U.S. Energy Policy: Mercury MACT Discussion

National Mining Association Briefing with the Environmental Protection Agency

Research Triangle Park, NC
April 10, 2003

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Assessing Goals, Needs and Resources

- America's energy policies must balance the needs of average Americans with the need for a:
  - Strong economy
  - Clean environment
  - Secure nation
- Events of recent years – terrorist acts, multiple energy crises, and a global focus on sustainable development – magnify these principles
- A reasoned review of America's energy and environmental policies should include our needs, our resources, and our capabilities

U.S. ENERGY: MERCURY MACT DISCUSSION
Assessing our Needs and Resources

- America's coal is the most abundant domestic energy resource of any nation in the world
- Electricity is by far the fastest growing form of U.S. energy
- Coal fuels more than half of America's generation
- Natural gas is more limited than policymakers realize – The economy can not rely on gas as a preferred fuel source
- Expanding utilization of America's existing coal-fired plants and development of new coal-fired plants bring enormous benefits to 1) individuals, 2) the economy, 3) the environment and 4) national security

U.S. ENERGY: MERCURY MACT DISCUSSION
NMA Core Issues

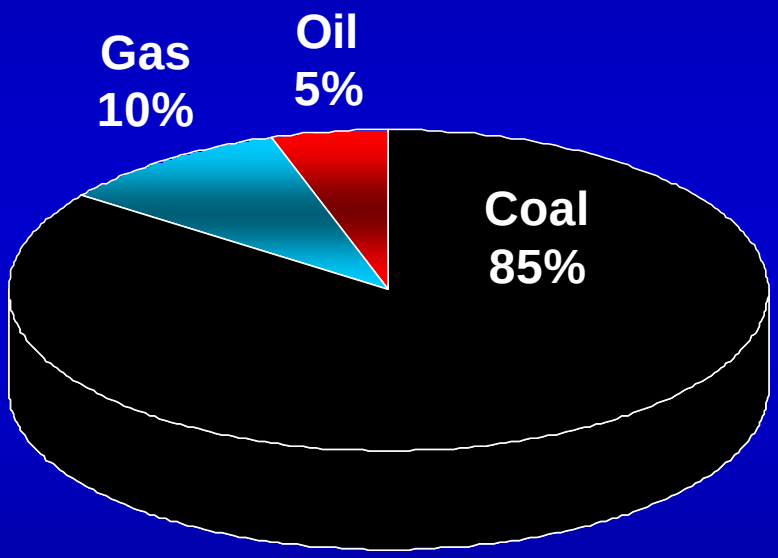
- The estimated amount of mercury emissions under a MACT rule should be between 30-33 tons per year from existing coal-fired power plants
- The less stringent of a lbs/trillion Btu or percent reduction standard
- Standard should not preclude emerging technologies and pre-combustion Hg reduction options
- Mercury control technology should be based on the following criteria:
  - Cost-effective
  - Verifiable public health benefits
  - Worst case fuel variability and operating scenarios should be taken into account in a manner consistent with Clean Air Act requirements

U.S. ENERGY: MERCURY MACT DISCUSSION
Concerns of Unbalanced Mercury Regulations

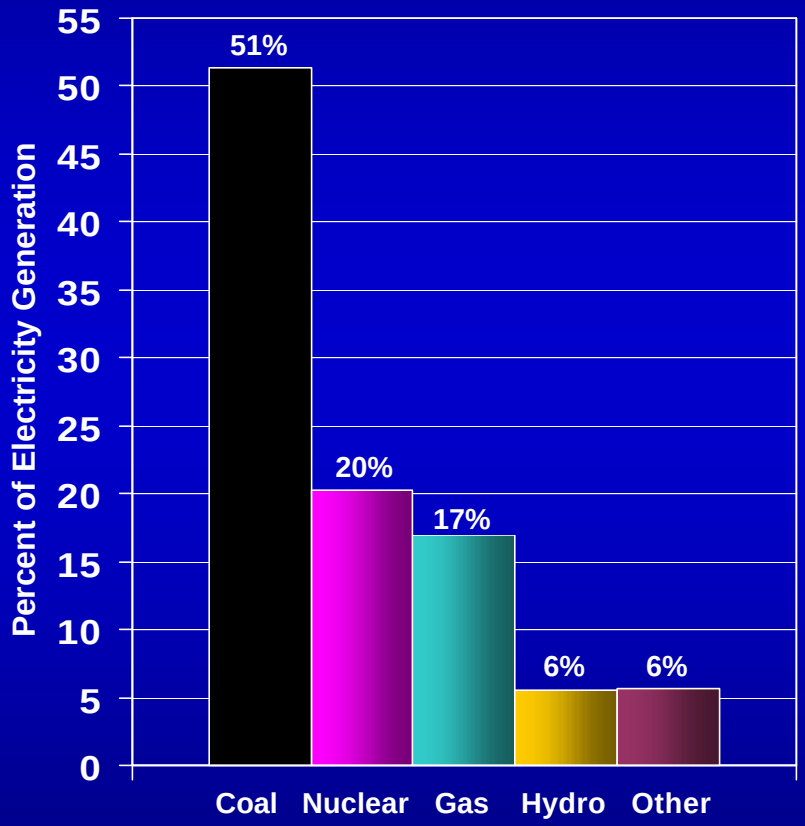
- Loss of fuel diversity
- Fuel switching to high cost, higher use fuels (natural gas/imported oil)
- Higher energy prices and its health impacts on the poor
- Strain on electric reliability
- No measurable environmental benefit
- Cost to electric utility industry

