MANE - VU
Mid-Atlantic/Northeast Visibility Union

# MANE-VU Modeling Inventory

## Developing the Technical Basis for Setting the 2nd Reasonable Progress Goals for the MANE-VU Class I Areas under the Regional Haze Program

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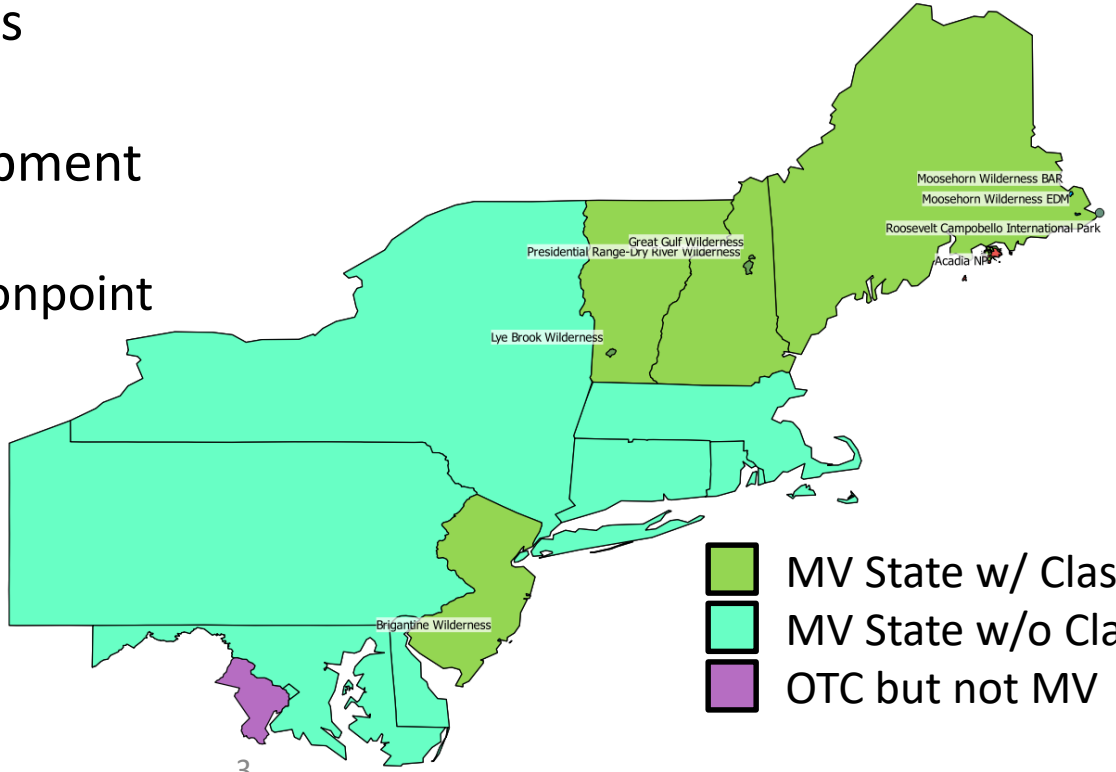
# Thanks

- Ozone Transport Commission/Mid-Atlantic Northeast Visibility Union
- Rob Sliwinski, NYSDEC – Former MANE-VU Technical Support Committee Chair
- Jeff Underhill, NHDES – OTC Modeling Committee Chair
- MANE-VU Collaborators

# Overview

1. Base Case Inventories
2. MANE-VU Ask
3. Control Case Development
   a) EGUs
   b) Non-EGU Point/Nonpoint
4. Results



# Base Case Inventory – “Gamma 2028”

- Starting point: EPA 2028 ‘el’ inventory
  - Upgrade from MARAMA α2 2028 Inventory
  - Included updates from MARAMA α2 for MANE-VU States
- ERTAC swapped for IPM – 3 sectors affected
  - ERTAC v2.7 replaces IPM
  - Non-ERTAC IPM EGUs added back (used MARAMA 2023 β projection)
  - ERTAC units in Non-EGU Point removed
- Other Changes
  - Point source offsets: MARAMA γ
  - Canadian: 2023 EPA v6.3 en

# MANE-VU "Ask"

Signed August 25, 2017

## States:

- Ensure effective use of installed controls on EGUs (>=25 MW) year-round
- 4-factor analysis for most important sources (> 3Mm$^{-1}$ extinction)
- Complete 2007 low sulfur fuel oil rule
- Update permits and/or rules to reflect already achieved rates for $SO_2$, $NO_X$, and $PM_{2.5}$
- **MANE-VU STATES ONLY:** "Must meet" or "strive to meet" particular $NO_X$ emissions standards or perform 4-factor analysis on HEDD units
- Increase energy efficiency and implement CHP or other DG

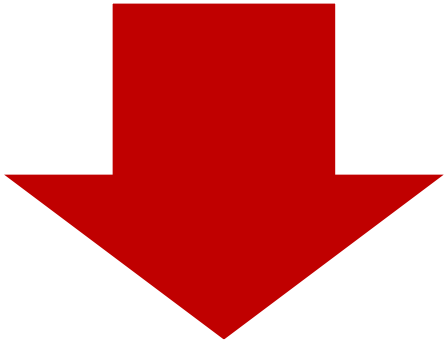
## FLMs/EPA:

- FLMs consult with MANE-VU Class I States when scheduling prescribed burns
- EPA develop measures that will further reduce emissions from heavy-duty onroad vehicles
- EPA ensure that Class I Area state "Asks" are addressed in "contributing" state SIPs prior to approval

