



**MDE Maryland Department of the Environment**

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# SO<sub>2</sub> Standards for Coal Fired Power Plants



**Air Quality Control Advisory Council - Briefing**

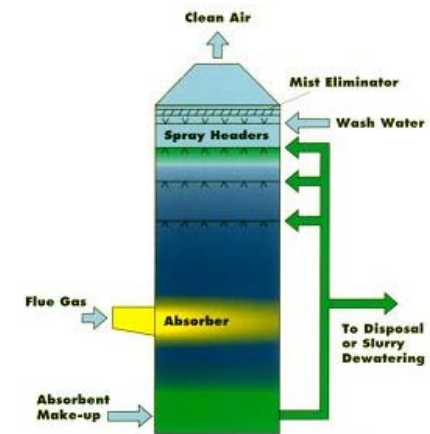
**December 8, 2014**





# Topics Covered

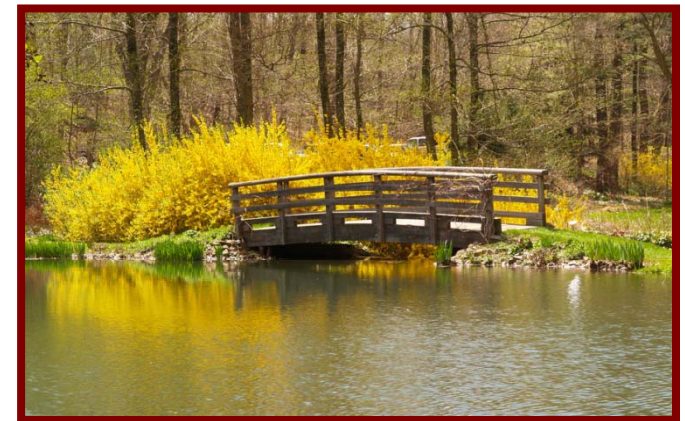
- Background
- The key role of modeling in the 1-hour SO<sub>2</sub> regulation development process
- Results of modeling completed to date
- Next Steps





# The New SO<sub>2</sub> Standard

- Finalized by EPA in 2010
  - 75 ppb as a 1-hour standard
- August 2013 – EPA only designated areas of the country that were monitoring nonattainment
- Rest of country, including all of Maryland, has not been designated:
  - Neither “unclassified/attainment” nor “nonattainment” designation
  - Undesignated areas will be designated in 2017-2020, based on monitoring or modeling data yet to be collected
  - Early attainment option also included in EPA guidance





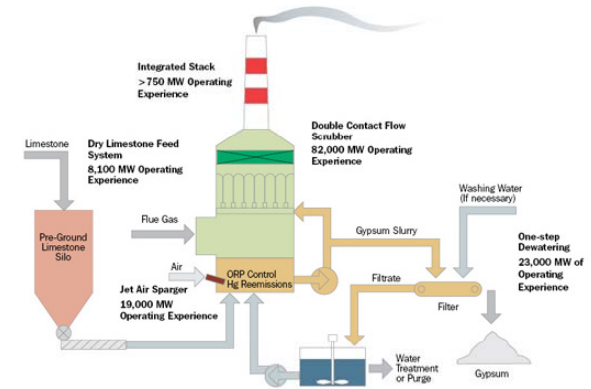
# Early Compliance Option

- Because of the Maryland Healthy Air Act (HAA), many sources have already installed state-of-the-art SO<sub>2</sub> controls
  - Not all
- EPA guidance sets up a process that allows states to achieve early compliance with the 1-hour SO<sub>2</sub> standard
  - Can avoid being designated “nonattainment” altogether
  - Also insures public health protection
- Must use models to establish emission limits for sources that guarantee that 1-hour standard will not be exceeded
- Not the usual process to comply with federal standards
  - Appropriate because peak 1-hour SO<sub>2</sub> levels are almost always associated with individual ... or closely located – stationary sources of SO<sub>2</sub>



