The Effect of Input Assumptions on the Results of IPM Modeling Runs Used to Predict Future Pollutant Emissions

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TWO TYPES OF REGULATION

- **COMMAND & CONTROL REGULATIONS**
  - New Source Review
  - New Source Performance Standards
  - Maximum Achievable Control Technology Standards

- **EMISSIONS CAP & TRADE REGULATIONS**
  - Title IV Acid Rain Program
  - NOX Budget Trading
  - Clean Air Interstate Rule (CAIR)

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ESTIMATING FUTURE EMISSIONS

- **THEN – COMMAND & CONTROL REGULATIONS**
  - Growth and Control Factors
  - Growth based on population and economic factors
  - Control based on expected installation of new equipment

- **NOW – EMISSIONS CAP & TRADE REGULATIONS**
  - Engineering economic models
  - Integration of regulatory and market drivers to meet the cap
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QUESTIONS:

- WHAT IS THE EFFECT OF INPUT ASSUMPTIONS ON EMISSIONS DISTRIBUTION?
- HOW DO CAP & TRADE REGULATIONS INTERFACE WITH COMMAND & CONTROL?

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MODELING RUNS COMPARED

- EPA 2.1.9
- RPO 2.1.9
- MARAMA 2.1.9 (5C)
- EPA 3.0

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MODELING RUNS COMPARED

- **EPA 2.1.9**
  - **Commissioned by EPA in 2004**
  - **Assess impact of CAIR**
  - **Run years: 2010, 2015, 2020 NOT 2018**

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MODELING RUNS COMPARED

- **RPO 2.1.9**
  - **Commissioned by Regional Planning Organizations (RPO) in 2005**
  - **EPA 2.1.9 was starting point for input assumptions**
  - **For use in SIP Modeling**
  - **Run years: 2009, 2012, 2018**

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MODELING RUNS COMPARED

- **MARAMA 2.1.9 5c**
  - **Commissioned by MARAMA in 2007**
  - **RPO 2.1.9 was starting point for input assumptions**
  - **Assess impact of lower CAIR caps**
  - **Run years: 2008, 2009, 2012, 2015, 2018**

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MODELING RUNS COMPARED

- **EPA 3.0**
  - **Commissioned by USEPA in 2006**
  - **EPA 2.1.9 was starting point for input assumptions**
  - **Extensive assumption updates make this a more current platform for policy studies, including proposed climate change bills in congress**
  - **Run years: 2009, 2012, 2018, 2020**

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INPUTS VARIED BETWEEN RUNS

- FUEL PRICE
- IMPLEMENTATION OF DOJ SETTLEMENTS
- STATE AND FEDERAL REGULATORY PROGRAMS

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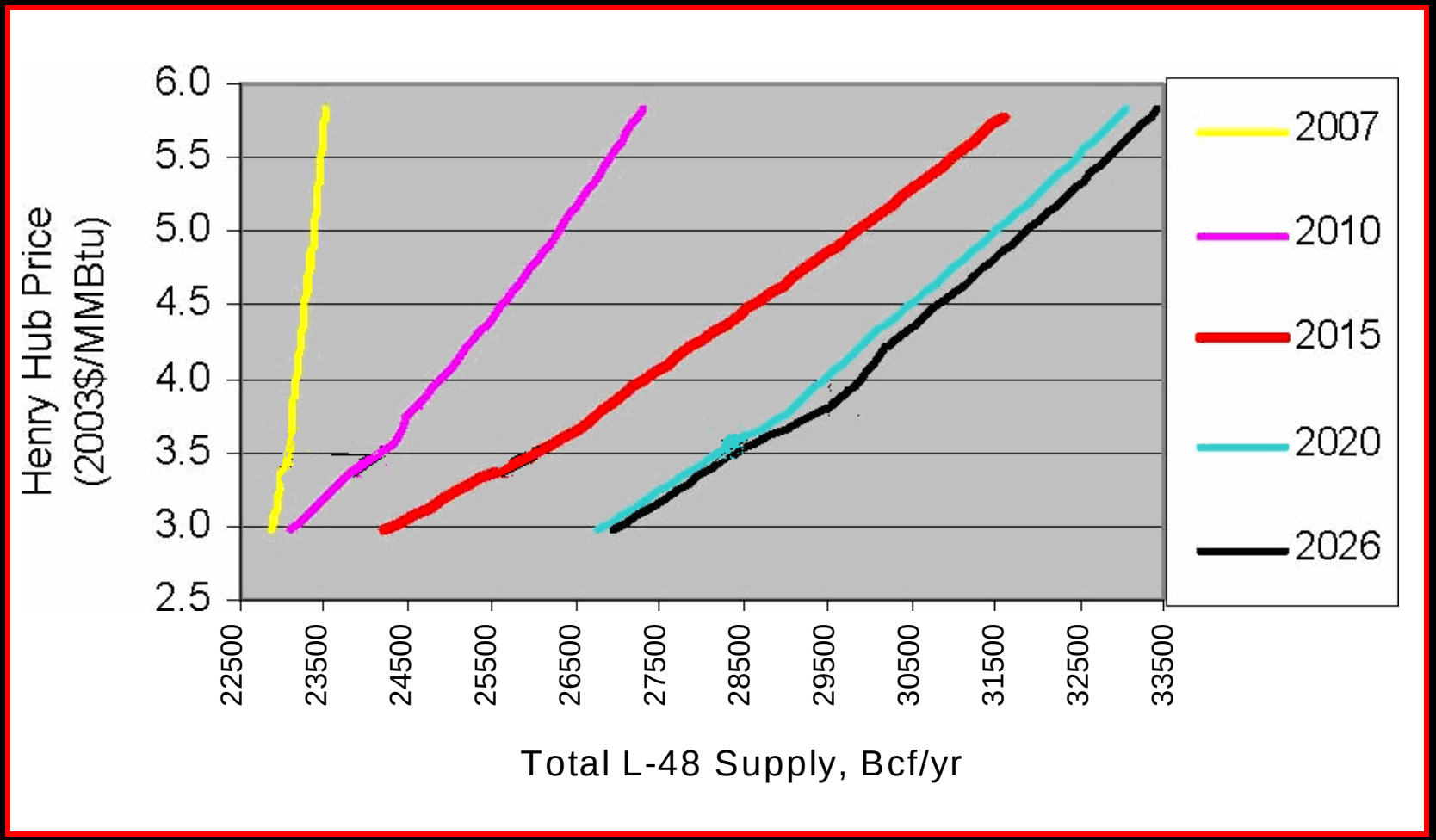
FUEL PRICE AND THE SUPPLY CURVE
EPA 2.1.9 NATURAL GAS



