

Market Power Implications of EPA's Proposed Alternative Allowance Allocations under CATR for 2012-13

May 9, 2011

CRA Charles River
Associates

Overview

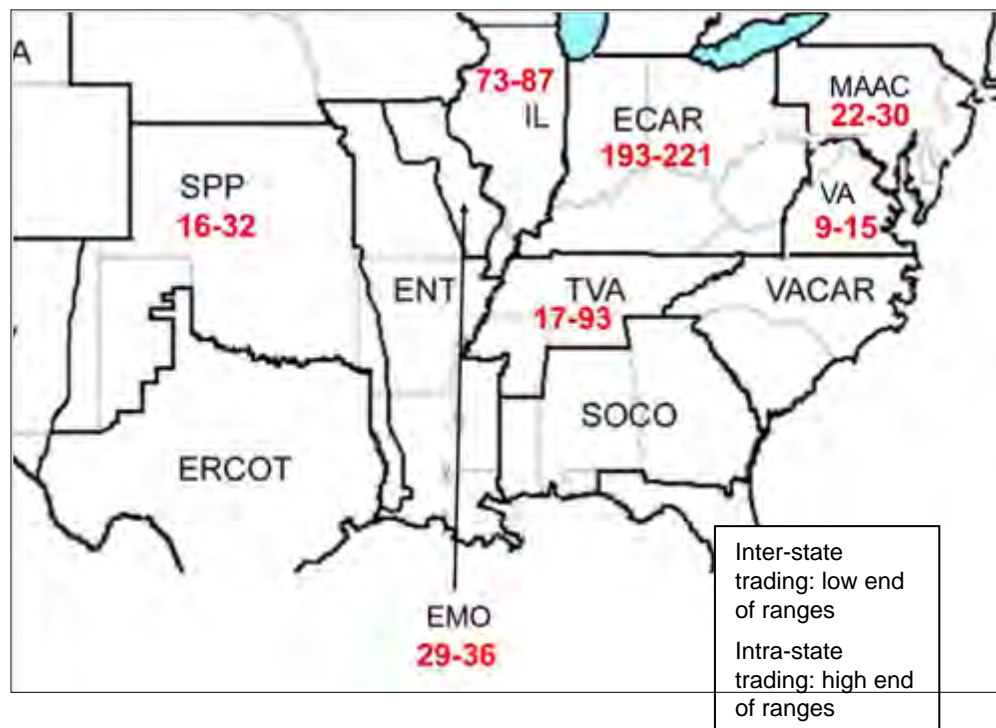
- Summary of Findings
- Introduction
- Market Power Implications
- Withholding Analysis
- Appendix

Key Findings

- Unlike EPA's initial 2010 Clean Air Transport Rule (CATR) proposal, its January 7 Notice of Data Availability's (NODA) alternative allocation proposals concentrate a large number of SO₂ allowances in the hands of a few entities that do not need them to operate their generating units, giving them market power, which they can exercise by withholding allowances from the market
- Excess SO₂ allowances are likely to have little, if any, value by 2015 according to EPA's analysis of the proposed Air Toxics Rule. Accordingly, holders of surplus allowances are not likely to bank them. Instead, they are more likely to use them to reduce their operating costs
- Withholding CATR SO₂ allowances from the market is in the self interest of electrical generating units (EGUs) that have been given the largest amount of surplus allowances under EPA's NODA allocation proposals
- Withholding leads to increased allowance prices, and consequently increased consumer power prices by as much as \$514 million per year in 2012 and 2013

Withholding Allowances May Increase Annual Consumer Power Costs Up to \$514 Million

Annual Increase in Electricity Costs Resulting from NODA vs.
EPA's Initial Transport Rule Proposal (million \$ 2010)



- Consumers in the Midwest bear the greatest increase in power costs
- Despite the added cost to consumers, the NODA proposals do not provide any environmental benefits since EPA imposes the same regional cap on SO₂ emissions under the initial proposal and the NODA's

Introduction

- GE EFS engaged CRA to look at the opportunity to exercise market power in both the allowance and wholesale power markets that EPA's proposed alternative allocation methodology (NODA) would give holders of surplus SO₂ allowances
- Two of EPA's three trading alternatives specified in the July 2010 Notice of Proposed Rule Making (NPRM) are analyzed in this report:
 - State budgets with inter-state trading (referred to as "Preferred Alternative" by EPA)
 - State budgets with intra-state trading (referred to as "Alternative 1" by EPA)
- EPA's Alternative 2 is plant-level command-and-control. CRA did not evaluate this trading option because there is no market power under this option

