



# Any Which Way the Wind Blows: Estimating Air Emissions Benefits

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# Study

- Itron non-comprehensive estimation/adaptation of NEBs values to MD
  - Air Emissions, Comfort, O&M, and Arrearages
  - Part of broader review of cost effectiveness policy and methods in MD
- Political Analytics
  - Attempt at consensus



# Politics of NEBs

- Most currently valued at zero by default
- Uncertainty is the mantra of opponents
  - A few good studies?
- And fairness....
  - Comfort – Ratepayers pay for participant benefits
  - Emissions – Ratepayers pay for air benefits to Virginia or China
- After a year of discussion...
  - Some minds changed (incl. mine), some stayed made up, some stayed ambivalent, some became ambivalent



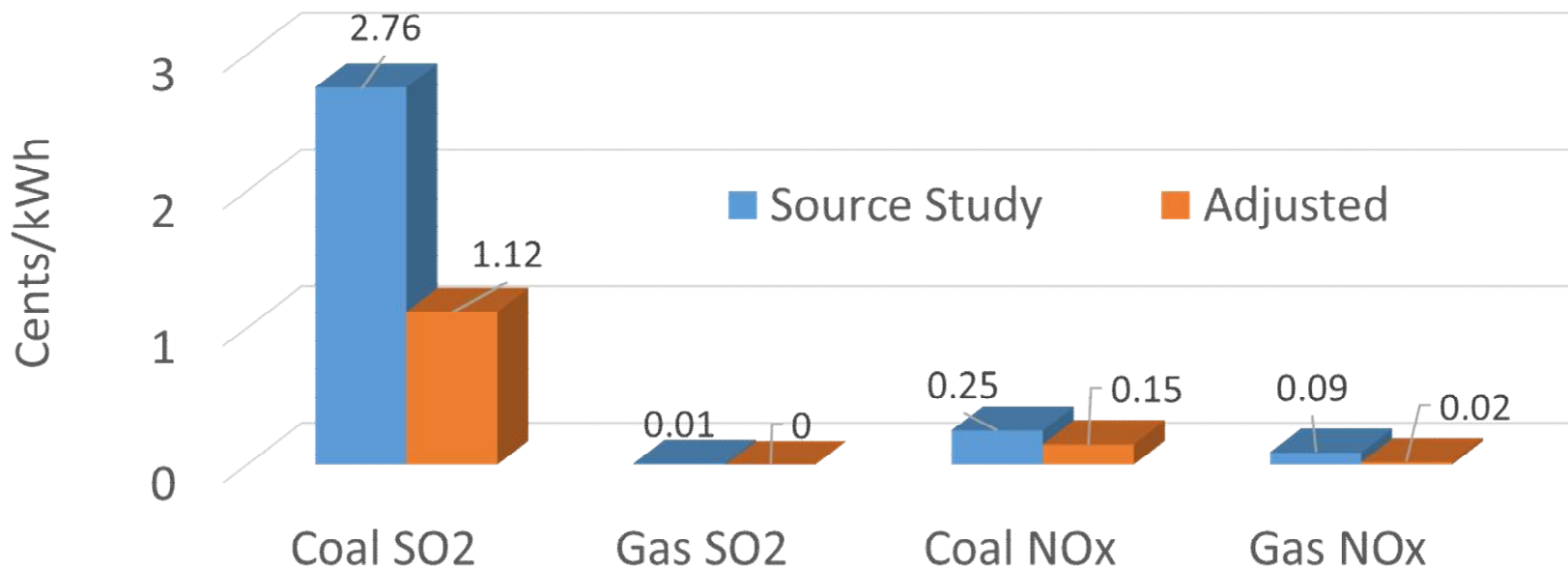
# Global SO<sub>2</sub> and NO<sub>x</sub> Valuation

- Source Study: National Research Council, Hidden Costs of Electricity (2010)
  - Mostly mortality and health damages
- Adjusted cents/kwh for coal and gas
  - \$2007 to \$2014
  - Converted to Weighted Average
  - Reflected emissions intensity reductions since 2007
  - Discounted future benefits
- Applied to PJM fuel mix



