



U.S. Department
of Transportation

**Federal Highway
Administration
Office of
Operations**

State-Level Transportation Re-Pricing for Carbon Reduction & Equity Toolkit

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Office of Operations

**Behavior, Energy, and Climate
Change Conference**
Sacramento, CA
Nov. 15, 2023





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Project Background

- Reducing vehicle-miles traveled (VMT) offers benefits related to congestion, emissions, safety, and equity
- Flat fees or bundled costs (e.g., free workplace parking) encourage driving by keeping the marginal cost of additional vehicle use low
- By introducing opportunities to save, transportation re-pricing strategies (converting fixed transportation costs to variable ones) are effective at reducing VMT through encouraging mode shift and driving discretion
- Despite the intersection of congestion, emissions, safety, and equity objectives necessitating action on VMT reduction, states may face challenges implementing re-pricing strategies



Project Goal

- Develop a toolkit and supporting report to aid both state and federal policymakers in understanding and advancing six re-pricing strategies
 - The analysis toolkit is in the form of a spreadsheet elasticity model that yields VMT reduction projections for each component of the transportation re-pricing policy bundle, and for the bundle as a whole, in each of 50 states and the District of Columbia
 - VMT reductions are also translated to reductions in congestion, emissions, and crashes
 - Impacts of the policies on equity are also explored



Policy Selections

Strategy	Description
Per-mile state sales taxes on newly purchased and leased vehicles	State sales taxes on newly acquired vehicles are converted to per-mile taxes, assessed over a defined timeframe (e.g., the first three years a vehicle is driven after acquisition).
Per-mile annual vehicle registration fees	Annual vehicle registration fees are converted to per-mile fees, assessed over a year.
Per-mile personal property taxes on owned vehicles	Annual personal property taxes on owned and leased vehicles are converted to per-mile fees, assessed over a year.
Pay-per-mile car insurance	A small portion of drivers' insurance premium is paid as a baseline rate, with the remainder being variable based on mileage driven.
Parking cash-out	Employers that provide free parking at work offer employees a new option to take an equivalently-valued benefit in the form of employer-paid transit and a taxable cash payment on a monthly or daily basis.
Per-mile monthly vehicle lease depreciation charges	A portion of fixed monthly vehicle lease charges is converted to per-mile fees to reflect the share of vehicle depreciation attributable to driving mileage.



Policy Descriptions (1)

- **Per-Mile State Sales Taxes on Newly Acquired Vehicles**
 - Per-mile state sales taxes require vehicle owners to pay sales taxes on newly purchased and leased vehicles over time, based on usage, rather than as a fixed cost at the time of acquisition.
 - For this study, state and local sales taxes are converted to per-mile taxes assessed over a defined timeframe – for reporting purposes, this timeframe is three years; in the toolkit, users are able to pick a different timeframe over which the variable taxes are assessed.



Policy Descriptions (2 and 3)

- **Per-Mile Annual Vehicle Registration Fees**
 - Per-mile annual vehicle registration fees are mileage-based fees prorated based on the amount a vehicle is driven over a year, rather than paid as an upfront fixed annual cost.
 - For this study, annual vehicle registration fees are converted to per-mile taxes assessed over a year.
- **Per-Mile Personal Property Taxes on Owned Vehicles**
 - Per-mile personal property taxes are mileage-based fees prorated based on the amount a vehicle is driven over a year, rather than paid as an upfront fixed annual cost.
 - For this study, annual vehicle registration fees are converted to per-mile taxes assessed over a year.



Policy Descriptions (4)

- Pay-Per-Mile (PPM) Car Insurance
 - PPM car insurance is a form of usage-based insurance (UBI) that allows consumers to pay vehicle insurance premiums based on the number of miles they drive during a given coverage period.
 - For this study, PPM insurance is a modeled policy where a 10% portion of liability and collision insurance premiums, and a higher portion of comprehensive premiums, remains fixed (in order to cover insurance companies' baseline costs of doing business, including of issuing and servicing policies unrelated to claims or claims that vary by mileage), while the remainder is converted to per-mile charges allocated across all miles driven, thus providing a new opportunity for savings.

