Estimating Emissions
From On-Road Mobile Sources

Key Challenges

presented by
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Outline

• On-Road Mobile Emissions Overview
  – Uses, Importance, Methods

• Technical and Process Challenges
  – MOVES
  – Data Updates
  – SIP Motor Vehicle Emission Budgets (MVEBs)
  – New and revised NAAQS

• Recommendations

• Questions / Discussion
On-Road Mobile Emissions Overview
Why Estimate On-Road Emissions?

Inventories for Criteria Pollutants
- Attainment demonstrations
- Reasonable further progress
- Maintenance plans

Reductions for Highway Vehicle Control Measures
- I/M

Transportation Conformity
- Effects of Transportation Improvement Program (TIP) and Plan projects

Evaluation of Effects
- Federal renewable fuel requirements

GHG?
- Climate change bill may include requirements
Importance of On-Road Emissions

Mobile on-road emission reductions have been instrumental in improving air quality...

but on-road emissions are still a major source of pollution ...

Reductions will be key to attaining new/revised NAAQS
Must be analyzed for project-level hot-spot analyses
New tools and methods will play key role in strategy impacts
The Challenge for Mobile Sources

Activity
- How much will VMT / vehicle population continue to increase?

Technology
- What vehicle technologies can be implemented to reduce emissions?

Control Strategies
- What other future control strategies can be identified to decrease mobile emissions?
Calculating On-Road Emissions

1. Assemble Traffic Data
2. Prepare Forecasts
3. Assemble Fleet, Meteorology, Fuel Data
4. Run EPA Emission Model
5. Calculate County Emissions

**Pennsylvania Example**

1. Use PennDOT / HPMS Data (Updated Triennially)
2. Evaluate Travel Model Growth / Historic Trend Analyses
3. PennDOT Traffic and Registration Data
4. Custom Post Processing Software to Run MOBILE/MOVES
5. Custom Post Processing Software to Calculate Emissions
On-Road Mobile Emissions Challenges
Technical / Process Challenges

- MOVES Technical Issues
- Data Assumptions Review and Update
- Update Emission MVEBs
- New / Revised NAAQS Plans
EPA’s MOVES Emission Model

- Officially adopted March 2, 2010
- Should be used **NOW** for all new/revised SIPs
- What’s New?
  - Broader Scope:
    - Simplified national test runs
    - Conformity/SIP applications
    - Project level emissions
  - Newer Data and Methodologies
    - Based on new vehicle emissions test results
    - New more detailed analysis procedures
    - Based on vehicle engine hours of operation by power (Vehicle Specific Power - VSP)
  - Operation
    - New interface
    - Can estimate emissions – Not just factors
MOVES Technical Issues

- Requires significant technical expertise
  - Staff training

- Affects current process procedures
  - Updates to post processing software
  - Linkages to air quality modeling (SMOKE-MOVES)

- Significant Increases to run time
  - More significant computer system configurations

- QA-QC
  - Lots of data – difficult to review
  - New procedures / programs to assist

- New Data Requirements
  - Vehicle population, New Vehicle Types
  - Requires efforts to investigate and prepare data inputs
Examples of MOVES Run Time

- Run time measured in hours, days and even months
  
  - Simple Run: 1 County, Ozone/PM/CO, One Month:
    • 72 Minutes (using 3 computers)
  
  - Typical Conformity Run: 6 Scenarios, 5 Counties, All Pollutants:
    • 38 hours
  
  - Current set of PA runs: 67 counties, Ozone/PM/CO, multiple occurrences, 12 months:
    • Up to 50 Days runtime at 12 hours/day
MOVES Linkages to SMOKE

• SMOKE is an emissions processing system designed to create gridded, speciated, hourly emissions for input into a variety of air quality models.

• SMOKE MOVES Integration Tool: July 2010

• Ozone SIP Modeling – NESCAUM / MARAMA
  – This will be first application of MOVES in PA
  – Addressing technical issues now
Data

Updating Data Assumptions

- New data needed for MOVES
- Updating VMT forecasts?
  - What does the future hold?
  - Changes in driving behavior / trip distances
  - Do last 5 years impact long-term forecasts?
- Assumptions on freight / intermodal activity
  - Significant impacts on PM emissions
- Addressing other recent data assumptions
  - Fleet age getting older (will this change in near future?)
  - Fewer SUVs
Updating MVEBs – Why?

