

Vermont State and Distribution Utility Electric Vehicle Programs Evaluation

INTERIM REPORT

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Prepared for:

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Executive Summary

The State of Vermont seeks to reduce greenhouse gas (GHG) emissions by promoting electrification of its transportation sector. Tier III of the Vermont Renewable Energy Standard (RES), passed in 2016, requires the state's electricity distribution utilities (DUs) to undertake projects that accelerate the transition from the use of fossil fuels to the use of clean power sources, including provision of incentive payments to utility customers to purchase electric vehicles (EVs). In 2020, the Vermont Legislature sought to further accelerate EV adoption when it passed The Energy Efficiency Modernization Act of 2020 (Act 151), authorizing the state's energy efficiency utilities (EEUs) to spend funds from the Energy Efficiency Charge to build thermal energy and transportation projects. EEUs are also using this funding to undertake public education campaigns to educate prospective buyers about the benefits of EVs and to reach out to auto dealers to better prepare them to sell EVs. The Legislature also authorized funding for EV purchase incentives of \$950,000 in FY2020 (Act 154), \$2.7 million in FY2022 (Act 55), and \$12 million in FY2023 (Act 184).

Evaluation Objectives

The Vermont Department of Public Service (PSD) retained Cadmus to evaluate the impacts of the DU and state incentive programs on residential purchases of EVs; the consumer experience with Vermont's EV incentive and education programs; and the impacts of EV outreach and education programs on the readiness of car dealerships to sell EVs.

More specifically, this evaluation has the following research objectives:

- Assess the design and administration of Vermont EV incentive and educational programs and provide recommendations on ways to improve delivery and cost-effectiveness.
- Investigate the consumer experience and satisfaction with EV incentive and education programs.
- Estimate the impacts of DU (Tier III) and state EV incentives on the purchases of all-electric vehicles (AEVs) and plug-in hybrid electric vehicles (PHEVs) by Vermont residents.

There are two phases to this research. Phase I is covered by this report and focuses on the state and DU EV purchase incentive programs. Phase II will also cover the incentive programs but focus more on the public and dealership outreach and education programs funded through Act 151.

For this Phase I research, Cadmus undertook the following activities:

- Reviewed EV incentive, education, and outreach program materials.
- Interviewed administrators of state, DU, and EEU EV programs.
- Conducted surveys with more than 1000 EV buyers who received purchase incentives from the State of Vermont or a DU.
- Interviewed representatives from two car dealerships that sell EVs to Vermont residents.

Conclusions

Cadmus reached the following conclusions about the administration of Vermont’s EV programs, the consumer’s experience with these programs, and the impacts of the programs on EV purchases.

CONCLUSION 1: DUs and Drive Electric Vermont were trusted sources of information for incentive recipients when shopping for EVs.

Roughly half of EV buyers reported that their DU or the Drive Electric Vermont website was important in informing their decision to purchase an EV. Roughly the same percentage of buyers considered information from the EV manufacturer website to be important. However, only 24% of EV buyers said the dealer was an important source of information.

RECOMMENDATIONS

Continue to invest in EV public education and outreach campaigns through Drive Electric Vermont and the DUs. Also, continue to invest in auto dealer EV readiness programs to ensure they can provide the information consumers need to make informed buying decisions.

CONCLUSION 2: While many EV buyers learned about the availability of state incentives from Drive Electric Vermont or Efficiency Vermont (25%), more buyers reported learning about the incentives from other sources (e.g., family members and friends), suggesting there is a wider audience for the EEU marketing to reach.

The largest percentage of EV buyers (about 25%) first heard about state EV incentives from Vermont energy efficiency program administrators including Drive Electric Vermont and Energy Efficiency Vermont. However, more EV buyers got information about state incentives from other sources, including car salespersons and family members. A larger percentage of EV buyers learned about DU incentives from their electric utility (about 30%) or Drive Electric Vermont or Efficiency Vermont (about 25%). However, more EV buyers got information about state incentives from other sources, including car salespersons and family members.

CONCLUSION 3: By providing EV purchase incentives and promoting construction of public charging infrastructure, Vermont is helping to address the most significant barriers to owning an EV.

Survey respondents cited range anxiety and the unavailability of charging infrastructure as the two greatest barriers to owning an EV. The high upfront cost of purchasing an EV was the third highest barrier. Vermont has invested more than \$3.5 million in public charging stations since 2014, and in 2022 filed its National Electric Vehicle Infrastructure (NEVI) plan with the federal government for the investment of an additional \$21.2 million over the fiscal years 2022–2026.¹

¹ State of Vermont Agency of Transportation (2023). “National Electric Vehicle Infrastructure Program,” web page at <https://vtrans.vermont.gov/planning/nevi>.

RECOMMENDATIONS

Continue to grow the public charging infrastructure across the state ensuring that it is equitably distributed.

CONCLUSION 5: Most DU and state incentive recipients found the rebate application process easy to navigate.

About 80% of state incentive recipients said it was easy to apply for incentives from the State of Vermont. Efficiency Vermont has expanded the network of Vermont car dealerships that can provide state incentives at the point of sale, which has simplified the rebate application process.

CONCLUSION 6: Vermont has improved the administration of the State EV incentive program.

Vermont hired an outside organization, the Center for Sustainable Energy (CSE), to administer the state incentive program beginning in summer 2022 and eliminated a pre-approval process for EV rebates. In addition, Efficiency Vermont has enabled a network of EV dealers to process state and DU incentives at the point of sale, reducing the number of EV buyers needing to apply for rebates on their own.

CONCLUSION 7: Vermont's electricity DUs have improved the administration of their EV incentive programs.

The DUs have shifted from paper applications to online portals for rebate processing or improved the usability of their online portals. The shift has also reduced processing times for rebate applications and reduced error rates.

CONCLUSION 8: Challenges to administering the State and DU incentive programs remain.

These include conflicting incentive eligibility requirements between State and DU programs, a shortage of staff to administer the DU programs, and uncertainty about future funding.

CONCLUSION 9: Price caps on electric vehicles eligible for state or DU purchase incentives exclude many makes and models of interest to prospective EV buyers and may limit future EV adoption.

The State of Vermont will not incentivize new AEV or PHEV vehicles with a manufacturer suggested retail price (MSRP) exceeding \$47,000.² Administrators of the incentive programs generally agreed the MSRP caps are low and narrow the types of EVs Vermont residents can buy, including most four-wheel drive options, trucks, and SUVs.

² Current eligible vehicles may be found at the Drive Electric Vermont website: <https://www.driveelectricvt.com/Media/Default/docs/purchase-incentives/electric-vehicle-vermont-state-incentive-guidelines.pdf>

RECOMMENDATIONS

Adjust the MSRP caps for inflation to ensure a range of makes and models remain eligible to receive incentives and consider making a large one-time increase in the cap.

CONCLUSION 10: EEU efforts at educating the public about EVs and engaging car dealers in promoting EVs have ramped up and are showing early signs of promise as reported by dealers.

Efficiency Vermont's dealership program consists of dealer training, dealer sales incentives, and dealer capital incentives. At the time of the interview in November 2022, the program had reached 48 dealerships, with 94 staff receiving EV training. The sales incentives had reached 34 dealerships, and the capital incentives had reached 21 dealerships. Dealerships have received these EV readiness and sales incentives programs positively.

CONCLUSION 11: Many state or DU incentive recipients were motivated by the environmental benefits of owning an EV, suggesting incentives went to early adopters for whom the economics of an EV mattered less than environmental benefits, or than it will matter for subsequent adopters.

The earliest adopters of new consumer technologies often are innovators and have motivations other than economics. Beneficial environmental impacts were the first most important reason for buying an EV for about 50% of incentive recipients. Saving money on fuel was the most important reason for only 20% of EV buyers.

CONCLUSION 12: The purchase incentives had larger effects for low-income households than middle- and high-income households.

About 91% of low-income respondents with annual income < \$50,000 said a Tier III incentive, state incentive, or both a Tier III and state incentive affected their purchase decisions. In contrast, only about 60% of high-income households said the incentives influenced their purchase decisions.

RECOMMENDATIONS

Market the program more aggressively to lower income customers whose main barrier to adopt EVs is the initial cost. This would encourage more low-income household to purchase EVs and increase the cost-effectiveness of the incentive programs.

CONCLUSION 13: Between 2021 and 2022, EV purchase incentives did not cause most recipients to switch from buying an internal combustion engine (ICE) vehicle to an EV. Instead, the incentives likely accelerated the purchase of EVs that would have been purchased in the future anyway.

About 70% of incentive recipients said they would not have purchased an EV without the state or DU incentives they received, suggesting the incentives strongly influenced EV buyers' purchases. However, 85% of incentive recipients said they did not consider an ICE vehicle when shopping for a vehicle. The absence of ICE vehicles from their choice sets suggests incentive recipients did not switch from ICE

vehicles to EVs but simply accelerated purchases of EVs that would have been made later without incentives.

CONCLUSION 14: The evaluation was hindered by the unwillingness of many Vermont Distribution Utilities to share incentive recipient contact information.

One DU provided customer contact and incentive information. The limited size of the DU sample was too small to draw firm conclusions about the customer experience with DU incentive programs overall. Two distribution utilities agreed to administer the EV buyer survey to their customers and collect anonymous responses, but we could not verify the identities of these respondents or the incentive amounts. Most other DUs refused to provide their customer contact information or to administer the survey to incentive recipients.

RECOMMENDATIONS

Include language in the incentive agreement with customers and DUs to make it clear that customer information will be shared confidentially for research and evaluation purposes.

Introduction

The State of Vermont seeks to decrease its greenhouse gas (GHG) emissions by reducing dependence on fossil fuels in the electricity generation, buildings, industrial, agricultural, and transportation sectors. Tier III of the Vermont Renewable Energy Standard (RES), passed in 2016, requires the state's electricity distribution utilities (DUs) to undertake projects that accelerate the transition from the use of dirty fossil fuels to the use of clean power sources. A key component of DU efforts to reduce GHG emissions under Tier III has been providing Vermont residents with financial incentives for purchasing electric vehicles (EVs). In 2020, the Vermont Legislature sought to further accelerate EV adoption when it passed The Energy Efficiency Modernization Act of 2020 (Act 151), authorizing the state's energy efficiency utilities (EEUs) to spend funds from the Energy Efficiency Charge to build thermal energy and transportation projects. The Legislature also authorized funding for EV purchase incentives of \$950,000 in FY2020 (Act 154), \$2.7 million in FY2022 (Act 55), and \$12 million in FY2023 (Act 184).

Vermont's transportation electrification programs aim to address externalities in the markets for new and used automobiles. Consumers often do not internalize the environmental benefits of EVs (e.g., fossil fuel savings and reductions in tailpipe emissions including GHGs) or the costs (e.g., higher power plant GHG emissions), and they often purchase fewer EVs than is socially optimal. Vermont's EV incentive programs attempt to address this market failure by making EVs more affordable and lifting EV sales.^{3, 4} Another market failure is the lack of knowledge among prospective buyers and dealers about EV technology and the benefits and costs of owning an EV. If prospective buyers and sellers better understood the benefits of EVs, they may purchase more of them. Using Act 151 funding, Vermont EEUs including Efficiency Vermont have undertaken public education and outreach campaigns to educate prospective buyers and deliver auto dealer education and incentives programs to promote EV adoption.

Vermont requires evaluation of its programs to understand whether they are having their intended impact of promoting EV adoption. The Vermont Department of Public Service (PSD) retained Cadmus to evaluate the impacts of DU Tier III programs and EEU Act 151 programs since 2019. The following is a summary of the state incentive, DU, and EEU programs this evaluation covers.

State EV Purchase Incentive Program

The State of Vermont offers an incentive of \$1,500 to \$3,000 for the purchase of a new plug-in hybrid electric vehicle (PHEV) and \$2,500 to \$4,000 for the purchase of a new all-electric vehicle (AEV). It also pays the purchaser 25% of the cost of a used hybrid or electric vehicle—up to \$5,000—for low- and middle-income purchasers through the MileageSmart program.

³ As of January 2023, 8,875 all-electric or plug-in hybrid electric light-duty vehicles were registered in Vermont. Source: Drive Electric Vermont January 2023 EV Registration Update.

⁴ EVs constitute 6.5% of all light-duty vehicle registrations in Vermont. Source: Table 4 of Report to the Vermont Legislature. Act 151 Energy Efficiency Programs Pursuant to Act 151 (2020). Submitted by the Vermont Public Utilities Commission. April 28, 2023.

Figure 1. State of Vermont New EV Purchase Incentives

Tax Filing Status	Adjusted Gross Income (AGI) Limits for Enhanced and Standard Incentives	State Incentive Amount	
		Plug-in Hybrid Electric Vehicle	All-Electric Vehicle
Individual filing as single or head of household	\$50,000 or less	\$3,000	\$4,000
	\$50,001 up to \$100,000	\$1,500	\$2,500
Married filing jointly	\$75,000 or less	\$3,000	\$4,000
	\$75,001 up to \$125,000	\$1,500	\$2,500
Married filing separately	\$50,000 or less	\$3,000	\$4,000
	\$50,001 up to \$100,000	\$1,500	\$2,500
Individual filing as qualifying widower	\$75,000 or less	\$3,000	\$4,000
	\$75,001 up to \$125,000	\$1,500	\$2,500

Source: Drive Electric Vermont. <https://www.driveselectricvt.com/incentives/vermont-state-incentives>. Accessed May 26, 2023. The state last adjusted the income limits and incentive amounts in August 2021.

Rebates are higher for lower-income buyers and unavailable to high-income buyers with household incomes above \$100,000 or \$125,000 depending on the buyer’s income tax filing status. Rebates are available for vehicles with a base Manufacturer’s Suggested Retail Price (MSRP) of up to \$40,000 for PHEVs and \$45,000 for AEVs.⁵

The Center for Sustainable Energy (CSE) has administered the state rebate program since assuming responsibility in July 2022. At that time, CSE removed a buyer pre-approval process that had caused delays in incentive issuances and high program administration costs. Now, eligible EV buyers can obtain the state incentives at the point of sale from EV dealers participating in Vermont’s Incentive Program.

Tier III Distribution Utility Purchase Incentive Programs

Vermont DUs offer EV and EV Supply Equipment (EVSE) purchase incentives as part of the transportation electrification Tier III programs. The DU programs do not impose income eligibility caps for vehicle incentives, but they do offer higher rebates for low- and middle-income (LMI) EV buyers. Some utilities also offer incentives for the purchase of used EVs.

The total value of rebates a utility can issue across its Tier III energy transformation project portfolio (including for EVs and EVSE projects) depends on its Alternative Compliance Payment, the penalties it would pay if it could not reduce GHG emissions according to the targets in the Renewable Energy Standard.

⁵ A list of vehicles currently eligible for state incentives based on the manufacturer MSRP is available here: <https://www.driveselectricvt.com/Media/Default/docs/purchase-incentives/electric-vehicle-vermont-state-incentive-guidelines.pdf>

Table 1 presents the incentives per EV available from the DUs for various vehicle types.

Table 1: Vermont Utility EV Incentives

DU	Base PHEV Incentive	LMI PHEV Adder	Base AEV Incentive	LMI AEV Adder	MSRP Cap
Green Mountain Power	\$1,000	None	\$2,200	\$1,000	None
Burlington Electric Department	\$2,300	\$700	\$2,000	\$300	\$60,000
Vermont Public Power Supply Agency (VPPSA) ⁶	\$500	\$400	\$1,000	\$400	None
Stowe Electric Department	\$750	\$250	\$750	\$250	None
Vermont Electric Coop	\$250	\$250	\$500	\$250	None
Washington Electric Coop	\$950	None	\$1,200	\$700	\$50,000

Additionally, some utilities also support installation of EVSE. These programs offer significant incentives towards Level 2 chargers for customers who enroll in an EV rate credit program. This incentive resembles a time-of-use tariff, but it is designed as a credit for billing reasons.⁷

Act 151 Programs

The Act 151 EEU programs comprise dealership EV-readiness programs and public outreach and education programs. The dealership program run by Efficiency Vermont under Act 151 consists of dealer training, dealer sales incentives, and dealer capital incentives. Efficiency Vermont’s dealer training does not aim to replicate training from automakers about vehicle capabilities and characteristics, but rather to educate dealers about Vermont-specific programs and policies, such as incentives and tax credits. It also covers Vermont-specific driving considerations, such as charging infrastructure and winter performance and range. To cover charging infrastructure, the training materials employ tools such as the PlugShare and AFDC maps of charging sites, as well as trip planning software.

At the time of the evaluation activities in November 2022, the program had reached 48 dealerships, with 94 staff members receiving EV training. The sales incentives had reached 34 dealerships, and the capital incentives had reached 21 dealerships. Since Efficiency Vermont and BED only began implementing Act 151 programs in 2021, the impacts of these programs will not be fully evident in the market.

A range of EV education and outreach programs support the rebate and incentive programs. The EEU implement education and outreach campaigns, including ride-and-drive events, websites, social media outreach, TV ads, and other forms of outreach. BED reported using a neighborhood news weekly as well as its annual Net Zero Energy Festival; VEIC reported doing radio interviews; and Efficiency Vermont reported a bus wrap campaign.

⁶ VPPSA is not a DU but operates a program that provides EV incentives to customers of 11 municipal utilities.

⁷ BED and GMP have pricing programs in which EVs pay approximately \$0.12/kWh for off-peak charging (or charging that can be curtailed at peak times), compared to base residential rates of \$0.18/kWh. VPPSA has a pilot program that issues free L2 chargers to customers who participate in off-peak charging; this is neither a Tier III program nor an Act 151 program, but rather part of VPPSA’s new flexible load management program, PowerShift.

Organization of this Report

The following section “Evaluation Objectives and Approach” describes the research aims and approach and methodologies, including the sources used and the details of how each research activity took place. The subsequent section “Evaluation Findings” presents the results, organized by topic. The first topic is the Vermont EV market and the administration of state and DU EV programs. The next topic is the experience of incentive recipients. The final topic is an attribution analysis of the impacts of the incentives on purchases of EVs.

Evaluation Objectives and Approach

The Vermont Department of Public Service (PSD) retained Cadmus to evaluate the impacts of the DU and state incentive programs on purchases of EVs; the consumer experience with Vermont's EV incentive and education programs; and the impacts of EV outreach and education programs on the readiness of car dealerships to sell EVs.

More specifically, this evaluation has the following research objectives:

- Assess the design and administration of Vermont EV incentive and educational and outreach programs and provide recommendations on ways to improve delivery and cost-effectiveness.
- Investigate the consumer experience and satisfaction with EV incentive and education programs.
- Estimate the impacts of DU (Tier III) and state EV incentives on the purchases of AEVs and PHEVs by Vermont residents.

There are two phases to this research. Phase I is the subject of this report and focuses on the state and DU EV purchase incentive programs. Phase II will also cover the incentive programs but focus more on the public and dealership outreach and education programs funded through Act 151.

Research Methodology and Activities

Cadmus' approach to addressing the research objectives above was to speak to participants on both sides of Vermont's EV market—the supply side and the demand side. On the supply side, we interviewed the representatives of auto dealerships selling EVs to Vermont residents. These individuals shed light on the challenges they face selling EVs and navigating supply constraints. On the demand side, we surveyed EV buyers who received incentives from the state or DUs since 2021. We collected data about their experiences with the incentive programs, the barriers to purchasing an EV, and the impacts of the incentives on their purchase decisions. Finally, we conducted interviews with Vermont EV program managers, who spoke to the barriers their programs aim to overcome and opportunities to grow the EV market.

The following pages describe these research activities at greater length.

Program Document and Materials Review

Cadmus analyzed program materials and program documentation to better understand the program process and gather background information to develop the participant interviews. In addition, Cadmus also reviewed past surveys of EV owners and incentive recipients. We reviewed the following sources and materials:

- CSE
- VEIC
- Drive Electric Vermont website

- PSD website
- Drive Electric Vermont’s 2016 Survey of Electric Vehicles Awareness & Interest
- Efficiency Vermont’s 2021 survey, “*Vermonters’ Vehicles: Current Trends and EV Opportunities*”
- VEIC’s Spring 2022 survey, “*State of Vermont Electric Vehicle Incentive Program Incentive Recipient Survey*”.
- 2022 Burlington Electric Department Customer Satisfaction Survey Residential

Program Administrator and Dealer Interviews

Cadmus conducted telephone interviews with seven representatives from six administrators of EV programs in Vermont. The team developed the interview list in consultation with PSD, focusing on the organizations or agencies most directly involved in EV incentive program administration. These entities included:⁸

- Green Mountain Power (GMP), the largest distribution utility in Vermont and an investor-owned utility. GMP administers its own Tier III programs and funds Act 151 programs implemented by an EEU.
- Burlington Electric Department (BED), the largest municipal utility in Vermont. BED serves as both the distribution utility and the EEU for its service territory, and so administers Act 151 programs.
- Vermont Public Power Supply Authority (VPPSA), a joint action agency supporting several smaller municipal utilities. Among other functions, VPPSA administers EV incentive programs for its member utilities.
- VEIC, a non-profit organization that administers the Efficiency Vermont program and the Drive Electric Vermont program. The Drive Electric Vermont program has had extensive involvement in the EV field in Vermont. When it was managed by the distribution utilities (prior to the selection of CSE as the rebate administrator in 2022), Drive Electric Vermont played a supporting role in state rebate administration.
- Efficiency Vermont, an EEU administering Act 151 programs in the state. (*Two interviews.*)
- Vermont Agency of Transportation (VTrans), a state agency responsible for many elements of EV programs.

Cadmus developed a set of interview guides tailored to each type of organization (distribution utility, energy efficiency utility, state agency). Key interview topics included:

- Respondent’s experience with both developing and administering specific EV programs
- Major design changes or “course corrections” in the programs
- Comparison of program expenditures to forecasts
- Feedback from EV buyers
- Barriers to EV adoption in Vermont

⁸ Cadmus attempted multiple times to contact the administrator of the MileageSmart program that incentivizes used EVs but was unsuccessful.

- Adequacy of current incentive levels to accelerate EV adoption
- Suggestions for improvements to the process of rebate administration
- Existence of a process flow diagram or logic model
- EV buyer participation levels in EVSE programs
- Design and effectiveness of EV education and outreach programs
- Observations about dealer engagement programs
- Challenges and lessons learned

Cadmus also interviewed market participants, focusing on leading EV dealerships in or neighboring Vermont as recommended by the program implementers interviewed. The team tailored the market participant interview guide to ensure shorter interviews, given the expected difficulty of obtaining hour-long interviews with dealership staff. Cadmus asked market participants to briefly describe their involvement in each of the following and offer suggestions for improvement:

- EV rebates
- Dealer training programs
- Dealer incentive programs
- Dealer capital improvement programs
- EV education and outreach

EV Purchase Incentive Recipient Surveys

Cadmus surveyed EV buyers who received vehicle purchase incentives between January 2021 and December 2022. We surveyed three types of incentive recipients: recipients of only state of Vermont incentives, recipients of only Tier III incentives from the DUs, and recipients of both types of incentives.

The survey sample frame comprised two subpopulations of recipients defined by whether Cadmus or a DU administered the survey. Cadmus administered the survey to incentive recipients for whom we had identifying and contact information (an email address). Administrators of the state incentive program (VEIC before June 30, 2022, and CSA after July 1, 2022) provided Cadmus with a list of state incentive recipients. Cadmus excluded respondents to a VTrans February 2022 survey of state incentive recipients from the sample frame. In addition, BED provided contact information for its customers who received Tier III incentives.

Two DUs (GMP and Vermont Electric Coop) agreed to administer the survey by sending an anonymous survey link to their customers who received Tier III incentives. Cadmus could not verify the identities or incentive amounts for these survey respondents. The other DUs did not provide customer contact information or agree to field the survey anonymously.⁹

⁹ Cadmus contacted Green Mountain Power, Vermont Public Power Supply Authority, Burlington Electric Department, Stowe Electric Department, Village of Hyde Park Electric, Washington Electric Coop, and Vermont Electric Coop.

Cadmus and the participating DUs distributed the survey through email and phone and offered recipients the opportunity to win one of three \$75 Visa gift cards as incentives to respond. Recipients for whom incentive type and amount was known received the complete survey, including a battery of counterfactual questions designed to isolate and assess the impact of the incentives on the purchase decisions. Anonymous incentive recipients received a simplified survey that omitted the incentive attribution questions, because their incentives were unknown.

