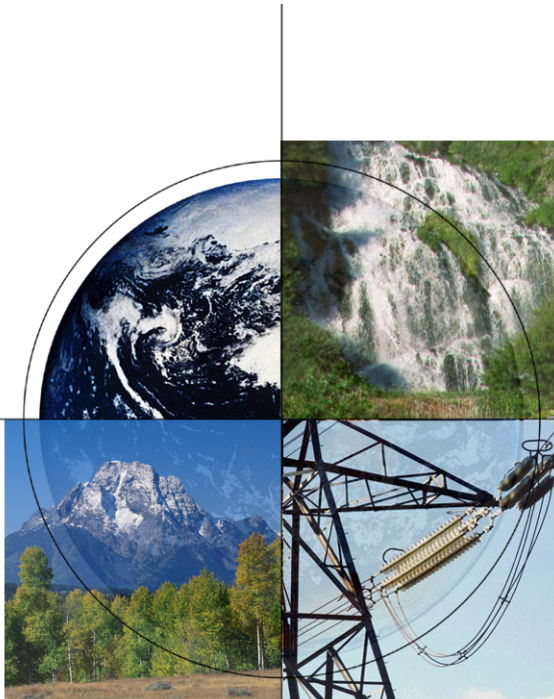


# DOE-NETL's Mercury Control Technology R&D Program for Coal-Fired Power Plants

## *AWMA 97<sup>th</sup> Annual Conference & Exhibition Mercury and Power Generation Panel*

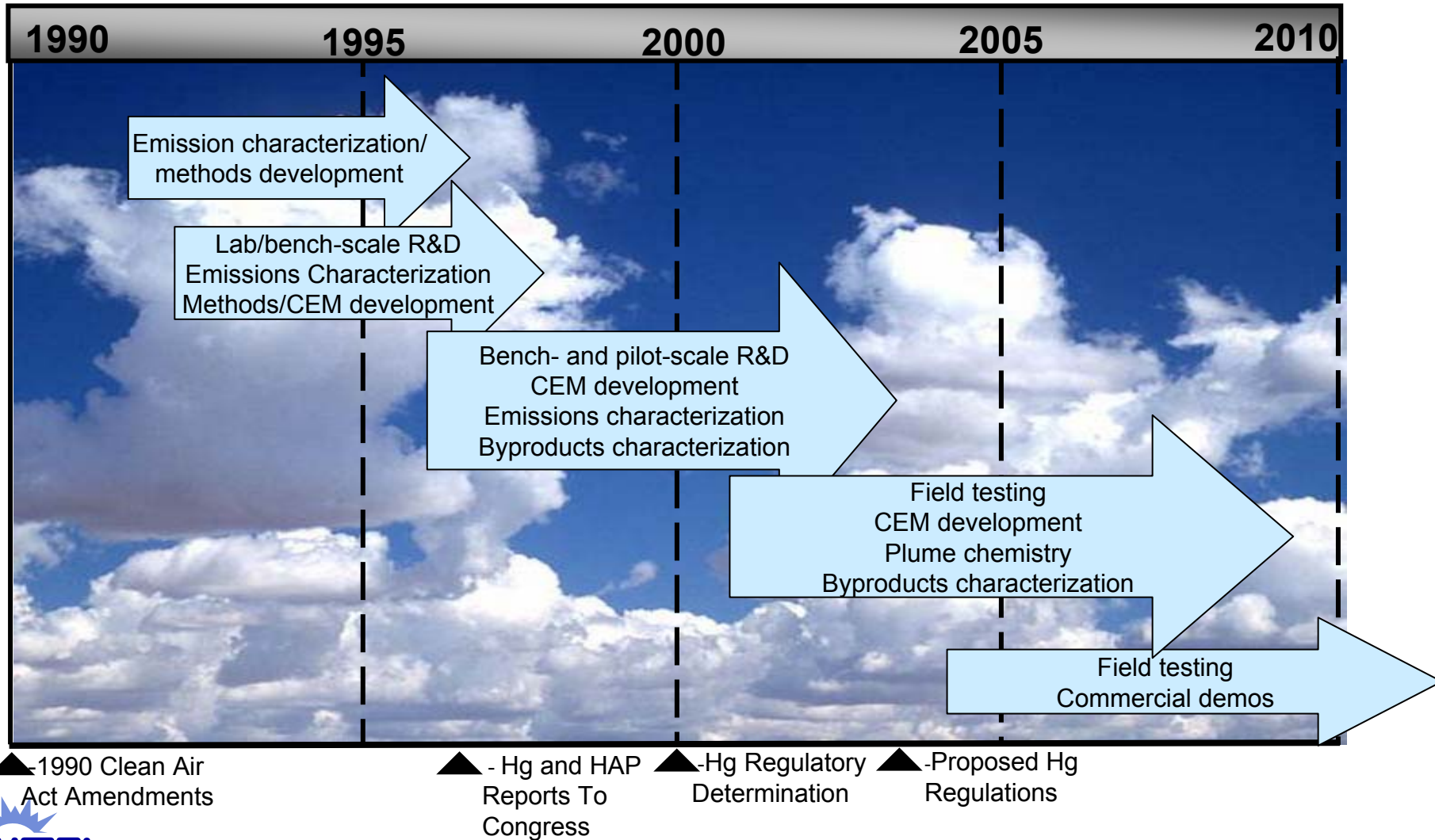
*June 23, 2003  
Indianapolis, IN*



Thomas J. Feeley, III  
thomas.feeley@netl.doe.gov  
National Energy Technology Laboratory

