Assessing Vermont’s Progress in Equitable Clean Vehicle Incentive Distribution

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Project Purpose

• Provide an overview of Vermont’s progress electrifying transportation to meet climate goals

• Examine the extent to which state-funded EV incentive programs are currently reaching those most in need

• Recommend new research, data collection, and analysis that would further embed equity and justice in future program development and evaluation in Vermont
Where are we now?

Good news:
- 3,971 all-electric and plug-in hybrid vehicles registered in 90% of zip codes (as of July 2020)
- 5th in country for per capita EV registrations
- 1st in nation for charging per capita
- Increasing vehicle efficiency

Bad news:
- Transportation is the largest source of greenhouse gas emissions statewide (40%)
- Increasing preference for larger vehicles
- Rising per capita vehicle miles traveled and single-occupancy vehicle commuting
Where do we need to be?

- **GWSA Requirements**
- **EAN Pathways Model: Transportation emissions 50% reduction by 2025 and an additional 41% by 2030**
  - EVs: 47,000 by 2025, 120,000 by 2030
- **Just Transitions Subcommittee Mandate and Guiding Principles**
  - Mitigation strategies must “minimize negative impacts on marginalized and rural communities and upon individuals with low and moderate income”
  - Principle II: Accountable and restorative
  - Principle V: Most impacted first
Transportation equity
• Lower income households in Vermont have higher transportation burdens than other households

Transportation justice
• BIPOC in Vermont are twice more likely than white respondents to report:
  • Lack of access to transportation
  • Lack of vehicle ownership
  • Other non-transportation related needs like food insecurity and lack of medical care access

Barriers to Low- and Middle-Income Adoption

• Perceived high upfront price
• Limited awareness
• Limited access to charging infrastructure
• Range anxiety
  • VT weather
  • Rural Vehicle Miles Traveled
• Limited availability
  • Four-wheel drive vehicles
  • Used EVs
Barriers Visualized

Rural and Urban areas based on Population Density

- Urban (pop. density >1000/sq.mi)
- Urban (500/sq.mi < pop. density > 1000/sq.mi)
- Rural (pop. density <500/sq.mi)
- Rural and low median income (>50k)

Rural vs. Urban Commute Times

Rural vs. Urban Vehicle Miles Traveled
VT Incentive Programs

- **Plug-in Electric Vehicle (PEV) Incentive Program**
  - $1,500 to $4,000 rebate on purchase or lease available for any PEV with MSRP <$40,000s
  - Eligibility scaled and capped (changed from WAP standards to AGI in 2020)
  - $2.5 million allocated since December 15th, 2019 (with another $2 million funded)
  - Incentive stacking

- **MileageSmart**
  - 25% off a high fuel-efficiency vehicle (40mpg or higher) up to $5,000
  - Eligibility: 80% AGI based on household size
  - 600 applicants, 93 incentives distributed (as of July 8th, 2021)
Program Evaluation and Results

PEV Incentive

- Lack of funding for comprehensive evaluation
- Statewide, low-income households received 44% of the number of incentives and 59% of total spending compared to the moderate-income households as of July 9th, 2021

- Geographic discrepancies
  - Chittenden and Washington County received the largest quantity and highest per capita amount respectively, while Essex County received the fewest for both

Sources: Drive Electric Vermont, ACS 2019 5-Year Estimates, Efficiency Vermont
Distribution by County

County PEV Incentive Funds per 10,000 People
As of December 7, 2020

County PEV Incentive Funds per 10,000 People
As of July 9th, 2021
Methods Used for Analysis

• Datasets
  1. American Community Survey 5-year estimates 2015-2019
  2. Efficiency VT Energy Burden data
  3. Vermont Environmental Disparity Index (EDI)
  4. The Vermont Plug-In Electric Vehicle Incentive Program data
  5. MileageSmart Incentive Program Participation data
  6. Alternative Fuels Data Center Charging station location data
  7. EAN Community Dashboard all-EV registration data (as of 2019)

• Mapping

• Analysis
  • Controls: Charging per capita, percent of housing units that were rented/vs owned, percent of population with higher education, average commute to work (in minutes), population density, median vehicles available
Overview of Mapping Results

Distribution of PEV Incentive Funding Per Eligibility with Charging and Burdens

Data Sources: Drive Electric Vermont, ACS 2019 5-Year Estimates, VT EDI, Efficiency Vermont

Orange: Top 25% Transportation Burden
Red: Top 25% EDI
Mapping Takeaways

• Transportation Burden
  • Funding is largely missing the areas with the highest transportation burden and VT EDI score.
  • 15.6% of PEV incentive funding went to the highest quintile of Transportation Burden while 39.5% went to those census tracts in the lowest quintile

• Rural vs Urban
  • 31% of the number of incentives and 24% of total funding are going to urban areas, while only 19.6% of census tracts in the state are considered urban

• Charging
  • Most charging infrastructure is located in areas of lower transportation burden.
  • Urban areas have .71 public chargers available per capita compared to 0.43 in rural areas

• Role of MileageSmart
  • MileageSmart Incentives are positively and significantly correlated with PEV incentives, meaning they are ending up in similar geographic areas of the state
What Factors Statistically Related to Incentive Uptake?

• Dependent Variable: Number of incentives per capita
• Independent variables tested/controlled for:
  • Charging per capita
  • Percent of housing units that were rented/vs owned
  • Percent of population with higher education
  • Estimated vehicle miles traveled
  • Population density
  • Median income
• Availability of charging and higher education statistically significant at the 90 and 99% respective confidence intervals (probability with which an estimated interval will contain the true value)
Recommendations

1. Target incentives and charging infrastructure to geographic areas with the highest transportation burden
   a. Used EVT Transportation Burden, VT EDI, and forthcoming assessment survey data to define areas that could benefit from marketing campaigns and charging infrastructure investment.

2. Define performance indicators and metrics early and evaluate throughout
   a. Given initial findings, examples of key metrics might include:
      i. Decrease in transportation burden spending,
      ii. Decrease in percentage of the population without access to a vehicle,
      iii. Increase in charging availability for communities with the highest transportation and environmental burdens
3. Expand the VTrans/TRC Survey and supplement with a mixed methods research approach
   a) Key data to collect for evaluation include:
      i. Counterfactuals (would you have purchased EV if the program didn’t exist?)
      ii. Demographic data (household size, income, race, gender, ethnicity)
      iii. Replaced vehicle data important for GHG accounting
   b) Mixed Methods: triangle of geographic analysis, participant survey, and focus groups/interviews with priority communities

4. Improve data analysis and transparency
   1. California’s principle of transparent data has facilitated the study of EV adoption on the state level
Questions and Comments?

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Further Research to Inform Clean Vehicle Incentive Programming

• Participant survey data analysis and Focus Group Interviews
• More comprehensive statistical analysis of census tracts especially focusing on neighborhood effect
  • Including variables of vehicle preferences and location of EV dealerships and service shops
• Incentive Adoption and type over time measuring program adjustments
• Where is public transportation and Go!Vermont working in the state?