A Comparison of Mobile Input Parameters between Two MOVES-Based National Emission Inventories of 2011 and 2014

Jin-Sheng Lin
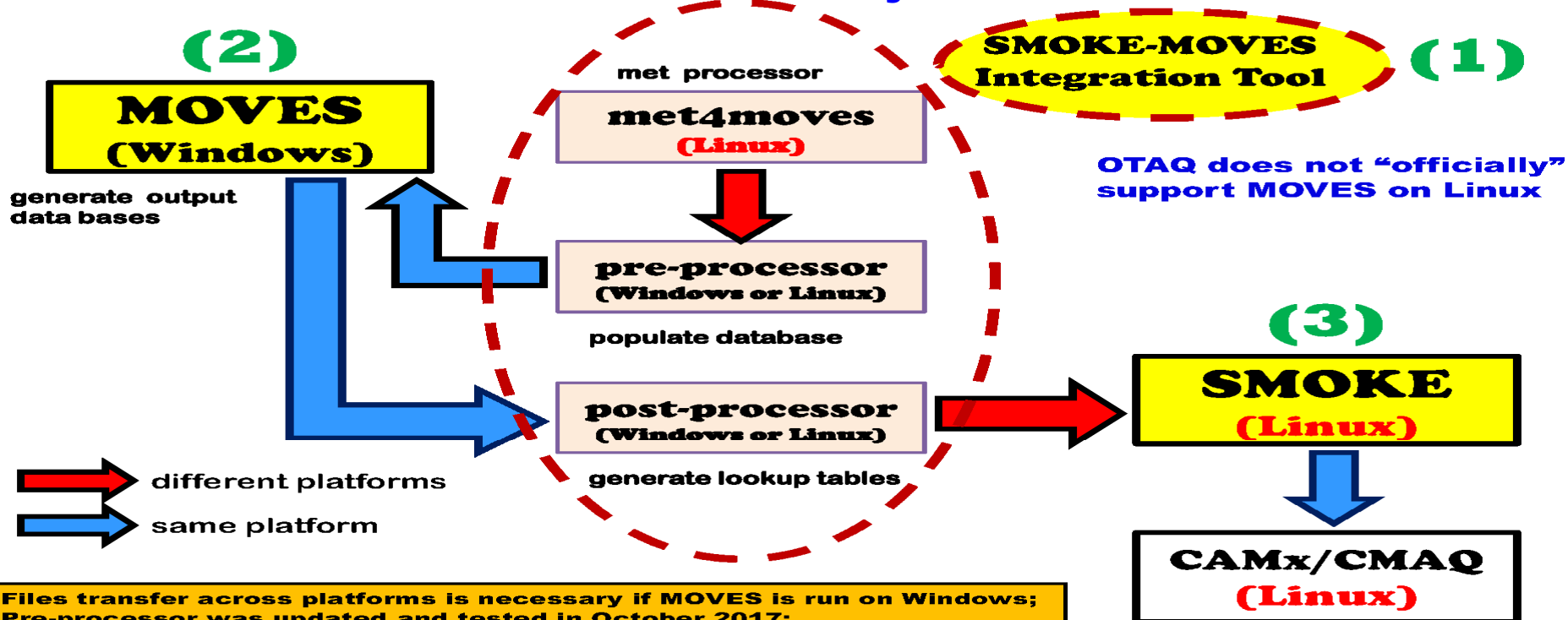**Virginia Department of Environmental Quality**

Eric Zalewsky
New York State Department of Environmental Conservation

EPA 2019 International Emission Inventory Conference
Lightning Session
July 30, 2019

Operation Modes for MOVES and SMOKE-MOVES

Mode	(1) Inventory Mode	(2) Emission Rate Mode	(3) Lookup Table Mode
Model	MOVES	MOVES	MOVES, SMOKE-MOVES
Primary Usage	Emission inventory development	Sensitivity runs	Regional emission modeling, NEI
Strength	Local data, No post-processing required	Detailed emission processes	Detailed meteorology, Large scale modeling
Weakness	Generalized meteorology	Complex output	Representative county, Difficult to operate
Resolution	County, Month	County, Month	Representative county, Fuel month

SMOKE-MOVES System

-- Files transfer across platforms is necessary if MOVES is run on Windows;
-- Pre-processor was updated and tested in October 2017;
-- This slide was originally made in 2012