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Comparison of Delivered Fuel Costs in Lower-48 in Four IPM® Configurations

Run Name	IPM Version	Coal Cost (1999$)		Gas Cost (1999$)	
		($/MMBTU)	Ratio *	($/MMBTU)	Ratio *
EPA Base Case 2004	2.1.9	1.05	1.00	3.34	1.00
MARAMA Base Case 5C	2.1.9 w/ 3.0 Gas Curve	1.07	1.02	4.82	1.44
MARAMA Policy Case 4C	2.1.9 w/ 3.0 Gas Curve	1.06	1.01	4.88	1.46
EPA Base Case 2006	3.0	1.41	1.34	5.38	1.61

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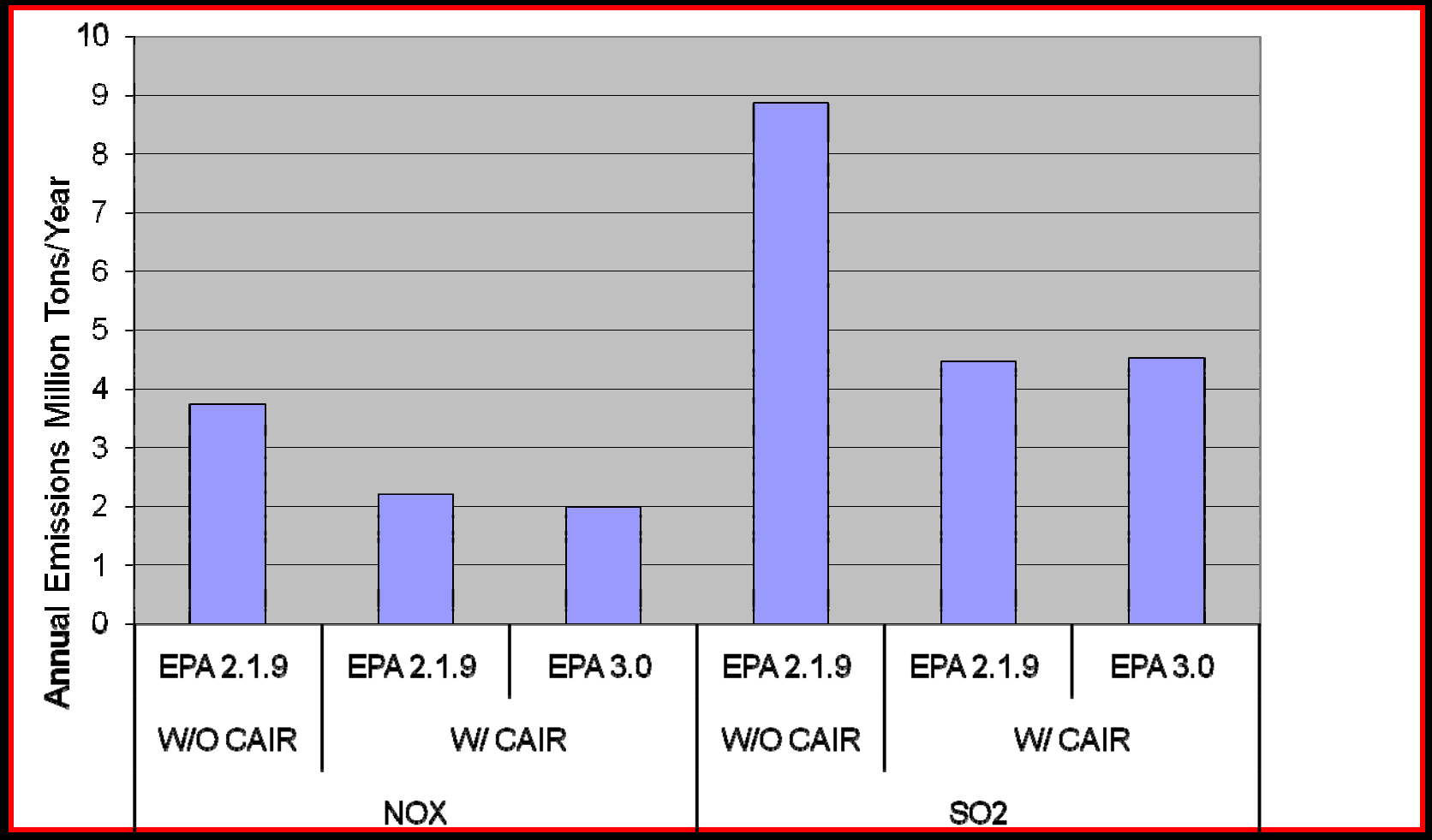
NEW SOURCE REVIEW SETTLEMENTS WITH TRADABLE ALLOWANCES UNDER CAIR

