

Coal Combustion Products: Challenges and Opportunities



**American Coal Ash
Association Conference**

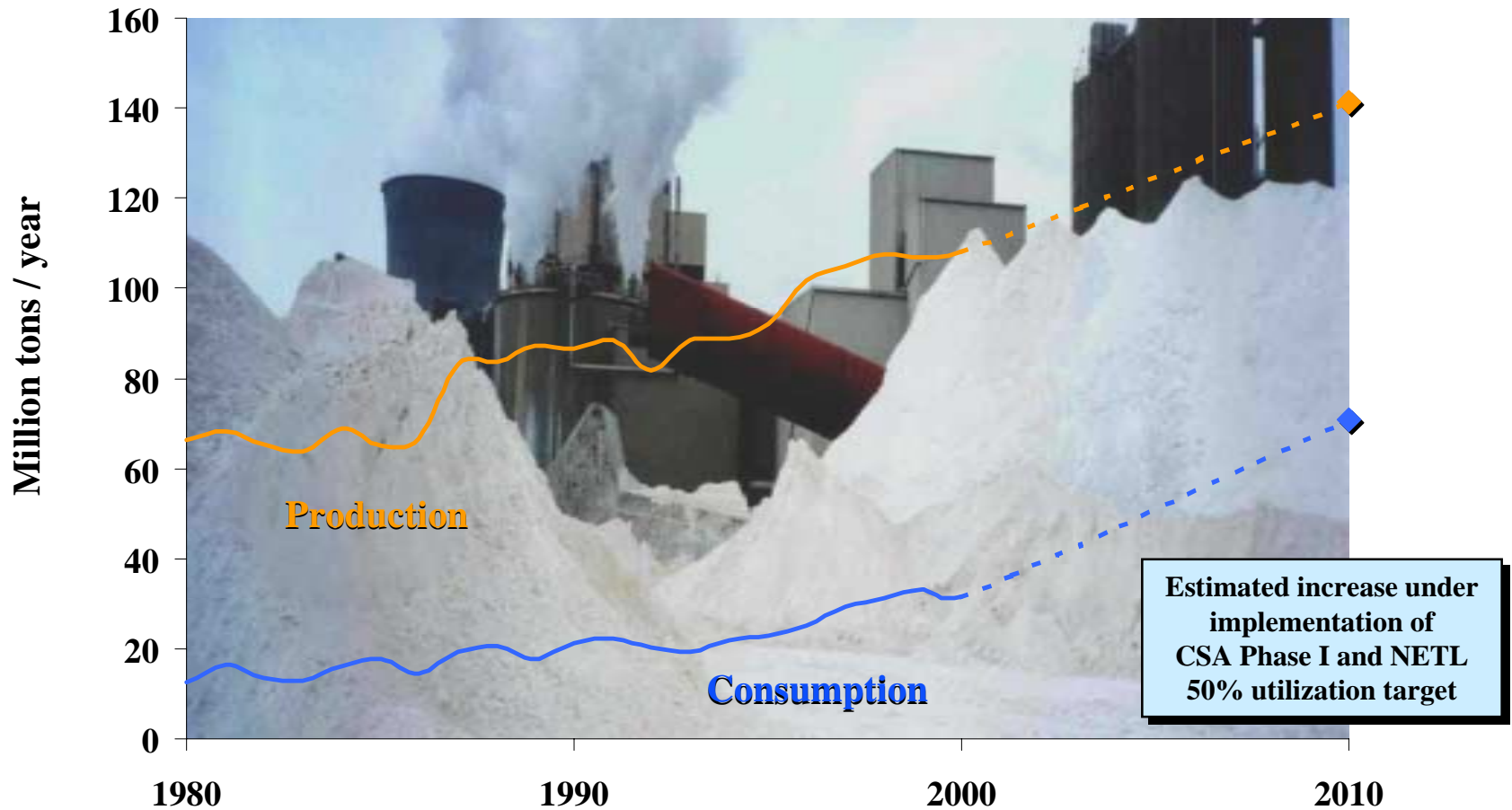
**St. Petersburg, FL
January 27-30, 2003**

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U.S. Coal Combustion Products

Historical Production and Consumption



Source: USGS, Historical Statistics for Mineral Commodities in the United States, May 2002

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2001 U.S. Coal Combustion Products *Production and Consumption*