U.S. ENERGY: MERCURY MACT DISCUSSION
Coal Is America's Most Abundant Fuel

U.S. Fuel Resources



Electricity Fuel Sources

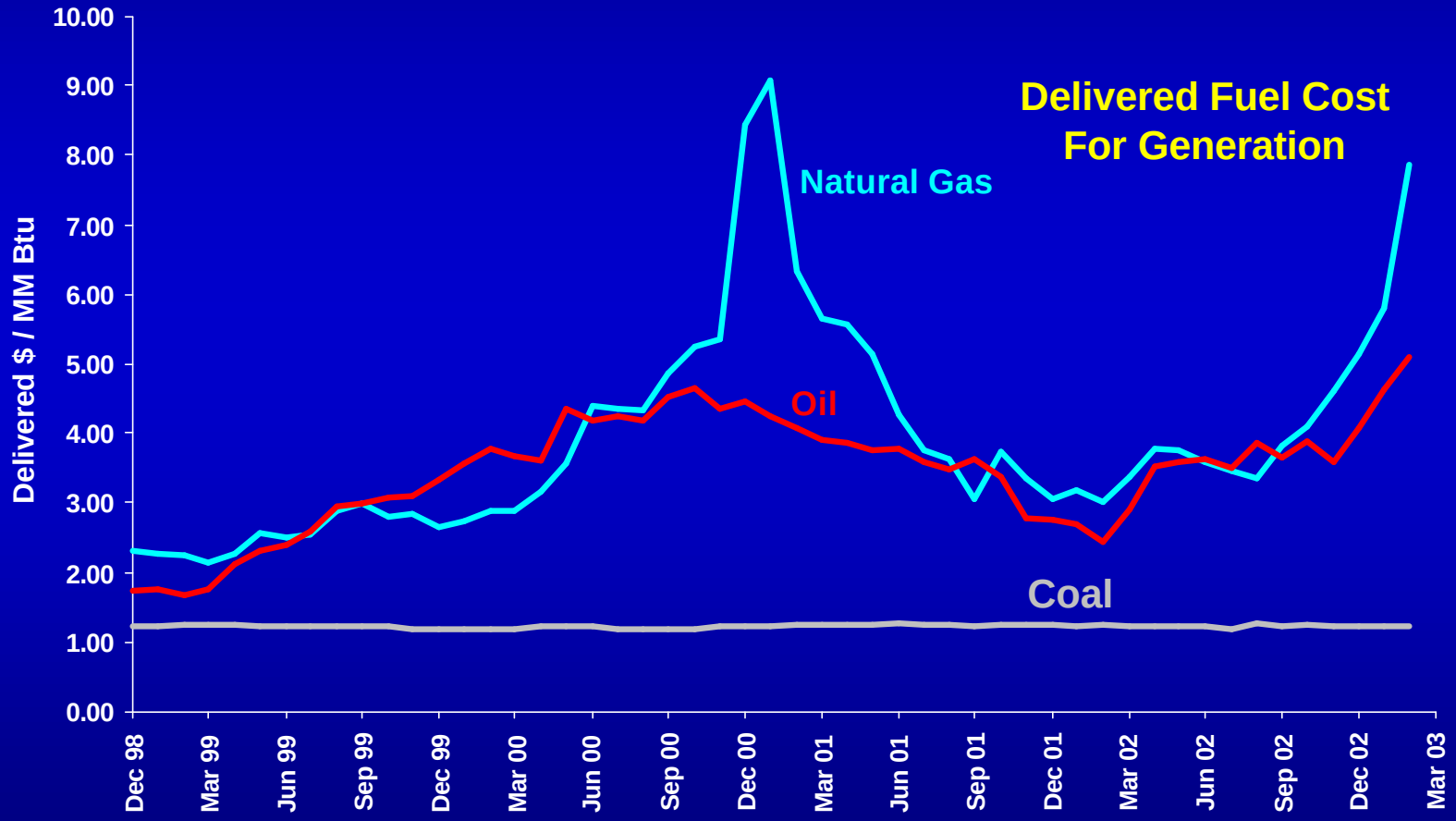


Ultimately recoverable demonstrated reserves on Btu basis.

Source: USGS, National Assessment of United States Oil and Gas Resources; U.S. Coal Reserves; Energy Information Administration Monthly Energy Review, January 2003, calendar year 2001 data.

U.S. ENERGY: MERCURY MACT DISCUSSION
Natural Gas Uncertain in Supply; Volatile in Price

Coal's Stable Pricing Makes it Ideal for Generation



Delivered cost of fossil fuel at steam electric utility plants.
Source: Energy Information Administration, Electric Power Monthly and February 2003 Short Term Energy Outlook; Peabody estimates.

U.S. ENERGY: MERCURY MACT DISCUSSION
Coal is Vital for a Healthy Economy & Environment

- Coal is the lowest cost fuel for electric generation
- A recent Penn State study shows that the average annual benefit of coal-fired electricity to the U.S. economy is $411 billion per year
- The new Klein-Keeney study shows that removing coal from the U.S. energy mix would lead to at least 14,000 to 25,000 premature deaths a year, and perhaps as many as 100,000 if employment-related effects were counted

U.S. ENERGY: MERCURY MACT DISCUSSION
High Energy Costs Threaten Lives and Lifestyles

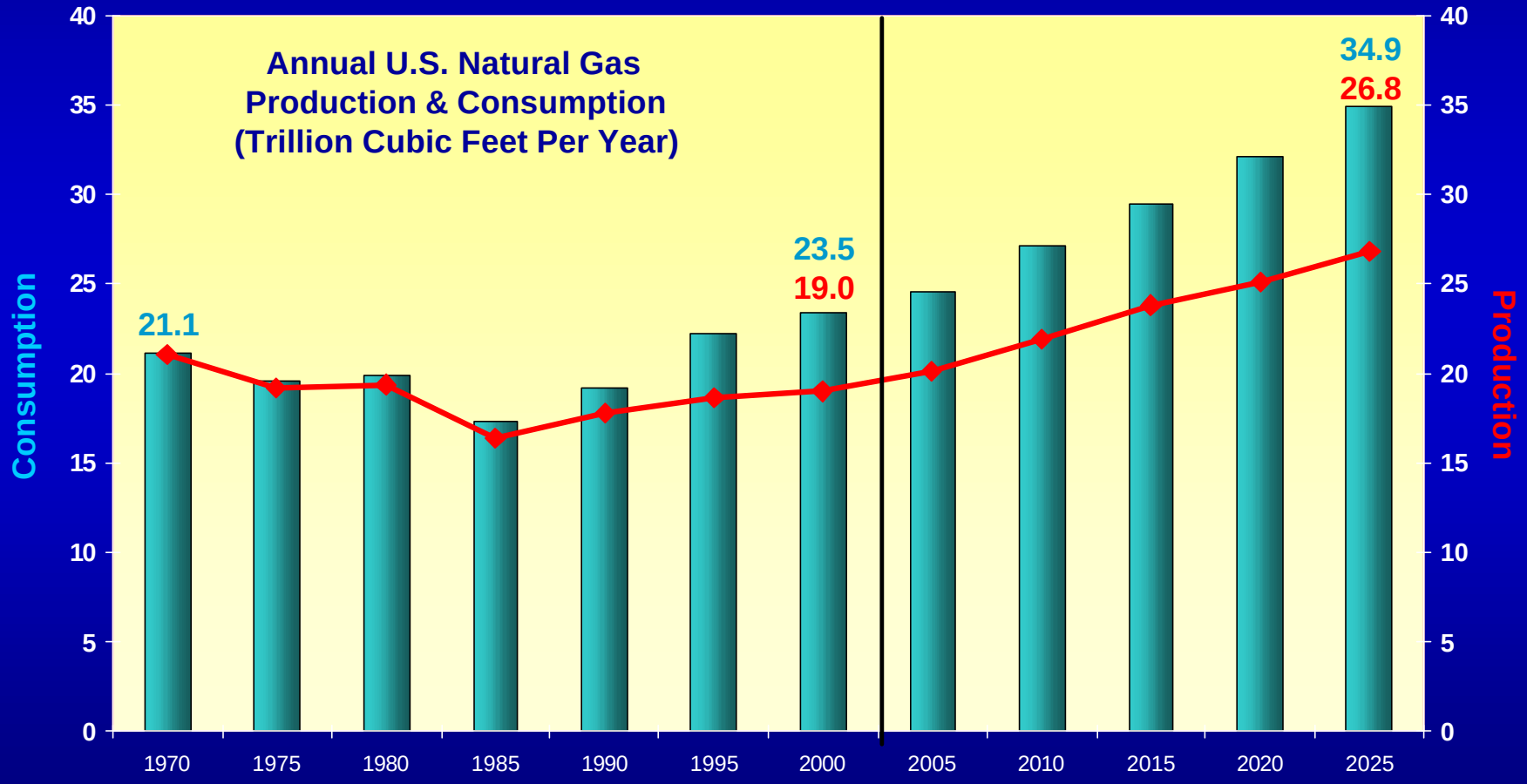
- During the energy crisis of 2000-2001…
  - Middle-class Americans faced average energy costs equaling 4.6% of their incomes
  - Low-income Americans were forced to pay 19.5% of their income on home energy costs
- Those who used natural gas used 29% of their income for energy
- A 2002 winter survey of 19 states and the District of Columbia showed that 4.3 million low-income households were at risk of having power or gas shut off because they couldn't afford to pay

U.S. ENERGY: MERCURY MACT DISCUSSION
America's Energy Needs Continue to Grow

- The U.S. Department of Energy projects a 45% increase of electricity consumption over the next 20 years
- All forms of energy are needed to meet these needs
  - Coal, hydrogen, natural gas, nuclear, hydroelectric and renewables
- Practical expectations are that coal and natural gas generation will be the primary new sources
- Natural gas faces enormous limitations in supply and price
  - This forces schools, homes and industries to compete with generators for natural gas supplies at unknown prices

U.S. ENERGY: MERCURY MACT DISCUSSION
Imbalance Forecasted in U.S. Gas Supply & Demand