Mobile Input Parameters

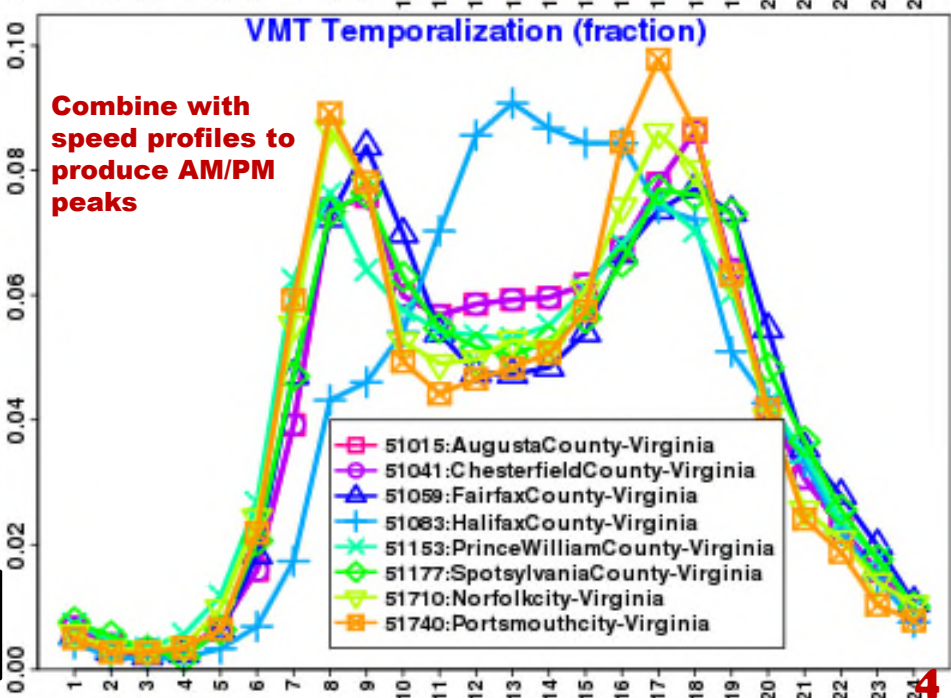| Parameter	Notes	References
Age Distribution on O3	"Smoothed" age distribution	(1) Jun 14 2018 presentation
Speed Profiles on O3	Hourly weekday/weekend	(2) Nov 29 2018 presentation
Age Distributions		(3) Jan 17 2019 presentation (part one)
Representative County		Jan 17 2019 presentation (part one)
Temporal Profiles	VMT temporalization	(4) Jan 31 2019 presentation (part two)
VPOP	Total and splits	(5) Feb 14 2019 presentation (part three)
VMT	Total and splits	Feb 14 2019 presentation (part three)
Emission Rates		Feb 14 2019 presentation (part three)
Hoteling	Diesel 62 on road 2&4	(6) Feb 21 2019 presentation (part four)
Emissions	By vehicle type and by sector	(7) Mar 7 2019 presentation (part five)
Miscellaneous	2016 alpha versus 2016 beta	(8) Mar 28 2019 presentation (part six)
CDB/FF10 Conversion	Program splitting VPOP/VMT	e-mailed OTAQ March 1 2019

Datasets available:

