Reinhold Environmental Ltd.

2007 APC Round Table & Expo Presentation

July 8-10, 2007
Chattanooga, TN
Hosted by TVA

Mercury Regulations

Carl V. Weilert, P.E.

Principal Air Pollution Control Engineer

cweiler@burnsmcd.com

Reinhold Environmental APC Roundtable

Workshop V

July 9, 2007

Presentation Topics

- Overview of the Clean Air Mercury Rule (CAMR)
- State-by-State Emission Reductions based on CAMR
  - For 2010
  - For 2018
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

Presentation Topics

- **Overview of the Clean Air Mercury Rule (CAMR)**
- State-by-State Emission Reductions based on CAMR
  - For 2010
  - For 2018
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

Overview of the Clean Air Mercury Rule

- Signed by U.S. EPA on March 15, 2005
  - Published in Federal Register May 18, 2005
  - Modifications published June 9, 2006
- Affects 50 States, D.C., and 2 Tribal Areas
- Targets mercury emission reductions from coal-fired utility units larger than 25 MW
- Program includes:
  - New source performance standards
  - “Cap and Trade” system for existing and new units
  - Requirements for continuous monitoring of mercury emissions by affected sources

Overview of the Clean Air Mercury Rule (Cont)

- Program to be implemented by the States
  - Each state must meet its mercury emission cap
  - State implementation plans must assure cap compliance
- Implementation in two phases:

Phase 1	**Phase 2**
Starts 1/1/2010	Starts 1/1/2018
Nationwide cap of 38 tons	Nationwide cap of 15 tons

- EPA established a Model Trading Rule for States to use in developing their SIPs
- EPA established a Federal Implementation Plan (FIP) for States that fail to submit a SIP

Overview of the Clean Air Mercury Rule (Cont)

New Source Performance Standards for Mercury Emissions

- Applicable to units commencing construction after January 30, 2004
- Subcategorized by coal and process type
- Expressed as lb/MW-hr on a gross output basis
- Compliance based on 12-month rolling average
- Continuous emission monitoring or sorbent traps required

Overview of the Clean Air Mercury Rule (Cont)

New Source Performance Standards for Mercury Emissions

Subcategory	"Final" Rule 10^{-6} lb/MWh
Bituminous	21
Subbituminous	
Using Wet FGD	42
Using Dry FGD	78
Lignite	145
Coal Refuse	1.4
IGCC	20

Overview of the Clean Air Mercury Rule (Cont)

