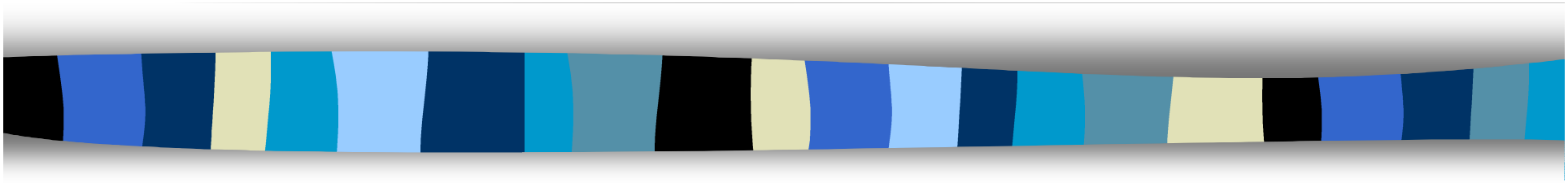
Assessment of Emissions Inventory Needs for Regional Haze Plans



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Project Contributors

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Project Purpose—bigger picture

- Help states meet requirements of EPA's Regional Haze regulations.
- Prepare a work plan for emission inventory improvements

Project Goals—specifics

- Explain need for a new regional emissions inventory to address causes and control options for regional haze;
- Discuss strengths and weaknesses of current methods used to develop haze precursor inventories;
- Prioritize activities for a 5 year initial planning period;
- Develop a list of activities to serve as a workplan to be implemented by Eastern RPOs.

Some Background—Need for Emissions Inventory

- Regional Haze SIPs are due in ~2004 or ~2006 (based on $PM_{2.5}$ attainment status)
  - May be delayed if state participating in regional planning process
- In ~2004 states wishing to participate in regional process must (among other things)
  - Show their emissions contribute to visibility impairment in Class I areas in other states

Status of Existing $PM_{2.5}$ Inventory

- EPA prepared national $PM_{2.5}$ inventory
  - A good start, but many uncertainties
  - Much based on 1985 NAPAP PM_{10} inventory
- Emissions factors derived using assumed size distribution of particles
- Activity data and emissions factors used vary in quality

Project Approach

- Identify why inventory needed
  - Regional haze modeling
  - Source attribution analysis
  - Identify sources subject to BART
- Evaluate the availability, accuracy, and utility of existing emissions data
  - clean, average, and hazy days
- Recommend a plan to improve inventory