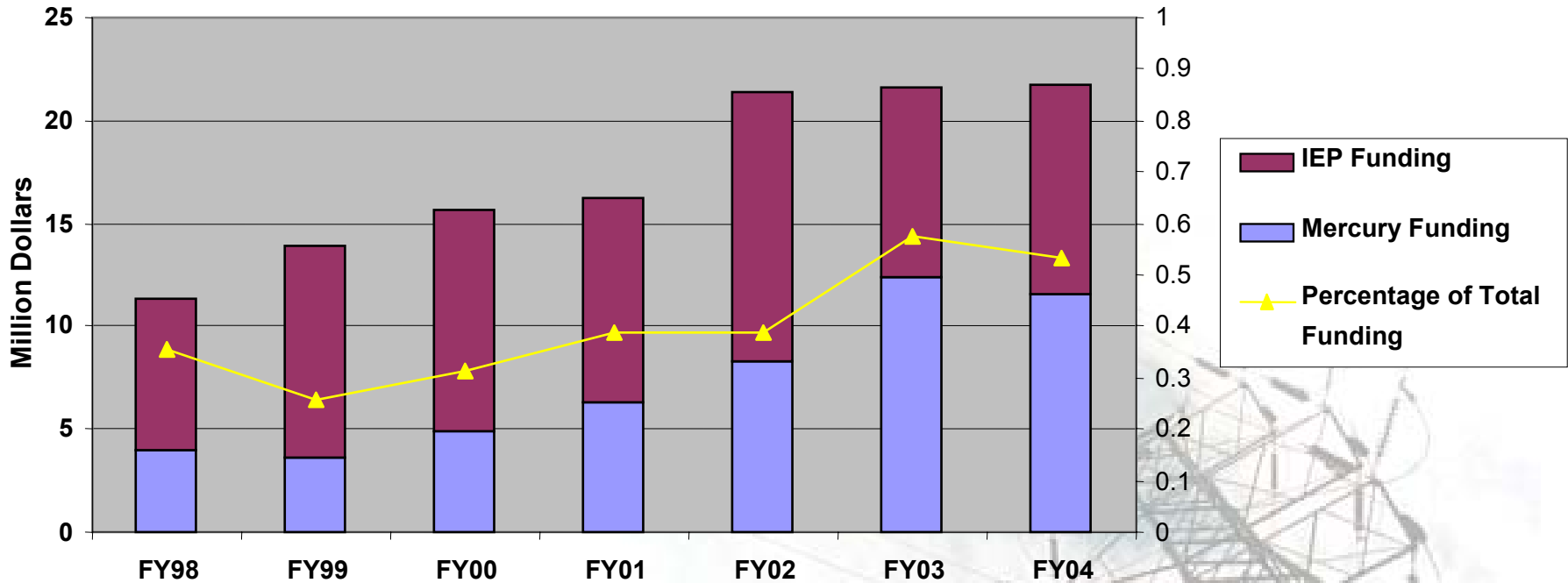


# Over a Decade of DOE/NETL Hg R&D



# DOE/NETL Funding for Hg R&D

## Fiscal Year Mercury Funding



***Over \$52.5 million spent on mercury R&D over the past seven years!***

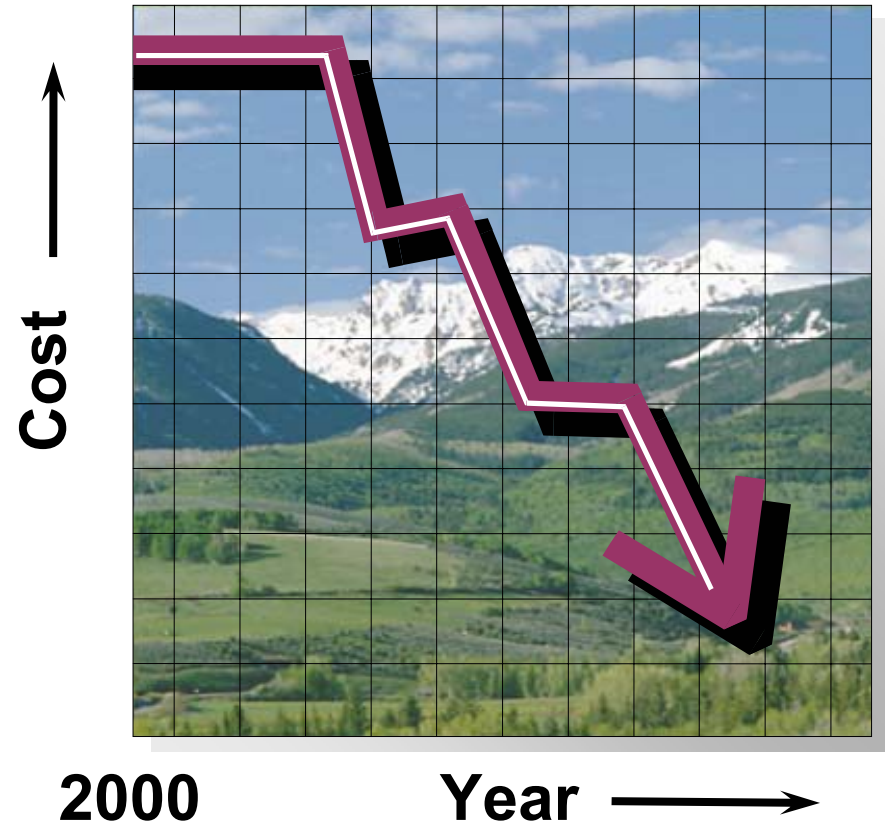


# DOE-NETL Mercury Control Program

## *R&D Goals*

Have control technologies ready for commercial demonstration:

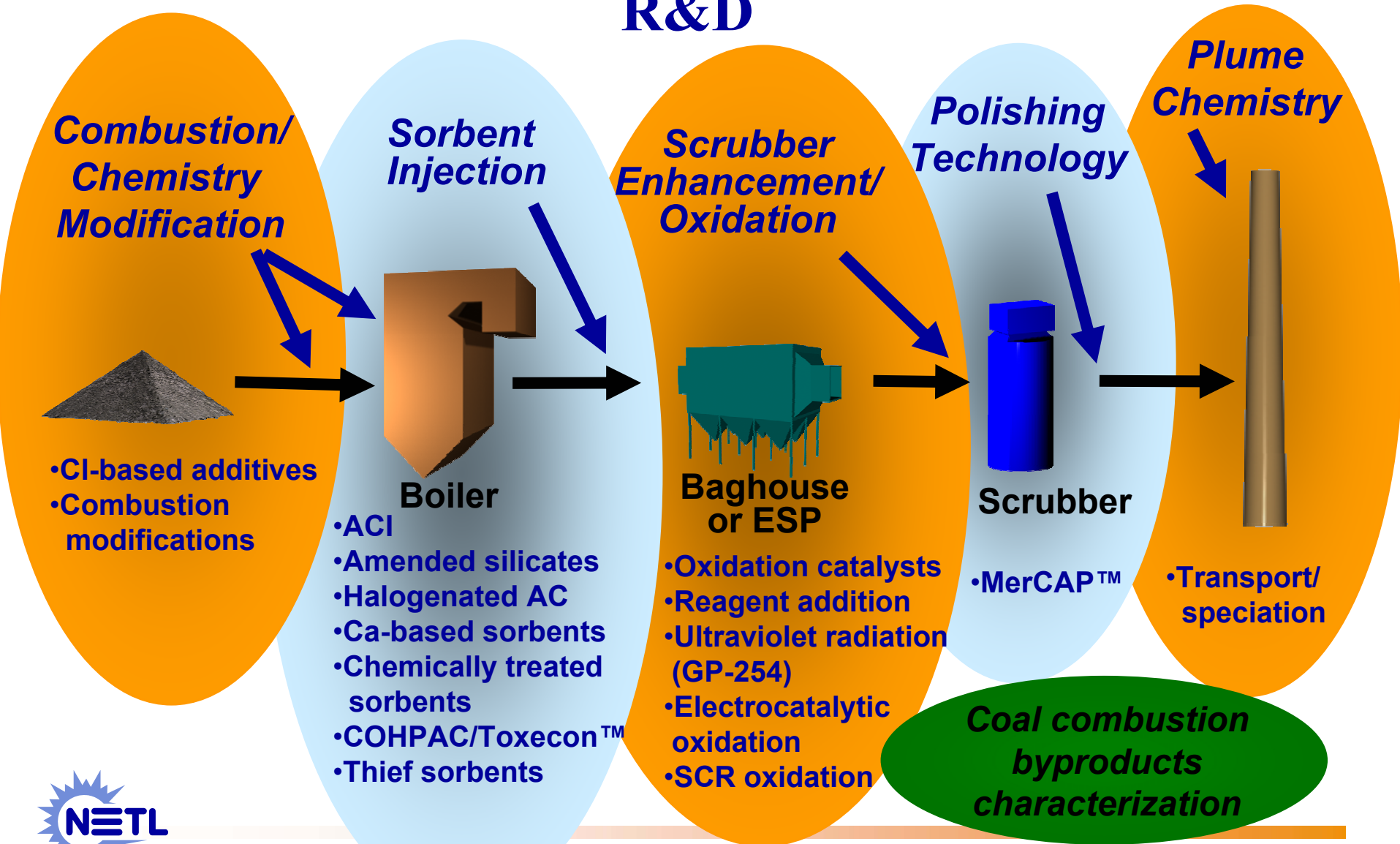
- **Near-term, reduce emissions 50-70%**
  - By 2005 for bituminous coal
  - By 2007 for low-rank coal
- **Long-term, reduce emissions 90% by 2010**
- **Cost 25-50% less than current estimates**