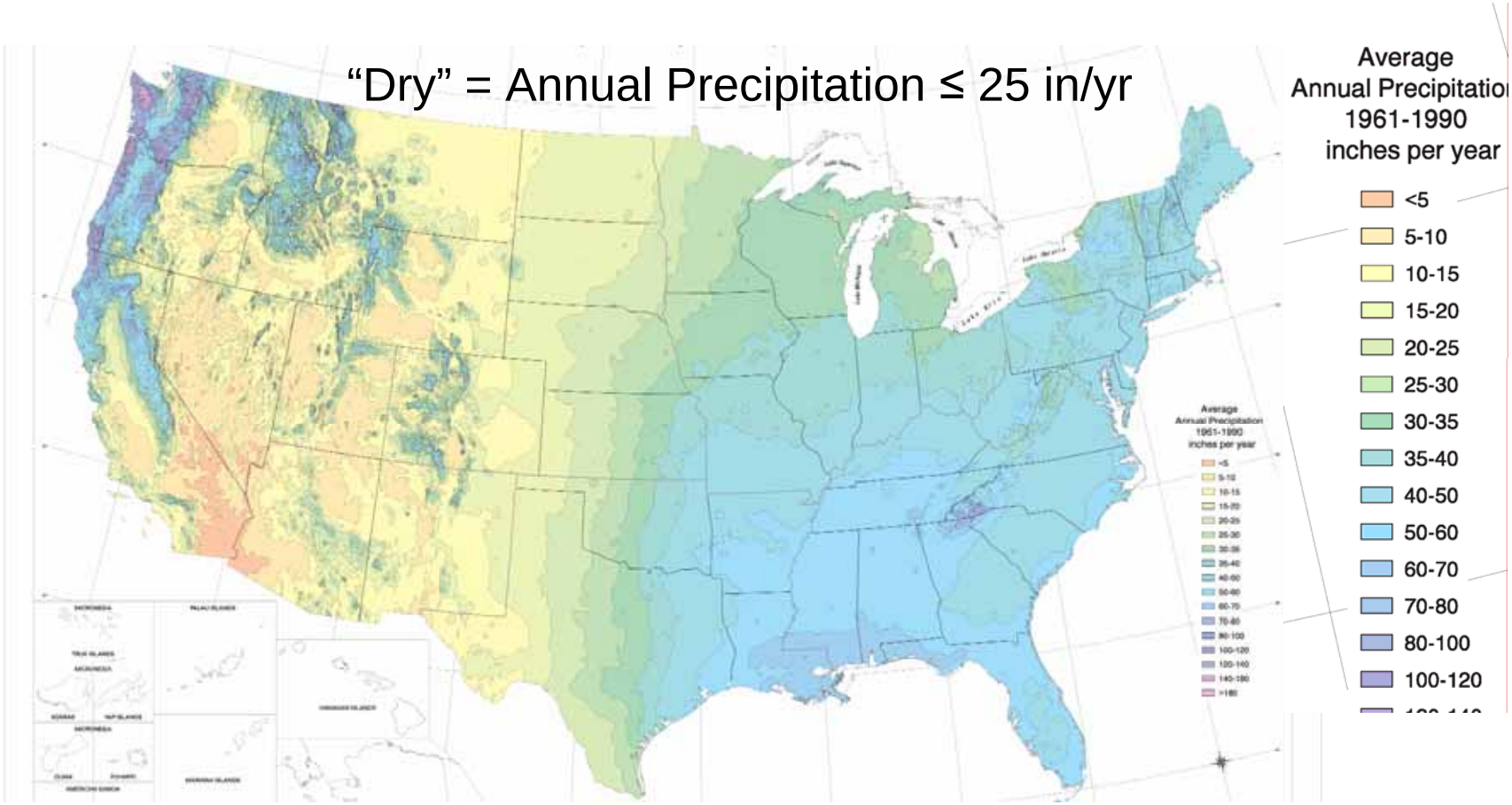
New Source Performance Standards for Mercury Emissions

Subcategory	"Final" Rule 10^{-6} lb/MWh	June 9, 2006 Change* 10^{-6} lb/MWh
Bituminous	21	20
Subbituminous		
In "Wet" Areas	42	66
In "Dry" Areas	78	97
Lignite	145	175
Coal Refuse	1.4	16
IGCC	20	20

*71 FR 33388

Overview of the Clean Air Mercury Rule (Cont)

Basis for Determination of "Wet" and "Dry" Areas



Overview of the Clean Air Mercury Rule (Cont)

Requirements of EPA's Model Trading Rule

- Each state was required to adopt regulations by 11/17/06 demonstrating compliance with EPA's cap
- Purpose of EPA's Model Trading Rule is to facilitate trading of mercury allowances
- State regulations may deviate significantly from EPA's Model Rule, as long as the cap is met
- Sources must monitor Hg emissions starting 1/1/2009 using Continuous Emission Monitors or Sorbent Traps.

Presentation Topics

- Overview of the Clean Air Mercury Rule (CAMR)
- **State-by-State Emission Reductions based on CAMR**
  - **For 2010**
  - For 2018
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

State-by-State Emission Reductions Based on CAMR
Calculation Methodology

- Emissions based on EPA's 1999 unit-by-unit emissions estimate used to derive state-by-state totals for 1999 (national total = 48 tons)
- State budgets for 2010 and 2018 as set by CAMR
- Reduction requirements calculated based on reduction in 1999 emissions needed to comply with state budget caps for 2010 and 2018
- Set-asides have not been considered