# Background- HAA

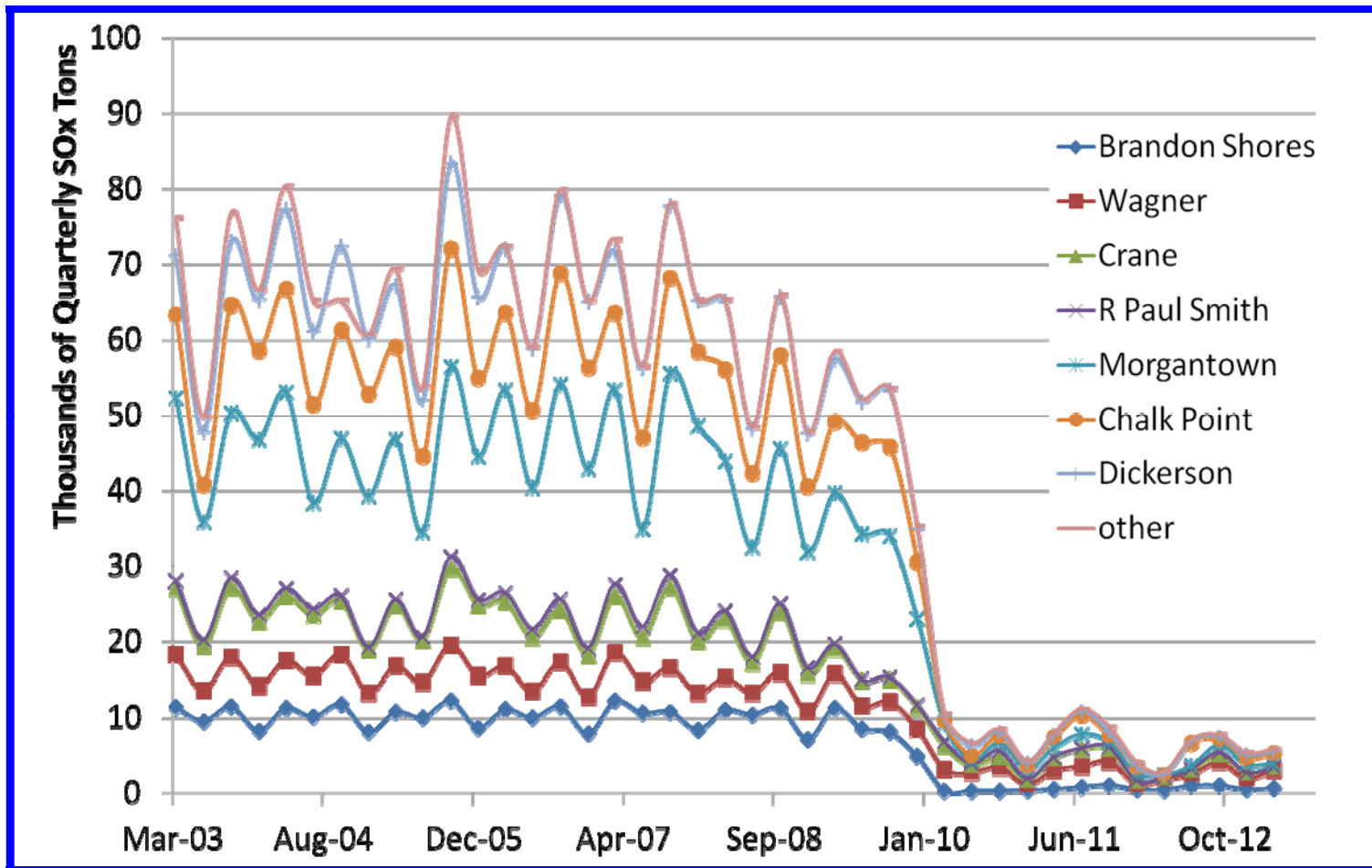
- The regulatory scheme in the HAA worked very well
  - Helped bring Maryland into attainment for the PM Fine standard and the old 85 ppb ozone standard.
  - The HAA (2006) was designed for these older standards
- The new 1-hour SO<sub>2</sub> standard requires an enhanced regulatory scheme that focuses on:
  - Individual units and
  - Shorter term (hourly or daily) emission limits