Cadmus and the participating DUs distributed the surveys to 4,693 customers, receiving a 33.2% response rate overall. Table 2 presents an overview of the response numbers and rates after dropping partial completes. The response rates for both recipient populations were high—37% for the known incentive recipients and 33% for the anonymous incentive recipients—suggesting high interest in the subject of EVs.

Table 2. EV Recipient Survey Samples and Survey Response Rates

EV Incentive Recipient Population	Sources	Sample Size	Survey Responses	Response Rate
Known recipients and incentive amounts	Center for Sustainable Energy (CSE), Drive Electric Vermont, (Through VEIC), and Burlington Electric Department	755 (647 email, 108 phone)	279	37.0%
Anonymous recipients and unconfirmed incentive amounts	Green Mountain Power (GMP), Vermont Electric Co-Op (VEC)	GMP: 3,700 VEC: 238	1,282	32.5%

Table 3 shows the survey responses rate by incentive recipient type.

Table 3. Response Rate by Incentive Recipient Type

Survey Data	Incentive Recipient Type			
	State	State and Tier III	Tier III	Anonymous Link
Distributed	465	104	186	3,938
Responses	194	25	60	1,282
Response Rate	41.7%	24.0%	32.2%	32.5%

Because we could not verify the identities or incentive amounts of the anonymous survey respondents, we analyzed and are reporting the data for this subpopulation separately. These responses appear in the results under the category “Anonymous Link,” to differentiate them from responses with a known incentive type.

Survey Sample Respondent Incentives and Vehicle and Demographic Attributes

Cadmus obtained information about incentive amounts and the purchased vehicles from VEIC, CSA, and the DUs, and the survey collected household demographic data. This section presents information about incentives and demographics for respondents in the survey analysis sample.

Table 4 shows the incentive amounts survey respondents with known identities received. Recipients of both incentives distributed directly by the state (henceforth “State”) and incentives distributed by the DUs (henceforth “Tier III”) received the largest incentive amounts, with an average of \$4,312.

Table 4. Incentive Amounts by Incentive Recipient Type

Incentive Types		State (n=194) (\$)	State and Tier III (n=25) (\$)	Tier III (n=60) (\$)
Total Incentive	Average	2,835	4,312	1,306
	Median	2,500	4,300	1,500
	Standard Deviation	899	1,226	524

Source: Incentive recipient data (VEIC, CSE).

As shown in Table 5, most survey respondents purchased AEVs (66%), but PHEVs also represented a significant share of purchases (34%).

Table 5. Electric Vehicles Purchased by Type

Vehicle Type	Total (n=1,389)		State (n=188)		State and Tier III (n=23)		Tier III (n=49)		Anonymous Link (n=1,129)	
	Count	%	Count	%	Count	%	Count	%	Count	%
AEV	919	66	122	65	15	65	29	59	753	67
PHEV	470	34	66	35	8	35	20	41	376	33

Source: Survey question B1: Please provide the type and model of electric vehicle did you purchased or leased since 2020 (n=1389).

Table 6 presents the education level of survey respondents. Survey respondents were largely educated, with more than 80% of respondents reporting having attained a bachelor’s degree or higher. By contrast, only 40.9% of all Vermont residents of age 25 and above have a bachelor’s degree or higher.¹⁰

Table 6. Educational Level of Respondents

Education Level	Total (n=1,291)		State (n=172)		State and Tier III (n=19)		Tier III (n=45)		Anonymous Link (n=1,055)	
	Count	%	Count	%	Count	%	Count	%	Count	%
Doctoral Degree	169	13.1	16	9.3	5	26.3	13	28.9	135	12.8
Master’s Degree	451	34.9	55	32.0	6	31.5	16	35.6	374	35.5
Bachelor’s Degree	451	34.9	63	36.6	7	36.8	16	35.6	365	34.6
Associate’s Degree or some college/university education	124	9.6	18	10.5	-	-	-	-	106	10
Professional/Trade school	21	1.6	4	2.3	-	-	-	-	17	1.6
High School/GED	55	4.3	12	7.0	-	-	-	-	43	4.1
Other	20	1.5	4	2.3	1	5.3	-	-	15	1.4

Source: Survey question E1: What is your highest level of education?

¹⁰ U.S. Census, 2022 Population Estimates for Vermont, Bachelor’s degree or higher, percent of persons ages 25 years and up, 2017–2021. <https://www.census.gov/quickfacts/fact/table/VT/EDU685221#EDU685221>. Accessed May 31, 2023

Most survey respondents (89%) reported their primary residence being a single-family home. The remaining 11% were split relatively equally between condos (5%), duplexes (3%), and multi-family apartments (3%).

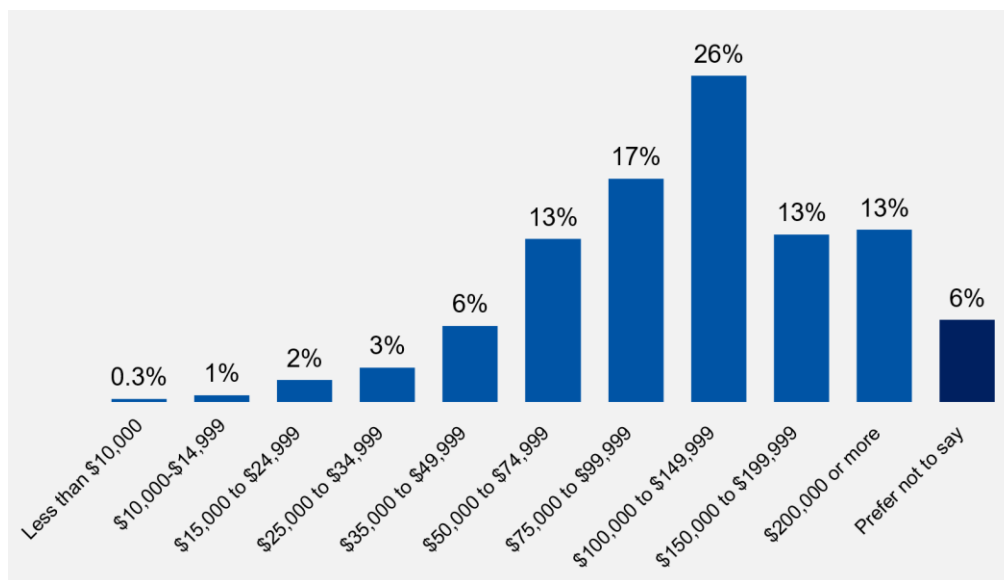
Table 7. Primary Place of Residence of Respondents

Residence Type	Total (n=1,295)		State (n=173)		State and Tier III (n=19)		Tier III (n=45)		Anonymous Link (n=1,058)	
	Count	%	Count	%	Count	%	Count	%	Count	%
Single family home	1149	88.7	149	86.1	13	68.4	37	82.2	950	89.8
Condo	67	5.2	7	4.0	4	21.1	4	8.9	52	4.9
Duplex	41	3.2	7	4.0	1	5.3	-	-	33	3.1
Multi-family apartment	38	2.9	10	5.8	1	5.3	4	8.9	23	2.2

Source: Survey question E3: Which of the following best describes your primary residence?

Survey respondents tended to report higher incomes than the median Vermont household. While the median annual household income in Vermont is roughly \$68,000, the median annual household income of survey respondents was above \$100,000.¹¹ The most common annual household income reported was between \$100,000 and \$149,999 (26%). The second largest remaining category was \$75,000 to \$99,999 (17%). The next three largest categories were \$50,000–\$74,999, \$150,000–\$199,999, and \$200,000 or more (13% each). About 12% of respondents had a household annual income less than \$50,000. Only a small percentage of respondents preferred to not disclose their income (6%).

Figure 2. Annual Household Income of Respondents

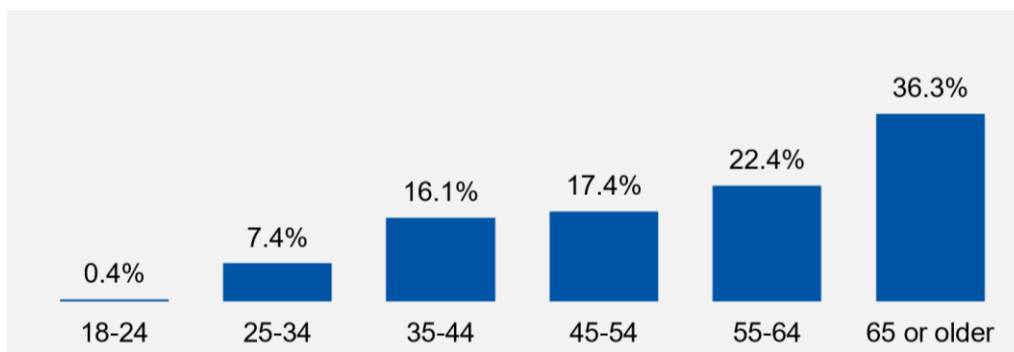


Source: Survey question E5: Which of the following best describes your annual household income before taxes? (n=1,105)

¹¹ U.S. Census, 2022 Population Estimates for Vermont, Bachelor’s degree or higher, percent of persons ages 25 years and up, 2017–2021. <https://www.census.gov/quickfacts/fact/table/VT/EDU685221#EDU685221>. Accessed May 31, 2023.

The distribution of respondent ages skewed older, especially in comparison to Vermont’s overall population. Approximately 36% of respondents were 65 or older. In comparison, just 21% of Vermont’s population is over 65 years of age.¹² Roughly 22% of respondents were between the ages of 55 and 64, 17% were between 45 and 54, 16% were between 35 and 44, and 7% were between 25 and 34 years of age.

Figure 3. Age of Respondents



Source: Survey question E8: How old are you? (n=1,276)

EV Incentives Attribution Analysis

Cadmus assessed the influence of Tier III and state incentives on Vermont resident vehicle purchase decisions. One challenge to conducting this assessment was attributing an EV purchase to a specific financial incentive because of the large number of different incentives available to potential EV buyers including the State incentive, DU incentives, and the federal tax credit. Another confounding factor was the concurrent efforts of other government entities to drive EV sales (e.g., consumer education and financial support for building public charging stations), which complicated efforts to isolate and quantify the impact of Tier III and State incentives.

As part of the EV buyer survey, Cadmus presented respondents with counterfactual scenarios designed to isolate the impact of the State and Tier III incentives on their purchase decisions. The survey asked respondents to consider a counterfactual situation in which they had not received the incentive in question but continued to receive all other EV purchase incentives.

If a respondent received only a Tier III incentive, they saw the question shown in Figure 4:

¹² U.S. Census, 2022 Population Estimates for Vermont, Median household income (in 2021 dollars), 2017–2021. <https://www.census.gov/quickfacts/fact/table/VT/INC110221#INC110221>. Accessed May 31, 2023.

Figure 4. Incentive Attribution Survey Question for Tier III Incentive Recipients

C9. **[IF INCENTIVEOPTION = TIER3 & C6 ≠2]** Our records show you received an incentive of \$**[INCENTIVEAMOUNTUTILITY]** from **[UTILITY]**. If you had not received this incentive, would you have still purchased an EV? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

Respondents who only received a state incentive saw an analogous question about state incentives.

The survey asked respondents who received Tier III *and* State incentives between one and three counterfactual scenario questions. Whether a respondent saw a second or third question depended on their response to the preceding question. The first question asked respondents to estimate the likelihood they would have made the same purchase decision if they had received neither incentive. The second question concerned the impact of the smaller of the two incentives, and a third question concerned the larger of the two incentives. Figure 5 shows a question presented to recipients of both state and DU incentives.

Figure 5. Incentive Attribution Survey Question for State and Tier III Incentive Recipients

C12. **[IF C10 = 2,3,4,5 AND DUST =0]** Think of the \$**[INCENTIVEAMOUNTSTATE]** you received from **the State of Vermont**. Would you have still purchased an EV if you had received this incentive but not the incentive from **[UTILITY]**? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

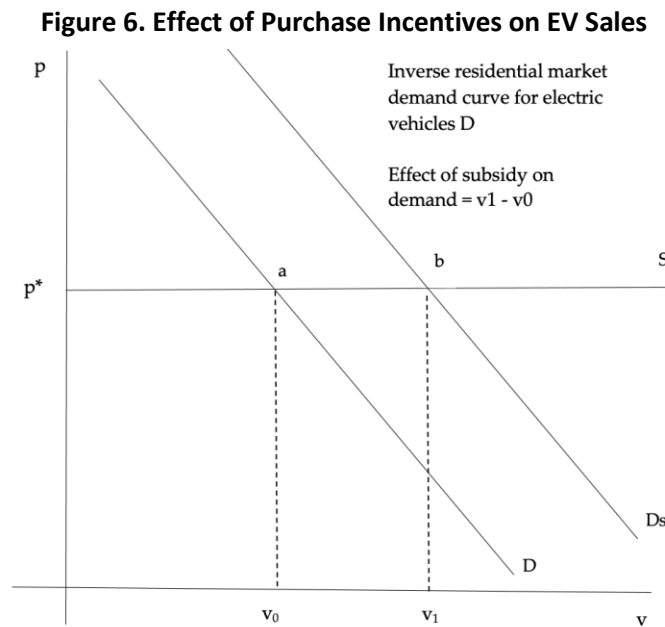
1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

Based on each respondent's answer(s), Cadmus categorized the purchase as *influenced* or *not influenced* by the incentive received. If a respondent replied that they would "Not Likely" or "Definitely Not" still purchase an EV in the absence of a particular incentive, we interpreted this response to mean that the incentive did affect the purchase decision. We refer to these buyers and these incentives as "marginal."

Conversely, if a respondent replied that they "Definitely" or "Very Likely" would have still purchased an EV in the absence of a particular incentive, we interpreted this response to mean the incentive did *not* affect the purchase decision. We refer to these buyers and these incentives as being "inframarginal."

For a respondent who received either a State or Tier III incentive (but not both), there were two possible outcomes: the incentive was marginal (i.e., it affected the purchase decision), or it was not. For respondents who received both incentives, there were four possible outcomes: neither incentive was marginal, only the State incentive was marginal, only the Tier III incentive was marginal, or the two incentives combined were marginal. Attribution Analysis Coding of Survey Responses provides additional details about the coding of the survey responses.

We then analyzed the responses to estimate the percentage of EV buyers for whom a Tier III incentive, a state incentive, or both types of incentives influenced their purchase decisions. Figure 6 illustrates the percentage effect we estimated through this analysis, which equals $\frac{v_1 - v_0}{v_1}$.



Notes: D is the EV demand curve without incentives. D_s is the demand curve with EV incentives. S is the supply curve of EVs in Vermont. Supply is perfectly-elastic (has no slope), which implies sellers of EVs are willing to supply as many vehicles as buyers want at price p^* . Total EV sales without incentives equals v_0 . Total EV sales with incentives equal v_1 . When the state provides an incentive, it provides an incentive to all buyers, even those who would have purchased an EV without the incentive. $v_1 - v_0$ is the impact of the incentives on EV purchases and represents “marginal” buyers. v_0 are “inframarginal” EV buyers—they receive an incentive, but the incentive did not affect their purchase decisions.

For this research, Cadmus did not attempt to attribute causality to other financial incentives such as the federal tax credit.

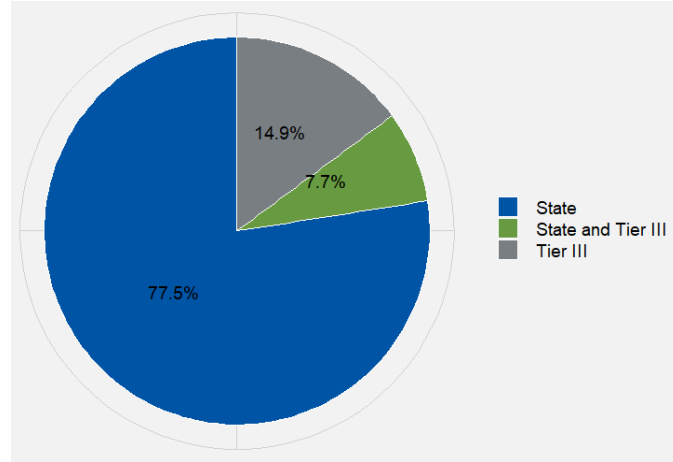
Analysis Sample

For the state and Tier III attribution analysis, Cadmus analyzed survey responses for 222 EV buyers who completed the incentive attribution questions and whose identities and incentive types were known.

Summary Statistics

Figure 7 shows the breakdown of the respondents by the type of incentive(s) received. About 78% of the analysis sample only received a state incentive, and the remainder received a Tier III incentive or both incentives.

Figure 7. Attribution Analysis Incentive Recipient Types



Source: Attribution analysis sample.

Table 8 shows summary statistics for the dollar amounts of each type of incentive (state or Tier III). The average state incentive amount was \$2,400, approximately eight times the average Tier III incentive amount. As such, we expect state incentives to have had a larger influence on EV purchases than Tier III incentives. Table 8 shows the distribution of the incentives in total and by incentive type.

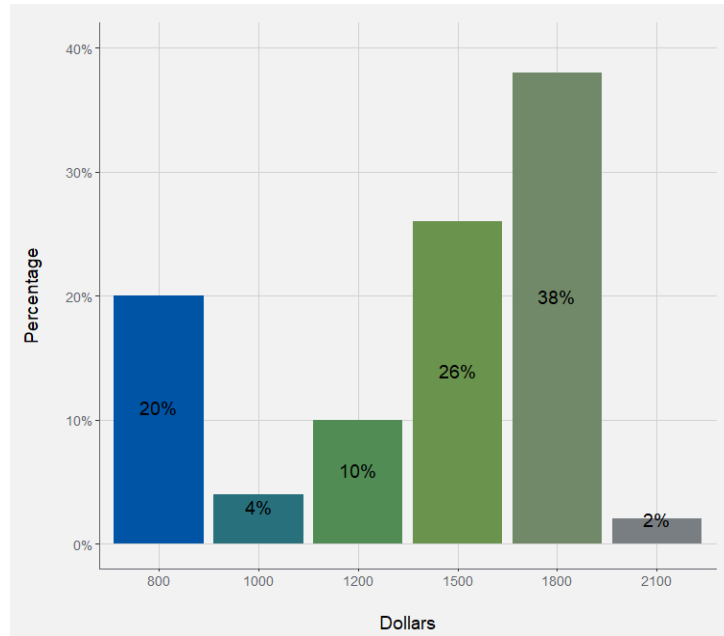
Table 8. State and Tier III Incentives Summary Statistics

Incentive Type	n	Mean (\$)	Standard deviation (\$)	Min (\$)	Max (\$)	Median (\$)
State	222	2,394	1,315	0	5,000	2,500
Tier III	222	323	630	0	2,100	0
Total	222	2,724	1,112	800	6,800	2,500

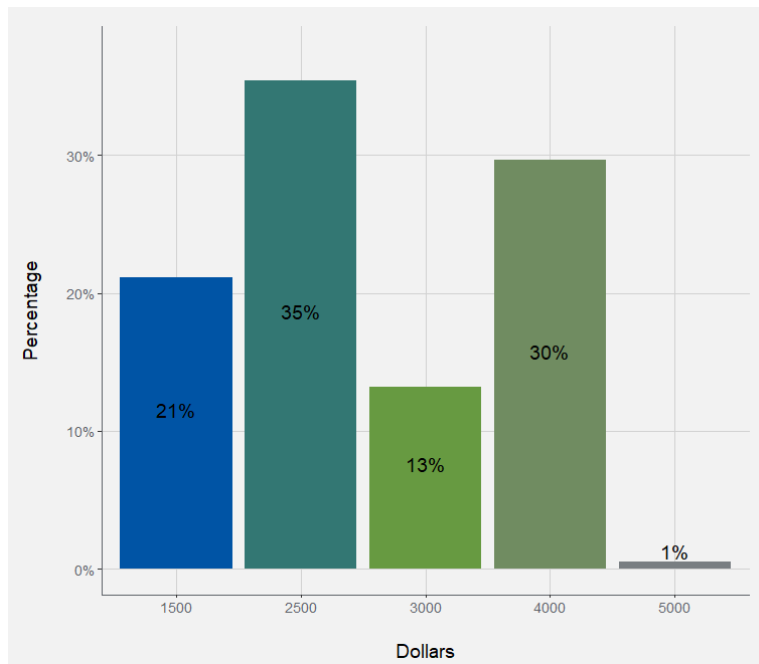
Notes: Based on analysis of incentives received for 222 recipients in the attribution analysis sample.

The average Tier III incentive across all recipients was relatively low at \$323, because a relatively small percentage of recipients received a Tier III incentive. Figure 8 shows the Tier III incentive amounts ranged between \$800 and \$2,100, with most respondents receiving \$1,500 or \$1,800.

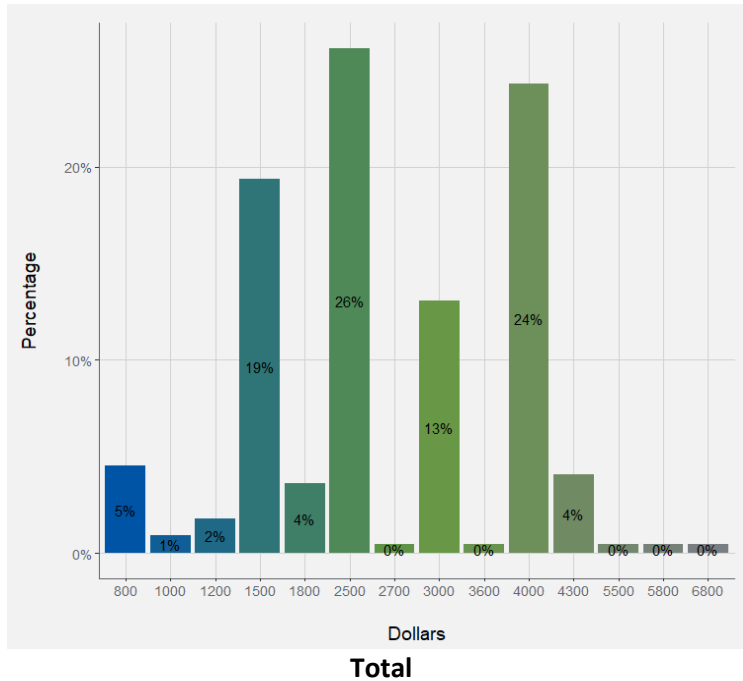
Figure 8. Distributions of Incentives by Incentive Type



Tier III

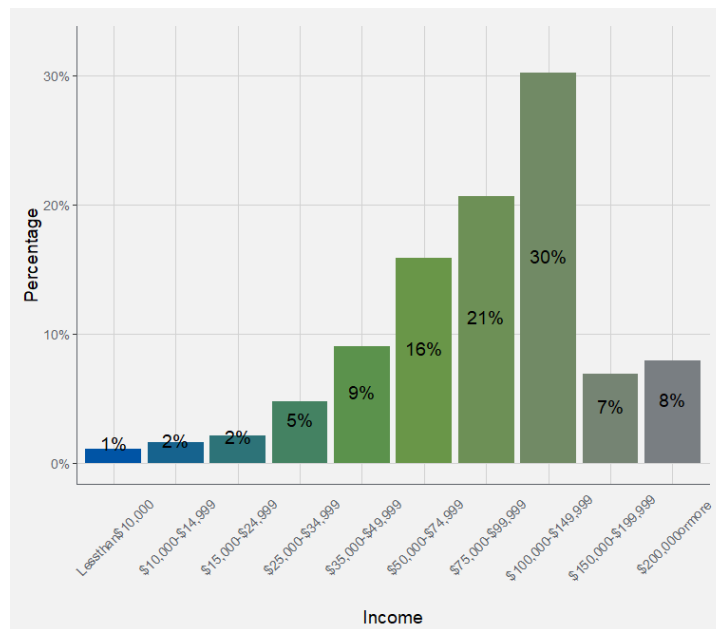


State



In the attribution analysis sample, 189 respondents provided information about their annual gross (before-tax) household incomes. There was a wide distribution of incomes among households receiving state or Tier II incentives. About 20% of respondents had income below \$50,000 and about 45% had income above \$100,000. About 85% of all incentive recipients in our sample had incomes less than \$150,000. Figure 9 shows the income distribution.

Figure 9. Distribution of Incentive Recipient Household Income



Evaluation Findings

Vermont’s EV Market and Purchase Incentive Programs

Barriers to EV Adoption

Lack of the inventory of EV models popular with or appealing to Vermont residents has hindered EV adoption.