	Production (million tons)	Consumption (million tons)	% Used
Fly Ash	71.2	25.1	35
Bottom Ash	19.1	6.0	31
Boiler Slag	2.5	1.8	72
FGD Material	28.5	7.6	27
Total	121.4	40.5	33

Source: American Coal Ash Association



Many Uses for Coal Combustion Products

- Drywall
- Portland cement
- Flowable fill
- Bowling balls
- Wall paints
- Carpeting
- Synthetic tiles
- AMD control
- Soil amendments



Energy Policy Act of 2002

- **§ 920 called for increased use of recovered material in Federally funded projects involving procurement of cement or concrete**
- **“Recovered materials” includes coal combustion fly ash**
- **Required DOE and DOT to conduct study of energy savings and greenhouse gas emission reduction benefits**



Coal Combustion Products Partnership (C²P²)

- EPA Deputy Administrator announced C²P² on October 10, 2002
- Team EPA with American Coal Ash Association, DOE/NETL, the Utility Solid Waste Activities Group, and other Federal agencies
- Encourage increased usage of coal combustion products (e.g., fly ash, scrubber solids)



State Incentives

- **California DOT requires that fly ash comprise at least 25 % of cementitious material in any concrete used in state-funded paving projects**
- **Montana provides tax incentives for companies that install equipment to begin recycling material like fly ash**

Source: ISG Resources, Inc. (www.flyash.com)