# Healthy Air Act SO2 Caps

*HAA caps reduced annual SO2 emissions dramatically*

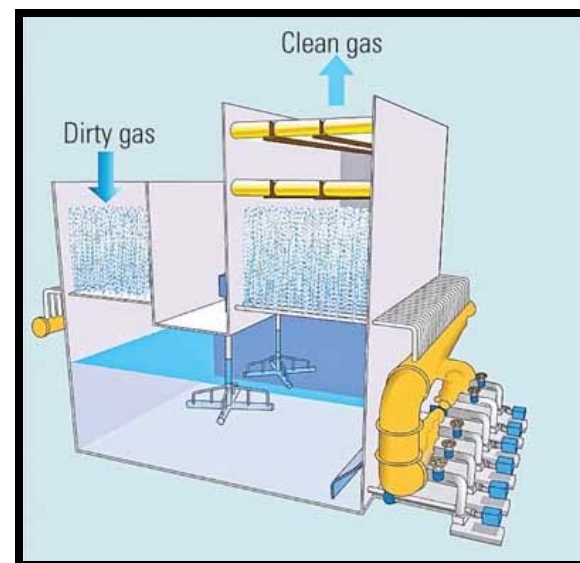






# The Role of SO<sub>2</sub> Modeling

- EPA has an approved regulatory model that must be used to perform this kind of SO<sub>2</sub> modeling
- The model uses several different types of data
  - Physical data from the source
    - Stack height, exit velocity, exit temperatures, etc.
  - Emissions data
  - Meteorological data
  - Topographical data
- The models can be used to work backwards and define an emission rate to meet the standard





# Who Has Modeled?

- Maryland has performed modeling for all of the Raven and NRG plants
  - The Maryland modeling was completed by MDE and the Department of Natural Resources (DNR) Power Plant Research Program (PPRP)
- Sierra Club has performed modeling for the Raven and NRG plants
- Raven and NRG may also be performing modeling to look at this issue









# Modeling Raven Power

- Three of the Raven plants are located fairly close to each other
  - Brandon Shores
  - Wagner
  - Crane
- This requires that all three of the plants be modeled together to insure that the potential concentrations in that area are modeled accurately





# Crane Modeling Results

## *Current Modeling Results*

	Sierra Club "Stand Alone"	MDE/PPRP "Stand Alone"	MDE/PPRP "Cumulative"
<b>Unit #1</b> <b>200 MW</b> Capacity factor 20- 35 % No add on controls	Not Completed	1,501 lbs/hr	1,436 lbs/hr
<b>Unit #2</b> <b>200 MW</b> Capacity factor 20-35 % No add on controls		1,501 lbs/hr	1,436 lbs/hr
<b>Plant Total</b> <b>(Units #1 &amp; #2)</b>	3,482 lbs/hr	3,002 lbs/hr	
<b>Modeled Concentration</b>	<196.2 ug/m <sup>3</sup>	195.6 ug/m <sup>3</sup>	

This modeling would drive limits of about 1,400 lbs/hr for each unit





# Wagner Modeling Results

## Current Modeling Results

	Sierra Club “Stand Alone”	MDE/PPRP “Stand Alone”	MDE/PPRP “Cumulative”
<b>Unit #2</b> 136 MW Capacity factor 20-50% Low sulfur coal	Not Completed	987 lbs/hr	493 lbs/hr
<b>Unit #3</b> 359 MW Capacity factor 30-70% Low sulfur coal		2,023 lbs/hr	1,011 lbs/hr
<b>Plant Total</b> (Units #2 & #3)	3,115 lbs/hr	3,010 lbs/hr	
<b>Modeled Concentration</b>	<196.2 ug/m <sup>3</sup>	194.6 ug/m <sup>3</sup>	

This modeling would drive limits of about 500 lbs/hr for Unit #2 – and 1,000 lbs/hr for Unit #3 –