# Which Controls Were Modeled

## Included

- Ask 1: Effective use of installed controls on EGUs
- Ask 2: 4-factor analysis for > $3Mm^{-1}$ sources
- Ask 3: Low sulfur fuel oil rule
- Ask 5: Must meet $NO_X$ emissions standards on HEDD units

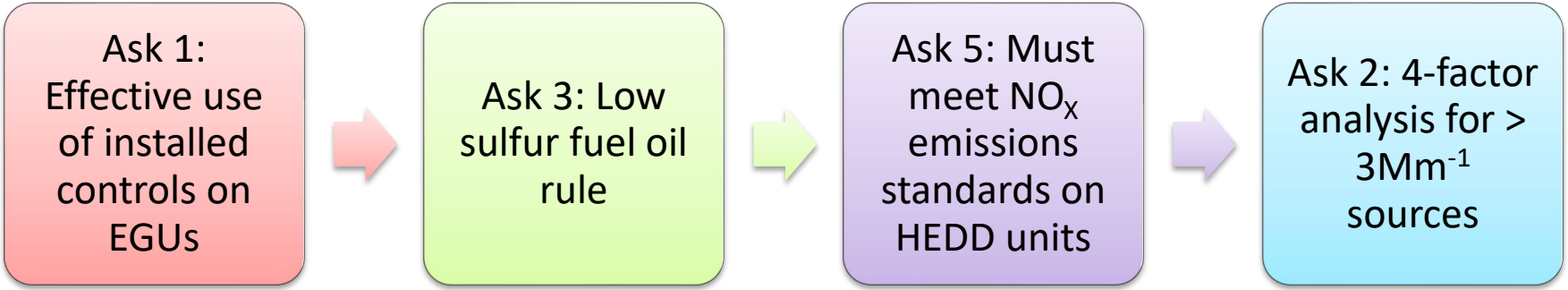


## Not Included

- Ask 4: Update permits and/or rules to reflect already achieved rates
- Ask 6: Increase energy efficiency, implement CHP…
- Federal Asks

# For ERTAC Order Mattered

- ERTAC was run four times with each Ask layered on
- Order Used:




- Only one run was completed using EMF with all controls applied

# Control File Types

## ERTAC

- ORIS Plant ID
- CAMD Unit ID
- Control Start Date
- Control End Date
- Pollutant
- Controlled Rate (lbs/mmbtu)
- Control Efficiency
- Programs for Pollutant
- Comments/Description
- Submitter's Email Address

## EMF

- FIPS
- SCC
- Pollutant
- Primary Control
- Control Efficiency
- Rule Efficiency
- Rule Penetration
- SIC
- MACT
- App. Flag
- Rep. Flag
- EIS Plant ID
- EIS Point ID
- EIS Stack ID
- EIS Segment ID
- Compliance Date
- Comments

# Ask 1: Installed controls(ERTAC)

**Started using Best Observed Ozone Season Emission Rates found by MDE from examining hourly emissions data from CAMD during the period 2005-2012**

**Conducted checks to ensure rates were appropriate**

Compared rates to Mode 4 $NO_X$ emission rates from EPA's NEEDS v5.15

Conducted check to ensure emission rates considered SCRs used as HG control

**ERTAC emissions control file created**

Entry added or replaced for a unit in the v2.7 base case run that did not meet the emission rate

# Ask 2: > 3Mm$^{-1}$ sources (ERTAC)

**Removed 20 units at 7 facilities that had retired since v2.7 was processed**

Brayton Point, MA | B L England, NJ | Big Sandy, KY | St. Clair, MI | Muskingum River, WV | Yorktown Power Station, VA | Kammer, WV

**Since 4-Factor analyses were not yet complete, estimated the emission rate of "a model unit"**

- Model unit would be a unit that it would be expected to be unreasonable to control further using a 4-factor analysis
- Looked for coal/oil units with a contribution < 1Mm$^{-1}$
- Filtered to include only MANE-VU states or MANE-VU & Ask States

**Calculated Model Unit Rates (lb/hour)**

| Geography | Coal $SO_2$ | Coal $NO_X$ | Oil $SO_2$ | Oil $NO_X$ |
|---|---|---|---|---|
| All MANE-VU states and states with units in Ask 2 | 1635.47 | 1106.74 | 367.25 | 384.889 |
| All MANE-VU states and states included in the Inter-RPO consultation | 1542.61 | 626.25 | 367.25 | 193.34 |

**ERTAC emissions control file created**

- Converted emission rates to lb/MMbtu
- Entry added or replaced for a unit in the Ask 1+3+5 run that did not meet the model unit emission rate

# Ask 2: > 3Mm$^{-1}$ sources (EMF)

- All Non-EGUs had emission reductions pending or were closing so control efficiencies were calculated from state specific feedback
- Entries added to control packet and run through EMF

| State | Facility Name | Unit ID | Control Measure | $SO_2$ CEFF | $NO_X$ CEFF |
|---|---|---|---|---|---|
| **MD** | Luke Paper | 18 | Switching to NG | 56.4 | 56.4 |
| **MD** | Luke Paper | 19 | Switching to NG | 22.7 | 50.3 |
| **ME** | Jackson Laboratory | | Closed | 0 | 0 |
| **ME** | Woodland Pulp LLC | | Closed | 0 | 0 |
| **NY** | Finch Paper LLC | 12 | SO2 Absorption | 20 | 20 |
| **NY** | Lafarge Building Materials Inc. | 43101 | Wet Scrubber | 20 | 53.8 |

