Stakeholder Comments on Maryland NO_x RACT rulemaking for Large Municipal Waste Combustors

Environmental Integrity Project

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Nitrogen Oxides (NO_x)

- NO_x

Air pollutants that affect human health

→ Nitrogen dioxide (NO_2)

→ Fine particulate matter ($PM_{2.5}$)

→ Ozone (why we're here)

Water quality

→Deposition of nitrogen (N) in water contributes to dead zones in the Chesapeake Bay

- About 33% of N in Chesapeake Bay comes from air deposition

Nitrogen Dioxide (NO_2)

- Short term exposure to high NO_2 levels can "aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms . . . , hospital admissions, and visits to the emergency room."
- Longer exposures to high levels of NO_2 may contribute to the development of asthma.
- People with asthma, as well as children and the elderly are especially susceptible to these adverse effects.

Source: EPA, Effects of NO2, https://www.epa.gov/no2-pollution/basic-information-about-no2#Effects

Fine Particulate Matter ($PM_{2.5}$)

- Consists of particles that are 2.5 microns or less in diameter, which is $1/30^{th}$ the size of a human hair.
- Can cause premature mortality due to heart and lung disease, can aggravate asthma, and increases the risk of adverse birth outcomes, including low birth weight and preterm birth.
- Can cause adverse health effects even at levels below federal air quality standards.

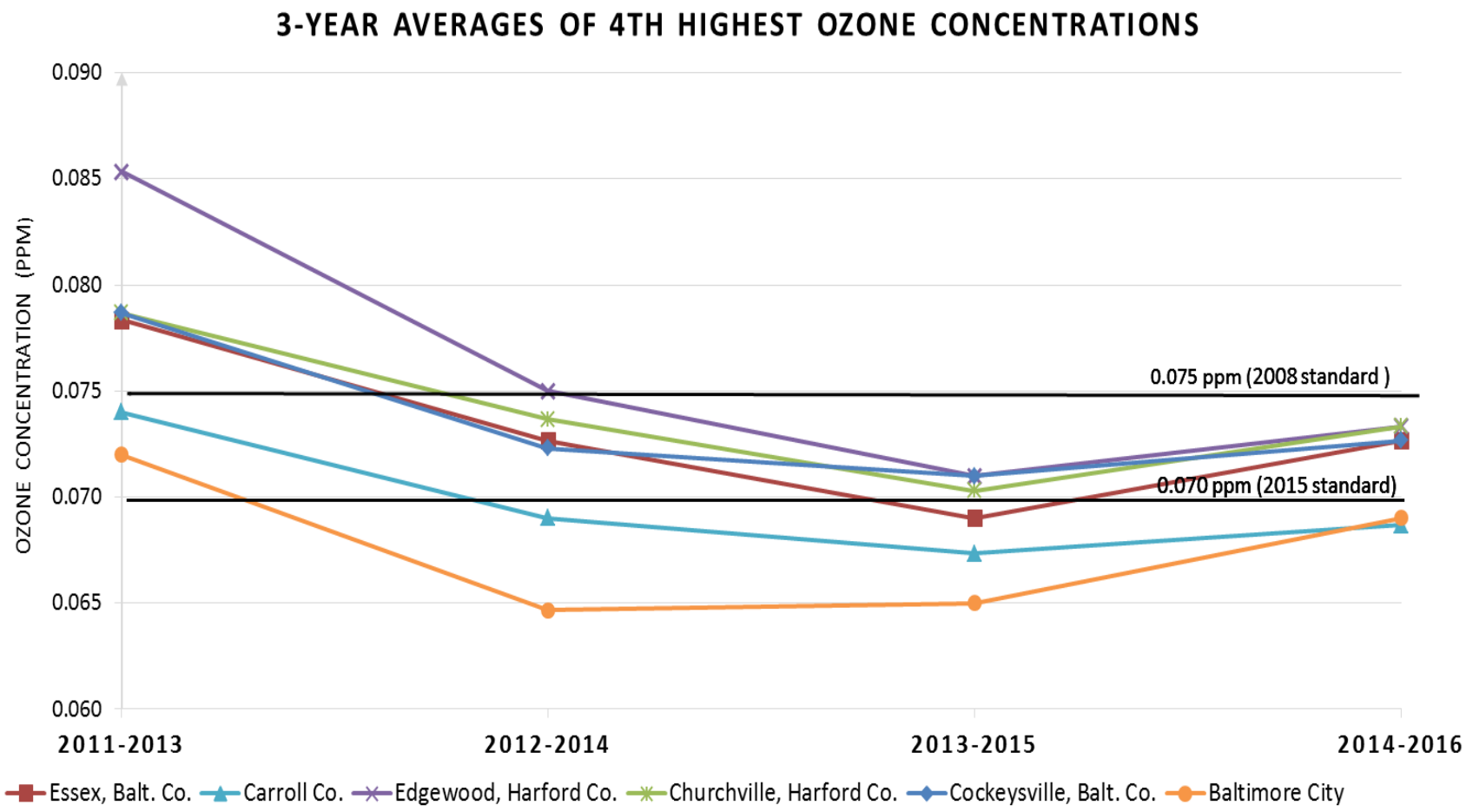
Source: *See generally*, U.S. EPA (2010) Summary of Expert Opinions on the Existence of a Threshold in the Concentration-Response Function for PM2.5-related Mortality, Technical Support Document, available at: http://www3.epa.gov/ttnecas1/regdata/Benefits/thresholdstsd.pdf,