Emission Reductions Based on CAMR Phase 1

State	1999 Estimate	2010 Budget	% Reduction
Alaska	0.007	0.010	-43%
Alabama	2.466	1.289	48%
Arkansas	0.506	0.516	-2%
Arizona	0.475	0.454	4%
California	0.004	0.041	-925%
Colorado	0.255	0.706	-177%
Connecticut	0.036	0.053	-47%
D. C.	0.000	0.000	
Delaware	0.104	0.072	31%
Florida	0.961	1.232	-28%
Georgia	1.489	1.227	18%
Hawaii	0.008	0.024	-200%
Iowa	0.975	0.727	25%
Idaho	0.000	0.000	
Illinois	2.995	1.594	47%
Indiana	2.442	2.097	14%
Kansas	0.825	0.723	12%

Emission Reductions Based on CAMR Phase 1

State	1999 Estimate	2010 Budget	% Reduction
Kentucky	1.740	1.525	12%
Louisiana	0.503	0.601	-19%
Massachusetts	0.146	0.172	-18%
Maryland	0.910	0.490	46%
Maine	0.002	0.001	50%
Michigan	1.541	1.303	15%
Minnesota	0.632	0.695	-10%
Missouri	1.372	1.393	-2%
Mississippi	0.340	0.291	14%
Montana	0.471	0.377	20%
North Carolina	1.538	1.133	26%
North Dakota	1.024	1.564	-53%
Nebraska	0.417	0.421	-1%
New Hampshire	0.018	0.063	-250%
New Jersey	0.098	0.153	-56%
New Mexico	0.564	0.299	47%
Nevada	0.165	0.285	-73%

Emission Reductions Based on CAMR Phase 1

State	1999 Estimate	2010 Budget	% Reduction
New York	0.514	0.393	24%
Ohio	3.555	2.056	42%
Oklahoma	0.861	0.721	16%
Oregon	0.084	0.076	10%
Pennsylvania	4.979	1.779	64%
Rhode Island	0.000	0.000	
South Carolina	0.534	0.580	-9%
South Dakota	0.056	0.072	-29%
Tennessee	1.125	0.944	16%
Texas	5.023	4.656	7%
Utah	0.140	0.506	-261%
Virginia	0.633	0.592	6%
Vermont	0.000	0.000	
Washington	0.265	0.198	25%
Wisconsin	1.132	0.890	21%
West Virginia	2.466	1.394	43%
Wyoming	0.914	0.952	-4%

Emission Reductions Based on CAMR Phase 1

- Nationwide emissions of mercury would be reduced by 21% from the 1999 baseline of 48 tons
- However, 20 States would be allowed to *increase* emissions by 2010 compared to EPA's 1999 baseline emission estimate
- This is due to differences between the basis for the estimate and the method used to determine the state budgets
  - Emission estimate accounted for mercury content of coal burned, as well as projected effect of control equipment
  - Budgets were based on heat input and adjustment factors that were based on coal rank, and DID NOT account for mercury content of coal or the effect of control equipment

Presentation Topics

- Overview of the Clean Air Mercury Rule (CAMR)
- **State-by-State Emission Reductions based on CAMR**
  - For 2010
  - **For 2018**
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

Emission Reductions Based on CAMR Phase 2

State	1999 Estimate	2018 Budget	% Reduction
Alaska	0.007	0.004	43%
Alabama	2.466	0.509	79%
Arkansas	0.506	0.204	60%
Arizona	0.475	0.179	62%
California	0.004	0.016	-300%
Colorado	0.255	0.279	-9%
Connecticut	0.036	0.021	42%
D. C.	0.000	0.000	
Delaware	0.104	0.028	73%
Florida	0.961	0.487	49%
Georgia	1.489	0.484	67%
Hawaii	0.008	0.009	-13%
Iowa	0.975	0.287	71%
Idaho	0.000	0.000	
Illinois	2.995	0.629	79%
Indiana	2.442	0.828	66%
Kansas	0.825	0.285	65%