**Baseline Costs: \$50,000 - \$70,000 / lb Hg Removed**

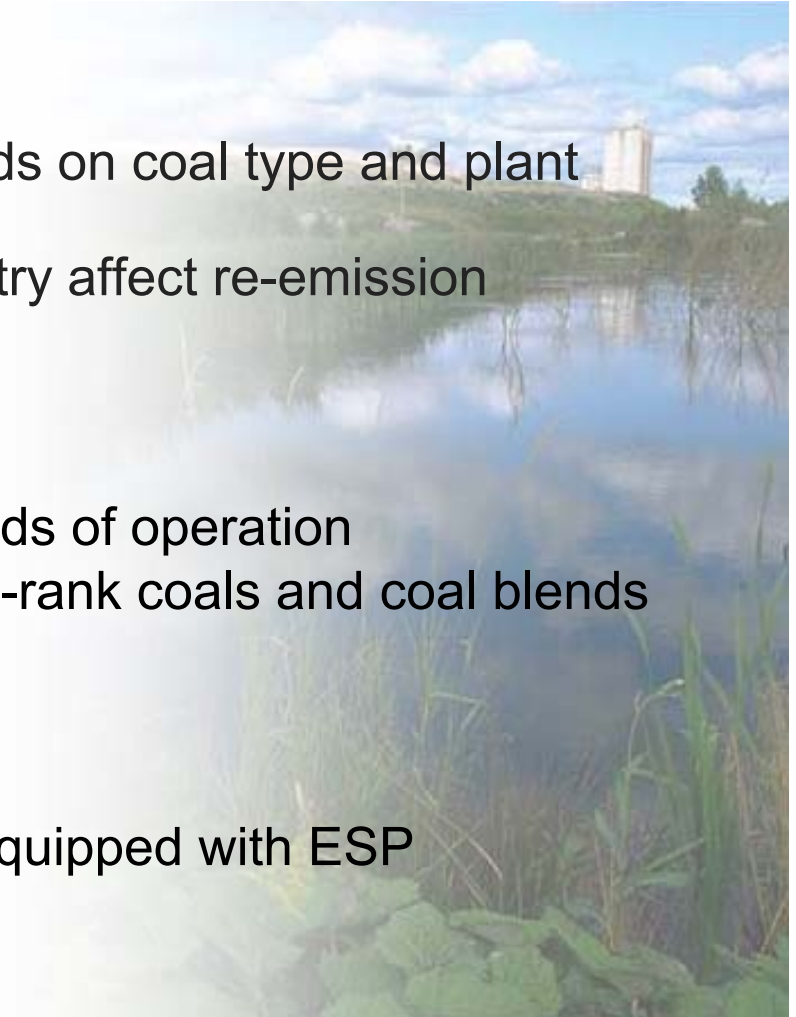


# DOE/NETL Mercury Control Technology R&D



# Observations From Phase I Field Tests

- **Hg capture performance**
  - ACI works, however...
    - Effectiveness of ACI depends on coal type and plant configuration
  - Wet scrubber size and chemistry affect re-emission
- **Uncertainties remain**
  - Performance over longer periods of operation
  - Capture effectiveness with low-rank coals and coal blends
  - Sorbent feed rate and costs
  - FGD Hg reduction/re-emission
  - By-product use and disposal
  - Need for fabric filter for units equipped with ESP
  - Balance-of-plant impacts



# DOE/NETL New Phase II, Round 1 Mercury Control Field Test Projects

- Eight new projects selected in September 2003
- Focus on longer-term, large-scale field testing of sorbent injection and mercury oxidation technologies
- Broad range of coal-rank and air pollution control device configurations



# DOE/NETL New Phase II, Round 1 Mercury Control Field Test Projects

| Project Title  | Lead Company         | Preliminary Test Schedule* | Host Utility       | Test Location     | Coal Rank      | PM   | FGD     |
|--|----------------------|----------------------------|--------------------|-------------------|----------------|--|---------|
| Evaluation of Sorbent Injection for Mercury Control                          | ADA-ES               | 3/04 - 6/04                | Sunflower Electric | Holcomb           | PRB/Bit. Blend | FF   | SDA     |
|  |                      | 8/05 - 11/05               | Ontario Power      | Nanticoke         | PRB/Bit. Blend | ESP  | ---     |
|  |                      | 8/04 - 11/04               | AmerenUE           | Meramec           | PRB            | ESP  | ---     |
|  |                      | 3/05 - 6/05                | AEP                | Conesville        | Bit.           | ESP  | Wet FGD |
| Amended Silicates for Mercury Control  | Amended Silicates    | 9/04 - 10/04               | Cinergy            | Miami Fort 6      | Bit.           | ESP  | ---     |
| Sorbent Injection for Small ESP Mercury Control                              | URS Group            | 3/04 & 9/04 - 10/04        | Southern           | Yates 1           | Bit.           | ESP  | Wet FGD |