Ozone

- NOx + volatile organic compounds (VOC) + sunlight → Ozone
- Can aggravate respiratory conditions like asthma, bronchitis, and emphysema.
- Can increase susceptibility to lung infections and cause chronic obstructive pulmonary disorder (COPD).
- People at increased risk are asthmatics, children, the elderly, and those who are active outdoors.

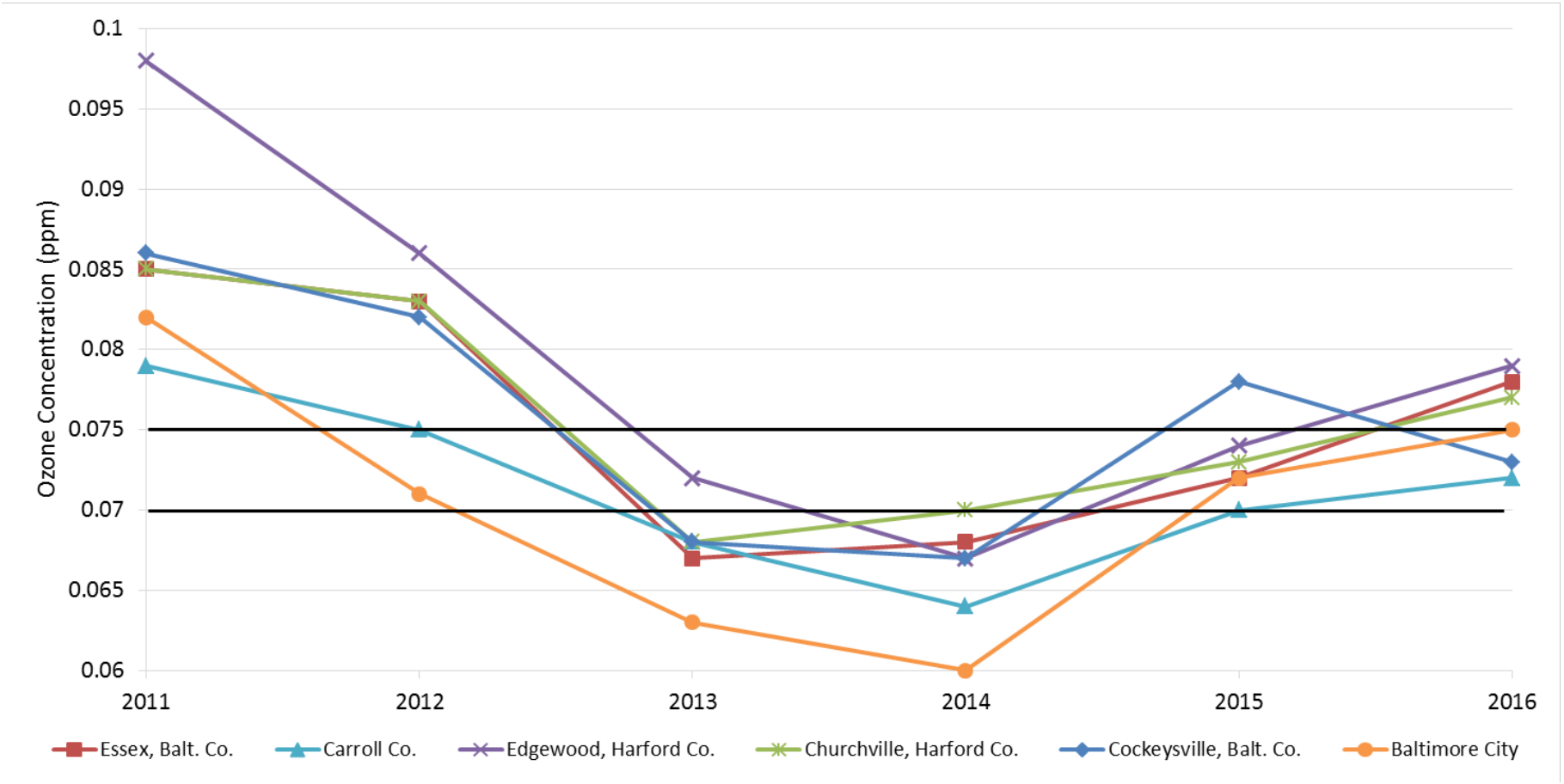
Source: EPA, Health Effects of Ozone Pollution, https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution

Baltimore Area Ozone Trends – Meeting EPA Air Quality Standards



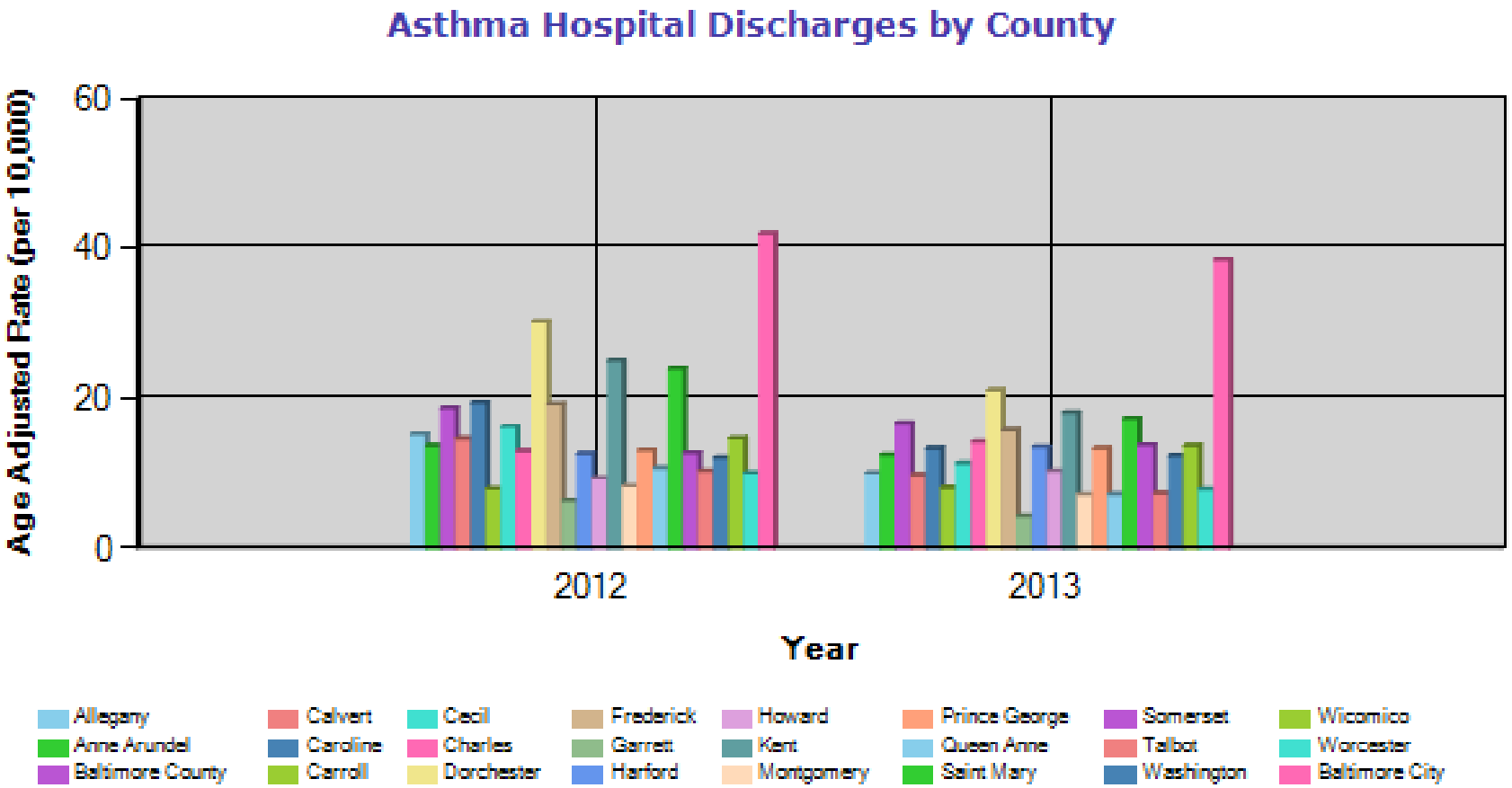
Source: EPA Airdata, https://www.epa.gov/outdoor-air-quality-data