All program administrators agreed that the lack of inventory and the price increases caused by supply chain issues had constrained EV adoption in Vermont. These price increases have diminished to some degree in the first quarter of 2023, although not for pickup truck EVs. Respondents noted that a greater availability of pickup truck and SUV options would be essential for accelerating the EV market in Vermont, with some noting that Subaru is a particularly popular brand in the state and others noting that the Ford F-150 is the most registered vehicle in the state. Limited numbers of the Subaru Solterra EV first reached the U.S. market in November 2022. Pickup truck EV options are limited to the Ford F-150 Lightning, the Rivian R1T, and the GMC Hummer EV Pickup, all of which are in scarce supply. Additional pickup truck EV options are due in late 2023 (the 2024 Chevy Silverado EV) and 2024 (the Tesla Cybertruck and the 2025 Ram 1500 EV).

Vermont’s mountainous geography and cold climate are further impediments to EV adoption.

Respondents identified Vermont’s geography as a challenge for EVs. The combination of mountainous terrain and dirt roads in rural areas create a strong preference for all-wheel drive (AWD) vehicles (respondents were split on whether they considered AWD a true necessity). The combination of cold winters and long driving distances make large battery size important. Both AWD and larger battery size tend to steeply increase the cost of an EV. Given the limited number of AEVs suitable for Vermont and priced within the state program’s price caps, Vermont has seen a higher preference for PHEVs over AEVs compared to other states, as shown in Table 9.

Table 9: Market Share of PHEV and AEV, in VT versus United States as a whole

Region	PHEV Share (2013–2022)	PHEV Share (2021–2022)	AEV Share (2013–2022)	AEV Share (2021–2022)
Vermont	1.25%	2.76%	1.3%	3.93%
United States	0.63%	1.33%	1.5%	4.57%

Source: Alliance for Automotive Innovation, Electric Vehicle Sales Dashboard, <https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard>. Accessed April 21, 2023.

PHEV vehicles have been important to EV adoption in Vermont, but analyzing their emission reductions can be difficult because it requires data on the battery state of charge or charging frequency and distance traveled for individual vehicle trips. Some respondents questioned the merit of continued incentives for PHEVs and sought improved information on their use patterns. Below, we show that at least half of the daily job or school commutes taken by incentive recipients who purchased PHEVs had a round-trip distance less than 20 miles.

Program administrators noted that Tesla has seen limited uptake in Vermont due to the lack of an in-state service center, but one is currently in development in Burlington.¹³ Some respondents expressed an opinion at the time that Tesla’s price point was too high for many Vermont residents, but the company reduced prices significantly in early 2023.

Program Design and Administration

CSE improved the efficiency of state incentive program administration.

DU and EEU respondents indicated generally high levels of support for the current program structure, and broadly considered the addition of an independent program administrator (CSE) superior to the prior system in which utilities were responsible for processing state rebates. Respondents noted that although the previous process had lower nominal administrative costs, it amounted to an unfunded mandate on the utilities, forcing them to expend additional labor hours on behalf of the state. Respondents described the prior system as more prone to delays and errors than the current system, with some describing it as “cumbersome and time-consuming.” In addition to the change in administration, the removal of the pre-approval process was also seen as a positive.

Vermont DUs are improving the administrative efficiency of their EV incentive programs.

Utilities offered numerous examples of how they had streamlined the application process for their own rebates. This streamlining predominately consisted of shifting from paper applications to online portals for rebate processing wherever possible or improving online portals. GMP noted that it has been using an online portal since 2019 but has improved it such that the failure rate (insufficient information to process the rebate) has fallen from 25% of applications to 5%. These improvements have also reduced processing time by 60–70%, creating a 2–3-week turnaround period. Remaining errors in rebate applications are often attributable to errors made by dealerships, such as applying incentives for which a vehicle was not eligible (for example, low- and middle-income incentives for PHEVs). Some dealerships have a track record of expertise, but frequent turnover can mean that less experienced sales staff may make errors when completing their applications.

VPPSA noted that Tier III regulations allowed it to become more directly customer-facing, rather than just providing support for their members’ programs. VPPSA noted several noteworthy changes to its rebate structure and process, such as increasing the rebate, adding a rebate for used EVs, and switching to a point-of-sale rebate. VPPSA also noted that the point-of-sale rebate has led to increased accuracy in rebate processing. VPPSA expects faster processing (from 6–10 weeks to 4–6 weeks) and greater

¹³ Tesla manufactures the two best-selling EVs in the United States by a wide margin: the Model Y and the Model 3. These two models alone accounted for more than 58% of the AEV market in the first quarter of 2023 (<https://www.coxautoinc.com/wp-content/uploads/2023/04/Kelley-Blue-Book-EV-Sales-and-Data-Report-for-Q1-2023.pdf>), with the Model Y achieving nearly five times the unit sales of the nearest non-Tesla AEV (the Chevy Bolt). Current prices for the Model Y are comparable to those of other AWD compact crossovers. The Model Y features AWD capabilities for just under \$47,000 (as of April 2023), comparable in price to other EVs of similar capabilities.

accuracy after transitioning in 2023 to direct data entry by the buyer. In 2022, buyers submitted the information by mail or email in 80% of cases, and the dealership submitted information in 20% of cases, and then VPPSA entered the information into a database. Respondents considered even the 2022 process to be an improvement over the prior administration by VPPSA's member utilities.

Despite improvements in program administration, Vermont DUs and EEs have remaining concerns about EV incentive programs:

- **Conflicting program eligibility requirements:** Several respondents noted that the differences in eligibility between the various programs made the rebate application process more difficult, but none had suggestions for improvement. If the state and utility program limitations continue to differ (such as MSRP and income caps), the applications will necessarily differ as well.
- **Program understaffing:** Some respondents expressed concern that state agencies involved in program administration were under-staffed for the anticipated growth in the EV market. Significant costs in labor and technology are involved in program administration, and respondents expressed a desire for the Legislature to allocate adequate funds for this purpose.
- **Uncertainty about future funding:** Efficiency Vermont shared that it was currently working on EV programs under temporary authorization and awaiting reauthorization from the Legislature. Respondents also expressed a desire for more predictable funding systems for the state EV incentive programs, rather than funding on an ad-hoc basis.
- **Differences in statutory incidence of taxes for purchase incentives:** Multiple respondents noted that a point-of-sale rebate is taxable for the seller but not for the buyer, while the opposite is true for post-sale rebates—making point-of-sale rebates considerably more appealing in the eyes of EV buyers and raising fairness concerns for buyers receiving post-sale rebates. These perceptions notwithstanding, it is an open question whether one type of rebate is better than the other for consumers because dealers have latitude to adjust EV sales prices depending on when the rebate is provided and who is responsible for paying taxes.¹⁴

EV dealers serving Vermont believed the rebate processing system worked relatively well. However, the dealers noted the potential to streamline the rebate process with faster online portals and immediate distribution of rebate funds. Dealers also had problems getting customer support in a timely manner (especially with the 10-day limit to claim the rebate) and reaching the right person to help.

Incentive Levels and Impact on EV Purchases

Vermont DUs vary in how they set purchase incentive amounts, and their incentive amounts differ as a result.

¹⁴ Economic theory predicts no difference in how the economic benefit of a subsidy is shared between buyers and sellers depending on whether the buyer or the seller receives the subsidy. Differences in tax rates on the subsidies between consumers and dealers and who is responsible for paying taxes on the subsidies could affect the division of the benefits.

Incentive amounts and eligibility criteria vary by utility. For example:

- BED's rebate is available on vehicles with an MSRP of up to \$60,000 (increased from \$50,000 previously); there is no income cap, but lower-income buyers receive an enhanced rebate.
- GMP's rebate has neither an MSRP cap nor an income cap, but lower-income buyers receive an enhanced rebate. GMP previously imposed a \$55,000 MSRP cap, later increased it to \$75,000, and then removed it entirely.
- The utilities served by VPPSA offer a rebate with neither an MSRP cap nor an income cap, and their rebates are significantly lower than either GMP's or BED's rebate (with a maximum of \$1,400 compared to \$3,200 for GMP and \$3,000 for BED).

BED increased its MSRP price cap due to EV price increases resulting from supply chain disruptions. GMP increased its price cap from \$55,000 to \$75,000 to reach the pickup truck segment.

Both GMP and BED stated that they set their rebates according to the carbon dioxide (CO₂) emissions reductions achieved by EVs and the Alternative Compliance Payment (ACP) established under the Tier III regulation. Both set aside a fraction of the ACP cost to cover program administration and the charger rebates. Other utilities offer lower levels of incentives based on their own ACP calculations, to the point where the respondents questioned the effectiveness of the incentives to affect purchase decisions. Respondents suggested that up-front ("cash on the hood") rebates were more likely than utility bill credits to boost adoption.

DU and EEU program administrators expressed skepticism about the influence of the EV purchase incentives.

Most respondents stated that the utility or state incentives alone may be insufficient to accelerate EV adoption but could be meaningful when combined with each other or with other incentives, such as the federal tax credit. The DUs also expressed a desire to claim the full emission reductions from EV sales benefiting from their incentives, even if state and federal incentives also motivated those sales.

Opportunity exists in other transportation sectors for the state, DUs, and EEU to promote vehicle electrification.

Some program administrators expressed a wish for incentives to promote fleet electrification (including commercial, non-profit, and municipal). Such programs are a common in many states. While the light-duty EV market has seen considerable momentum in the United States, with the first quarter of 2023 seeing 250,000 EVs sold, representing 7% of new vehicle purchases, the medium- and heavy-duty truck market is much smaller.¹⁵ Recently, GMP has launched a pilot fleet electrification program for commercial customers, including incentives for electrification of medium- and heavy-duty vehicles.

Vermont EV dealers agree EV buyers are well-educated, but they disagree about the influence of incentives on vehicle purchases.

¹⁵ Tucker, S. (2023). "EV Sales Broke Records in First Quarter of 2023."

Two dealerships noted that many EV buyers had taken advantage of state and DU rebate programs, customers were well-educated about the programs and EVs, and the incentives have helped them sell EVs. One dealership claimed incentives were a primary factor in their level of EV sales, noting that the incentive dollar amounts are significant enough to motivate sales, but smaller incentives would be ineffective. The other participant claimed that while the incentives had helped sell EVs, many customers would purchase EVs with or without incentives. The two dealerships had different views about the level of incremental EV adoption attributable to the incentives.

Price and Income Caps

Vermont DU and EEU program administrators hold different opinions about the effectiveness of the sticker price and income caps on EV incentives.

The differences in perspective centered around the two goals of incentive programs—equity and market transformation, which arguably conflict in some ways. More specifically, are incentives designed to increase **equity** by helping low-income people afford EVs—that is, to level the playing field and lift purchase ability to the level of demand? Or are incentives designed to promote **market transformation** by encouraging all buyers—regardless of income—to choose an EV over a gasoline vehicle—that is, to maximize uptake and raise demand to the level of purchase ability? Which is more important?

Some respondents suggested that the state incentives were overly restrictive in their income caps, thus dissuading high-income buyers from purchasing EVs. Others noted that there may not be a need for both an income cap and an MSRP cap, and that changing vehicle prices caused considerable confusion as models fell into or out of eligibility. Others expressed discontent at EV buyers who did not need the incentive but still claimed it. Others noted that if the EV incentive program were viewed as a public benefit program, assets or wealth may be a better metric to assess need rather than income; rebate recipients skew older, and some may be retirees with considerable assets even if their income is low.

In general, Vermont EV incentive program administrators believed sticker-price caps should be higher.

Respondents expressed a broad range of views on this topic, but most suggested that the state MSRP cap should be higher (though possibly with a lower incentive for higher-priced vehicles). One administrator expressed that the income caps make sense in theory, but in practice buyers find loopholes to qualify for incentives they may not need. Another participant remarked that raising the income thresholds would encourage more widespread adoption and make selling EVs easier.

Respondents noted impacts on equity as well as on market transformation. One respondent observed that near-term adoption of EVs by higher-income buyers not only enables the manufacturing expansion that will make lower-priced EVs possible—it also paves the way for a secondary market of used EVs. The

respondent noted that some lower-income vehicle buyers might be unable to afford a new EV even with the incentive, making used EVs the only accessible option for them.¹⁶

Education and Outreach

Act 151 has lifted funding for public education and awareness efforts related to EVs.

Efficiency Vermont noted a significant increase in their EV education efforts since the passage of Act 151; they have taken over much of the statewide EV awareness campaign and can leverage their brand recognition and marketing and communications experience from their other efficiency rebate programs. Efficiency Vermont can also leverage its Efficiency Excellence Network of qualified contractors that implement its energy efficiency programs to support the dealership capital improvement program.

Vermont needs more education about public EV charging options.

Some program administrators noted a need for better education on public charging options and procedures, especially for new EV buyers. The instructions for opening the charge port on an EV and unhooking the cable at the public charger are not always clear.

Dealership Programs

Efficiency Vermont noted that the dealer programs had been slow to start but had gained significant momentum.

The dealership program run by Efficiency Vermont consists of dealer training, dealer sales incentives, and dealer capital incentives. At the time of the interview in November 2022, the program had reached 48 dealerships, with 94 staff receiving EV training. The sales incentives had reached 34 dealerships, and the capital incentives had reached 21 dealerships. Efficiency Vermont's approach was to leverage existing relationships and grow the program through word-of-mouth, advertising, and incentives. Respondents noted that dealerships are small businesses, often pressed for time and facing many competing priorities. Getting a response can require multiple phone calls or emails.

Most prospective EV buyers are not interested in purchasing an ICE vehicle, and vice versa.

Incentive program administrators noted hearing from dealerships that prospective vehicle buyers are generally decided on the type of vehicle they wish to buy by the time they arrive at the dealership—EV or ICE—with relatively few buyers changing their minds. This observation is consistent with Cadmus' survey data analysis showing few EV incentive recipients considered purchasing an ICE vehicle.

¹⁶ In April 2023, the lowest-priced gasoline vehicle was the Nissan Versa, starting at \$15,830, while the lowest-priced EV was the Chevy Bolt starting at \$26,500—a difference of more than \$10,000. For trucks, the disparity is even more stark: the gasoline-fueled Ford Maverick starts at \$22,595 while the EV Ford F-150 Lightning Pro starts at \$59,974—a difference of more than \$35,000.

Dealer Training

The focus of Efficiency Vermont's dealer training is not to replicate the training automakers develop on vehicle capabilities and characteristics, but rather to inform dealers about Vermont-specific considerations such as incentives, tax credits, winter performance and range, and charging infrastructure. To cover charging infrastructure, Efficiency Vermont employs tools such as the PlugShare and Alternative Fuels Data Center (AFDC) maps of charging sites, as well as trip planning software.

DU and EEU administrators believe dealership programs are improving car dealer knowledge and expertise about EVs.

EEU administrators noted a general sense of improvement in dealership familiarity with and expertise about EVs, but reported that staff turnover presents a challenge for knowledge retention. Respondents noted that most training sessions are remote, but in-person training is preferable due to higher levels of engagement. EEU administrators also noted that dealer feedback on the training has been positive.

DU program administrators noted that dealerships have sometimes incorrectly advised EV buyers that utilities are responsible for installing home EV chargers, leading to confusion among buyers.

Automobile dealers found Efficiency Vermont training sessions about EV purchase incentives helpful.

One EV dealership representative noted that while they have not participated in EV dealer training programs conducted by Efficiency Vermont, they have observed zoom calls where Efficiency Vermont delivered a "refresh" on available incentives. The dealership representative found it helpful hearing this information from an official and found that the session reinforced understanding. Another dealership representative said they had attended webinars conducted by Efficiency Vermont, and that these programs were helpful to learn more about the rebate and incentive programs, and how to implement them. The representative also appreciated to ability to access and watch recordings and replays afterwards.

EV Sales Incentives

Efficiency Vermont offers an incentive of \$800 for every EV sold to dealerships that have enrolled in the program and participated in EV sales trainings, regardless of whether the vehicle sold is an AEV or PHEV, or whether it's new or used. The dealership must pay at least half of the incentive to the salesperson who made the sale.

EV sales incentives are popular with dealership salespeople.

Dealership representatives generally considered dealer sales incentives to be particularly effective at accelerating EV adoption. One participant specifically expressed appreciation for the requirement to pay the salesperson half of the \$800 incentive and noted that this incentive encourages salespeople to push EVs. This participant also considered the payment to the dealership to be helpful. Overall, this participant considered these incentive programs well-structured and reported a desire to see them remain in place.

EV Readiness Incentive Program

Efficiency Vermont assists dealerships in installing EV charging stations, tools and equipment for EV servicing, and training for service departments. Efficiency Vermont leveraged existing systems and expertise by modeling the capital investment incentive program on the Efficiency Excellence Network, a network of contractors who deploy other energy efficiency improvements in the state.

EV Readiness incentives can help car dealers absorb some transition costs from selling and servicing ICEs to selling and servicing EVs.

This program can help defray some EV servicing costs, though many dealers would prefer less stringent requirements by manufacturers. They characterized some manufacturer demands on dealerships as excessive (such as requiring three on-site DC Fast Charger ports).

EV Infrastructure Programs

Efficiency Vermont offers significant incentives toward Level 2 chargers for customers who enroll in the time-varying EV rate credit program.

Utility programs subsidizing the installation of EVSE are very popular with EV buyers.

The costs associated with EVSE installation can be significant, especially if the customer is also undertaking other electrification options such as converting from a gas or oil heating system to a heat pump. DUs and EEs reported very high adoption of their EVSE programs, with approximately 65–75% of EV buyers enrolling in the programs with both BED and GMP.

EV buyers face barriers to participation in EVSE incentive programs.

EVSE program administrators noted that obstacles to participation in the EVSE program include the difficulty of installing Level 2 EVSE at multifamily residences, as well as some instances in which a home's layout does not allow the networked Level 2 EVSE to function (such as a large distance between the garage and the Wi-Fi router).

EVSE incentive programs can help dealerships in the transition to selling and servicing EVs.

One dealer noted that while they do not participate in the EVSE incentive program, the vehicle manufacturer has contributed funds to the dealership for certain investments, such as a Level 3 fast charger. Another dealer said they had already planned to install a Level 3 fast charger, but funds from Efficiency Vermont allowed them to complete that installation and reallocate their original funds into supplying their technicians with more information on EVs and installing more chargers around the building. This participant considered programs to help dealerships get started with EV infrastructure installation to be big help.

Market Participant Experience Findings

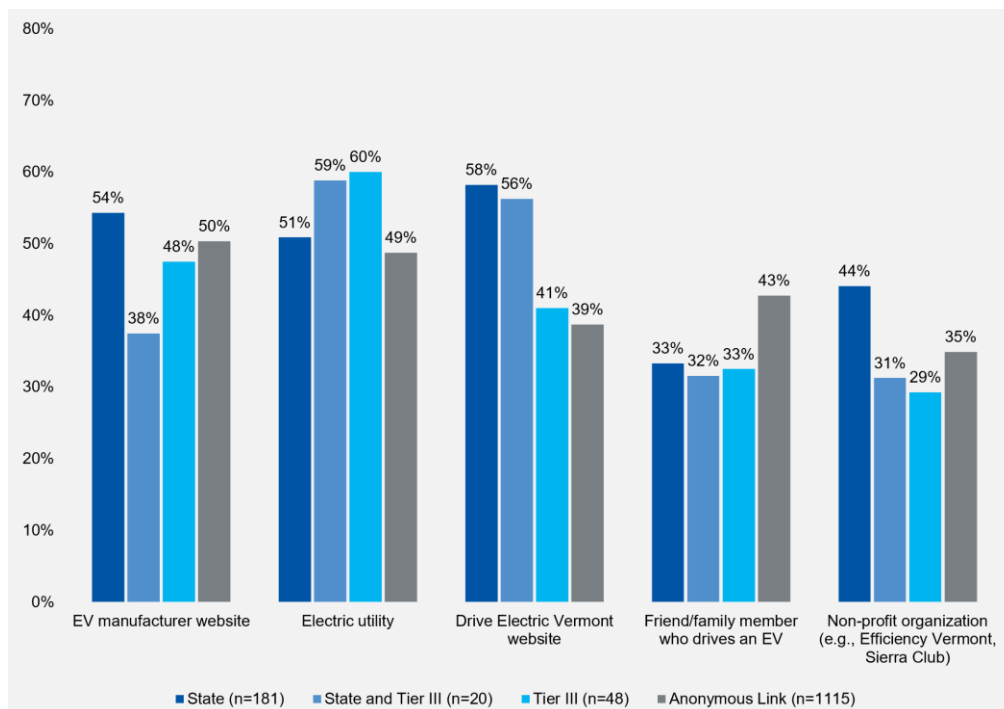
The following findings are based on Cadmus' analysis of the survey responses from EV buyers who received state or DU incentives in 2021 or 2022.

EV Awareness and Motivations

In addition to EV manufacturer websites, the most important sources of information for Vermont EV buyers were the electric distribution utilities and the Drive Electric Vermont websites.

Figure 10 shows the sources of information incentive recipients deemed most important in purchasing an EV. Roughly 50% of buyers identified the EV manufacturer website, the Drive Electric Vermont website, or the DU websites as important. In contrast, only 24% of incentive recipients said car salespeople were an important source of information (not shown), highlighting the need for Efficiency Vermont's dealership education and training programs.

Figure 10. Important Sources of Information in Decision to Choose EV over Gas-Powered Vehicle



Source: Survey question B2: For each source, please rate how important the source's information was in your decision to acquire an electric vehicle (EV) over a similar gas-powered vehicle. Includes the 5 most common sources considered important or very important. (n=1,364)

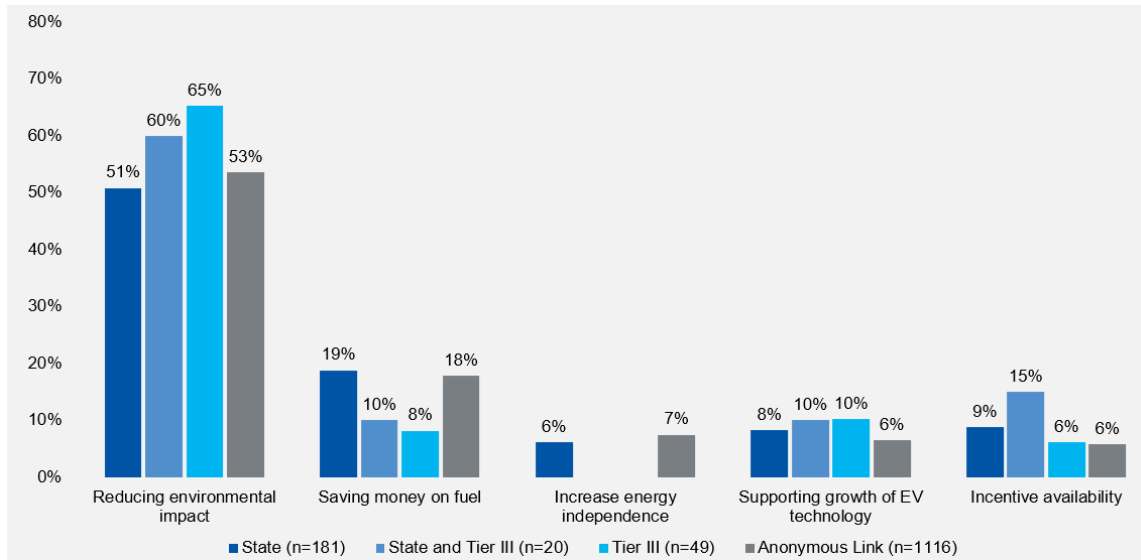
Reasons for buying an EV

By a large margin, incentive recipients reported that their most important reason for buying an EV was to reduce the environmental impact of driving.

As is shown in Figure 11, between 50% and 60% of incentive recipients reported that the most important reason for choosing an EV was reducing environmental impact. Saving money on fuel was the

second-most frequently cited reason for state incentive recipients (20%, n=181) and anonymous link recipients (18%, n=1,116).