Emission Summaries

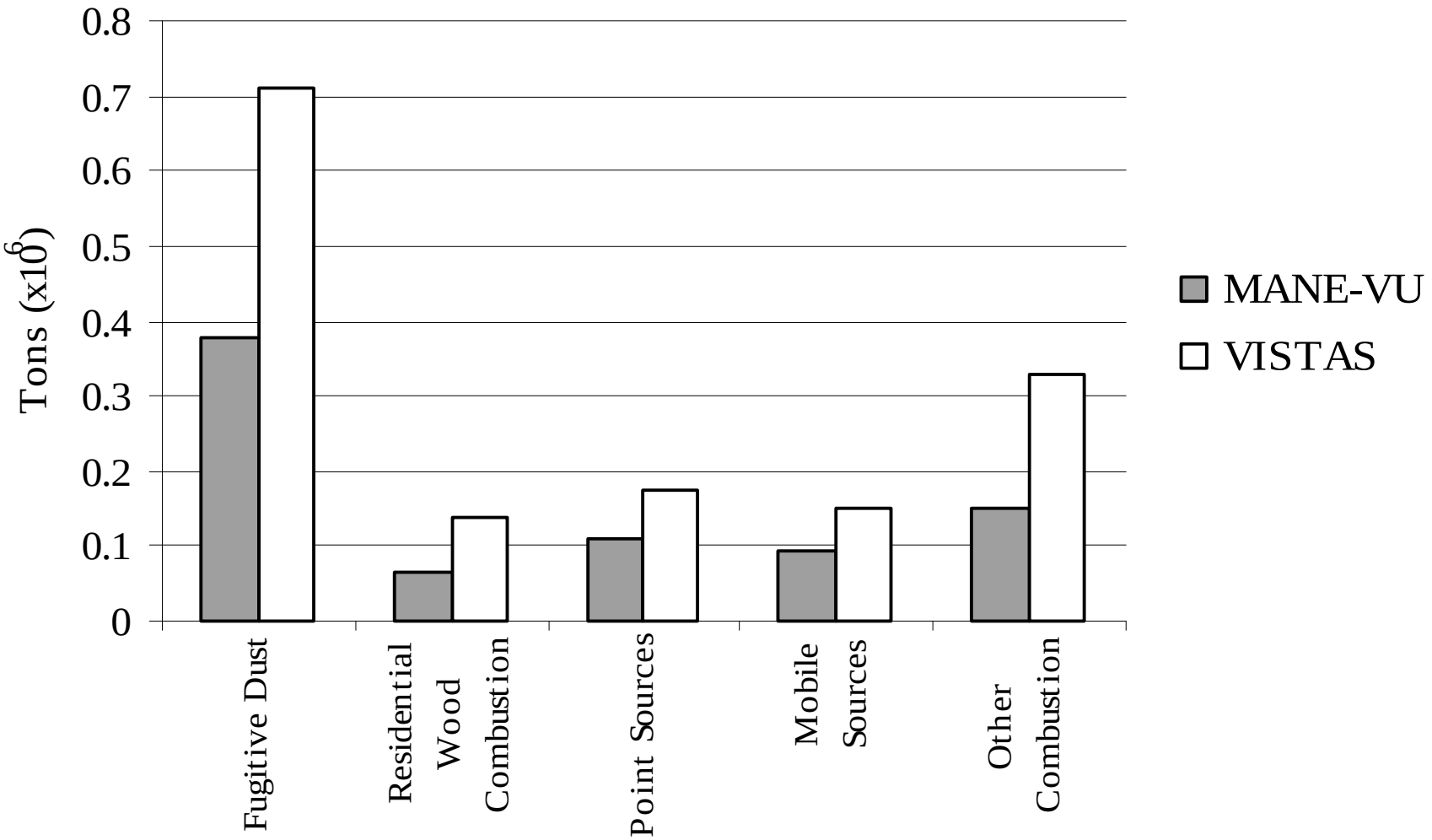
- Emission estimates based on 1996 National Emission Inventory;
- Emissions summed at sector level by state and by region (NESCAUM, MARAMA, MANE-VU and VISTAS/SESARM);
- Summaries represent 90% of emissions and/or top 10 categories for PM_{10}, $PM_{2.5}$, SO_2, NO_x, and NH_3.

Results-Example Table for PM_{10}

Source Category	Source Type	Emissions (tons)	Percent of Total
Industrial – Construction	Area	40,999	40.0
Mobile - Paved Roads	Mobile	23,386	22.8
Misc. Area - Residential – Wood	Area	18,439	18.0
Mobile - Unpaved Roads	Mobile	8,750	8.5
Mobile - Diesel, Off-highway	Mobile	2,477	2.4
Mobile - Diesel Highway Vehicle	Mobile	1,759	1.7
Industrial - Mining & Quarrying	Area	1,302	1.3
Mobile - Gasoline Highway	Mobile	1,214	1.2
Agricultural Prod. – Crops	Area	821	0.8
Misc. Area - Other Burning	Area	721	0.7
Top 10 Categories		99,869	97.4
Other Point Sources	*Point*	*1,550*	*1.5*
Other Mobile Sources	*Mobile*	*548*	*0.5*
Other Area Sources	*Area*	*523*	*0.5*
Connecticut Total PM_{10} Emissions		102,489	100.0

