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Policy Guidance on the Use of  
MOVES3 for State Implementation  
Plan Development, Transportation  
Conformity, General Conformity,  
and Other Purposes



# Policy Guidance on the Use of MOVES3 for State Implementation Plan Development, Transportation Conformity, General Conformity, and Other Purposes

Office of Transportation and Air Quality  
U.S. Environmental Protection Agency

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## **INTRODUCTION**

### **1. What is the purpose of this guidance?**

This guidance describes how and when to use the latest version of the MOtor Vehicle Emission Simulator (MOVES) emissions model for state implementation plan (SIP) development, transportation conformity determinations, general conformity determinations, and other purposes.<sup>1</sup>

MOVES3 is the U.S. Environmental Protection Agency's (EPA's) latest motor vehicle emissions model for state and local agencies to estimate nitrogen oxides (NO<sub>x</sub>), particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>), volatile organic compounds (VOCs), carbon monoxide (CO), and other pollutants/precursors from cars, trucks, buses, and motorcycles for SIP purposes and conformity determinations outside of California.<sup>2</sup>

EPA will be publishing a *Federal Register* notice to announce the availability of MOVES3 for official purposes. All states other than California should use MOVES3 for future SIPs to take full advantage of the improvements incorporated in this version. However, state and local agencies that have already completed significant work on a SIP with MOVES2014<sup>3</sup> may continue to use it for that SIP. See Questions 6-10 for further information on using MOVES3 in SIP development.

EPA intends to include in the *Federal Register* notice a two-year grace period for using MOVES3 for regional transportation conformity purposes and a two-year grace period for project-level conformity purposes.<sup>4</sup> EPA coordinated with the U.S. Department of Transportation (DOT) on the length of the grace period. MOVES3 will need to be used for new regional emissions analyses for transportation conformity determinations begun after the two-year grace period. MOVES3 will also need to be used for new PM and CO hot-spot analyses for project-level conformity determinations begun after the two-year project-level grace period. See Questions 11-17 for further information on using MOVES3 in transportation conformity determinations. In addition, see Question 18 for information on using MOVES3 in general conformity determinations.

EPA has also included information regarding the use of MOVES for estimating mobile source air toxic (MSAT) and greenhouse gas (GHG) emissions. Although there are no SIP or conformity requirements for these pollutants, MOVES3 is EPA's best tool for estimating air toxics and greenhouse gas emissions from onroad mobile sources, for regulatory purposes. See Questions 19 and 20 for further information.

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<sup>1</sup> This guidance, along with the other EPA guidance referenced in this document, is listed in the EPA guidance portal at [www.epa.gov/guidance/guidance-documents-managed-office-air-and-radiation](http://www.epa.gov/guidance/guidance-documents-managed-office-air-and-radiation).

<sup>2</sup> In California, a different onroad emissions model, EMFAC, is used for regulatory purposes instead of MOVES. MOVES can also model emissions in the District of Columbia, Puerto Rico, and the U.S. Virgin Islands.

<sup>3</sup> References to "MOVES2014" in this guidance relate to the previously released versions of MOVES2014, MOVES2014a, and MOVES2014b.

<sup>4</sup> See 40 C.F.R. 93.111(b).

This guidance applies to the current version of MOVES3, as well as any future MOVES3 minor revisions.<sup>5</sup> This guidance supersedes the previous July 2014 version of the MOVES2014 guidance (EPA-420-B-14-008).

The following EPA contacts are available regarding this guidance:

- for general questions about the MOVES model, email [mobile@epa.gov](mailto:mobile@epa.gov);
- for SIP questions, contact [Rudy Kapichak](mailto:Rudy.Kapichak@epa.gov) or [kapichak.rudolph@epa.gov](mailto:kapichak.rudolph@epa.gov);
- for transportation conformity questions, contact [Astrid Terry](mailto:Astrid.Terry@epa.gov) or [terry.astrid@epa.gov](mailto:terry.astrid@epa.gov);
- for general conformity questions, contact [Virginia Raps](mailto:Virginia.Raps@epa.gov) or [raps.virginia@epa.gov](mailto:raps.virginia@epa.gov), and
- for questions about the National Emissions Inventory, contact [Janice Godfrey](mailto:Janice.Godfrey@epa.gov) or [godfrey.janice@epa.gov](mailto:godfrey.janice@epa.gov).

Questions about the application of this guidance to specific SIPs or transportation conformity analyses should be addressed to the EPA Regional Office SIP or transportation conformity contact. Regional contacts for transportation conformity can be found at [www.epa.gov/state-and-local-transportation/epa-regional-contacts-regarding-state-and-local-transportation](http://www.epa.gov/state-and-local-transportation/epa-regional-contacts-regarding-state-and-local-transportation).

A copy of this policy guidance can be found at the following website: [www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission](http://www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission).

## 2. Why is this model called MOVES3?

MOVES3 is a major revision to the previous versions of MOVES2014. EPA has changed the naming system for MOVES with this revision. Under the new naming convention, this model is MOVES3, as it is the third major MOVES release – the first two were MOVES2010 and MOVES2014. As shown in Table 1, under this new naming system, future minor revisions would be designated by increments of the number after a decimal point (e.g., MOVES3.1, compared to using a new letter in the previous version, e.g., MOVES2014a). EPA may also use an additional decimal point to designate minor patches (e.g., MOVES3.0.1). This guidance should apply to all versions of MOVES3 until it is replaced with a new major revision.