Company	Date of Settlement	SO2 Removed (1)	Allowances Surrendered		EPA 2.1.9	RPO 2.1.9	EPA 3.0
TECO	2000	70,000	Excess allowance to be retired		Yes	Yes	Yes
PSEG	2002	35,937	Excess allowance to be retired		Yes	Yes	Yes
VEPCO	2003	176,545	45,000	Per year	Yes	Yes	Yes
WEPCO	2003	65,053	Excess allowance to be retired		Yes	Yes	Yes
SIGECO	2003	6,384	Excess allowance to be retired		Yes	Yes	Yes
SANTEE	2004	39,014	None		Yes	Yes	Yes
Illinois	2005	39,014	Scaling up to 30,000	Per year	no	Yes	Yes
Ohio Edison	2005	171,500	None		No	Yes	Yes
Alabama Power	2006	22,788	7538	One time	No	No	Yes
Minnkota	2006	23,600	Scaling up to 14,886	Per year	No	No	Yes
Mirant Mid-Atlantic	2006	Unknown	None		No	Yes	Yes
Nevada	2007	None	Unknown		No	No	No
East Kentucky	2007	48,000	Unknown		No	No	No
AEP	2007	654,000	Unknown		No	No	No
TOTAL		**1,351,835**					

PREDICTED 2020 SO2 & NOX EGU EMISSIONS NATIONWIDE



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EMISSIONS NATIONWIDE

- TOTAL EMISSIONS OF NOX AND SO2 DO NOT CHANGE
- CAIR CAP IS THE OVERARCHING GOAL SET IN THE MODEL
- CHANGES IN INPUT ASSUMPTIONS MAKE A DIFFERENCE IN ALLOWANCE PRICE