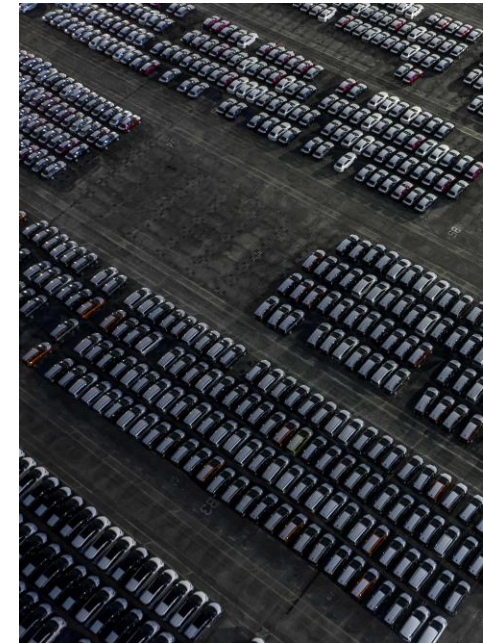




Policy Descriptions (5)

• Parking Cash-Out

- Employers that provide free or subsidized parking at work also offer employees a new option to instead take an equivalent-valued benefit in the form of employer-paid transit and a taxable cash payment.
- This policy (and the subsequently impacted commute VMT) does not apply to employees working for firms with fewer than 10 employees.
- Firms with 10-99 employees offering free parking at work begin to also offer monthly parking cash-out.
- Firms with 100 or more employees with free workplace parking offer daily parking cash-out (with elasticity values increased from monthly cash-out due to the expected increased uptake in response to the flexibility of daily cash-out).
- Employees already offered cash-out (i.e., in California) are excluded.
- Further adjustments are made to account for increased post-pandemic telework trends and commuters who are already offered transit subsidies at work.





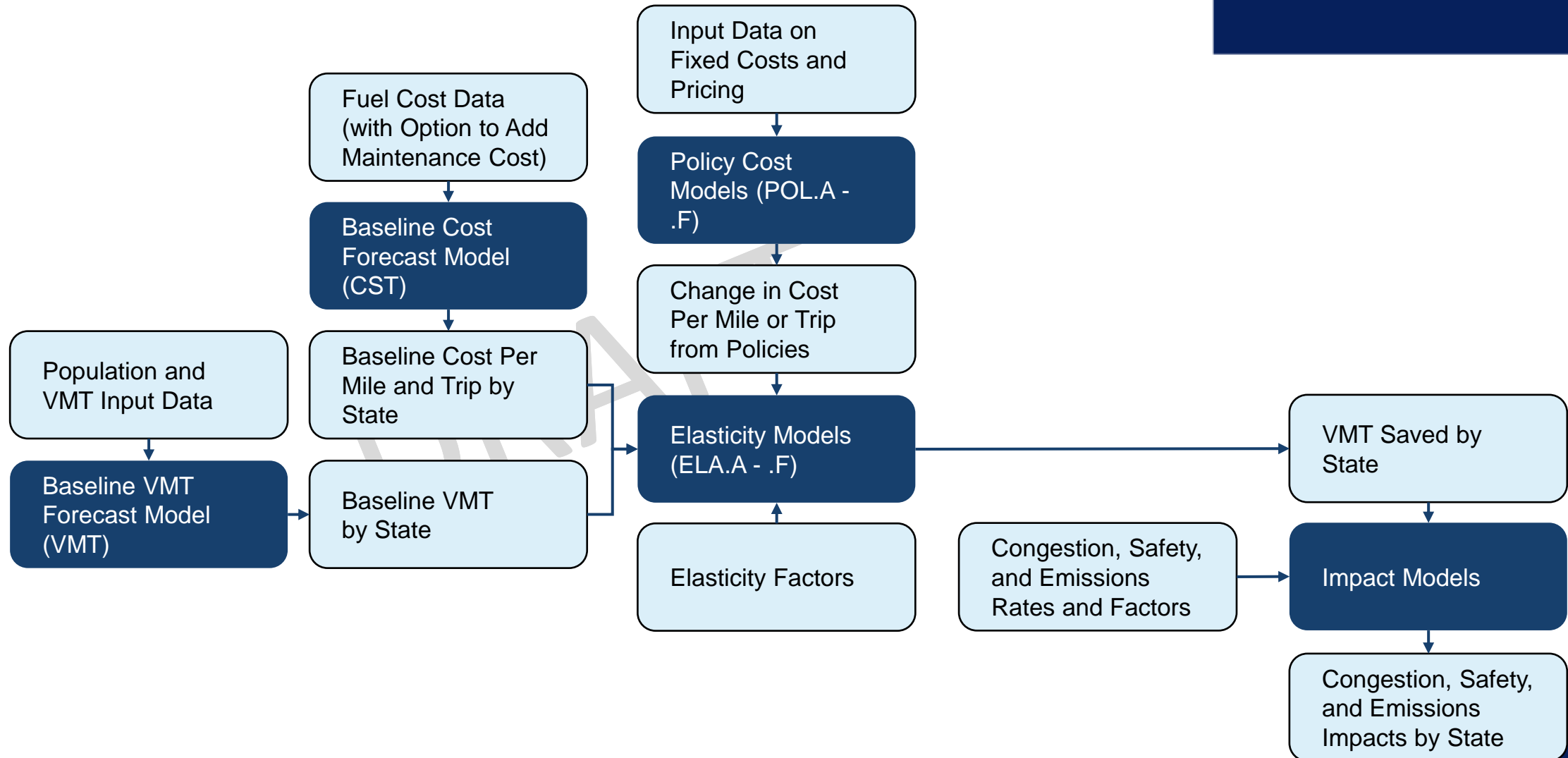
Policy Descriptions (6)