# Ask 3: LSFO (ERTAC)

**Calculated emission rates**

| Distillate: 0.0015 lb/MMBtu | Residual: 0.525 lb/MMBtu |
|---|---|

**Emission rate applied based on CAMD "Primary Fuel"**

| Distillate: All other units with ERTAC Fuel Unit Type Bin "Oil" | Residual: "Residual Oil" or "Pipeline Natural Gas" with a Secondary Fuel Type "RFO" |
|---|---|

**ERTAC emissions control file created**

Entry added or replaced for a unit in the Ask 1 run that did not meet the emission rate

# Ask 3: LSFO (EMF)

**Considered 3 Rule Scenarios**

| 1. LSFO Ask in Base Case Inventory | 2. Less stringent rule in Base Case Inventory | 3. Rule not in Base Case Inventory |
|---|---|---|
| •CT, DE, ME, MA, NJ, NY, RI, VT, and Philadelphia | •Remainder of PA | •OTB: DC, MD (only less stringent #2 OTB), NH (only #2 OTB)<br>•Not OTB: remainder of states |

**Applied Control Efficiencies to Specific SCCs**

| | | |
|---|---|---|
| Control efficiencies based on max control efficiency from base case control files | 98 separate SCCs included | All had SO2 control efficiency, most NOX, handful PM |

**Entries added to control packet and run through EMF**

# Ask 5: HEDD (ERTAC)

## Identified HEDDs

| SCCs of potential HEDDs | Evaluated units that matched SCC based on | Additional exclusion based on state feedback |
|---|---|---|
| • 20100101, 20100109, 20100201, 20100209, 20100901, 20100909, 20101302 | • Capacity (ERTAC UAF), 2014-16 avg. op. hrs. (CAMD), Online after 5/1/07 (ERTAC UAF) | |

## Calculated emission rate (lb/MMbtu) using "must meet" rate from Ask

| Gas-fired: 0.154 lb/MMBtu | Oil-fired: 0.371 lb/Mmbtu | CT requested lower oil-fired rate: 0.19 lb/MMbtu |
|---|---|---|

## ERTAC emissions control file created

Entry added or replaced for a unit in the Ask 1+3 run that did not meet the emission rate

# Ask 5: HEDD (EMF)

## Identified HEDDs

| SCCs of potential HEDDs | Evaluated units that matched SCC based on | Other exclusions based on state feedback |
|---|---|---|
| • 20100101, 20100109, 20100201, 20100209, 20100901, 20100909, 20101302 | • Capacity (ff10), 2014-16 op. hrs. (states), Online after 5/1/07 (states), Supplies electricity? (states) | |

## Calculated emission rate (lb/MMbtu) using "must meet" rate from Ask

| Gas-fired: 0.154 lb/MMBtu | Oil-fired: 0.371 lb/Mmbtu |
|---|---|

## Calculated Control Efficiencies to add to Control Packet for EMF

| Control Efficiency = Must Meet Rate/2028 Base Case Rate | 2028 Base Case Rate determined through:<br>• State feedback (MD, NJ), Calculations based on the capacity (PA) |
|---|---|

# Not Included – Why?

## Ask 4: Update permits and/or rules to reflect already achieved rates

- These reductions were expected to have been included in the base case and this Ask was intended to prevent back sliding

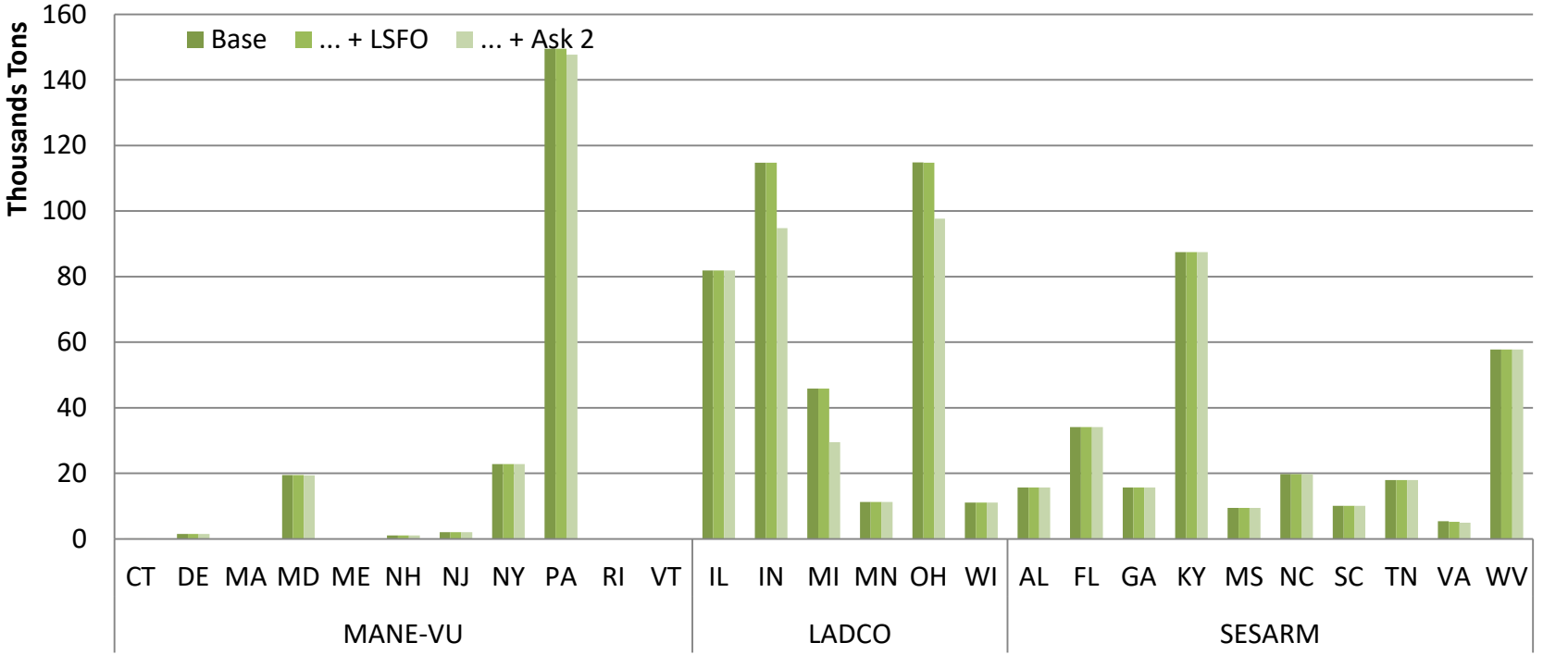
## Federal Ask 2: Heavy-duty Truck $NO_X$ Standards