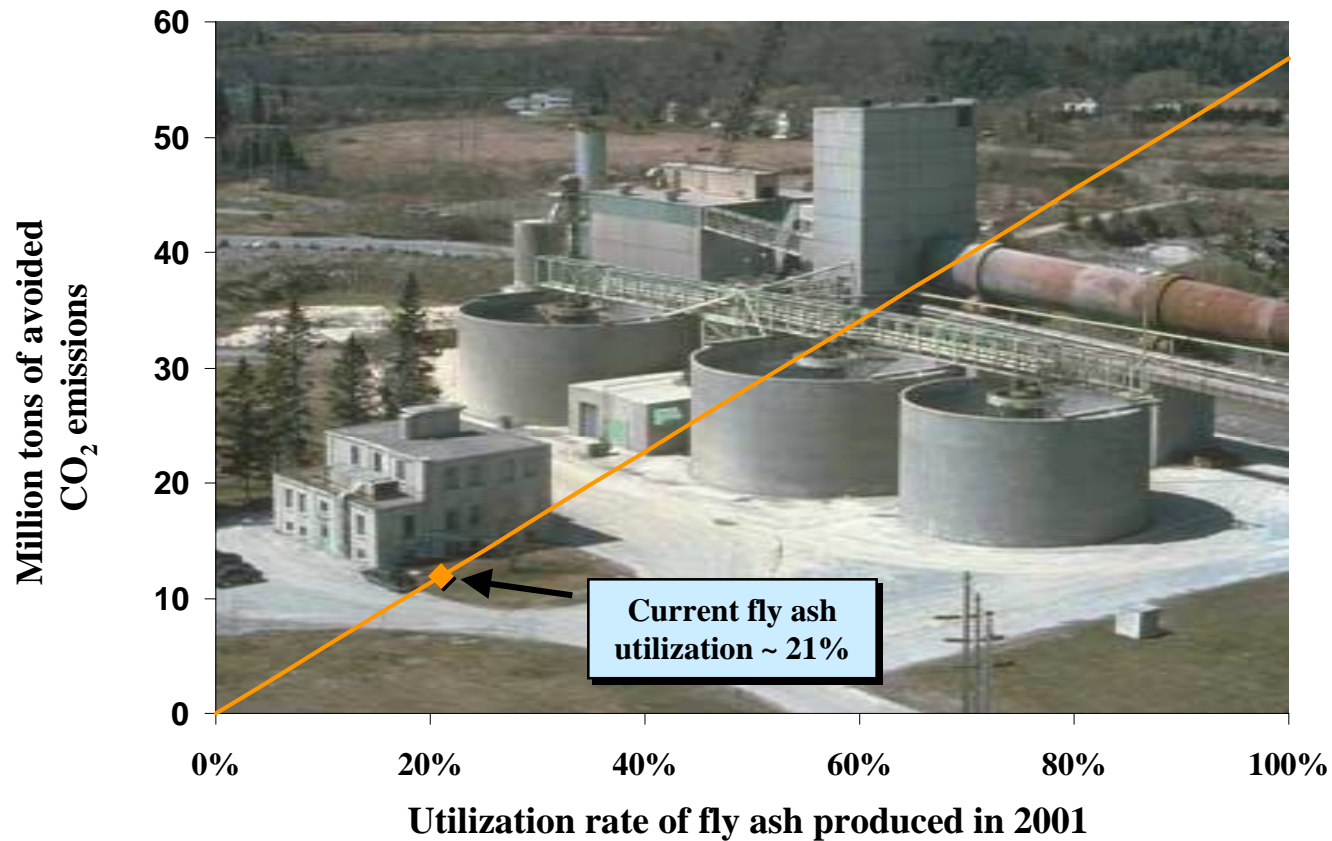


Greenhouse Gas Reductions

- **One ton of fly ash in concrete will avoid approximately 0.8 tons of CO₂ emitted from cement production**
 - Using fly ash reduces the need for limestone calcination and fossil-fuel consumption used in making cement
- **Approximately 71 million tons of fly ash are produced each year**
- **Approximately 90 million tons of cement are produced each year**



Potential To Reduce Greenhouse Gases



1 ton of fly ash used in cement manufacturing provides for approximately 0.8 tons of avoided CO₂ emissions



How Can We Encourage Further CO₂ Reductions Through Use of Fly Ash?

- Meet quality specs
- Ensure an economic win-win for both cement manufacturers and fly-ash marketers
- Ensure equitable allocation of CO₂ credits, i.e., who gets them



Challenges to Increased Utilization

- **Future air pollution regulations, e.g., Clear Skies, Mercury MACT**
 - Increase volume of coal utilization products
 - Change characteristics (i.e., quality) of products
- **Future solid waste regulations under RCRA**
 - Limit use applications
 - Regulate coal utilization products as hazardous
- **Public perception**



Proposed Emissions Reductions

Electric Power Plants (Tons/Year)

			Clear Skies		Jeffords
<i>Emission</i>	<i>Actual 2001</i>	<i>Baseline</i>	<i>2008/2010 Cap</i>	<i>2018 Cap</i>	<i>2007 Cap</i>
SO ₂	10.6 M	8.9 M	4.5 M	3.0 M	2.2 M
NO _x	4.7 M	4.0 M	2.1 M	1.7 M	1.5 M
Mercury	48	48	26	15	4.8



Hg Control and Coal Combustion Products

- **Continued progress in development and testing of advanced control technology to remove Hg from coal-fired power plant flue gas**
- **Research must also focus on the ultimate fate of Hg in coal combustion products, e.g., fly ash, FGD solids**



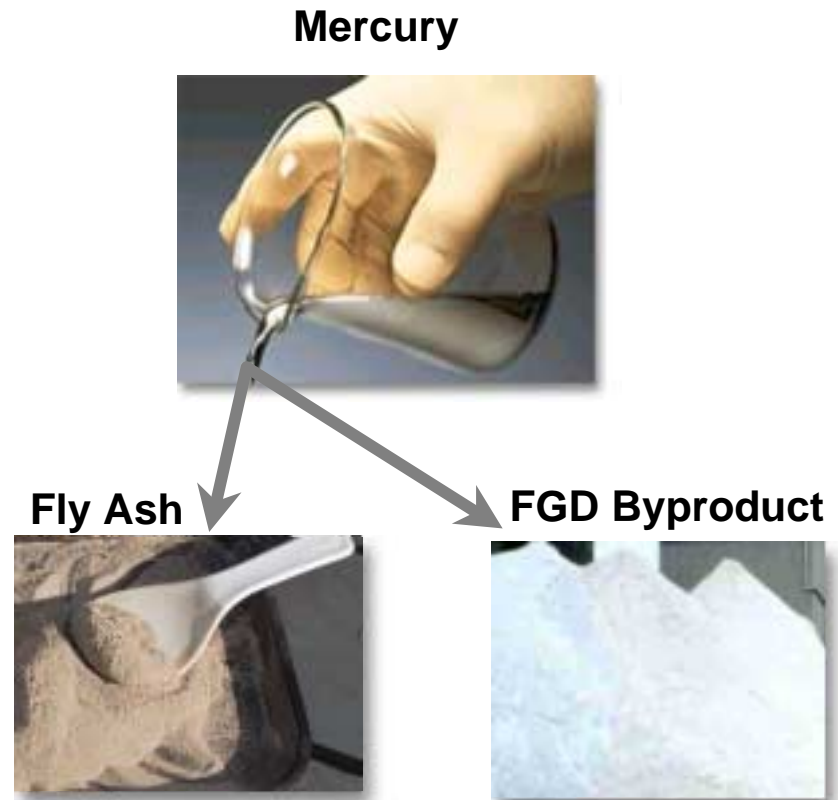
Potential Impact of Mercury Regulations on Coal Combustion Products