- MOVES projects higher PM and NOx emissions
- Conformity analyses after March 2012 will need to use MOVES.
- Could result in conformity failures based on existing MVEBs
Updating Mobile Budgets - Challenge

• MOVES technical issues
• Schedule and # of Plans
  – Number of nonattainment/maintenance areas
  – Finish by end of 2011?
• Would MOVES impact attainment analysis?
  – % reduction from base year is key to attainment analysis

*MOVES comparison to MOBILE6.2: As estimated by EPA:*

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>% Change for Single Year</th>
<th>% Change from Base to Future Year</th>
<th>Affect on Attainment Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM2.5</td>
<td>Higher</td>
<td>Larger Reduction</td>
<td>Positive</td>
</tr>
<tr>
<td>NOx</td>
<td>Higher</td>
<td>Less Reduction</td>
<td>Negative</td>
</tr>
</tbody>
</table>
Magnitude of Effort in PA

For 1997 ozone standard, of 67 counties:
- 12 designated nonattainment
- 25 designated maintenance
- 30 designated attainment
- Of 23 Metropolitan or Regional Planning Organizations, 20 are currently nonattainment or maintenance and involved in transportation conformity.
New / Revised NAAQS

Recently issued and upcoming NAAQS:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Potential SIP Due Date</th>
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</thead>
<tbody>
<tr>
<td>Lead</td>
<td>• Jun 2012</td>
</tr>
<tr>
<td>NO2</td>
<td>• Primary - Sep 2013; Secondary – Dec 2015</td>
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<tr>
<td>SO2</td>
<td>• Primary - Feb 2014; Secondary – Dec 2015</td>
</tr>
<tr>
<td>CO</td>
<td>• Jul 2015</td>
</tr>
<tr>
<td>PM$<em>{2.5}$ / PM$</em>{10}$</td>
<td>• 24-Hour – Dec 2012; Revision – Oct 2016</td>
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<tr>
<td>NO2</td>
<td>• Primary – Sep 2013; Secondary – Dec 2015</td>
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<tr>
<td>Greenhouse Gases</td>
<td>• Future?</td>
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</tbody>
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On-Road Mobile Emissions
Addressing Challenges
Advice to modelers

• Early Start and Advance Planning Critical
  – Schedule carefully, realistically.
    • Air agency, planning partners, sister agencies
  – Allow for EXPECTED and UNEXPECTED glitches, delays
  – Start early
  – Thorough preparation (incl. training)
  – Allow sufficient time – esp. for first products

• Resources will be stretched, likely need to be augmented.

• Robust QA/QC process
# Example PA Schedule – *Evolving, Multiple Triggers*

<table>
<thead>
<tr>
<th>Item</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
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<tbody>
<tr>
<td><strong>MOVES 2010</strong></td>
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<tr>
<td><strong>MOVES Grace Period</strong></td>
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<tr>
<td><strong>TIP Cycle/Conformity</strong></td>
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<tr>
<td>TIP/Conformity Analysis, Start Through Approval</td>
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<tr>
<td>Model/Conformity Test - Ozone</td>
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<tr>
<td>Model/Conformity Test - PM2.5 Annual</td>
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<tr>
<td>Model/Conformity Test - PM2.5 Daily</td>
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<tr>
<td><strong>MVEB Development (Revise Existing SIP)</strong></td>
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<tr>
<td>Ozone (Philadelphia Only)</td>
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<tr>
<td>PM2.5 Annual (Philadelphia, Pittsburgh)</td>
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<tr>
<td><strong>Revised PM2.5 Daily Standard</strong></td>
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<tr>
<td>Conformity Due (within one year to avoid lapse)</td>
<td>X</td>
<td></td>
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<tr>
<td>SIP Development and Approval</td>
<td></td>
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<tr>
<td>SIP Due</td>
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<tr>
<td><strong>Revised 8-Hr Ozone Std.</strong></td>
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<tr>
<td>Conformity (1 Year)</td>
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**Notes:**
- MOVES - Multiple Year Standards
- Ozone (Philadelphia Only)
- PM2.5 Annual (Philadelphia, Pittsburgh)
- New Ozone 8Hr Inventory - 0.060 - 0.070ppm Std - MOVES - Duration TBD (1)
- New PM2.5 Annual Inventory - MOVES - Duration TBD (2)
- Use Interim Test
- New Budget (MOVES) or Interim under New Std.
- New Budget
- Potential Lapse
- Start 2 Months Early
- Duration TBD
- A
- PM2.5 SIP - Duration TBD
Questions and Discussion

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