

Including Energy Programs in Air Quality Planning: States' Perspectives

April 30, 2015



Presentation for webinar hosted by Regulatory Assistance Project (RAP)
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Project Partners

- Maryland Department of Environment (MDE)
- Massachusetts Department of Environmental Protection (MassDEP)
- New York State Department of Environmental Conservation (NYSDEC)
- Northeast States for Coordinated Air Use Management (NESCAUM)
- Regulatory Assistance Project (RAP)
- EPA: OAP, OAQPS, Regions 1, 2, and 3

Funded by EPA/OAP and NESCAUM States



Project Goals

- Help pave the way for integrating energy efficiency (EE) and renewable energy (RE) into air quality planning through real-world examples
- Road-test EPA's *Roadmap for Incorporating Energy Efficiency and Renewable Energy in State and Tribal Implementation Plans*
 - Inform future efforts to use the Roadmap
 - Identify issues and work with EPA to improve the Roadmap



EPA's Roadmap Pathways

- **Baseline emissions projection pathway**: assess various EGU baselines and account for impact of EE programs not included in those baselines
- **Control strategy pathway**: quantify nontraditional, “on-the-way” programs in a manner similar to traditional AQ control programs and demonstrate meeting the four SIP criteria (permanent, enforceable, quantifiable, and surplus)
- **Weight-of-evidence (WOE) determination pathway**: document how state programs will maintain or reduce emissions without the need for otherwise required AQ modeling; EPA does not allow crediting
- **Emerging/voluntary measures pathway**: basis for EPA's 2004 guidance on EE in SIPs

EPA's Roadmap and supporting documents: <http://epa.gov/airquality/eere/>



Maryland
Department of the Environment



Department of the Environment

Including Energy Efficiency & Renewable Energy in Our Ozone SIP

Yes ... We Actually Plan to Do This



Tad Aburn - Air Director, MDE
April 30, 2015 - NESCAUM – Webinar



- A little background on air quality in Maryland
- The Baltimore Ozone SIP
 - Isn't Baltimore now measuring attainment?
- Challenges in building a clean air plan
 - Also called the “SIP” or State Implementation Plan
 - The role of air pollution “transport”
 - “Low hanging fruit” – It's all gone
- What will go in our SIP
 - Our own EE/RE efforts
 - Estimated benefits from EE/RE linked to 111d in other states



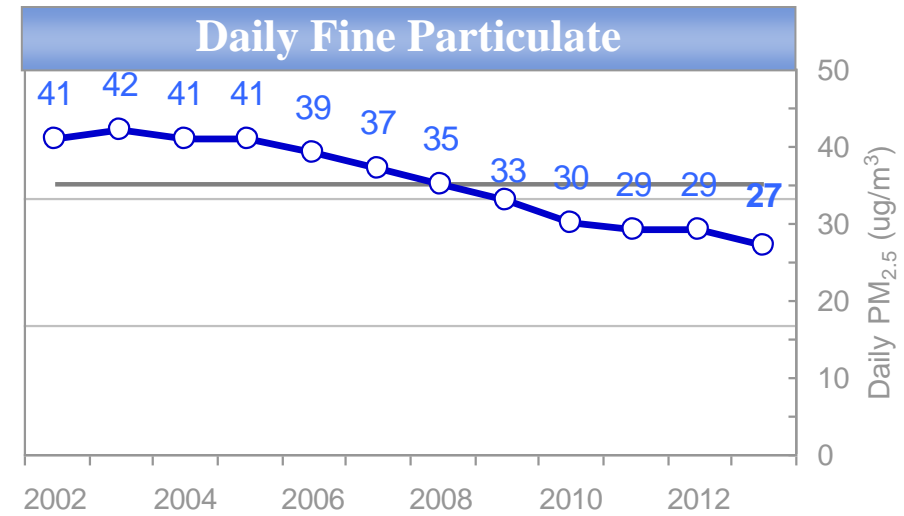
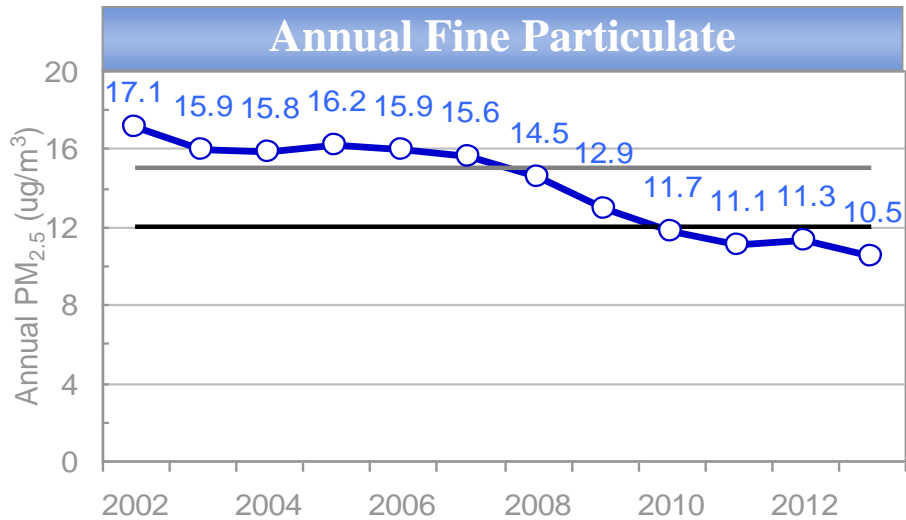
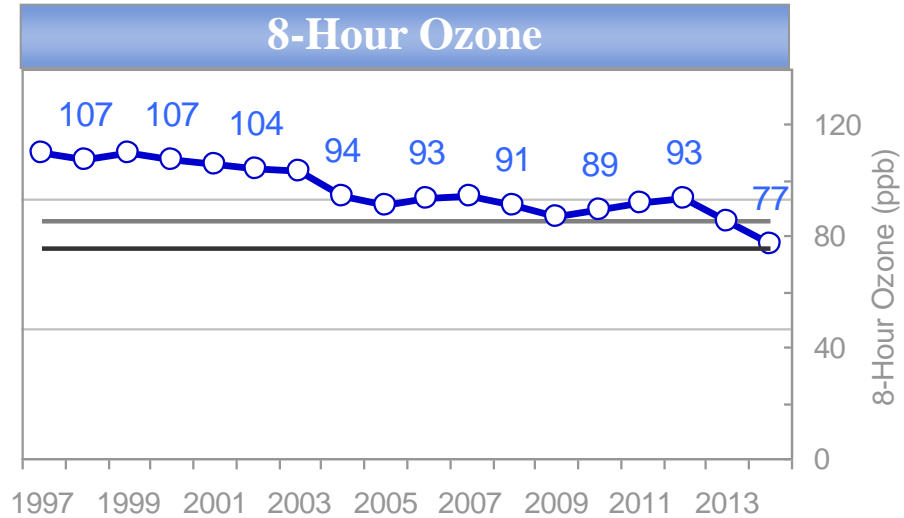
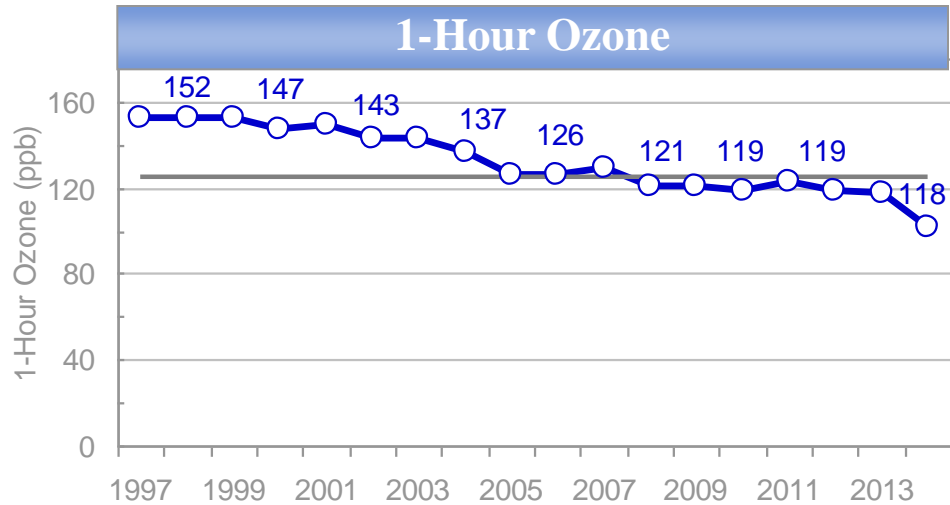
Air Quality Issues in Maryland

- Ground level Ozone and Transport
- Fine Particulate
- The new SO₂, NO₂ and lead standards
- Air quality contributions to the Chesapeake Bay
- A State required greenhouse gas SIP
- Multi-Pollutant Planning, Environmental Justice and more
- EE/RE efforts can help with all of these problems





Progress in Cleaning Maryland's Air





Lower Concentrations & Smaller Problem Areas

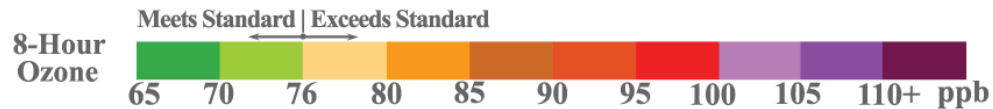
Ozone

1990

2005

2000

2010





So What Else Can MD Do?