- Inventory runs were completed to approximate the benefits of this program but running control strategies using emission rate MOVES to produce a SIP quality run with limited resources was not possible

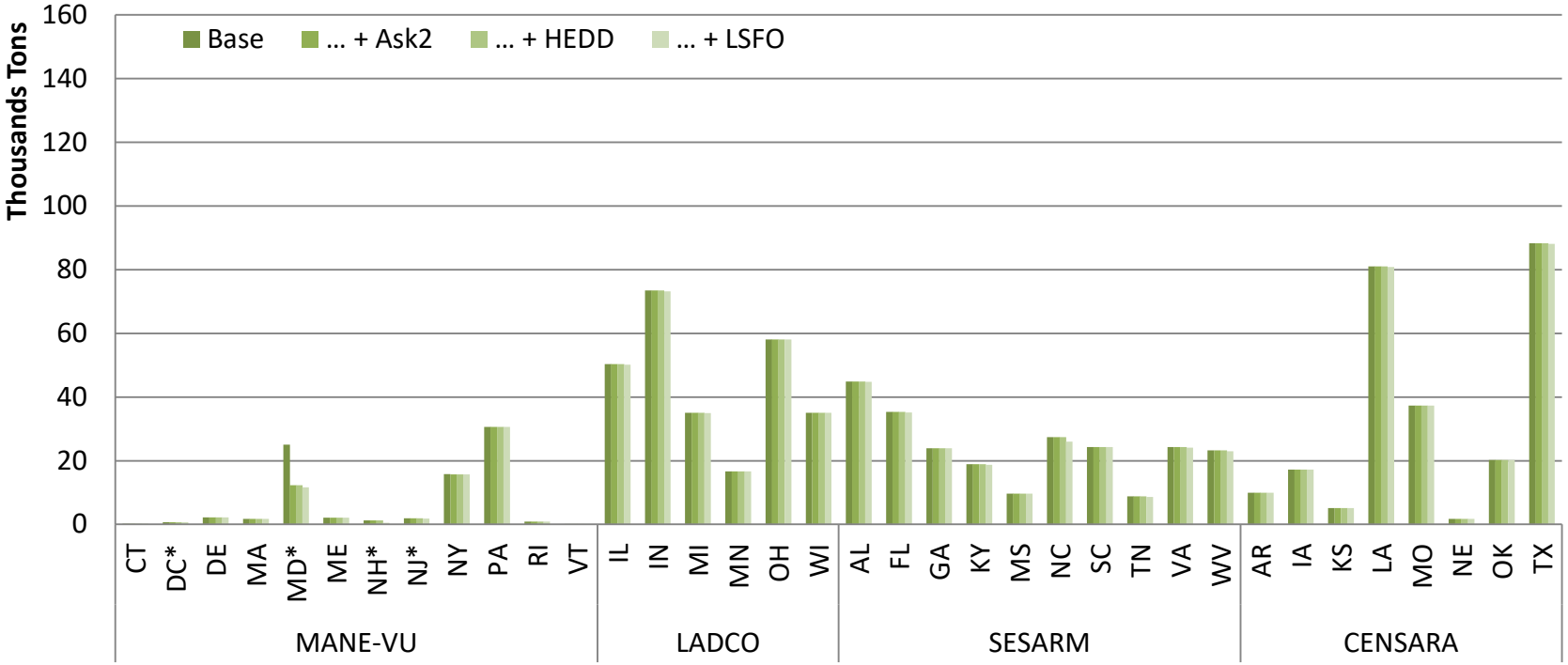
## Other Asks (Ask 6, Federal Asks 1 & 3)