Initial CATR Proposal – Does Not Exhibit Significant Market Concentrations

- EPA's proposed initial allocation, based on historical emissions and adjusted for anticipated 2012 allowance requirements, was intended to give each EGU approximately the allowances it needed, less a small amount
- The initial proposal resulted in most EGUs, both nationally and within a state, being net-short or net-long in allowances by a small amount
- To comply with the overall state cap (or group cap under inter-state trading), individual EGUs would have been required to reduce their output slightly, or perform a combination of the following:
 - Use more expensive, lower sulfur coal
 - Operate FGDs at higher levels
 - Change dispatch
 - Purchase allowances from other EGUs
- Those companies that have lower-cost SO₂ control options would reduce emissions more than they needed, and sell allowances to companies that have higher-cost options
- The volume of allowances sold would be small since they would occur only with changes in companies' operations, primarily fuels, and dispatch mix
- Thus, the allowance allocation under the initial CATR proposal did not result in any significant market concentrations

January 2011 NODA – Same SO₂ Cap...Different Allocation Methodology

- The two alternative allocation methodologies provided in the NODA do not distribute allowances based on need:
 - **NODA Alternative 1:** allocations based on heat input for each fuel type
 - **NODA Alternative 2:** has the same initial allocation pattern as Alternative 1, but adds a limit on allocations based on a unit's "reasonably foreseeable maximum emissions under the proposed Transport Rule trading programs"
- The total amount of available allowances under the NODA is virtually identical to allowances under EPA's initial proposal. Since demand is also the same in both proposals, allowance prices should be unchanged
- However, allowance and power prices will likely increase if a few entities receive large amounts of allowances that are not required for operations, and especially if the concentration of surplus allowances creates market power, enabling entities to profitably withhold significant numbers of allowances from the market

January 2011 NODA – Allocation Methodology Results in High Concentrations of Surplus Allowances

- The two alternative allocation methodologies proposed in the NODA, both result in a high degree of concentration of surplus allowances
- Any market power analysis must be focused on shares of surplus allowances, not total allowances, since only the surplus allowances are available to buyers
 - The allocation of allowances under NODA Alternative 1 result in a highly concentrated market conducive to the exercise of market power
 - Standard anti-trust measures indicate still higher concentrations for NODA Alternative 2 in most states and hence a greater risk of market power
 - For example, in Pennsylvania the two holding companies with large surplus allowance positions for whom we test withholding strategies have 96,000 excess allowances with Allocation 2 and 72,000 with Alternative 1
 - CRA's analysis conservatively focuses on Alternative 1
- While EPA looked at the market power effects of allowance allocations under the initial CATR proposal, it did not conduct a similar analysis with regard to the NODA

Large Imbalances in Market Concentration Can Lead to Increased Allowance and Power Prices

- For NODA Alternative 1, owners of scrubbed coal units are allocated far more allowances, and owners of un-scrubbed units far fewer than needed for anticipated operations
- In any particular state, a single owner may control the majority of allowances not needed to dispatch its own units, but needed by others to dispatch theirs
- Even if one owner is not dominant, concentration of allowances in the hands of several owners enables oligopolistic pricing
- Withholding allowances from competing EGUs that do not have enough allowances will result in higher allowance prices. Two things happen when allowance prices go up:
 - An un-scrubbed price-setting coal unit has a higher variable cost and electricity prices rise
 - Some coal units run less and what were initially higher-cost units run more, again raising the price of electricity

Measures of Market Concentration

- **Market share:** anti-trust agency guidance about market share:
 - The antitrust agencies regard a share of 35 percent or more as indicative of a serious potential for exercising unilateral market power
 - The Federal Energy Regulatory Commission generally regards a share of 20 percent as a threshold for concern
- **Herfindahl-Hirshmann Index (“HHI”):** used by the antitrust agencies (DOJ and FTC) and FERC to measure market power
 - The HHI is the sum of squares of market shares; for example 10 firms, each of which has a 10 percent share yields an HHI of 1,000
 - Under the guidelines used by the agencies, an HHI of 1,500 is moderately concentrated and 2,500 is highly concentrated and ripe for abuse
 - FERCs guideline levels are lower, with boundaries of 1,000 (moderate) and 1,800 (high)