Baltimore Area Ozone Trends by Year (4th highest max)



Source: EPA Airdata, https://www.epa.gov/outdoor-air-quality-data

Asthma Levels in Baltimore



Source: Maryland Department of Health and Mental Hygiene , Maryland Environmental Public Health Tracking Tool
https://maps.dhmh.maryland.gov/epht/query.aspxl

NO_x Emissions from BRESCO

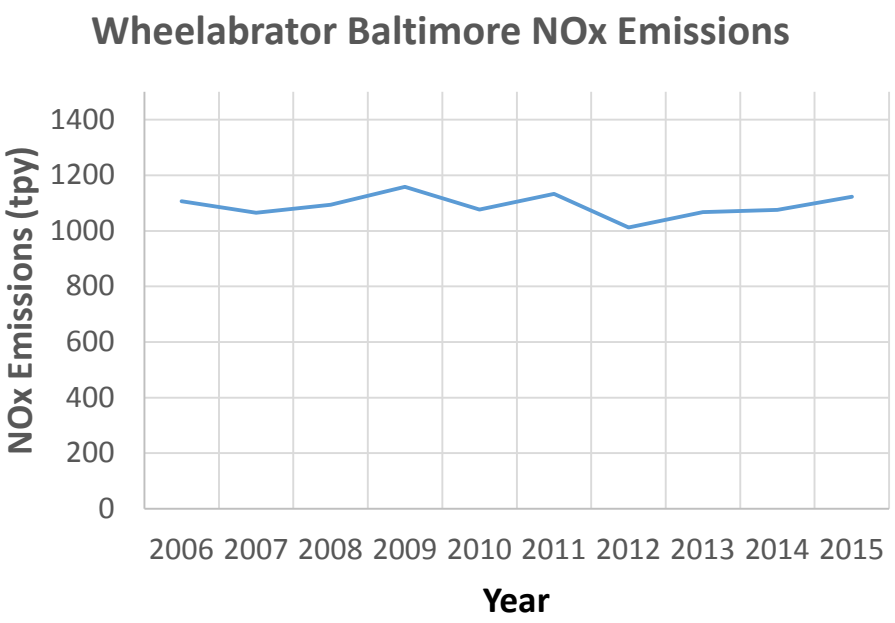
- 6th highest NOx emitter in Maryland in 2015

Rank	Company	NO_x (tons)
1	Raven Power-Ft. Smallwood Complex	3102
2	Lehigh Cement-Union Bridge (cement plant)	2936
3	GENON-Chalk Point/SMECO	2126
4	Luke Paper Company (paper mill)	1887
5	HOLCIM (US), Inc. (cement plant)	1225
6	Wheelabrator-Baltimore (RESCO)	1123
7	Constellation Power-Crane	1078
8	GENON-Dickerson	987
9	NRG -Morgantown	897
10	AES Warrior Run	445
11	Montgomery County RRF	441