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<sup>5</sup> Details on MOVES can be found at [www.epa.gov/moves](http://www.epa.gov/moves).

**Table 1: New MOVES Naming Convention**

Type of Release	Naming Convention	Examples
<b>Major release</b>	“MOVES” followed by a new number in sequence	MOVES3, MOVES4
<b>Minor revision</b>	Addition of a decimal followed by a new number in sequence	MOVES3.1, MOVES3.2
<b>Minor patch, e.g., new user features</b>	Addition of a second decimal followed by a new number in sequence	MOVES3.0.1, MOVES3.0.2

The first model in the MOVES series, called MOVES2010, was released in December of 2009. MOVES2010 was followed by two minor updates, MOVES2010a and MOVES2010b. Both of these minor MOVES2010 revisions enhanced model performance and did not significantly affect the criteria pollutant emissions results from MOVES2010. MOVES2014 was released in July 2014 and was a major revision to the MOVES2010 versions of MOVES with new data, emissions standards, and functional improvements and features. It incorporated substantial new data for emissions, fleet, and activity developed since the release of MOVES2010. MOVES2014 was followed by two minor updates, MOVES2014a and MOVES2014b. Both minor MOVES2014 revisions enhanced model performance and did not significantly affect the onroad criteria pollutant emissions results from MOVES2014.

References to “MOVES3” in this guidance relate to “MOVES3” and any future minor revisions to MOVES3. References to “MOVES2014” in this guidance relate to all versions of MOVES2014.

**3. What is MOVES3 and how does it compare to MOVES2014?**

MOVES is EPA’s state-of-the-art model for estimating emissions from onroad mobile sources. MOVES3 also models most nonroad emissions sources.

MOVES3 is the newest MOVES model. It is a major update to previous versions of MOVES. The model is based on analyses of millions of emission test results and considerable advances in EPA’s understanding of vehicle emissions. MOVES3 incorporates new regulations, features and significant new data, as detailed in the MOVES3 technical reports. Notably, MOVES3 incorporates:

- Improvements to heavy-duty (HD) diesel running emission rates based on manufacturer in-use testing data from hundreds of HD trucks;
- Updated emission rates for HD gasoline and compressed natural gas (CNG) trucks;
- Updated light-duty (LD) vehicle emission rates for hydrocarbons (HC), CO and NOx-based on in-use testing data;
- Updated LD PM rates for Model Year (MY) 2004 and later, incorporating data on gasoline direct injection engines;
- New fuel characteristic data from EPA fuel compliance submissions;

- Updated fuel effect calculations to better characterize the base fuel used to develop LD base emission rates;
- The effects of the HD Phase 2 GHG rule;<sup>6</sup>
- The effects of the Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule on light-duty fuel economy;<sup>7</sup>
- “Off-network idle” emissions beyond the idling that is already considered in the MOVES drive cycles; and
- Several improvements to the MOVES interface, user inputs and outputs.

MOVES3 also includes a variety of activity updates, most notably:

- Vehicle start and idling activity patterns are based on real-world instrumented vehicle data collected by a telecommunications company for LD vehicles and the Department of Energy’s (DOE) National Renewable Energy Lab (NREL) for HD vehicles;
- Default hotelling activity has been substantially reduced from what was included in MOVES2014 based on the NREL instrumented truck data;
- National vehicle miles travelled (VMT) and vehicle population inputs have been updated with newer historical data from Federal Highway Administration (FHWA) and more recent forecasts from DOE; and
- National onroad vehicle default fuel, regulatory class, and age distributions are based on newer vehicle registration data.

MOVES3 includes the capability to estimate vehicle exhaust and evaporative emissions as well as brake wear and tire wear emissions for criteria pollutants and precursors. However, MOVES3 does not include the capability to estimate emissions of re-entrained road dust. To estimate emissions from re-entrained road dust, practitioners should continue to use the latest approved methodologies.<sup>8</sup>

The structure of MOVES3 is fundamentally the same as MOVES2014, although there are new format options for some inputs, and the model run time may differ depending on the type of run and user inputs and computer configuration. As for emissions, EPA performed a comparison of MOVES3 to MOVES2014b using default information in MOVES3 at the national level, and for two sample urban counties with different local travel patterns and ambient conditions. In general, compared to MOVES2014b, MOVES3 national emission estimates are slightly lower for most criteria pollutants in future years. However, in the two sample urban counties, NO<sub>x</sub> emissions estimates were higher in future years. This is due to higher running emissions from heavy-duty trucks outweighing declines from heavy-duty hotelling. Note that results will vary based on the pollutant selected and that area’s local inputs. Based on our testing, MOVES run time at the Default and County Scale should be about the same or faster than runs with

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<sup>6</sup> [81 FR 7348, October 25, 2016.](#)

<sup>7</sup> [85 FR 24174, April 30, 2020.](#)

<sup>8</sup> See EPA’s notice of availability, “Official Release of the January 2011 AP-42 Method for Estimating Re-Entrained Road Dust from Paved Roads,” published in the *Federal Register* on February 4, 2011 ([76 FR 6328](#)).

MOVES2014b. In addition, as noted later in this document, MOVES3 run time at the Project Scale may be notably longer compared to MOVES2014 depending on the type of run, user inputs and computer configuration.

