

Clean Coal Power Initiative

- CCPI Overview
- Round 1 Status
- Round 2 Planning

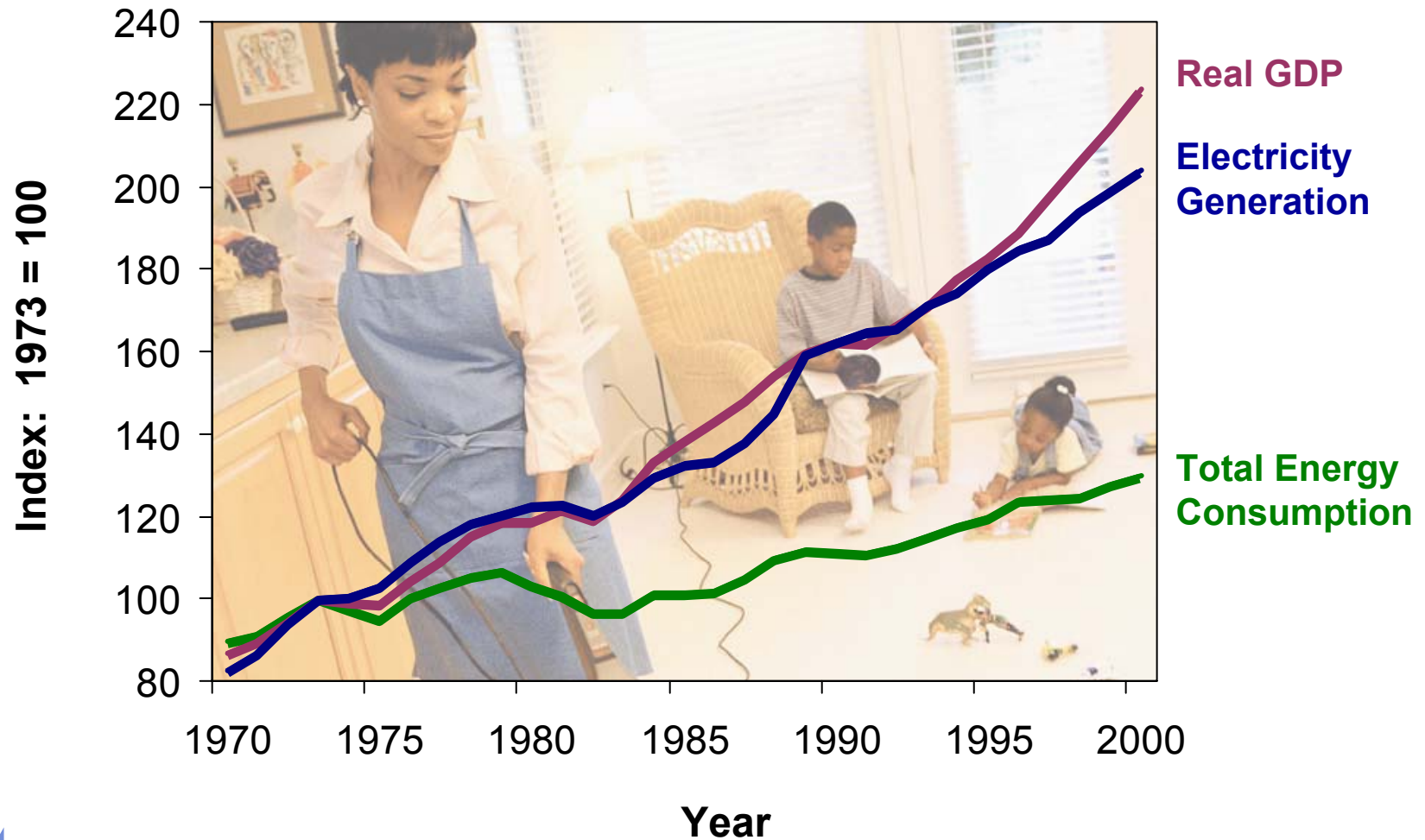
Clean Coal and Power Conference
&
2nd Joint U.S.-People's Republic of
China Conference on Clean Energy

Washington, D.C.
November 17-19, 2003

Mike Eastman, Technology Manager, NETL



Economic Growth Linked to Electricity



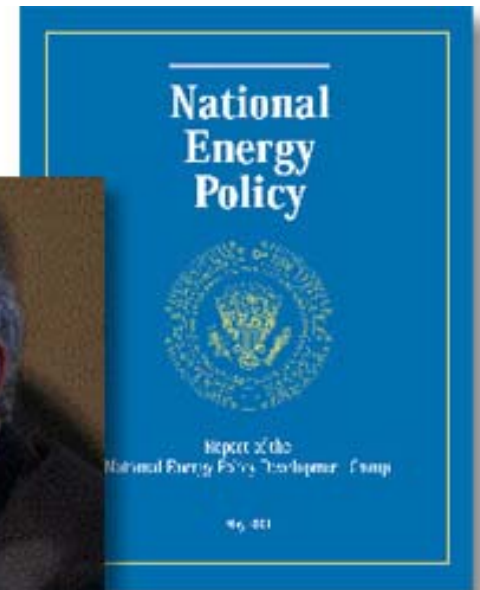
Presidential Priorities

National Energy Policy

- Increasing America's domestic energy supplies
- Protecting America's environment
- Ensuring a comprehensive delivery system
- Enhancing national energy security

Initiatives

- Clear Skies
- Climate Change
- Clean Coal Power
- FutureGen/Hydrogen

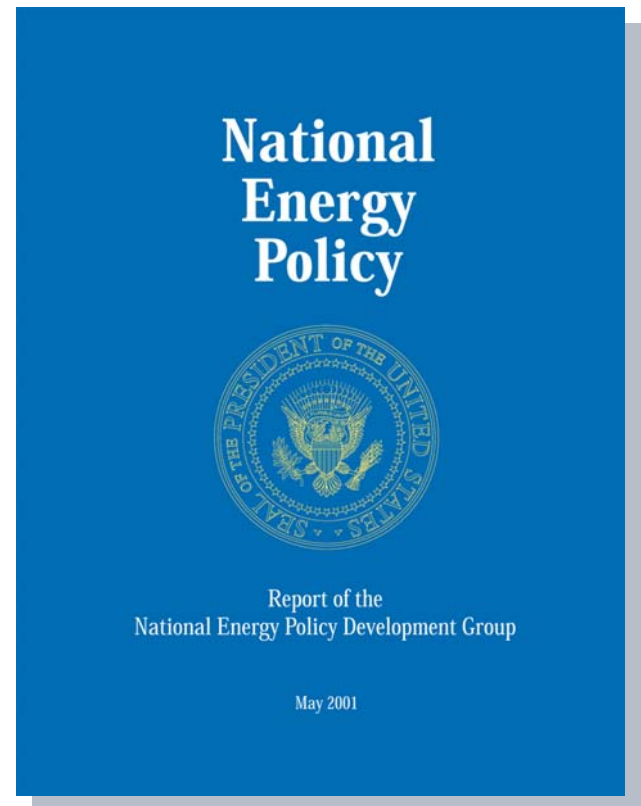


White House photo: Paul Morse

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Clean Coal Power Initiative

- Implemented NEP recommendation to increase investment in clean coal technology
- \$2 billion over 10 years starting in FY 02
 - Anticipates series of competitive solicitations
 - Industry cost share of at least 50%