*** Note on HHI :**

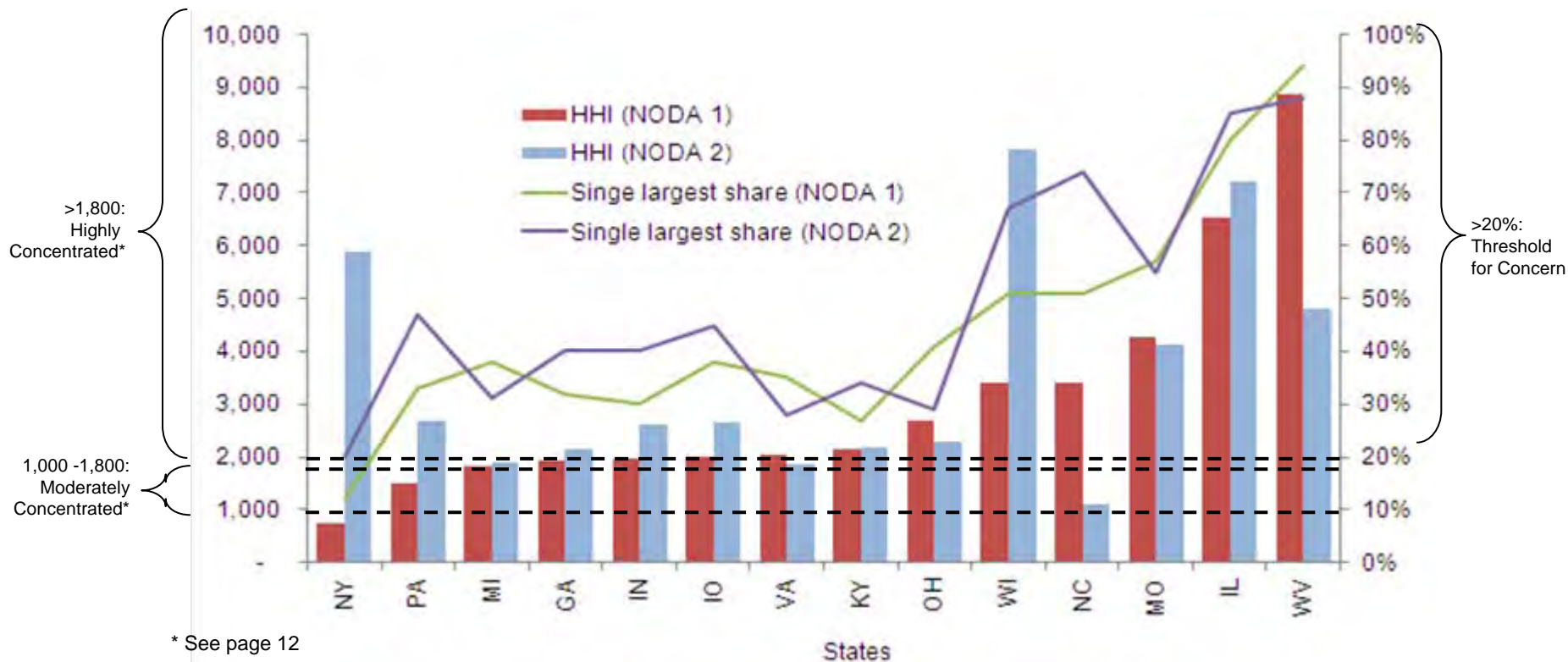
HHIs are a measure of market power in a single product market – in this case, the market for allowances. Because allowance holders are also in the wholesale power market, they are able to leverage the effect of withholding in the allowance market to a considerable extent, making a large HHI very troublesome. As a consequence, a modest HHI does not rule out the ability of surplus allowance holders to withhold allowances, which in turn can drive up power prices

States Show High Concentration of Surplus Allowances Under Both NODA Alternatives

Herfindahl-
Hirshmann
Index

Intra-State Trading Case

Single largest
market share



Markets are concentrated, and shares of the largest potential suppliers are high in all states except New York, where it is unconcentrated in NODA Alternative 1

Companies Allocated More Allowances Than Required Have a Potential Incentive to Withhold

- There are three types of potential sellers:
 - **Independent Power Producer generators:** these retain all increased profits arising from withholding
 - **Partly regulated generators:** these include all regulated generators that do not purely pass-through all fuel and purchased power costs and allowance revenues. This group includes most or all vertically integrated, regulated utilities. The optimum withholding strategy will be similar or identical to the IPP generators' strategy
 - **Fully regulated generators:** in this idealized case, there is no direct profit incentive to withhold (or not). However, there is an indirect incentive to the utility since reducing its relative rates when others increase theirs' makes for more satisfied customers and hence more supportive regulators. Moreover, a combination of higher allowance prices and higher prices for wholesale sales, netted off of costs passed through in rates, would often lead to lower rates for regulated native load customers, but higher rates for everyone else

