Updating Hotelling Hours in MOVES

David Brzezinski

FACA MOVES Review Work Group

December 7, 2016

Hotelling Hours

- Hotelling is the name we use in MOVES to refer to the hours spent by drivers of long-haul trucks with their trucks parked during mandatory rest periods.

- Engine idling and auxiliary power unit (APU) use occurs during these hotelling hours.

- MOVES accounts for idling and APU use as separate emission processes in addition to truck operation on roadways.

Hotelling Operating Modes

- The time spent during hotelling is distributed to different modes:
  - Engine idle.
  - Diesel auxiliary power unit (APU) use.
  - Engine(s) off.
- The fraction of time spent in each mode is a separate table that varies by model year.
- Hotelling refers to the time spent during rest periods in all modes.

Need for Change

- MOVES2014a uses a different default method to calculate the allocation of default hotelling hours than EPA's National Emission Inventory (NEI) for both 2011 and 2014.
  - MOVES uses only rural VMT.
  - NEI uses both rural and urban VMT.
- The only option for MOVES2014a users to supply hotelling hours for runs is to populate the large HotellingHours table manually.

Proposed Design Changes

- Alter the calculation of default hotelling hours to match the methodology used by the NEI.

- Alter the Hotelling importer to use new "shaping" tables to calculate hotelling hours from smaller user input tables.
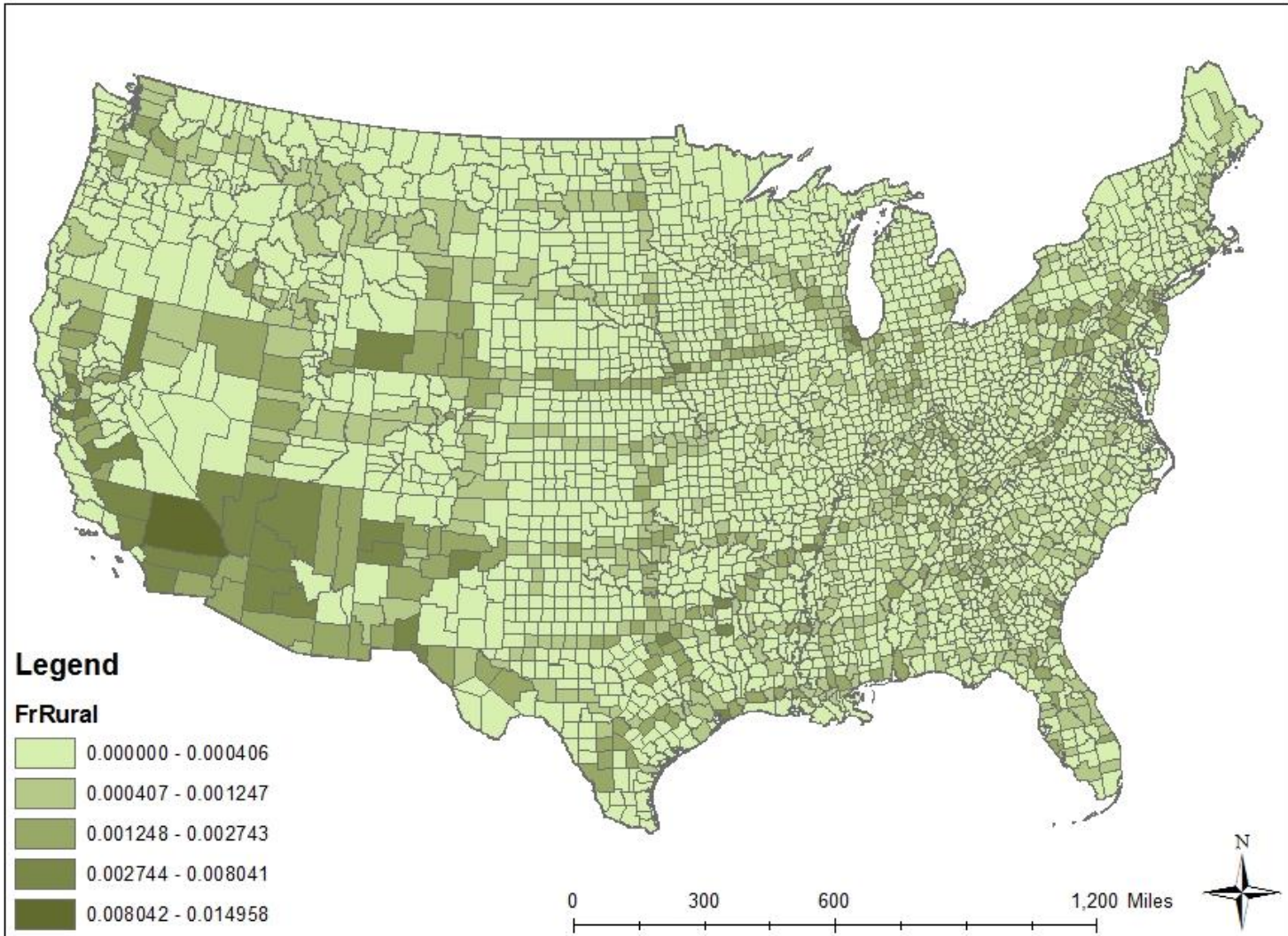
New Default Hours Calculation