|  |                      |                            | Southern           | Yates 2           | Bit.           | ESP w/<br>NH <sub>3</sub> /SO <sub>3</sub> | ---     |
| Pilot Testing of Mercury Oxidation Catalysts for Upstream of Wet FGD Systems | URS Group            | 6/04 - 7/05                | TXU                | Monticello 3      | TX Lignite     | ESP  | Wet FGD |
|  |                      | 2/05 - 3/06                | Duke               | Marshall          | Bit.           | ESP  | ---     |
| Evaluation of MerCAP for Power Plant Mercury Control                         | URS Group            | 2/04 - 8/04                | Great River Energy | Stanton 10        | ND Lignite     | FF   | SDA     |
|  |                      | 1/05 - 6/05                | Southern           | Yates 1           | Bit.           | ESP  | Wet FGD |
| Enhancing Carbon Reactivity in Mercury Control in Lignite-Fired Systems      | UNDEERC              | 4/04 - 6/04                | Basin Electric     | Leland Olds 1     | ND Lignite     | ESP  | ---     |
|  |                      | 9/04 - 10/04               | Great River Energy | Stanton 10        | ND Lignite     | FF   | SDA     |
|  |                      | 4/05 - 6/05                | Basin Electric     | Antelope Valley 1 | ND Lignite     | FF   | SDA     |
|  |                      | 4/04 - 5/04                | Great River Energy | Stanton 1         | ND Lignite     | ESP  | ---     |
| Mercury Oxidation Upstream of an ESP and Wet FGD                             | UNDEERC              | 6/05 - 8/05                | Minnkota Power     | Milton R. Young 2 | ND Lignite     | ESP  | Wet FGD |
|  |                      | 8/05 - 9/05                | TXU                | Monticello 3      | TX Lignite     | ESP  | Wet FGD |
| Advanced Utility Mercury-Sorbent Field-Testing Program                       | Sorbent Technologies | 1/05 - 4/05                | Duke               | Buck              | Bit.           | Hot ESP                                    | ---     |
|  |                      | 6/04 - 9/04                | Detroit Edison     | St. Clair         | Bit./PRB blend | ESP  | ---     |

\* These are preliminary test schedules subject to change based on plant availability.