4. What resources are available to assist in implementing MOVES3?

In addition to this guidance document, EPA has developed technical guidance to assist in implementing MOVES3:

- *MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity* (available at [www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission](http://www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission)) provides guidance on how to set up a MOVES run and add local data using the County Data Manager for SIPs and regional transportation conformity analyses.

There are several existing MOVES2014 guidance documents that are still generally applicable to using MOVES3 as well:

- *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM<sub>2.5</sub> and PM<sub>10</sub> Nonattainment and Maintenance Areas* (available at [www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses](http://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses)) explains how to use MOVES to complete hot-spot analyses required for projects of local air quality concern in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas.
- *Using MOVES2014 in Project-Level Carbon Monoxide Analyses* (available at [www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses](http://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses)) describes how to use the MOVES emissions model to estimate CO emissions from transportation projects.
- *Using MOVES for Estimating State and Local Inventories of On-Road Greenhouse Gas Emissions and Energy Consumption – Final* (available at [www.epa.gov/state-and-local-transportation/estimating-greenhouse-gas-emissions](http://www.epa.gov/state-and-local-transportation/estimating-greenhouse-gas-emissions)) describes how to use MOVES to estimate greenhouse gas emissions and/or energy consumption from onroad vehicles in a state or metropolitan area.

EPA will be updating these guidance documents following the release of MOVES3. Where users are modeling with MOVES2014, please continue to refer to the MOVES2014-based guidance.

Additional training materials, examples, and MOVES technical information are available at the MOVES website: [www.epa.gov/moves](http://www.epa.gov/moves) and at the Transportation Conformity Training and Presentations website: [www.epa.gov/state-and-local-transportation/transportation-conformity-training-and-presentations](http://www.epa.gov/state-and-local-transportation/transportation-conformity-training-and-presentations).



MOVES users are urged to check the MOVES website regularly and subscribe to EPA's mobile source emissions model listserv to receive EPA email announcements related to MOVES. Subscription information is found on the EPA's MOVES website at [www.epa.gov/moves/forms/epa-mobilenews-listserv](http://www.epa.gov/moves/forms/epa-mobilenews-listserv).

5. Does this guidance create new requirements?

No. The discussion in this document is intended solely as guidance. The statutory provisions and EPA regulations discussed in this document contain legally binding requirements. This document is not a regulation itself, nor does it change or substitute for statutory provisions and regulations. Thus, it does not impose legally binding requirements on EPA, the DOT, states, or the regulated community. EPA retains the discretion to consider and adopt approaches on a case-by-case basis that may differ from this guidance, but still comply with the statute and regulations. Any decisions regarding a particular SIP or conformity determination will be made based on the statute and regulations. This guidance may be revised periodically without an opportunity for public comment.

**USING MOVES3 IN SIPs**

6. How does the release of MOVES3 affect SIPs that are currently under development?

MOVES3 should be used in ozone, CO, PM, and NO<sub>2</sub> SIP development as expeditiously as possible, as there is no grace period for the use of MOVES3 in SIPs. The Clean Air Act (CAA) and implementation rules for the NAAQS require that SIP inventories and control measures be based on the most current information and applicable models that are available when a SIP is developed.<sup>9</sup> However, EPA recognizes the time and level of effort involved in SIP development. States should consult with their EPA Regional Office if they have questions about how MOVES3 affects SIPs under development in specific nonattainment or maintenance areas. Early consultation can facilitate EPA's adequacy finding for transportation conformity purposes or for the SIP approval process.

States should use the latest version of MOVES that is available at the time that a SIP is developed. All states other than California should use MOVES3 for SIPs that will be submitted in the future so that they are based on the most accurate estimates of emissions possible. However, state and local agencies that have already completed significant work

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<sup>9</sup> See Clean Air Act section 172(c)(3). Also see the discussion of emissions inventory requirements in the "Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements" rule (81 FR 58029, August 24, 2016) and in the "Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements" rule (83 FR 63022, December 6, 2018).

on a SIP with MOVES2014 (e.g., attainment modeling has already been completed with MOVES2014) may continue to rely on the earlier version of MOVES.

New regional emissions analyses that support transportation plan and transportation improvement program (TIP) conformity determinations and are started after the end of the conformity grace period must be based on the latest emissions model available. (40 CFR 93.111). Therefore, incorporating MOVES3 into the SIP now could assist areas in mitigating possible transportation conformity difficulties in the future after the MOVES3 conformity grace period ends. See Question 11 for more information on using MOVES3 for regional emissions analyses and transportation plan and TIP conformity.

7. How does the release of MOVES3 affect SIPs that have already been submitted or approved?

The CAA does not require states to revise submitted SIPs or SIPs that have already been approved simply because a new motor vehicle emissions model is now available.<sup>10</sup> States can choose to update these SIPs with MOVES3, for example, if it is determined that it is appropriate to update motor vehicle emissions budgets (“budgets”) with the model for future conformity determinations.

However, as stated above, states should use MOVES3 where SIP development is in its initial stages or has not progressed far enough along that switching from a previous model version would create a significant adverse impact on state resources.

8. When existing SIPs and budgets are revised with MOVES3, what do states need to submit to show that a SIP continues to meet applicable requirements?