- Use both rural and urban VMT from restricted access roads from diesel long-haul combination trucks to calculate default hotelling hours. (See next slides.)

- The hotelling rate (hours per mile) will need to be updated to reflect the change in the method.

- Default hotelling hours will be calculated if no user input is provided.

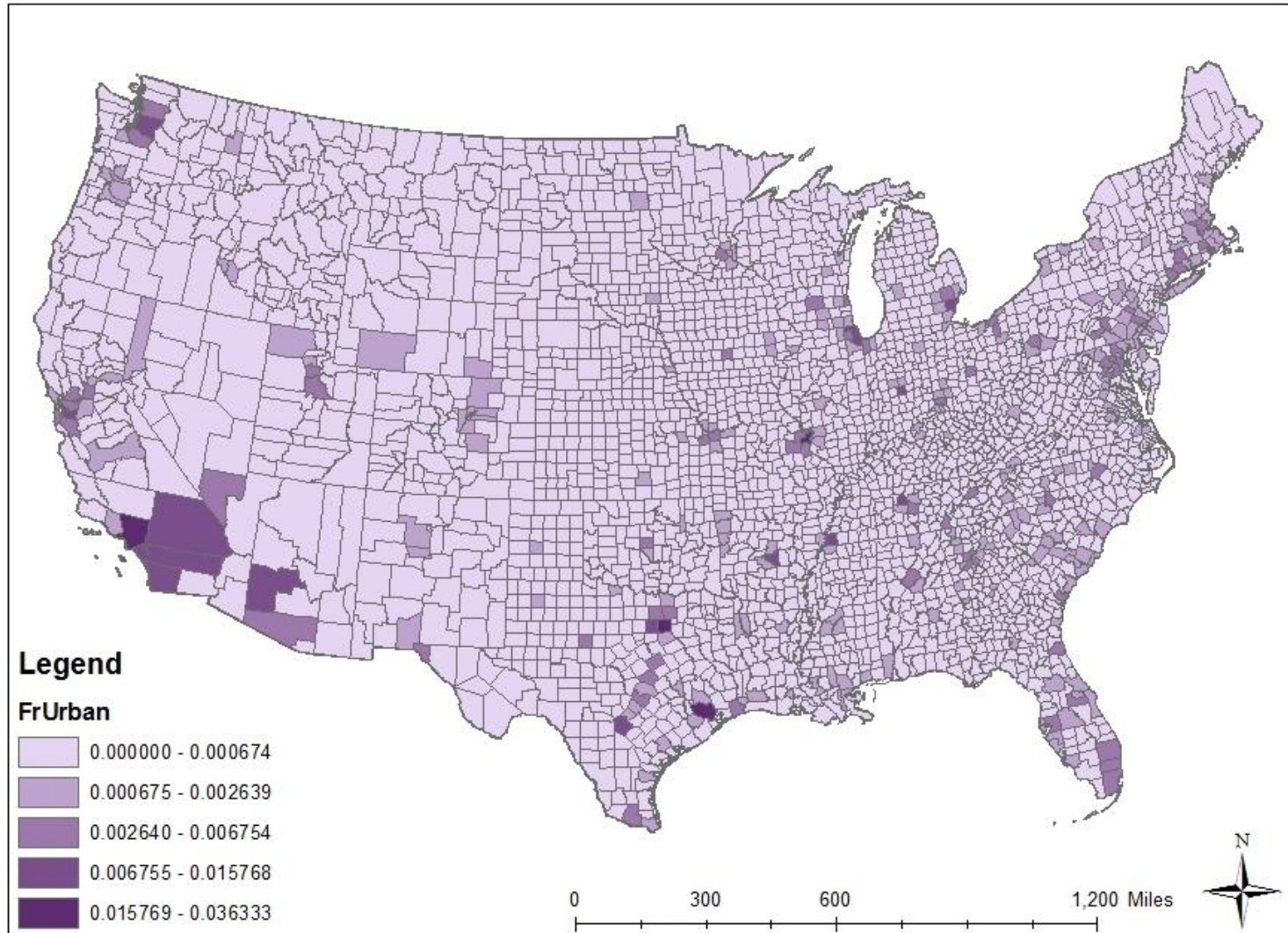 – Users may provide their own estimates.