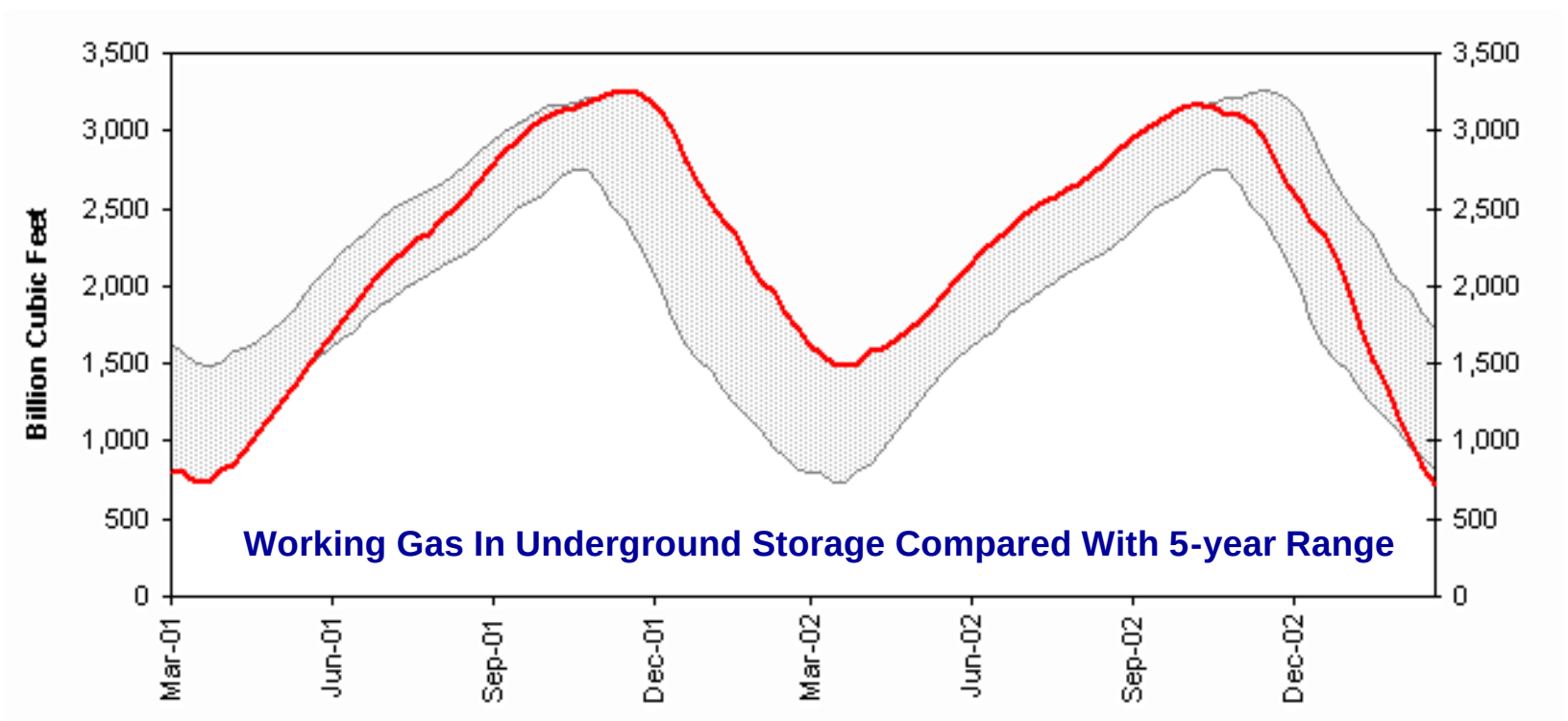
EIA Projects Alarming Consumption Shift From 23 to 35 TCF



Source: Energy Information Administration, Annual Energy Review 2001, 1970 – 2000; Annual Energy Outlook 2003, 2005 – 2025.

U.S. ENERGY: MERCURY MACT DISCUSSION
Gas Storage Capacity is Stretched

Current Gas Storage at Record Low Levels



Natural Gas in storage at the end of the first week in March 2002: 1.728 Tcf
Natural Gas in storage at the end of the first week in March 2003: 0.721 Tcf

Source: DOE Weekly Natural Gas Storage Report March 13, 2003

U.S. ENERGY: MERCURY MACT DISCUSSION
Record Low Storage Threatens U.S. Energy Future

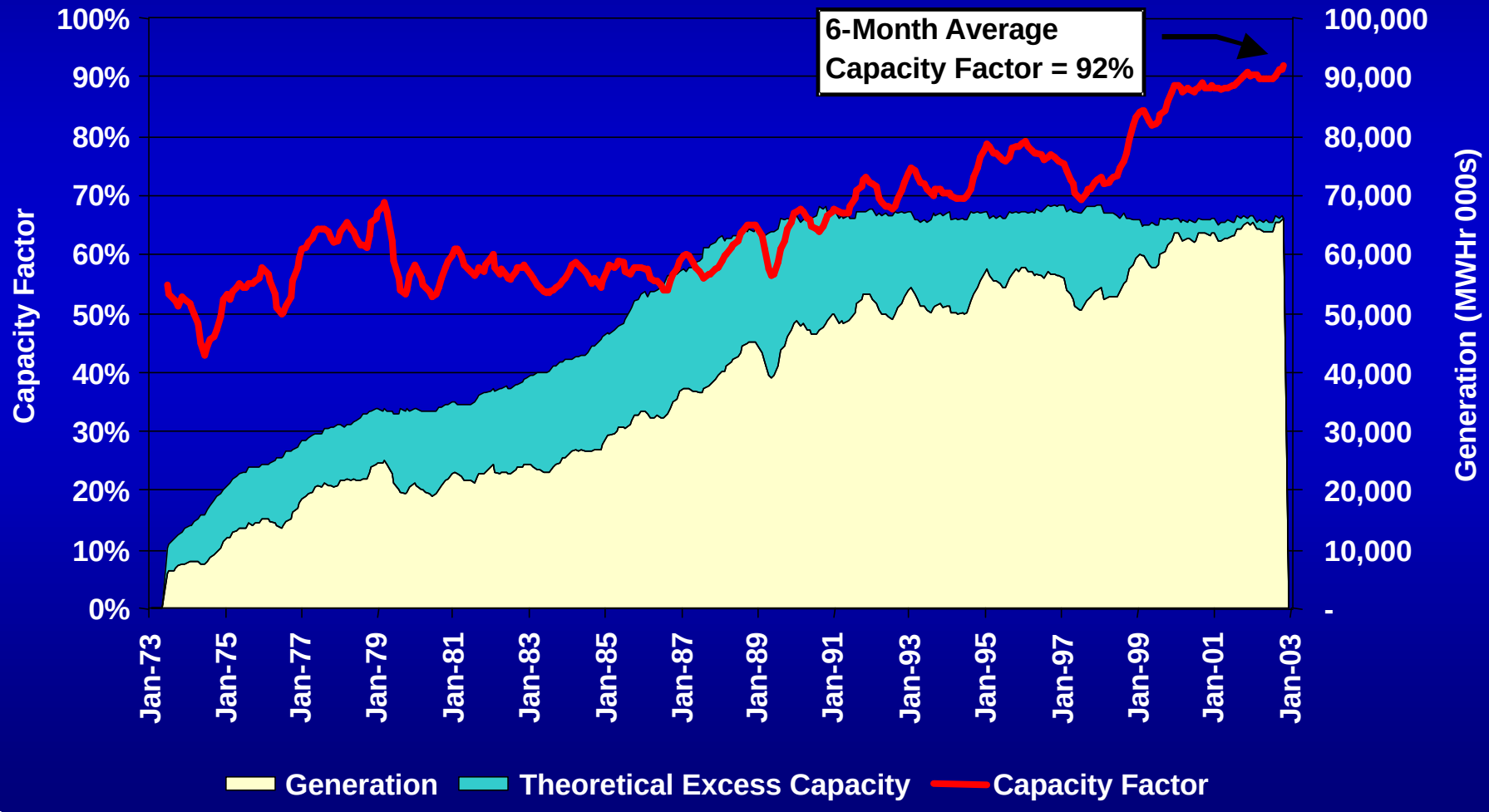
Gas in Storage (3/31/03)	700 Bcf	
Likely Summer Injections	1,435 Bcf	
10/31/03 Ending Storage	2,135 Bcf	
10/31/02 Ending Storage	3,200 Bcf	
Summer-to-Summer Shortfall		(1,065) Bcf