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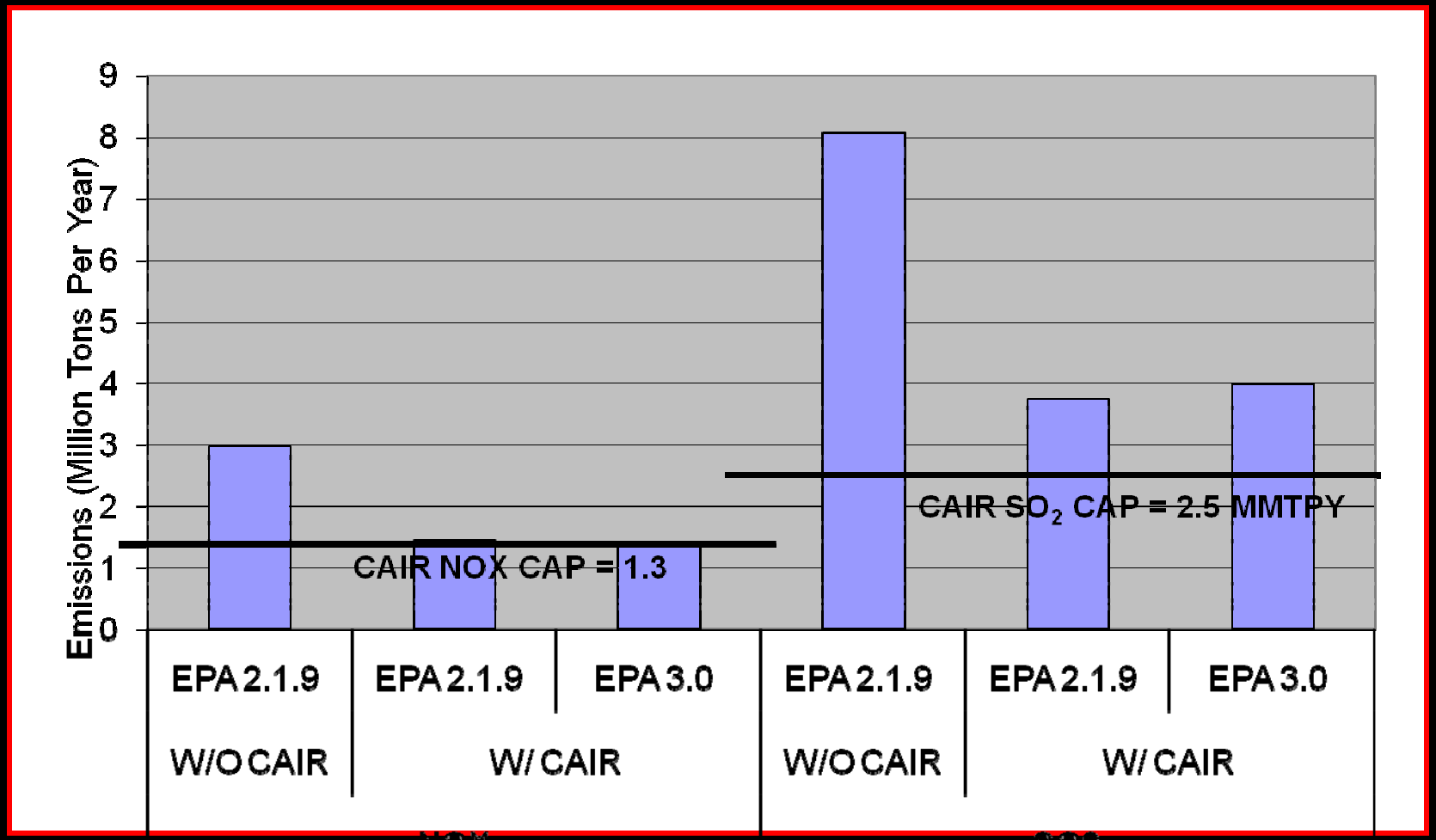
PREDICTED 2020 SO2 & NOX EGU EMISSIONS CAIR REGION



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EMISSIONS WITHIN CAIR REGION

- TOTAL EMISSIONS OF NOX AND SO2 DO NOT CHANGE
- CAIR CAP IS THE OVERARCHING GOAL SET IN THE MODEL
- CHANGES IN INPUT ASSUMPTIONS MAKE A DIFFERENCE IN ALLOWANCE PRICE
- CAIR CAP FOR SO2 WILL NOT BE MET IN 2020