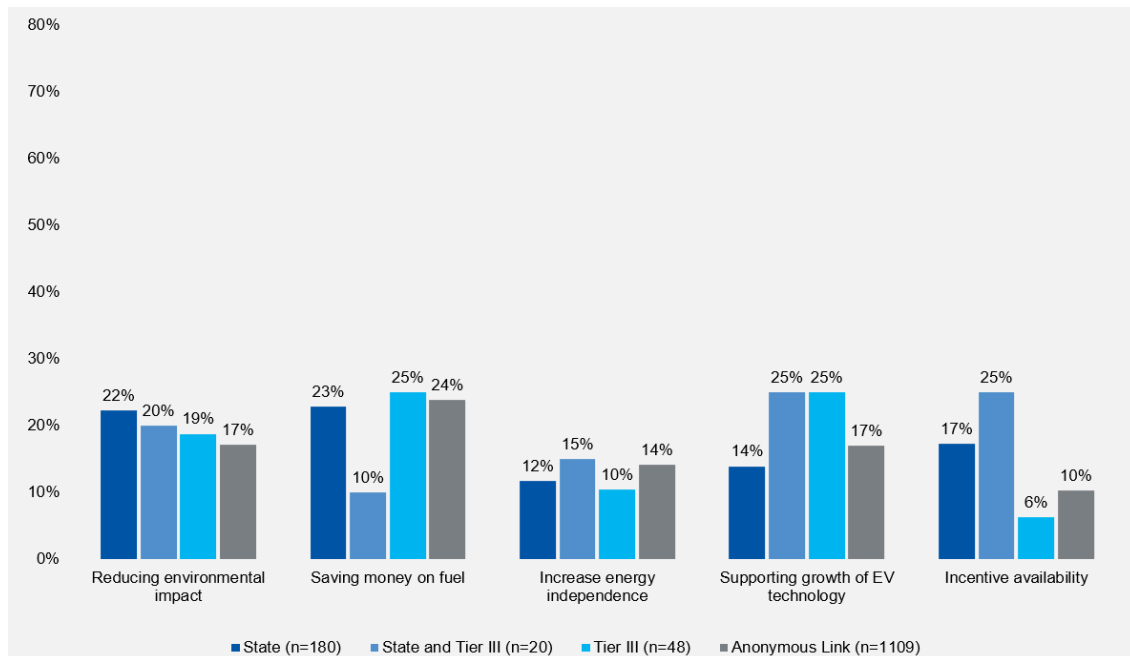
Figure 11: Most Important Reasons for Choosing an EV



Source: Survey question B5: Which of the following best describes the **most important** reason you chose an electric vehicle (EV) rather than a similar gas-powered vehicle? (n=1,366). Includes top five most common reasons.

Figure 12 shows that the second most important reason for choosing an EV was somewhat evenly distributed across the response options. Environmental impacts were the first or second most important reason for between 70% and 80% of EV buyers, depending on the incentive recipient type.

Figure 12. Second Most Important Reasons for Choosing an EV



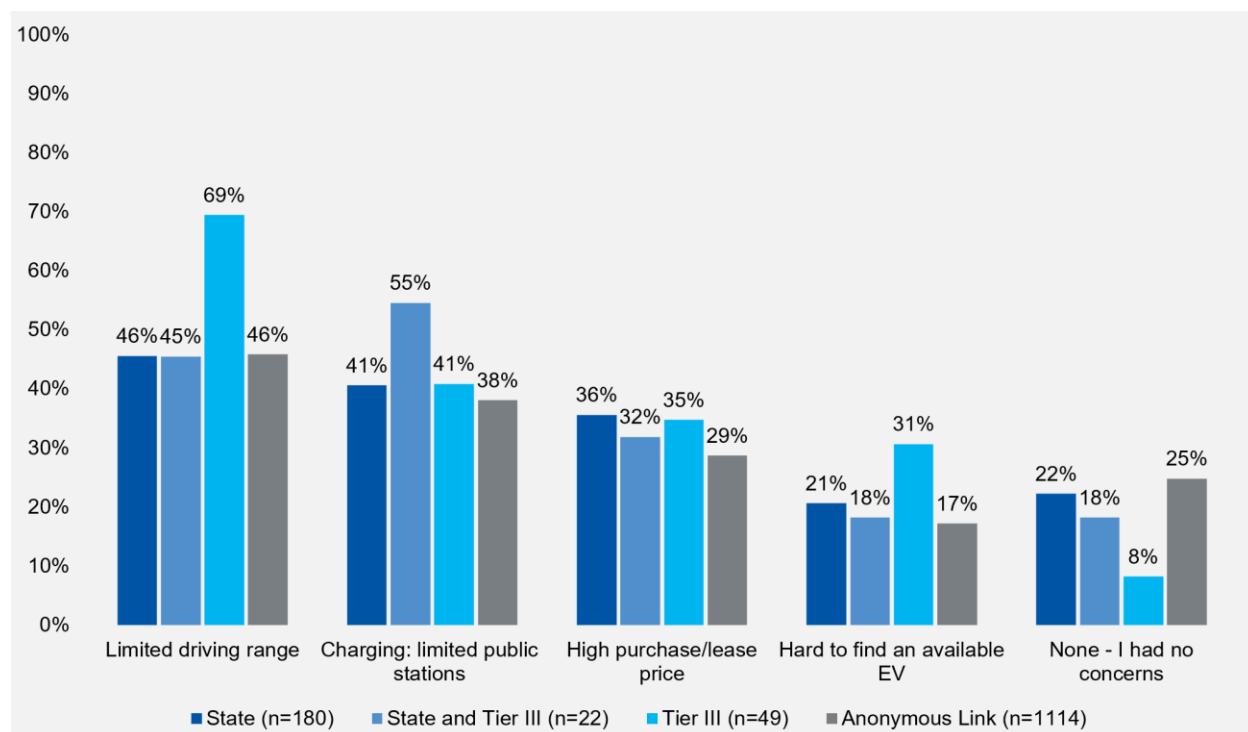
Source: Survey question B6: Which of the following best describes the **second-most important** reason you chose an electric vehicle (EV) rather than a similar gas-powered vehicle? (n=1,357). Includes top five most common reasons.

Barriers to choosing an EV

Anxiety about range and the unavailability of charging infrastructure were the two greatest barriers for EV buyers in Vermont. The upfront cost of EVs was the third largest barrier.

Figure 13 shows the reported barriers to choosing an EV. In general, the largest reported barriers to purchasing an EV were: limited driving range, limited availability of public charging stations, and high purchase/lease price, in that order. Tier III incentive recipients were far more likely than other respondents to report limited driving range as their biggest hesitation when choosing an EV over a gas-powered vehicle (69%, n=49). Respondents who received both the state and Tier III incentives reported the limited availability of public charging stations as their biggest hesitation when buying an EV over a gas-powered vehicle (55%, n=22). The third-greatest barrier was the upfront purchase or leasing prices of EVs, which was cited by about 30%–35% of incentive recipients. About 25% of incentive recipients said they had no concerns and experienced no barriers.

Figure 13. Barriers to Choosing an EV



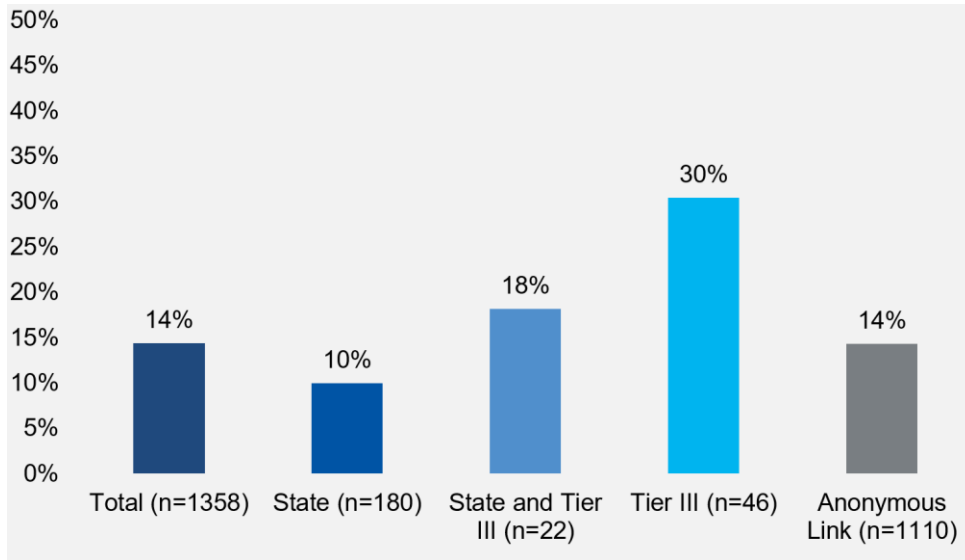
Source: Survey question B7: The following are reasons some people say they would **not** choose an electric vehicle (EV). Which of these, if any, **caused you to hesitate** when choosing an EV over a gas-powered vehicle? If you had no hesitations about choosing an EV rather than a gas-power vehicle, please select “None – I had no concerns”. Includes top five most common reasons for hesitation. (n=1,365)

Vehicle Options Considered

Fewer than 15 percent of EV incentive recipients considered purchasing an ICE vehicle.

Most EV buyers did not consider an ICE vehicle, but Tier III incentive were most likely to have considered one (30%, n=46), followed by respondents who received both state and Tier III incentives (18%, n=20).

Figure 14. Percentage of Respondents Who Also Considered a Conventional Gas Vehicle



Source: Survey question B8: When you shopped for your EV, did you also consider buying or leasing a conventional gas vehicle? Percentage shown is “yes” responses. (n=1,358)

For respondents who said they considered an ICE vehicle, when asked what ICE vehicle they most considered buying, respondents most commonly reported Toyota as the make, Crosstrek AWD or Outback AWD (Subaru) as the model, and 2022 as the year. Many of the alternatives considered were AWD vehicles with relatively low fuel efficiencies.

Table 10. ICE Vehicles Considered by Make, Model, Year

Make (n=180)	Count
Toyota	46
Subaru	33
Honda	19
Ford	13
Model (n=179)	Count
Crosstrek AWD	10
Outback AWD	10
RAV4 Hybrid AWD	8
CR-V AWD	6
Year (n=170)	Count
2019	11
2020	17
2021	46
2022	55
2023	18

Source: Survey questions B10: What was the conventional gas vehicle you most seriously considered buying or leasing? and B11: What year was the conventional gas vehicle you considered buying? Results across all incentive recipient types (state, Tier III, both, anonymous link).

Most EV buyers purchased AEVs; however, about a third purchased PHEVs.

The most common type of EV that incentive recipients reported buying (about 66% of all EVs) was an AEV, as seen in Table 11. Toyota was the most common make, RAV4 Prime 4WD the most common model, 2022 the most common year, and front-wheel drive (FWD) the most common drive train.

Table 11. EVs Purchased by Type, Make, Model, Year, Drivetrain

Type (n=681)	Count
AEV	919
PHEV	470
Make (n=1387)	Count
Toyota	104
Chevrolet	91
Nissan	73
Hyundai	69
Tesla	67
Model (n=1386)	Count
RAV4 Prime 4WD	150
Bolt EV	123
Prius Prime	100
Bolt EUV	88
Kona Electric	64
Year (n=623)	Count
2019	80
2020	163
2021	315
2022	521
2023	164
Drivetrain (n=1298)	Count
Front-Wheel Drive	684
All-Wheel Drive	546
Rear-Wheel Drive	43
4-Wheel Drive	19
Part-time 4-Wheel Drive	6

Source: Survey question B1: Please provide the type and model of electric vehicle did you purchased or leased since 2020. Results across all incentive recipient types (State, Tier III, both, anonymous link). 30 respondents reported purchasing a hybrid vehicle. As conventional hybrids are not eligible for incentives, we assumed they meant PHEV and counted them as such.

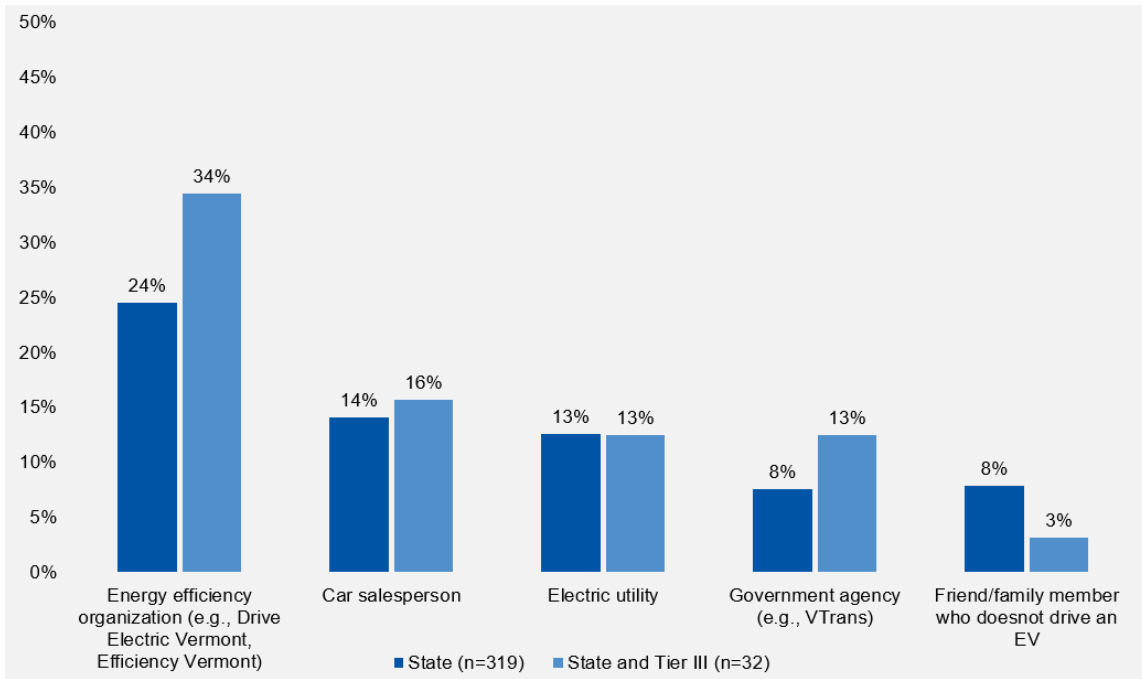
Program Experience and Satisfaction

Awareness of EV Incentives

Energy efficiency program administrators such as Drive Electric Vermont or Efficiency Vermont were the top sources of information about EV purchase incentives from the state. The DUs were the top source of information about Tier III incentives.

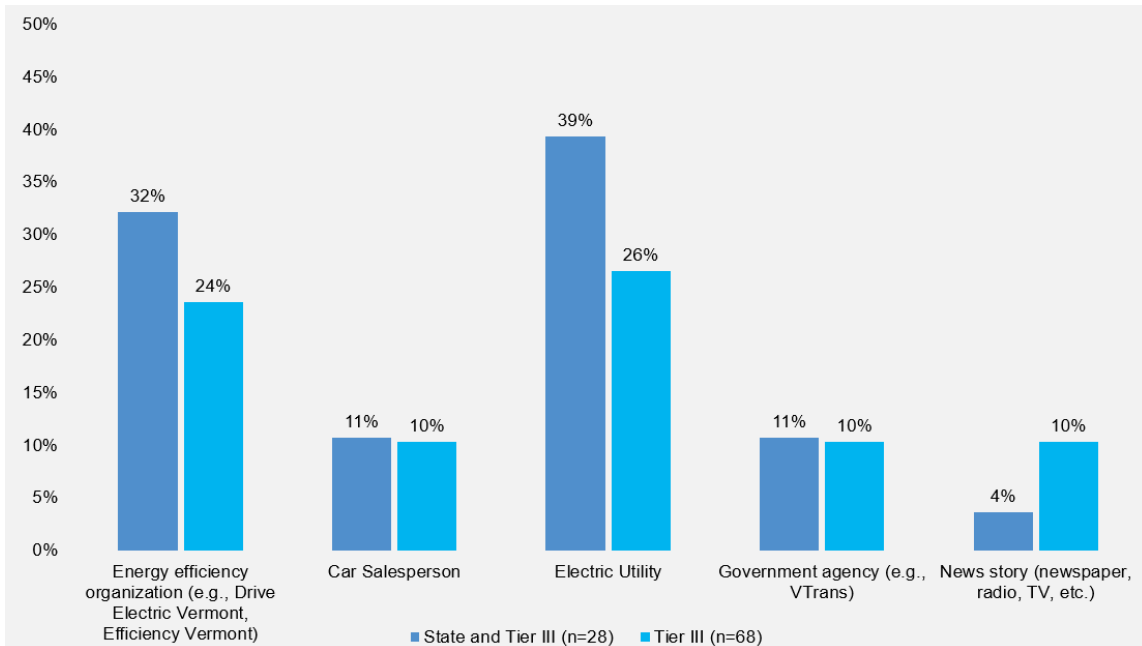
Figure 15 below compares how recipients learned about state incentives. Between 24% and 34% of state incentive recipients learned about the incentives from the energy efficiency organizations, depending on whether the recipient also received a DU incentive. Figure 16 below compares how recipients learned about Tier III incentives. Between 26% and 39% of DU incentive recipients learned about the incentives from the DUs.

Figure 15. How Respondents Learned About State of Vermont Incentives



Source: Survey question C2: How did you first hear about the EV incentive(s) you received from the State of Vermont? (n=351, indicates total responses across all sources). Includes top five sources of information. Respondents only include those for which we had data on type of incentive received. Multiple responses allowed.

Figure 16. How Respondents Learned About Distribution Utility Incentives



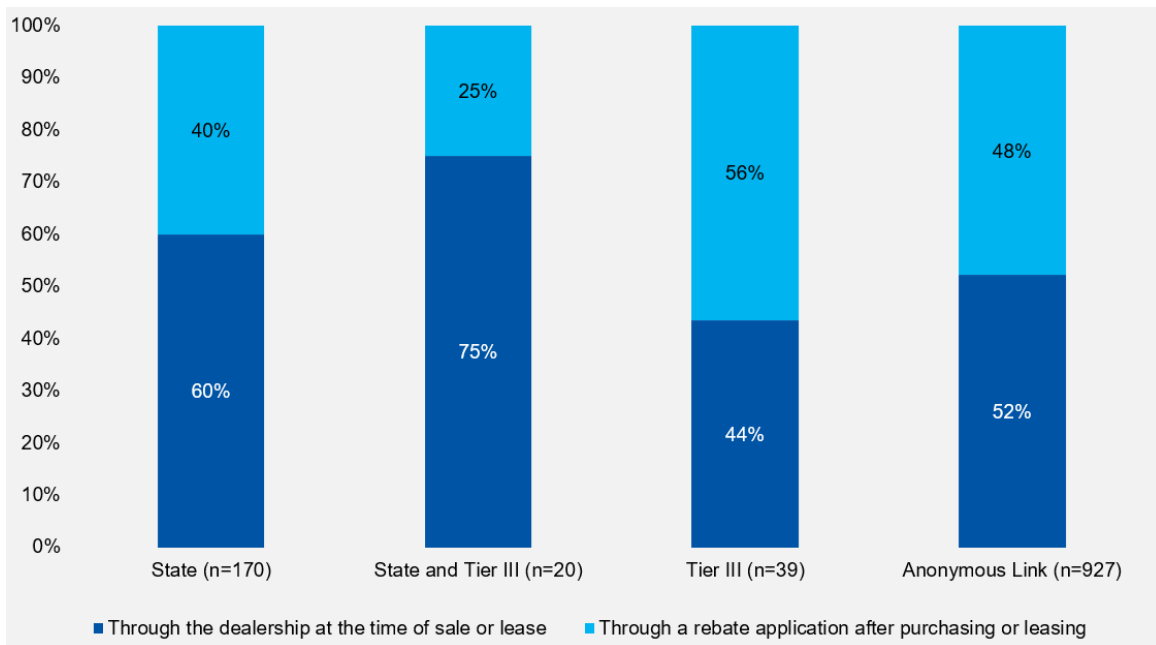
Source: Survey question C2: How did you first hear about the EV incentive(s) you received from your Electric Utility? (n=96, indicates total responses across all sources). Includes top five sources of information. Respondents only include those for which we had data on type of incentive received.

Processing of EV Incentives

About half of all EV buyers received incentives through a post-purchase rebate application, not at the point of sale.

The percentages of EV buyers receiving rebates at the point of sale varied by recipient type. About 75% of recipients of state and Tier III incentives and 60% of state incentive-only recipients received their incentives through the dealership at the time of sale or lease, as Figure 17 shows. However, only about half of Tier III recipients and anonymous incentive recipients received incentives at the point of sale. Across all incentive recipient types, 53% received incentives at the point of sale. As Efficiency Vermont expands the network of Vermont car dealerships that can provide state incentives at the point of sale, the percentage of EV buyers receiving state incentives at the point of sale will likely increase over time.¹⁷

Figure 17. Incentive Delivery Channel



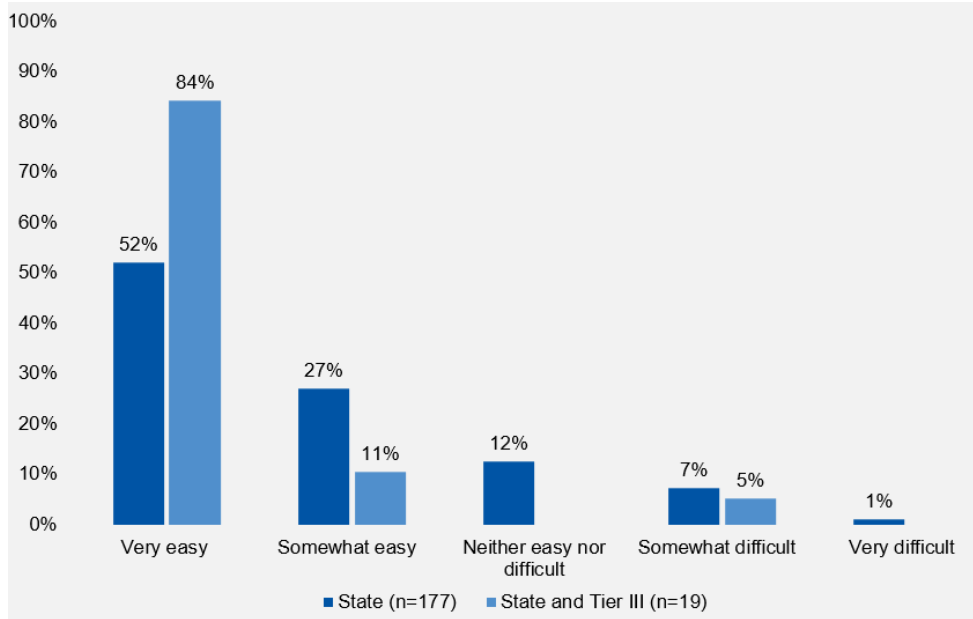
Source: Survey question C1: Did you receive your incentive at a participating dealership at the time of sale/lease or by submitting a rebate application after the sale/lease was completed? (n=1,156)

More than 80% of respondents were satisfied with the state and Tier III rebate application processes and found them easy to navigate.

Together, roughly 80% of all state incentive recipients—including recipients of only state incentives, and recipients of both state and Tier III incentives—said the application process was “very easy” or “somewhat easy.” Roughly half of state incentive-only recipients and more than 80% of state and Tier III incentive recipients said it was “very easy” to apply for state incentives, as seen in Figure 18. A very low percentage of both groups said it was “somewhat difficult” or “very difficult.”

¹⁷ As noted above, there are 51 car dealerships in this network.

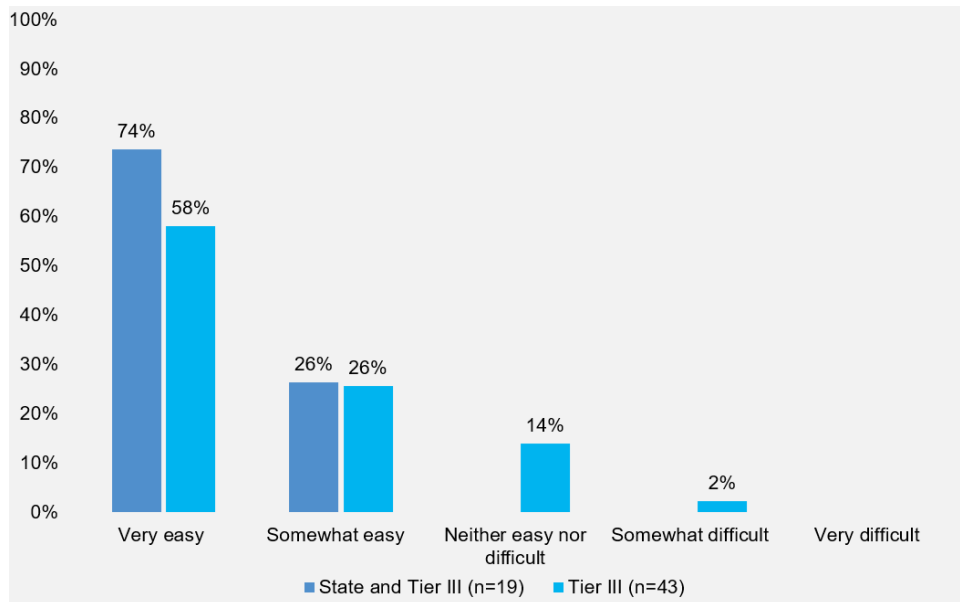
Figure 18. Ease of State of Vermont EV Purchase Incentive Application



Source: Survey questions C15 and C17: How easy was the process of submitting the rebate application for incentive from the State of Vermont? (n=196)

More than 80 percent of state and Tier III incentive recipients and Tier III incentive recipients reported that the application process was “very easy” or “somewhat easy.” As shown in Figure 17 (page 40), Tier III recipients were more likely to have submitted a rebate application through their utility after purchasing or leasing their vehicle, which may explain the higher reported difficulty among Tier III recipients.