Source: 2015 Maryland Emissions Inventory

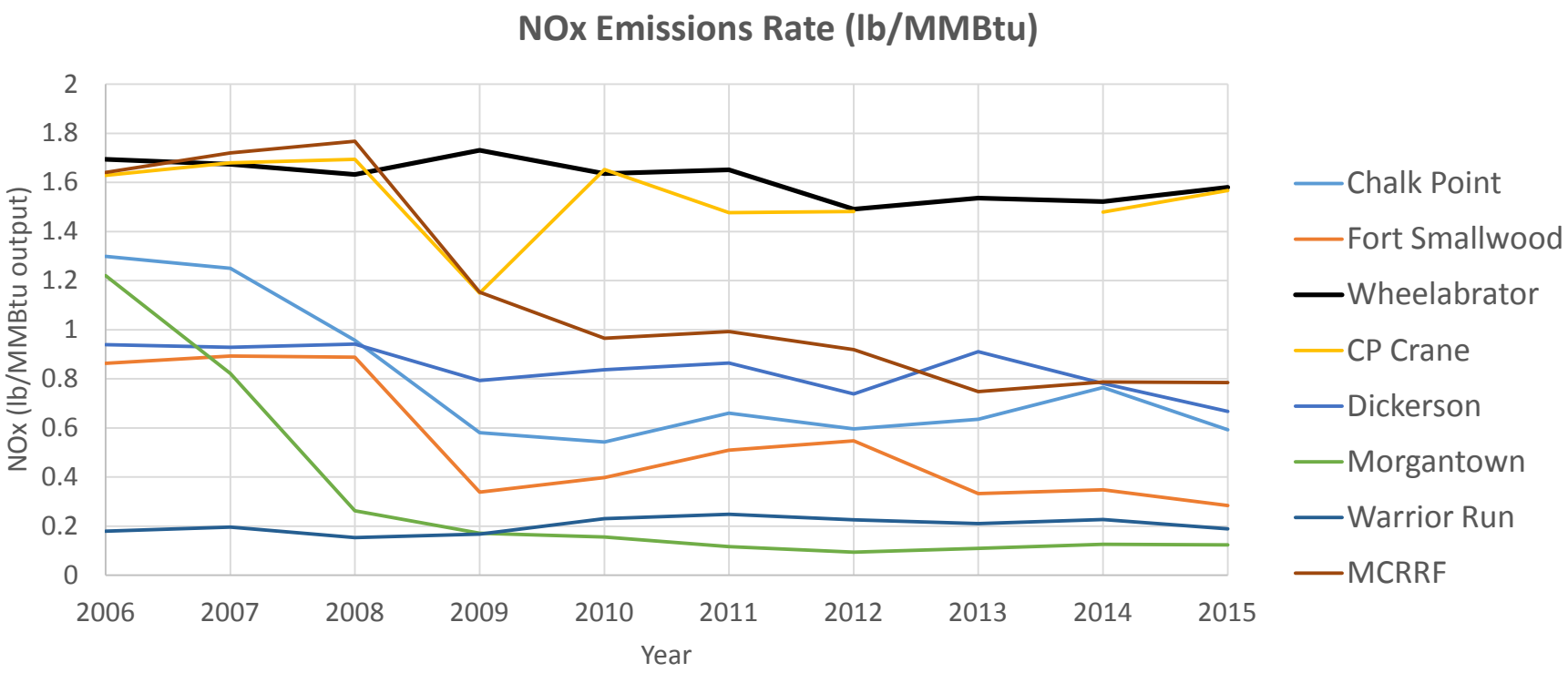
Wheelabrator Baltimore (BRESCO)

- Over last decade, relatively constant annual emissions (tons per year)
- Between 2006-2015, has gone from 13th highest NOx emitter to 6th



Sources: NOx emissions-Maryland Emissions Inventory: 2006-2015
Electricity output and useful thermal output- Energy Information Administration Power Plant Operating Data

Maryland Electrical Generating NOx Sources



Sources: NOx emissions-Maryland Emissions Inventory: 2006-2015
Electricity output and useful thermal output- Energy Information Administration Power Plant Operating Data

Treatment Technologies

- Selective Catalytic Reduction (SCR)
- Regenerative Selective Catalytic Reduction (RSCR)
- Low NOx Controls

- Most effective technology for controlling NOx emissions from variety of sources
- SCR can provide control efficiencies of 75% or greater at MSW incinerators

Source: Maryland Power Plant Research Program (PPRP), Supplemental Environmental Review Document, Motion by Energy Answers Baltimore, LLC, to Amend the Construction Commencement Deadline in its Certificate of Public Convenience and Necessity, Maryland Public Service Commission Docket No. 9199 (June 2012) at 6-6.

Treatment Technologies

- Selective Catalytic Reduction (SCR)
- Regenerative Selective Catalytic Reduction (RSCR)
- Low NOx Controls

- Variation of SCR utilizing flue gas re-heat to improve cost-effectiveness
- Would have been control technology used at Energy Answers
- "Estimated minimum 80% removal efficiency for NOx"
- Energy Answers- 45 ppmdv
- Wheelabrator actual 2015 annual average= 168 ppmdv