As stated in Question 7, a SIP revision would not be required solely due to the release of MOVES3 for SIPs that have been approved, submitted, or where significant development has already occurred. However, there may be cases where an existing SIP that is based on an older emissions model (e.g., MOVES2014 or MOVES2010) is revised with MOVES3. As discussed below, in addressing these cases, EPA is applying the same principles it has in the past when budgets have been revised using a new emissions model. States should consult with their EPA Regional Office prior to submitting MOVES3 SIP revisions. Early consultation can facilitate EPA’s adequacy finding or SIP approval process.

EPA cannot approve revisions to existing SIPs and budgets unless the revised SIP and budget meets applicable CAA requirements (e.g., for reasonable further progress (RFP), attainment, maintenance). If a state revises an existing SIP with MOVES3, it must show

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<sup>10</sup> Sierra Club v. EPA, 356 F.3d. 296, 308 (D.C. Cir. 2004) (“To require states to revise completed plans every time a new model is announced would lead to significant costs and potentially endless delays in the approval processes.”)

that the SIP continues to meet applicable requirements with the new level of motor vehicle emissions calculated by the new model.

In addition, the transportation conformity rule (40 CFR 93.118(e)(4)(iv)) requires that “the motor vehicle emissions budget(s), when considered together with all other emissions sources, is consistent with applicable requirements for reasonable further progress, attainment, or maintenance (whichever is relevant to the given implementation plan submission).” This and other regulatory requirements must be satisfied before EPA can find submitted budgets adequate or approve them for use in the conformity process.

The following describes how to meet applicable requirements for existing SIPs that are revised with MOVES3, including ideas for how to streamline these revisions whenever possible.

Use of latest planning assumptions: When SIPs are revised with MOVES3, the motor vehicle emissions inventories for base year, milestone year and attainment/maintenance year will need to be recalculated with the latest available planning assumptions. This should include, at a minimum, the latest information for VMT, speeds, fleet mix, and SIP control measures.<sup>11</sup> Base year and historical year inventories should use the latest data available for those years. Future year projection inventories should also be based on the latest data available.<sup>12</sup> If planning assumptions have not changed since the original SIP was submitted, the state should document this in its new SIP submission.

In addition, states will need to consider and evaluate whether growth and control strategy assumptions for non-motor vehicle sources (i.e., stationary, area, and nonroad mobile sources) are still accurate at the time that the MOVES3 SIP revision is developed to ensure the revised emissions inventories are consistent with the relevant applicable requirement (e.g., RFP, attainment, or maintenance). Such assumptions include population and economic assumptions and any allowable emissions relied upon for stationary or other sources. If these assumptions have not changed, the state can explain this and re-submit the original SIP with the revised motor vehicle emissions inventories and budgets to meet the remaining requirements as discussed below. The state may also in these cases provide summary emissions information for categories of sources and references to the applicable portions of the original SIP, as long as those portions continue to apply after the SIP revision with the MOVES3 budget is approved. Otherwise, the emissions categories in the SIP that have changed should be brought up to

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<sup>11</sup> See EPA and DOT’s joint “[Guidance for the Use of Latest Planning Assumptions in Transportation Conformity Determinations](#),” EPA420-B-08-901, December 2008. This guidance also addresses requirements for using the latest planning assumptions in SIP development. Also see the discussion of emissions inventory requirements in the “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” rule (81 FR 58029, August 24, 2016) and in the “Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements” rule (83 FR 63022, December 6, 2018).

<sup>12</sup> See the discussion of emissions inventory requirements in the “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” rule (81 FR 58029, August 24, 2016) and in the “Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements” rule (83 FR 63022, December 6, 2018).

date to ensure that the emissions inventory is accurate, current, and consistent with the relevant statutory requirements.<sup>13</sup> States should consult with their EPA Regional Office to determine what should be included in the SIP revision.

Milestone, attainment, or maintenance demonstration: As discussed above, SIP revisions must continue to show that the SIP still meets applicable CAA requirements (e.g., attainment, maintenance, or interim milestones) when previous motor vehicle emissions inventories are replaced with MOVES3 inventories. The level of analysis and support needed for this demonstration can vary depending upon how MOVES3 affects the level of motor vehicle emissions and whether non-motor vehicle inventories require updating. The modeling and post-processing choices made in the original demonstration could also be a factor.

Areas may be able to revise their motor vehicle emissions inventories and budgets using MOVES3 without revising the entire SIP or completing additional modeling. This could be the case if:

- (1) the SIP meets applicable requirements when the previous motor vehicle emissions inventories are replaced with MOVES3 base year and milestone, attainment, or maintenance year inventories; and
- (2) the state can document that the growth and control strategy assumptions for non-motor vehicle sources continue to be valid and any minor updates do not change the overall conclusions of the SIP.<sup>14</sup>

For example, if an ozone SIP relied on changes in emissions from the base year to an attainment or maintenance year inventory to demonstrate attainment or maintenance, that requirement would be satisfied by demonstrating that the relative emissions reductions between the base year and the attainment or maintenance year are the same or greater using MOVES3 than they were under the model previously used. Similarly, if an ozone attainment SIP relied on absolute model predictions to demonstrate attainment for the future attainment year, that requirement would be satisfied by demonstrating that the MOVES3 estimates are equal to or lower than the previous estimates for the future attainment year. Or, if a CO maintenance plan relied on either a relative or absolute demonstration of maintenance, that requirement could be satisfied by documenting that the relative emissions reductions between the base year and the maintenance year are the same or greater using MOVES3.