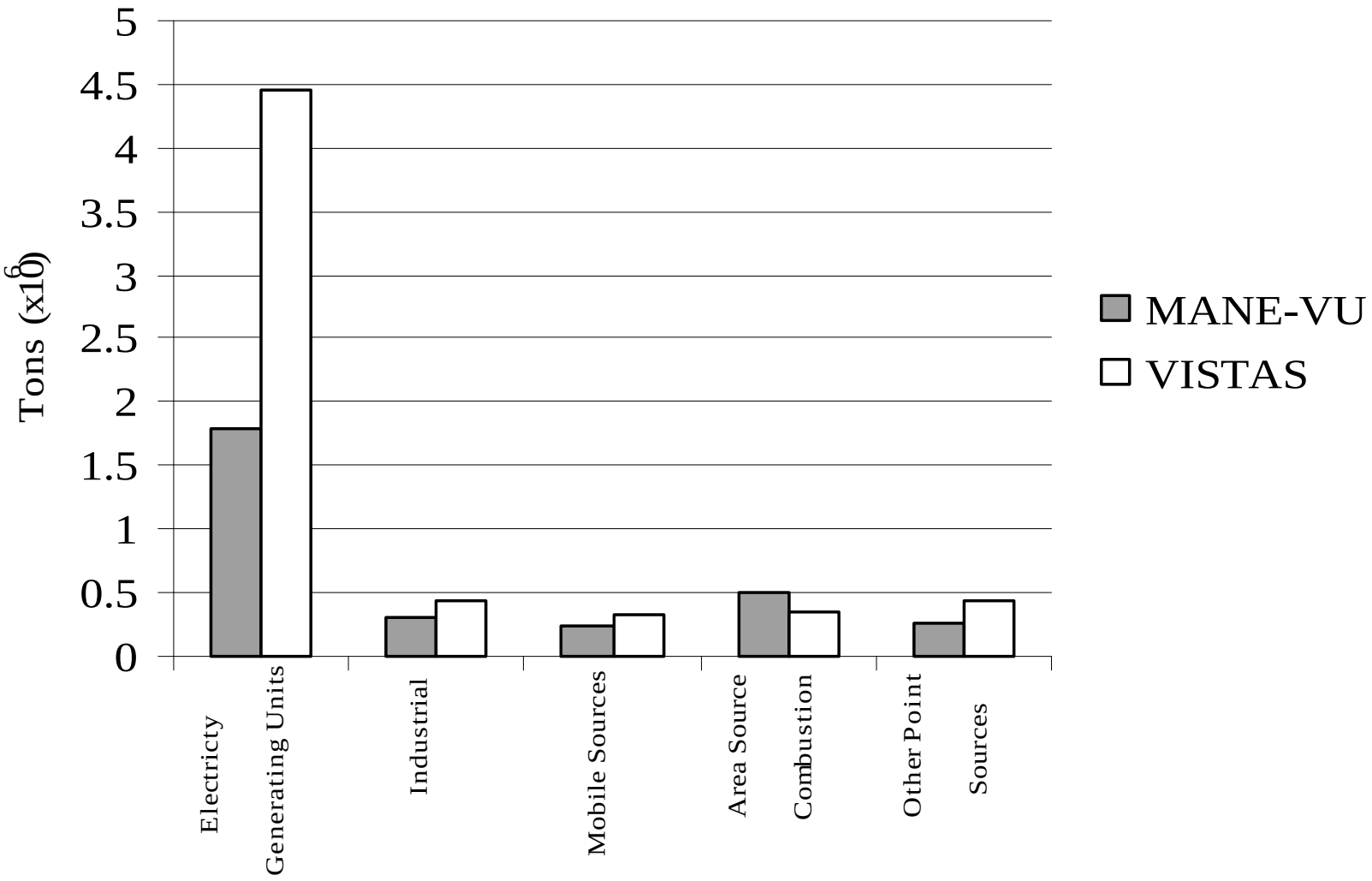
Results-Example Graph

Emissions of $PM_{2.5}$ by major source category groupings



Results-Example Graph

Emissions of SO_2 by major source category groupings



Approach-Identify Weaknesses

- Reviewed applicable Emission Inventory Documentation
  - 1996 Procedures Document,
  - Trends Report
  - Focused on weaknesses of categories using non-local activity data (e.g. area source fuel use)

Approach (cont'd)

- Prioritize Improvement Activities
  - Criteria
    - Emissions magnitude
    - Activity data sources
    - Likelihood of finding local activity data to improve estimates
    - Cost and time constraints

Approach (cont'd)

- Developed a 5-Year Work Plan
  - Identified activities best suited for U.S. EPA to perform,
  - Identified activities best suited for RPO's,
  - Identified activities best suited for state, tribal, and local agencies/authorities,

Conclusions

- High-priority activities identified at the national level best handled with EPA support:
  - Accepted source measurement method for both filterable and condensable components of $PM_{2.5}$
  - Understanding of mechanisms that decrease the mass of primary fine particulate matter from fugitive dust

Conclusions (cont'd)

- High-priority activities identified at the national level best handled with EPA support (cont'd):
  - Improved understanding of chemical mechanisms that control gas-to-particle conversion process,
  - Improved emission factors for major ammonia sources,
  - Better understanding of sources and sinks of ammonia,
  - Improved speciation factors for $PM_{2.5}$ and VOC.