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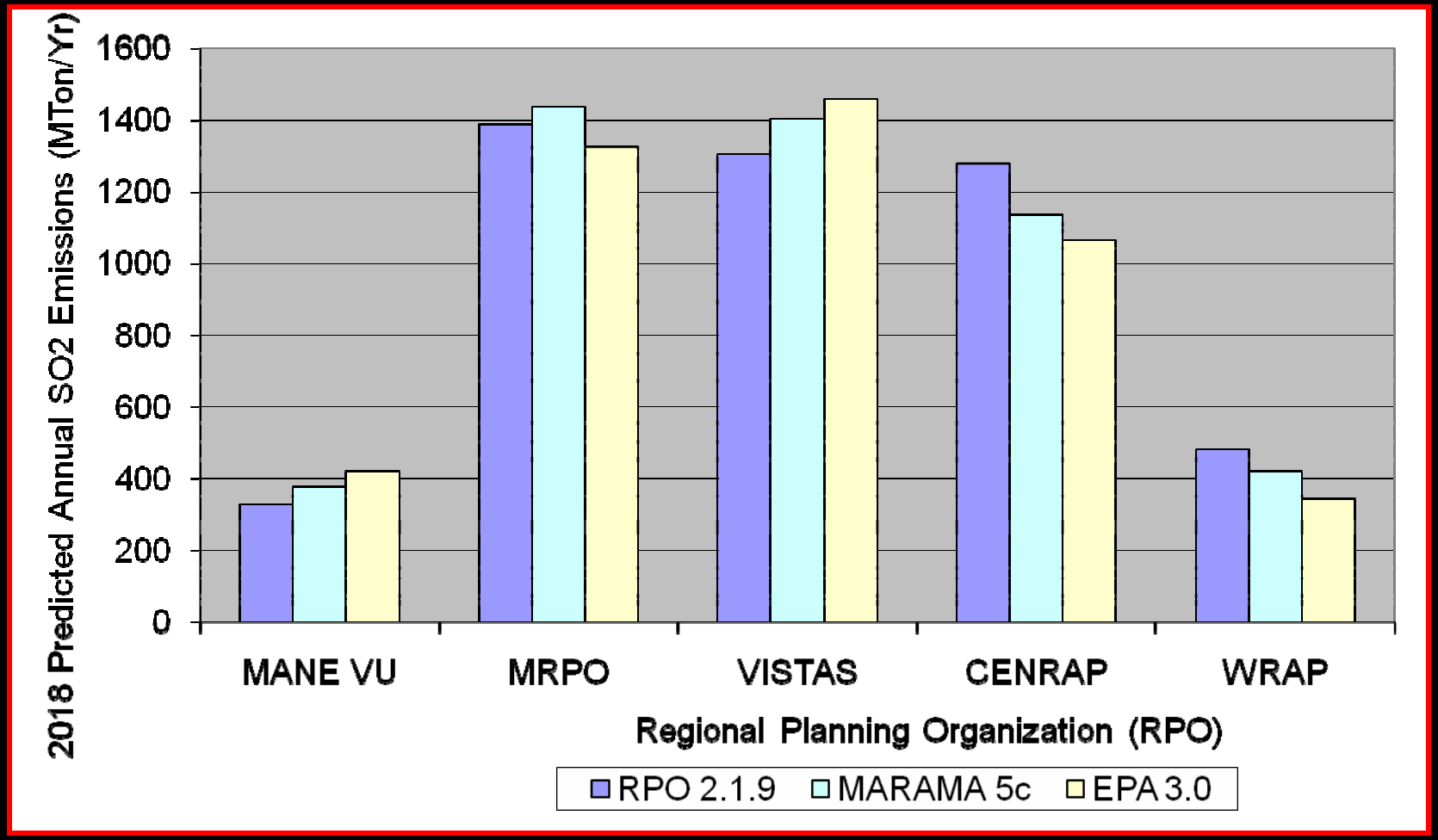
2018 REGIONAL SO2 EMISSIONS PREDICTED BY THREE MODELING RUNS



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GEOGRAPHIC DISTRIBUTION OF SO2 EMISSIONS

- EASTERN EMISSIONS INCREASE (MANE VU AND VISTAS)
- WESTERN EMISSIONS DECREASE (WRAP AND CENRAP)
- MIDWESTERN EMISSIONS RISE SLIGHTLY
- EMISSIONS ARE GENERALLY SHIFTED EASTWARD

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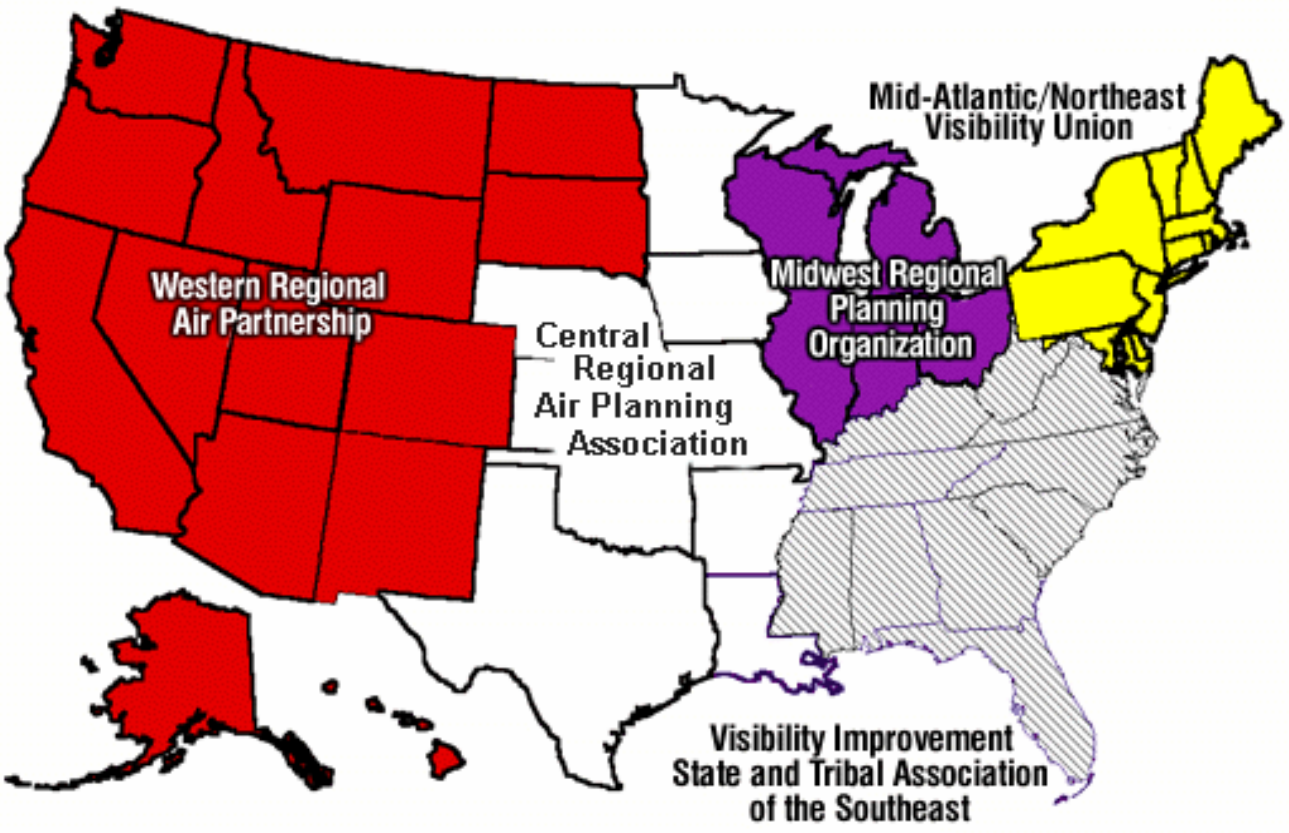
REGIONAL PLANNING ORGANIZATIONS