DOE's Coal Demonstration Programs

A History of Innovative Projects



**Clean Coal Technology
Program - 1985-1993**

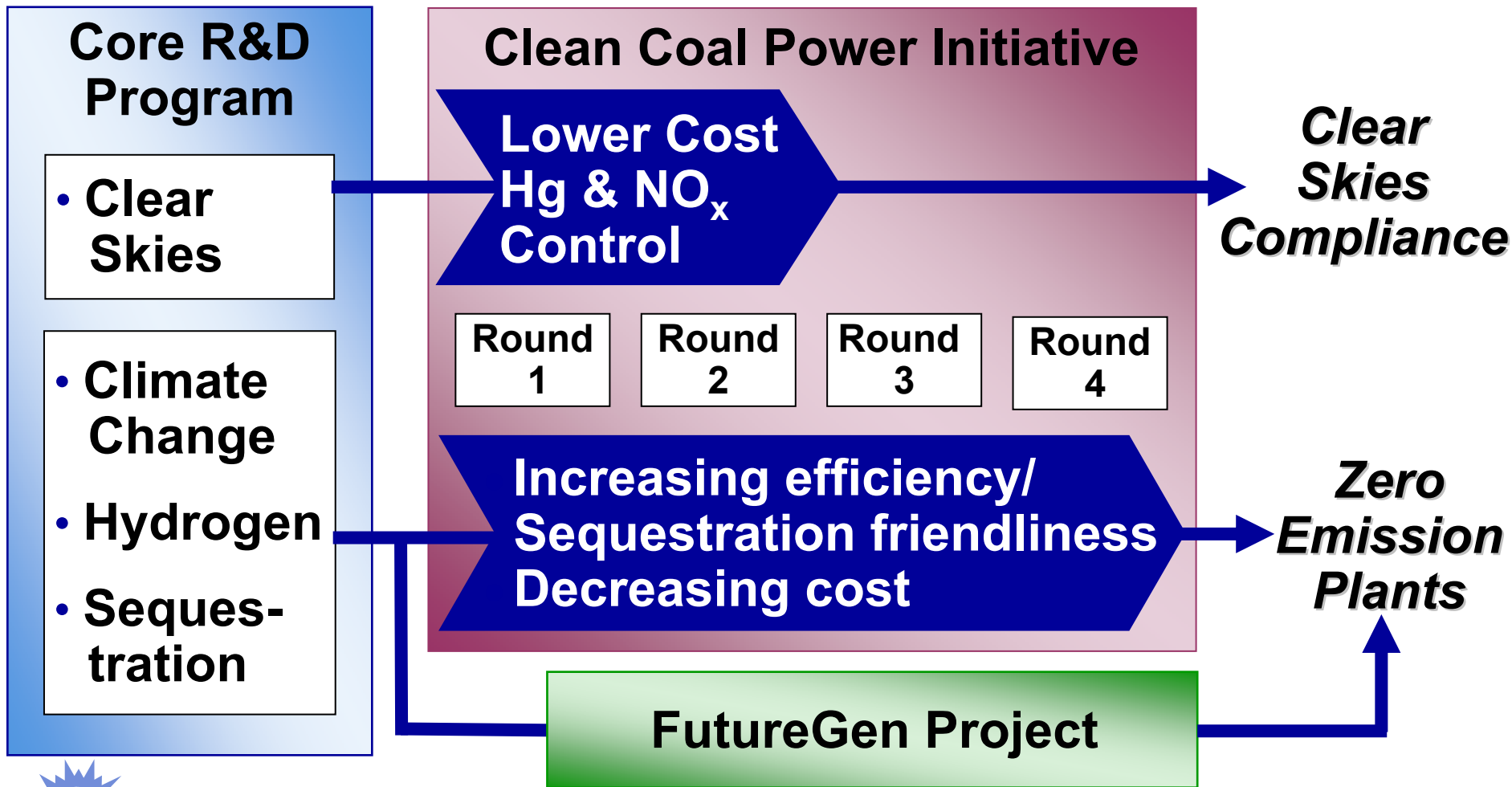
**Power Plant Improvement
Initiative - 2001**

**Clean Coal Power
Initiative - 2002-2012**



Linkages

Coal and Power Programs



CCPI Philosophy

- **Demonstrations - necessary step between R&D and commercialization**
- **CCPI provides demonstration platform**
- **Multiple demonstrations needed for new capital intensive technologies**
 - Each demo must raise bar
 - Industry cost share commensurate with risk



Coal Power Program Roadmap Addresses Near- and Long-range Needs

- **Short-term: existing fleet**
 - Cost-effective environmental control technologies to comply with current and emerging regulations
- **Long-term: future energy plants**
 - Near-zero emissions power and clean fuels plants with CO₂ management capability



Can be found on CURC website

www.coal.org



Existing Plants

Roadmap Performance Objectives

- Reduced Cost for NO_x Control
- Reduced Cost for High-Efficiency Hg Control
- Achieve PM Targets in 2010: 99.99% capture of 0.1 – 10 μ Particles



Coal Power Program Roadmap

New Plant Performance Targets

(Represents best integrated plant technology capability)

	Reference Plant	2010	2020 Vision 21
Air Emissions	98% SO ₂ removal	99%	>99%
	0.15 lb/10 ⁶ Btu NO _x	0.05 lb/10 ⁶ Btu	<0.01 lb/10 ⁶ Btu
	0.01 lb/10 ⁶ Btu Particulate Matter	0.005 lb/10 ⁶ Btu	0.002 lb/10 ⁶ Btu
	Mercury (Hg)	90% removal	95% removal
By-Product Utilization	30%	50%	near 100%
Plant Efficiency (HHV)	40%	45-50%	50-60%