- There is no clear enforceable emission reductions for these Asks

# Δ Annual ERTAC $SO_2$ Emissions When Implementing the MV Ask

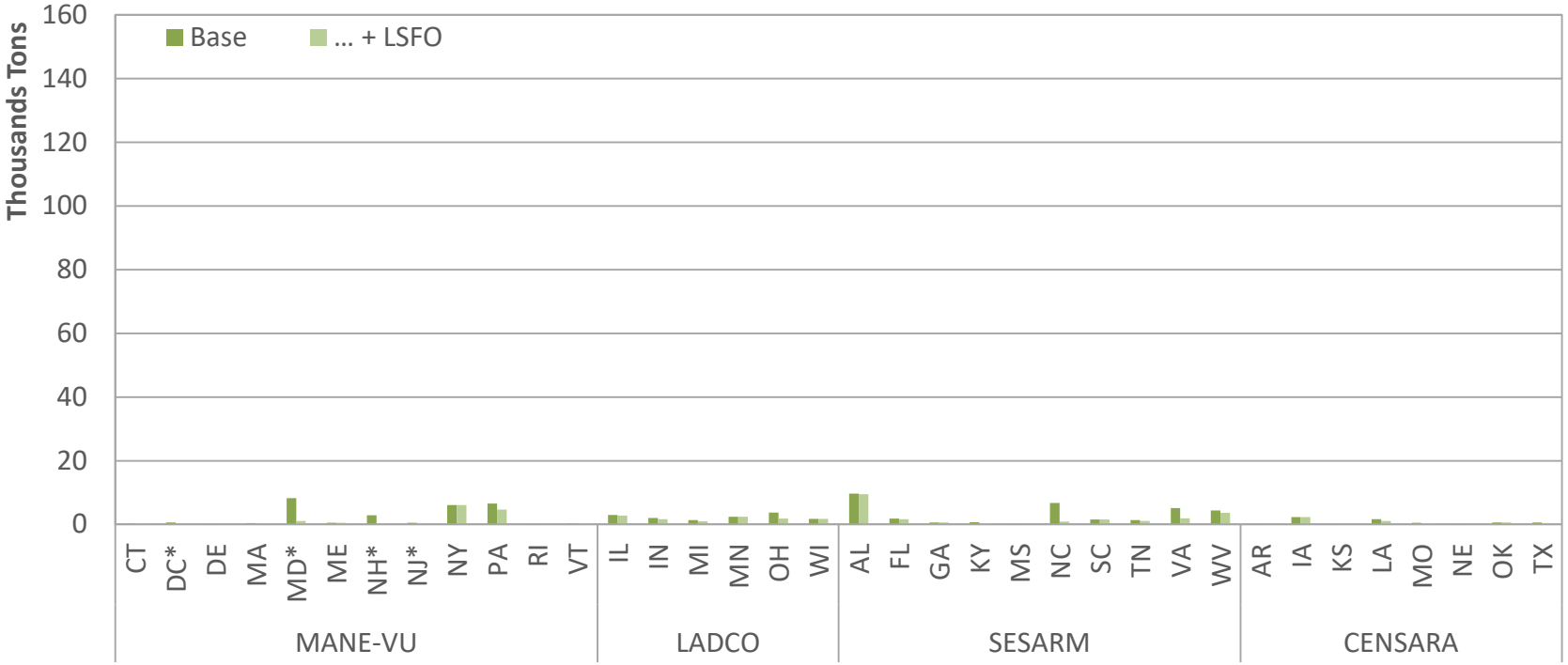


# Δ Annual EMF Point $SO_2$ Emissions When Implementing the MV Ask




* Note: Several States in MANE-VU have implemented some or all of the LSFO rule, but do not include it in their FY projections

# Δ Annual EMF NonPoint $SO_2$ Emissions When Implementing the MV Ask

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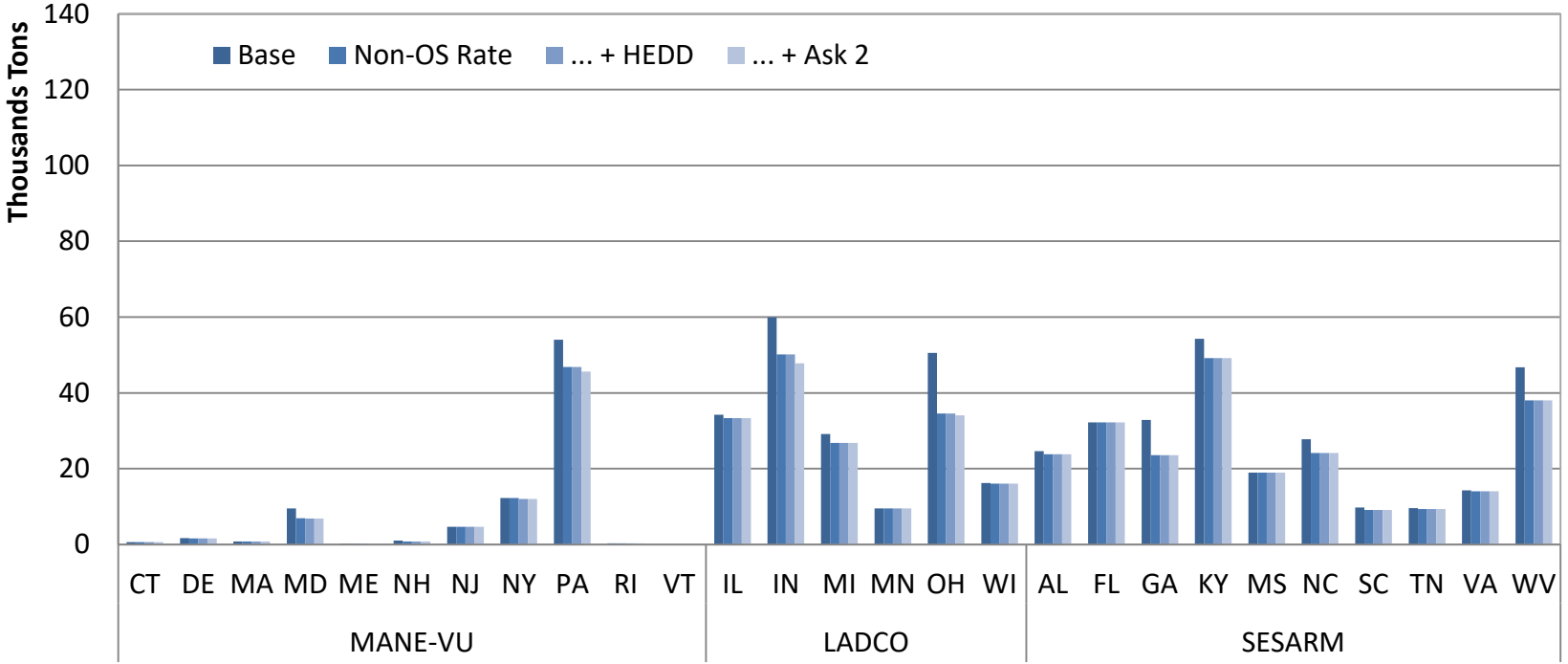