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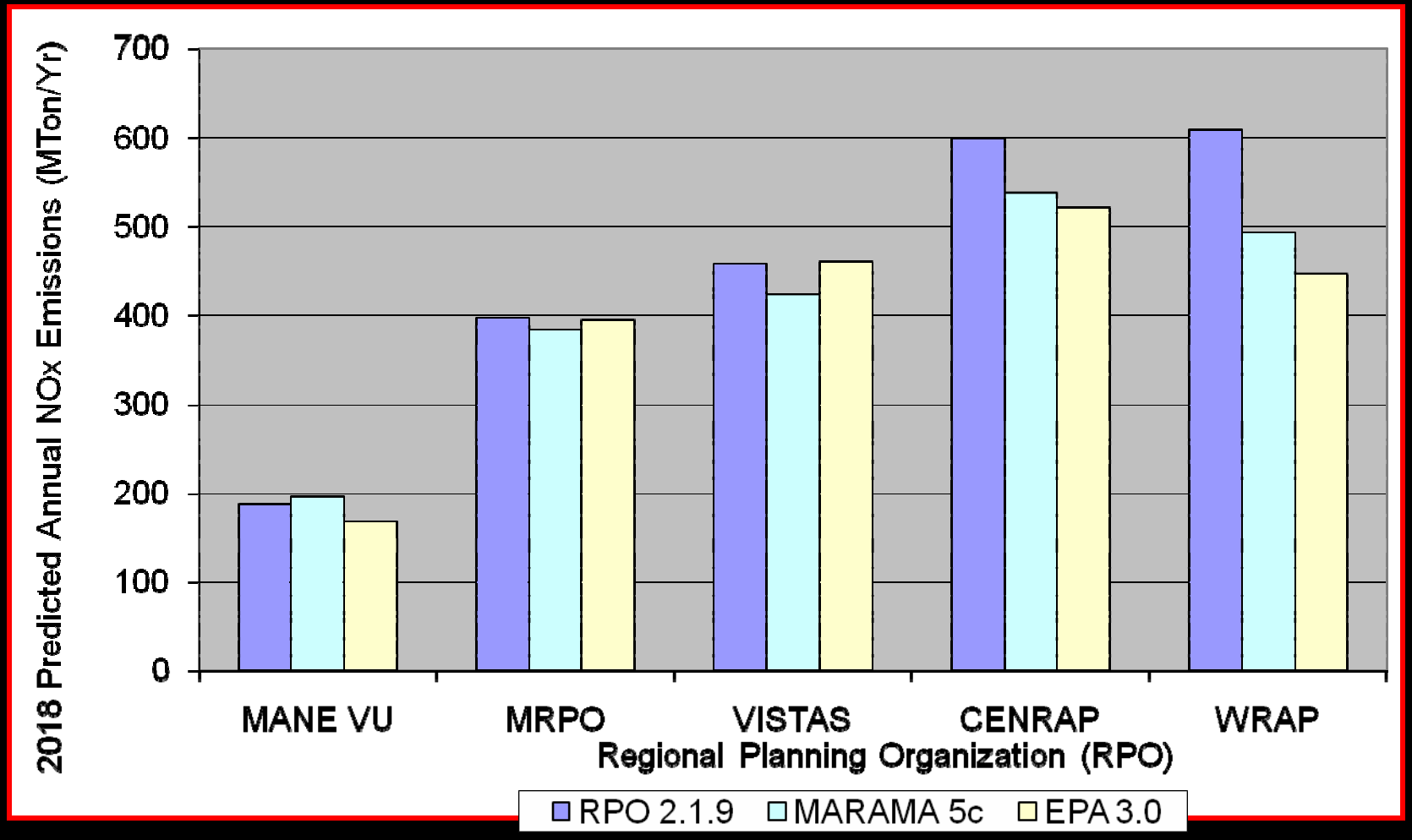
2018 REGIONAL NOX EMISSIONS PREDICTED BY THREE MODELING RUNS