Coal Power Program Roadmap

New Plant Performance Targets¹

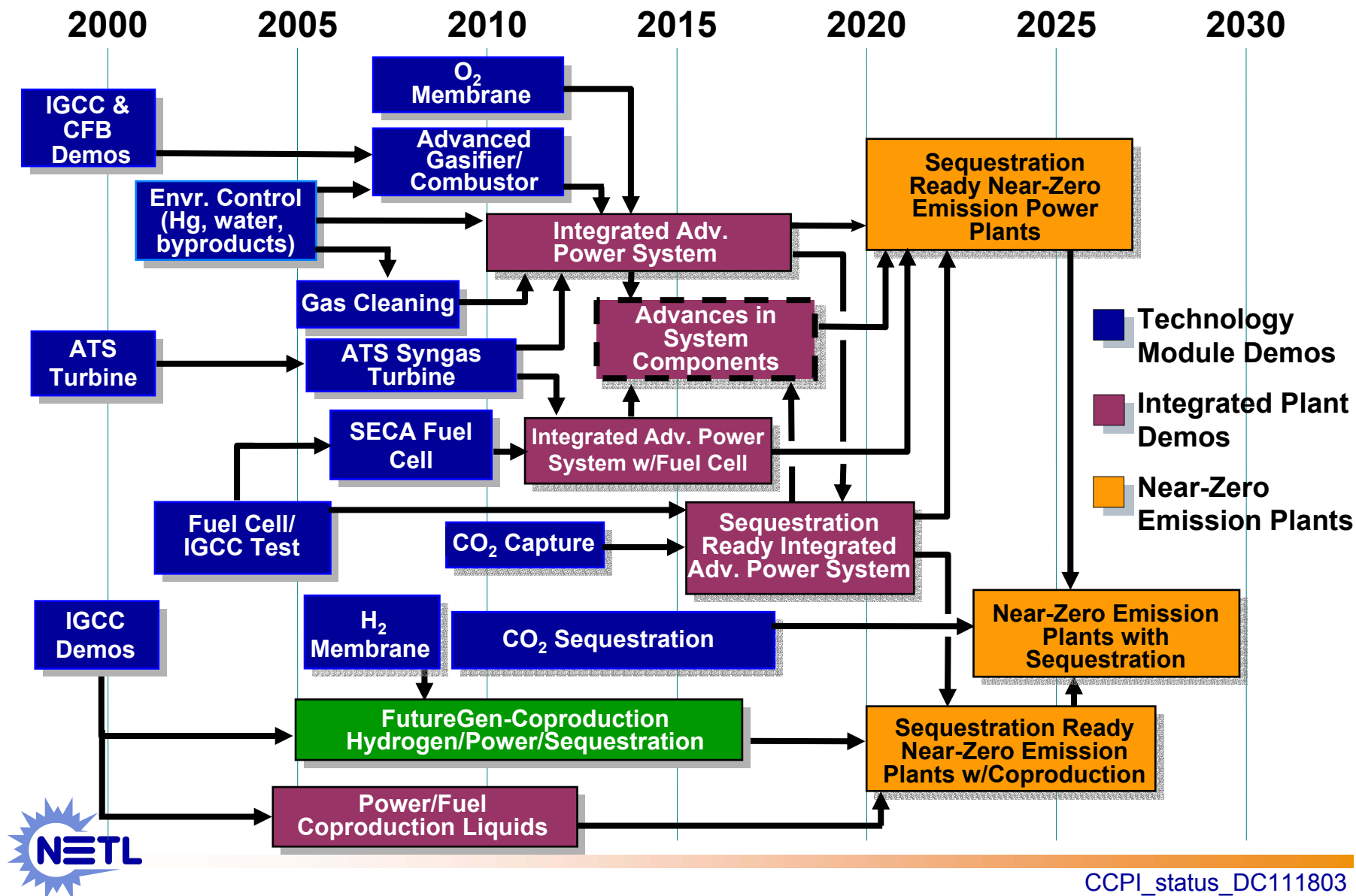
(Represents best integrated plant technology capability)

	Reference Plant	2010	2020 Vision 21
Availability⁽³⁾	>80%	>85%	≥90%
Plant Capital Cost⁽²⁾ \$/kW	1000 – 1300	900 – 1000	800 – 900
Cost of Electricity⁽⁴⁾ ¢/kWh	3.5	3.0 - 3.2	<3.0

- (1) Targets are w/o carbon capture and sequestration and reflect current cooling tower technology for water use
- (2) Range reflects performance projected 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, \$1.20/10⁶ Btu coal cost