# Brandon Shores Modeling Results

## Current Modeling Results

	Sierra Club "Stand Alone"	MDE/PPRP "Stand Alone"	MDE/PPRP "Cumulative"
<b>Unit #1</b> <b>700 MW</b> Capacity Factor 70-40% FGD	Not Completed	1,797 lbs/hr	1,026 lbs/hr
<b>Unit #2</b> <b>700 MW</b> Capacity Factor 70-30% FGD		1,797 lbs/hr	1,026 lbs/hr
<b>Plant Total</b> <b>(Units #1 &amp; #2)</b>	2,182 lbs/hr	3,594 lbs/hr	
<b>Modeled Concentration</b>	196 ug/m <sup>3</sup>	194 ug/m <sup>3</sup>	

This modeling would drive limits of about 1,000 lbs/hr for each unit







# Modeling NRG Energy

- In designing their scrubber systems, for all three of their plants, NRG vents to tall “by-pass” stacks when the scrubber or the continuous emission monitors are being repaired or tested
  - Emissions may also vent to the by-pass stacks during emergencies
- Because of this, the modeling must look at operations when the scrubbers are running and also when emissions vent to by-pass stacks





# Chalk Point Modeling Results

## Current Modeling Results

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 2 units) <b>710 MW</b> Capacity factor 32-78% FGD	2,300.2	2,430.9 lbs/hr
<b>Modeled Concentration</b>	<196.2 ug/m <sup>3</sup>	195.6 ug/m <sup>3</sup>



By-Pass Stack (729 feet) Results		
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 2 units) <b>710 MW</b> Capacity factor 32-78% FGD	Not Completed	11,705.8 lbs/hr
<b>Modeled Concentration</b>	—	196.0 ug/m <sup>3</sup>

This modeling would drive limits of about ...

Scrubber - 2,400 lbs/hr for all units – one stack

By-Pass – 11,500 lbs/hr for all units – one stack





# Morgantown Modeling Results

## Current Modeling Results

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 2 units) 640 MW Each Capacity factor 90-45% FGD	2,615.5 lbs/hr	3,126.2 lbs/hr
<b>Modeled Concentration</b>	<196.2 ug/m <sup>3</sup>	195.0 ug/m <sup>3</sup>

By-Pass Stack (700 feet) Results		
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 2 units) 1280 MW	Not Completed	7,551.6 lbs/hr
<b>Modeled Concentration</b>	—	195.8 ug/m <sup>3</sup>



This modeling would drive limits of about ...

Scrubber - 1,500 lbs/hr for each unit

By-Pass – 7,500 lbs/hr for both units





# Dickerson Modeling Results

## Current Modeling Results

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 3 units) <b>570 MW</b> Capacity factor range 70-20% FGD	360 lbs/hr	1,043.3 lbs/hr
<b>Modeled Concentration</b>	<196.2 ug/m <sup>3</sup>	195.6 ug/m <sup>3</sup>
	Sierra Club	MDE/PPRP
<b>Facility Emissions</b> (Total of 3 units)	Not Completed	8,909.8 lbs/hr
<b>Modeled Concentration</b>	—	195.9 ug/m <sup>3</sup>



This modeling would drive limits of about ...

Scrubber - 1,000 lbs/hr for all units – one stack

By-Pass – 8,900 lbs/hr for All units – one stack





# Next Steps

- Initial work on the draft regulation is complete
- Continuing to work with affected sources and other stakeholders on several key issues
  - Additional modeling
    - Both NRG and Raven have initiated their own modeling
  - Capturing the SO<sub>2</sub> emission reduction benefits from the federal MATS (Mercury and Air Toxics) rule
    - Several units are adding controls to comply with MATS that will reduce SO<sub>2</sub>
  - Blending the SO<sub>2</sub> requirements with the recently proposed NO<sub>x</sub> regulations
  - Additional stakeholder meetings in 2015
  - Back to AQCAC in early 2015



ANY  
QUESTIONS  
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