If both 1 and 2 above are met, the state may be able to submit summary emissions information for categories of sources and references to the applicable portions of the original SIP as the needed SIP revision. States should consult with their EPA Regional

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<sup>13</sup> *Id.*

<sup>14</sup> See the discussion of emissions inventory requirements in the “Fine Particulate Matter National Ambient Air Quality Standards: State Implementation Plan Requirements” rule (81 FR 58029, August 24, 2016) and in the “Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements” rule (83 FR 63022, December 6, 2018).

Office to determine what should be included in the SIP revision. However, if emissions from other source categories in the SIP have changed, those inventories should be brought up to date in order to demonstrate that the SIP submission complies with the applicable statutory requirement for attainment, maintenance, or interim milestones. Any changes in control strategies, including regulations that apply to stationary or area sources and affect those portions of the inventories, will need to be factored in to both base and future year inventories to determine whether the SIP still meets the applicable statutory requirement. However, a state may not need to revise emissions for a non-motor vehicle emissions inventory category, if a regulatory change resulted in a reduction in emissions in the attainment or maintenance year relative to the existing SIP. In that circumstance, the SIP could be assumed to continue to demonstrate attainment or maintenance.

Regardless of the technique used, a more rigorous assessment of the SIP's attainment or maintenance demonstration may be necessary if a state decides to reallocate the original SIP's excess emissions reductions to the motor vehicle emissions budget as a safety margin.<sup>15</sup> In other words, the state will need to assess how its original demonstration is affected by using MOVES3 and confirm whether excess emissions reductions exist prior to allocating them to the budget. The assessment of the SIP's attainment or maintenance demonstration, after onroad emissions are calculated using MOVES3, would need to be sufficiently detailed to allow the state to determine the magnitude of the available safety margin, if any, and to decide how much of the available safety margin to allocate to the motor vehicle emissions budgets. This assessment is critical to ensure that SIP budgets in the context of all other emissions sources continue to protect public health and meet the conformity rule's adequacy criteria (40 CFR 93.118(e)(4)).

9. How will MOVES3 affect the need for emissions reductions in the development of future attainment or maintenance SIPs?

The answer depends upon the unique circumstances of each nonattainment or maintenance area. The emissions comparisons depend on the pollutants of concern, the dates of concern, and on existing local regulations, travel activity patterns, fleet age, and mix of cars and trucks. In some cases, a change from MOVES2014 to MOVES3 may result in increased emissions estimates, while in other cases it may result in decreased emissions estimates for the relevant time periods.

Moreover, because of the complex chemistry and meteorology of air pollution, the implications of changes in onroad vehicle emissions may not be clear until multiple years are examined, and the new emissions levels are applied in an air quality model. Relative differences in emissions over time from MOVES2014 to MOVES3 may be as important as, or more important than, differences between the models in any one year. Therefore,

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<sup>15</sup> A "safety margin" is the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment, or maintenance (40 CFR 93.101). See also 40 CFR 93.124(a) for its application.

MOVES3 users should not immediately assume that increases or decreases in emissions in any single year imply the need for more or fewer SIP control measures until those changes in emissions have been applied in the complete SIP context.

An increase in emissions due to the use of MOVES3 may affect an area's ability to demonstrate conformity for its transportation plan and/or TIP. Areas are encouraged to consider, through interagency consultation, if and how MOVES3 will impact their future conformity determinations and discuss any concerns with the appropriate EPA Regional Office.

10. What role will MOVES3 play in EPA's National Emissions Inventory?

EPA will use MOVES3 for the 2020 National Emissions Inventory (NEI). The NEI is updated with state, local, and tribal submissions once every three years. The most recent NEI is the 2017 NEI and is available at [www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data](http://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data).<sup>16</sup> Mobile source emissions for the 2017 NEI were generated with MOVES2014b with a mix of EPA and state-provided inputs.

**USING MOVES3 IN TRANSPORTATION CONFORMITY**

11. When will the use of MOVES3 be required for regional emissions analyses in transportation plan and TIP conformity determinations?

EPA will be publishing a *Federal Register* notice to announce the availability of MOVES3 for official purposes (outside of California). EPA, in consultation with DOT, intends to establish a two-year grace period before MOVES3 needs to be used for regional emissions analyses in transportation conformity determinations of transportation plans and TIPs. Section 176(c)(1) of the CAA requires conformity determinations to be based on "the most recent estimates of emissions." Additionally, the transportation conformity rule (40 CFR 93.111) requires conformity analyses to be based on "the latest emissions estimation model available," and further states that this requirement is satisfied if the most current version of EPA's motor vehicle emissions model is used. When EPA announces a new emissions model, such as MOVES3, we establish a grace period before the model is considered the latest version of EPA's motor vehicle emissions model for transportation conformity purposes (40 CFR 93.111(b)). In consultation with DOT, EPA must consider several factors when establishing a grace period for conformity determinations, including the degree of change in the emissions model and the effects of the new model on the transportation planning process (40 CFR 93.111(b)(2)).

Transportation conformity is a CAA requirement to ensure that federally supported highway and transit activities are consistent with ("conform to") the SIP. Conformity to a SIP means that a transportation activity will not cause or contribute to new air quality violations; worsen existing violations; or delay timely attainment of the national ambient air quality standards or an interim milestone.

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<sup>16</sup> NEI on-road emissions for California are based on California's EMFAC model.