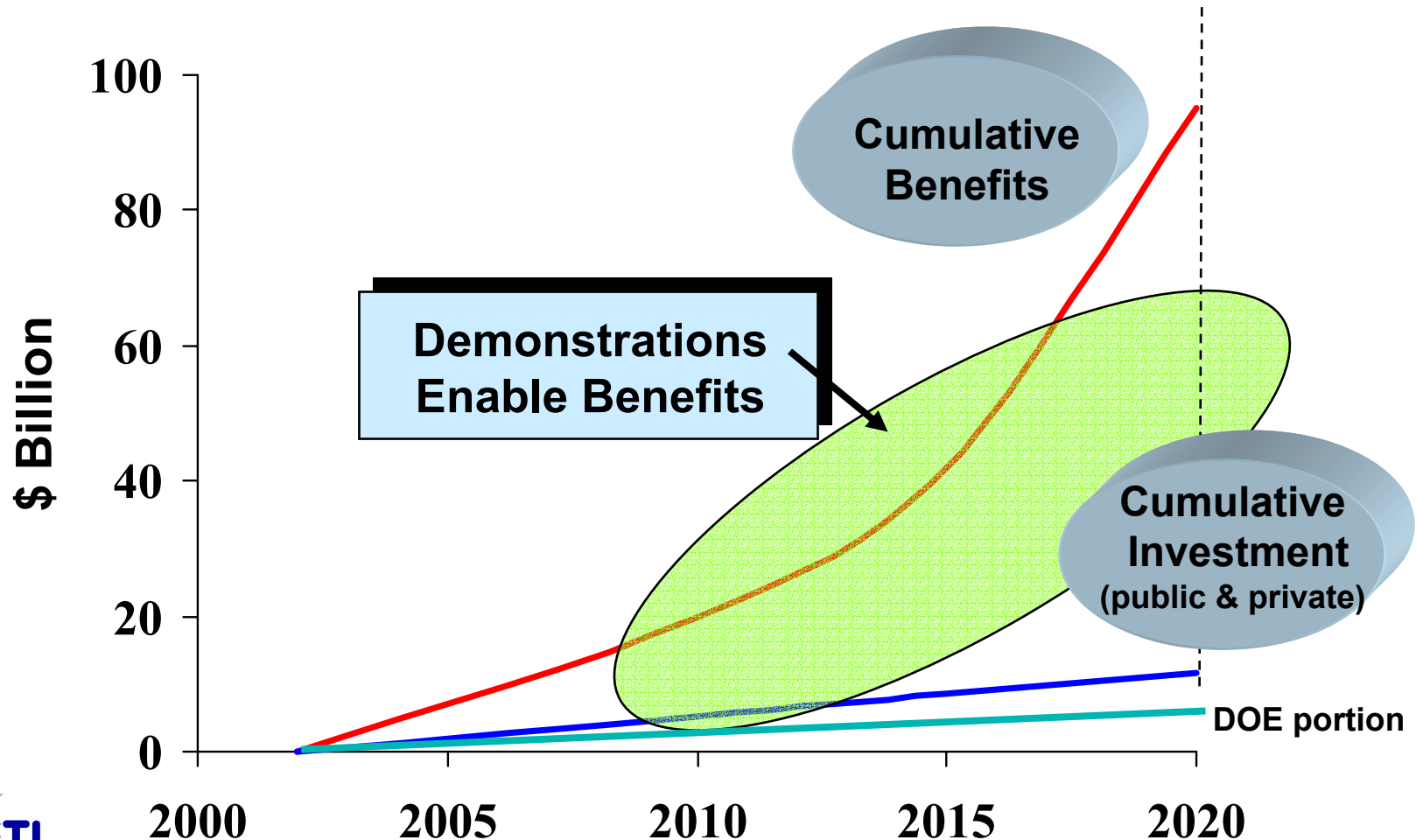


Technology Roadmap – Future Energy Plants



Demonstration Initiatives are Key Pathway to Benefits

Coal Program - Benefits/Investment

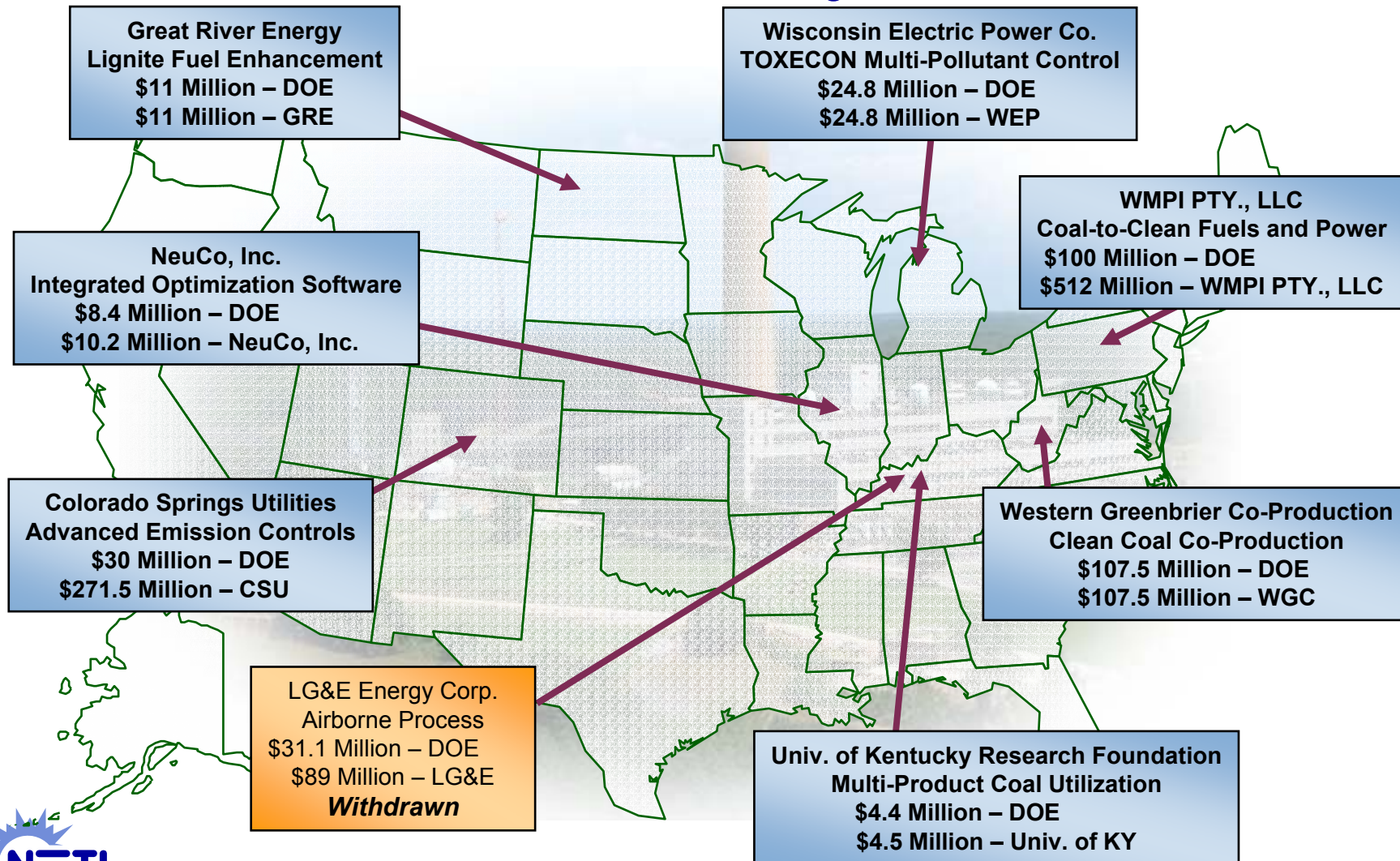


CCPI – Round 1

- **Competitive solicitation FY 02**
- **Broad in scope**
 - Advanced power generation
 - Efficiency, environmental, economic improvement
- **Eight projects selected January 2003 (1 withdrawn)**
 - \$286M DOE cost share
 - \$1.2B industry cost share

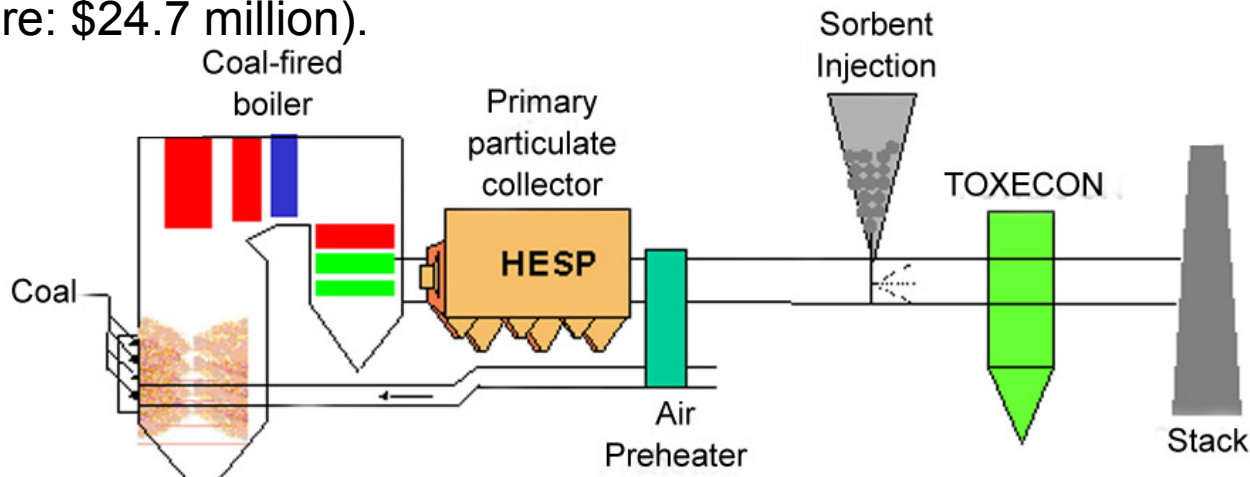
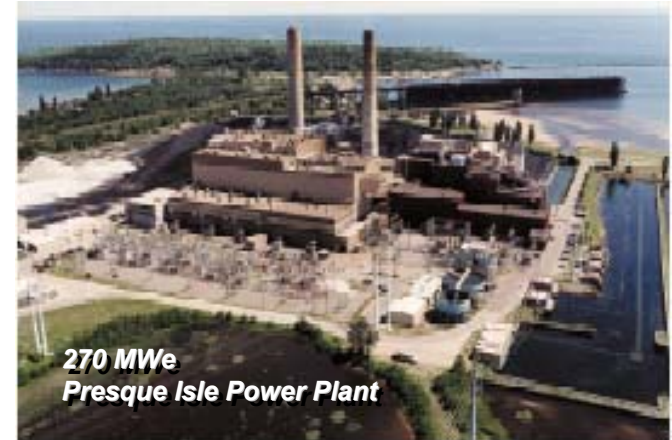


Clean Coal Power Initiative (CCPI) – Round 1 Projects



Wisconsin Electric Power Company

- An integrated emission control approach installed on combined flue gas for units 7, 8, and 9.
- Maximizes use of coal combustion by-products.
- Provides for timely compliance with future mercury regulations, such as Clear Skies Initiative.
- Total project funding: \$49.5 million (DOE share: \$24.7 million).

