Instructions for Using LEV and NLEV Inputs for MOVES2014

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

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       This document provides instructions for using California Low Emission Vehicle (LEV) inputs, Zero Emission Vehicle (ZEV) inputs, and National Low Emitting Vehicle (NLEV) inputs in certain northeast states in MOVES. EPA has provided these inputs in the form of two databases and one spreadsheet file. The emission rates in these files are for use only in states other than California that adopted California LEV standards, and states in the Ozone Transport Commission (OTC) that received early implementation of NLEV standards.

       OTC states that did not adopt California LEV standards but were subject to the early implementation of NLEV should follow the instructions in Section 1.

       OTC states that adopted California LEV standards prior to the 2001 model year should follow the instructions in Section 2.

       OTC states that were subject to the early implementation of NLEV and adopted California LEV standards beginning with model year 2001 or later should follow the instructions in Sections 1 and 2.

       All other states that adopted California LEV standards in any year should follow the instructions in Section 2.

       States that adopted the California ZEV standard in any year should also follow the instructions in Section 3.

Section 1: Instruction for using NLEV inputs in Ozone Transport Commission (OTC) states

       The National Low Emission Vehicle Program was the result of an agreement between EPA, Ozone Transport Commission (OTC) states, and the auto manufacturers to introduce new emission standards in the OTC states beginning with the 1999 model year and in the rest of the country beginning with the 2001 model year (details of the NLEV program can be found at http://www.epa.gov/oms/lev-nlev.htm).

       The default emissions database that is included with MOVES2014 includes the effects of the nationwide NLEV standards beginning with the 2001 model year. However, it does not include the effects of the NLEV standards for the 1999 and 2000 model years in OTC states. EPA has created a separate input database that allows OTC states to model the early introduction of NLEV standards in those states. This database provides a set of alternate hydrocarbon (HC), carbon monoxide (CO), and oxides of nitrogen (NOx) start and running emission rates based on EPA analysis of the NLEV program. The input database provides

rates only for model years 1999 and 2000. These rates replace the rates in the default database for these particular pollutants.

The new database is called "MOVES2014_early_NLEV" and is included in this zip file. Use of the new database is simple.

Steps:

1. Save the "MOVES2014_early_NLEV" database to the MySQL data folder that also contains the default MOVES database (C:\...\MySQL\MySQL Server 5.6\data\).
2. Open MOVES and create a RunSpec for the current analysis
3.   In the Manage Input Datasets Panel, locate the "MOVES2014_early_NLEV" database. Be aware that the databases are sorted first by capital letter alphabetically, then lower case letter alphabetically. If you don't see the database, press the refresh button to refresh the list.
4. Select the database and press the "Add" button.
5. Complete the MOVES RunSpec and run as usual.

Section 2: Instructions for using California LEV inputs in MOVES

Beginning in the 1990s, a number of states chose to adopt California LEV standards in place of federal standards. The effects of these LEV standards are not included in the default MOVES emissions database. EPA has created a separate input database for those states that have adopted the California LEV program regulations. The California LEV input database provides a set of alternate HC, CO, NOx and PM start and running emission rates based on EPA and CARB analysis of the LEV programs. The input database provides rates from model year 1994 until model year 2050, including the LEV I, LEV II, and LEV III California standards. These rates replace the rates in the default database for these particular pollutants.

Because states adopted the LEV standards at different points in time, substituting the full set of LEV emission rates may not be appropriate. For example, if the user's state adopted the LEV program starting in 1999, it would be incorrect to use the rates that apply to earlier model years. Along with the database, EPA has provided a MySQL script (MOVES2014MyLEVs.sql) that users can tailor to select the appropriate model years from the LEV database. The script (MOVES2014MyLEVs.sql) is located in the ReadMe folder of the "MOVES2014_LEV_Standards" folder which users should have placed in the MySQL data folder (C:\...\MySQL\MySQL Server 5.6\data\MOVES2014_LEV_Standards'). All states that adopted the LEV program must customize and run the MOVES2014MyLEVs script.

The distributed version of the MOVES2014MyLEVs script lists all of the model years in the database, i.e., if the script is run without making any changes, all model years will be created in the database and LEV benefits will be calculated for model years 1994 to 2050 (depending on the calendar year selected in the RunSpec). To properly use the database to

calculate LEV program benefits for a given state, the user must delete the model years in which the LEV standards were not applicable.

Steps:

1. Save the "MOVES2014_LEV_Standards" database to C:\...\MySQL\MySQL Server 5.6\data\

2. Open the MySQL Query Browser.

3. Open a new script file (File→ Open Script).

4. Locate the script file (C:\...\MySQL\MySQL Server 5.6\data\MOVES2014_LEV_Standards\ReadMe\MOVES2014MyLEVs.sql)

5. Customize the script:

   a. Change the database name (if desired) and

   b. Delete the short codes for model years that the LEV program is not applicable.

6. Run the script (click on the lightning bolt icon). A new database "MOVES2014_MyLEVs" (or user-specified name) is produced.