Fly Ash

- 71M tons/yr generated
- 35%used
- Utilization loss of all reuse applications \leq \$908 M impact

FGD Solids

- 28 M tons/yr generated
- 27%used
- Utilization loss of all reuse applications \leq \$213 M impact



Hazardous designation of all by-products could cost more than \$11 billion/year

DOE/NETL's Coal Utilization By-Products Research Program

- Increase coal combustion products utilization to 50% by 2010 (~51% increase over current (2001) levels)

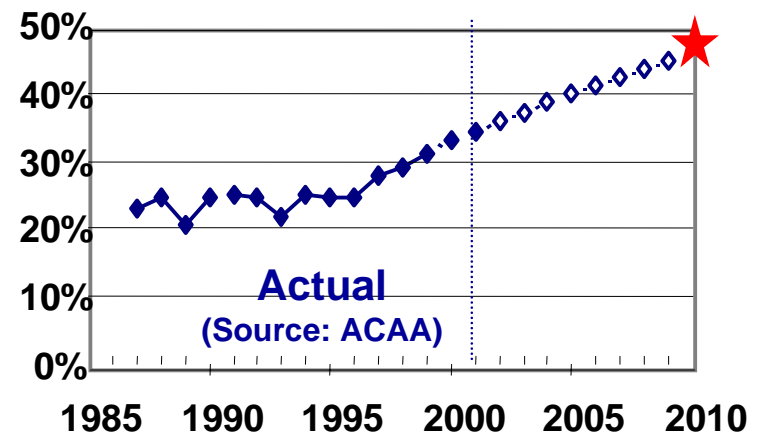
- Working with key stakeholders such as American Coal Ash Association, EPRI, and EPA

- Evaluating leaching and volatilization characteristics of Hg and other metals

- Demonstrating reuse applications

- Developing carbon-fly ash separation technologies

- Research includes products from advanced coal gasification and FBC technologies



Combustion By-Products Recycling Consortium (CBRC)

- **Divided into three geographic regions:**
 - Western
 - Midwestern
 - Eastern
- **Focus on regional and national priorities**
- **To date, over \$3 million in DOE/NETL funding and \$2.5 million in cost sharing**
- **67 applications submitted against current solicitation**



Increasing Value of Coal Combustion Products

- **Power Plant Improvement Initiative project**
- **Universal Aggregates to demonstrate aggregate manufacturing technology using spray dryer ash @ 250MWe Mirant-Birchwood Plant-King George, VA**
- **\$19.6 million project (including \$7.2 million DOE)**
- **21 existing spray dryers currently operating--more likely to come**



Potential Product Uses



250 MWe Mirant-Birchwood Power Facility



Multi-Product Coal Utilization By-Product Processing Demonstration

- Recent Clean Coal Power Initiative selection
- Team led by University of Kentucky-CAER to demonstrate hydraulic classification and froth flotation for making pozzolan & other products @ 2,200 Ghent Station in Kentucky
- \$8.9 million project (including \$4.4 million DOE)
- Portland cement substitute



Phoenix Cement Plant



Summary

- **Coal combustion product (CCPs) production and use is increasing in United States**
- **Use of fly ash as a substitute for cement is a viable approach to reducing CO₂ emissions**
- **Regulatory development and public perception will challenge increased use of CCPs**
- **Continued private-public partnership will be needed to ensure the continued environmentally safe use of CCPs**



DOE/NETL Coal Utilization By-Products *Technical Focal*

www.netl.doe.gov/coalpower/environment



Lynn Brickett, DOE/NETL CUB Technical Focal