A repeat of this winter's economy and weather next year =

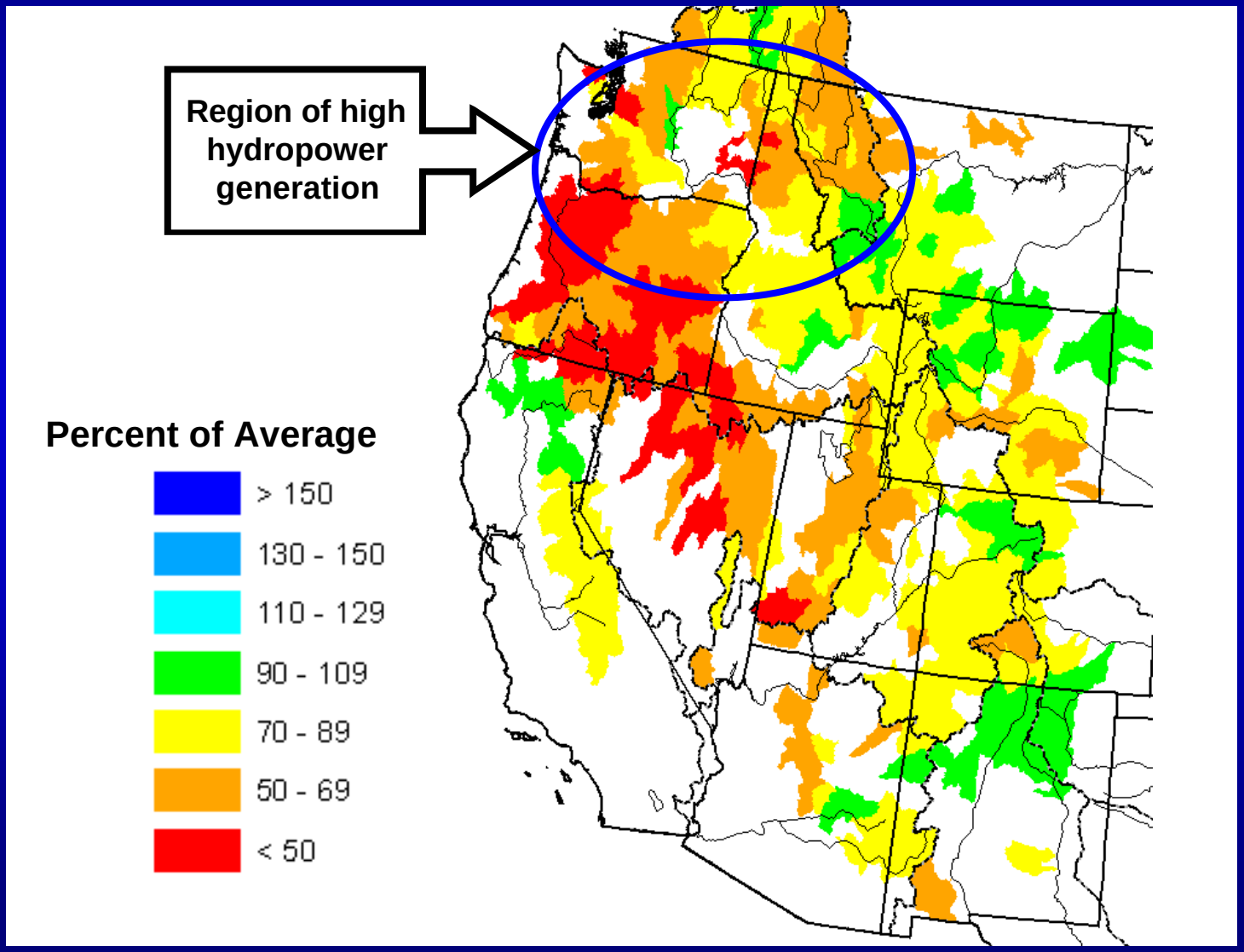
- **Extremely tight gas supplies by February and**
- **Soaring gas prices**

Data Source: Raymond James Equity Research 3/17/03.

U.S. ENERGY: MERCURY MACT DISCUSSION
Nuclear Generation is Reaching its Peak



U.S. ENERGY: MERCURY MACT DISCUSSION
Variability in Hydro Generation Leads to Gas Volatility



Mercury MACT Policy

U.S. ENERGY: MERCURY MACT DISCUSSION
Mercury Regulation Criteria

- Mercury control technology should be based on the following criteria:
  - Cost-effective
  - Verifiable public health benefits
  - Worst case fuel variability and operating scenarios should be taken into account in a manner consistent with Clean Air Act requirements
  - The estimated mercury emissions under a MACT rule should be between 30-33 tons per year from existing coal-fired power plants

U.S. ENERGY: MERCURY MACT DISCUSSION
Challenges facing Mercury Control Regulation

- No continuous monitoring systems have been commercially demonstrated
- No effective control technology is available for all types of coal
- Co-benefit removal is highly variable based on individual plant design and coal source

Mercury MACT ICR Data Discussion

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Statistical Analysis of ICR Data

- Methods used for analysis:
  - ASTM Method D 6722-01 – Coal Analysis
  - US EPA – Standard Test Method for Elemental, Oxidized, Particle-bound, and Total Mercury in Flue Gas Generated from Coal-fired Stationary Sources

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Statistical Analysis of ICR Data

- Evaluated four criteria
  - Negative Removals
  - Missing Critical Data
  - Mercury Material Balance
  - Data Precision
- Only 15 plants passed all four criteria
- No lignite plants in remaining 15 plants
- Removal rates was as high as negative 200%

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Negative Removals

- Negative Removals are found in:
  - 20 test reports
  - Twelve units between 0 and –25.3%
  - Eight units greater than –25.3%

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
List of units with > than 25.3% negative removal

Plant Name	Unit No.	Fuel in test	% Hg Removal coal-stack
Bay Front Plant Generating	5	Bituminous	-47.37
Clifty Creek	6	Subbituminous / Bituminous	-30.49
Gaston	1	Bituminous	-39.98
Gibson Generating Station (0300)	3	Bituminous	-201.04
Platte	1	Subbituminous	-67.53
Rawhide	101	Subbituminous	-25.64
Valley	2	Bituminous / Petcoke	-108.60
Wyodak	BW 91	Subbituminous	-144.00

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Missing Critical Data

- The ICR Database has missing critical data in the following categories:
  - Coal-feed rate
  - Coal mercury content
  - Gas flow
  - No inlet mercury data

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
List of Units Missing Critical Data

Plant Name	Unit No.	Fuel Type	Data Deficiency
Dwayne Collier Battle Cogen Facility	2B	Bituminous	(1)
Jim Bridger	BW 74	Subbituminous	(2)
La Cygne	1	Subbituminous	(3)
Leland Olds Station	2	Lignite	(4)
Polk Power	1	Bituminous	(1), (3), (5)
R. D. Morrow Sr. Generating plant	2	Bituminous	(1)
Wabash River Generating Station	1 + 1A	Bituminous	(3), (5)

Note:

(1) No Hg-in-coal data
(2) No data on coal feed rate into the boiler
(3) No data on inlet gas flow rate
(4) No Hg-in-coal data for Runs 1 and 3
(5) No data on inlet Hg.

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION

Hg Material Balance

- Inlet total Hg (OH) / Inlet total Hg (from coal)
- 1 ± 2s (95% confidence)
- Statistical Method

$$\mathrm{Var}(Y/Z) \approx (1/m_Z)^2 \mathrm{Var}(Y) + (1/m_Z)^4 (m_Y)^2 \mathrm{Var}(Z)$$

Var (Y/Z) = variance of the ratio Y to Z

Var (Y) = variance of Y

Var (Z) = variance of Z

m_Z, m_Y = mean values for Z and Y, respectively

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Precision Criterion

OH – RSD = 11% if = 3µg/m^3 for elemental and oxidized
RSD = 34% if < 3µg/m^3 for elemental and oxidized

ASTM – ± 0.019 ppm of mean for coal Hg

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION

List of Plants That Are Outside 2S

Plant name	Unit No.	No. of Runs failed
Antelope Valley Station	B1	1
Big Bend	BB03	1
Big Brown	1	2
Charles R. Lowman	2	3
Cholla	3	3
Clay Boswell	4	1
Clover Power Station	2	3
Columbia	1	1
George Neal south	4	1
Gibson Generating Station (10/99 testing)	3	1
Gibson Generating Station (03/00 testing)	3	3
Kline Township Cogen Facility	GEN1	3
Laramie River Station	1	2
Laramie River Station	3	2

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION

List of Plants That Are Outside 2S (CONT.)