- MDE has worked with the University of Maryland for 20+ years to study where our air pollution problem comes from
- It's not all that complicated
 - Just very, very difficult
- Two basic pieces
 - Maryland emissions
 - Emissions in upwind states
 - On many bad days sources in upwind states are responsible for 70% to 90% of our problems
 - This piece - “air pollution transport” - is our #1 priority





So is Maryland Still Pushing Local Controls?

- Yes – For example, the Maryland Health Air Act
 - It's a \$2.6 Billion power plant control program
 - Single sources in upwind states now emit more NOx than all of MDs sources combined
- We are also a California Car State
 - Toughest car standards allowed by law
- New local rules on everything we can find
 - Cement kilns to perfume
 - Even pushing crazy – nontraditional - stuff
 - Voluntary programs, outreach programs, incentive programs, out-of-the box transportation initiatives ... and so on
- This is where our efforts on getting EE/RE programs into our clean air planning process fit
 - It's one of the crazy – nontraditional – approaches we're pushing to further clean the air



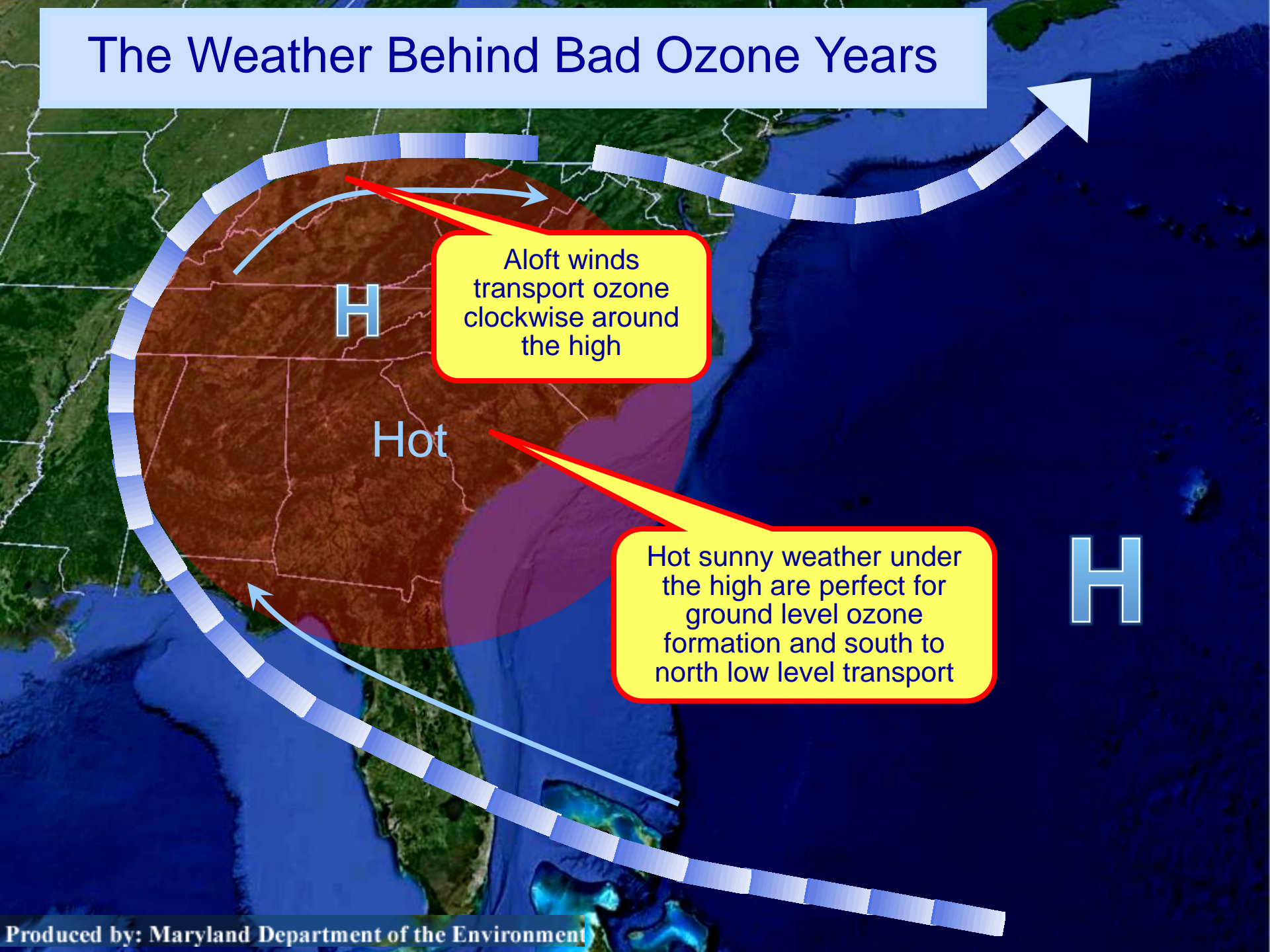


The Strange Story of Ozone in Baltimore

- Lowest emissions of any city in DC to Boston corridor
- In 2010 to 2012 Baltimore had the highest ozone levels in the East
 - Only area in the East designated as “Moderate” by EPA
 - Only area in the East that is required to submit a SIP in 2015
- Then a miracle happened ...
 - Measured very low ozone in 2013 and 2014
 - Lower than DC, lower than Philly, way lower than CT/NY/NJ
 - If 2014 repeats in 2015 and 2016 – We’ll most likely meet the next standard – it was really clean in 2014
- EPA proposed a Clean Data Determination in March of 2015
- Maryland tells EPA to not take the current data too seriously ... we take our CAA responsibility to attain standards as expeditiously as possible very seriously ... so ... we still plan to submit our SIP in 2015
- So what the heck is going on – was it really a miracle?