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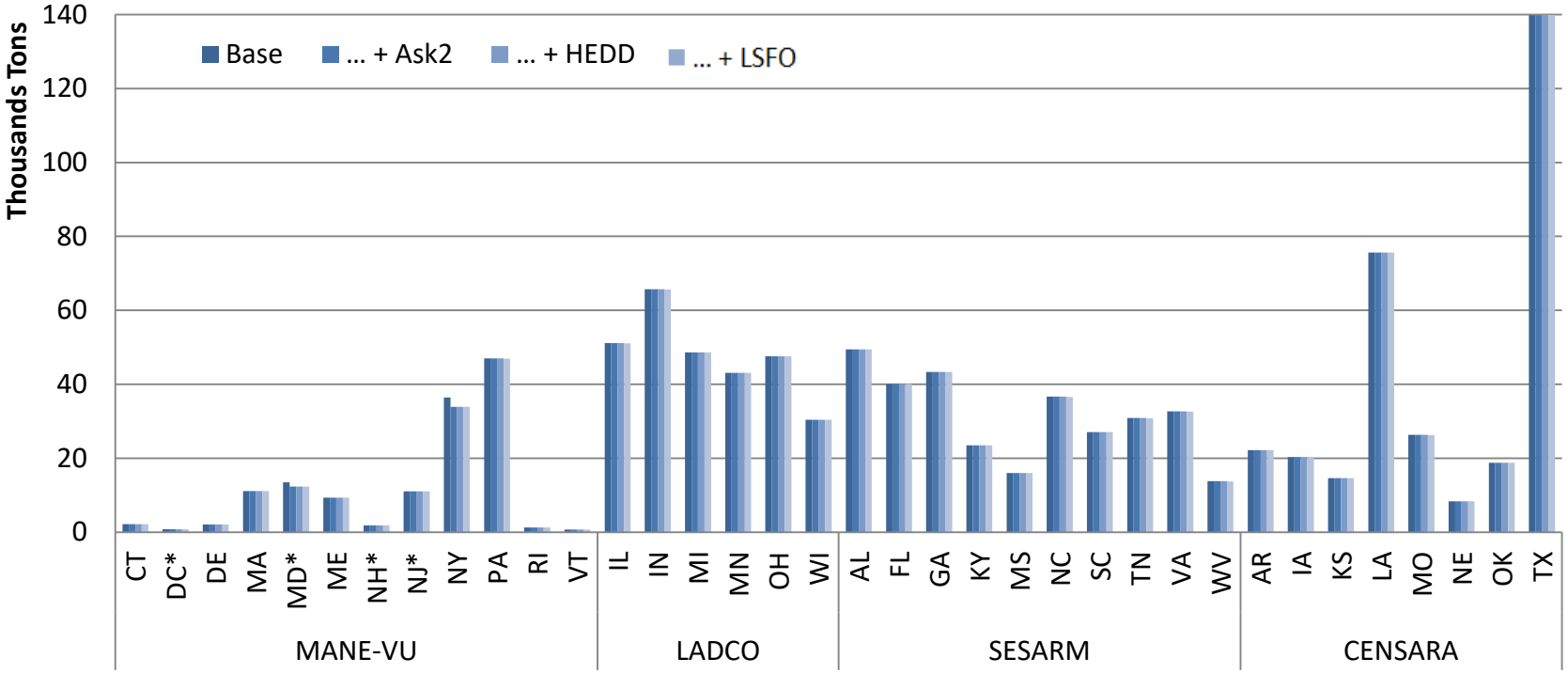