7. Use the following MySQL query (make sure the FROM clause has the correct database name) to check that the short codes (and the associated model years as found in the reference table in the script) are correct. The result of running the script should be the short codes of the model years that apply to the desired LEV program

   SELECT DISTINCT(MID(sourcebinid,8,2)) AS shortcode

   FROM moves2014_mylevs.emissionratebyage

   ORDER BY mid(sourcebinid,8,2);

8. If the table is not correct, return to step 3 and revise the script as needed.

9. Open MOVES

10. In the Manage Input Datasets Panel, locate the "MOVES2014_MyLEVs" database (or the user- specified name, if changed). Be aware that the databases are sorted first by capital letter alphabetically, then lower case letter alphabetically. If you don't see the database, press the refresh button to refresh the list.

11. Select the database, and press the "Add" button.

12. Complete the MOVES Run Spec and run as usual.

Example 1:

State A adopted LEV standards beginning with the 1999 model year, and will continue those standards in the future.

-Edit the last statement in the script:

```
        and mid(sourcebinid,8,2) in
          (94,95,96,97,98,99,20,21,22,
          23,24,25,26,27,28,29,30,31,32,
          33,34,35,36,37,38,39,40,41,42,
          43,44,45,46,47,48,49,50,9);
```

Delete the numbers 94, 95, 96, 97, 98

The new script should now read:

```
        and mid(sourcebinid,8,2) in
          (99,20,21,22,
          23,24,25,26,27,28,29,30,31,32,
          33,34,35,36,37,38,39,40,41,42,
          43,44,45,46,47,48,49,50,9);
```

- Run the script.
- Launch MOVES and add the database "MOVES2014_MyLEVs" as an input database.

Using this approach, the new script will provide a LEV database that includes model years 1999-2050. The database will not contain the 1994-1998 model years.

Example 2:

State B adopted LEV standards with the 1999 model year, but reverted to federal standards with the 2005 model year.

-Edit the last statement in the script:

```
        and mid(sourcebinid,8,2) in
          (94,95,96,97,98,99,20,21,22,
          23,24,25,26,27,28,29,30,31,32,
          33,34,35,36,37,38,39,40,41,42,
          43,44,45,46,47,48,49,50,9);
```

Delete the numbers 94, 95, 96, 97, 98 and numbers 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 9.

The new script should now read:

```
            and mid(sourcebinid,8,2) in
                (99,20,21,22,23,24);
```

- Run the script.
- Launch MOVES and add the database "MOVES2014_MyLEVs" as an input database.

Using this approach, the new script will provide a LEV database that includes model years 1999-2004. The database will not contain the 1994-1998 and 2005-2050 model years.

Section 3: Instructions for modeling evaporative impact of the California Zero Emission Vehicle (ZEV) Program

We assume that the ZEV mandate in the California program will be met primarily with Partial Zero Emission Vehicles (PZEVs) or Advanced Technology Partial Zero Emission Vehicles (AT-PZEVs), which are certified to lower evaporative standards than their LEV counterparts. Exhaust emissions of these vehicles are already included in the LEV program emission rates described in Section 2 above. However, states that also adopt the ZEV mandate would get an additional benefit in evaporative emissions, which we have ascribed to permeation emissions.

Reflecting both the LEV and ZEV programs requires two unique runs of MOVES. The "MOVES2014_LEV_Standards" database, described in Section 2, accounts for the impact of the Zero Emission Vehicle Program on exhaust emissions. A different approach is needed to reflect the reduction in evaporative permeation emissions from the ZEV program.

States adopting the ZEV program along with the LEV program will need to do a separate run for evaporative permeation that includes an Alternative Vehicle Fuels & Technologies (AVFT) file reflecting zero evaporative permeation emissions for ZEV and their equivalent. It is important that this run be for **the evaporative permeation process only**. Choosing any additional exhaust or evaporative processes in this run would result in incorrect emissions estimates; therefore, if other pollutants and processes are desired, they should be selected in the LEV exhaust run. The combined results of the LEV runs (without evaporative permeation emissions) done in Section 2 and the ZEV runs (only evaporative permeation emissions) done in this section provide the complete emissions for a LEV program including the ZEV mandate.

The AVFT file bundled in this zip file (ZEV_AVFT_MOVES2014.xlsx) is a Microsoft Excel file. ZEV_AVFT_MOVES2014.xlsx is to be used **with MOVES2014 only**. The files reflect ZEV program implementation beginning with the 2005 model year. States with later implementation dates will need to modify this file to remove the model years before implementation. This can be accomplished by modifying the coefficients in columns B and C in the ZEV_AVFT_Generator worksheet of the AVFT file. These coefficients represent the ZEV fraction of a particular model year. By setting these coefficients equal to zero, one may delay the implementation of the ZEV program.

Please note that the ZEV_AVFT file distributed by EPA includes fractions based on the default fuel and engine technology fractions in the default MOVES2014 database. If users have developed their own fuel and technology fractions, the EPA-distributed values may not apply. In this case, the user should develop their own ZEV_AVFT file that assigns the ZEV fraction from the appropriate EPA spreadsheet to electric vehicles. This fraction should be subtracted from the relevant sourcetype/fuel combinations that contain PZEVs. For details on creating a user-specific fuel and technology fractions, please refer to the MOVES User Guide, the Reference Manual, and the MOVES Technical Guidance document.

Once complete, the ZEV_AVFT_MOVES2014 file should be imported into the run specification file from the "Alternative Vehicle Fuels & Technologies" screen, under the "Strategies" menu item. The tab "AVFT" should be chosen.