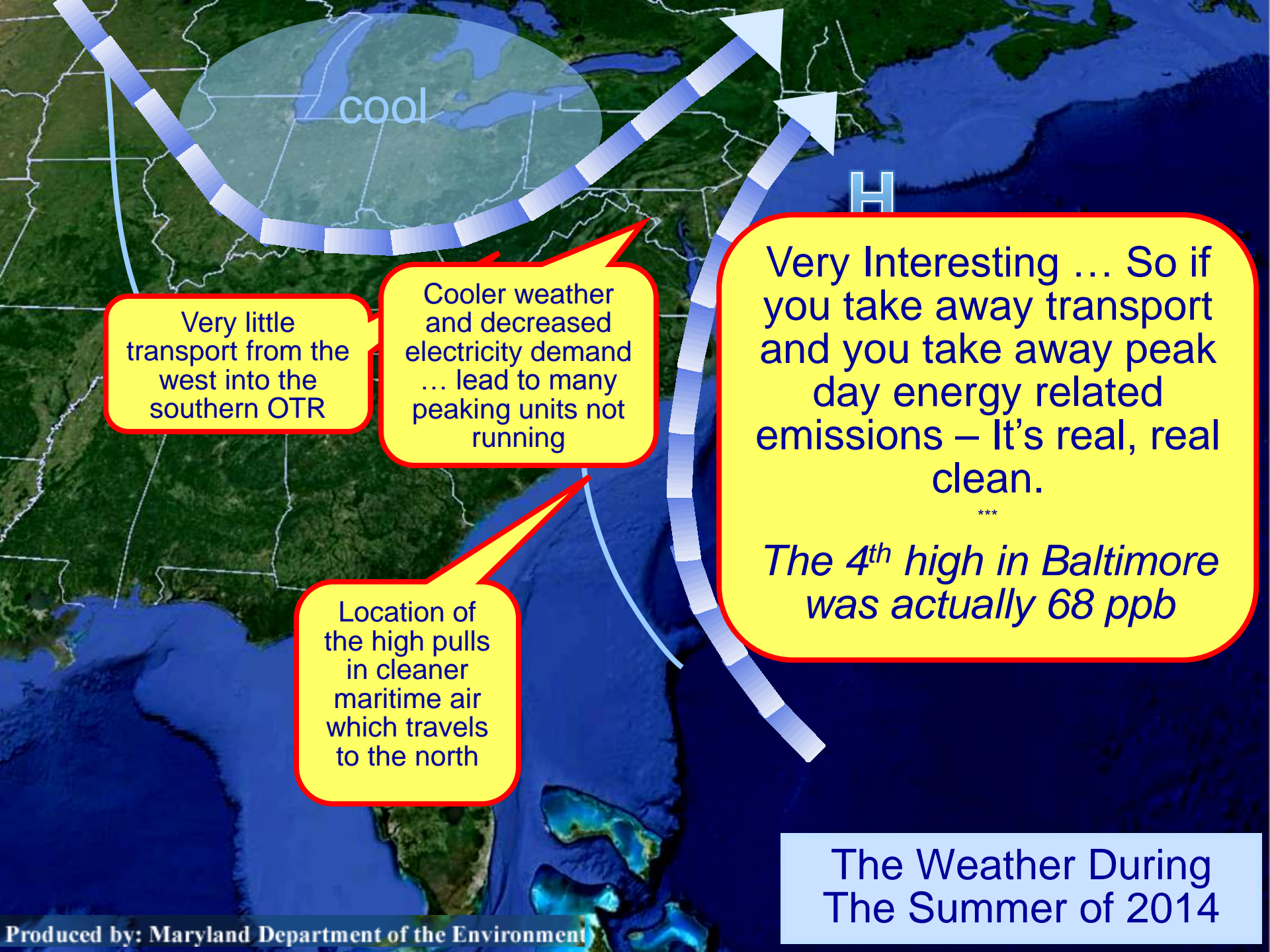
The Weather Behind Bad Ozone Years



Aloft winds
transport ozone
clockwise around
the high

Hot

Hot sunny weather under
the high are perfect for
ground level ozone
formation and south to
north low level transport



cool

H

Very little transport from the west into the southern OTR

Cooler weather and decreased electricity demand ... lead to many peaking units not running

Location of the high pulls in cleaner maritime air which travels to the north

Very Interesting ... So if you take away transport and you take away peak day energy related emissions – It's real, real clean.

The 4th high in Baltimore was actually 68 ppb

The Weather During The Summer of 2014



Back to EE/RE in Our SIP

- We plan to submit our ozone SIP for Baltimore in the Fall
 - We are 95% ready to go
- All the traditional stuff
 - New controls in MD
 - New controls in upwind states
 - Credit for all “on-the-books” federal programs
 - Rate of Progress, Attainment, all the bells and whistles
- Will also include lots of non-traditional stuff
 - Things that will probably help further clean the air, but are not included in federally enforceable regulations
 - EE/RE in MD
 - EE/RE (and more) from potential 111d scenarios
 - Urban tree canopy benefits
 - Voluntary programs and partnerships ,, , Much more
- All part of additional “Weight of Evidence” used to support the SIP





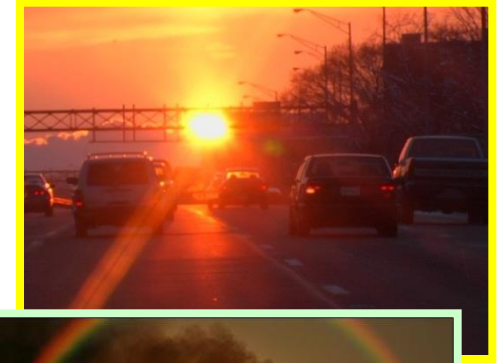
Just a Little on Weight of Evidence

- EPAs definition is sort of rigid
- Maryland's version fits within EPAs concept, but is more creative ... maybe a bit more honest
- How creative?
 - “All models are wrong ... some are useful” – George E. P. Box, 1987
- Maryland's approach is very focused on being honest on what our technical work really does tell us
 - Addresses uncertainty qualitatively and quantitatively
 - May result in both potentially higher and lower ozone
 - Allows for potential benefits to be shown/credited for programs that are less enforceable and historically not included in SIPs
 - EPA sort of pushes us to a bright line demo – “will ozone levels in 2018 ... in Edgewood MD ... at 4:45 on July 15 ... be below 75 ppb
 - Maryland's approach sort of paints a picture about attainment ... Very good chance that we will make it .. but stuff happens
- This is where our EE/RE effort fits in



So What Have We Done?

- Started with our State 2012 GHG requirements
 - Now driven by our 2015 ozone SIP
 - We are doing our EE/RE work (and other work) as part of a multi-pollutant planning framework
- We've worked with NESCAUM (Northeast States for Coordinated Air Use Management) to build an analytical framework that allows us to:
 - Quantify the emission reductions of multiple pollutants for a broad suite of EE/RE efforts
 - Model the reductions in ozone, fine particulate and other pollutants
 - Estimate the public health benefits associated with those reductions, and quantify the economic benefits and costs
- University of Maryland (air quality modeling) and Towson University (economic modeling) are also part of the team doing this work



The Programs We Have Analyzed

- At this time, we have analyzed our highest priority EE/RE initiatives in Maryland
 - The Regional Greenhouse Gas Initiative (RGGI)
 - The EmPOWER Maryland program
 - The Maryland Renewable Portfolio Standards (RPS) program
 - The Maryland Clean Cars program
 - Electric vehicle initiatives
 - Smart growth initiatives
 - Green building initiatives



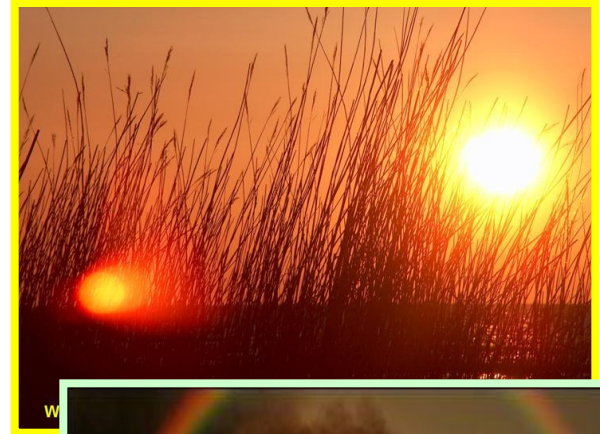
The Framework

- Kudos to NESCAUM
 - Maryland is building off of work originated by our partners in the Northeast
 - The workhorse
 - NE-MARKAL model – an energy model that we now use to analyze the energy implications and emission reductions from a suite of selected EE/RE programs
 - Linked models
 - The photochemical – “air quality” model (CMAQ)
 - An economic model (REMI)
 - A cost-benefit model (BenMAP)