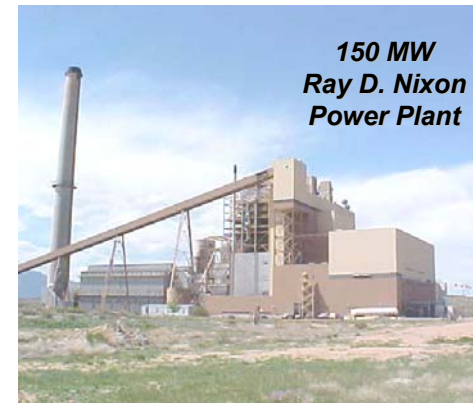
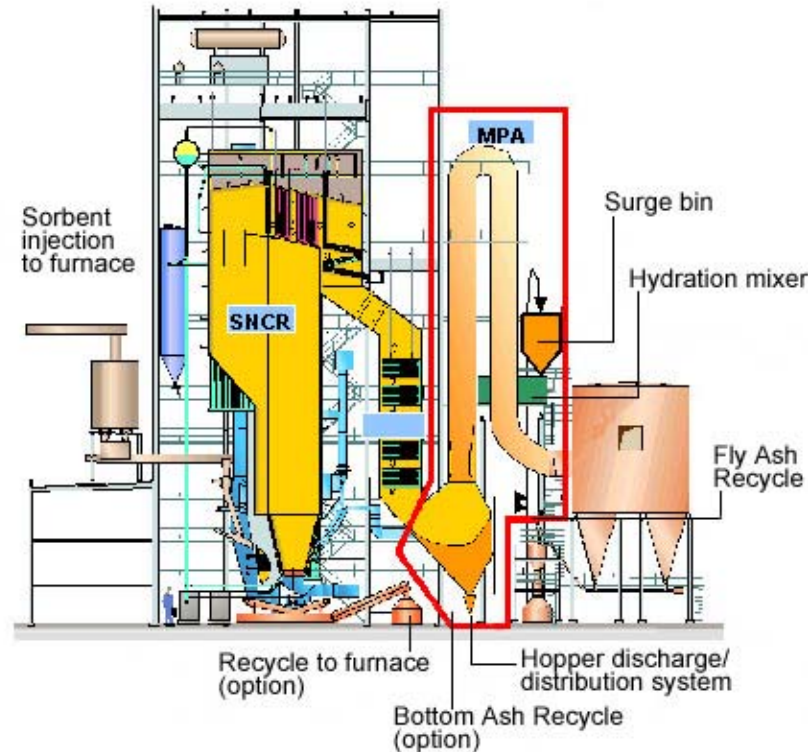


A CCPI Round 1 Project



Colorado Springs Utilities

- One of cleanest U.S. coal-fired power plants for SO_x, NO_x and mercury control.
- Helps achieve compliance with upcoming regulations, such as Clear Skies Initiative.
- Uses variety of fuels: bituminous, subbituminous, coal wastes, and wood wastes.
- Total project funding: \$301.5 million (DOE share: \$30 million).

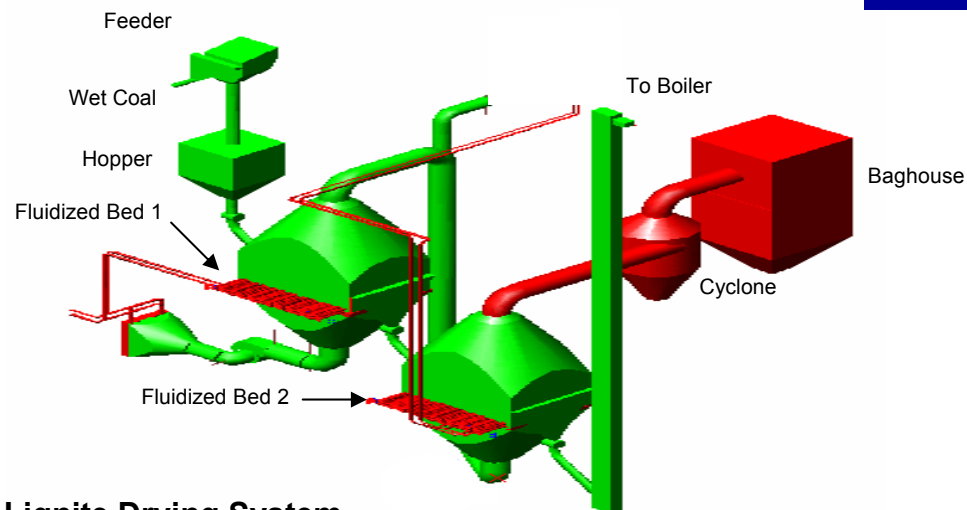


A CCPI Round 1 Project

Great River Energy

- Lignite fuel enhancement - applicable to power plants burning inherently high-moisture coals.
- Achieving higher efficiencies to help meet Climate Change goals.
- Total project funding: 22 million (DOE share: \$11 million).

Two-Stage Fluidized Bed Dryer System using Waste Heat



Lignite Drying System



546 MW
Coal Creek Station
Underwood, ND

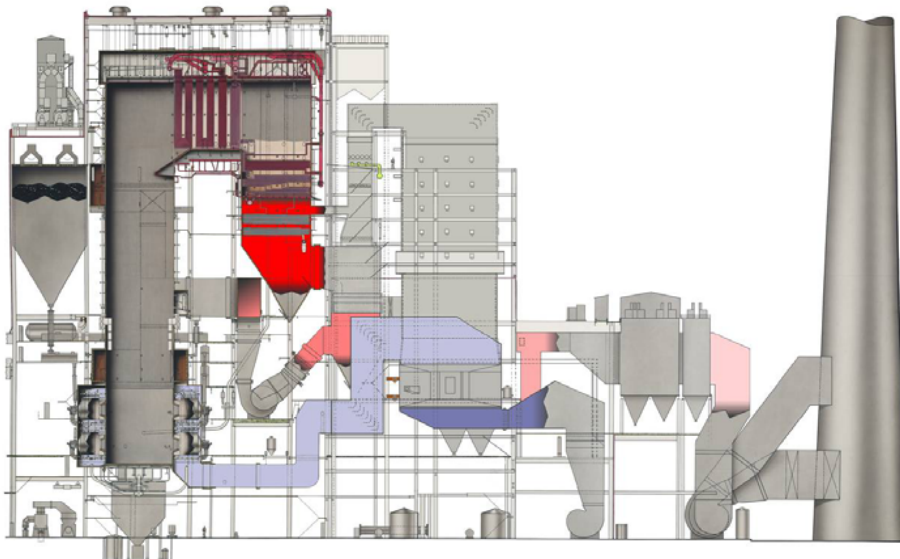


A CCPI Round 1 Project



NeuCo, Inc.

- Integrated optimization software on three 600 MW units reduces emissions, increases efficiency, and increases reliability.
- Five optimization modules: cyclone combustion, sootblowing, SCR operations, thermal performance, and profit optimization.
- Higher efficiencies help to meet Climate Change goals.
- Total project funding: \$18.6 million (DOE share: \$8.4 million).