EPA encourages state and local agencies to use the latest version of the MOVES model available at the time that any conformity modeling begins, so that users can take advantage of the latest information and improvements included in the model.

12. Under what circumstances will the MOVES3 grace period for regional emissions analyses be shorter than two years?

The conformity grace period for regional emissions analyses will end two years after we publish the *Federal Register* notice announcing MOVES3, unless new MOVES3-based SIP budgets become applicable sooner, in which case the grace period will end for specific areas and a specific pollutant once these new MOVES3-based approved or adequate budgets become effective. In this case, the new regional emissions analysis for that pollutant must use MOVES3 if the conformity determination is demonstrating consistency with a MOVES3-based budget per 40 CFR 93.118. The interagency consultation process must be used to develop any SIP revision based on MOVES3 (40 CFR 93.105(c)(1)(i)).

It is possible that areas that are designated nonattainment or maintenance for multiple pollutants may rely on both MOVES3 and MOVES2014 to determine conformity for different pollutants during the grace period. For example, if an area revises a previously submitted (but not approved) MOVES2014-based PM<sub>10</sub> SIP with MOVES3 and EPA finds these revised MOVES3 budgets adequate for conformity, such budgets would apply for conformity on the effective date of the *Federal Register* notice announcing EPA's adequacy finding. In this example, if an area was in nonattainment for PM<sub>10</sub> and ozone, the MOVES3 grace period would end for PM<sub>10</sub> once EPA found the new MOVES3-based SIP budgets adequate. However, MOVES2014 could continue to be used for ozone conformity determinations until the end of the MOVES3 grace period for regional emissions analyses.<sup>17</sup>

In addition, in most cases, if the state revises previously approved budgets based on an earlier EPA emissions model SIP budget with MOVES3, the revised MOVES3 budgets could not be used for conformity purposes until EPA approves them, i.e., approves the SIP revision. In general, submitted SIPs cannot supersede approved budgets until the submitted SIP is approved. See 40 CFR 93.118(e)(1).

However, 40 CFR 93.118(e)(1) allows an approved budget to be replaced by an adequate budget if EPA's approval of the initial budgets specifies that the budgets being approved may be replaced in the future by new adequate budgets. This flexibility has been used in limited situations in the past. In such cases, the MOVES3-based budgets would be used for conformity purposes once they have been found adequate, if

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<sup>17</sup> In this example, such an area would use MOVES3 to develop a regional emissions analysis for comparison to the revised MOVES3-based budgets (e.g., PM<sub>10</sub> budgets). The regional emissions analysis for ozone could be based on MOVES2014 for the VOC and NO<sub>x</sub> budgets in the ozone SIP for the remainder of the conformity grace period.

requested by the state in its SIP submission and if specified in EPA's SIP approval. States should consult with their EPA Regional Office to determine if this flexibility could be applied to their situation.

13. How will the MOVES3 conformity grace period be implemented for regional emissions analyses?

During this two-year grace period, areas should use interagency consultation to examine how MOVES3 will impact their regional emissions analyses and future transportation plan and TIP conformity determinations. Isolated rural areas should also consider how future regional emissions analyses will be affected when MOVES3 is required, if such an analysis is anticipated. Areas should carefully consider whether the SIP and budget(s) should be revised with MOVES3 or if transportation plans and TIPs should be revised before the end of the conformity grace period, since doing so may be necessary to ensure conformity in the future.

The conformity rule provides flexibility for analyses that are started during the grace period. Regional emissions analyses that are started during the grace period can use either MOVES2014 or MOVES3 (40 CFR 93.111(c)). Interagency consultation should be used if it is unclear if a MOVES2014-based analysis was begun before the end of the grace period.

When the grace period ends, MOVES3 will replace MOVES2014 as the current EPA motor vehicle emissions model for transportation conformity purposes in states outside California. In general, this means that all new regional emissions analyses started after the end of the grace period will be based on MOVES3, even if the SIP is based on a previous EPA emissions model. As discussed above, the grace period for new regional emissions analyses would be shorter for a given pollutant if an area revised its SIP and budgets with MOVES3 and such budgets were approved or found adequate for conformity purposes prior to the end of the grace period. Also, when the grace period ends, conformity determinations cannot rely on a previous emissions analysis that was prepared using MOVES2014.

As discussed in more detail in the MOVES Technical Guidance, MOVES allows for multiple approaches in developing a regional emissions analysis, which may result in small differences in results.<sup>18</sup> EPA recommends that the same approach be used in any analysis that compares two or more cases (e.g., the SIP budget and the regional emissions analysis for transportation conformity). Per 40 CFR 93.105(c)(1)(i), interagency consultation must be used to evaluate and choose model or models and associated methods and assumptions for conformity determinations. If different approaches are used for the SIP budget and the regional emissions analysis for practical reasons, interagency consultation should be used to determine how to address (and minimize) any differences

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<sup>18</sup> See the most current version of the MOVES Technical Guidance, available at [www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission](http://www.epa.gov/state-and-local-transportation/policy-and-technical-guidance-state-and-local-transportation#emission).



in results. The methods used to develop inventories should be fully documented in the SIP and conformity determination.