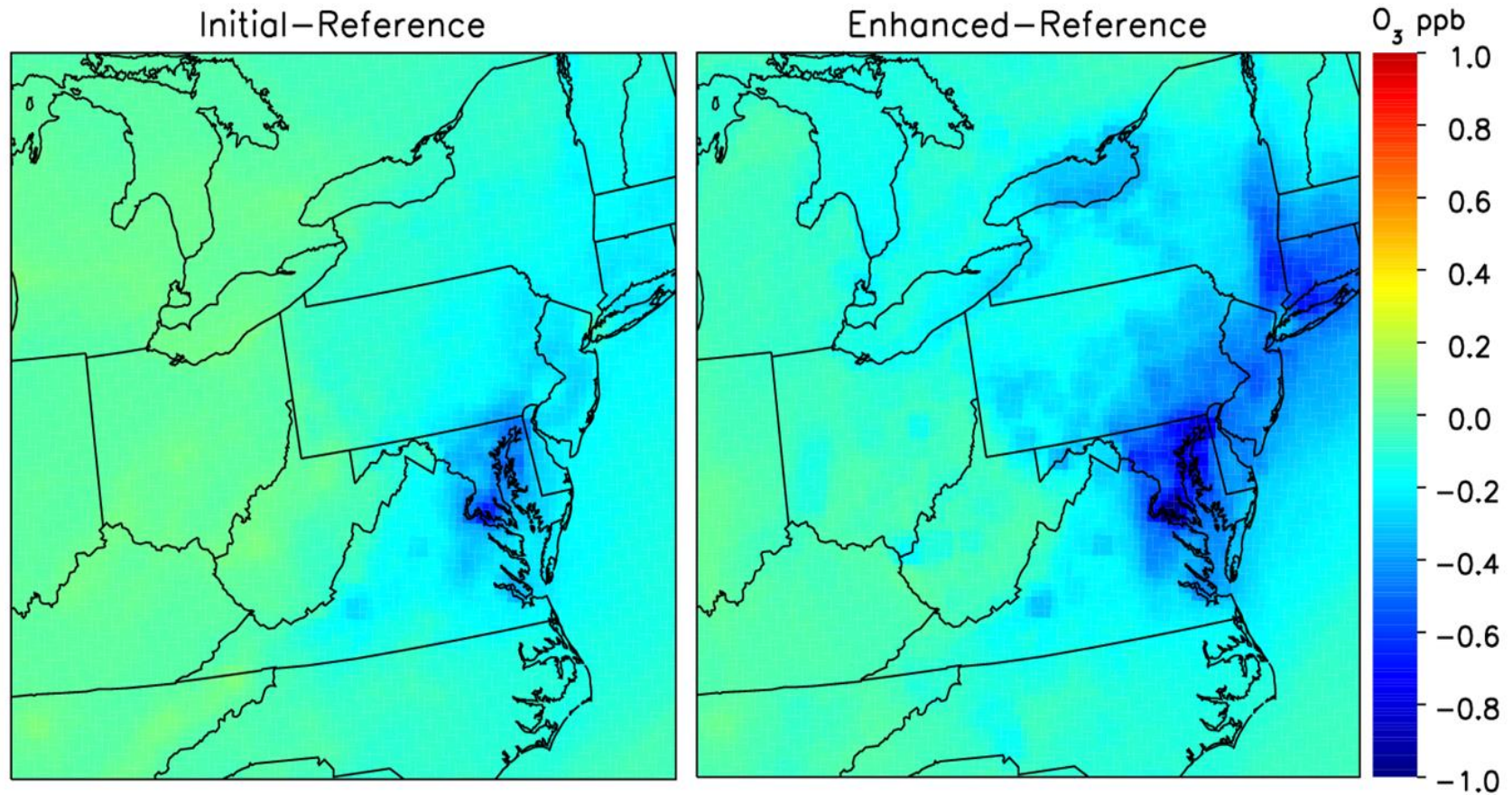


A Sampling of What Will Be in Our SIP

- It's an ozone SIP
 - So ozone benefits from EE/RE
 - Reduced ozone concentrations
 - NO_x and VOC emission reductions
 - More
- Other co-benefits
 - Fine particulate, greenhouse gases, other pollutants
 - Health risks avoided ... less asthma, less early death, in MD and downwind of MD
 - Jobs created, economic benefits
 - More

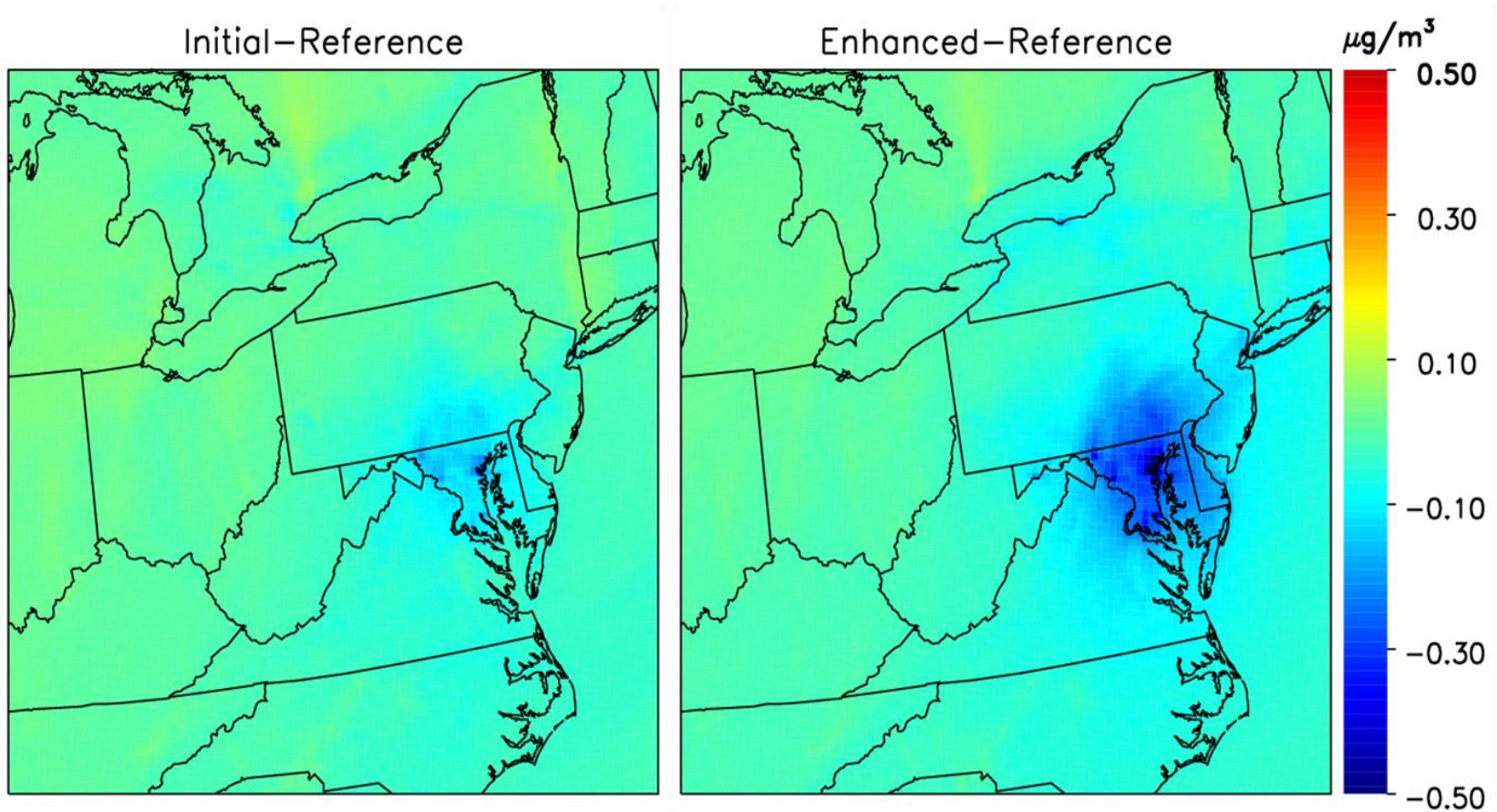


Small ... But Important Ozone Benefits



Difference between average maximum daily 8-hour average ozone calculated for the policy and reference cases

Small ... But Important PM Co-Benefits

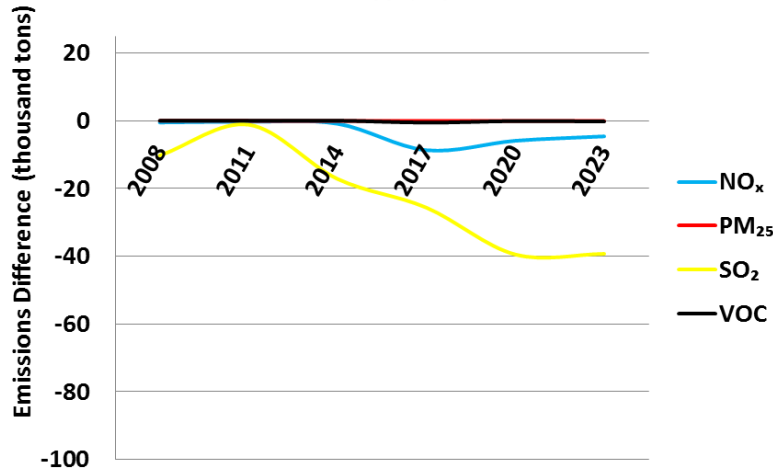


The greatest reductions in particulate matter are centered in Maryland. Largest decreases in Maryland are found near Baltimore/Edgewood and in the vicinity of power plants within the state.

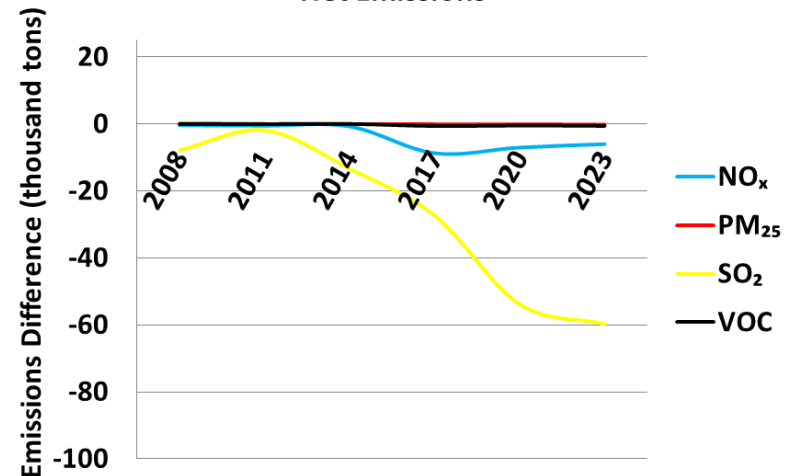


Aggregate Emission Reductions from EE/RE

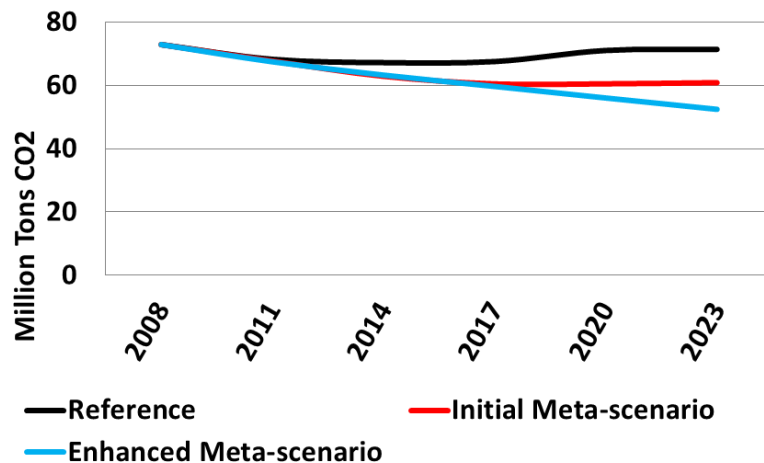
Difference in Criteria Emissions Between Reference Case and Initial Meta-scenario: Net Emissions