Current (Rural Only) Allocation

Legend

FrRural

- 0.000000 - 0.000406
- 0.000407 - 0.001247
- 0.001248 - 0.002743
- 0.002744 - 0.008041
- 0.008042 - 0.014958
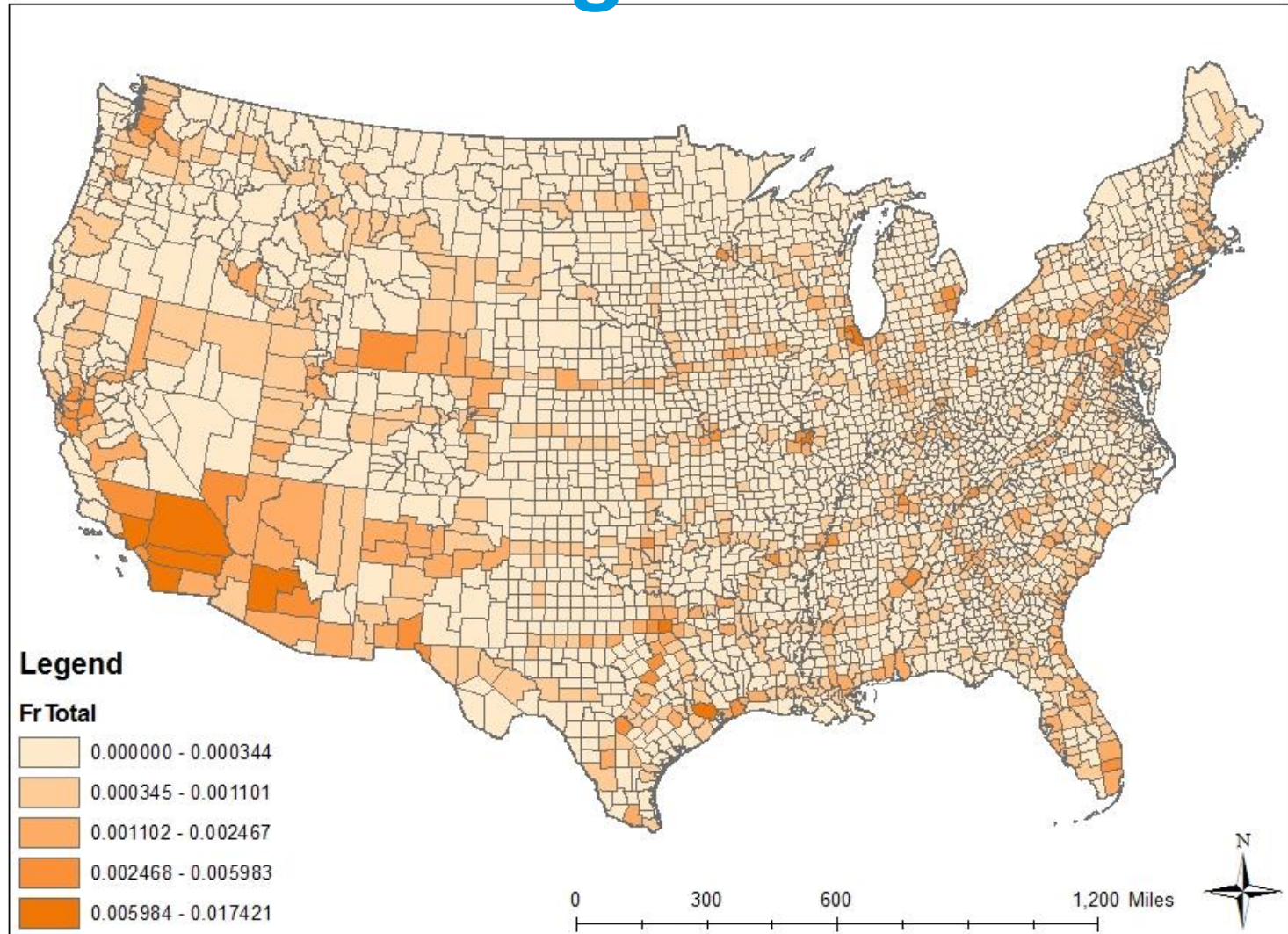
0   300   600   1,200 Miles