Recommended Work Plan Tasks

- Tasks for CY 2001:

– Review CMU NH_3 Inventory

– Review/correct point source physical data

– Identify point sources for condensable matter

– Improved activity for Residential Wood Combustion and Open Burning

– Develop GIS tool for emissions allocation

– Identify BART eligible sources

Recommended Work Plan Tasks (cont'd)

- Tasks for CY 2002

– Collect activity data for area combustion sources,
– Collect activity data for nonroad mobile sources,
– Improve activity data for rural highway sources
– *Process for reporting EC/OC emission splits
– *Identify sources of agri. activity data,
– Assemble improved emissions estimates for Residential Wood Combustion and Open Burning.

Recommended Work Plan Tasks (cont'd)

- CY 2003 Tasks
  - *Collect activity data for paved and unpaved roads,
  - Collect activity data for agricultural sources of NH_3,
  - Identify and assess misc. NH_3 Point Sources
  - Compile 2002 regional point source emissions inventory

Recommended Work Plan Tasks (cont'd)

- CY 2004 Tasks

– Compile 2002 regional area, nonroad and mobile source emissions inventory,

– *Develop activity data for natural sources

- CY 2005 Tasks

– Assess and address remaining weaknesses in emissions inventory,

– Assemble and QA emission estimates for modeling and source apportionment studies

Follow-up Efforts by MANE-VU

- Work Plan for a Survey to Determine Residential Wood Combustion Activity and Open Burning Activity—July 2001
- Preliminary Work Plan for Emissions Inventory Improvement for Regional Haze Planning—August 2001
- Source Apportionment Analysis of IMPROVE and CASTNet Data—Phase I due in May 2002
- MANE-VU Emissions Inventory Workgroup—ongoing
- Residential Wood Combustion Survey Frame Design and Test Surveys—current RFP
- Emissions Inventory Development for Open Burning—RFP just closed

Follow-up Efforts by MANE-VU

Example—use of emissions summary tables in prioritization

- Which categories important for all/multiple pollutants?
- For which categories improved/consistent estimates are needed?
- For which categories controls/reductions are possible?

Follow-up Efforts by MANE-VU

Source categories important for all/multiple pollutants:

- Example: Stationary Source Fuel Combustion (area)
  - $PM_{2.5}$ (commercial/institutional) # 3
  - $PM_{2.5}$ (residential wood combustion) # 4
  - PM_{10} (residential wood combustion) # 5
  - PM_{10} (commercial/institutional) # 6
  - SO_2 (industrial) # 3
  - SO_2 (commercial/institutional) # 4
  - SO_2 (residential) # 5
  - NO_x (residential) # 5
  - NO_x (industrial) # 12
  - NH_3 (residential) # 9

Follow-up Efforts by MANE-VU

Source categories important for all/multiple pollutants:

- Example: External Combustion Boiler (point)
  - $PM_{2.5}$ (industrial) # 11
  - $PM_{2.5}$ (electric generation) # 12
  - PM_{10} (industrial) # 11
  - SO_2 (electric generation) # 1
  - SO_2 (industrial) # 2
  - SO_2 (commercial/institutional) # 8
  - NO_x (electric generation) # 2
  - NO_x (industrial) # 6

Follow-up Efforts by MANE-VU

Source categories important for all/multiple pollutants:

- Example: Diesel (mobile)
  - $PM_{2.5}$ (off-highway vehicles) # 6
  - $PM_{2.5}$ (highway vehicles) # 9
  - PM_{10} (off-highway vehicles) # 9
  - SO_2 (off-highway vehicles) # 6
  - NO_x (highway vehicles) # 3
  - NO_x (off-highway vehicles) # 4

Follow-up Efforts by MANE-VU

Uncertainties and Potential Improvements

Example: Fugitive Dust (area)—$PM_{2.5}$ and PM_{10}

- Construction, paved and unpaved roads, agricultural crops production, residential wood combustion, open burning
- Improvements: activity data (states?); emissions factors (EPA?)

Example: Ext. Comb. Boilers (point)—all pollutants except NH_3

- Emissions are highly certain (CEM based data)
- Improvements: stack parameters (states?)

Follow-up Efforts by MANE-VU

Uncertainties and Potential Improvements

Example: Agricultural Emissions (area)—NH_3

- Emissions are highly uncertain.
- Improvements: activity data (states?); emissions factors (EPA?)

Example: Diesel and Gasoline (mobile)—all pollutants

- Level of uncertainty?
- Improvements: activity data (states?); emissions factors (EPA?)

Contacts

- A final report is available at
  - http://www.marama.org/reports/
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