Difference in Criteria Emissions Between Reference Case and Enhanced Meta-scenario: Net Emissions



Carbon Dioxide Emissions: Net Emissions



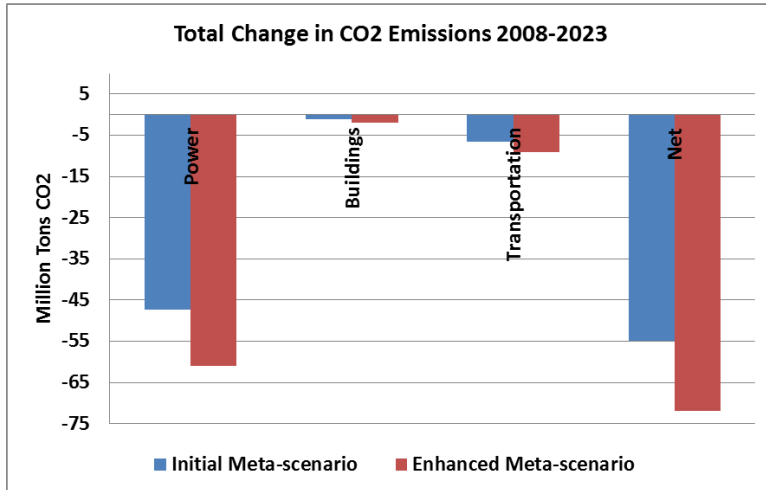
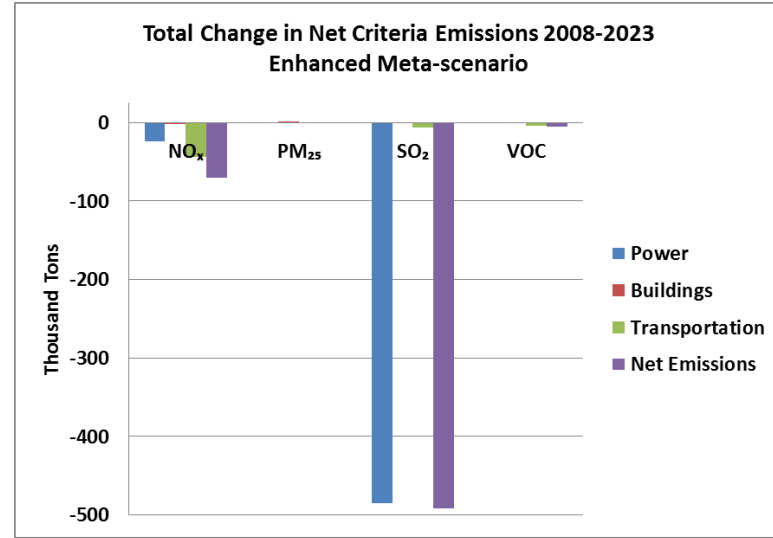
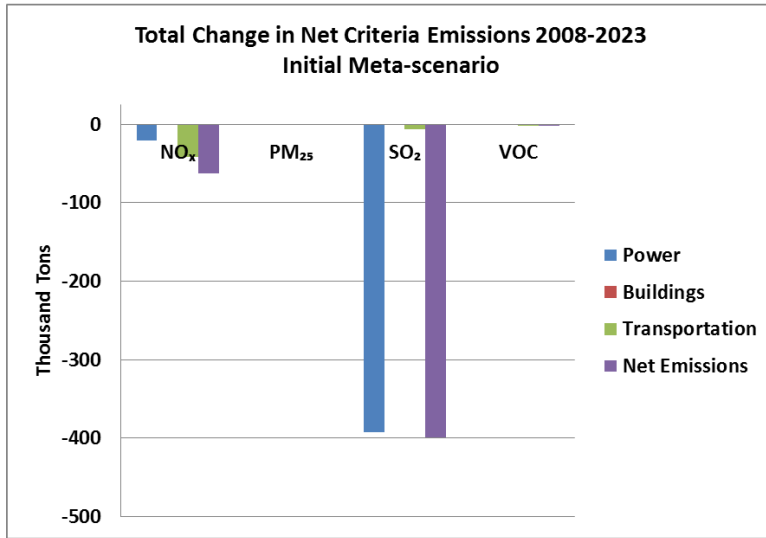
Cummulative Change 2008-2023 (kt)

	Initial	Enhanced
CO ₂ *	-55	-72
NO _x	-63	-70
PM ₂₅	-1	-1
SO ₂	-399	-492
VOC	-2	-5

* CO2 in Million Tons



EE/RE Emission Reductions by Sector

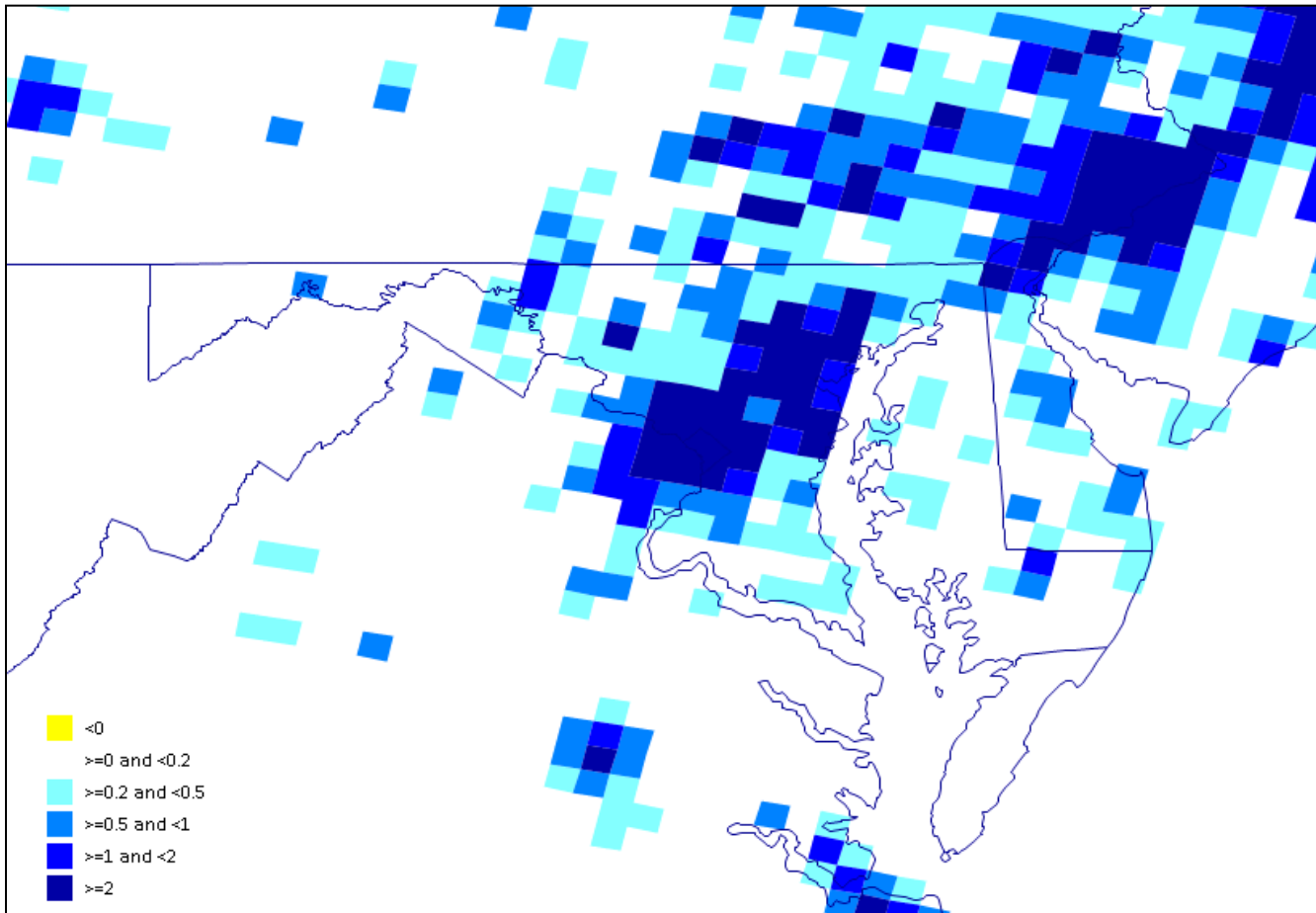


Estimated Health Benefits

- Multi-pollutant benefits
- Reduced incidences of...
 - Mortality
 - Various morbidity incidences (asthma attacks, heart attacks, lost school/work days, etc.)
- A few samples using reduced mortality as the example
 - 84 to 192 avoided deaths per year in MD
 - Monetized benefits of \$620 million to \$1.6 billion from avoided health costs