14. When will the use of MOVES3 be required for hot-spot analyses in project-level conformity determinations?

EPA, in consultation with DOT, intends to establish a two-year grace period before MOVES3 needs to be used for conformity hot-spot analyses outside of California, i.e., the same period of time as the grace period that will apply for conformity regional emissions analyses. The *Federal Register* notice that announces the availability of MOVES3 for official purposes will establish the grace period for both regional emissions analyses and hot-spot analyses. The structure of MOVES3, including at the Project Scale, is fundamentally the same as MOVES2014, although there are new format options for some inputs, and the model run time may be notably longer compared to MOVES2014 depending on the type of run, user inputs and computer configuration. Hot-spot analyses are required to be included in conformity determinations for all non-exempt FHWA/FTA projects in CO areas, and for “projects of air quality concern” in PM<sub>2.5</sub> and PM<sub>10</sub> nonattainment and maintenance areas.<sup>19</sup>

Section 176(c)(1) of the CAA requires conformity determinations to be based on “the most recent estimates of emissions.” Additionally, the transportation conformity rule (40 CFR 93.111) requires conformity analyses to be based on “the latest emissions estimation model available,” and further states that this requirement is satisfied if the most current version of EPA’s motor vehicle emissions model is used. When EPA announces a new emissions model, such as MOVES3, we establish a grace period before the model is considered the latest version of EPA’s motor vehicle emissions model for transportation conformity purposes (40 CFR 93.111(b)). In consultation with DOT, EPA must consider the degree of change in the emissions model and the effects of the new model on the transportation planning process (40 CFR 93.111(b)(2)).

Once EPA announces the availability of MOVES3 in the *Federal Register*, MOVES3 will be the latest EPA motor vehicle emissions model for new conformity hot-spot analyses outside of California and will need to be used in new analyses that begin after the two-year grace period ends. The MOVES3 grace period for conformity hot-spot analyses applies to the use of MOVES3 and any future minor revisions that occur during the grace period.

EPA encourages state and local agencies to use the latest version of the MOVES model available at the time that any conformity modeling begins, so that users can take advantage of the latest information and improvements included in the model.

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<sup>19</sup> See 40 CFR 93.116 and 93.123 for more information.

15. How will the MOVES3 grace period be implemented for CO, PM<sub>10</sub> and PM<sub>2.5</sub> hot-spot analyses?

EPA intends to establish a two-year conformity grace period for the use of MOVES3 for CO, PM<sub>10</sub> and PM<sub>2.5</sub> hot-spot analyses, as stated above. See Question 11 for more general information about the conformity grace period.

Sections 93.116 and 93.123 of the conformity regulations contains the requirements for when a hot-spot analysis is required for project-level conformity determinations.<sup>20</sup> In addition, the conformity regulation provides flexibility for analyses that are started before the end of the grace period. A conformity determination for a transportation project may be based on a previous model if the analysis was begun before or during the grace period, and if the final environmental document for the project is issued no more than three years after the issuance of the draft environmental document (40 CFR 93.111(c)). Interagency consultation should be used if it is unclear if a previous analysis was begun before the end of the grace period.

For CO, PM<sub>10</sub> and PM<sub>2.5</sub> hot-spot analyses that start during the grace period, project sponsors can choose to use MOVES2014 or MOVES3 as the current EPA motor vehicle emissions model, since both are available during the grace period. The consultation process must be used to determine which option may be most appropriate for a given situation, per 40 CFR 93.105(c)(1)(i). Any new CO, PM<sub>10</sub> or PM<sub>2.5</sub> hot-spot analyses for conformity purposes begun after the two-year grace period must be based on MOVES3.

EPA guidance on how to use MOVES for CO and PM hot-spot analyses is available (see Question 4). Until EPA updates guidance to reflect the new model, the existing guidance is still largely applicable to MOVES3. See EPA's [Project-level Conformity website](#) for latest information and guidance documents on how to conduct CO, PM<sub>10</sub> and PM<sub>2.5</sub> hot-spot modeling for transportation conformity purposes.

The length of the grace period for hot-spot analyses would not be affected by an early submission of MOVES3-based SIP budgets. Using the same example as described in Question 12, the two-year grace period would apply for PM<sub>10</sub> hot-spot analyses even if approved or adequate MOVES3-based budgets for PM<sub>10</sub> are available before it ends.

Please consult with your EPA Regional Office (or Offices, where appropriate) if there are questions about which model should be used in a project-level conformity determination.

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<sup>20</sup> In CO nonattainment and maintenance areas, a hot-spot analysis is required for all non-exempt projects, with quantitative hot-spot analyses being required for larger, congested intersections and other projects (40 CFR 93.123(a)(1)). In addition, the conformity rule requires that a quantitative PM<sub>10</sub> or PM<sub>2.5</sub> hot-spot analysis be completed for certain projects of local air quality concern (40 CFR 93.123(b)(1)).

16. How will MOVES3 affect FHWA's CO categorical hot-spot finding?

FHWA released the updated CO categorical hot-spot finding for intersection projects on July 17, 2017 that was based on MOVES2014a.<sup>21</sup> During the MOVES3 grace period, a project sponsor may continue to rely on the categorical finding for applicable projects that are determined through interagency consultation to be covered by the finding's parameters. Any new CO hot-spot analyses for conformity purposes begun after the end of the MOVES3 grace period may no longer rely on the July 2017 CO categorical hot-spot finding because the finding was based on MOVES2014.

17. How will MOVES3 affect CO hot-spot protocols that were previously approved into the SIP?

Section 40 CFR 93.123(a)(1) of the transportation conformity regulation allows areas to develop alternate procedures for determining localized CO hot-spot analyses, when developed through interagency consultation and approved by the EPA Regional Administrator. Some states have chosen in the past to develop such procedures based on previously approved EPA emissions models.