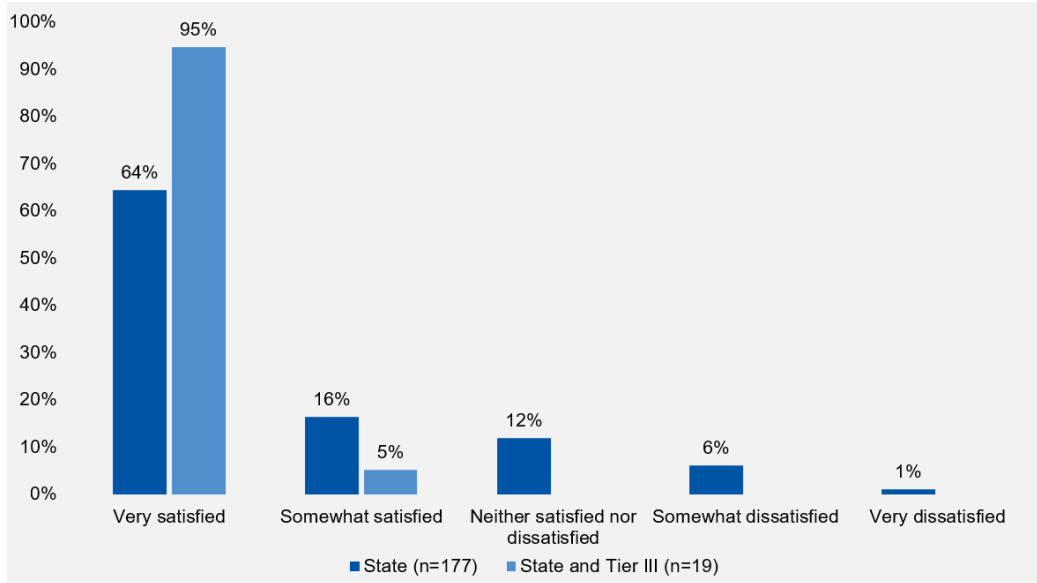
Figure 19. Ease of Tier III EV Incentive Application



Source: Survey questions C16 and C17: How easy was the process of submitting the application for incentive from your electric utility? (n=62)

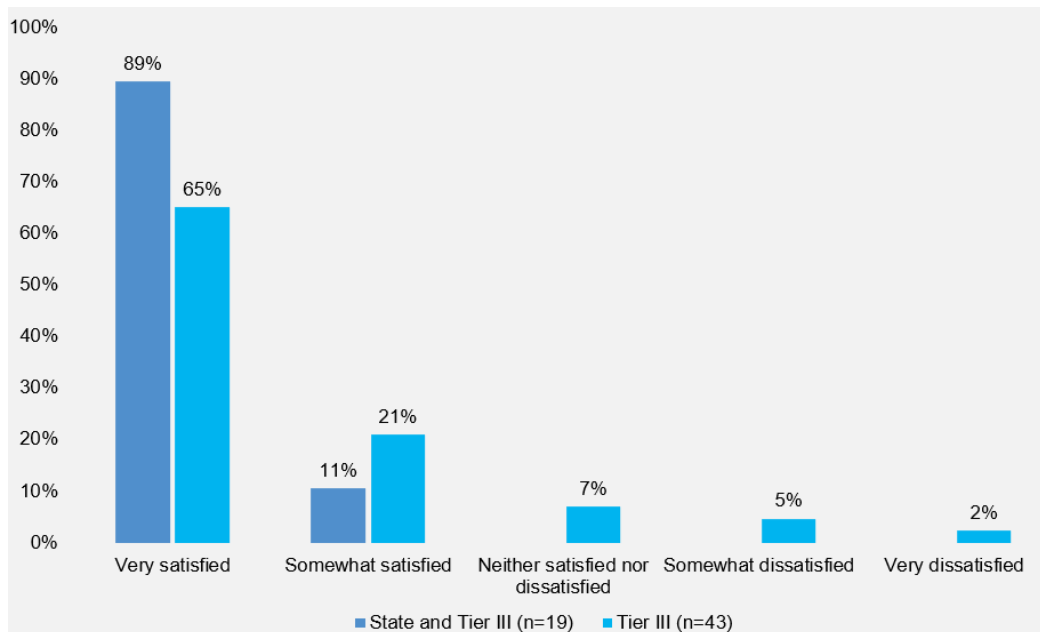
Satisfaction with the state (Figure 20) and Tier III (Figure 21) rebate application processes was high overall, and the percentages of recipients satisfied with the processes mirrored those of recipients who found the application processes easy to navigate.

Figure 20. Satisfaction with State Incentive Application Process



Source: Survey questions C18 and C20: How satisfied or dissatisfied were you with the process of applying for and receiving the rebate from the State of Vermont for purchasing an EV? (n=196). Percentages may not sum to 100% due to rounding.

Figure 21. Satisfaction with Tier III Incentive Application Process



Source: Survey questions C19 and C20: How satisfied or dissatisfied were you with the process of applying for and receiving the rebate from your electric utility for purchasing an EV? (n=62)

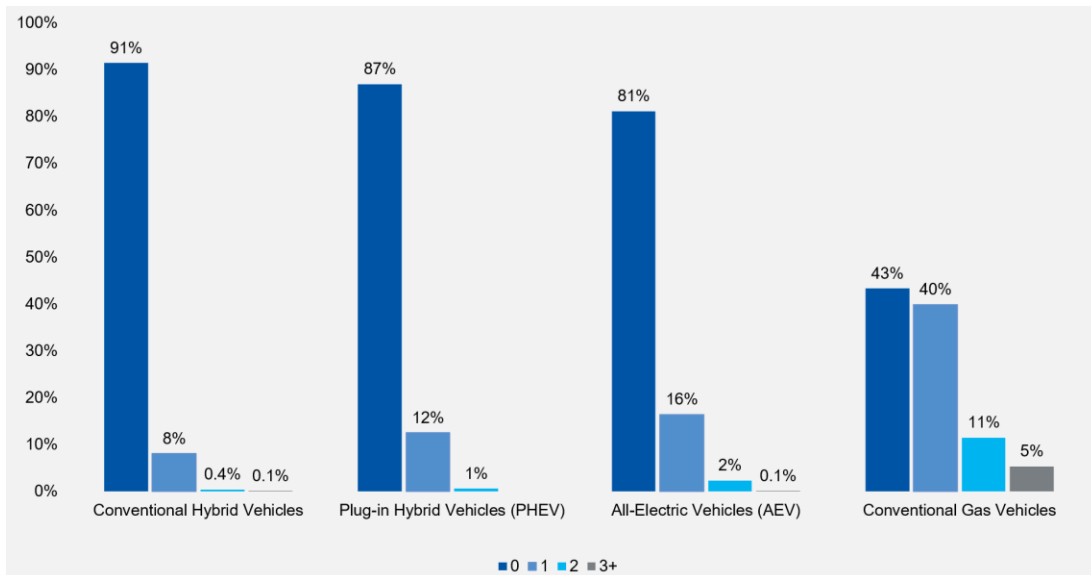
Vehicle Ownership and Driving and Charging Habits

Vehicle Ownership

Many incentive recipients own another fuel-efficient vehicle such as an AEV, PHEV, or a conventional hybrid vehicle.

In addition to the incentivized vehicle, about 8% of incentive recipients owned a conventional hybrid vehicle, 13% owned a PHEV, and 18% owned an AEV, providing more evidence that incentive recipients are mindful of vehicle fuel efficiency and the environmental benefits of electric vehicles.

Figure 22. Number of Additional Vehicles Owned by Type

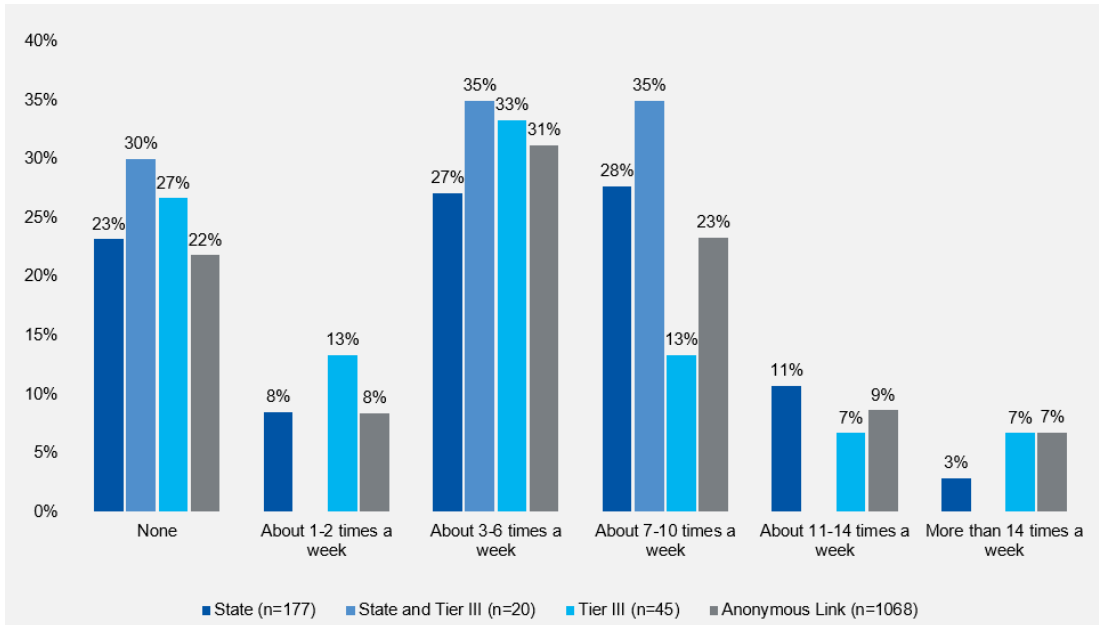


Source: Survey question D1: Excluding the incentivized EV, how many vehicles does your household currently own or lease? (Provides separate entry boxes for each type of vehicle. Percentages are percent of full analysis sample (n=1,561). As some people left boxes blank, Cadmus assumed these respondents had zero additional vehicles of this type.)

Household Driving Habits

As Figure 23 shows, the number of vehicle round trips incentive taken by recipients commuting to a job or school per week was fairly evenly spread across none, 2–6 times per week, and 7–10 times per week.

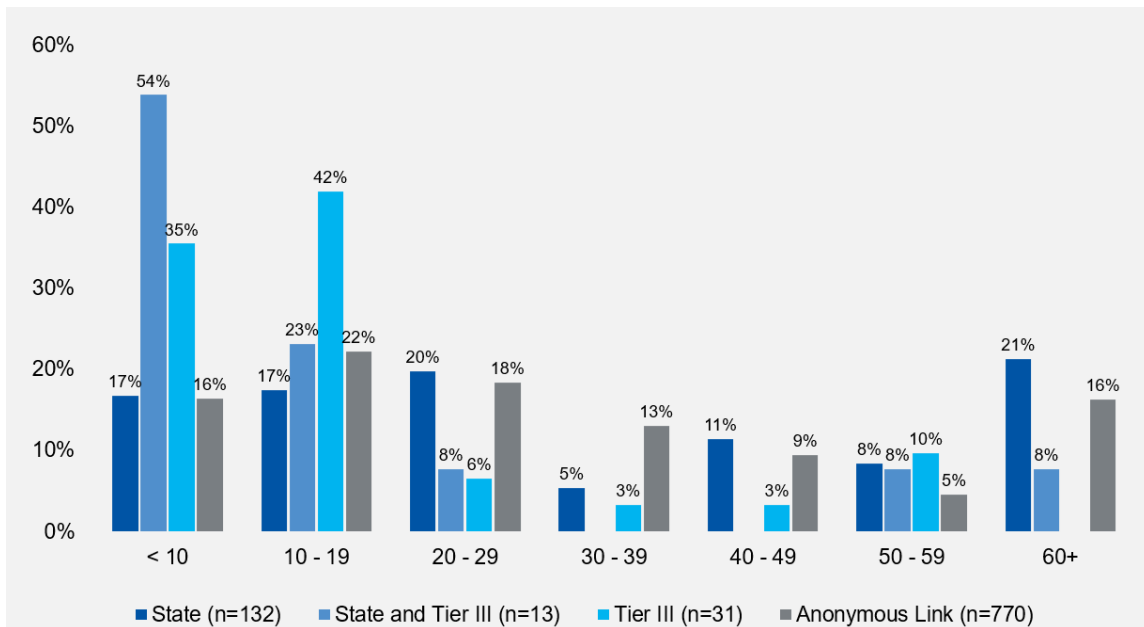
Figure 23. Number of Vehicle Round Trips for Commuting to Job or School Per Week



Source: Survey question D2: How many vehicle round trips do you and others in your household take to commute to a job or school during a typical week? Please count the total number of vehicle round trips. For example, if you commute three times per week and the second member of your household separately commutes four times per week, your household’s total weekly round trips would be seven. (n=1,310)

Respondents most often reported that they did not commute, or commuted 3–6 times per week or 7–10 times per week. Among EV buyers making at least one commute weekly, distances were spread across categories, but shorter round-trip commutes (less than 60 miles) were most common.

Figure 24. Average Roundtrip Commuting Distance

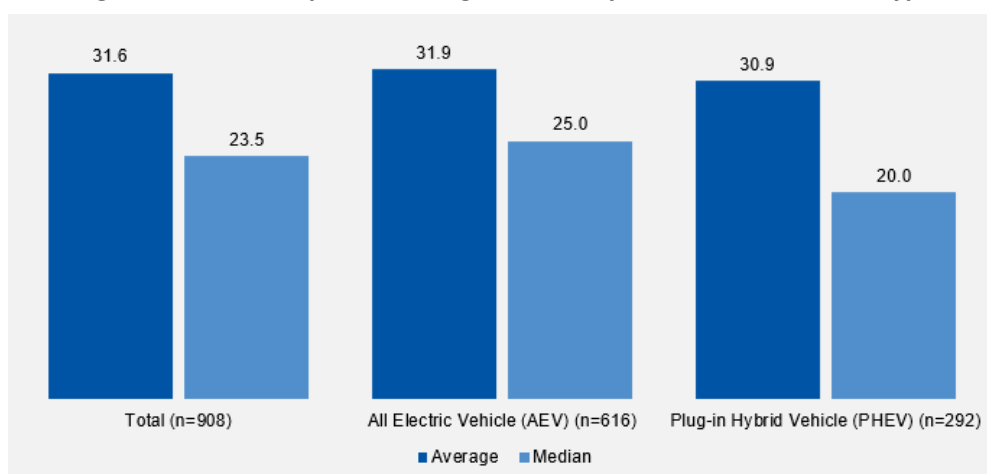


Source: Survey question D3: About how many miles is the average roundtrip commute for your household? (n=946)

Many buyers of PHEVs reported having short round-trip commuting distances, within the battery range of most PHEVs, suggesting a low likelihood that these drivers are operating their vehicles primarily in gas (conventional hybrid) mode.

As Figure 25 shows, the median round-trip commuting distance for incentivized PHEVs is 20 miles (about 20% less than that for AEVs), meaning that at least half of the reported round-trip commutes are possible exclusively using battery power, based on typical battery ranges for today's PHEVs.¹⁸

Figure 25. Roundtrip Commuting Distance by Incentivized Vehicle Type

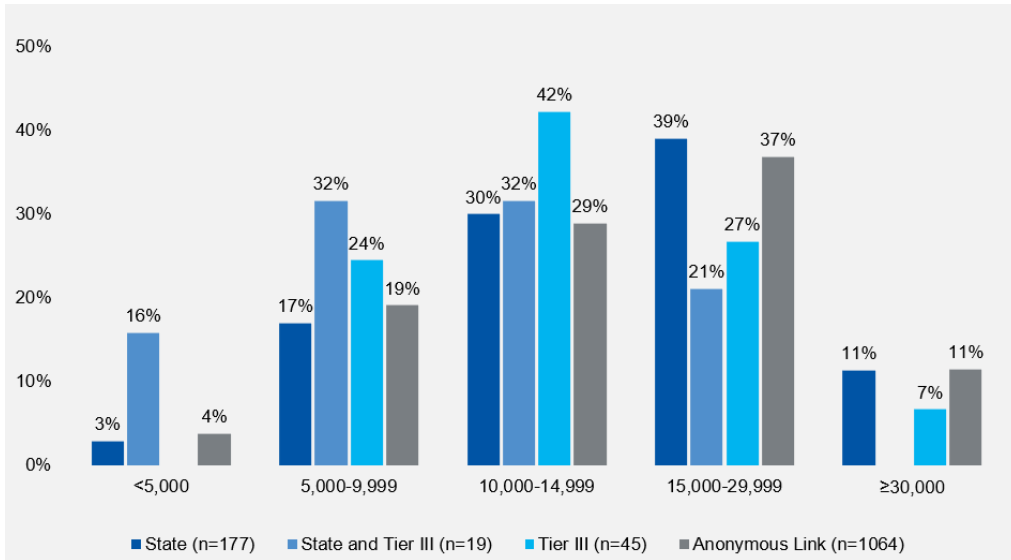


Source: Survey questions B1: Please provide the type and model of electric vehicle did you purchased or leased since 2020. and D3: About how many miles is the average roundtrip commute for your household? Excluded responses indicating roundtrips longer than 200 miles. (n=927).

As shown in Figure 26, just under half of Tier III respondents reported driving between 10,000 and 14,999 miles annually (42%, n=45). Anonymous link respondents (37%, n=1064) and state incentive respondents (39%, n=177) were most likely to report driving between 15,000 and 29,999 thousand miles annually. Just under a third (32%, n=19) of respondents who received both state and Tier III incentives reported driving between 5,000 and 9,999 miles annually.

¹⁸ See "Is a Plug-In Hybrid Vehicle Right for You?" Consumers Reports. February 19, 2023. <https://www.consumerreports.org/cars/hybrids-evs/is-a-plug-in-hybrid-vehicle-right-for-you-a9339147016/> Accessed May 31, 2023.

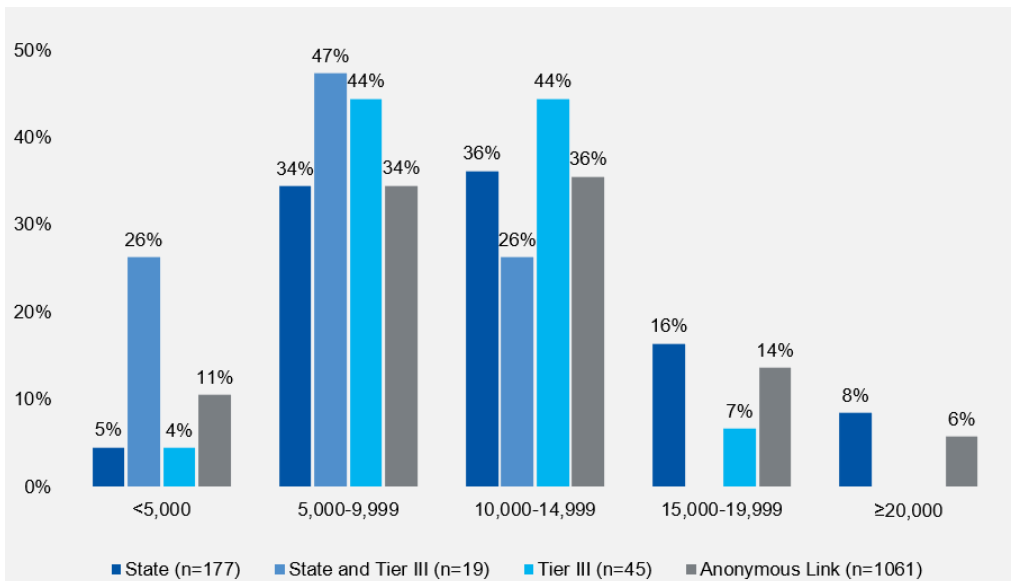
Figure 26. Annual Miles Driven Per Household



Source: Survey question D4: What is your best estimate of the total number of miles your household drives each year? (n=1,305)

Figure 27 shows that most respondents either drove between 5,000 and 9,999 miles annually or between 10,000 and 14,999 miles annually in their incentivized EV. Respondents tended to drive slightly less in their incentivized EV compared to their overall annual driving habits, as shown in Figure 27. Annual Miles Driven in Incentivized EV, possibly because EVs have a shorter driving range than traditional gas-powered vehicles and public charging stations are less readily available.

Figure 27. Annual Miles Driven in Incentivized EV



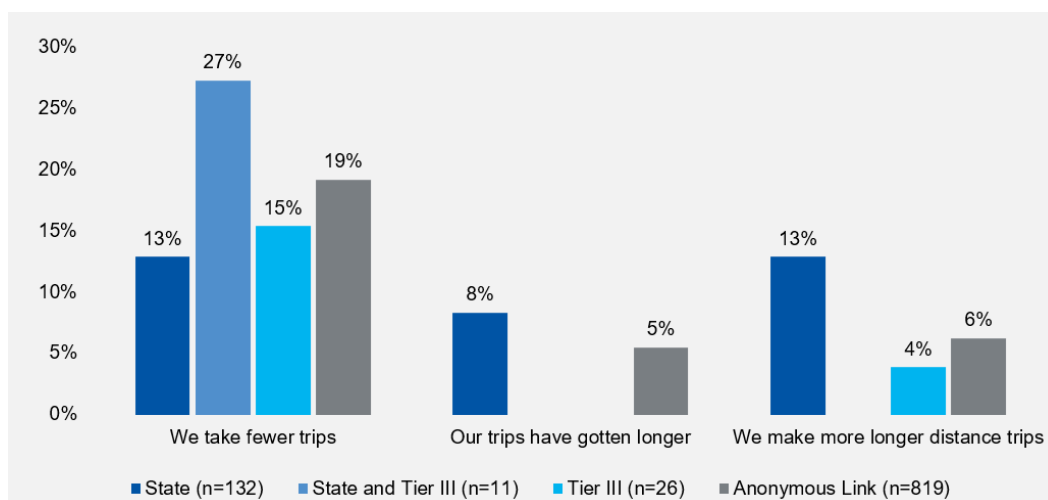
Source: Survey question D5: What is your best estimate of the number of miles your household drives in your incentivized EV each year? (n=1,302)

Based on a back-of-the-envelope calculation, Cadmus estimated incentive recipients drove about 65 percent of their annual household miles in their new EVs.¹⁹

Few incentive recipients reported changing their driving habits since purchasing an EV.

As seen in Figure 28, roughly 19% of respondents reported taking fewer trips since purchasing their incentivized EV.

Figure 28. Changes in Driving Habits Since Purchasing the EV



Source: Survey question D6: How has the purchase or lease of your EV affected your household’s driving habits? Please tell if the following statements are true or false about your household’s driving habits. Percentage shown is percentage of “true” responses. (n=988). Most responses came in the “Other” category so are excluded here. “Other” responses largely fell into these categories: driving habits were unchanged, avoiding longer distance trips with EV, more planning for trips to accommodate range needs and charger locations, and using the EV primarily for local trips.