# Adjusted SO2 and NOx Damages

Weighted Average Emission Damages Source Study vs Adjusted

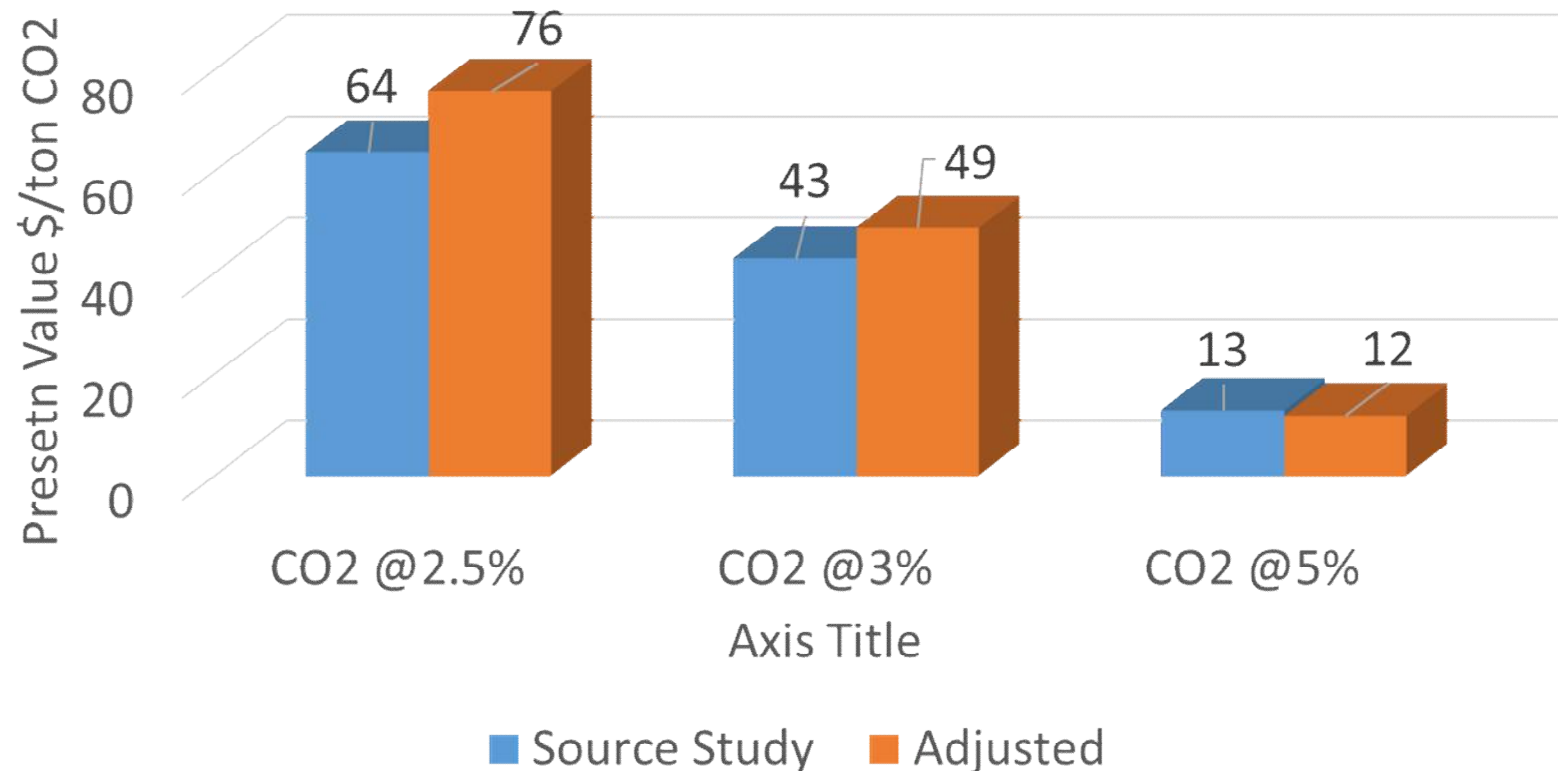


# Global CO2 Cost

- Federal Interagency Task Force on Social Cost of Carbon (2013)
  - Global Cost of Carbon Dioxide (\$2007/ton)
  - Mostly economic damages
- Adjustments
  - \$2007 to \$2014
  - Subtract RGGI allowance prices (\$3.26/ton)
  - Discount future benefits
    - CO2 value itself highly sensitive to discount rate

# Adjusted Global CO2 Cost

Global Social Cost of CO2:  
Source Study versus Adjusted



# Allocation of Benefits

- “What portion of benefits accrue to MD ratepayers?”
  - Question directed at SO<sub>2</sub> and NO<sub>x</sub>
  - Dispersion and population sensitivity models needed
  - Hmmmm....
- But CO<sub>2</sub> benefits swamp SO<sub>2</sub> and NO<sub>x</sub>
  - Uh oh!!



# Allocation of CO2 Benefits to a Sub-global Entity

## Per Capita Allocation

Jurisdiction	Population	CO2 Value (\$/ton)
Me	1	0.6 millionths of a cent
Maryland	6 million	\$0.03
Cambodia	15 million	\$0.09
California	39 million	\$0.22
United States	319 million	\$1.82
China	1,357 million	\$7.75
World	7,000 million	\$40

# Allocation of CO2 Benefits (cont'd)

- Be creative

- Per \$GDP, ability to respond, catastrophe adder, etc.

- Caveats

- Altruism or Reciprocity/Leveraging

- It is hard to justify a global benefit claim

- But if everybody thinks this way we're goners

# Benefit = 0.05 to 2.5 cents kWh

- VSL \$4m to \$8m
- Discount rate 3% to 5%
  - Aligned with MD discount rate consensus
  - i.e., CO2 global valuation \$15 to \$53 per ton
- Emissions 0.086% to 100%
- Should we take average, split, median, second order average, mid range scenario?

# Scenario Calculator

	Emissions Reductions	PV Damages over measure Life (\$)	PV Damages Cents per kWh Saved	Damages % Change to 2013 TRC
CO2 (metric tons)	3,416,361	97,212,079	1.40	20%
NOx (lbs)	3,196	4,954,705.53	0.07	1%
SO2 (lbs)	7,361	69,751,246.35	1.01	14%
Total	NA	171,918,031	2.48	35%
Assume:	<i>Real Discount Rate</i>		3.0%	<< User Entry
	<i>CO2 Price</i>		MED	
	<i>% CO2 Emissions Counted</i>		100.000%	
	<i>% NOx SO2 Emissions Counted</i>		100%	
	<i>VSL</i>		HIGH	



# In the End...

- We recommended...

- ☐ Add 1.1 cents/kWh to PV benefits
- ☐ 50% of emissions, 3% discount, \$5.9m VSL, midrange CO2 and emissions values

- PSC decided (in effect) ...

- ☐ 10% of emissions, 3% discount, \$5.9m VSL, midrange CO2 and emissions values

- Biggest challenge

- ☐ Sub-global valuation of emissions

