

## CHAPTER 6: ESTIMATION OF OFF-NETWORK ACTIVITY

The non-roadway-based inventory estimates (e.g., from vehicle starts, parked vehicle evaporative processes, non-roadway-based vehicle idling, hoteling activity) were calculated as the product of the amount of associated activity and the mass per unit of activity. To estimate the source hours parked (SHP) and vehicle starts activity, vehicle population estimates were needed. Hoteling activity estimates (composed largely of the emissions-producing source hours extended idling [SHEI] and diesel auxiliary power unit [APU] hours) were based on county-specific actual estimates.

Motor Vehicle Emission Simulator (MOVES)<sup>3</sup> (utilities) and the methodology provided by the Texas A&M Transportation Institute (TTI) is used to calculate the vehicle population and off-network activity estimates.

### 6.1 Vehicle Type Populations

NCTCOG based the vehicle population estimates on vehicle registration data, vehicle population factors developed from the vehicle miles of travel (VMT) mix, and additionally for future years, VMT growth estimates. For a historical year, the vehicle population estimates are based on mid-year Texas Department of Transportation (or Texas Department of Motor Vehicles) county registrations data, if available, and regional, all roads-weekday VMT mix-based vehicle type population factors for the analysis year. For future years, vehicle type populations were estimated as a function of base (e.g., latest available, if available, mid-year) registrations, grown to a future value (growth as a function of base and future VMT), and all roads-weekday VMT mix-based vehicle type population factors for the analysis year. This same procedure may be used to back-cast vehicle populations for earlier years for which vehicle registrations are unavailable.

### 6.2 ONI Hours

Off-Network Idle (ONI) hours (new with MOVES<sup>3</sup>) are not related to combination truck hoteling activity. These are idling activities that occur while a vehicle is idling in a parking lot, drive-through, driveway, while waiting to pick up passengers, or loading/unloading cargo. ONI applies to all MOVES source types. Emissions are calculated by multiplying the emission rates (exhaust running emissions for MOVES roadType ID “1” or “off-network”) with the corresponding hours of ONI.

NCTCOG estimates ONI activity consistent with the MOVES methodology. This is accomplished, in general, using a formula that calculates ONI as a function of MOVES default relationships on total idling and total operating hours, derived from telematics data, in combination with local roadway network activity estimates (VMT and speeds), and MOVES default road idling fractions (proportions of vehicle idling while operating on roads).

### 6.3 SHP

SHP was estimated as a function of total hours (hours a vehicle exists) minus its hours operating on roads (source hours operating [SHO]) minus ONI hours. For a historical year, vehicle type SHP estimates are based on VMT mix, link VMT and speeds, and the vehicle population estimates. The VMT mix is applied to the link VMT to produce vehicle-type-specific VMT estimates. Link VMT is divided by the associated speed to produce SHO estimates, which are aggregated by vehicle type and subtracted from associated source hours, resulting in SHP estimates. For a future year, vehicle type SHP was estimated in the same manner as for historical years, except using the future year link VMT and speeds, VMT mix, and vehicle population estimates. This was performed by county and hour.

#### **6.4 Starts**

Vehicle starts were estimated using county-level vehicle type populations and data from MOVES representing the average number of vehicle starts per vehicle type per hour. The starts per vehicle were calculated using MOVES with data on the age distribution and fuel fractions of the local fleet.<sup>22</sup> NCTCOG used local age distributions and fuel fractions inputs to MOVES combined with MOVES default parameters, starts age adjustment, starts month adjust (three-month seasonal average), and starts per vehicle) to produce hourly starts per vehicle output representative of each seasonal period. The MOVES output provided the scenario-specific starts per vehicle defined by the study scope.

For each hour of the day, the MOVES starts per vehicle data were multiplied by the local vehicle type population estimates to produce the total number of starts by vehicle type per hour. The starts per vehicle data were used with constant vehicle type populations (i.e., vehicle type populations were assumed to be constant throughout the calendar year).

#### **6.5 SHEI and APU Hours**

The source hours extended idling and APU hours, two of four activity components comprising the diesel combination long-haul truck hoteling hours, were estimated for each county activity scenario using TTI's current procedure and base and activity estimates from the Texas Commission on Environmental Quality's 2017 truck idling study. The North Central Texas Council of Governments used the winter weekday, 24-hour, 2017 base county-level hoteling estimates from the truck idling study, in combination with county scaling factors estimated from the base year and the analysis year link VMT and VMT mixes, to produce 2023, 2026, 2036, and 2045, county, hourly hoteling activity estimates. Hoteling hourly factors (estimated by inverting hourly vehicle hours of travel factors) were then applied to allocate the 24-hour hoteling hours estimates for each county to each hour of the day. Estimated SHEI and APU hours fractions of hoteling hours based on an updated hoteling activity distribution from the truck idling study (which is the same as the MOVES3 default) were used to separate SHEI and APU hours activity from total hoteling hours for each county and hour.

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<sup>22</sup> Previously MOVES default start per vehicle (which varied only by MOVES day type) was used in combination with local vehicle populations to estimate vehicle starts activity. In MOVES3, vehicle starts per hour also vary by county (because age distributions also vary by county).