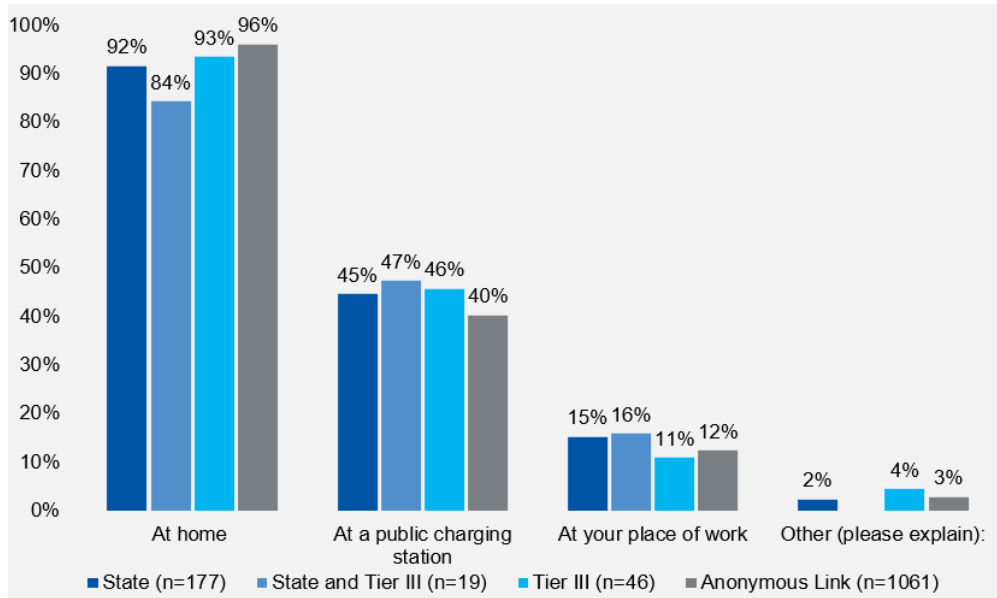
Charging Habits

Most incentive recipients reported that they primarily charge their EV at home.

As seen in Figure 29, the percentage of respondents who reported that they primarily charge their vehicle at home ranged from 84% (state and Tier III, n=19) to 96% (anonymous link, n=1061). The second most reported location was a public charging station.

¹⁹ We performed this calculation by assuming the respondent drove miles equal to the midpoint of the range they selected except for respondents in the two highest ranges. We consolidated the top two ranges in Figure 26 and Figure 27 so the top range in both figures was mileage greater than or equal to 15,000 miles. To calculate average miles driven for households in the top consolidated ranges, we assumed households driving more than 30,000 miles annually drove an average of 40,000 miles and households driving more than 20,000 miles annually in their incentivized EVs drove 30,000 miles annually. We then calculated a weighted average of the mileages for the top two ranges using the shares of households falling in each range.

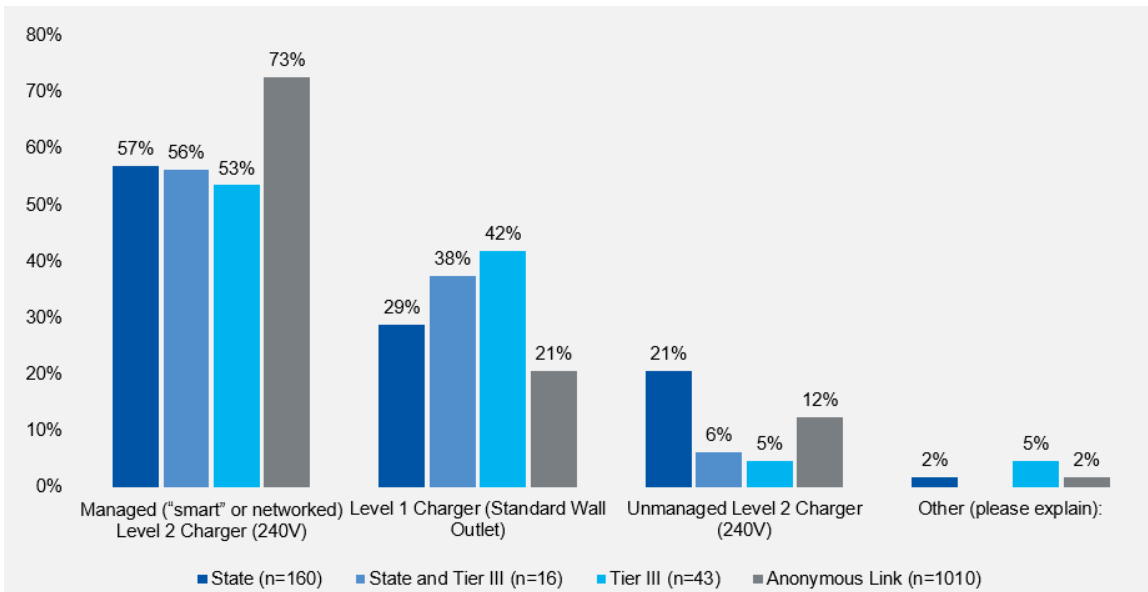
Figure 29. Charging Locations of Incentivized Electric Vehicle



Source: Survey question D7: Where do you charge your incentivized vehicle? Select all that apply. (n=1,303)

Most survey respondents who used a charger at home reported primarily using a managed Level 2 charger, as seen in Figure 30. The second most common choice was a Level 1 charger.

Figure 30. Types of Chargers Used at Home



Source: Survey question D8: What type(s) of charger do you use at home? Select all that apply. (n=1,229)

Electric Vehicle Incentive Attribution

The incentive attribution analysis assessed the impact of Tier III and state incentives on the EV purchases of Vermont residents. Cadmus reports two measures of attribution:

- The percentage of incentive recipients whose purchases were influenced by incentive(s); and

- The percentage of dollars paid to incentive recipients whose purchase decisions were influenced by incentive(s).

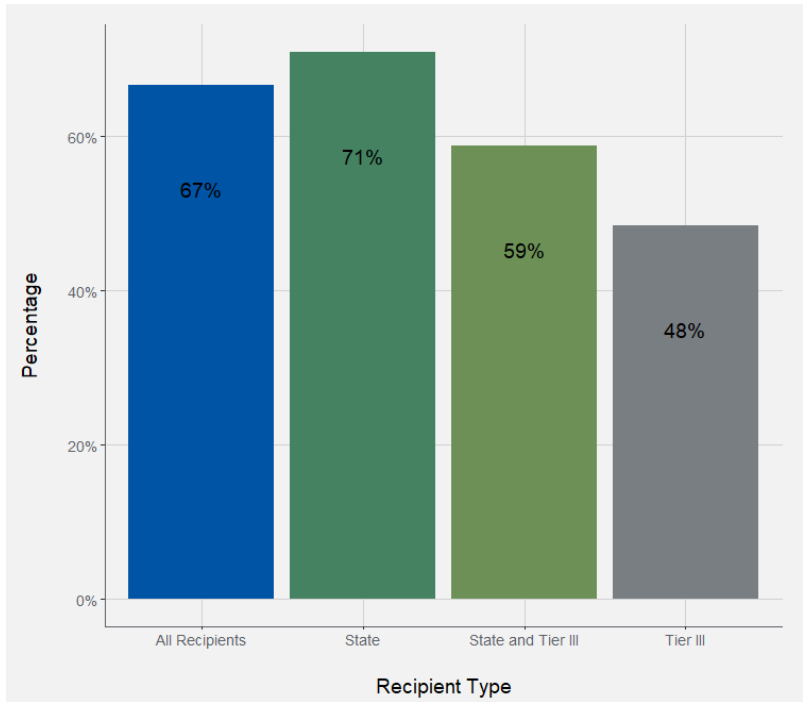
As explained in the Evaluation Objectives and Approach section, as shorthand, we refer to buyers influenced by the incentives as “marginal” and calculate the percentage of marginal EV buyers by *incentive recipient type* (only received state incentive, only received Tier III incentive, or received state and Tier III incentives) as well as by *incentive type* (received a state incentive, or received a Tier III incentive). The “percentage of incentive dollars paid” metric provides an upper bound estimate for the influence of incentives, because an incentive smaller than the one received could have also influenced the EV buyer’s decision. For example, a marginal EV buyer who received a \$4,000 incentive may have been similarly affected by a \$3,000 incentive.

Marginal Incentive Recipients

Figure 31 and Figure 32 show, respectively, the percentage of EV incentive recipients who said the incentives influenced their purchase decisions, organized by incentive recipient type and incentive type. The main takeaways are:

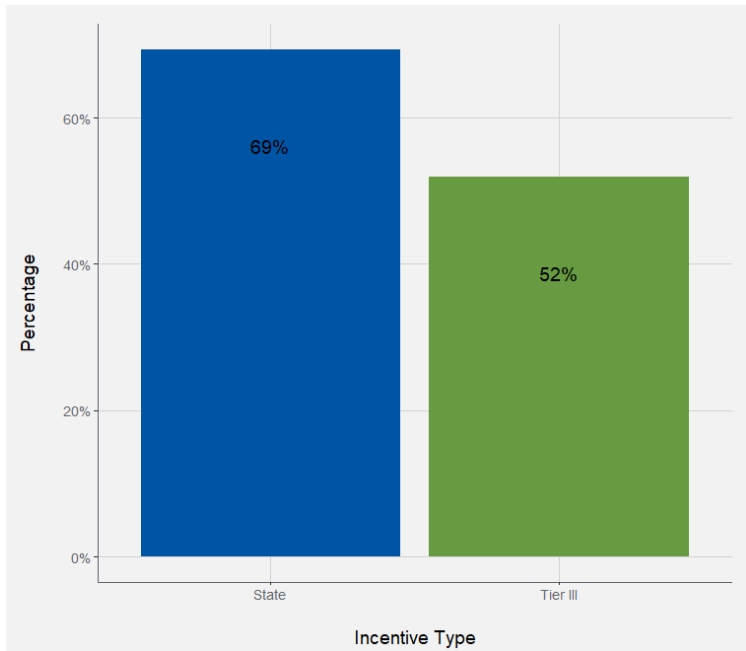
- About 67% of recipients said the state incentive, Tier III incentive, or state and Tier III incentives affected their purchase decision (Figure 31).
- As expected, the percentage of marginal EV buyers was higher for state incentives only recipients (71%) than for Tier III only recipients (48%), likely due to the larger amounts of the state incentives (Figure 31).
- More than half (52%) of Tier III or state and Tier III recipients said the Tier III incentive affected their purchase decision (Figure 32).

Figure 31. Marginal Incentive Recipients by Recipient Type



Notes: Percentages of EV incentive recipients by recipient type who said the state or DU incentive(s) affected their purchase decisions. Results based on analysis of 222 incentive recipients.

Figure 32. Marginal Incentive Recipients by Incentive Type



Notes: Percentages of EV incentive recipients by incentive type (state or DU) who said the incentive(s) affected their purchase decisions. Results based on analysis of 222 incentive recipients.

Regression Results

State incentives and some Tier III incentives are dependent on household income. More incentive dollars are available to households with lower incomes, in recognition of the high upfront costs of electric vehicles and that higher income households are better able to afford them. However, from an evaluation perspective, this difference can make it difficult to isolate and quantify the effect of incentives on EV purchases. Households that receive the largest incentives are also the least able to afford EVs, making it difficult to disentangle the effects of the incentive and income.²⁰

Table 12 shows results from OLS regressions of the marginality of EV incentive recipients that control for household income and that are intended to disentangle the effects of income and incentives. The dependent 0–1 indicator variable represents whether the incentive(s) were marginal. The independent 0–1 indicator variables represent incentive recipient type (Tier III only, state only, Tier III and state), 0–1 indicator variables for household income, and 0–1 indicators for incentive amount.²¹

Table 12. Regression Models of the Influence of EV Incentives

	Model 1	Model 2	Model 3	Model 4
Intercept	0.709*** (0.035)	0.588*** (0.054)	0.643*** (0.058)	0.715*** (0.083)
State & Tier III	-0.121 (0.128)		-0.058 (0.122)	-0.097 (0.126)
Tier III only	-0.224** (0.095)		-0.198** (0.099)	-0.171 (0.134)
Low Income		0.326*** (0.072)	0.307*** (0.074)	0.278*** (0.077)
Middle Income		0.049 (0.079)	0.003 (0.081)	-0.011 (0.082)
Total incentive < \$2,000				-0.093 (0.115)
\$2000 ≤ Total incentive < \$4000				-0.086 (0.081)
Adj R2	0.022	0.055	0.065	0.061
N	222	189	189	189

Notes: Dependent variable equals 1 if the incentive(s) affected the incentive recipient's vehicle purchase decision and equals 0 otherwise. All models estimated by OLS. Heteroskedasticity robust standard errors in parentheses. Asterisks indicate an estimate's statistical significance at a specified level: *** = 1%, ** = 5%, * = 10%. Omitted categories are Only Received a State Incentive, High Annual Household Income (≥\$100,000), and total incentive amount ≥ \$4,000.

²⁰ If we measured the effect of incentives by looking only at low-income households, we might wrongly conclude the incentive is less effective at increasing EV purchases than it is, because these households cannot afford the vehicles even with the incentives. If we measured the effect of incentives by looking only at high-income households, we might wrongly conclude that the incentive is more effective than it is, because these households can afford the vehicles without the incentives.

²¹ Low-income households had annual income less than \$50,000, middle-income households had income between \$50,000 and \$99,999, and high-income households had income greater than or equal to \$100,000.

Model 1 replicates the results shown in Figure 31. The intercept (0.709) shows the percentage of marginal EV incentive recipients among recipients who only received a state incentive (the omitted category). The coefficients on state and Tier III recipients and Tier III-only recipients show the percentage of these recipient types who were marginal relative to state-only recipients. For example, the percentage of marginal state and Tier III recipients was about 59% ($0.709 + -.121$). Model 2 shows the results by the recipient's self-reported income for the subsample of survey respondents who reported their incomes ($n=189$). Model 3 shows the results by recipient type when controlling for household income. Model 4 shows results by income type controlling for household income and the incentive amount.

The main takeaways of this analysis are as follows:

- The estimates of marginality by incentive recipient type are robust to the inclusion of controls for household income. In Model 3, about 64% of state-only EV incentive recipients reported the incentive influenced their purchase decision. There is no statistically significant difference between state-only and state and Tier III incentive recipients in the percentage marginal. About 44% of Tier III-only incentive recipients said the incentive influenced their purchase decision. This result is approximately equal to the percentage for Tier III-only recipients not controlling for income (Model 1).
- The results are also robust to the inclusion of controls for the incentive amount. After conditioning on income and the incentive amount (Model 4), the percentages of marginal incentive recipients are essentially unchanged.

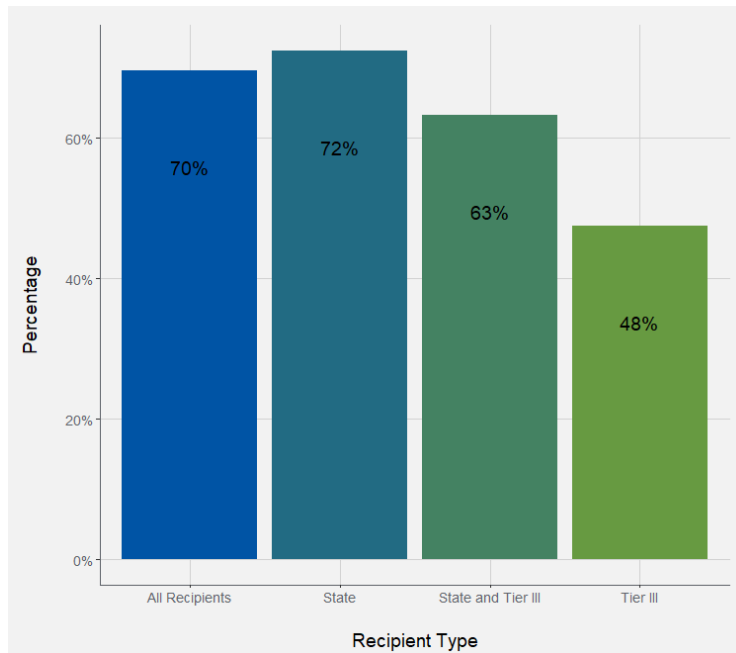
We address the impacts of household income on the marginality of incentives below.

Marginality of EV Incentive Amounts

Figure 33 and Figure 34 show, respectively, the percentage of EV incentive dollars paid to recipients who reported that incentives influenced their purchase decisions. The main takeaways from this analysis are:

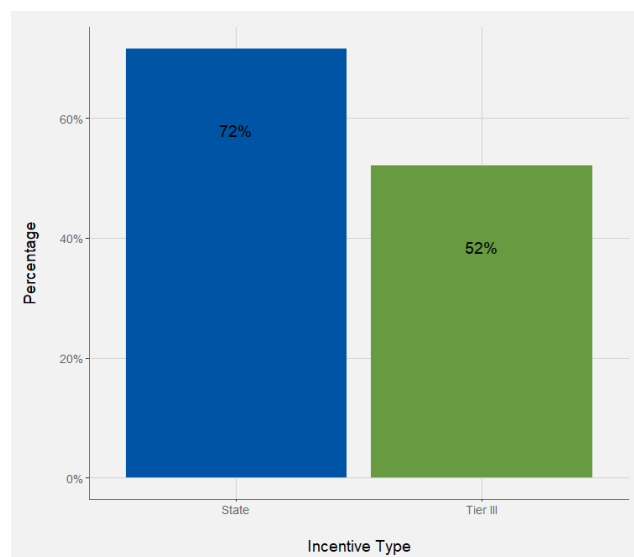
- The percentage of incentive dollars paid to marginal EV buyers was slightly higher than the percentage of marginal incentive recipients, suggesting that larger incentives impacted purchase decisions more than smaller incentives.
- About 70% of all incentive dollars went to respondents who said incentives affected their purchase decisions.
- About 69% of all state incentive dollars went to respondents who said the state incentives affected their purchase decisions.
- About 52% of all Tier III incentive dollars went to recipients who said the Tier III incentives affected their purchase decisions.

Figure 33. Marginal Incentive Dollars by Recipient Type



Notes: Percentage of EV incentives given to recipients whose purchase decisions were affected by the incentives by recipient type. Results based on analysis of 222 incentive recipients.

Figure 34. Marginal Incentive Dollars by Incentive Type

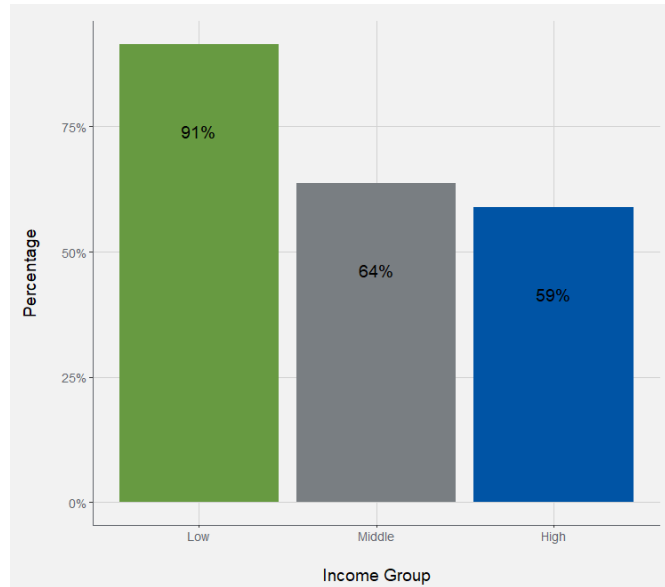


Notes: Percentage of EV incentives given to recipients whose purchase decisions were affected by the incentives by recipient type. Results based on analysis of 222 incentive recipients.

Marginal Incentives by Household Income

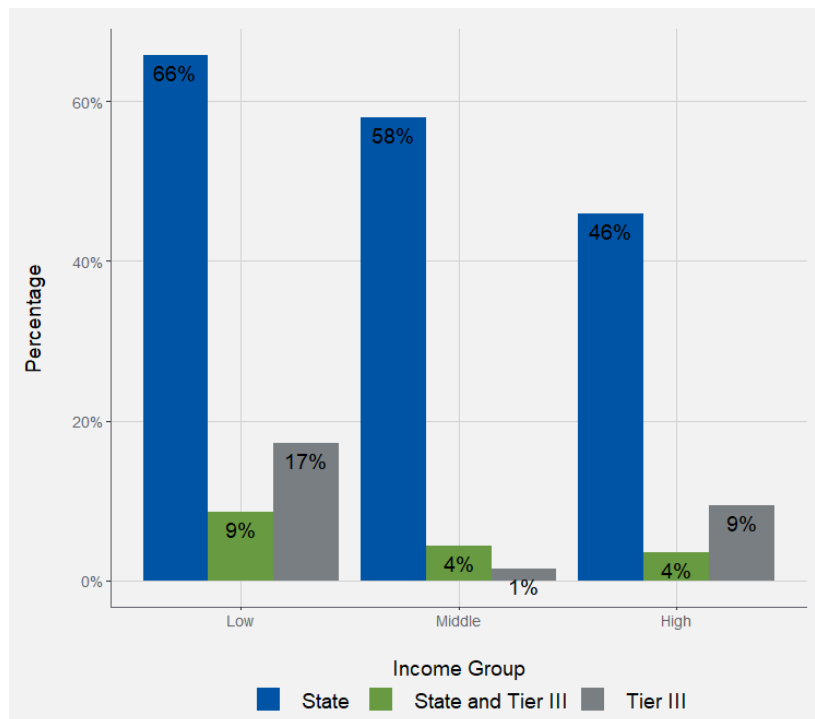
Cadmus also investigated the effects of state and Tier III incentives across household income levels. Figure 35 shows the percentage of incentive recipients whose purchases were affected by the incentives for low-, middle-, and high-income households. Figure 35 separates the incentive impacts and shows that incentives made a bigger difference for low- income than middle- and high-income households.

Figure 35. Marginal Incentive Recipients by Household Income



Notes: Percentages of EV incentive recipients by household income who said the incentive(s) affected their purchase decisions. Results based on analysis of 222 incentive recipients. Low-income recipients had incomes below \$50,000, middle-income recipients had incomes between \$50,000 and \$99,999, and high-income households had incomes greater than or equal to \$100,000.

Figure 36. Marginal Incentive Recipients by Household Income and Type



Notes: Percentages of marginal EV incentive recipients by incentive recipient types. For example, 66% of low-income incentive recipients were marginal and only received a state incentive, 9% were marginal and received a state and Tier III incentive, and 17% were marginal and only received a Tier III incentive. Results based on analysis of 189 incentive recipients who reported their income. Low-income recipients had incomes below \$50,000, middle-income recipients had incomes between \$50,000 and \$99,999, and high-income households had incomes greater than or equal to \$100,000.

The main takeaways were as follows:

- About 91% of low-income respondents (annual income < \$50,000) said a Tier III, state, or Tier III and state incentive(s) affected their purchase decisions.
- Only 64% of middle-income households (\$50,000<=annual income<100,000) and 59% of high-income households (annual income ≥ \$100,000) said the state or Tier III incentives affected their purchase of an EV. If the threshold for defining high-income households is increased to \$150,000, the results are mostly unchanged (54% of high-income households indicated the incentives mattered).
- Incentives of both types (state and Tier III) mattered more to low-income households than middle- and high-income households. About 19% of marginal low-income households only received a Tier III incentive (which tends to be smaller), whereas just 1.5% and 15% of middle- and high-income marginal incentive recipients only received a Tier III incentive.

Discussion

Overall, the attribution results suggest EV incentives had large effects on the purchase decisions of Vermont households and lifted EV sales. The large impact of incentives suggests that demand for EVs is strongly price-elastic (i.e., sensitive to price), at least for Vermont households eligible for the incentives.

However, important differences emerged between incentive types (Tier III and state) and recipient types (Tier III, state, or state & Tier III). State incentives, which tended to be larger, had a bigger effect on purchase decisions, consistent with the notion of highly price elastic demand for EVs. In addition, the incentives had much larger impacts for low-income than middle- and high-income households. Muehlegger and Rapson (2018) similarly found a large effect of purchase subsidies on EV purchases for California low- and middle-income households.²² They estimate a price elasticity of demand of -3.9, implying a subsidy representing 10% of vehicle purchase price increased demand for EVs by 39%. In a subsequent paper, the authors (Rapson and Muehlegger 2022) perform a back-of-the envelope calculation showing that 64% to 77% of non-Tesla EV purchases in California can be attributed to federal and state purchase incentives.²³

However, Figure 14 illustrates one important caveat to the finding that Vermont incentives influenced EV purchases: most incentive recipients (about 85%) said they did not consider a conventional vehicle when shopping for a vehicle. This finding suggests that incentives are not causing vehicle buyers to switch from ICE vehicles to EVs, but simply accelerating EV purchases that would happen eventually even without incentives. Accelerating EV purchases might avoid tailpipe emissions from continued use of an existing conventional vehicle, but it will not have the same vehicle lifetime effect on emissions as

²² Muehlegger, Erich and David Rapson (2018). "Understanding the Distributional Impacts of Vehicle Policy: Who Buys New and Used Alternative Vehicles?" [UC Davis: National Center for Sustainable Transportation. https://escholarship.org/uc/item/0tn4m2tx.](https://escholarship.org/uc/item/0tn4m2tx)

²³ Rapson, David and Erich Muehlegger (2023). "The Economics of Electric Vehicles." National Bureau of Economic Research working paper 29093.

causing a would-be buyer of an ICE vehicle to switch to an EV. Phase II of this research will investigate more thoroughly whether and how the absence of subsidies would have delayed EV purchases.