Emission Reductions Based on CAMR Phase 2

State	1999 Estimate	2018 Budget	% Reduction
Kentucky	1.740	0.602	65%
Louisiana	0.503	0.237	53%
Massachusetts	0.146	0.068	53%
Maryland	0.910	0.193	79%
Maine	0.002	0.001	50%
Michigan	1.541	0.514	67%
Minnesota	0.632	0.274	57%
Missouri	1.372	0.550	60%
Mississippi	0.340	0.115	66%
Montana	0.471	0.149	68%
North Carolina	1.538	0.447	71%
North Dakota	1.024	0.617	40%
Nebraska	0.417	0.166	60%
New Hampshire	0.018	0.025	-39%
New Jersey	0.098	0.060	39%
New Mexico	0.564	0.188	79%
Nevada	0.165	0.112	32%

Emission Reductions Based on CAMR Phase 2

State	1999 Estimate	2018 Budget	% Reduction
New York	0.514	0.155	70%
Ohio	3.555	0.812	77%
Oklahoma	0.861	0.285	67%
Oregon	0.084	0.030	64%
Pennsylvania	4.979	0.702	86%
Rhode Island	0.000	0.000	
South Carolina	0.534	0.229	57%
South Dakota	0.056	0.029	48%
Tennessee	1.125	0.373	67%
Texas	5.023	1.838	63%
Utah	0.140	0.200	-43%
Virginia	0.633	0.234	63%
Vermont	0.000	0.000	
Washington	0.265	0.078	71%
Wisconsin	1.132	0.351	69%
West Virginia	2.466	0.550	78%
Wyoming	0.914	0.376	59%

Emission Reductions Based on CAMR Phase 2

- Nationwide emissions of mercury would be reduced by 69% from the 1999 baseline of 48 tons
- However, 5 States would be allowed to *increase* emissions by 2018 compared to EPA's 1999 baseline
- This is due to differences between the basis for the estimate and the budget cap as described before.

Presentation Topics

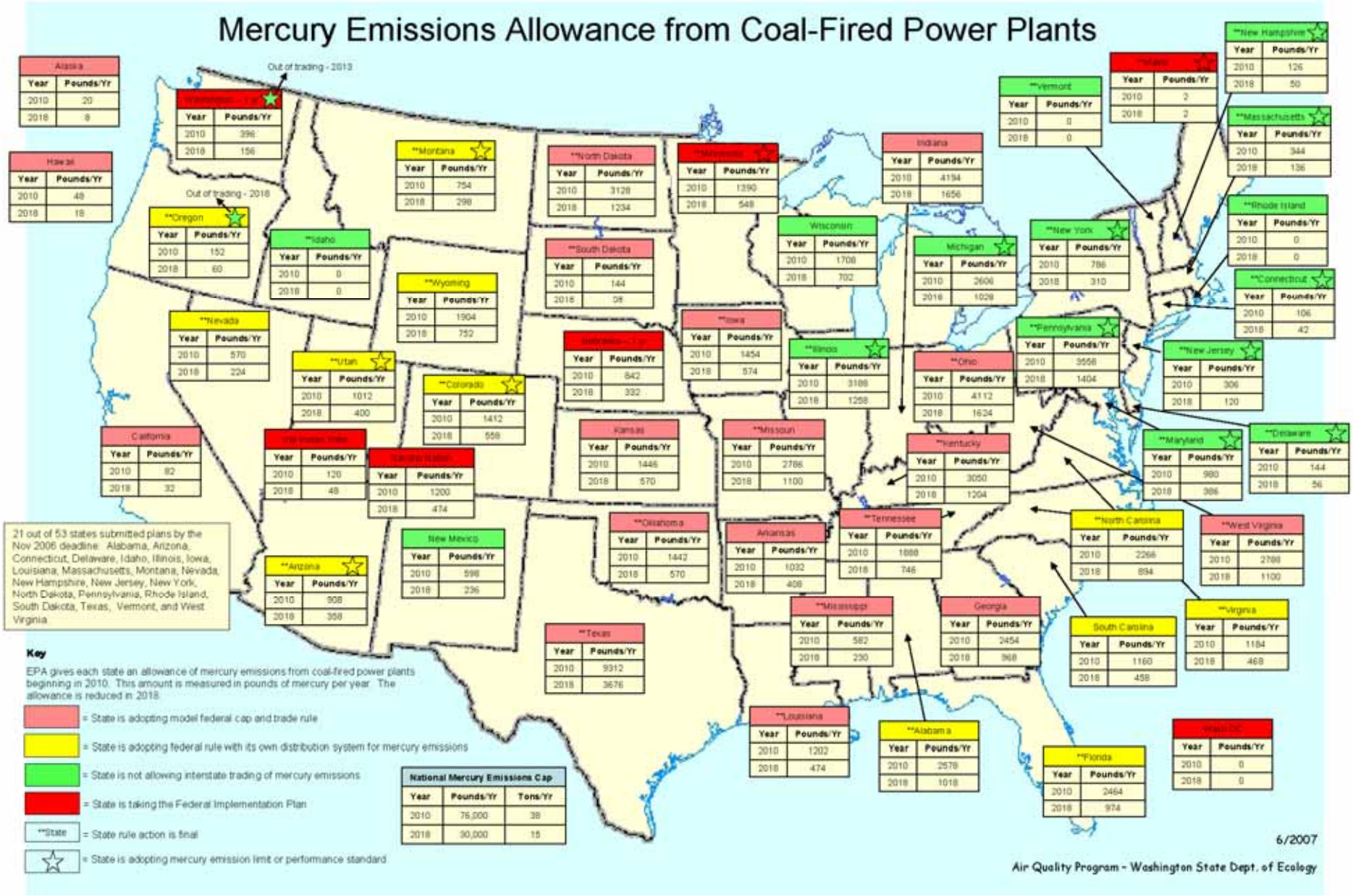
- Overview of the Clean Air Mercury Rule (CAMR)
- State-by-State Emission Reductions based on CAMR
  - For 2010
  - For 2018
- **State response to CAMR**
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

