control Technology Cost (Existing Plants)	32
Avoided Environmental Costs	10
Technology Export	36

Other Benefits (not included above)

- Increased jobs from technology export – estimate 75,000 new jobs in 2010, increasing to 200,000 in 2020.
- Additional $500 billion to $1 trillion savings through 2050. If coal were replaced by other resources, a net increase of 1 – 2 ¢/kWh in the cost of electricity would occur.

VIII. Summary

Successful completion of the CCPI program will introduce technologies to the U.S. marketplace that can achieve compliance with emerging air regulations, such as Clear Skies, and will support NEP priorities. The program will also help to ensure that upcoming regulations are science and engineering based and exploit emerging technologies developed under CCPI. Commercialization of CCPI technologies will help to maintain fuel flexibility and decrease dependence on foreign

imports. New generation technologies will replace lost generating capacity as plants are retired and supply additional electricity as demand increases. Electricity disruptions will, therefore, be minimized. Expected program outcomes include reduced capital costs for new plants, lower control technology costs, and higher environmental performance for existing plants. CCPI fosters economic growth while protecting the environment and supports efficient and sustainable use of domestic energy resources.

The aggressive environmental performance objectives in DOE's Roadmap represent a challenging path ahead. Achieving the Roadmap performance targets will position coal as a strategic resource for the foreseeable future. Coupling these targets with those of DOEs carbon sequestration program will ensure the economic benefits of continued coal use to be realized even in a carbon constrained world.

CCPI will mitigate costs and reduce the technical and environmental risks associated with advanced technology development. The program, as a proving ground in the U.S., will speed technologies to market both here and abroad, assuring early environmental benefits to be realized.

Figure 23. Closing Comments

This paper is available on the CCPI web site at www.netl.doe.gov/coalpower/ccpi/index.html.

Figure 24. NETL Websites

IX. Acronyms and Abbreviations

CCPI	Clean Coal Power Initiative
CCT	Clean Coal Technology
CFB	Circulating Fluidized Bed
CSI	Clear Skies Initiative
CUB	Coal Utilization By-product
DOE	United States Department of Energy
FGD	Flue Gas Desulfurization
GCCI	Global Climate Change Initiatives
GW	Gigawatts
Hg	Mercury
IGCC	Integrated Gasification Combined Cycle
kWh	Kilowatts
LNBs	Low NOx Burners
NEP	National Energy Policy
NOx	Nitrogen Dioxide
NSR	New Source Review
NZE	Near Zero Emissions
PPII	Power Plant Improvement Initiative
R&D	Research & Development
RD&D	Research, Development & Demonstration
SCR	Selective Catalytic Reduction
SO_2	Sulfur Dioxide