Dynegy Midwest Generation's Baldwin Energy Complex

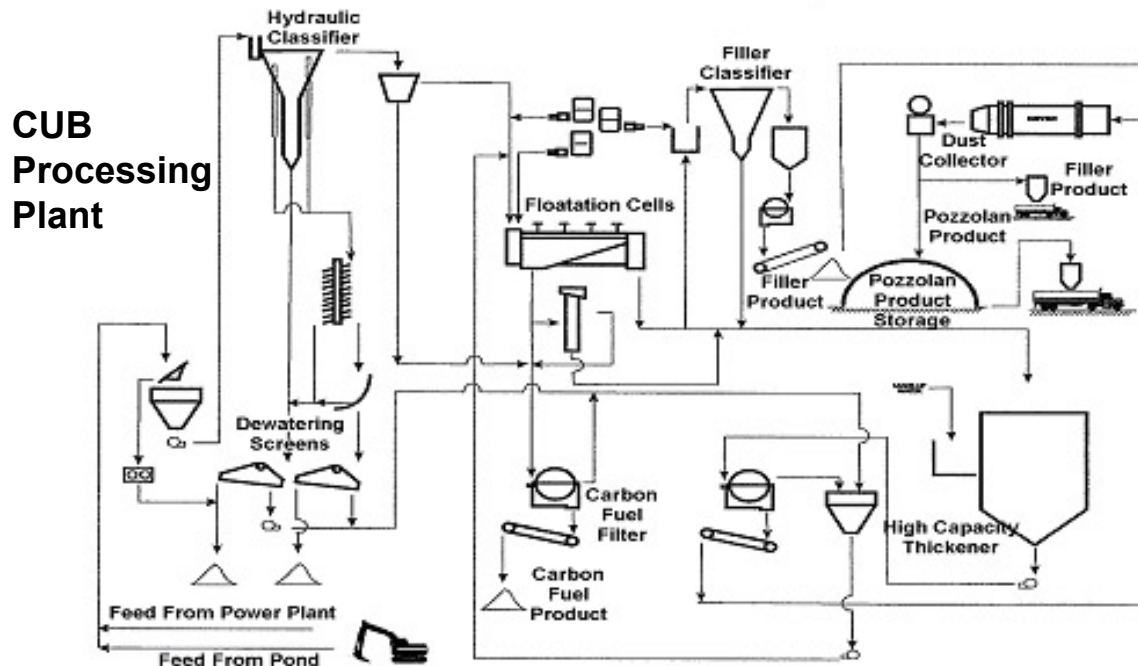


A CCPI Round 1 Project



University of Kentucky Research Foundation

- Next generation coal ash beneficiation processing plant addressing entire coal utilization by-product (CUB) stream and producing a variety of value-added products.
- Helps meet Climate Change goals: reduces emissions in cement manufacturing.
- Total project funding: \$8.9 million (DOE share: \$4.4 million).

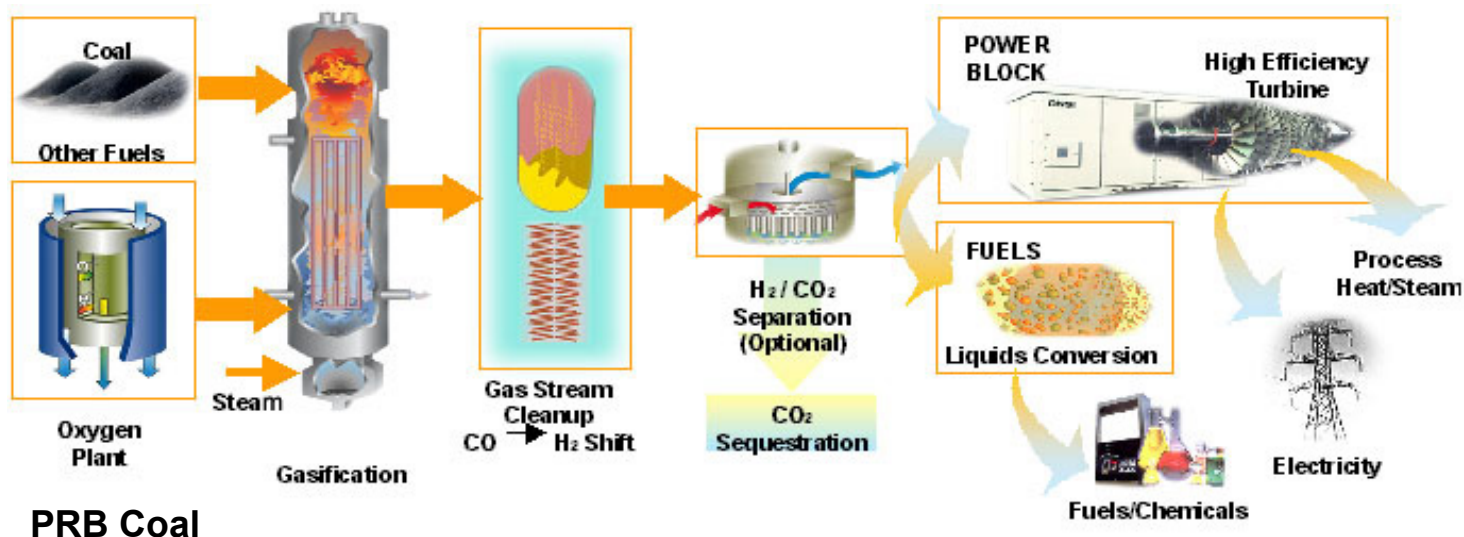


A CCPI Round 1 Project



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

- First power plant in U.S. gasifying waste-coal and low-value resources to produce clean electrical power, thermal energy, and liquid fuels.
- Project enhances Nation's energy security by producing liquid transportation fuels.
- Converts 4,700 tpd of coal waste into 41 MWe and 5,000 bpd of fuel.
- Total project funding: \$612 million (DOE share: \$100 million).