Distribution of Health Benefits



Distribution of Upper End (Lepeule et al. 2012) Estimate of Premature Mortality in Maryland from Changes in $PM_{2.5}$ Concentrations from Reference Case to Enhanced Meta-scenario



Estimated Economic Benefits

- 3,588 jobs created from enhanced Meta-scenario by 2020
- \$98,300,000 increase in wages by 2020
- \$23,233,333 average annual output from 2010-2020
- \$217,320,000 increase in real disposable income by 2020 – money that goes back into the pockets of Marylanders



Next Steps

- Continue to enhance all analyses through Fall 2015
 - Continued air quality, health benefit and economic modeling
 - Quantifying Chesapeake Bay benefits
 - Adding new EE/RE efforts into the mix
 - Offshore wind, updated RGGI, others
- Submit the SIP that includes weight-of-evidence based credit for EE/RE by the end of the year



One Last Piece

- Looking at how the EE/RE in the EPA Clean Power Plan (CPP) could help reduce exposure to ozone, PM and other air pollutants
- Remember ... 70% of Maryland's ozone problem originates in upwind states
- Expect to see meaningful additional ozone benefit from potential CPP implementation concepts



Questions?





New York State
Department of Environmental Conservation



Department of
Environmental
Conservation

Including Energy Programs in Air Quality Planning: NY Perspective

Robert D. Bielawa, P.E.

NESCAUM Webinar
April 30, 2015

“Roadmap for Incorporating Energy Efficiency/Renewable Energy Policies and Programs into State and Tribal Implementation Plans

- Roadmap goals
 - Facilitate use of EE/RE into air quality plans
 - Provide potential methodologies to account for emissions reductions
- New York’s interest
 - Ozone standard difficult to attain in NYC
 - Need to consider all potential sources of emissions reductions
 - Vigorous EE/RE implementation in NY



Roadmap SIP Pathways

- Baseline emissions projection pathway;
- **Control strategy pathway;**
- Emerging/voluntary measures pathway; and
- Weight of evidence determination pathway

NY : Roadmap Pilot Focus

- NY-Sun Initiative
 - <http://ny-sun.ny.gov/>
- BuildSmart NY Initiative
 - <http://www.buildsmart.ny.gov/>
- Combined Heat and Power (CHP)
 - <http://www.nyserda.ny.gov/All-Programs/Programs/Combined-Heat-and-Power-Acceleration-Program>
 - <http://www.nyserda.ny.gov/All-Programs/Programs/Combined-Heat-and-Power-Performance-Program>

NY-Sun Initiative

- Pilot: Goal of 239 MW installed photovoltaic capacity by 2013
- 2014: 316 MW installed or under contract
- April 2014: \$1B commitment to expand deployment of solar capacity in New York State
- 3 GW installed capacity by 2023

Source: <http://ny-sun.ny.gov/About/NY-Sun-FAQ>

BuildSmart NY Initiative

Pilot: A 20% improvement in the energy efficiency performance of State agencies, authorities, departments, offices, and other gubernatorial organizations by April of 2020.

2013 Progress Report*

- Progress toward targets is measured through utility consumption data
- In Year 1 (FY11/12) the State's source Energy Use Intensity (EUI) decreased by 4.7%
- The BuildSmart NY team estimates that the State may have already achieved a 6.9% in its source EUI (Year 3).

* Source: <http://www.buildsmart.ny.gov/progress/annual-progress-reports/>



- Source: <http://ny-sun.ny.gov/About/NY-Sun-FAQ>

Combined Heat and Power

Pilot: A hypothetical oil burning boiler replacement (370 mmBtu/hr) with 8 CHP natural gas-fired combustion turbines rated at 13.5kW each.

- Approximately 200 CHP installations, ranging from 50 kW to 1.3 MW each, over the next four years
- 2025 technical potential of 3.9 GW, 2034 technical potential of 6.4 GW
- 2025 economic potential of 2.8 GW, 2034 economic potential of 4.7 GW

* Source: NYSERDA RFP 3019 and Optimal Energy Report, October 2014

- Source: <http://ny-sun.ny.gov/About/NY-Sun-FAQ>

Various Tools

Pilot Project: DEC primarily relied upon the Northeast Market Allocation (NE-MARKAL) energy model run by NESCAUM. EE/RE program details were obtained from official program reports posted on public websites. DEC also used EPA's CHP Emissions Calculator.

Note: NE-MARKAL is not a forecast too and real world reductions can vary, as with any model.

Other Available Resources:

- New York State Energy Research & Development Authority (NYSERDA)
- New York State Department of Public Service (NYSDPDS)
- New York Independent System Operator (NYISO)
- New York Power Authority (NYPA)
- Long Island Power Authority (LIPA)

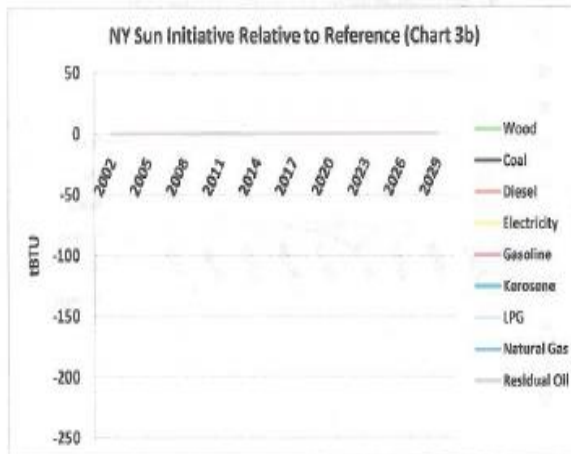
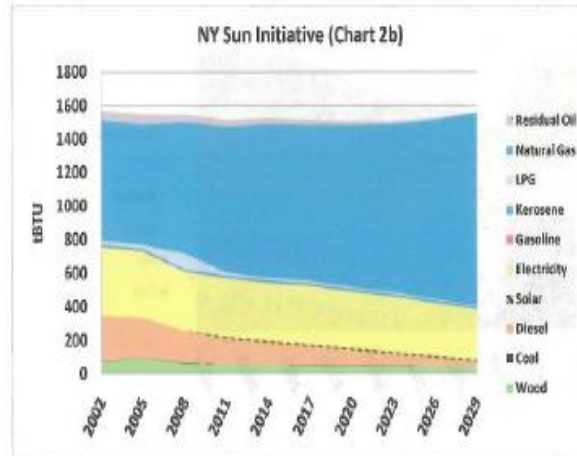
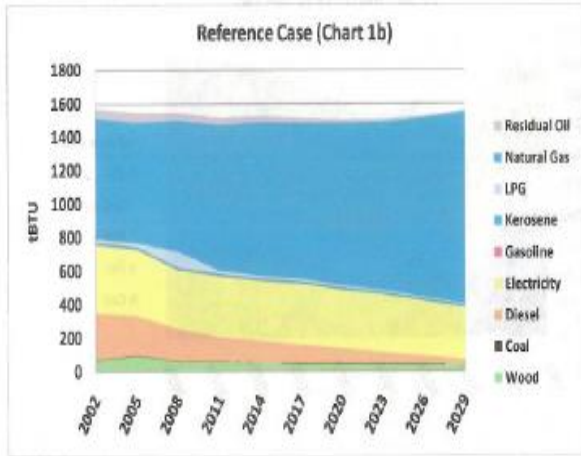
NE-MARKAL Results

NY-Sun, BuildSmart NY and All NY Buildings for 2002 – 2029:

- Energy Consumption
- Electricity Generation by Fuel Type
- Emissions Indicators
 - Difference between reference case for each initiative in the power and buildings sectors
 - Total emissions change