Withholding in the Inter-state Case

- If inter-state trading is allowed without limit, then the market structure of net-long allowances is unconcentrated ($HHI = 479$)
- This ordinarily would suggest that market power could not be exercised profitably within the allowance market. However, leveraging higher allowance prices into the power market creates an additional incentive. As a consequence, the same withholding strategy that is profitable for the large net sellers in the intra-state case remains profitable in the inter-state trading case notwithstanding the low HHI
- A withholding strategy has little risk of detection and sanction since there are opportunities to use withheld allowances for the EGU's own production to reduce costs, providing cover for the withholding strategy

Procedure

- We used our North American Electricity and Environment Model (“NEEM”)¹ to explore the types of strategies that sellers can employ to maximize profits from the sale of power and the management of allowances in Group 1 states
 - The Group 1 states (see map in Appendix p. 26) are defined in the CATR NPRM as those states whose EGUs have a greater SO₂ impact than the Group 2 states, according to the EPA. As a result, SO₂ caps in Group 1 states become tighter in 2014, while Group 2 state caps remain constant
- We considered two market scenarios, which correspond to EPA’s assumptions:
 - 15 individual state markets (intra-state trading only)
 - One single 15-state market (inter-state trading)
- Next, we evaluated the profit impact of shifting from the initial allocation to the January 7 NODA allocation (Appendix pgs 31 and 36)

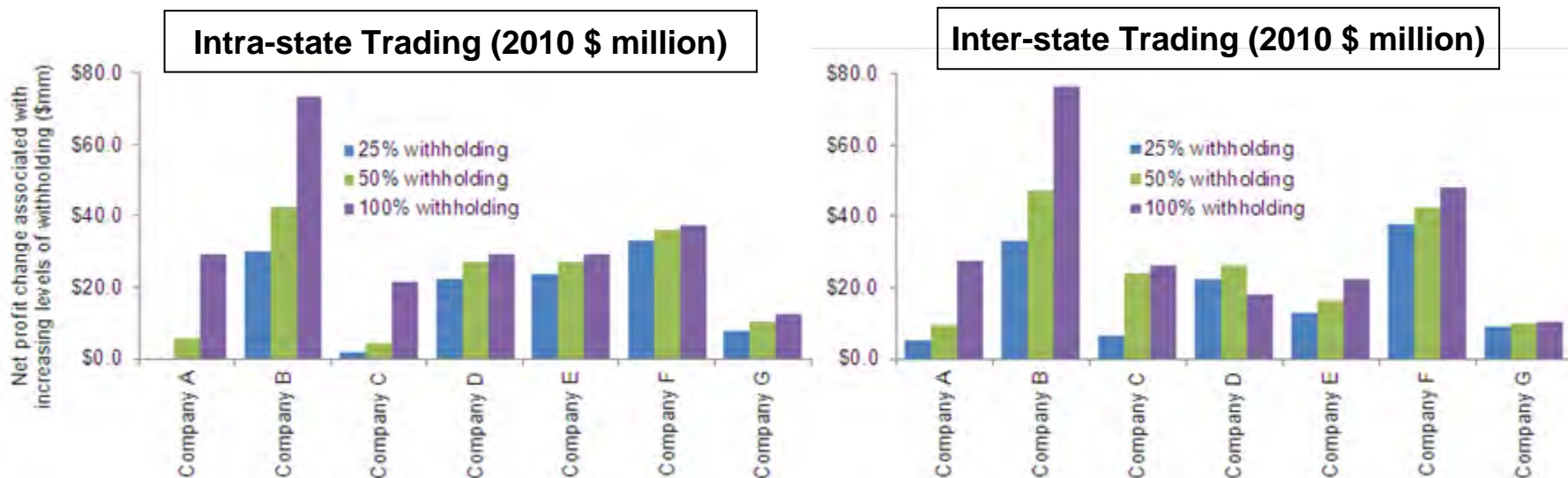
¹ NEEM is CRA’s linear-programming model of the North American electric sector. NEEM finds the least-cost path to production over multiple years, while meeting electricity demand and satisfying all environmental policy constraints such as CATR and state Renewable Portfolio Standards (RPS).