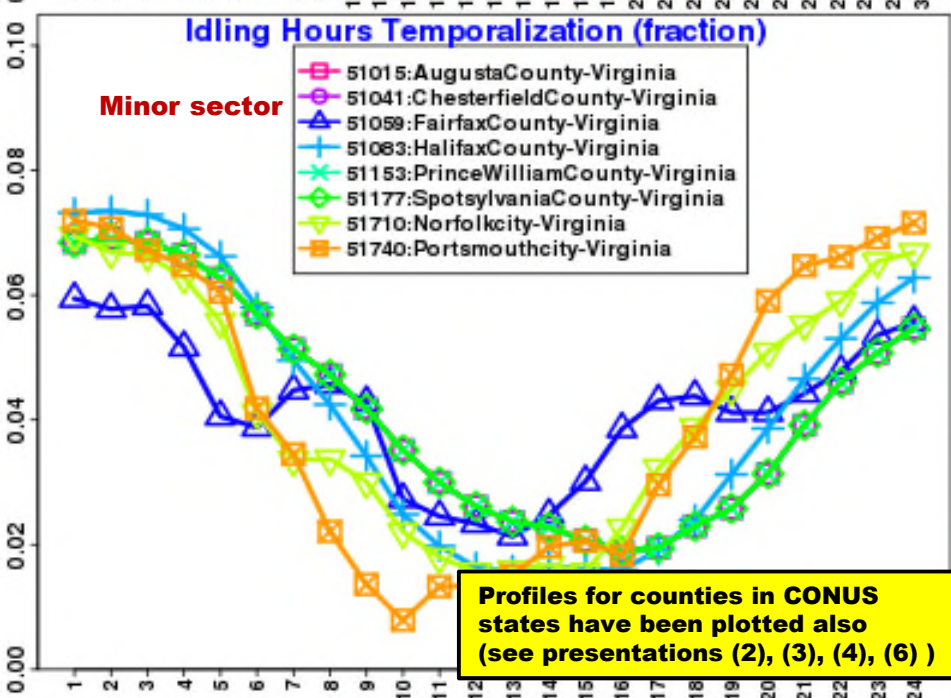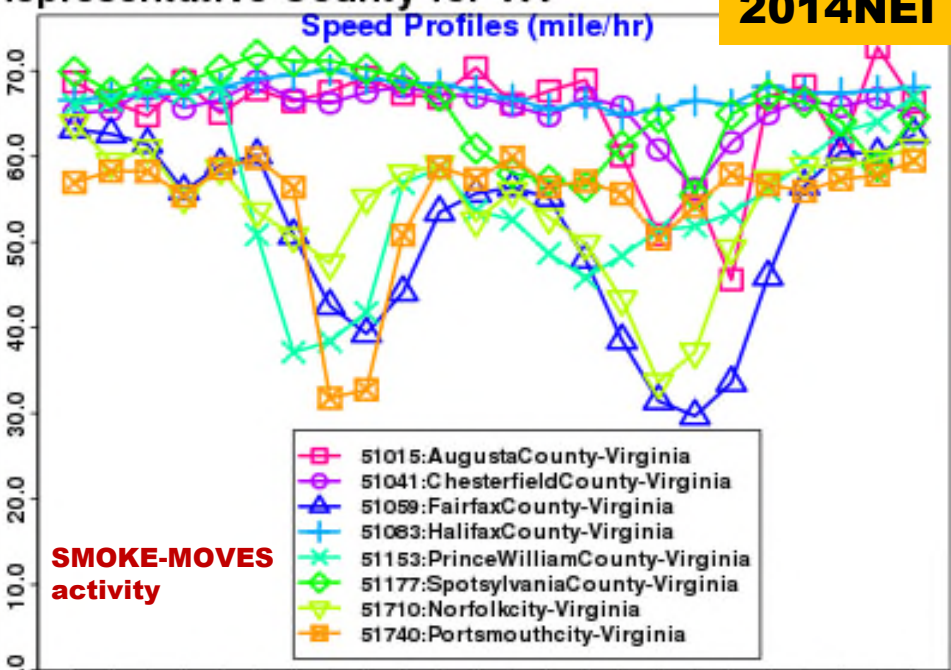**Eight presentations have all been forwarded to OTAQ**

- **2011 NEIv2**
- **2014 NEIv2**
- **2015 (non-NEI year, 2014-based)**
- **2016 Alpha (non-NEI year, 2014-based)**
- **2016 Beta (non-NEI year, 2014-based, some local data supplied by states)**
- **2017 NEI (in preparation by states/EPA, due 01/15/2019)**
- **2023 (future year projected from 2016)**
- **2028 (future year projected from 2016)**

Past presentations are available for download in MDE Photochemical Modeling Dropbox:
https://www.dropbox.com/sh/f92bs5a6mhy4cqf/AAB8K07OpBuwi4CSIbE5a4nAa?dl=0

SMOKE-MOVES Profiles by Representative County for VA

2014NEI

Age Distribution(fraction)

Legend:
- 51015:AugustaCounty-Virginia
- 51041:ChesterfieldCounty-Virginia
- 51059:FairfaxCounty-Virginia
- 51083:HalifaxCounty-Virginia
- 51153:PrinceWilliamCounty-Virginia
- 51177:SpotsylvaniaCounty-Virginia
- 51710:Norfolkcity-Virginia
- 51740:Portsmouthcity-Virginia

Representative county; MOVES run

Speed Profiles (mile/hr)

Legend:
- 51015:AugustaCounty-Virginia
- 51041:ChesterfieldCounty-Virginia
- 51059:FairfaxCounty-Virginia
- 51083:HalifaxCounty-Virginia
- 51153:PrinceWilliamCounty-Virginia
- 51177:SpotsylvaniaCounty-Virginia
- 51710:Norfolkcity-Virginia
- 51740:Portsmouthcity-Virginia

SMOKE-MOVES activity

Idling Hours Temporalization (fraction)