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GEOGRAPHIC DISTRIBUTION OF NOX EMISSIONS

- EASTERN AND MIDWESTERN EMISSIONS UNCHANGED (MANE VU AND VISTAS)
- WESTERN EMISSIONS DECREASE (WRAP AND CENRAP)
- EMISSIONS ARE GENERALLY LOWER, BUT DECREASE LARGELY OCCURS IN THE WEST

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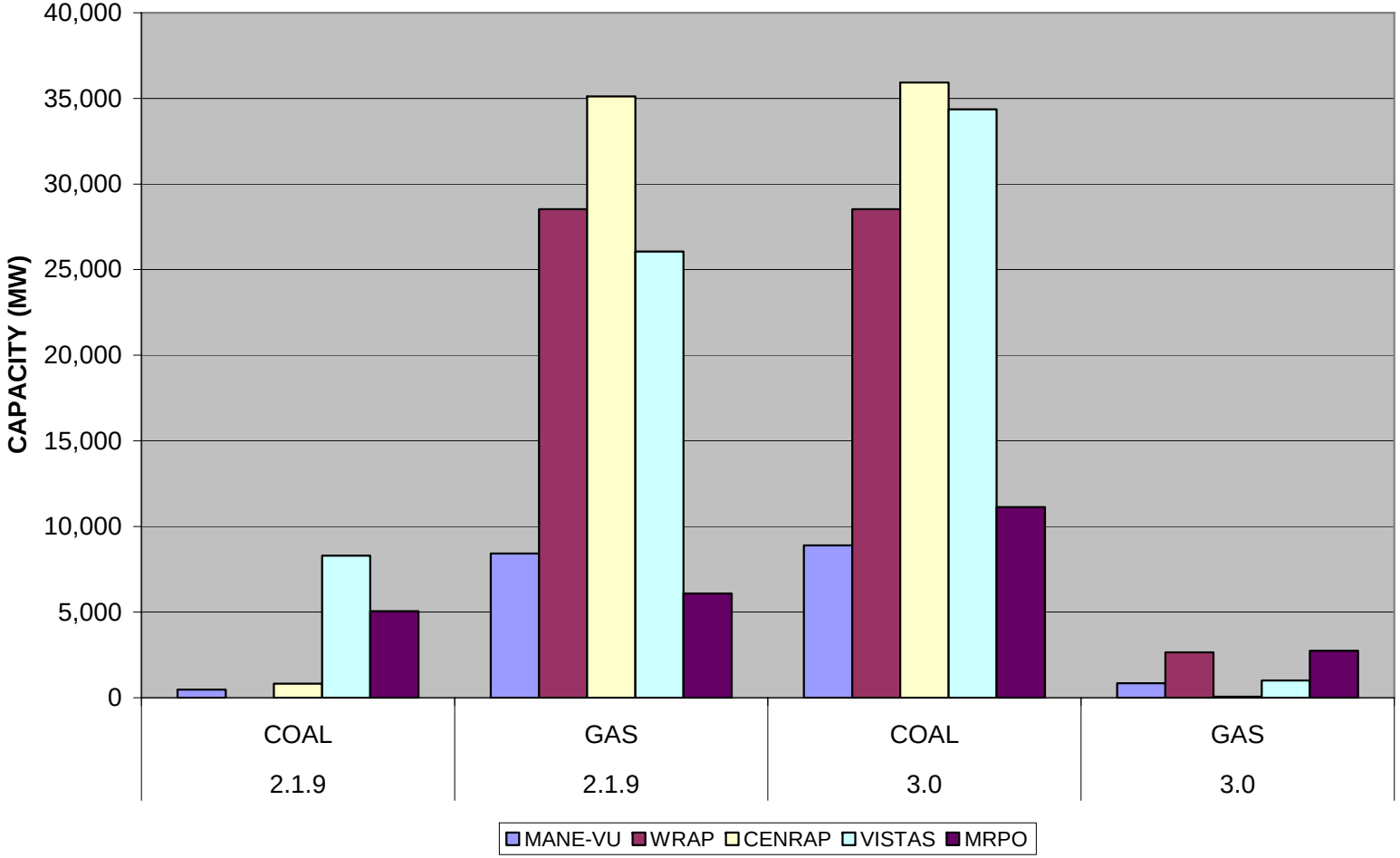
COMPARISON OF NEW BUILD CHOICE OF FUEL IN RPO 2.1.9 AND EPA 3.0



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SHIFT IN FUEL FROM GAS TO COAL FOR NEW-BUILDS

- GAS PRICES ARE SUBSTANTIALLY HIGHER IN EPA 3.0
- DRIVES ECONOMICS OF NEW-BUILD CHOICE
- RESULTS IN DISLOCATION OF EMISSIONS WEST TO EAST BETWEEN TWO MODEL RUNS