Plant name	Unit No.	No. of Runs failed
Lewis & Clark	B1	1
Limestone	LIM1	3
Mecklenburg Cogeneration Facility	GEN 1	1
Monticello	3	3
Montrose	1	3
Nelson Dewey	1	2
Platte	1	1
Port Washington	4	3
R.M. Heskett Station	B2	1
Rawhide	101	1
Sam Seymour	3	3
Scrubgrass Generating Company L. P.	GEN1	2
Stanton Station	1	3
W. H. Sammis	1	3

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Precision Criterion for Inlet & Outlet Hg

Method to calculate variance

$$\text{Var (Y)} = \sum_{i=1}^{3} \text{Var (Yi)} = \sum\left[(\text{Yi} \times \text{RSD})^2\right]$$

Twenty-eight units fail precision criterion for 2 or more Hg species.

RSD = 11% if = 3µg/n^3

RSD = 34% if < 3µg/n^3

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
List of Plants Failing Precision Criterion-Inlet Hg

Plant Name	Unit No.	Fuel Type
Big Brown	1	Lignite
Brayton Point	3	Bituminous
Cholla	3	Subbituminous
Clay Boswell	3	Subbituminous
Clay Boswell	4	Subbituminous
Cliffside	1	Bituminous
Comanche	2	Subbituminous
Dwayne Collier Battle Cogeneration Facility	2B	Bituminous
Gaston	1	Bituminous
George Neal South	4	Subbituminous
Gibson Generating Station (10/99 testing)	3	Bituminous
Gibson Generating Station (03/00 testing)	3	Bituminous
GRDA	2	Subbituminous/Bituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
List of Plants Failing Precision Criterion-Inlet Hg Cont.

Plant Name	Unit No.	Fuel Type
Jack Watson	4	Bituminous
Jim Bridger	BW 74	Subbituminous
Laramie River Station	3	Subbituminous
Leland Olds Station	2	Lignite
Lewis & Clark	B1	Lignite
Logan Generating Plant	Gen 1	Bituminous
Mecklenburg Cogeneration Facility	GEN 1	Bituminous
Meramec	4	Subbituminous/Bituminous
Monticello	1	Lignite
Newton	2	Subbituminous
Platte	1	Subbituminous
Port Washington	4	Bituminous
Presque Isle	5	Bituminous/Petroleum Coke

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
List of Plants Failing Precision Criterion-Inlet Hg Cont.

Plant Name	Unit No.	Fuel Type
Presque Isle	6	Bituminous/Petroleum Coke
R. D. Morrow Sr. Generating plant	2	Bituminous
R.M. Heskett Station	B2	Lignite
Rawhide	101	Subbituminous
Salem Harbor	3	Bituminous
Sam Seymour	3	Subbituminous
San Juan	2	Subbituminous
Scrubgrass Generating Company L. P.	GEN1	Waste Bituminous
St Clair Power Plant	4	Subbituminous/Bituminous
Stanton Station	1	Lignite
Stanton Station	10	Lignite
TNP-One	U2	Lignite

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants Failing Precision Criterion-Outlet Hg

Plant Name	Unit No.	Fuel Type
AES Cayuga (NY) (formerly NYSEG Milliken)	2	Bituminous
Antelope Valley Station	B1	Lignite
Bay Front Plant Generating	5	Bituminous
Clay Boswell	2	Subbituminous
Clay Boswell	4	Subbituminous
Cliffside	1	Bituminous
Clifty Creek	6	Subbituminous/Bituminous
Clover Power Station	2	Bituminous
Coronado	U1B	Subbituminous
Coyote	1	Lignite
Dunkirk	2	Bituminous
Gaston	1	Bituminous
George Neal south	4	Subbituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants Failing Precision Criterion-Outlet Hg (Cont.)

Plant Name	Unit No.	Fuel Type
Gibson Generating Station (10/99 testing)	3	Bituminous
GRDA	2	Subbituminous/Bituminous
Jack Watson	4	Bituminous
Limestone	LIM1	Lignite
Logan Generating Plant	Gen 1	Bituminous
Monticello	1	Lignite
Northern States Power - Sherburne County Generating Plant	#3	Subbituminous
Presque Isle	5	Bituminous/Petroleum Coke
R.M. Heskett Station	B2	Lignite
Salem Harbor	3	Bituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Fail at Least One Quality Criterion

Plant Name	Unit No.	Fuel Type
AES Cayuga (NY) (formerly NYSEG Milliken)	2	Bituminous
Antelope Valley Station	B1	Lignite
Bay Front Plant Generating	5	Bituminous
Big Bend	BB03	Bituminous
Big Brown	1	Lignite
Brayton Point	3	Bituminous
Charles R. Lowman	2	Bituminous
Cholla	3	Subbituminous
Clay Boswell	2	Subbituminous
Clay Boswell	3	Subbituminous
Clay Boswell	4	Subbituminous
Cliffside	1	Bituminous
Clifty Creek	6	Subbituminous/Bituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Fail at Least One Quality Criterion (Cont.)

Plant Name	Unit No.	Fuel Type
Clover Power Station	2	Bituminous
Columbia	1	Subbituminous
Comanche	2	Subbituminous
Coronado	U1B	Subbituminous
Coyote	1	Lignite
Dunkirk	2	Subbituminous
Dwayne Collier Battle Cogeneration Facility	2B	Bituminous
Gaston	1	Bituminous
George Neal south	4	Subbituminous
Gibson Generating Station (10/99 testing)	3	Bituminous
Gibson Generating Station (03/00 testing)	3	Bituminous
GRDA	2	Subbituminous/Bituminous
Jack Watson	4	Bituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Fail at Least One Quality Criterion (Cont.)

Plant Name	Unit No.	Fuel Type
Jim Bridger	BW 74	Subbituminous
Kline Township Cogen Facility	GEN1	Waste Anthracite
La Cygne	1	Subbituminous
Laramie River Station	1	Subbituminous
Laramie River Station	3	Subbituminous
Leland Olds Station	2	Lignite
Lewis & Clark	B1	Lignite
Limestone	LIM1	Lignite
Logan Generating Plant	Gen 1	Bituminous
Mecklenburg Cogeneration Facility	GEN 1	Bituminous
Meramec	4	Subbituminous/Bituminous
Monticello	1	Lignite

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Fail at Least One Quality Criterion (Cont.)

Plant Name	Unit No.	Fuel Type
Monticello	3	Lignite
Montrose	1	Subbituminous
Nelson Dewey	1	Subbituminous/Petroleum Coke
Newton	2	Subbituminous
Northern States Power - Sherburne County Generating Plant	#3	Subbituminous
Platte	1	Subbituminous
Polk Power	1	Bituminous
Port Washington	4	Bituminous
Presque Isle	5	Bituminous/Petroleum Coke
Presque Isle	6	Bituminous/Petroleum Coke
R. D. Morrow Sr. Generating plant	2	Bituminous
R.M. Heskett Station	B2	Lignite

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Fail at Least One Quality Criterion (Cont.)

Plant Name	Unit No.	Fuel Type
Rawhide	101	Subbituminous
Salem Harbor	3	Bituminous
Sam Seymour	3	Subbituminous
San Juan	2	Subbituminous
Scrubgrass Generating Company L. P.	GEN1	Waste Bituminous
St Clair Power Plant	4	Subbituminous/Bituminous
Stanton Station	1	Lignite
Stanton Station	10	Lignite
TNP-One	U2	Lignite
Valley	2	Bituminous/Petroleum Coke
W. H. Sammis	1	Bituminous
Wabash River Generating Station	1 + 1A	Bituminous
Wyodak	BW 91	Subbituminous