Legend:
- 51015:AugustaCounty-Virginia
- 51041:ChesterfieldCounty-Virginia
- 51059:FairfaxCounty-Virginia
- 51083:HalifaxCounty-Virginia
- 51153:PrinceWilliamCounty-Virginia
- 51177:SpotsylvaniaCounty-Virginia
- 51710:Norfolkcity-Virginia
- 51740:Portsmouthcity-Virginia

Minor sector

Profiles for counties in CONUS states have been plotted also (see presentations (2), (3), (4), (6))

VMT Temporalization (fraction)

Combine with speed profiles to produce AM/PM peaks

Legend:
- 51015:AugustaCounty-Virginia
- 51041:ChesterfieldCounty-Virginia
- 51059:FairfaxCounty-Virginia
- 51083:HalifaxCounty-Virginia
- 51153:PrinceWilliamCounty-Virginia
- 51177:SpotsylvaniaCounty-Virginia
- 51710:Norfolkcity-Virginia
- 51740:Portsmouthcity-Virginia

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O3 (2014v2 SPDPRO) minus O3 (2011v2 SPDPRO)

4pm EST in June

VA 2014v2 SPDPRO minus
VA 2011v2 SPDPRO ---
2011 modeling platform

ppb

SPDPRO: SMOKE terminology for speed profile
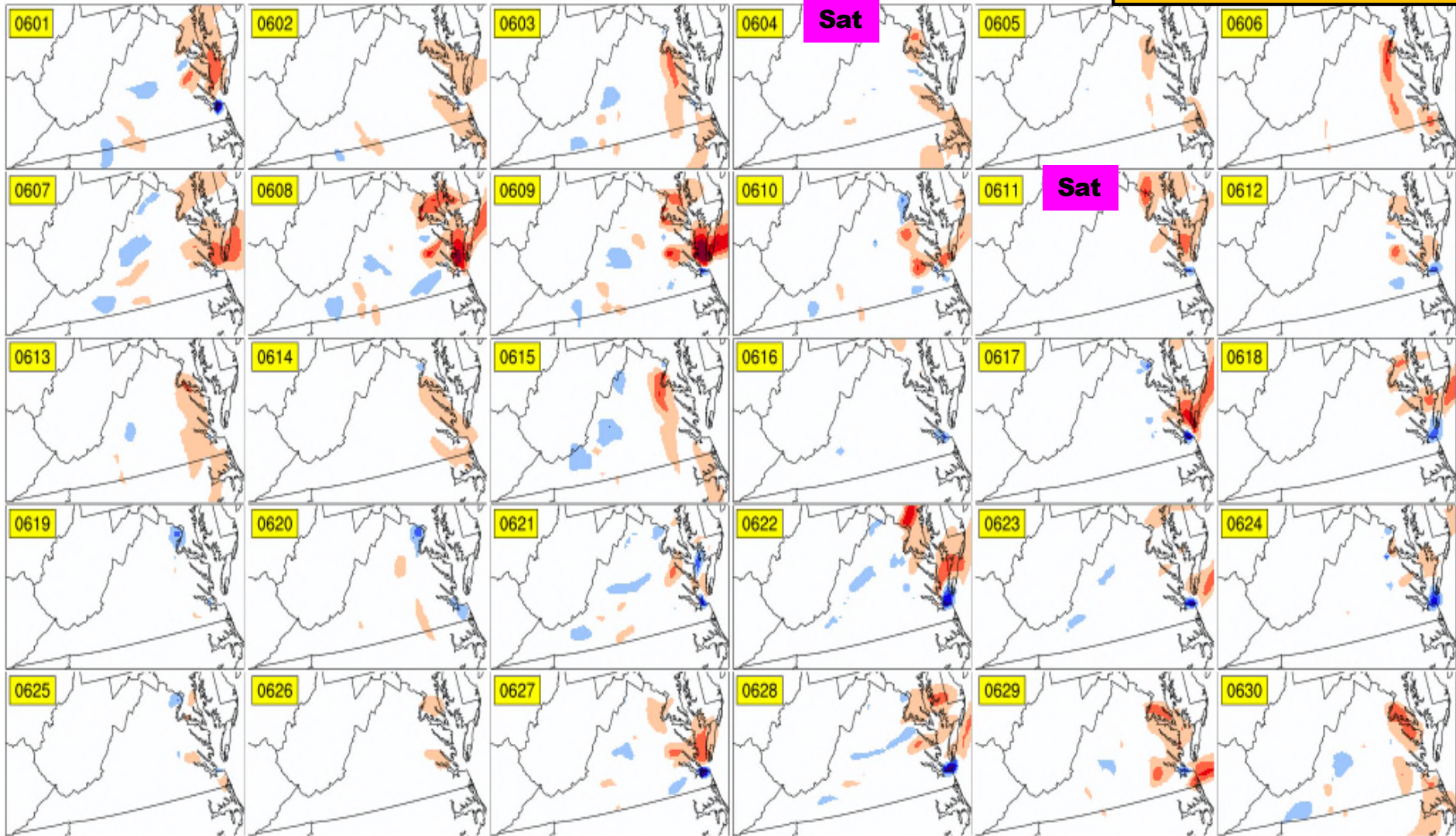
O3 2014v2 profiles > O3 2011v2 profiles