State Responses to CAMR

- Only 21 States submitted their Mercury Plans by the 11/17/06 regulatory deadline.
- States that failed to meet the deadline are at risk of imposition of the FIP by EPA
- Several States intend to allow EPA to impose the FIP
- Many States went beyond CAMR and required specific emission reductions from individual units
- Many States have accelerated the compliance date, especially for Phase 2

Status of State Mercury Plans

[Source = NACAA]



State Adoption of CAMR Model Rule

State	Adopt CAMR?	More Stringent?	Allow Trading?	2010 Cap
Alaska	Yes	No	Yes	0.01
Alabama*	Modified	No	Yes	1.29
Arkansas	Yes	No	Yes	0.52
Arizona*	Modified	Yes	Yes	0.45
California	Yes	No	Yes	0.04
Colorado	Modified	Yes	Yes	0.71
Connecticut*	No	Yes	No	0.05
D. C.	FIP	No	Yes	0.00
Delaware*	No	Yes	No	0.07
Florida	Modified	No	Yes	1.23
Georgia	Yes	?	Yes	1.23
Hawaii	Yes	No	Yes	0.02
Iowa*	Yes	No	Yes	0.73
Idaho*	No	No	No	0.00
Illinois*	No	Yes	No	1.59
Indiana	Yes	No	Yes	2.10
Kansas	Yes	No	Yes	0.72

State Adoption of CAMR Model Rule

State	Adopt CAMR?	More Stringent?	Allow Trading?	2010 Cap
Kentucky	Yes	No	Yes	1.53
Louisiana*	Yes	No	Yes	0.60
Massachusetts*	No	Yes	No	0.17
Maryland	No	Yes	No	0.49
Maine	FIP	Yes	No	0.00
Michigan	No	Yes	No	1.30
Minnesota	FIP	Yes	Yes	0.70
Missouri	Yes	No	Yes	1.39
Mississippi	Yes	No	Yes	0.29
Montana*	Modified	Yes	Yes	0.38
North Carolina	Yes	No	Yes	1.13
North Dakota*	Yes	No	Yes	1.56
Nebraska	FIP	No	Yes	0.42
New Hampshire*	No	Yes	No	0.06
New Jersey*	No	Yes	No	0.15
New Mexico	No	Yes	No	0.30
Nevada*	Modified	Yes	Yes	0.29