During the MOVES3 grace period, areas with previously approved CO hot-spot protocols based on MOVES2014 may continue to rely on these protocols. Once the MOVES3 two-year grace period ends, new CO hot-spot analyses for conformity purposes will need to be based on MOVES3 and thus may no longer rely on a CO hot-spot protocols based on MOVES2014.

**USING MOVES3 FOR GENERAL CONFORMITY**

18. When will the use of MOVES3 be required under the General Conformity Rule?

CAA section 176(c)(4)(A) directs EPA to establish general conformity regulations for federal actions not otherwise defined as a transportation action. General conformity is implemented under 40 CFR part 93, subpart B and requires federal agencies to work with state, tribal and local governments<sup>22</sup> to ensure that emissions caused by a federal action proposed to occur within a nonattainment or maintenance area do not interfere with (i.e., conforms to) the air quality plans established in the applicable implementation plan.<sup>23</sup>

The general conformity regulations in 40 CFR 93.159(b)(1) require a federal agency to include in its applicability analysis<sup>24</sup> an estimate of the action's motor vehicle emissions using the most current version of the motor vehicle emissions model specified by EPA,

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<sup>21</sup> See [www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#cohotspot](http://www.epa.gov/state-and-local-transportation/project-level-conformity-and-hot-spot-analyses#cohotspot).

<sup>22</sup> See 40 CFR 93.155 and 93.156 for General Conformity reporting and public participation requirements.

<sup>23</sup> See 40 CFR 93.153 definition of *Applicable implementation plan*.

<sup>24</sup> See 40 CFR 93.153 definition of *Applicability analysis*.

unless the appropriate EPA Regional Administrator approves a modification or substitution. When EPA updates its motor vehicle emissions model, a grace period of three months shall apply during which a Federal agency may use the model previously specified by EPA as the most current version, unless EPA announces a longer grace period in the *Federal Register*.<sup>25</sup> Since EPA intends to specify in the *Federal Register* a two-year grace period before MOVES3 must be used, that grace period will apply for general conformity analyses.<sup>26</sup>

The general conformity regulations provide flexibility if a Federal agency begins its applicability analysis during the grace period announced in the *Federal Register*, allowing the Federal agency to use either MOVES2014 or MOVES3.<sup>27</sup> When the two-year grace period ends, MOVES3 must be used for the general conformity applicability analysis. If the Federal agency begins its applicability analysis within the three months prior to the beginning of the grace period, the Federal agency may continue to use the previous version of the model for its analysis.

If the motor vehicle emissions model specified by EPA is inappropriate for the action, a Federal agency may, under 40 CFR 93.159(b), obtain written approval from the appropriate EPA Regional Administrator for a modification or substitution of other emission estimation techniques on a case-by-case basis, or on a generic basis for a specific federal agency program.

## **USING MOVES3 FOR OTHER PURPOSES**

### **19. Can MOVES3 be used to estimate greenhouse gas emissions?**

Yes, MOVES3 is currently the best tool EPA has for estimating GHG emissions from the transportation sector for regulatory purposes and is a significant improvement over MOVES2014. As described in Question 3, MOVES3 incorporates new emissions standards not included in MOVES2014, as well as improved methane emission algorithms and updated vehicle activity and population inputs. EPA notes that there are no SIP and transportation conformity requirements for GHG emissions. State and local agencies estimating GHG emissions in the transportation planning process should consider using the latest version of MOVES in the future.

EPA has developed technical guidance<sup>28</sup> that describes how to use MOVES to estimate GHG emissions and/or energy consumption from onroad vehicles in a state or metropolitan area. Until EPA updates this guidance to reflect the new model, the existing MOVES2014 guidance is still largely applicable to MOVES3.

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<sup>25</sup> See 40 CFR 93.159(b)(1)(ii).

<sup>26</sup> See 40 CFR 93.111(b)(1).

<sup>27</sup> See 40 CFR 93.111(c).

<sup>28</sup> The latest version of *Using MOVES for Estimating State and Local Inventories of On-Road Greenhouse Gas Emissions and Energy Consumption* is available on EPA's website at [www.epa.gov/state-and-local-transportation/estimating-greenhouse-gas-emissions](http://www.epa.gov/state-and-local-transportation/estimating-greenhouse-gas-emissions).

20. Can MOVES3 be used to estimate mobile source air toxics?

Yes, MOVES3 estimates emissions for MSATs such as benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene, and ethylbenzene.<sup>29</sup> MOVES3 is EPA's best available tool for quantifying emissions of these MSATs. State and local agencies, academic institutions, and other interested parties who are interested in analyzing MSAT emissions from transportation projects should consider using the latest version of MOVES.

EPA notes that there are no SIP and transportation conformity requirements for air toxics. Regarding the analysis of MSAT emissions in the National Environmental Policy Act (NEPA) process, DOT has responsibility for implementing NEPA for federally funded or approved transportation projects.

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<sup>29</sup> More information, including a list of the mobile source air toxics in MOVES, can be found in EPA's report, *Air Toxic Emissions from Onroad Vehicles in MOVES3*, EPA-420-R-20-022, available at [www.epa.gov/moves/moves-onroad-technical-reports](http://www.epa.gov/moves/moves-onroad-technical-reports).