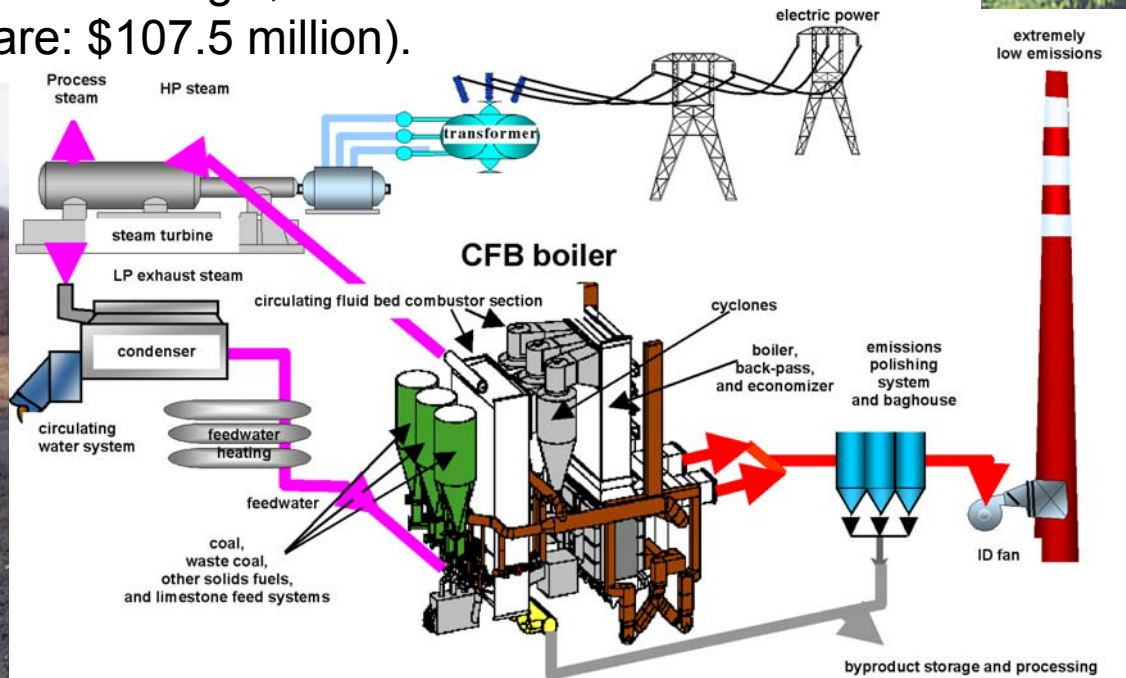


A CCPI Round 1 Project



Western Greenbriar Co-Generation, LLC

- Anchor tenant in a proposed environmentally balanced industrial “Eco Park”; remediation model for State/Local Governments.
- 85 MW waste-coal to clean energy circulating fluid bed combustor with advanced multi-pollutant control system.
- Total project funding: \$215 million (DOE Share: \$107.5 million).



A CCPI Round 1 Project

Preliminary NEPA Evaluation Strategy

- **Environmental Impact Statements (EIS)**
 - Colorado Springs Utilities
 - Waste Management & Processors, Inc.
 - Western Greenbrier Co-Gen LLC
- **Probable Environmental Assessments (EA)**
 - Great River Energy
 - Louisville Gas & Electric Corporation
 - University of Kentucky Research Foundation
 - Wisconsin Electric Power Company
- **Probable Categorical Exclusion**
 - NeuCo, Inc.



Funding

CCPI - Round 2

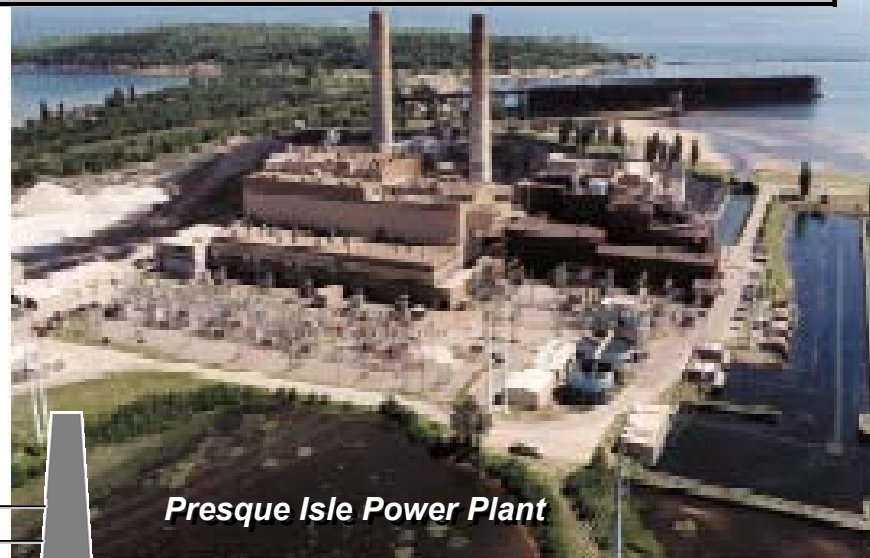
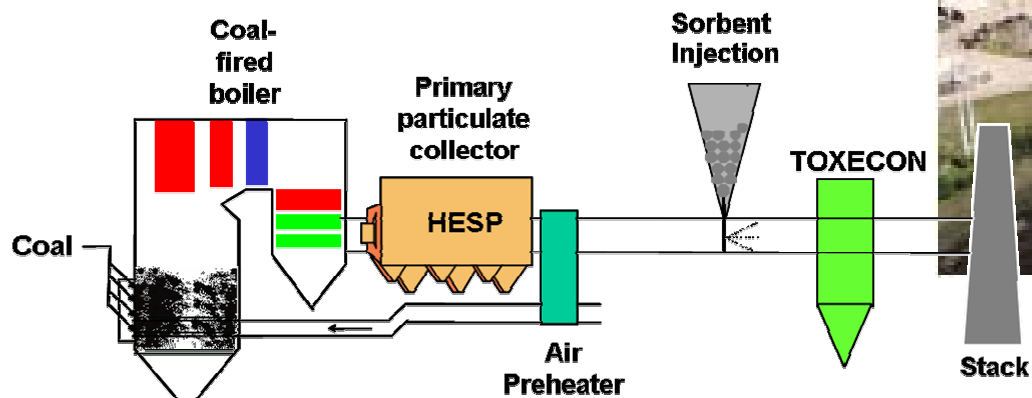
- **Anticipate ~ \$300 million DOE funding**
 - FY 04 Appropriations
 - FY 05 Appropriations
 - Carryover from PPII
and CCPI Round 1



CCPI Program Funding

(in thousands)

	FY2003	FY2004	FY2004	FY2004	FY2004
RD&D Activities	Enacted	President	House	Senate	Conf.
CCPI	150,000	130,000	130,000	130,000	172,000



Tentative Priority Technologies

Future CCPI Rounds

- **Emission control**
 - Mercury
 - NO_x

- **Advanced Power Technologies**
 - Improved efficiency/lower capital cost
 - Sequestration friendly
- **Sequestration**