Procedure

- Finally, we compared how different levels of withholding under the NODA allocation affect the prices of allowances (Appendix pgs 27 and 32) and the cost of power (Appendix pgs 28 and 33)
- We assumed that one dominant company with surplus allowances in each of seven of the Group 1 states would withhold its allowances in both trading cases
 - Since no companies had clearly dominant positions in the eight other Group 1 states, we assumed no company withheld its allowances in these states
 - The choice of which companies would withhold was based solely on their share of surplus allowances in a particular state
 - We tested withholding strategies based on the assumption that the seven EGUs with a dominant surplus allowance position in a state would withhold 25%, 50% or 100% of those surplus allowances in that state
 - We assumed all others companies trade
- This withholding analysis allowed us to isolate a transfer of consumer wealth to EGUs
- All dollar values are reported in 2010 dollar terms

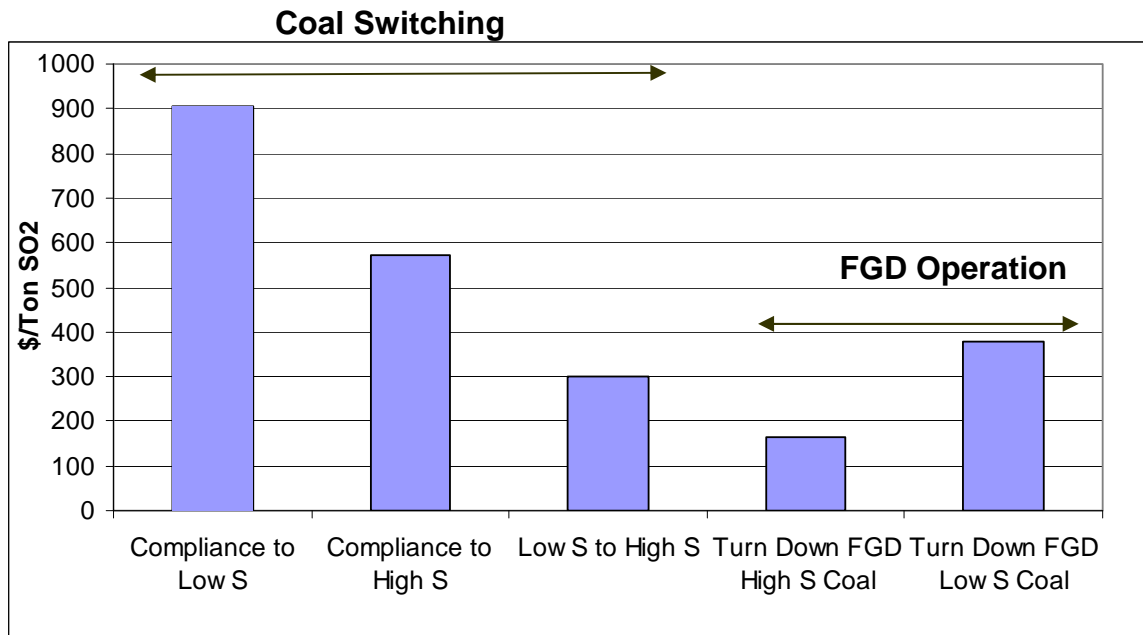
Results – EGUs Controlling a Large Percentage of Allowances in Their States Have an Economic Incentive to Withhold

- The charts below show results for three levels of withholding under the NODA allocation
- The incremental profits shown are measured against a base case, which is the initial CATR proposal without withholding, and consist of two components:
 - The value of the increased proportion of allowances allocated to the seven dominant companies under the NODA (see slides 29 and 34)
 - Incremental profits due to the effects of withholding on allowance prices and power prices (see slides 30 and 35)
- The seven dominant companies in aggregate are assumed to withhold up to 40% of the total Group 1 surplus allowances, which equates to 6% of the total allowances available in the 15 Group 1 states



Surplus Allowances Can Be Used to Reduce Variable Costs

- Entities that withhold allowances under the NODA can manage their surpluses by using them to reduce operating costs in the period before January 1, 2015 if the Air Toxics Rule comes into effect as proposed by EPA
- The chart below illustrates options that are available to EGUs to reduce their operating costs by using surplus allowances



For example, the fourth bar represents an option to use an allowance to reduce variable costs by approximately \$160 by reducing FGD on a unit with a 4 lb/MMBtu coal