New York Case Study Result Sample

Buildings Sector Final Energy Consumption - b



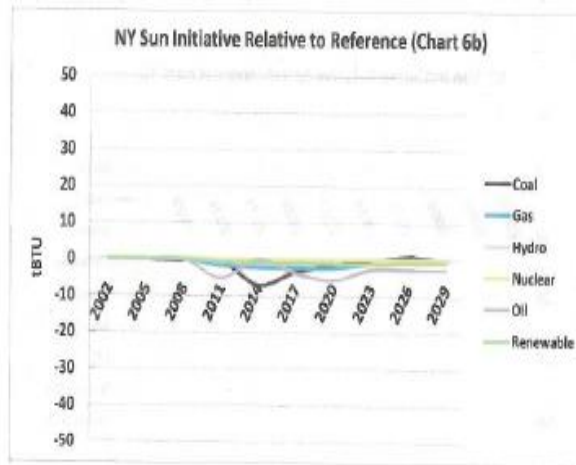
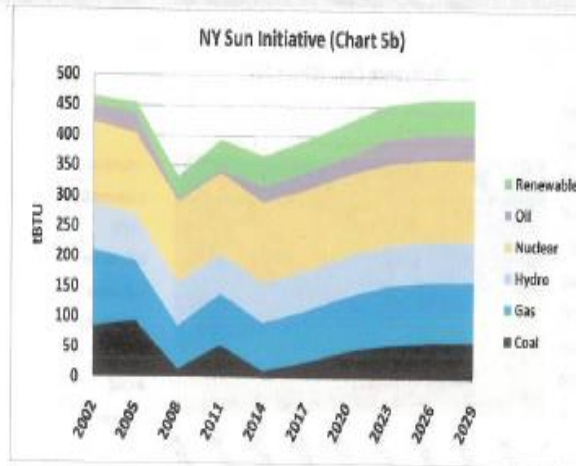
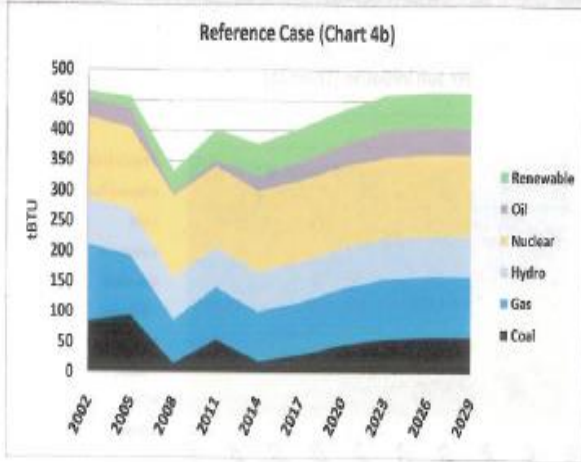
Cumulative Change (tBTU) - Table 11:

	2002-2014	2002-2029
Wood	0	0
Coal	0	0
Diesel	0	0
Electricity	0	0
Gasoline	0	0
Kerosene	0	0
LPG	0	0
Natural Gas	0	0
Residual Oil	0	0



New York Case Study Result Sample

Electricity Generation by Fuel Type - b



Cumulative Change 2002-2029 - Table 2b:

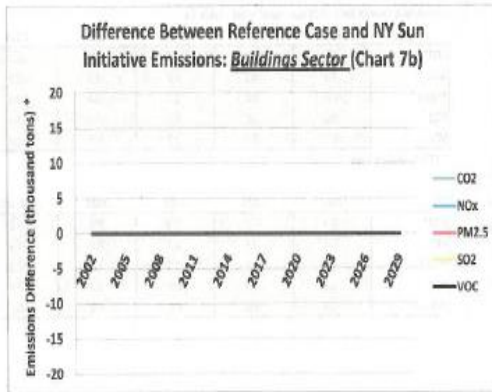
	MWh	tBTU
Coal	-3,481,565	-12
Gas	-3,021,366	-10
Hydro	267,321	1
Nuclear	0	0
Oil	-6,485,492	-22
Renewable	-1,842,409	-6



New York Case Study Result Sample

NY-Sun Initiative Emissions Indicators - b

Indexed Emissions - b



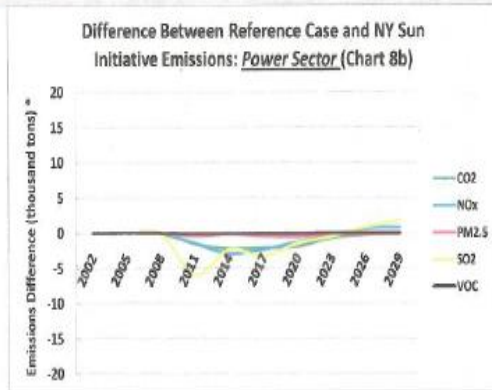
Cumulative Change (thousand tons) - Table 3b:

	2002	2005	2008	2011	2014	2017
CO2*	0.0	0.0	0.0	0.0	0.0	0.0
NOx	0.0	0.0	0.0	0.0	0.0	0.0
PM2.5	0.0	0.0	0.0	0.0	0.0	0.0
SO2	0.0	0.0	0.0	0.0	0.0	0.0
VOC	0.0	0.0	0.0	0.0	0.0	0.0

* CO2 in Million Tons

	2020	2023	2026	2029	2002-2014	2002-2029
CO2*	0.0	0.0	0.0	0.0	0.0	0.0
NOx	0.0	0.0	0.0	0.0	0.0	0.0
PM2.5	0.0	0.0	0.0	0.0	0.0	0.0
SO2	0.0	0.0	0.0	0.0	0.0	0.0
VOC	0.0	0.0	0.0	0.0	0.0	0.0

Indexed Emissions - b



Cumulative Change (thousand tons) - Table 4b :

	2002	2005	2008	2011	2014	2017
CO2*	0.0	0.0	-0.1	-1.5	-2.2	-3.1
NOx	0.0	-0.1	0.0	-1.5	-2.9	-3.3
PM2.5	0.0	0.0	0.0	-0.4	-0.1	-0.4
SO2	0.0	0.0	-0.1	-6.0	-2.4	-3.3
VOC	0.0	0.0	0.0	0.0	0.0	0.0

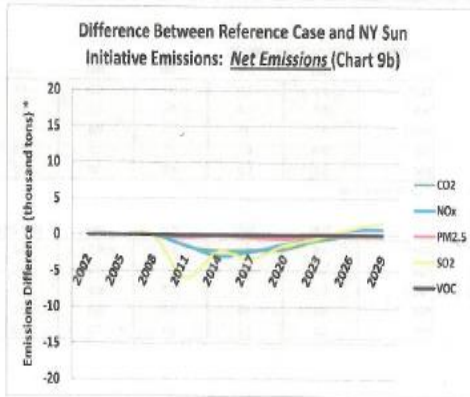
* CO2 in Million Tons

	2020	2023	2026	2029	2002-2014	2002-2029
CO2*	-2.0	-0.7	-0.3	0.0	-3.8	-8.9
NOx	-1.3	-0.4	0.7	0.8	-4.5	-7.1
PM2.5	-0.5	-0.2	-0.2	-0.2	-0.5	-1.1
SO2	-1.5	-0.5	0.9	1.7	-8.5	-11.2
VOC	0.0	0.0	0.0	0.0	-0.1	-0.17



New York Case Study Result Sample

increased Emissions - b



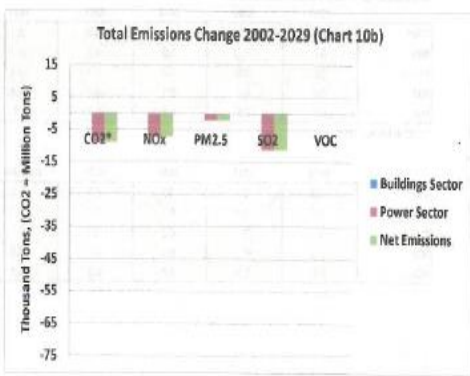
Cumulative Change 2002-2029 (thousand tons) - Table 5b:

	2002	2005	2008	2011	2014	2017
CO2*	0.0	0.0	-0.1	-1.5	-2.2	-2.1
NOx	0.0	-0.1	0.0	-1.5	-2.9	-2.3
PM2.5	0.0	0.0	0.0	-0.4	-0.1	-0.4
SO2	0.0	0.0	-0.1	-6.0	-2.4	-3.3
VOC	0.0	0.0	0.0	0.0	0.0	0.0