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Presentations	Parameter Examined	Overarching Issues
(1) Jun 14 2018	Age Distribution on O3	"Smoothed" age distribution by NJ
(2) Nov 29 2018	Speed Profiles on O3	(a) Incorporation of CRC A100 speed into unseeded CDBs
		(b) Incorporation of CRC A100 speed into MOVES default
		(c) Override mechanism on unreasonable state data
		(d) Are SMOKE reports based on average or hourly speeds?
(3) Jan 17 2019 (part one)	(1) Age Distributions	(a) Suitability of representative county approach
	(2) Representative County	(b) Inconsistent (altered) age data in GA's unseeded CDBs
		(c) National (centralized) archive center for CDBs
(4) Jan 31 2019 (part two)	Temporal Profiles	(a) Incorporation of CRC A100 temporal into unseeded CDBs
	(VMT allocation)	(b) Incorporation of CRC A100 temporal into MOVES default
		(c) Emissions change by manipulating VMT profiles
		(d) Change in emissions by changing monthly temporal profiles
(5) Feb 14 2019 (part three)	Activity & Emission Rates	(a) Have NEIs accounted for known controls (NLEV and CALEV)?
	(1) VPOP/VMT	(b) How can controls be included in SMOKE-MOVES modeling?
	(2) Emission Rates	(c) CDBs and FF10 conversion (released with SMOKE-MOVES)
	(3) VMT growth	(d) Problematic 31/32, 52/53. 61/62 splits
		(e) Non-road integration to MOVES framework
(6) Feb 21 2019 (part four)	Extended Idling	(a) Addition of EXT as a grouping criterion in rep county
	(Diesel 62 on road 2/4)	(b) No correlation between idling hours and 62 VMT
(7) Mar 7 2019 (part five)	Activity and Emissions	(a) Are SMOKE reports based on average or hourly speeds?
	(1) by vehicle type	(b) Low NOx rank with highly ranked activity for NY/NJ
	(2) by sector	(c) SMOKE-MOVES too complicated (controls can't be simulated)
	(3) SMOKE outputs	(d) Poor coordination between OTAQ and OAQPS
(8) Mar 28 2019 (part six)	Miscellaneous	(a) No county variation in monthly temporal profiles
	(1) Monthly temporal	(b) Low NOx rank with highly ranked activity for NY
	(2) beta (vs alpha) activity	(c) Problematic vehicle classification
	(3) NY NOx	(d) VPOP to be replaced with # of starts in RPV

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Summary on EPA Responses to Selected Issues

- SMOKE reports are based on hourly speeds (SMOKE won't run without average speed) -- OAQPS

- Updating national averages with speed and temporal data derived in CRC A100 is in the works but county-specific data is not allowed in MOVES default – OTAQ (Proposed incorporating data into MOVES GUI to share CRC A100 with states)

- SMOKE is being revised to consider speed distribution (instead of actual speed) -- OAQPS

- Instruction on how to model controls is available – OTAQ (Further clarification made indicating the problem is with SMOKE-MOVES not MOVES)

- Issue with vehicle classification or vehicle split: consolidating some vehicles types (such as 52 and 53) is being considered and debated internally – OTAQ

- Non-road has been in MOVES since MOVES2014 – OTAQ (Further clarification made indicating incompatibility (to Linux) of Windows-based non-road executable)

- EPA disagreed and is unwilling to override data submitted by states – OTAQ (Further clarification and additional examples provided, GA and LADCO offered interesting perspectives)

- Some misunderstanding on control strategy – OTAQ (Further clarification made)

- VPOP will have little role in SMOKE once RPV input is switched to # of starts -- OTAQ

Web Link for Presentations

In addition to MDE Photochemical Modeling Dropbox (on page 3), all presentations are posted in one place at:

https://www.arc.vt.edu/air-quality-modeling

Emission Modeling: ~50 pdf on MOVES and SMOKE-MOVES (from 2011 to present)
Air Quality Modeling: ~30 pdf (from 2016 to present)

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