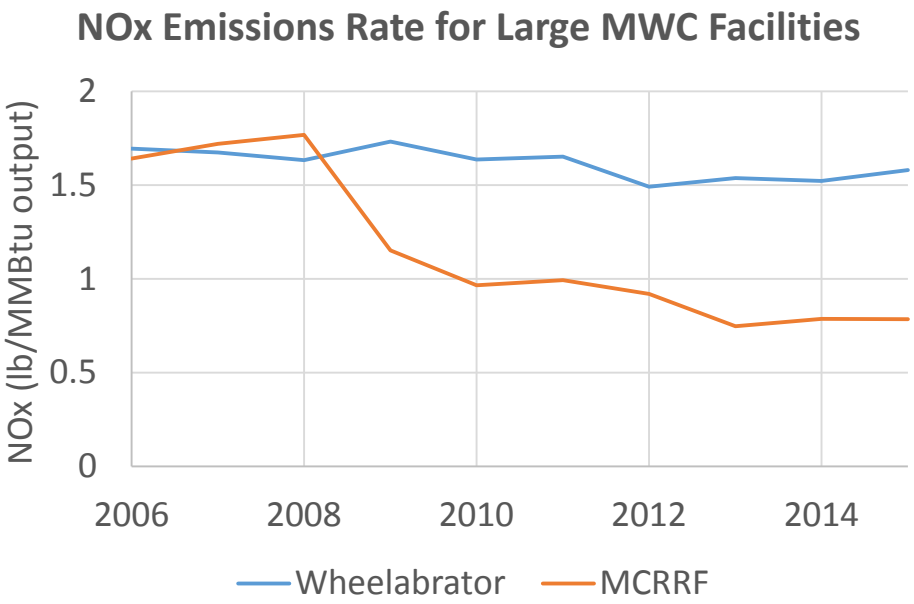
Source: Maryland Power Plant Research Program (PPRP), Supplemental Environmental Review Document, Motion by Energy Answers Baltimore, LLC, to Amend the Construction Commencement Deadline in its Certificate of Public Convenience and Necessity, Maryland Public Service Commission Docket No. 9199 (June 2012) at 6-6.

Treatment Technologies

- Selective Catalytic Reduction (SCR)
- Regenerative Selective Catalytic Reduction (RSCR)
- Low NOx Controls
  - Modifying combustion processes to maximize NOx reduction
  - Retrofit can be combined with existing SNCR systems

Montgomery County Resource Recovery Facility (MCRRF)

- Utilizes SNCR and Low NOx control technology
- Low NOx installed in 2009
- Similar boiler technology, control technology, and pre-2009 emissions rates to Wheelabrator facility



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"Low NO_x" Technology – Montgomery County RRF v. BRESCO

Montgomery County RRF Emissions and Waste Processing 2006-2015		
Year	**NO_x emissions (tons)**	**Waste processed (tons)**
2006	1,041	620,666
2007	1,009	578,804
2008	998	573,293
2009	554	527,623
2010	499	551,670
2011	512	556,266
2012	479	544,647
2013	388	555,716
2014	427	Not available
2015	441	599,250

BRESCO Emissions and Waste Processing 2012-2015		
Year	**NO_x (tons)**	**Waste processed (tons)**
2012	1,012	697,078
2013	1,067	713,410
2014	1,076	Not available
2015	1,124	730,150

Sources: Maryland Emissions Inventory for emissions; U.S. Energy Information Administration for power generated; Northeast Maryland Waste Disposal Authority for waste processed

Efficiency of BRESCO Current Controls
Selective Non-Catalytic Reduction ("SNCR")

- Wheelabrator optimization tests for existing SNCR system stated optimized NOx removal of 25%

	NOx ppm	NOx Removal	Urea Utilization
Original Configuration	175	14-21%	25%
Optimized Configuration	150-165	25%	40%

*from August 30, 2016 MDE NOx RACT for Municipal Waste Combustors Presentation

- Maryland PPRP's analysis- "SNCR typically achieves minimum control efficiencies in range of 50-60% for MSW incinerators"

Source: Maryland PPRP, *supra*, note 15 at 6-7 (Attachment A).

NOx RACT Limits for Incinerators in Other States

State	NOX limit (ppmvd @ 7% O2)	Action	Averaging time	Notes
Connecticut	150 for mass burn waterwall combustors	Final rule effective 8/2/16	24-hour daily average	Limit effective 8/2/17 12 months to comply
New Jersey	150 for municipal solid waste incinerators	Effective April 2009	Calendar day average	Allows owner/operator to apply for alternative NOx limit
Massachusetts	150 for mass burn waterwall combustors	Proposed May 2013. Not finalized.	Daily average	