- Per-Mile Monthly Vehicle Lease Depreciation Charges
 - Per-mile monthly vehicle lease charges enable lessees to pay a smaller fixed-rate lease payment for vehicle age-related depreciation in exchange for also paying a new per-mile fee reflective of the share of new vehicle depreciation that can be attributed to driving mileage.

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Methodology Overview





Policy-Specific Cost Models

- These models convert the fixed costs under current policies to variable (per mile or per trip) costs under each of the proposed policies.
- In each case, the models are designed to reallocate costs in a way that is revenue neutral (but also allowing drivers to save money where there is “system cost” savings).





Elasticity Models

- The elasticity models estimate the change in VMT (from the baseline VMT forecast) associated with change in variable costs (from the baseline cost forecast) associated with each policy.
- The elasticity models use arc elasticity values obtained through a literature search to estimate the percent change in VMT that would occur in response to the percent change in costs.
- When reporting results of deploying policies in combination, multiplicative dampening is applied.





Impact Models

The pricing policies reduce VMT and associated externalities, including congestion, emissions, and crashes. These models apply factors to convert VMT savings into monetary benefits resulting from impacts on these externalities.

- **Congestion** – Per mile factors convert VMT reduction to monetized benefits of congestion and noise reduction. We apply distinct factors to urban and non-urban VMT reduction.
- **Emissions** – Aggregate emissions rates are applied to convert VMT to reductions in CO₂, volatile organic compounds (VOC), NO_x, SO₂, and particulate matter (PM 2.5).
- **Crashes** – Applying crash rates per VMT monetizes safety benefits resulting from the pricing policies.





Equity Analysis

Pricing policies transforming fixed travel costs into variable costs may impact segments of the population differently. Three policies – per-mile state sales taxes, per-mile registration fees, and PPM insurance include quantitative equity analysis *within the model framework*. In each of the policies, lower income households save the most since, on average, they drive less than higher income household.

- **Per-mile State Sales Taxes and Personal Property Taxes** - Per-mile vehicle tax costs for different income groups are estimated. Vehicles purchased and owned by lower income groups are driven less often than state average, and thus costs less under the per-mile policy.
- **Per-mile Registration Fees and PPM Insurance** - By using VMT per household per income group, the team assesses changes to the average driving costs per household by income group as a result of the proposed policies.

Equity impacts are explored qualitatively for all other policies, and are included in final reporting.





Key Data Sources

Primary Data Types

- Travel volume data (VMT by urban/non-urban, and income group)
- Baseline travel cost data (fuel costs, with an option to add maintenance costs)
- Policy cost data (vehicle prices and sales tax rates, registration fees, vehicle personal property taxes, insurance premiums, parking costs, lease depreciation costs)
- Impact factors (congestion and noise valuation, emission rates, crash rates)

Major Data Sources

- US Census Bureau
- Association of Insurance Commissioners
- Energy Information Association
- Federal Highway Administration
- US Department of Transportation
- NHTS 2017

Initial Results: Percentage VMT Reduction in 2030



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Scenario	Type / Implementation	Percent Change
Vehicle Sales Tax	Per-mile	8.2%
Vehicle Registration	Per-mile	1.5%
Vehicle Property Tax	Per-mile	4.5%
Vehicle Insurance	Per-mile	12.9%
Parking Cash Out	Use-based	6.4%
Vehicle Lease Depreciation	Per-mile	0.8%
Bundle	All Policy Total	30.2%

Initial Results: 2030 Carbon Reductions



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Scenario	Type / Implementation	Million Metric Tons
Vehicle Sales Tax	Per-mile	87.2
Vehicle Registration	Per-mile	15.8
Vehicle Property Tax	Per-mile	47.9
Vehicle Insurance	Per-mile	137.3
Parking Cash Out	Use-based	67.7
Vehicle Lease Depreciation	Per-mile	*pending
Bundle	All Policy Total	314.6



Questions & Contacts

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