Round 2

Round 3

Round 4

**Technologies
for Clear
Skies
Compliance**

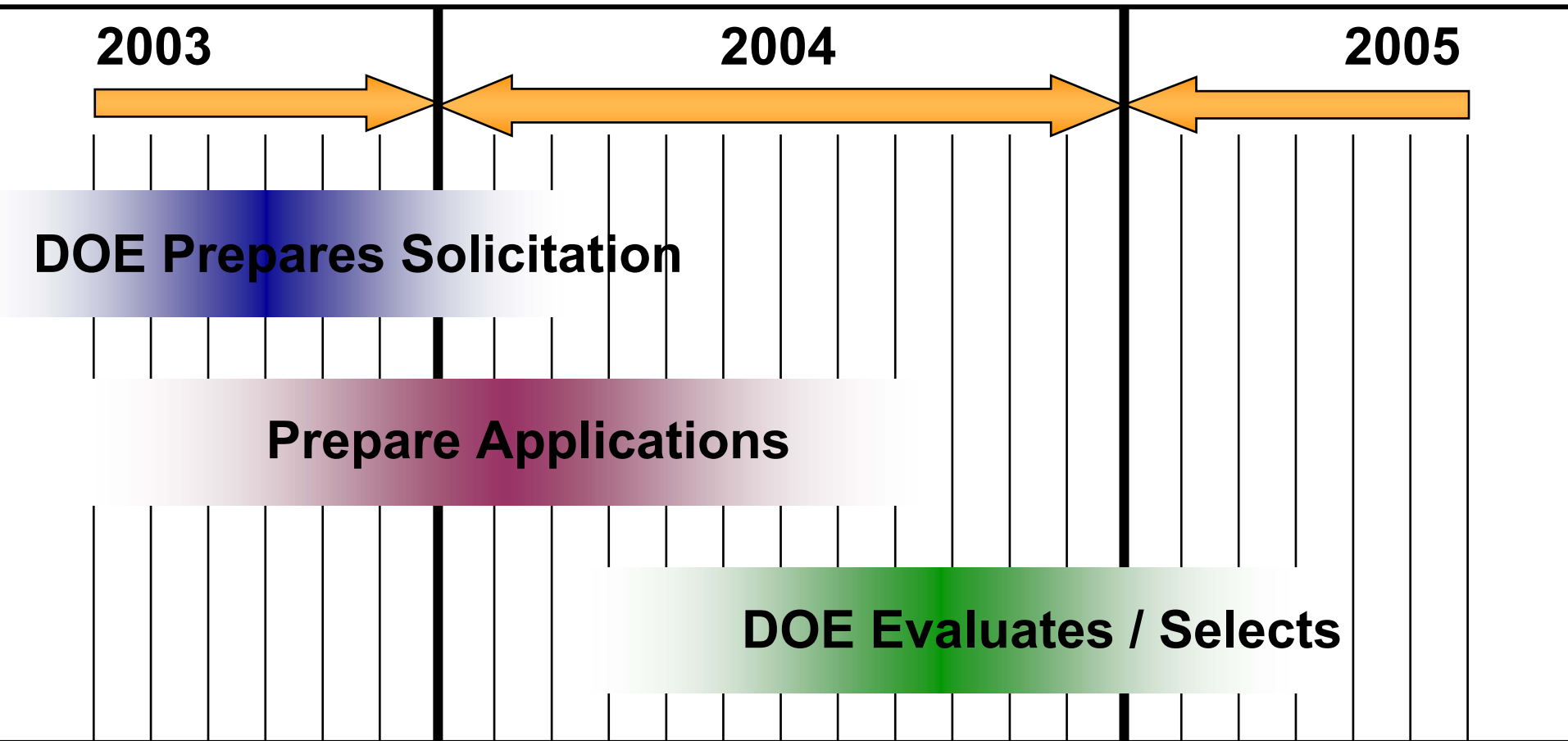
**Technologies
For Zero-
Carbon
Emission
Plants**

**Program
Goals**



CCPI Round 2 Schedule

Calendar Years



Stakeholder Feedback (1)

Round 2

- **From August 26, 2003 Workshop in Pittsburgh**
 - Do not pre-select technology (e.g. gasification vs. combustion)
 - Consider distributed sources (e.g. industrial ~50MW scale)
 - Repayment as a “zero-interest” loan is an issue
 - Some feel it discourages risk-taking and some from applying
 - Some think it attracts non-commercial type projects
 - Other than “full-scale” demos may be appropriate



Stakeholder Feedback (2)

Round 2

- **From August 26, 2003 Workshop in Pittsburgh**
 - Clarify how much electricity needs to be generated in the demo
 - No incentive for CO₂ capture now
 - Some Energy Bill provisions (i.e. loan guarantees and investment tax credits) may be more attractive than CCPI
 - Good Q&A; DOE will make some improvements in next solicitation (i.e. clarifications on Project Definition Phase)

**Workshop Summary and Transcript of Q&A session
now posted on CCPI website**



Challenges for CCPI Program

- **Maintaining a priority for funding in a competitive budget climate**
- **Picking “winners”**
 - Technology (e.g. gasification vs. combustion systems)
 - Projects (strong vs. technically significant)
- **Need for multiple demonstrations**
 - Narrowing down solicitation scope of interest (i.e. follow roadmap)



Closing Comments

- **Coal must play a key role to secure a healthy economy**
 - Is recognized in Presidential-level initiatives; Clear Skies, Climate Change, FutureGen, Hydrogen, Sequestration
 - Coal can play an important role in a potential future carbon-constrained world
- **Regulatory uncertainty improving (e.g. NSR)**
- **Coal RD&D Roadmap charts challenging but doable path forward**
 - Best ideas needed
 - Sustain Federal and private sector investments



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www.netl.doe.gov

Visit Our OCES Website

www.netl.doe.gov/coalpower/
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February 09, 2003

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TOP NEWS STORIES

DOE Names Winners of Clean Coal Competition
\$1.3 Billion of Projects Aimed at Clear Skies, Climate Change & Coal Waste Cleanup
The Department of Energy has named the first winners in President Bush's [Clean Coal Power Initiative](#). The eight projects are valued at more than \$1.3 billion and include new technologies to reduce air pollutants, boost power plant efficiencies, and extract energy from coal waste piles. [Read More!](#)

Experimental Fiber Optic Cables To Warn of Potential Pipeline Damage Tests Begin of an "Early Warning" System To Prevent Damage to Natural Gas Pipelines
Technicians in a joint DOE-industry project have deployed fiber optic cables over a mile of an active gas pipeline in the first test of a new system to detect encroaching construction activity. [Read More!](#)

Gas Upgrading R&D "Success Story"
A new gas upgrading technology funded by DOE and the Gas Technology Institute moves to market. [Link To GTI Announcement](#)

NEW! DOE AWARDS NEW CONTRACTS TO IMPROVE POWER PLANTS BY:

Recycling Coal Combustion Ash
A cooperative agreement with Universal Aggregates, LLC calls for a manufacturing plant at the Birchwood Power Facility in King George, Virginia, to turn coal ash into aggregate. [Read More!](#)

Integrating Lower Cost NOx Controls
A unique combination of high-tech combustion modifications and sophisticated control systems will be tested on a Kansas coal plant to show how new technology can reduce air emissions and save. [Read More!](#)

Visit the Homeland Security Energy Infrastructure Website!

SPECIAL ANNOUNCEMENTS

- [Powder River Coal Can Be Rich Source of Natural Gas](#) [PDF]
- [Abraham Announces Plans to Expand Sequestration Program](#)
 - [Regional Carbon Sequestration Partnerships Solicitation](#)

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Welcome to NETL's [Office of Coal and Environmental Systems](#) webpage. From promoting gasification and combustion technologies, to funding and fostering carbon sequestration and advanced research, we take the steps necessary to ensure coal is sustained as a clean and affordable energy supply.

Through this website, we hope to answer your questions about using coal as a reliable, stable, and sustainable source for electric power. We will share with you the technologies in place now to make this a reality, and the planning, funding, and development efforts to make tomorrow's technologies a reality, today.

[Tracking New Coal-Fired Power Plants](#) (PDF-445KB)

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2002 National Energy Technology Laboratory
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Playing a central planning and coordination role in ensuring that coal is sustained as an abundant, affordable, and acceptable resource for satisfying our country's need for energy, now and well into the future.

Advanced Research
Carbon Sequestration
Clean Coal Power Initiative (CCPI)
Combustion Technologies
Environmental & Water Resources
Gasification Technologies
Mining Industry of the Future
Vision 21

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