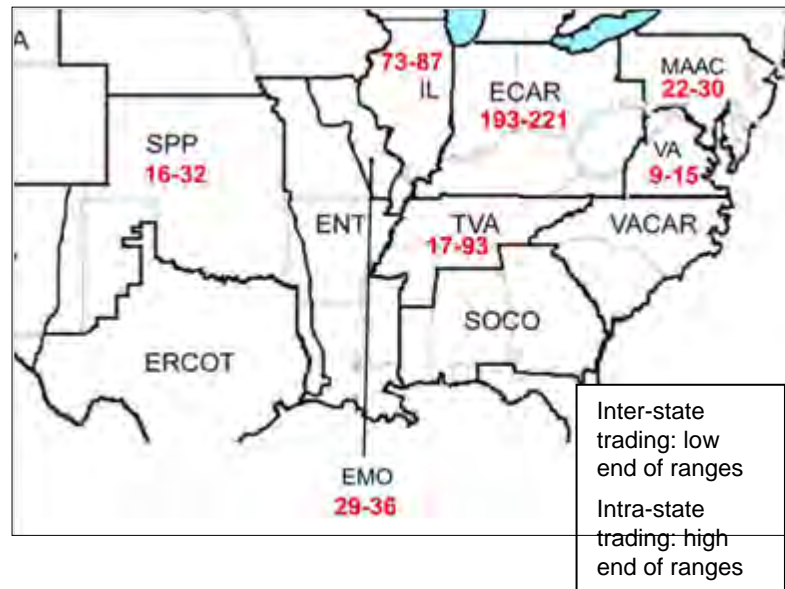
Notes on Withholding Analysis

- It could be argued that a fear of allegations of market manipulation (whether or not justified) may temper surplus allowance-holders' behavior. However, we doubt that such fears will have a significant impact on willingness to withhold since market manipulation intent is largely indistinguishable from the intent to use allowances or bank them for future use
- Limitations to our withholding analysis:
 - To be conservative, we only allowed for potential cost savings from reduced FGD operations. We did not allow for potential fuel cost savings from switching to higher sulfur coals. As a result, our estimate of the incentive to withhold may be understated
 - In conducting the analysis we did not look at individual EGUs to determine if there are permit or other restrictions that might limit the ability of an EGU to use allowances to reduce costs

Key CRA Findings

- The NODAs increase annual power costs by at least \$359 MM (inter-state trading) and potentially as much as \$514 MM (intra-state trading)
- Consumers in the Midwest bear the greatest increase in power costs
- Higher power prices benefit entities receiving large surpluses including those that do not withhold, since non-withholding surplus firms also benefit from higher allowance and power prices
- No environmental benefits accrue from the change from the July allocation to the NODA allocation

**Annual Increase in Electricity Costs Resulting from NODA vs.
EPA's Initial Transport Rule Proposal (in million \$ 2010)**



Appendix

Comparison of CRA and EPA Allowance Prices

- EPA's July CATR intra-state regulatory impact analysis assumed high (\$6.50/MMBtu) gas prices and the viability of banking as a strategy
- These assumptions led EPA to estimate high allowances prices
- CRA assumed low (\$4.50/MMBtu) gas prices in 2012, consistent with the current actual futures prices, and no banking because the Toxics Rule effectively renders allowances worthless as of 2015 value by 2015 according to EPA's analysis of the proposed Air Toxics Rule
 - That said, to demonstrate the fact that CRA's and EPA's analytical methodologies are consistent, we conducted a sensitivity analysis, the results of which are shown on the second line below. In this analysis, we assumed that banking is a viable EGU strategy and that gas prices are significantly higher than is indicated by the current futures market price.
- The figure below shows the combined effect of higher gas prices (+\$2.00/MMBtu at HH) and banking on the market price of SO₂ allowances

Allowance prices (2010 \$)

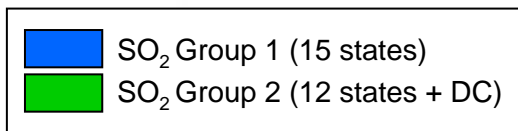
	Kentucky	Illinois	Indiana	Missouri	Ohio	Pennsylvania
CRA - Low Gas / No Banking	\$ 478	\$ 673	\$ 474	\$ 1,417	\$ 559	\$ 559
CRA - High Gas / Banking	\$ 1,231	\$ 2,089	\$ 1,202	\$ 2,678	\$ 1,209	\$ 1,209
EPA	\$ 1,629	\$ 2,715	\$ 1,412	\$ 1,086	\$ 1,195	\$ 1,195

High allowance prices might have led EPA to conclude that surplus allowance holders would trade instead of withholding allowances that are not needed for operations

Background on Clean Air Transport Rule (CATR)