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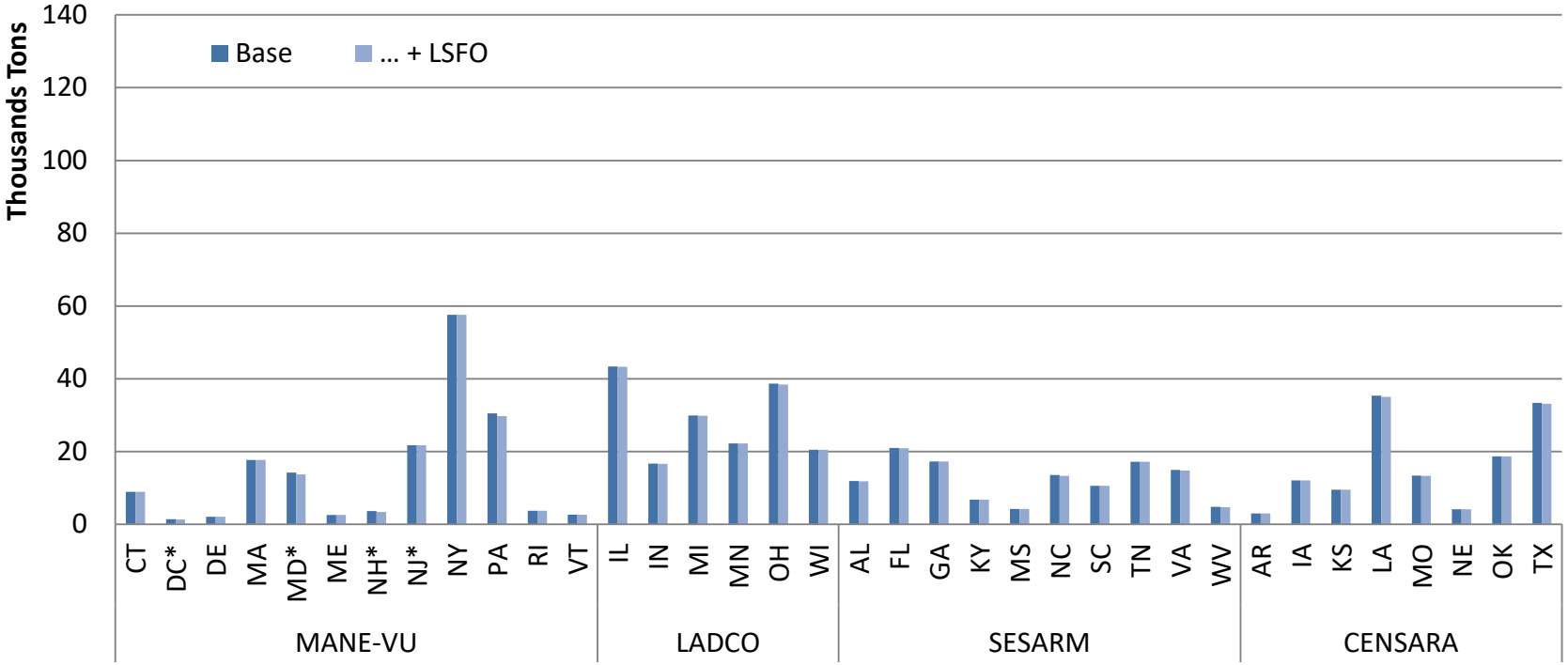


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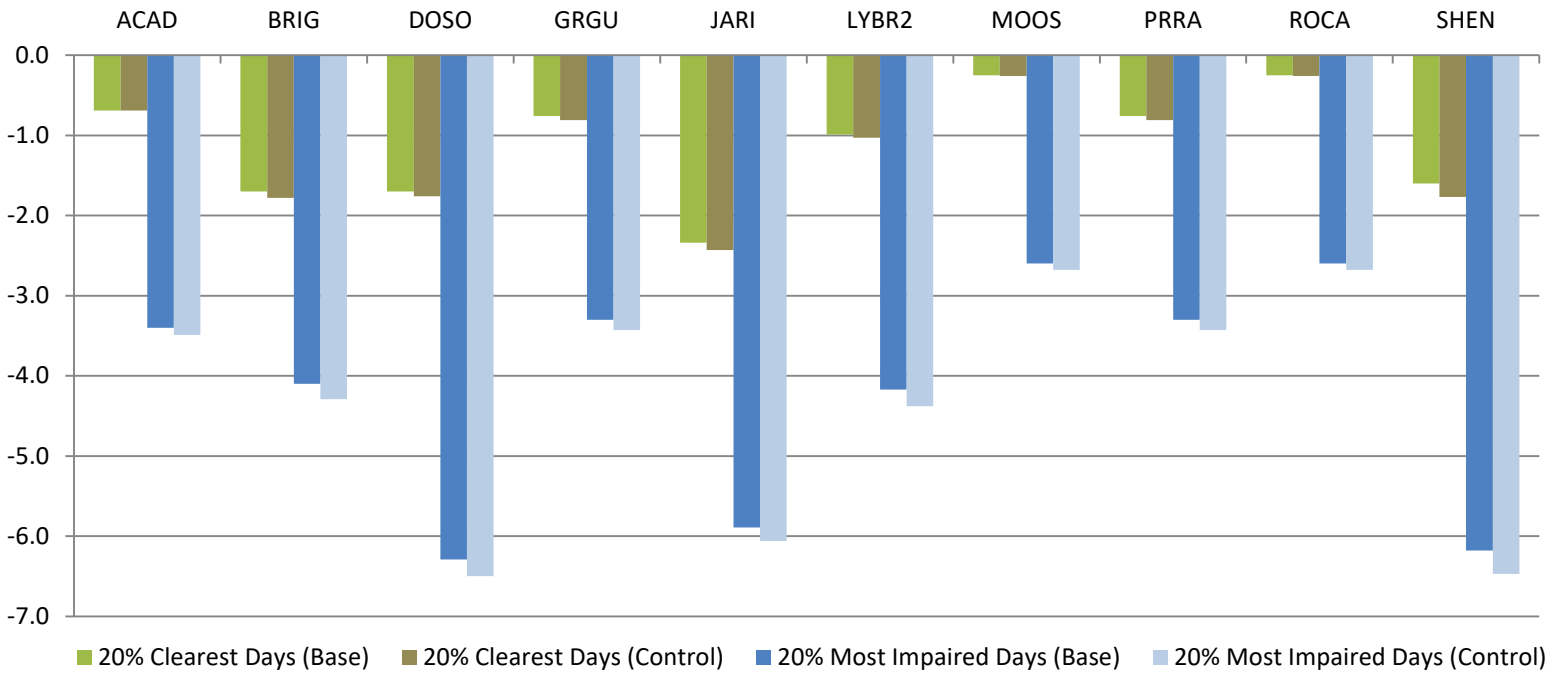
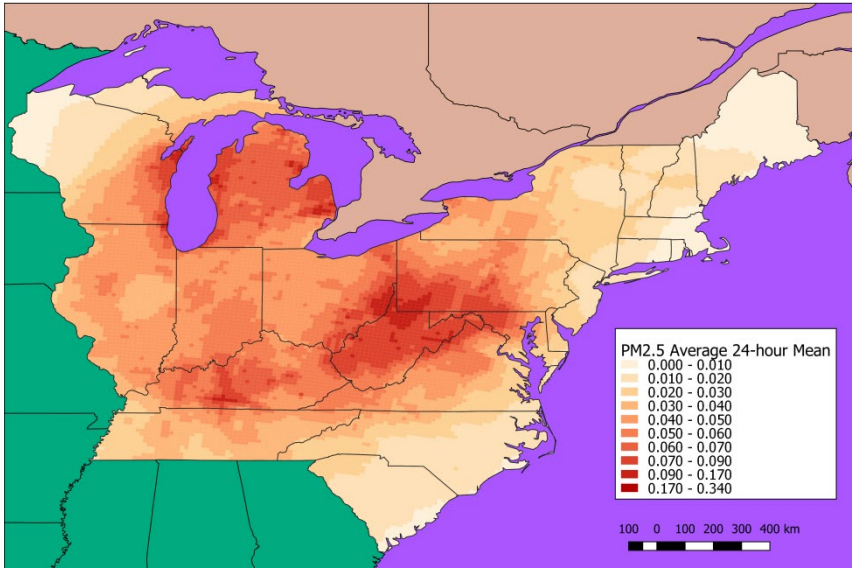
# Haze Modeling Results (Δ deciview)