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants That Pass All Criteria

Plant Name	Unit No.	Fuel Type	Air Pollution Control Device	% Hg Removal coal-stack
Bailly	7 and 8	Bituminous	SO_2/Wet Scrubber	58.61
Intermountain	2SGA	Bituminous	SO_2/Wet Scrubber	83.84
Brayton Point	1	Bituminous	PM/ESP- CS	24.56
Bruce Mansfield	1	Bituminous	PM/Part. Scrubber	7.99
SEI - Birchwood Power Facility	1	Bituminous	SO_2/SDA	97.2
Valmont	5	Bituminous	PM/Baghouse	77.33
Widows Creek Fossil Plant	6	Bituminous	PM/ESP- CS	29.91
AES Hawaii, Inc.	A	Subbituminous	PM/Baghouse	78.80
Cholla	2	Subbituminous	PM/Mech/Part. Scrubber	24.36
Colstrip	3	Subbituminous	PM/Part. Scrubber	14.72
Craig	C1	Subbituminous	SO_2/Wet Scrubber	23.67
Craig	C3	Subbituminous	SO_2/SDA	12.81
Presque Isle	9	Subbituminous	PM/ESP- HS	9.93
Shawnee Fossil Plant	3	Bituminous/Subbituminous	PM/Baghouse	49.74
Stockton Cogen Company	GEN1	Bituminous/Petcoke	PM/Baghouse	89.27

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Plants Additional Data

Additional Facilities
Hg Removal & Material Balance
Cold Side ESP – Wet FGD

Plant	% Removal ± s	Material Balance Closure
"1"	66 ± 3	103%
"2"	56 ± 6	92%
"3"	72 ± 9	116%
"4"	75 ± 6	97%
"5"	67 ± 3	104%
"6"	63 ± 4	104%

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION Plants Additional Data

Activated Carbon Injection

Plant Name	% Removal (one-week test)	# carbon/mmcf
Gaston	60%	1-1.5
Bituminous	80%	2-2.5
(COPAC)	mid-90's	3.5-4.0
Pleasant Prairie	40%	2-3
Sub-Bituminous	60%	10-11
	61-62	30
Brayton Point	42%	7
Bituminous	60-61%	10
	82-83%	20

U.S. ENERGY: MERCURY MACT DISCUSSION
2003 Mercury Emissions Testing

	Hg Species	2003.00 Inlet	2003.00 Outlet	Percent Removal	Hg Species	ICR Inlet	ICR Outlet	Percent Removal
Laramie River Unit 1	Hg_p	2.51	0.10	96.0%	Hg_p	0.15	0.02	86.7%
WFGD-ESP	Hg^0	4.72	2.77	41.3%	Hg^0	11.33	7.63	32.7%
Coal Hg - 0.12 ppm	Hg^{2+}	1.07	0.42	60.7%	Hg^{2+}	4.07	0.21	94.8%
	Hg_{total}	8.30	3.29	**60.4%**	Hg_{total}	15.55	7.86	**49.5%**
Laramie River Unit 3	Hg_p	0.91	0.15	84.1%	Hg_p	2.28	0.04	98.4%
DFGD-ESP	Hg^0	*6.80*	8.50	-25.0%	Hg^0	6.77	5.80	14.3%
Coal Hg - 0.11 ppm	Hg^{2+}	1.06	0.10	90.6%	Hg^{2+}	0.44	0.07	84.1%
	Hg_{total}	8.77	8.78	**-0.1%**	Hg_{total}	9.48	5.91	**37.7%**
Dave Johnston Unit 2	Hg_p	9.10	0.13	98.6%	Hg_p			
ESP-CS	Hg^0	1.40	1.38	1.4%	Hg^0		No Data	
Coal Hg - 0.13 ppm	Hg^{2+}	0.20	1.20	-500.0%	Hg^{2+}		Not ICR	
	Hg_{total}	10.70	2.70	**74.8%**	Hg_{total}			
Grand Island	Hg_p	0.54	0.12	77.8%	Hg_p	0.03	0.02	33.3%
ESP-HS	Hg^0	7.00	7.03	-0.4%	Hg^0	10.42	11.39	-9.3%
Coal Hg - 0.09 ppm	Hg^{2+}	1.27	0.70	44.9%	Hg^{2+}	3.33	1.05	68.5%
	Hg_{total}	8.80	7.89	**10.3%**	Hg_{total}	13.78	12.46	**9.6%**
Sheldon Unit 2	Hg_p	4.90	0.03	99.4%	Hg_p			
FF	Hg^0	1.80	1.16	35.6%	Hg^0		No Data	
Coal Hg - 0.13 ppm	Hg^{2+}	0.07	0.15	-114.3%	Hg^{2+}		Not ICR	
	Hg_{total}	6.78	1.30	**80.8%**	Hg_{total}			

U.S. ENERGY: MERCURY MACT DISCUSSION
2003 Mercury Emissions Testing Cont'd

	Hg Species	2003.00 Inlet	2003.00 Outlet	Percent Removal	Hg Species	ICR Inlet	ICR Outlet	Percent Removal
Pawnee	Hg_p				Hg_p			
FF	Hg^0		Data being		Hg^0		No Data	
	Hg^{2+}		Re-checked		Hg^{2+}		Not ICR	
	Hg_{total}				Hg_{total}			
Rawhide Unit 101	Hg_p	0.27	0.00	100.0%	Hg_p	1.74	0.09	94.8%
DFGD - FF	Hg^0	5.94	4.83	18.7%	Hg^0	11.89	8.35	29.8%
Coal Hg- 0.06 ppm	Hg^{2+}	1.68	1.55	7.7%	Hg^{2+}	0.79	0.68	13.9%
	Hg_{total}	7.90	6.38	**19.2%**	Hg_{total}	14.42	9.11	**36.8%**
Bridger Unit 4	Hg_p				Hg_p	0.16	5.40	-3275.0%
WFGD	Hg^0		Scheduled		Hg^0	4.30	0.04	99.1%
Sched-April 3/4	Hg^{2+}		for 4-3&4-03		Hg^{2+}	1.80	0.21	88.4%
	Hg_{total}				Hg_{total}	6.30	5.60	**11.1%**
Columbia Unit 1	Hg_p				Hg_p	0.01	0.00	100.0%
ESP-HS-Sburn	Hg^0		Delayed		Hg^0	13.32	10.10	24.2%
(delayed till late April	Hg^{2+}				Hg^{2+}	2.27	2.10	7.5%
	Hg_{total}				Hg_{total}	15.60	12.21	**21.7%**
Nelson Dewey	Hg_p				Hg_p	0.00	0.00	100.0%
ESP-HS	Hg^0		Delayed until		Hg^0	2.31	2.56	-10.8%
(delayed till late April	Hg^{2+}		Late April		Hg^{2+}	0.26	0.21	19.2%
	Hg_{total}				Hg_{total}	2.57	2.77	**-7.8%**

U.S. ENERGY: MERCURY MACT DISCUSSION
Mercury Emissions Testing Cont'd

Retest of FirstEnergy Sammis Unit #1

Test	Hg % Reduction From Coal
ICR Results	87%
Retest (6/6/02 – 6/27/02)	49% - 75%

U.S. ENERGY: MERCURY MACT DISCUSSION
Mercury ICR data

- Extent to which the mercury removal is achievable by coal varies by:
  - Degree of speciation
  - Chlorine content
  - Loss of ignition (LOI)
  - Boiler type
  - Control technology
  - Plant configuration

U.S. ENERGY POLICY: MERCURY MACT DISCUSSION
Coal Variability

		Hg	Cl
Coal Type		(ppm)	(ppm)
Bituminous	Mecklenburg (VA - 132 mw)	0.097	1893
	Dwayne Collier Battle Cogen 2B (NC - 115 mw)	0.03	1700
	Valmont 5 (CO - 166 mw)	0.008	39
	ICR CO Average	***0.042***	***209***
	SEI - Birchwood Power Facility 1 (VA - 240 mw	0.11	917
	Intermountain 2SGA (UT - 820 mw)	0.023	200
	ICR UT Average	***0.057***	***219***
	Averages	***0.054***	***950***
Subbituminous			
	Clay Boswell 2 (MN - 75 mw)	0.057	50
	Craig C3 (CO - 420 mw)	0.01	117
	Cholla 3 (AZ - 290 mw)	0.037	50
	Craig C1 (CO - 420 mw)	0.023	267
	Coronado U1B (AZ - 395 mw)	0.035	117
	Averages	***0.032***	***120***
	ICR Average	***0.0695***	***127***
Lignite			
	Antelope Valley Station B1 (ND - 435 mw)	0.062	107
	Leland Olds Station 2 (ND - 440 mw)	0.041	91
	Stanton Station 10 (ND - 60 mw)	0.084	28
	Stanton Station 1 (ND - 140 mw)	0.082	50
	Coyote 1 (ND - 450 mw)	0.111	100
	Average	***0.076***	***75***
	ICR Average	***0.089***	***134***