- EPA promulgated the Clean Air Inter-state Rule (CAIR) in 2005 to control emissions of SO_2 and NO_x in 28 Eastern States and D.C.
- In 2008, the D.C. Circuit remanded CAIR to EPA, holding that regulation did not adequately address Clean Air Act requirements
- EPA proposed CATR in August 2010 to replace the CAIR program to address the court's concerns
- CATR is scheduled to be finalized June 2011
- CATR imposes SO_2 and NO_x caps in 2012 (Phase I) and a more stringent SO_2 cap in 2014 affecting the 15 Group 1 states (Phase II)
- As originally proposed, Phase I caps are based on emission reductions achieved by operation of existing and planned pollution control equipment
- Phase II caps are based on computer modeling of air quality needs and controls that can be “reasonably” installed by 2014

EPA's Group Designation of States



Group 1

Georgia
Illinois
Indiana
Iowa
Kentucky
Michigan
Missouri
New York
North Carolina
Ohio
Pennsylvania
Tennessee
Virginia
West Virginia
Wisconsin

Group 2

Alabama
Connecticut
Delaware
District of Columbia
Florida
Kansas
Louisiana
Maryland
Massachusetts
Minnesota
Nebraska
New Jersey
South Carolina

Allowance Prices (2010 \$ per ton)

Intra-state Trading Case

		Withholding of Excess Allowances by the Dominant Company in Each State			
		0%	25%	50%	100%
Kentucky	Amount of State SO2 Allowances Withheld (%)	0%	1%	2%	5%
	Price	\$ 478	\$ 478	\$ 478	\$ 478
Illinois	Amount of State SO2 Allowances Withheld (%)	0%	2%	5%	10%
	Price	\$ 673	\$ 709	\$ 743	\$ 829
Indiana	Amount of State SO2 Allowances Withheld (%)	0%	1%	2%	3%
	Price	\$ 474	\$ 494	\$ 514	\$ 557
Missouri	Amount of State SO2 Allowances Withheld (%)	0%	2%	4%	8%
	Price	\$ 1,417	\$ 1,457	\$ 1,558	\$ 1,692
Ohio	Amount of State SO2 Allowances Withheld (%)	0%	2%	4%	9%
	Price	\$ 559	\$ 581	\$ 598	\$ 655
Pennsylvania	Amount of State SO2 Allowances Withheld (%)	0%	5%	10%	19%
	Price	\$ 559	\$ 581	\$ 598	\$ 655
West Virginia	Amount of State SO2 Allowances Withheld (%)	0%	2%	5%	9%
	Price	\$ 604	\$ 675	\$ 720	\$ 817
Rest of Group 1	Amount of State SO2 Allowances Withheld (%)	0%	0%	0%	0%
	Price	\$ 1,241	\$ 1,261	\$ 1,292	\$ 1,330

Annual Increased Wholesale Power Cost to Load Zones (2010 \$)

Intra-state Trading Case

	Base Costs	Additional Costs Due to SO2 Allocation Withholding Strategies		
		25% Withholding	50% Withholding	100% Withholding
ECAR	\$ 19,933	\$ 51	\$ 104	\$ 221
EMO	\$ 2,562	\$ 8	\$ 18	\$ 36
IL	\$ 6,170	\$ 20	\$ 45	\$ 87
MAAC	\$ 11,352	\$ 2	\$ 17	\$ 30
SPP	\$ 9,614	\$ 6	\$ 18	\$ 32
TVA	\$ 8,375	\$ 15	\$ 51	\$ 93
VA	\$ 4,975	\$ 1	\$ 8	\$ 15
		\$ 103	\$ 260	\$ 514

Annual Impact of the NODA on the Value of Allocations before Withholding

Intra-state Trading Case

Withholding Company	Net Allocation Change (tons)	Option 1 Net Allocation Revenue (2010\$ millions)
A	(12,173)	(\$9.70)
B	32,964	\$18.40
C	12,905	\$0.12
D	23,934	\$15.74
E	15,146	\$21.47
F	60,875	\$33.22
G	8,315	\$3.94
Homer City	(62,633)	(\$35.00)

This is the annual change in value of allowance allocations to specific entities going from the original EPA allocation to the January NODA allocation, assuming no withholding

Incremental Annual Profits due to Withholding Surplus NODA Allocations

Intra-state Trading Case

(2010 \$ million)

Withholding Company	Net Profit Increase (\$, Millions)		
	25% Withhold	50% Withhold	100% Withhold
A	\$8.36	\$15.52	\$38.98
B	\$11.92	\$24.01	\$54.88
C	\$1.55	\$4.32	\$21.50
D	\$6.58	\$11.19	\$13.37
E	\$2.04	\$5.47	\$7.81
F	\$0.11	\$2.86	\$4.06
G	\$3.83	\$6.25	\$8.39
Homer City	(\$1.57)	(\$1.95)	(\$5.46)