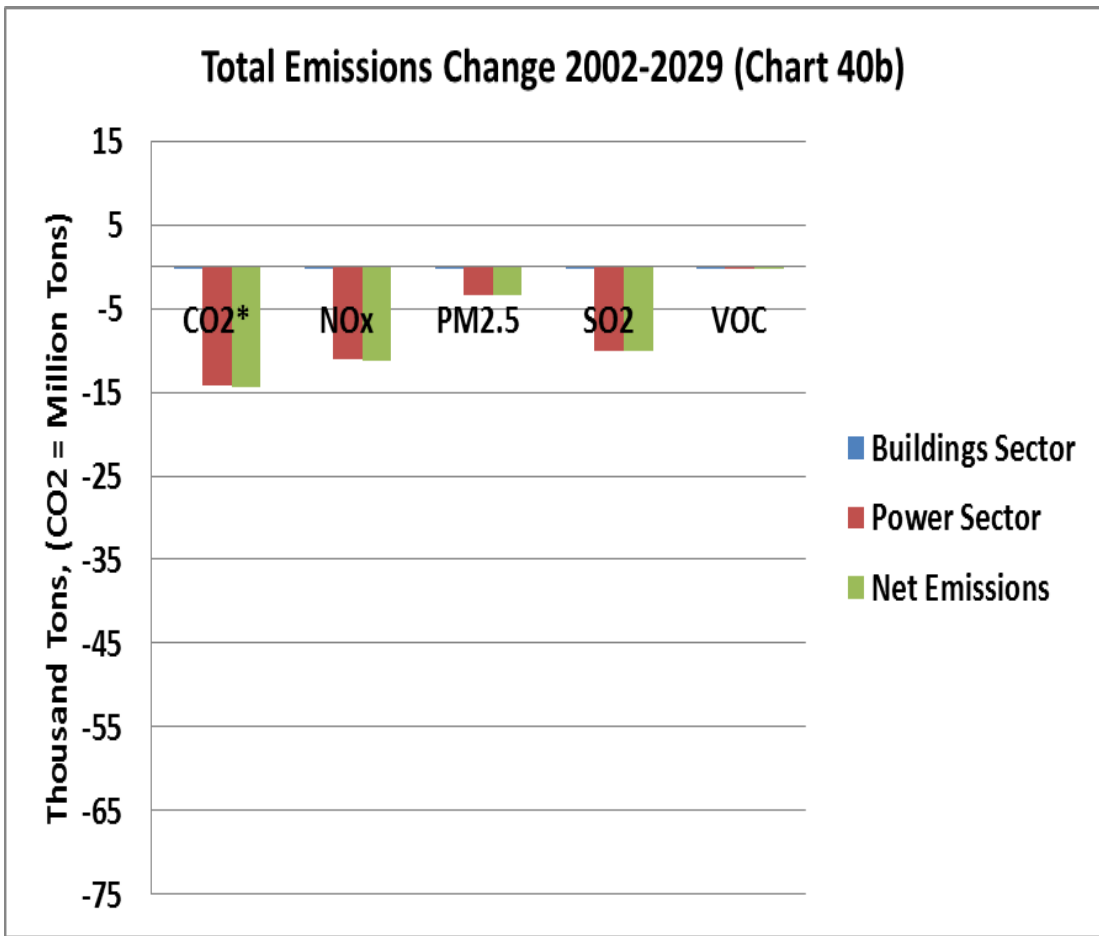
* CO2 in Million Tons

	2020	2023	2026	2029	2002-2014	2002-2029
CO2*	-2.0	-0.7	-0.3	0.0	-3.8	-8.9
NOx	-1.3	-0.4	0.7	0.8	-4.5	-7.1
PM2.5	-0.5	-0.2	-0.2	-0.2	-0.5	-2.1
SO2	-1.5	-0.5	0.9	1.7	-4.5	-11.2
VOC	0.0	0.0	0.0	0.0	-0.1	-0.17

Net Emissions Summary - b



New York Case Study Result Sample



Cumulative Change (thousand tons) Table 20b:

	2002-2014	2002-2029
CO2*	-5.1	-14.4
NOx	-6.4	-11.2
PM2.5	-0.6	-3.4
SO2	-5.9	-10.2
VOC	-0.1	-0.3

* CO2 in Million Tons

NY-Sun and Build NY Combination Scenario

Key Findings and Recommendations

- Magnitude of EE and RE programs needed to achieve meaningful results could be significant
- Determining SIP credit will likely occur on case-by-case basis; therefore important that EPA document and share decisions nationally to promote regional consistency
- Need to work with EPA during future SIP development to clarify use of EPA's *"Guidance on Incorporating Bundled Measures in State Implementation Plans"* in relation to the Roadmap
- Enforceability issues a concern

Thank You

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Department of
Environmental
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Massachusetts
Department of Environmental Protection

EE/RE and Air Quality Planning: Massachusetts Case Study

Will Space

Massachusetts Department of Environmental Protection

April 30, 2015



Massachusetts Background

- EE programs ranked #1 by ACEEE
- Annual investments of ~ 500 million/year yield:
 - ~ 100 + MW in avoided generation (ongoing)
 - ~ 2.5 + billion/year in benefits (over measure lifetimes)
- Funding includes RGGI “cap-and-invest” program
- Annual EM&V spending ~ \$20 million per year

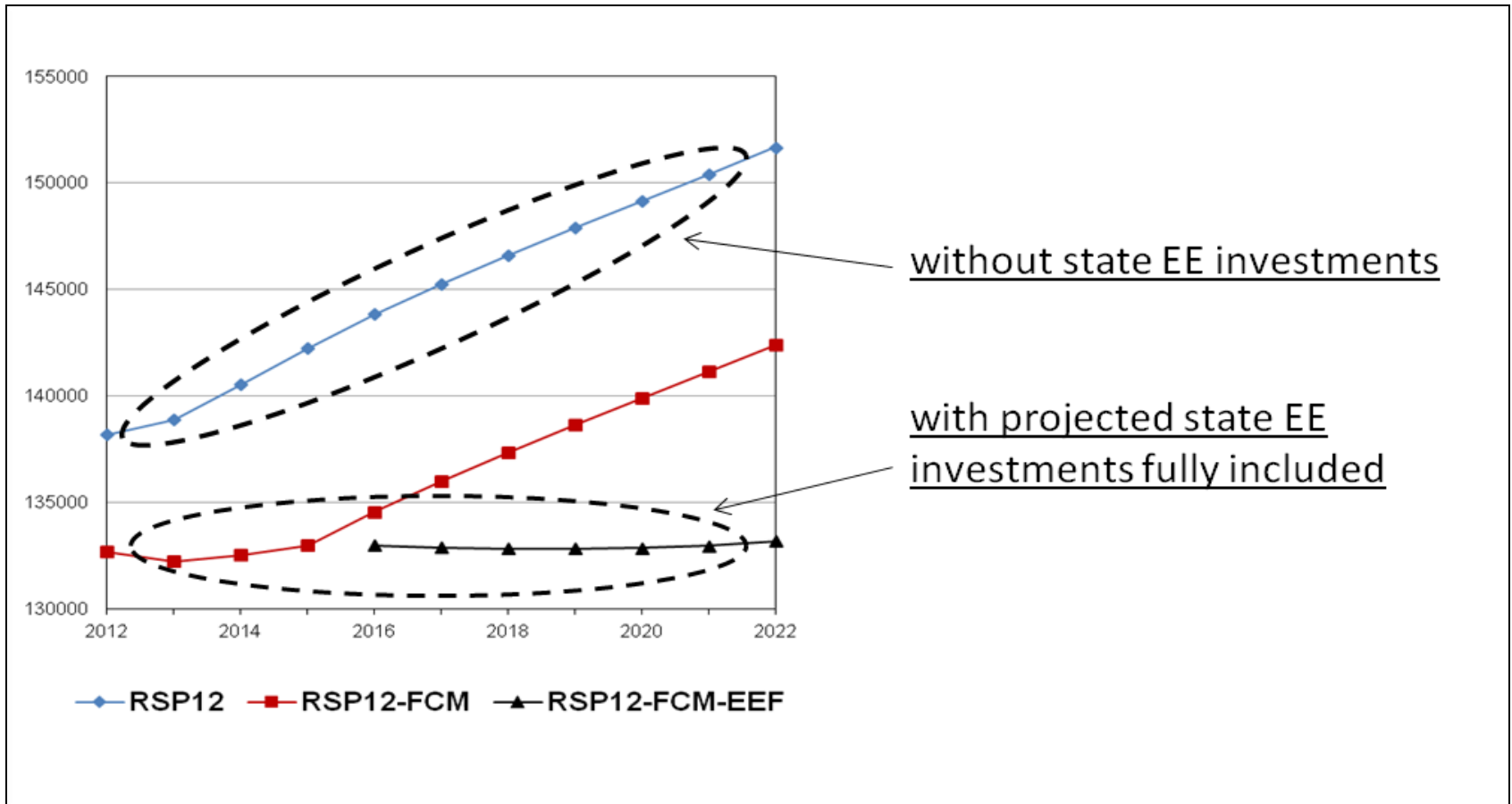


Massachusetts Case Study

- Applied baseline pathway to statutory requirement to implement all cost-effective EE
- Reviewed EIA's AEO, ERTAC's EGU Growth Model, and the ISO NE load forecast
- Described experience working with ISO-NE to develop load forecasts for the RGGI program:
 - ISO-NE revised forecasts to reflect EE programs
 - States used ISO load forecasts as modeling inputs



ISO-NE Load Forecasts



Findings and Recommendations

- The baseline pathways requires knowledge of whether and how EE is reflected in load forecasts.
 - Energy savings data are adequate and available.
 - The RGGI experience working with ISO-NE on load forecasting is exemplary.
 - There is no standard methodology for determining how EE is reflected in load forecasts.
- EPA and DOE should work with states to:
 - Reflect state EE programs in load forecasts (EIA)
 - Standardize EM&V practices



EE/RE and Air Quality Planning: Massachusetts Case Study

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