U.S. ENERGY: MERCURY MACT DISCUSSION
West Reported Observations on ICR data

- Only North Dakota lignite units in the top 5 of the lignite group
- ICR tests used coals that contained less mercury than the average.
- There are multiple factors involving coal chemistry and unit configuration that contribute to the ICR data

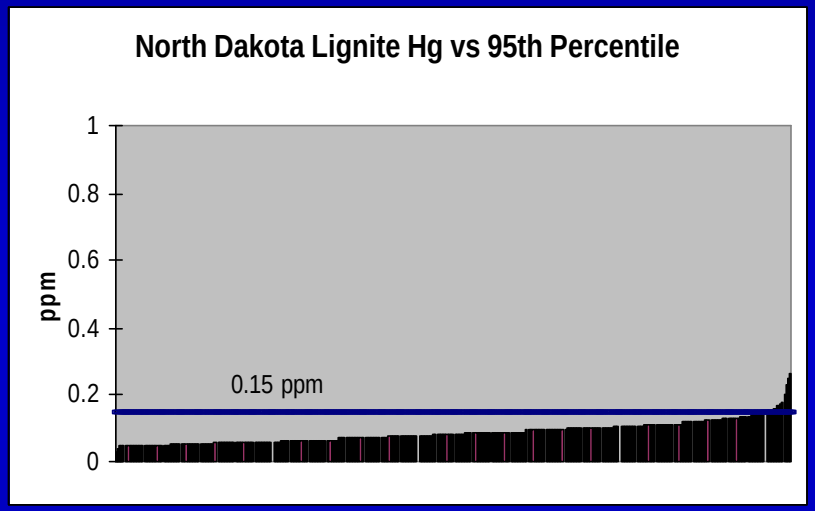
U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data Summary (95th Percentile)

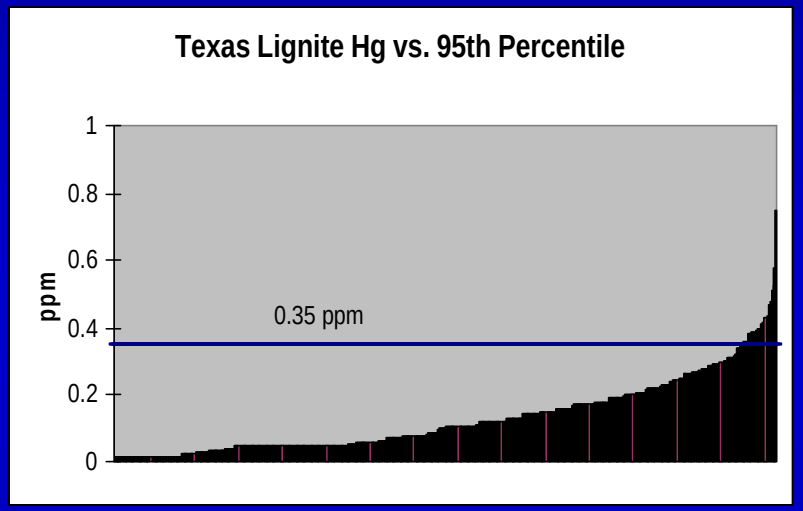
		Hg (ppm)
Lignite	Texas	0.35
	North Dakota	0.15
Subbituminous	Wyoming	0.15
	Montana	0.11
Western Bituminous	Colorado	0.09
	Utah	0.13
Eastern Bituminous	Kentucky	0.18
	West Virginia	0.27
	Pennsylvania	0.49
	Illinois	0.15

U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data 95th Percentile

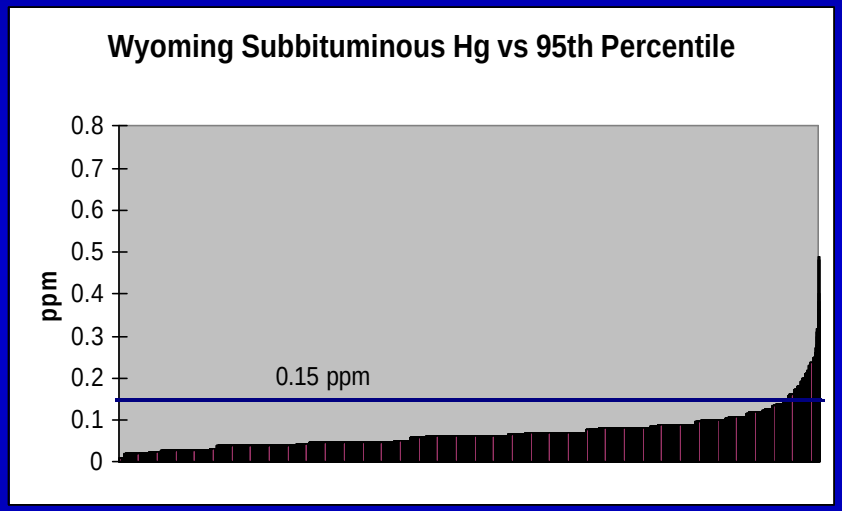
		lb Hg/Tbtu in Coal
Lignite	Texas	20
	North Dakota	13
Subbituminous	Wyoming	8
	Montana	7
Western Bituminous	Colorado	4
	Utah	5
Eastern Bituminous	Kentucky	16
	West Virginia	9
	Pennsylvania	15
	Illinois	8

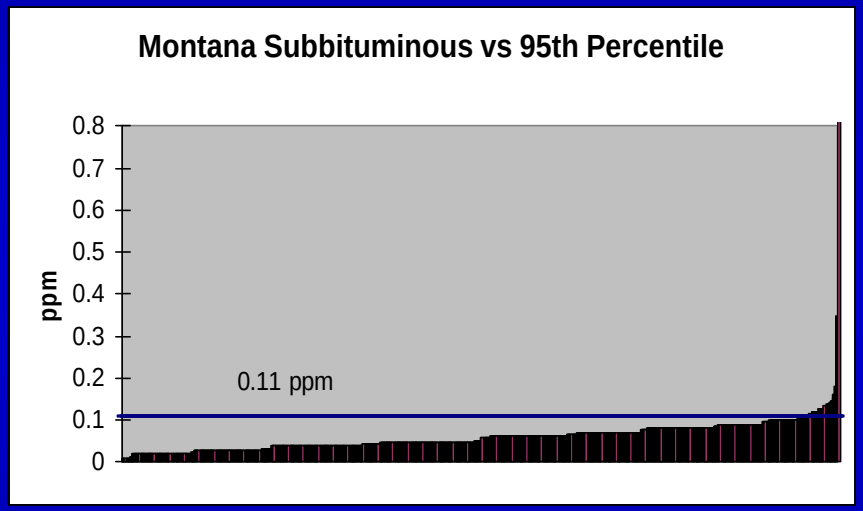
U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data 95th Percentile – Lignite