Annual holding companies' profitability increases at the expense of consumers if the seven dominant companies withhold in the state in which they are dominant

Net Change in Annual Profit due to Allocation Change + Withholding

Intra-state Trading Case

(2010 \$ million)

Withholding Company	Net Profit Increase (\$, Millions)		
	25% Withhold	50% Withhold	100% Withhold
A	(\$1.34)	\$5.82	\$29.28
B	\$30.32	\$42.41	\$73.28
C	\$1.67	\$4.44	\$21.61
D	\$22.32	\$26.93	\$29.11
E	\$23.51	\$26.94	\$29.28
F	\$33.33	\$36.08	\$37.28
G	\$7.78	\$10.20	\$12.33
Homer City	(\$36.57)	(\$36.95)	(\$40.46)

This is the annual profit change due to the allowance imbalance created by the January NODA *plus* potential withholding by the seven dominant companies in the state in which they are dominant

Allowance Prices (2010 \$ per ton)

Inter-state Trading Case

		Withholding of Excess Allowances by the Dominant Company in Each State			
		0%	25%	50%	100%
Group 1	Amount of Group 1 SO2 Allowances Withheld (%)	0%	2%	3%	6%
	Price	\$ 615	\$ 634	\$ 665	\$ 710

Annual Increased Wholesale Power Cost to Load Zones (2010 \$)

Inter-state Trading Case

	Base Costs	Additional Costs Due to SO2 Allocation Withholding Strategies		
		25% Withholding	50% Withholding	100% Withholding
ECAR	\$ 19,908	\$ 66	\$ 99	\$ 193
EMO	\$ 2,531	\$ 11	\$ 18	\$ 29
IL	\$ 6,108	\$ 24	\$ 41	\$ 73
MAAC	\$ 11,320	\$ 1	\$ 5	\$ 22
SPP	\$ 9,529	\$ 9	\$ 9	\$ 16
TVA	\$ 8,158	\$ 3	\$ 7	\$ 17
VA	\$ 4,953	\$ 1	\$ 2	\$ 9
		\$ 115	\$ 182	\$ 359

Annual Impact of the NODA on the Value of Allocations before Withholding

Inter-state Trading Case

Withholding Company	Net Allocation Change (tons)	Preferred Option Net Allocation Revenue (2010\$ millions)
A	(12,173)	(\$7.49)
B	32,964	\$20.28
C	12,905	\$7.94
D	23,934	\$14.72
E	15,146	\$9.32
F	60,875	\$37.45
G	8,315	\$5.12
Homer City	(62,633)	(\$38.53)

This is the annual change in value of allowance allocations to specific entities going from the original EPA allocation to the January NODA allocation, assuming no withholding

Incremental Annual Profits due to Withholding Surplus NODA Allocations

Inter-state Trading Case

(2010 \$ million)

Withholding Company	Net Profit Increase (\$, Millions)		
	25% Withhold	50% Withhold	100% Withhold
A	\$12.88	\$17.09	\$35.21
B	\$12.99	\$27.13	\$56.44
C	(\$1.41)	\$16.31	\$18.49
D	\$7.60	\$11.48	\$3.21
E	\$3.46	\$7.26	\$13.13
F	\$0.30	\$5.33	\$10.82
G	\$3.76	\$4.68	\$5.17
Homer City	(\$1.33)	(\$3.52)	(\$6.10)

Annual holding companies' profitability increases at the expense of consumers if the seven dominant companies withhold in the state in which they are dominant

Net Change in Annual Profit due to Allocation Change + Withholding

Inter-state Trading Case

(2010 \$ million)

Withholding Company	Net Profit Increase (\$, Millions)		
	25% Withhold	50% Withhold	100% Withhold
A	\$5.39	\$9.61	\$27.72
B	\$33.27	\$47.41	\$76.71
C	\$6.53	\$24.25	\$26.42
D	\$22.32	\$26.20	\$17.93
E	\$12.78	\$16.57	\$22.45
F	\$37.75	\$42.77	\$48.27
G	\$8.87	\$9.80	\$10.29
Homer City	(\$39.86)	(\$42.05)	(\$44.63)

This is the annual profit change due to the allowance imbalance created by the January NODA *plus* potential withholding by the seven dominant companies in the state in which they are dominant