Our research suggests that governments and other agencies promoting residential transportation electrification should focus first on building public EV charging infrastructure and then shift their attention to encouraging EV adoption through purchase incentives. Vermont incentive recipients reported the biggest barriers to adoption were range anxiety and a lack of public charging infrastructure. We also provide evidence that incentive recipients in our survey sample were early adopters for whom the economics of EVs matter less than the beneficial environmental impacts and that the likely effect of the EV incentives was to accelerate the purchases of EVs that would have occurred in the future without incentives. Our findings are consistent with those of Springel (2021), which found subsidies for charging infrastructure had twice the effect on vehicle adoption as purchase incentives, especially early in the development of EV markets.²⁴ As Vermont's market for EVs matures, we expect more consumers to consider buying EVs or ICE vehicles, the economics of EVs to matter more in their decisions, and the incentives to have larger effects. This research suggests future policymakers and incentive program administrators should consider the changing nature and importance of barriers to technology adoption and that incentive programs may need to evolve to meet the changes in the market.

Limitations of the Survey-based Attribution Approach

Our survey-based approach for assessing attribution has several limitations that we wanted to acknowledge.

- Our research reaches conclusions about Vermont EV policies at the early stage of development of Vermont's market for EVs. The conclusions may not apply to later stages.
- We asked consumers to consider a counterfactual scenario and to report the impacts of the incentives. Consumers may not be very good at assessing counterfactuals and predicting what they would have done if they had not received the incentives.
- All respondents in our sample received incentives from the state or their DUs, and they may feel pressure (possibly subconsciously) to provide answers that justify the programs.
- The EV incentive amounts are not random. They are adjusted for household income levels and the type of vehicle purchased. Means-testing makes it hard to disentangle the effect of income from the incentive and to use the results to construct counterfactuals for alternative incentive amounts.
- This analysis only studies EV buyers who received incentives. We did not survey buyers of ICE vehicles or prospective vehicle buyers. We did not assess the impact of the incentives on the overall market for vehicles, i.e., what percentage of all vehicle buyers purchased an EV because of the incentives.

²⁴ Springel (2021). "Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives." *American Economic Journal: Economic Policy* **13** (4), pp. 393-432.

Future Research

Additional future research will provide further opportunity to assess the impacts of state incentive, Tier III incentive, and Act 151 programs on the vehicle purchase decisions of Vermont residents. Importantly, the Phase II research will more thoroughly assess the impacts of the EEU Act 151 programs on transforming the market for EVs.

The following questions raised by the Phase I research about Vermont's EV incentive and market transformation programs could be addressed in Phase II or subsequent research:

EV Buyers

The market for EVs in Vermont is still in the early stages and the market is changing rapidly.

- Have the demographic and socio-economic characteristics of EV buyers changed since the Phase I research was conducted?
- Have the motivations of EV buyers changed?
- Have actual or perceived barriers to purchasing EVs changed?

Non-EV Buyers

The Phase I research only surveyed EV incentive recipients but not recent buyers of ICE vehicles or prospective EV or ICE buyers.

- What is the awareness of ICE and prospective vehicle buyers of Vermont and DU EV incentives?
- How did prospective vehicle buyers learn about the incentives?
- What factors affect the purchase decisions of ICE and prospective vehicle buyers?
- What are the barriers to purchasing EVs for this group?
- Do these factors differ from those affecting EV buyers?

EV Incentive Impacts

The Phase I research suggested that the incentives accelerated the purchases of EVs but did not cause buyers to switch from ICE vehicles to EVs.

- Has the impact of EV purchase incentives changed as the market has grown? Do the incentives cause some buyers to switch from ICE vehicles to EVs?
- If incentives accelerate the purchase of EVs, by how much are the purchases accelerated? One year? Two years?

Information to inform GHG Emissions Impact Calculations

A key objective of the Vermont and DU incentive and Act 151 programs is to accelerate the transformation of the market for personal automobiles and the transition from fossil fuels to clean power. A future, separate study will estimate the impacts of these programs on GHG emissions. Quantifying the programs' impacts on GHG emissions requires information on EV buyers' driving and charging behaviors. Future research should survey EV buyers about the following:

- Where and when EV buyers charge their vehicles?
- How do vehicle miles traveled change after buying an EV?
- How does buying an EV affect the vehicle miles traveled for other vehicles owned by the household? Did buying an EV result in the sale of any vehicles owned by the household?

Act 151 Program Impacts

The Phase I research documented the implementation of the Act 151 programs in 2021 and the first half of 2022. Future research should document the subsequent implementation and evaluate the market transformation impacts of the programs. Future research should address these questions:

- What barriers in the market for EVs do the Act 151 programs address?
- What were the impacts of the Act 151 programs on prospective buyer and dealership salesperson awareness and knowledge of EVs? What are the biggest misconceptions about EVs among prospective buyers and dealers?
- Why do dealerships participate in Act 151 programs?
- How have Act 151 program goals and implementation evolved, if at all, since the Phase I research?
- How did Act 151 programs better prepare dealerships to sell EVs?
- What impact did dealership salesperson EV incentives have on EV sales?

Appendix A. Attribution Analysis Coding of Survey Responses

Through the surveys, Cadmus asked incentive recipients how likely they would have been to purchase an EV if they had not received the incentive(s). If a household says they “definitely” or “very likely” would have purchased an EV, we concluded the incentive likely did not influence the purchase decision. In the context of Figure 6, the respondent would be one of v_0 “inframarginal” buyers who would have purchased an EV in absence of the subsidy. If they say, “Somewhat likely,” “Not likely,” or “Definitely Not,” we can conclude the incentive likely influenced the purchase decision. These are “marginal” buyers.

We coded the survey data about the impacts of the incentives on incentive recipient purchase decisions as follows:

1. Code variable(s) for whether the incentive(s) was marginal or not for each respondent and what the marginal incentive amount was for each respondent.

-*Tier3Marginal*: = “1” if the Tier 3 incentive was marginal; = “0” if the Tier 3 incentive was not marginal; = “.” if the respondent did not receive a Tier 3 incentive.

-*StateMarginal* = “1” if the State incentive was marginal; = “0” if the state incentive was not marginal; = “.” if the respondent did not receive a state incentive.

-*Marginal Incentive*: = “Tier 3” if the Tier 3 incentive was marginal, = “State” if state incentive was marginal, = “Tier 3 + State” if the combined incentives were marginal, = “None”, otherwise.

-*Marginal Incentive Amount* (\$): = the minimum incentive amount that influenced the purchase decision. If neither incentive was marginal, the marginal incentive amount = \$0.

2. Logic for Coding Marginal Incentive Variables

- a. For customers who received only one incentive:
 - i. The incentive was marginal if the respondent reported he or she was “somewhat likely,” “not likely,” to or would “definitely not” purchase an EV without the incentive.
 - ii. The marginal incentive amount was the incentive they received. Otherwise, the incentive was not marginal; and the marginal incentive amount equals \$0.
- b. For customers who received multiple incentives (note: these respondents are first asked a counterfactual question about their purchase decision without either incentive and then possibly the smaller incentive amount and larger incentive amounts depending on their answers to the preceding questions).

Supposing they had received neither incentive:

- i. Neither incentive was marginal if they responded “definitely” or “very likely” to the question about purchasing an EV with neither incentive.
- ii. If respondent says, “Somewhat likely,” “Not likely”, or “Definitely Not”, they likely wouldn’t have purchased an EV without an incentive and the respondent moves onto a question about smaller incentive amount.

Supposing they had only received the smaller incentive:

- i. If respondent says, “Definitely” or “Very Likely”, when asked if he or she would have purchased an EV if this was the only incentive received, the smaller incentive is marginal, and the marginal incentive amount is the smaller incentive.
- ii. If respondent says, “Somewhat likely,” “Not likely”, or “Definitely Not”, then respondent likely wouldn’t have purchased an EV without a larger incentive and the respondent moves onto a question about the larger incentive amount.

Supposing they had only received the larger incentive:

- i. If respondent says, “Definitely” or “Very Likely”, when asked if he or she would have purchased an EV if the larger incentive was the only incentive received, the larger incentive is marginal and the marginal incentive amount is the larger incentive.
- ii. If respondent says, “Somewhat likely,” “Not likely”, or “Definitely Not”, the respondent likely would have purchased an EV without a larger incentive, and the total (combined) incentive amount is marginal, and the marginal incentive is the total incentive amount.

Appendix B. Survey Tools

Complete Survey

Vermont PSD EV Survey

Survey Overview: This survey is part of the evaluation of Vermont Electric Vehicles Incentives. Its goal is to gather information on participants’ motivations, experiences, and program awareness.

Research Questions or Objectives	Item
Awareness and Motivations Assess overall awareness of EV incentive programs Assess awareness of the Tier III incentive program Assess awareness of State EV incentives and programs Understand motivation to purchase an EV Determine the importance of non-financial factors for EV adoption Understand decision-making process when deciding between an ICE and an EV	Sections A, B, Questions C1– C3
Incentive Attribution Assess the qualitative impact of the incentive program in customer’s decision to purchase an EV Determine attribution of the incentive amount received to the decision to purchase an EV Determine the marginality of the received incentive amount	Section C
Program Ease Assess program ease	Questions C15, C18
Driving and Charging Behaviors Assess driving habits before the EV purchase Assess EV driving habits Understand whether driving habits changed with the EV adoption Understand EV charging habits Assess charging needs not currently met	Section D
Drive Electric Vermont Website [Moved to Phase II]	
Demographics and Home Attributes	Section E

Target Audience: Vermont households who received an incentive from a Vermont electric distribution utility or the State of Vermont for purchasing or leasing an electric vehicle.

Expected number of completions: _____

Estimated timeline for fielding: _____

Variables to be Pulled into Survey

- EMAIL
- FIRSTNAME
- LASTNAME
- EVMAKE
- EVMODEL
- EVYEAR
- INCENTIVEOPTION: STATE, TIER3, STATEANDTIER3
- INCENTIVEAMOUNTSTATE
- INCENTIVEAMOUNTUTILITY
- INCENTIVEAMOUNTTOTAL
- INCENTIVEDATE
- DEALERSHIP
- UTILITY: name of the utility

- **DUST: 1 if INCENTIVEAMOUNTUTILITY <= INCENTIVEAMOUNTSTATE, 0 if otherwise**

Email Invitation

To: **[EMAIL]**

From: Keith.Levenson@vermont.gov

Subject: Tell us about your electric vehicle purchase experience and you could win a \$75 Visa gift card!

Dear **[FIRSTNAME AND LASTNAME]**,

You recently received an incentive from your electric distribution utility or the State of Vermont for buying or leasing an electric vehicle.

We'd like to hear your thoughts about your experience with your electric vehicle and the incentives you received. Please take a moment to answer a few short questions about your experience in an online survey. The survey will only take about 15 minutes to complete.

[Click HERE to take the survey](#)

Or copy and paste the following URL into your internet browser: **[SURVEY LINK]**

For completing the survey, we are offering you a chance to enter a drawing to win the choice of a \$75 VISA gift card. Three winners will be randomly selected.

If you have any difficulties taking this survey, please contact Barbara dos Santos at Cadmus, the research firm conducting this survey on behalf of Vermont Public Service Department. You can reach Barbara dos Santos at (240) 204-6208 or barbara.dossantos@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Sincerely,

[PSD SIGNATURE]

Reminder Email Invitation

To: **[EMAIL]**

From: Keith.Levenson@vermont.gov

Subject: Don't forget to tell us about your electric vehicle purchase experience and you could win a \$75 Visa gift card!

Dear **[FIRSTNAME AND LASTNAME]**,

You recently received a survey about an incentive from your electric distribution utility or the State of Vermont for buying or leasing an electric vehicle.

We'd like to hear your thoughts about your experience with your electric vehicle and the incentives you received. Please take a moment to answer a few short questions about your experience in an online survey. The survey will only take about 15 minutes to complete.

[Click HERE to take the survey](#)

Or copy and paste the following URL into your internet browser: **[SURVEY LINK]**

For completing the survey, we are offering you a chance to enter a drawing to win the choice of a \$75 VISA gift card. Three winners will be randomly selected.

If you have any difficulties taking this survey, please contact Barbara dos Santos at Cadmus, the research firm conducting this survey on behalf of Vermont Public Service Department. You can reach Barbara dos Santos at (240) 204-6208 or barbara.dossantos@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Sincerely,

[PSD SIGNATURE]

Survey Introduction

Welcome! Thank you for participating in this survey of recent buyers of electric vehicles (EV). The survey is being conducted on behalf of Vermont Public Service Department and will help the state understand residents' vehicle buying and leasing decisions.

This survey will take about 15 minutes to complete. Your responses will remain confidential and will only be used for research purposes.

As a thank you for participating in this survey, you will be entered into a raffle of three **\$75 Visa gift cards**.

A. Screener

Vermont residents who purchase or lease an electric vehicle (plug-in hybrid or all-electric) are eligible to receive an incentive from the State of Vermont or from an electric utility. Qualified purchases could have incentives passed through at the dealership or direct payment through mail-in rebate claims.

1. Have you applied for or received an incentive from the **State of Vermont** for purchasing or leasing of an electric vehicle since 2020? The State of Vermont provides incentives of \$1,500 to \$4,000 for eligible purchases of new electric vehicles and up to \$5,000 for the purchase of used electric vehicles.

1. Yes
2. No
3. Don't know

2. Have you applied for or received an incentive from **your electric utility** for purchasing or leasing an electric vehicle –since 2020? Electric utilities offering financial incentives for the purchase of an EV include Burlington Electric Department, Green Mountain Power, Stowe Electric Department, Vermont Electric Coop and VPPSA.

1. Yes
2. No
3. Don't know

3. **[IF INCENTIVE OPTION = STATE OR TIER3]** Prior to today, did you know that the State of Vermont and Vermont electric utilities each provide separate incentives for the purchase or lease of Electric Vehicles?

1. Yes
2. No
3. Don't know

B. Motivations for Purchasing or Leasing an Electric Vehicle

Thanks for confirming. We'd like to start with questions about the electric vehicle you purchased or leased.

1. Please provide the type and model of electric vehicle did you purchased or leased since 2020.

1. Type: **[DROPDOWN: Plug-in Hybrid Electric Vehicle, All Electric Vehicle]**
2. Make: **[DROPDOWN]**
3. Model: **[DROPDOWN]**
4. Year: **[DROPDOWN: for the last 10 years]**
5. Drivetrain: **[DROPDOWN: 2WD, 4WD]**

2. For each source, please rate how important the source's information was in your decision to acquire an electric vehicle (EV) over a similar gas-powered vehicle. **[RANDOMIZE A-M]**

	1. Not at all important	2. Somewhat important	3. Important	4. Very important	Not Applicable
--	-------------------------	-----------------------	--------------	-------------------	----------------

a. Friend/family member who does not drive an EV					
b. Friend/family member who drives an EV					
c. Car salesperson					
d. EV manufacturer website					
e. Drive Electric Vermont website					
f. EV test drive event					
g. Electric utility					
h. Online discussion forums					
i. YouTube or TikTok EV videos					
j. News story (newspaper, radio, TV, etc.)					
k. Advertisement (newspaper, radio, TV, etc.)					
l. Non-profit organization (e.g., Efficiency Vermont, Sierra Club, etc.)					
m. Government agency (e.g., Agency of Transportation, etc.)					
n. Other (please explain) [OPEN END TEXT BOX]					

3. Did you seriously consider buying or leasing a different EV make and model?
 1. Yes
 2. No
 3. There was not a viable EV in the vehicle class that I wanted in my price range
4. **[IF B3= 1]** What was the alternative EV model you most seriously considered buying or leasing?
 1. Make: **[DROPDOWN]**
 2. Model: **[DROPDOWN]**

3. Year: **[DROPDOWN]**
5. Which of the following best describes the **most important** reason you chose an electric vehicle (EV) over a similar gas-powered vehicle? **[RANDOMIZE 1-8]**
1. Saving money on fuel
 2. Saving money on maintenance
 3. Incentive availability
 4. Reducing environmental impact
 5. Increase energy independence
 6. Wanted the newest technology
 7. Driving performance
 8. Supporting growth of EV technology
 9. Other (please explain) **[OPEN END TEXT BOX]**
6. Which of the following best describes the **second-most important** reason you chose an electric vehicle (EV) over a similar gas-powered vehicle? **[RANDOMIZE 1-8. DISPLAY LIST FROM PREVIOUS QUESTION WITHOUT RESPONSE SELECTED IN PREVIOUS QUESTION]**
1. Saving money on fuel
 2. Incentive availability
 3. Saving money on maintenance
 4. Reducing environmental impact
 5. Increase energy independence
 6. Wanted the newest technology
 7. Driving performance
 8. Supporting growth of EV technology
 9. Other (please explain) **[OPEN END TEXT BOX]**
7. The following are reasons some people say they would **not** choose an electric vehicle (EV). Which of these, if any, **caused you to hesitate** when choosing an EV over a gas-powered vehicle? If you had no hesitations about choosing an EV rather than a gas-power vehicle, please select “None – I had no concerns.” **[ALLOW MULTIPLE SELCTIONS, RANDOMIZE 1-10]**
1. Environmental impact of battery or manufacturing
 2. High purchase/lease price
 3. High maintenance cost
 4. Poor reliability
 5. Limited driving range
 6. Poor winter driving performance
 7. Charging: limited public stations
 8. Charging: limited home plug/charger access
 9. Limited vehicle types available (e.g., Pick-up, SUV, etc.)
 10. Hard to find an available EV
 11. Other (please explain) **[OPEN END TEXT BOX]**
 12. None – I had no concerns **[Make exclusive]**
8. When you shopped for your EV, did you also consider buying or leasing a conventional gas vehicle?
1. Yes
 2. No
1. **[IF B8= 1]** What were your reasons for doing so?
1. **[OPEN ENDED – MEDIUM TEXT BOX]**

2. **[IF B8= 1]** What was the conventional gas vehicle you most seriously considered buying or leasing? Leave blank if you did not consider a specific vehicle.

1. Make: **[DROPDOWN]**
2. Model: **[DROPDOWN]**

3. **[IF B8=1]** What was the year of the conventional gas vehicle you most seriously considered buying or leasing? Leave blank if you did not consider a specific vehicle.

1. Year: **[YEAR ENTRY]**

C. [SKIP C1-C21 IF A1=2 & A2=2] *Electric Vehicle Incentives*

Now, we'd like to ask you questions about the financial incentive(s) you received for your EV. You may have received this incentive at the dealership at the time of sale/lease or after you purchased/leased your EV.

1. Did you receive your incentive at a participating dealership at the time of sale/lease or by submitting a rebate application after the sale/lease was completed?

1. Through the dealership at the time of sale or lease
2. Through a rebate application after purchasing or leasing
3. Don't know

2. **[ASK IF A1= 1 OR A2= 1 OR INCENTIVEOPTION = STATE, TIER3 OR STATEANDTIER3]** How did you first hear about the EV incentive(s)?

	State of Vermont [DISPLAY IF INCENTIVEOPTION=STATE OR STATEANDTIER3]	Electric Utility [DISPLAY IF INCENTIVEOPTION=TIER3 OR STATEANDTIER3]
1. Friend/family member who does not drive an EV		
2. Friend/family member who does drive an EV		
3. Car salesperson		
4. EV manufacturer website		
5. Drive Electric Vermont website		
6. EV test drive event		
7. Online discussion forums		
8. Blogs (not on manufacturer websites)		
9. News story (newspaper, radio, TV, etc.)		
10. Advertisement (newspaper, radio, TV, etc.)		
11. Non-profit organization (e.g., Drive Electric Vermont, Efficiency Vermont, etc.)		
12. Government agency (e.g., Department of Transportation, etc.)		
13. Electric utility		
14. Other (Please describe) [OPEN TEXT ENTRY BOX]		
1. Don't know [MAKE EXCLUSIVE]		

3. Did/will you receive any of these other incentives for purchasing or leasing your EV?

1. Federal tax credits **[YES/NO/DON'T KNOW OPTIONS]**

2. Low-and moderate-income supplemental incentives **[YES/NO/ DON'T KNOW OPTIONS]**
3. Utility EV charging rates (Time of Use Rates, Flat Rates, Tiered Rates) **[YES/NO/ DON'T KNOW OPTIONS]**
4. Other **[PLEASE DESCRIBE BOX]**
4. **[IF INCENTIVEOPTION= STATE OR STATEANDTIER3]** Our records show that you received an incentive of \$**[INCENTIVEAMOUNTSTATE]** from the **State of Vermont** after purchasing or leasing your plug-in electric vehicle. Is this correct?
 1. Yes
 2. No
 3. Don't know
5. **[DISPLAY IF C4=2]** What was the incentive amount you received from the State of Vermont after purchasing/leasing your plug-in electric vehicle?
 1. **[NUMBER ENTRY BOX]**
6. **[IF INCENTIVEOPTION= TIER3 OR STATEANDTIER3]** Our records show that you received an incentive of \$**[INCENTIVEAMOUNTUTILITY]** from **[UTILITY]** after purchasing or leasing your plug-in electric vehicle. Is this correct?
 1. Yes
 2. No
 3. Don't know
7. **[DISPLAY IF C6 = 2]** What was the incentive amount you received from **[UTILITY]** after purchasing/leasing your plug-in electric vehicle?
 1. **[NUMBER ENTRY BOX]**
8. **[IF INCENTIVEOPTION = STATE & C4 ≠2]** Our records show you received an incentive of \$**[INCENTIVEAMOUNTSTATE]** from the **State of Vermont**. If you had not received this incentive, would you have still purchased an EV? **[FORCE RESPONSE]**
 1. Definitely
 2. Very likely
 3. Somewhat likely
 4. Not likely
 5. Definitely not
9. **[IF INCENTIVEOPTION = TIER3 & C6 ≠2]** Our records show you received an incentive of \$**[INCENTIVEAMOUNTUTILITY]** from **[UTILITY]**. If you had not received this incentive, would you have still purchased an EV? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**
 1. Definitely
 2. Very likely
 3. Somewhat likely
 4. Not likely
 5. Definitely not
10. **[IF INCENTIVEOPTION = STATEANDTIER3 & A1 ≠ 2]** Our records show you received an incentive of \$**[INCENTIVEAMOUNTSTATE]** from the **State of Vermont** and an incentive of \$**[INCENTIVEAMOUNTUTILITY]** from **[UTILITY]**. Would you have still purchased an EV if you had received *neither* incentive? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**
 1. Definitely
 2. Very likely
 3. Somewhat likely

4. Not likely
5. Definitely not

11. **[IF C10 = 2,3,4,5 AND DUST = 1]** Think of the \$**[INCENTIVEAMOUNTUTILITY]** you received from **[UTILITY]**. Would you have still purchased an EV if you had received this incentive but not the incentive from the **State of Vermont**? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

12. **[IF C10 = 2,3,4,5 AND DUST =0]** Think of the \$**[INCENTIVEAMOUNTSTATE]** you received from **the State of Vermont**. Would you have still purchased an EV if you had received this incentive but not the incentive from **[UTILITY]**? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

13. **[IF C11 = 2,3,4,5 AND DUST =1]** Now think of the \$**[INCENTIVEAMOUNSTATE]** you received from the **State of Vermont**. Would you have still purchased an EV if you had received this incentive but not the incentive from **[UTILITY]**? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

14. **[IF C12= 2,3,4,5 AND DUST =0]** Think of the \$**[INCENTIVEAMOUNTUTILITY]** you received from the **[UTILITY]**. Would you have still purchased an EV if you had received this incentive but not the incentive from the **State of Vermont**. Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**

1. Definitely
2. Very likely
3. Somewhat likely
4. Not likely
5. Definitely not

15. **[IF INCENTIVEOPTION =STATEANDTIER3]** How easy was the process of submitting the rebate application process for incentive from the **State of Vermont**?

