



Maryland Department of the Environment

SO₂ Regulatory Support Modeling

***What Emission Rates Are Needed to Comply
With the 1-Hour SO₂ Standard?***



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Stakeholder Meeting # 3

Draft Power Plant Regulations – February 12, 2014



Topics Covered

- Background
- Role of modeling in 1-hour SO₂ compliance
- Modeling completed by Maryland
- Modeling completed by Sierra Club
- Summary of results
- Emission rates from the modeling



Background

- EPA guidance sets up a process that allows states to achieve early compliance with the 1-hour SO₂ standard
 - Can avoid being designated “nonattainment” altogether
- 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 SO₂ levels are almost always associated with individual ... or closely located – stationary sources of SO₂



The Model

- EPA has approved regulatory model that must be used to perform this kind of modeling
- The model use several different types of data
 - Physical data from the source
 - Stack height, exit velocity, exit temperatures, etc.
 - Emissions data
 - Meteorological data
 - Topographical data



Who Has Modeled?

- Maryland has performed modeling for all of the Raven and NRG plants
 - Modeling for Warrior Run is in the works
 - 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





Model Set-Up

- **MDE/PPRP**

- **AERMOD(v12345) Model**
- **Raven Power:**
 - **BWI Met data (2008-2012)**
 - **Essex Background (2010-2012)**
- **NRG Power**
 - **Met Data (2008-2012)**
 - **Washington National (Chalk Point & Morgantown)**
 - **Dulles (Dickerson)**
 - **Beltsville Background (2010-2012)**

- **Sierra Club**

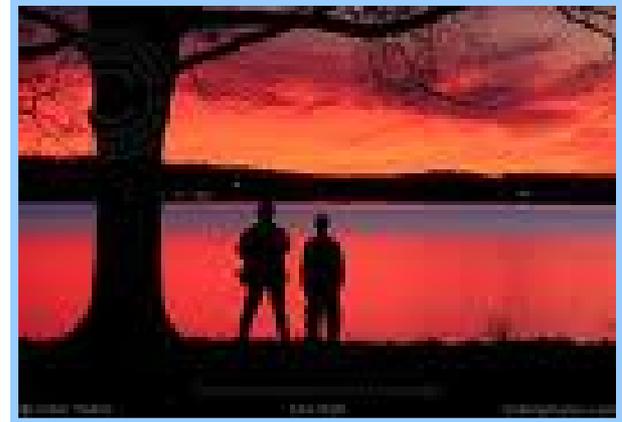
- **Raven Power:**
 - **AERMOD (v11103) Model**
 - **BWI Met data (2006-2010)**
 - **No Background**
- **NRG Power**
 - **AERMOD (v12345) Model**
 - **Met Data (2007-2011)**
 - **Washington National (Chalk Point)**
 - **Dulles (Dickerson)**
 - **Dulles (2008 – 2012) (Morgantown)**
 - **Beltsville Background (2009-2011)**





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

Allowable Rates From the Modeling

	Sierra Club "Stand Alone"	MDE/PPRP "Stand Alone"	MDE/PPRP "Cumulative"
Unit #1	Not Completed	1,501 lbs/hr	1,436 lbs/hr
Unit #2		1,501 lbs/hr	1,436 lbs/hr
Plant Total (Units #1 & #2)	3,482 lbs/hr	3,002 lbs/hr	
Modeled Concentration	<196.2 ug/m ³	195.6 ug/m ³	

Limits in the Regulation
1,400 lbs/hr for each unit





Wagner Modeling Results

Allowable Rates From the Modeling

	Sierra Club "Stand Alone"	MDE/PPRP "Stand Alone"	MDE/PPRP "Cumulative"
Unit #2	Not Completed	987 lbs/hr	493 lbs/hr
Unit #3		2,023 lbs/hr	1,011 lbs/hr
Plant Total (Units #2 & #3)	3,115 lbs/hr	3,010 lbs/hr	
Modeled Concentration	<196.2 ug/m ³	194.6 ug/m ³	

Limits in the Regulation
 Unit #2 – 500 lbs/hr
 Unit #3 – 1,000 lbs/hr





Brandon Shores Modeling Results

Allowable Rates From the Modeling

	Sierra Club "Stand Alone"	MDE/PPRP "Stand Alone"	MDE/PPRP "Cumulative"
Unit #1	Not Completed	1,797 lbs/hr	1,026 lbs/hr
Unit #2		1,797 lbs/hr	1,026 lbs/hr
Plant Total (Units #1 & #2)	2,182 lbs/hr	3,594 lbs/hr	
Modeled Concentration	196 ug/m ³	194 ug/m ³	

Limits in the Regulation
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

Allowable Rates From the Modeling

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
Facility Emissions (Total of 2 units)	2,300.2	2,430.9 lbs/hr
Modeled Concentration	<196.2 ug/m ³	195.6 ug/m ³



By-Pass Stack (729 feet) Results		
	Sierra Club	MDE/PPRP
Facility Emissions (Total of 2 units)	Not Completed	11,705.8 lbs/hr
Modeled Concentration	—	196.0 ug/m ³

Limits in the Regulation

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

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





Morgantown Modeling Results

Allowable Rates From the Modeling

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
Facility Emissions (Total of 2 units)	2,615.5 lbs/hr	3,126.2 lbs/hr
Modeled Concentration	<196.2 ug/m ³	195.0 ug/m ³



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

Limits in the Regulation

Scrubber - 1,500 lbs/hr for each unit

By-Pass – 7,500 lbs/hr for both units





Dickerson Modeling Results

Allowable Rates From the Modeling

Scrubber Stack (400 feet) Results		
	Sierra Club	MDE/PPRP
Facility Emissions (Total of 3 units)	360 lbs/hr	1,043.3 lbs/hr
Modeled Concentration	<196.2 ug/m ³	195.6 ug/m ³ —



By-Pass Stack (703 feet) Results		
	Sierra Club	MDE/PPRP
Facility Emissions (Total of 3 units)	Not Completed	8,909.8 lbs/hr
Modeled Concentration	—	195.9 ug/m ³

Limits in the Regulation

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

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



ANY
QUESTIONS
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