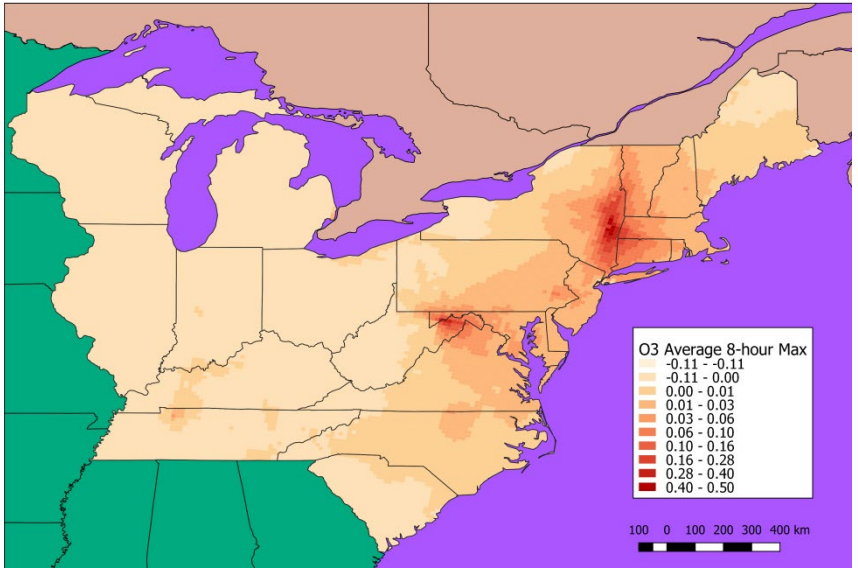


# Criteria Pollutant Modeling Results

Change in modeled $PM_{2.5}$ (average 24-hour mean)




Change in modeled Ozone (average 8-hour maximum)



# Wrap Up

- Process
  - ERTAC and EMF were both easy to work with to develop a control case
  - Ease and costs for running control strategies in MOVES are challenging and can be insurmountable
- Asks
  - Asks 1 and 2 are clearly effective control programs
  - Ask 3's benefits may get hidden since many states have the program and we are already experiencing the benefits
  - Ask 5's benefits may get hidden when looking at annual results since they occur during HEDDs not every day
- Implementation of the Ask leads to health and visibility benefits throughout the eastern US

# References


- McDill, Julie, and Susan McCusker. “Technical Support Document: Emission Inventory Development for 2011 for the Northeastern U.S. Gamma Version,” January 29, 2018.
- Mid-Atlantic Northeast Visibility Union. *Impact of Wintertime SCR/SNCR Optimization on Visibility Impairing Nitrate Precursor Emissions*, November 20, 2017.
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- US EPA. *Documentation for the EPA’s Preliminary 2028 Regional Haze Modeling*. Research Triangle Park, NC. Office of Air Quality Planning and Standards. October 2017.

# Questions

Acadia National Park - 2016

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