

Supplemental Information

Manuscript Title: Evaluating Federal Electric Vehicle Fee Equity and Highway Trust Fund Revenue: Evidence from Vermont

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The following information provides technical details for methods described in the main manuscript:

- **Why do we use 2023 calendar year data?** We have all registration and inspection records dating between the start of 2017 and the end of 2024. For each calendar year dataset, we need the following year's data to confirm two things: where vehicles are registered in the prior year (for 2023, using 2024 addresses to confirm vehicle didn't move or get sold in late 2023) and how far they travelled during the 2023 calendar year (using 2024 inspection odometer readings). Therefore, while we have data up till 2024, we are more confident in the 2023 data.
- **How do we calculate calendar-year VMT from annual vehicle inspection odometer readings?** Vehicle inspections are not always regular, so we cannot simply calculate the difference between odometer readings. Rather, we calculate daily VMT (difference between subsequent inspections divided by time elapsed) and then calendar-year VMT from the overlap of daily VMTs with the calendar year.
- **How do we define "residential" mailing addresses?** We use Vermont's Enhanced 911 dataset (available at Vermont's Open Geodata Portal at this link: https://geodata.vermont.gov/datasets/b226846d719a4b3fa59485a41aed1ddf_0/explore?location=43.870575%2C-72.459722%2C8) containing all addresses in Vermont linked to site types. We define residential as the following site types: single family dwellings, multi-family dwellings, mobile homes, condominiums, other residential homes, commercial with residences, seasonal homes, nursing homes / long term care units, and residential farms.
- **How do we define rural, suburban, and urban?** We use the USDA's Rural Urban Commuting Area Codes for Vermont, available at the census tract level. Urban = RUCA codes 1, 4, and 7; Suburban = RUCA codes 2, 3, 5, 6, 8, and 9; Rural = RUCA code 10.
- **How do we calculate the 2023 fleet average fuel economy from our vehicle data?** We calculate fleet-average fuel economy as the VMT-weighted harmonic mean of all gasoline, diesel, and non-plug-in hybrid vehicles in Vermont. Plug-in hybrid electric vehicles are omitted because their usage involves an indeterminate number of electric miles.
- **How do we determine Vermont's 2023 light-duty vehicle federal gas tax revenue?** First, we obtain the Vermont Joint Fiscal Office's December 2023 12-month sums of motor fuel volume purchases: 286 million gallons of motor gasoline and 62.3 million gallons of motor diesel (as published by Logan Mooberry from the Joint Fiscal Office in April 2024 at this link https://ljfo.vermont.gov/assets/Subjects/Monthly-Data/33e92c2bf8/Gas-Diesel-Tax-Revenue-and-Gallons-Monthly-Update-Apr24-Sales-Data_May24_Sch2.xlsx). With the \$0.184 per gallon of gasoline and \$0.244 per gallon of diesel taxes, this totals approximately \$67.8 million in federal gas tax revenue from Vermont. The Joint Fiscal Office reports motor fuel purchased by all vehicles, but our revenue projections only include light-duty vehicles.

The Federal Highway Administration’s 2023 Highway Statistics estimate light-duty vehicles travel somewhere between 83% and 92% of miles on roads, with rural roads closer to 83% and urban roads closer to 91% LDV mileage (FHWA Highway Statistics 2023 – Table VM-1 at this link <https://www.fhwa.dot.gov/policyinformation/statistics/2023/vm1.cfm>). Given Vermont’s rural character, we assume light-duty vehicles account for 89% of VMT on Vermont roads — within FHWA’s range but toward the rural end. Applying this share to the \$67.8 million total yields our final estimate of Vermont’s light-duty federal gas tax revenue contribution, calculated as follows: $LDV\ Federal\ Gas\ Tax\ Revenue = \frac{LDV\ VMT}{All\ VMT} \times (All\ Vehicle\ Federal\ Gas\ Tax\ Revenue) = (0.89) \times (\$67.8\ million) = \$60.3\ million$. While this is an imperfect approximation, it is a defensible one.

- **What is our inflation adjustment?** We estimate an annual NHCCI growth rate of approximately 4% by fitting a log-linear trend to quarterly-adjusted NHCCI values as reported from 2001 and 2025.
- **How does MOVES5.R3 forecast change in vehicle counts, VMT, and fuel economy?** We use the default county-level databases from MOVES5. This includes projections of vehicle fleets based on manufacturer standard compliance and consumer preferences using OMEGA (EPA, 2024). Vehicle activity and fuel economy projections come from a combination of data sources including the Energy Information Administration (EIA) Annual Energy Outlook and the HPMS (Highway Performance Monitoring System). For more information, MOVES inputs and calculations are extensively documented by the EPA. EPA’s “Overview of EPA’s MOtor Vehicle Emission Simulator (MOVES5)” provides an overview of the key assumptions and data used in each MOVES5 calculation process and includes links to more detailed information (EPA, 2025).

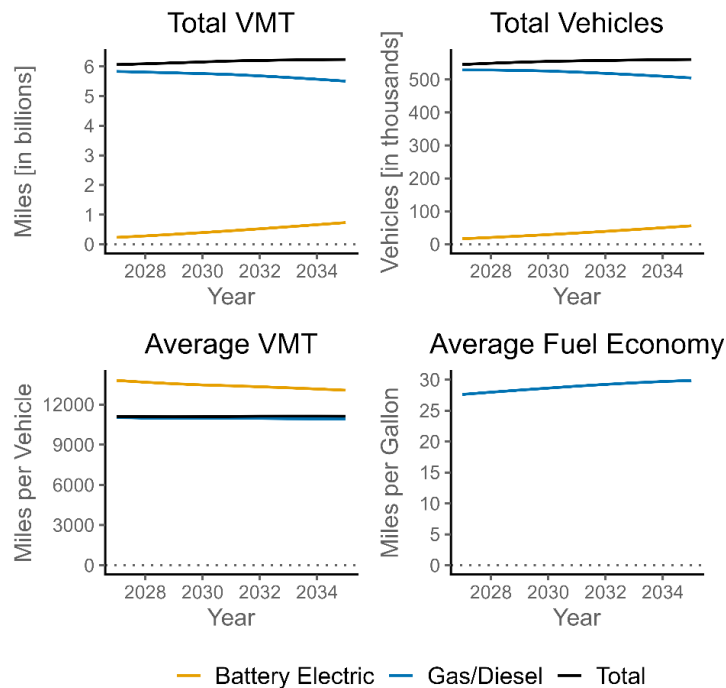


Figure S1. Vehicle Travel and Attributes Projections for Vermont from EPA’s MOVES5.R3

- **Why does our definition of equity not include additional marginal costs?** The surface transportation system also generates costs beyond roadway construction and maintenance, such as those from traffic accidents, noise pollution, and air pollution. Federal gas taxes are intended to capture roadway construction and maintenance costs associated with using the roadway system, not these additional costs. We therefore do not evaluate the proposed EV-equivalent fee in terms of these currently uncovered costs.

References Cited

EPA (2025). *Overview of EPA's MOtor Vehicle Emission Simulator (MOVES5)*. EPA-420-R-25-005. Office of Transportation and Air Quality, U.S. Environmental Protection Agency.

<https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P101DQ9V.pdf>

EPA (2024). *OMEGA 2.5.0 Documentation*. U.S. Environmental Protection Agency.

<https://omega2.readthedocs.io/en/2.5.0/>