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IMPLICATIONS

- A DISCONNECT EXISTS BETWEEN "COMMAND & CONTROL" VS "CAP & TRADE" REGULATIONS
- REDUCTIONS TAKEN TO COMPLY WITH NSR SETTLEMENTS DO NOT RESULT REGIONAL REDUCTIONS
- RETIREMENT OF EMISSIONS NEEDED FOR REGIONAL REDUCTIONS

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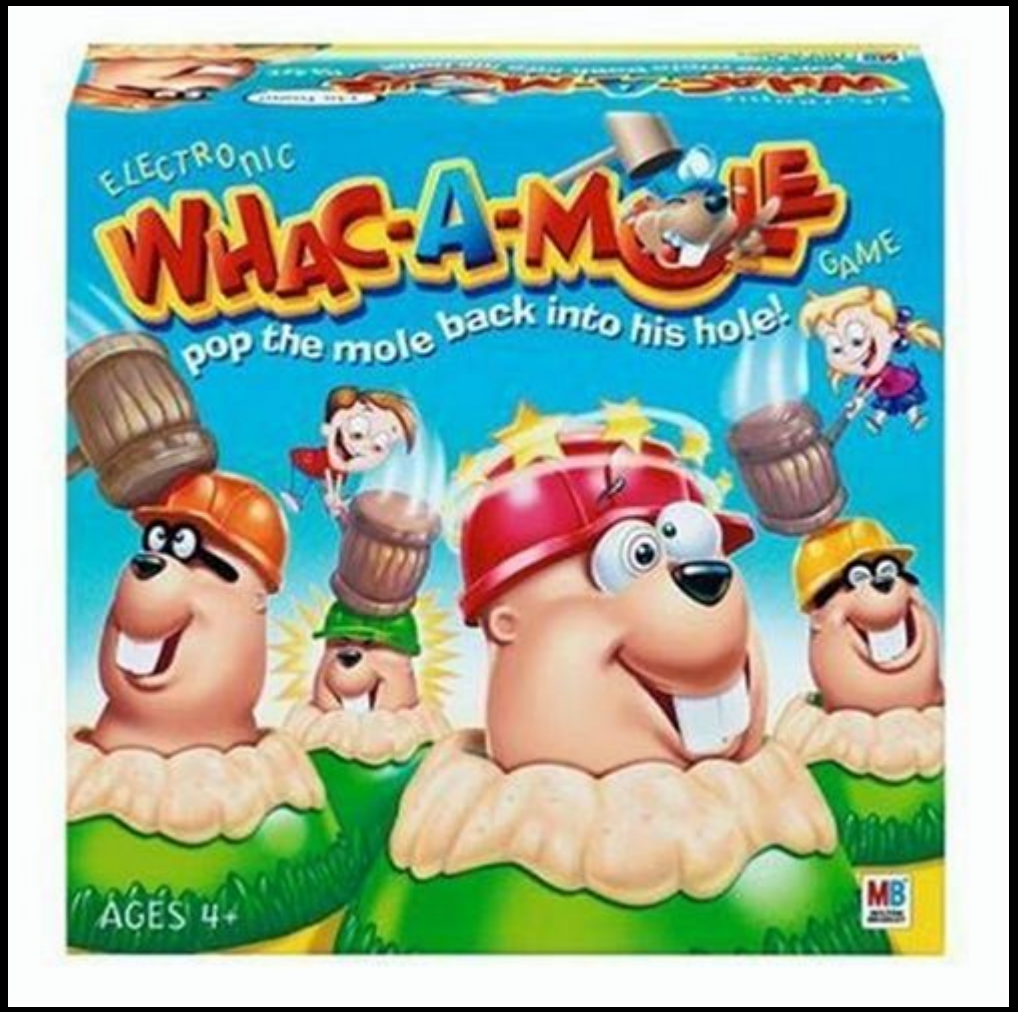
REGULATION BY “WHACK A MOLE”



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IMPLICATIONS

- REDUCTIONS UNDER CAIR CAPS MAY RESULT IN EMISSION DISLOCATION
- DISLOCATIONS MAY RESULT IN LOCAL INCREASE IN EMISSIONS
- COULD HAVE IMPACT ON PUBLIC HEALTH

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CONCLUSIONS

- NATIONAL EMISSIONS NOT AFFECTED BY CHANGES TO INPUT ASSUMPTION CHANGES BETWEEN EPA 2.1.9 AND EPA 3.0
- DISTRIBUTION OF EMISSION BETWEEN REGIONS IS AFFECTED BY MODELING ASSUMPTIONS
- EMISSIONS GENERALLY SHIFTED FROM WEST TO EAST WHEN TRANSITIONING FROM EPA 2.1.9 TO EPA 3.0

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