# DOE/NETL New Phase II, Round 2 Mercury Control Field Test Projects

- **Proposals due by end of April 2004**
- **Focus on technologies for plants that burn low-rank coal**
  - Powder River Basin
  - Texas Lignite
  - Coal blends



# Toxecon™ Retrofit for Mercury and Multi-Pollutant Control – CCPI Demonstration Project

- Multi-pollutant control with PRB coal
  - 90% Hg reduction
  - 70% SO<sub>2</sub> reduction
  - 30% NO<sub>x</sub> reduction
- Hg recovery from sorbent
- Hg CEM performance

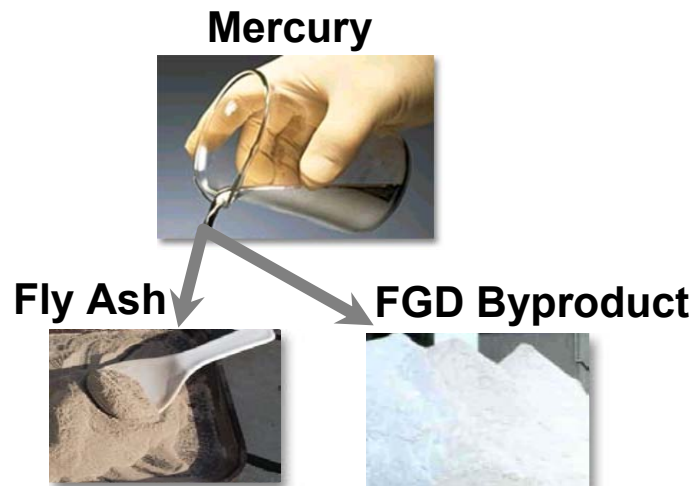


*We Energies Presque Isle  
Power Plant*



# Challenges to Increased CUB Utilization

- **Future air pollution regulations, e.g., Clear Skies, Mercury MACT**
  - Increase volume of coal utilization by-products
  - Change characteristics (i.e., quality) of by-products



- **Future solid waste regulations under RCRA?**
  - Limit use applications
  - Regulate coal utilization by-products as hazardous
- **Public perception**

**Hazardous Waste Designation of All By-products  
Could Cost \$11 Billion / Year**

# NETL External Projects Addressing the Environmental Characterization of CUBs

- **Fate of mercury from control technology field demonstrations**
  - ADA-ES and Reaction Engineering
  - B&W and McDermott Technology
- **Trace element leaching from CUB disposal and utilization applications**
  - CONSOL Energy
  - University of North Dakota Energy & Environmental Research Center (UNDEERC)
  - Electric Power Research Institute (EPRI)
- **Fate of mercury in synthetic gypsum used for wallboard production**
  - US Gypsum



# DOE/NETL Hg Control Technology R&D

## *Future Plans – 5-Year Horizon*

| Fiscal Year | Major Activities   |
|-------------|--|
| 2005        | <ul style="list-style-type: none"><li>•Continue Phase II field testing of 50%-70% Hg control technologies</li><li>•Continue byproduct characterization</li><li>•Complete pilot-scale testing of +90% control options</li><li>•Initiate evaluation of pre-combustion Hg control</li></ul> |
| 2006        | <ul style="list-style-type: none"><li>•Continue Phase II field testing</li><li>•Continue byproducts characterization</li><li>•Initiate Phase III field testing of +90% control technologies</li></ul>  |
| 2007        | <ul style="list-style-type: none"><li>•Complete Phase II field testing</li><li>•Continue byproducts characterization</li><li>•Continue Phase III field testing</li></ul>   |
| 2008        | <ul style="list-style-type: none"><li>•Continue byproducts characterization</li><li>•Continue Phase III field testing</li></ul>  |
| 2009        | <ul style="list-style-type: none"><li>•Continue byproducts characterization</li><li>•Continue Phase III field testing</li></ul>  |