State Adoption of CAMR Model Rule

State	Adopt CAMR?	More Stringent?	Allow Trading?	2010 Cap
New York*	No	Yes	No	0.39
Ohio	Yes	No	Yes	2.06
Oklahoma	Yes	No	Yes	0.72
Oregon	Modified	Yes	Yes	0.08
Pennsylvania*	No	Yes	No	1.78
Rhode Island*	No	No	No	0.00
South Carolina	Yes	No	Yes	0.58
South Dakota*	Yes	No	Yes	0.07
Tennessee	Yes	No	Yes	0.94
Texas*	Yes	No	Yes	4.66
Utah	Modified	Yes	Yes	0.51
Virginia	Modifed	Yes	Yes	0.59
Vermont*	No	No	No	0.00
Washington	FIP	Yes	Yes	0.20
Wisconsin	No	Yes	No	0.89
West Virginia*	Yes	No	Yes	1.39
Wyoming	Modified	No	Yes	0.95

Presentation Topics

- Overview of the Clean Air Mercury Rule (CAMR)
- State-by-State Emission Reductions based on CAMR
  - For 2010
  - For 2018
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- **CAMR compliance issues**
  - For existing units
  - For new units
- Market Considerations for Mercury Allowances
  - Availability
  - Cost

CAMR Compliance Issues for *Existing* Units

- Problem:
  - Some States are requiring controls at all units
  - Some of these States are prohibiting trading
  - Example: Illinois
    - Requires 90% reduction
    - Prohibits interstate trading of allowances
  - Units burning high-sulfur coal and relying on PAC injection may not be able to achieve 90% reduction due to effects of SO_3

CAMR Compliance Issues for *New* Units

- Problem:
  - Must continuously comply with NSPS
  - Must also hold allowances to match emissions
  - EPA Model Rule provides a new unit "set-aside"
    - 5% of state budget for 2010 – 2014
    - 3% of state budget from 2015 on
  - For most States, this will not be adequate to cover the allowance needs of a large new unit
  - Allowance purchases may be required

CAMR Compliance Issues for New Units (Cont)

- Example: Missouri
  - State budget for CAMR Phase 1 = 1.393 tons
  - 5% set-aside = 0.07 tons = 139 pounds
  - EPA's adjusted NSPS limit = 66 x 10^{-6} lb/MWh
  - Assume new 500 MW unit with 85% capacity factor
  - Annual gross generation = 3,723,000 MWh
  - Annual Hg emission at NSPS = 246 pounds
  - This one new unit uses 177% of the set-aside

CAMR Compliance Issues for New Units (Cont)

- New units will need to do much better than the NSPS, based on limited set-aside availability.
- Recent Hg limits in some permits for new units are well below the NSPS levels
- This is especially true for PRB coal fired units where the NSPS limits are higher than the typical uncontrolled mercury emissions
- Most new plants are being designed for 90% mercury control on a “coal-to-stack” basis

Presentation Topics

- Overview of the Clean Air Mercury Rule (CAMR)
- State-by-State Emission Reductions based on CAMR
  - For 2010
  - For 2018
- State response to CAMR
  - Participation in nationwide trading program
  - States with mercury regulations more stringent than CAMR
- CAMR compliance issues
  - For existing units
  - For new units
- **Market Considerations for Mercury Allowances**
  - Availability
  - Cost