Values are fractions of total national vehicle miles traveled by long-haul combination trucks.

Additional (Urban) Allocation

Values are fractions of total national vehicle miles traveled by long-haul combination trucks.

Final Proposed Default Hotelling Allocation

Legend

Fr Total

- 0.000000 - 0.000344
- 0.000345 - 0.001101
- 0.001102 - 0.002467
- 0.002468 - 0.005983
- 0.005984 - 0.017421

0   300   600   1,200 Miles

Values are fractions of total national vehicle miles traveled by long-haul combination trucks.

Total National Hotelling Hours

- The default hotelling rate (hotelling hours per mile of travel) is calculated from the total national source hours operating (as calculated by MOVES) from the combination of vehicle miles traveled and default average speeds for diesel long-haul combination trucks.

- Federal regulations require that drivers spend at least 8 hours of rest after each 10 hours of driving.

Rest Hours = Total Hours * 8/10

Default Hotelling Rate

- The rest hours are distributed to locations using VMT.

  – Assuming all resting occurs in locations with interstate (restricted access) roads.

  – Assuming the resting hours are proportional only to VMT on restricted access roads.

- The default hotelling rate (hours per mile) is calculated from total national rest hours divided by total national restricted access VMT:

Hotelling Rate = Hours / VMT

User Supplied Hotelling Hours

- MOVES2014a users supply hotelling hours using the HotellingHours core model input table (CMIT) and not designed for users.

- This table contains 17,856 rows by:

    hourDayID

    monthID

    yearID

    ageID

    zoneID (County)

    sourceTypeID

New Tables for User Input

- Instead of using the HotellingHours table for input, users will supply the same data using four additional tables:

  - HotellingHoursPerDay

  - HotellingHourFraction

  - HotellingAgeFraction

  - HotellingMonthAdjust

- These tables will be used to generate the contents of the HotellingHours CMIT.

New User Input Features

- Users may enter data for only some of the tables. MOVES default information will be used for any data not provided.

- All hotelling input tables will include zoneID, which will allow storage of state supplied data in the default MOVES database.

New User Input Features

- The redesign of the Hotelling importer will allow users to import all tables located in a single spreadsheet with a single selection.

  - Reduce repetitive file/tab selection.

- The Hotelling importer will allow for some checking of user inputs.

Requested Feedback

- Are there any issues with changing MOVES to using the NEI approach to hotelling allocation to counties?

- Are the proposed changes to the hotelling importer adequate?

Requested Feedback

- Are there data sources that we should be reviewing that include measurements of truck activity that would include useful statistics for:

  - Allocating hotelling hours spatially or temporally.

  - Correlating hotelling hours to activity among long-haul trucks.

Further Data Improvements

- Are there nationwide data sources for factors that may influence EPA local estimates for:
  - APU use in preference to engine idling.
  - Engine idling during hotelling hours.
  - Options, such as rest stop electrification.
  - Technical innovations.