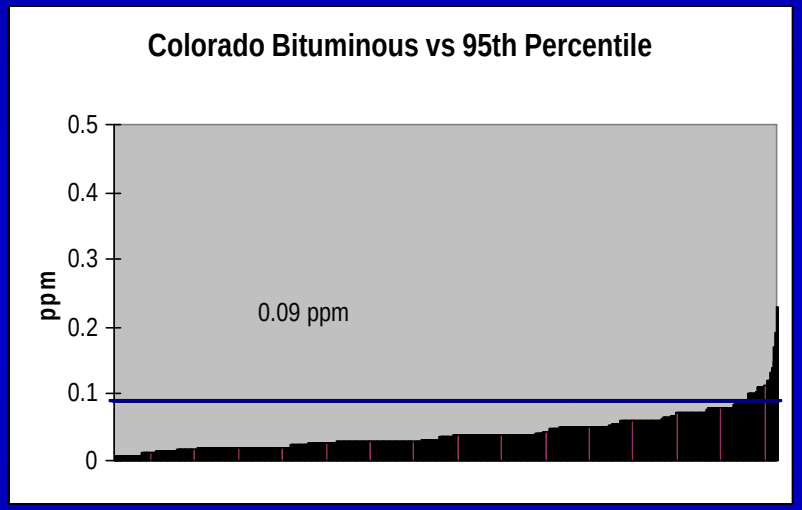


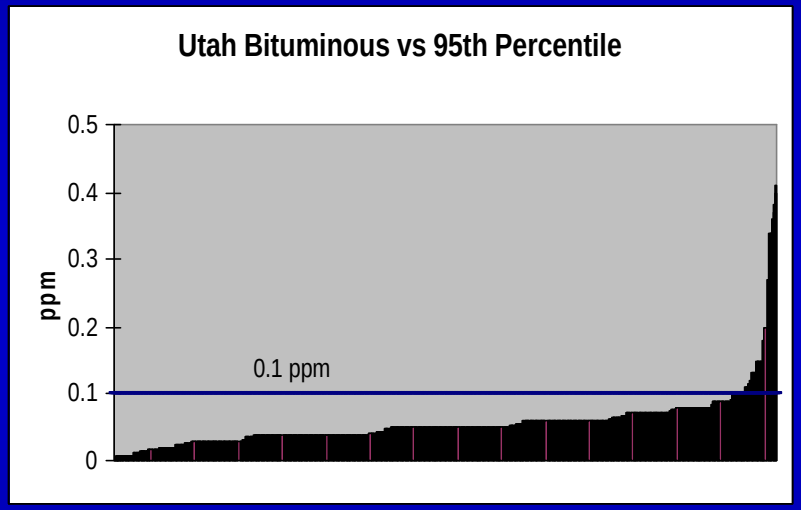
U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data 95th Percentile – Subbituminous Coal



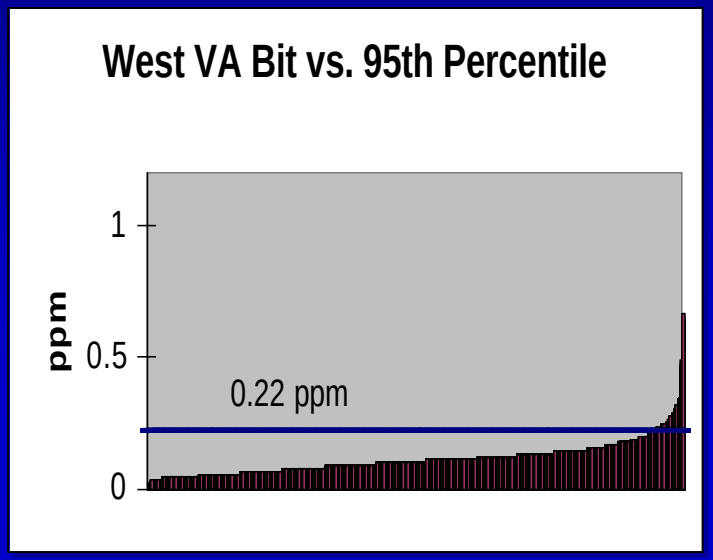


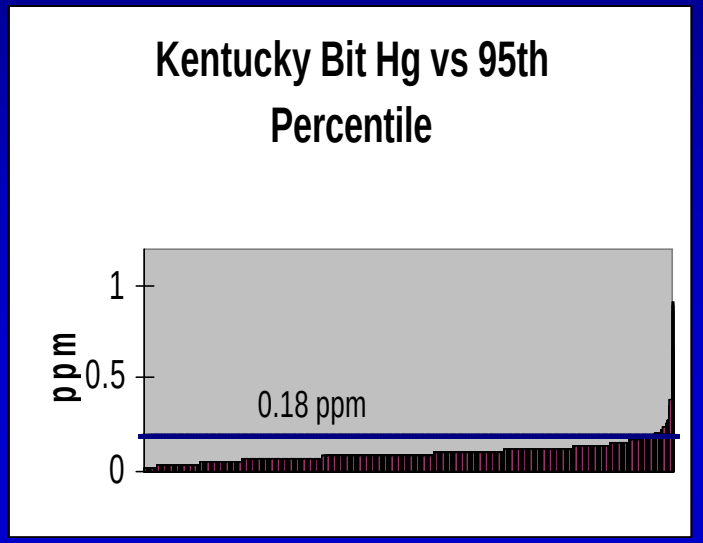
U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data 95th Percentile – Western Bituminous Coals

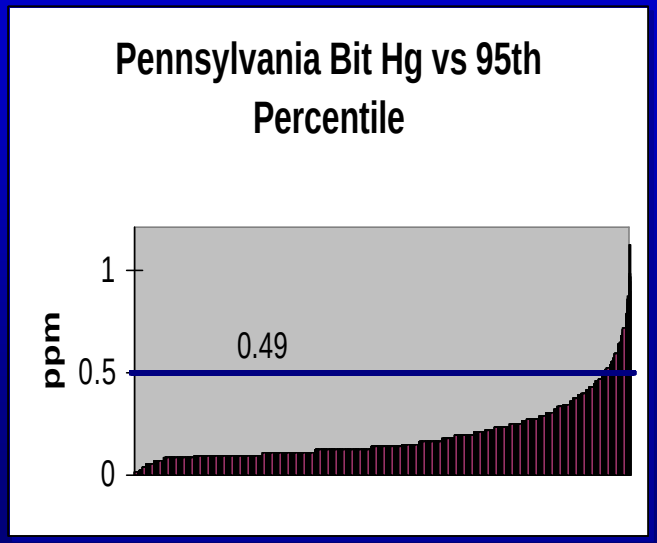


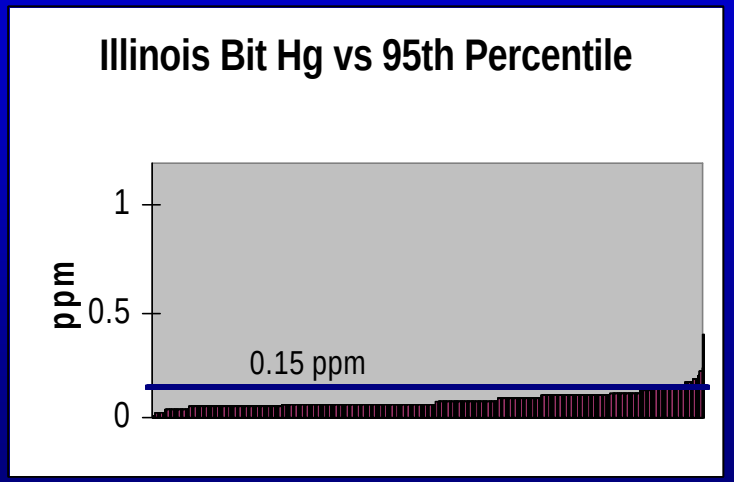


U.S. ENERGY: MERCURY MACT DISCUSSION
ICR Data 95th Percentile-Midwest/Eastern Bit. Coals









Mercury MACT Summary

U.S. ENERGY: MERCURY MACT DISCUSSION
NMA Core Issues

- The estimated amount of mercury emissions under a MACT rule should be between 30-33 tons per year from existing coal-fired power plants
- The less stringent of a lbs/trillion Btu or percent reduction standard
- Standard should not preclude emerging technologies and pre-combustion Hg reduction options
- Mercury control technology should be based on the following criteria:
  - Cost-effective
  - Verifiable public health benefits
  - Worst case fuel variability and operating scenarios should be taken into account in a manner consistent with Clean Air Act requirements

U.S. ENERGY: MERCURY MACT DISCUSSION
Concerns of Unbalanced Mercury Regulations

- Loss of fuel diversity
- Fuel switching to high cost, higher use fuels (natural gas/imported oil)
- Higher energy prices and its health impacts on the poor
- Strain on electric reliability
- No measurable environmental benefit
- Cost to electric utility industry

U.S. ENERGY: MERCURY MACT DISCUSSION
Mercury Regulation Criteria

- **Mercury control technology should be based on the following criteria:**
  - **Cost-effective**
  - **Verifiable public health benefits**
  - **Worst case fuel variability and operating scenarios should be taken into account in a manner consistent with Clean Air Act requirements**

U.S. Energy Policy: Mercury MACT Discussion

National Mining Association Briefing with the Environmental Protection Agency

Research Triangle Park, NC
April 10, 2003