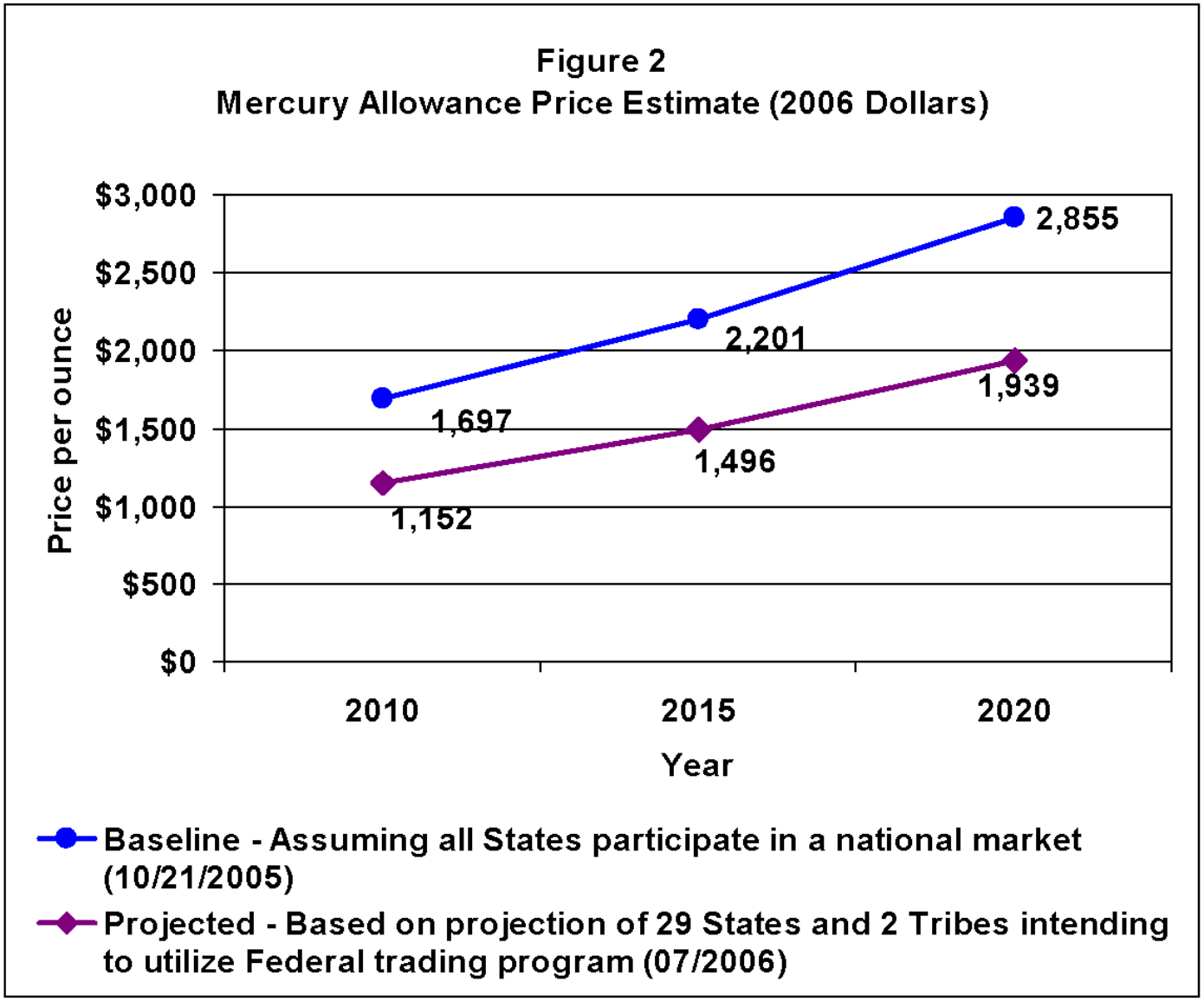
Market Considerations for Mercury Allowances
Key Questions

- What will be the effect of some States not participating in the trading program?
- Will there be a viable allowance market?
- What will allowances cost?

EPA's Responses to Allowance Trading Issues

- EPA expects co-benefit Hg control from SCR and FGD retrofits (due to CAIR) to create a large excess of mercury allowances in Phase 1
- EPA modeling studies have estimated that the effect of failure of some States to participate in the trading program will be a *reduction* in allowance prices
- EPA estimates that mercury allowance costs in 2010 will range between $1,152 and $1,697 per ounce (in 2006$).

EPA's Mercury Allowance Cost Estimate



Source: EPA Analysis

Assessment of Allowance Market Potential

- Based on analysis of 2010 caps for states that will participate in the Model Rule trading program, 30 tons of the 38 ton Phase 1 cap will be covered by interstate trading programs
- At least 5% of this will be set aside for new units and some states may not allocate the full 95% to existing units
- The extent to which a market develops will depend on:
  - The degree of reduction achieved by existing units
  - The willingness of utilities to trade “off system”

The End

Thank You!

Questions?