1. Very easy
2. Somewhat easy
3. Neither easy nor difficult
4. Somewhat difficult

5. Very difficult
16. **[IF INCENTIVEOPTION =STATEANDTIER3]** How easy was the process of submitting the rebate application process for incentive **from your electric utility**?
 1. Very easy
 2. Somewhat easy
 3. Neither easy nor difficult
 4. Somewhat difficult
 5. Very difficult
17. **[IF INCENTIVEOPTION =STATE OR TIER3]** How easy was the process of submitting the rebate application process?
 1. Very easy
 2. Somewhat easy
 3. Neither easy nor difficult
 4. Somewhat difficult
 5. Very difficult
18. **[IF INCENTIVEOPTION =STATEANDTIER3]** How satisfied or dissatisfied were you with the process of applying for and receiving the rebate from the **State of Vermont** for purchasing an EV?
 1. Very satisfied
 2. Somewhat satisfied
 3. Neither satisfied nor dissatisfied
 4. Somewhat dissatisfied
 5. Very dissatisfied
19. **[IF INCENTIVEOPTION =STATEANDTIER3]** How satisfied or dissatisfied were you with the process of applying for and receiving the rebate from your **electric utility** for purchasing an EV?
 1. Very satisfied
 2. Somewhat satisfied
 3. Neither satisfied nor dissatisfied
 4. Somewhat dissatisfied
 5. Very dissatisfied
20. **[IF INCENTIVEOPTION =STATE OR TIER3]** How satisfied or dissatisfied were you with the process of applying for and receiving the rebate for purchasing an EV?
 1. Very satisfied
 2. Somewhat satisfied
 3. Neither satisfied nor dissatisfied
 4. Somewhat dissatisfied
 5. Very dissatisfied
21. **[IF C15,C18,C19,C20 = 3,4,5]** How could the rebate application process have been better?
 1. **[OPEN TEXT ENTRY BOX]**

D. Household Driving and Charging

Next, we'd like to ask questions about your household driving and charging behaviors.

1. Excluding the **incentivized** EV **[EVMODEL]**, how many vehicles does your household currently own or lease?
 1. Conventional Gas Vehicles: **[NUMBER ENTRY BOX]**
 2. Conventional Hybrid Vehicles: **[NUMBER ENTRY BOX]**

3. Plug-in Hybrid Vehicles: **[NUMBER ENTRY BOX]**
4. All Electric Vehicles: **[NUMBER ENTRY BOX]**
2. How many vehicles round trips do you and others in your household take to commute to a job or school during a typical week?
Please count the total number of vehicles round trips. For example, if you commute three times per week and the second member of your household separately commutes four times per week, your household's total weekly round trips would be seven.
 1. None
 2. About 1-2 times a week
 3. About 3-6 times a week
 4. About 7-10 times a week
 5. About 11-14 times a week
 6. More than 14 times a week
3. **[IF D2=2-6]** About how many miles is the average roundtrip commute for your household?
 1. **[Open ended, force numeric]**
4. What is your best estimate of the total number of miles your household drives each year?
 1. Less than 5,000 Miles
 2. Between 5,000-9,999 miles
 3. Between 10,000-14,999 miles
 4. Between 15,000-29,999 miles
 5. Greater than 30,000 miles
5. What is your best estimate of the number of miles your household drives in your incentivized EV **[EVMODEL]** each year?
 1. Less than 5,000 Miles
 2. Between 5,000-9,999 miles
 3. Between 10,000-14,999 miles
 4. Between 15,000-29,999 miles
 5. Greater than 30,000 miles
6. How has the purchase or lease of your EV **[EVMODEL]** affected your household's driving habits? Please tell if the following statements are true or false about your household's driving habits. Select all that apply: **[RANDOMIZE ORDER 1-3]**
 1. We take fewer trips
 2. Our trips have gotten longer
 3. We make more longer distance trips
 4. Other (please explain) **[OPEN END TEXT BOX]**

[ADD PAGE BREAK]

Now we'd like to ask about how and where you charge the EV **[EVMODEL]**.

7. Where do you charge your incentivized electric vehicle? Select all that apply. **[ALLOW MULTIPLE SELECTIONS]**
 1. At home
 2. At my place of work
 3. At a public charging station
 4. Other: Please Specify **[TEXT ENTRY BOX]**
8. **[IF D7 = 1]** What type(s) of charger do you use at home?
 1. Level 1 Charger (Standard Wall Outlet)

2. Managed (smart or networked) Level 2 Charger (240V)
 3. Unmanaged Level 2 Charger (240V)
 4. : Other (please explain) **[TEXT ENTRY BOX]**
 2. Don't know
9. **[IF D7 = 1]** About what percentage of your **incentivized** vehicle's charging occurs at home?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
 10. **[IF D7 = 2]** What type(s) of charger do you use at work? **[ALLOW MULTIPLE SELECTIONS]**
 1. Level 1 charger / standard wall outlet
 2. Level 2 charger
 3. DC fast charger
 4. Don't know
 5. Other (please explain) **[TEXT ENTRY BOX]**
 11. **[IF D7 = 2]** About what percentage of your **incentivized** vehicle's charging occurs at work?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
 12. **[IF D7 = 3]** What type(s) of public chargers do you use? **[ALLOW MULTIPLE SELECTIONS]**
 1. Level 1 charger / standard wall outlet
 2. Level 2 charger
 3. DC fast charger
 4. Don't know
 13. **[IF D7 = 3]** About what percentage of your vehicle's charging occurs at public chargers?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
 14. What specific locations would you like to see more public chargers?
 1. **[TEXT ENTRY BOX]**

E. Demographics

You're almost done! These last questions are about you and your home. If there is a question you prefer not to answer, you may skip it.

1. What is your highest level of education?
 1. High School/GED
 2. Professional/Trade school
 3. Associate's degree or some college/university education
 4. Bachelor's degree
 5. Master's degree
 6. Doctoral degree
 7. Other (please describe) **[TEXT ENTRY BOX]**
2. What is your zip code?
 1. **[ZIP CODE – ZIPCODE VALIDATION ONLY]**
3. Which of the following best describes your primary residence?
 1. Single family home
 2. Duplex
 3. Condo, with about this many units: **[NUMBER ENTRY]**
 4. Multi-family apartment, with about this many units: **[NUMBER ENTRY]**
4. Where do you normally park your electric vehicle at night?
 1. Garage
 2. Carport

3. Dedicated outdoor parking space
 4. Shared outdoor parking space
 5. On-street parking
 6. Other (please describe) **[TEXT ENTRY BOX]**
5. Which of the following best describes your annual household income before taxes?
1. Less than \$10,000
 2. \$10,000 to \$14,999
 3. \$15,000 to \$24,999
 4. \$25,000 to \$34,999
 5. \$35,000 to \$49,999
 6. \$50,000 to \$74,999
 7. \$75,000 to \$99,999
 8. \$100,000 to \$149,999
 9. \$150,000 to \$199,999
 10. \$200,000 or more
1. Prefer not to say
6. Do you consider yourself to be... ? Select all that apply **[MULTIPLE SELECTION, RANDOMIZE ORDER 1-7]**
1. Caucasian or White
 2. African American or Black
 3. American Indian or Alaska Native
 4. Asian
 5. Native Hawaiian or Pacific Islander
 6. Middle Eastern or North African
 7. Hispanic or Latino
 8. Multi-racial or multi-ethnic
 9. Other (please describe) **[TEXT ENTRY BOX]**
7. How do you identify?
1. Woman
 2. Man
 3. Non-binary
 4. Prefer to self-describe **[TEXT ENTRY BOX]**
8. How old are you?
1. 18-24
 2. 25-34
 3. 35-44
 4. 45-54
 5. 55-64
 6. 65 or older

The State of Vermont Public Service Department thank you for your participation. If you'd like to know more about the EV incentive program and other resources visit [Drive Electric Vermont \(driveelectricvt.com\)](https://driveelectricvt.com).

The survey prize raffle will be on **March 20, 2023** we will contact the winners on the email we have on record. If you'd like to change your email on record, please contact barbara.dossantos@cadmusgroup.com.

Thank you!

Simplified Survey

Vermont PSD EV Survey

Survey Overview: This survey is part of the evaluation of Vermont Electric Vehicles Incentives. Its goal is to gather information on participants' motivations, experiences, and program awareness.

Research Questions or Objectives	Item
Awareness and Motivations Assess overall awareness of EV incentive programs Assess awareness of the Tier III incentive program Assess awareness of State EV incentives and programs Understand motivation to purchase an EV Determine the importance of non-financial factors for EV adoption Understand decision-making process when deciding between an ICE and an EV	Sections A, B , Questions C1– C3
Incentive Attribution Assess the qualitative impact of the incentive program in customer's decision to purchase an EV Determine attribution of the incentive amount received to the decision to purchase an EV Determine the marginality of the received incentive amount	Section C
Program Ease Assess program ease	Questions C7, C8
Driving and Charging Behaviors Assess driving habits before the EV purchase Assess EV driving habits Understand whether driving habits changed with the EV adoption Understand EV charging habits Assess charging needs not currently met	Section D
Drive Electric Vermont Website [Moved to Phase II]	
Demographics and Home Attributes	Section E

Target Audience: Vermont households who received an incentive from a Vermont electric distribution utility or the State of Vermont for purchasing or leasing an electric vehicle.

Expected number of completions: _____

Estimated timeline for fielding: _____

Variables to be Pulled into Survey

- **EMAIL**
- **FIRSTNAME**
- **LASTNAME**
- **EVMAKE**
- **EVMODEL**
- **EVYEAR**
- **INCENTIVEOPTION: STATE, TIER3, STATEANDTIER3**
- **INCENTIVEAMOUNTSTATE**
- **INCENTIVEAMOUNTUTILITY**
- **INCENTIVEAMOUNTTOTAL**
- **INCENTIVEDATE**
- **DEALERSHIP**
- **UTILITY: name of the utility**
- **DUST: 1 if INCENTIVEAMOUNTUTILITY <= INCENTIVEAMOUNTSTATE, 0 if otherwise**

Email Invitation

To: **[EMAIL]**

From: Keith.Levenson@vermont.gov

Subject: Tell us about your electric vehicle purchase experience and you could win a \$75 Visa gift card!

Dear **[FIRSTNAME AND LASTNAME]**,

You recently received an incentive from your electric distribution utility or the State of Vermont for buying or leasing an electric vehicle.

We'd like to hear your thoughts about your experience with your electric vehicle and the incentives you received. Please take a moment to answer a few short questions about your experience in an online survey. The survey will only take about 15 minutes to complete.

[Click HERE to take the survey](#)

Or copy and paste the following URL into your internet browser: **[SURVEY LINK]**

For completing the survey, we are offering you a chance to enter a drawing to win the choice of a \$75 VISA gift card. Three winners will be randomly selected.

If you have any difficulties taking this survey, please contact Barbara dos Santos at Cadmus, the research firm conducting this survey on behalf of Vermont Public Service Department. You can reach Barbara dos Santos at (240) 204-6208 or barbara.dossantos@cadmusgroup.com.

Thank you in advance for sharing your experiences and your time.

Sincerely,

[PSD SIGNATURE]

Survey Introduction

Welcome! Thank you for participating in this survey of recent buyers of electric vehicles (EV). The survey is being conducted on behalf of Vermont Public Service Department and will help the state understand residents' vehicle buying and leasing decisions.

This survey will take about 15 minutes to complete. Your responses will remain confidential and will only be used for research purposes.

As a thank you for participating in this survey, you will be entered into a raffle of three **\$75 Visa gift cards**.

A. Screener

Vermont residents who purchase or lease an electric vehicle (plug-in hybrid or all-electric) are eligible to receive an incentive from the State of Vermont or from an electric utility. Qualified purchases could have incentives passed through at the dealership or direct payment through mail-in rebate claims.

1. Have you received an incentive from the **State of Vermont** for purchasing or leasing of an electric vehicle since 2020? The State of Vermont provides incentives of \$1,500 to \$4,000 for eligible purchases of new electric vehicles and up to \$5,000 for the purchase of used electric vehicles.

1. Yes
2. No
3. Don't know

2. Have you received an incentive from **your electric utility** for purchasing or leasing an electric vehicle –since 2020? Electric utilities offering financial incentives for the purchase of an EV include Burlington Electric Department, Green Mountain Power, Stowe Electric Department, Vermont Electric Coop and VPPSA.

1. Yes
2. No
3. Don't know

3. Prior to today, did you know that the State of Vermont and Vermont electric utilities each provide separate incentives for the purchase or lease of Electric Vehicles?

1. Yes
2. No
3. Don't know

B. Motivations for Purchasing or Leasing an Electric Vehicle

Thanks for confirming. We'd like to start with questions about the electric vehicle you purchased or leased.

1. Please provide the type and model of electric vehicle did you purchased or leased since 2020.

1. Type: **[DROPDOWN: Plug-in Hybrid Electric Vehicle, All Electric Vehicle]**
2. Make: **[DROPDOWN]**
3. Model: **[DROPDOWN]**
4. Year: **[DROPDOWN: for the last 10 years]**
5. Drivetrain: **[DROPDOWN: 2WD, 4WD]**

2. For each source, please rate how important the source's information was in your decision to acquire an electric vehicle (EV) over a similar gas-powered vehicle. **[RANDOMIZE A-M]**

	1. Not at all important	2. Somewhat important	3. Important	4. Very important	Not Applicable
a. Friend/family member who does not drive an EV					
b. Friend/family member who drives an EV					
c. Car salesperson					
d. EV manufacturer website					
e. Drive Electric Vermont website					
f. EV test drive event					
g. Electric utility					
h. Online discussion forums					
i. YouTube or TikTok EV videos					
j. News story (newspaper, radio, TV, etc.)					
k. Advertisement (newspaper, radio, TV, etc.)					
l. Non-profit organization (e.g., Efficiency					

Vermont, Sierra Club, etc.)					
m. Government agency (e.g., Agency of Transportation, etc.)					
n. Other (please explain) [OPEN END TEXT BOX]					

3. Did you seriously consider buying or leasing a different EV make and model?
 1. Yes
 2. No
 3. There was not a viable EV in the vehicle class that I wanted in my price range
4. **[IF B3= 1]** What was the alternative EV model you most seriously considered buying or leasing?
 1. Make: **[DROPDOWN]**
 2. Model: **[DROPDOWN]**
 3. Year: **[DROPDOWN]**
5. Which of the following best describes the **most important** reason you chose an electric vehicle (EV) over a similar gas-powered vehicle? **[RANDOMIZE 1-8]**
 1. Saving money on fuel
 2. Saving money on maintenance
 3. Incentive availability
 4. Reducing environmental impact
 5. Increase energy independence
 6. Wanted the newest technology
 7. Driving performance
 8. Supporting growth of EV technology
 9. Other (please explain) **[OPEN END TEXT BOX]**
6. Which of the following best describes the **second-most important** reason you chose an electric vehicle (EV) over a similar gas-powered vehicle? **[RANDOMIZE 1-8. DISPLAY LIST FROM PREVIOUS QUESTION WITHOUT RESPONSE SELECTED IN PREVIOUS QUESTION]**
 1. Saving money on fuel
 2. Incentive availability
 3. Saving money on maintenance
 4. Reducing environmental impact
 5. Increase energy independence
 6. Wanted the newest technology
 7. Driving performance
 8. Supporting growth of EV technology
 9. Other (please explain) **[OPEN END TEXT BOX]**
7. The following are reasons some people say they would **not** choose an electric vehicle (EV). Which of these, if any, **caused you to hesitate** when choosing an EV over a gas-powered vehicle? If you had no hesitations about choosing an EV rather than a gas-power vehicle, please select “None – I had no concerns.” **[ALLOW MULTIPLE SELCTIONS, RANDOMIZE 1-10]**

1. Environmental impact of battery or manufacturing
 2. High purchase/lease price
 3. High maintenance cost
 4. Poor reliability
 5. Limited driving range
 6. Poor winter driving performance
 7. Charging: limited public stations
 8. Charging: limited home plug/charger access
 9. Limited vehicle types available (e.g., Pick-up, SUV, etc.)
 10. Hard to find an available EV
 11. Other (please explain) **[OPEN END TEXT BOX]**
 12. None – I had no concerns **[Make exclusive]**
8. When you shopped for your EV, did you also consider buying or leasing a conventional gas vehicle?
1. Yes
 2. No
1. **[IF B8= 1]** What were your reasons for doing so?
 1. **[OPEN ENDED – MEDIUM TEXT BOX]**
 2. **[IF B8= 1]** What was the conventional gas vehicle you most seriously considered buying or leasing? Leave blank if you did not consider a specific vehicle.
 1. Make: **[DROPDOWN]**
 2. Model: **[DROPDOWN]**
 3. **[IF B8=1]** What was the year of the conventional gas vehicle you most seriously considered buying or leasing? Leave blank if you did not consider a specific vehicle.
 1. Year: **[YEAR ENTRY]**

C. [SKIP C1-C5 A2=2] Electric Vehicle Incentives

Now, we'd like to ask you questions about the financial incentive(s) you received for your EV. You may have received this incentive at the dealership at the time of sale/lease or after you purchased/leased your EV.

1. Did you receive your incentive at a participating dealership at the time of sale/lease or by submitting a rebate application after the sale/lease was completed?
 1. Through the dealership at the time of sale or lease
 2. Through a rebate application after purchasing or leasing
 3. Don't know
2. How did you first hear about the EV incentive(s)?
 1. Friend/family member who does not drive an EV
 2. Friend/family member who does drive an EV
 3. Car salesperson
 4. EV manufacturer website
 5. Drive Electric Vermont website
 6. EV test drive event
 7. Online discussion forums
 8. Blogs (not on manufacturer websites)
 9. News story (newspaper, radio, TV, etc.)
 10. Advertisement (newspaper, radio, TV, etc.)
 11. Non-profit organization (e.g., Drive Electric Vermont, Efficiency Vermont, etc.)
 12. Government agency (e.g., Department of Transportation, etc.)

13. Electric utility
 14. Other (Please describe) **[OPEN TEXT ENTRY BOX]**
 15. Don't know
3. Did/will you receive any of these other incentives for purchasing or leasing your EV?
 1. Federal tax credits **[YES/NO/DON'T KNOW OPTIONS]**
 2. Low-and moderate-income supplemental incentives **[YES/NO/ DON'T KNOW OPTIONS]**
 3. Utility EV charging rates (Time of Use Rates, Flat Rates, Tiered Rates) **[YES/NO/ DON'T KNOW OPTIONS]**
 4. Other **[PLEASE DESCRIBE BOX]**
 4. What was the incentive amount you received from your utility after purchasing/leasing your plug-in electric vehicle? Please do not consider other incentives such as federal incentives. If you don't remember the exact number an approximation is ok.
 1. **[open text box – validate numbers only]**
 5. If you had not received this incentive, would you have still purchased an EV? Please assume all other incentives you would have received if you purchased an EV (e.g., a federal tax credit) were the same. **[FORCE RESPONSE]**
 1. Definitely
 2. Very likely
 3. Somewhat likely
 4. Not likely
 5. Definitely not
 6. How easy was the process of submitting the rebate application process for incentive from your electric utility?
 1. Very easy
 2. Somewhat easy
 3. Neither easy nor difficult
 4. Somewhat difficult
 5. Very difficult
 7. How satisfied or dissatisfied were you with the process of applying for and receiving the rebate from your electric utility for purchasing an EV?
 1. Very satisfied
 2. Somewhat satisfied
 3. Neither satisfied nor dissatisfied
 4. Somewhat dissatisfied
 5. Very dissatisfied
 8. **[IF C8= 3,4,5]** How could the rebate application process have been better?
 1. **[OPEN TEXT ENTRY BOX]**

D. Household Driving and Charging

Next, we'd like to ask questions about your household driving and charging behaviors.

1. Excluding the incentivized EV **[EVMODEL]**, how many vehicles does your household currently own or lease?
 1. Conventional Gas Vehicles: **[NUMBER ENTRY BOX]**
 2. Conventional Hybrid Vehicles: **[NUMBER ENTRY BOX]**
 3. Plug-in Hybrid Vehicles: **[NUMBER ENTRY BOX]**
 4. All Electric Vehicles: **[NUMBER ENTRY BOX]**

2. How many vehicle round trips do you and others in your household take to commute to a job or school during a typical week?

Please count the total number of vehicles round trips. For example, if you commute three times per week and the second member of your household separately commutes four times per week, your household's total weekly round trips would be seven.

1. None
 2. About 1-2 times a week
 3. About 3-6 times a week
 4. About 7-10 times a week
 5. About 11-14 times a week
 6. More than 14 times a week
3. **[IF D2=2-6]** About how many miles is the average roundtrip commute for your household?
1. **[Open ended, force numeric]**
4. What is your best estimate of the total number of miles your household drives each year?
1. Less than 5,000 Miles
 2. Between 5,000-9,999 miles
 3. Between 10,000-14,999 miles
 4. Between 15,000-29,999 miles
 5. Greater than 30,000 miles
5. What is your best estimate of the number of miles your household drives in your incentivized EV **[EVMODEL]** each year?
1. Less than 5,000 Miles
 2. Between 5,000-9,999 miles
 3. Between 10,000-14,999 miles
 4. Between 15,000-29,999 miles
 5. Greater than 30,000 miles
6. How has the purchase or lease of your EV **[EVMODEL]** affected your household's driving habits? Please tell if the following statements are true or false about your household's driving habits. Select all that apply: **[RANDOMIZE ORDER 1-3]**
1. We take fewer trips
 2. Our trips have gotten longer
 3. We make more longer distance trips
 4. Other (please explain) **[OPEN END TEXT BOX]**

[ADD PAGE BREAK]

Now we'd like to ask about how and where you charge the EV **[EVMODEL]**.

7. Where do you charge your incentivized electric vehicle? Select all that apply. **[ALLOW MULTIPLE SELECTIONS]**
1. At home
 2. At my place of work
 3. At a public charging station
 4. Other: Please Specify **[TEXT ENTRY BOX]**
8. **[IF D7 = 1]** What type(s) of charger do you use at home?
1. Level 1 Charger (Standard Wall Outlet)
 2. Managed (smart or networked) Level 2 Charger (240V)
 3. Unmanaged Level 2 Charger (240V)

4. : Other (please explain) **[TEXT ENTRY BOX]**
 1. Don't know
9. **[IF D7 = 1]** About what percentage of your incentivized vehicle's charging occurs at home?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
10. **[IF D7 = 2]** What type(s) of charger do you use at work? **[ALLOW MULTIPLE SELECTIONS]**
 1. Level 1 charger / standard wall outlet
 2. Level 2 charger
 3. DC fast charger
 4. Don't know
 5. Other (please explain) **[TEXT ENTRY BOX]**
11. **[IF D7 = 2]** About what percentage of your incentivized vehicle's charging occurs at work?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
12. **[IF D7 = 3]** What type(s) of public chargers do you use? **[ALLOW MULTIPLE SELECTIONS]**
 1. Level 1 charger / standard wall outlet
 2. Level 2 charger
 3. DC fast charger
 4. Don't know
13. **[IF D7 = 3]** About what percentage of your vehicle's charging occurs at public chargers?
 1. **[DROP-DOWN WITH 10% INCREMENTS: 0% – 10%, 11% - 20%, 21% - 30%, 31% - 40%, 41% - 50%, 51% - 60%, 61% - 70%, 71% - 80%, 81% - 90%, 91% – 100%]**
14. What specific locations would you like to see more public chargers?
 1. **[TEXT ENTRY BOX]**

E. Demographics

You're almost done! These last questions are about you and your home. If there is a question you prefer not to answer, you may skip it.

1. What is your highest level of education?
 1. High School/GED
 2. Professional/Trade school
 3. Associate's degree or some college/university education
 4. Bachelor's degree
 5. Master's degree
 6. Doctoral degree
 7. Other (please describe) **[TEXT ENTRY BOX]**
2. What is your zip code?
 1. **[ZIP CODE – ZIPCODE VALIDATION ONLY]**
3. Which of the following best describes your primary residence?
 1. Single family home
 2. Duplex
 3. Condo, with about this many units: **[NUMBER ENTRY]**
 4. Multi-family apartment, with about this many units: **[NUMBER ENTRY]**
4. Where do you normally park your electric vehicle at night?
 1. Garage
 2. Carport
 3. Dedicated outdoor parking space
 4. Shared outdoor parking space

5. On-street parking
6. Other (please describe) **[TEXT ENTRY BOX]**
5. Which of the following best describes your annual household income before taxes?
 1. Less than \$10,000
 2. \$10,000 to \$14,999
 3. \$15,000 to \$24,999
 4. \$25,000 to \$34,999
 5. \$35,000 to \$49,999
 6. \$50,000 to \$74,999
 7. \$75,000 to \$99,999
 8. \$100,000 to \$149,999
 9. \$150,000 to \$199,999
 10. \$200,000 or more
 1. Prefer not to say
6. Do you consider yourself to be... ? Select all that apply **[MULTIPLE SELECTION, RANDOMIZE ORDER 1-7]**
 1. Caucasian or White
 2. African American or Black
 3. American Indian or Alaska Native
 4. Asian
 5. Native Hawaiian or Pacific Islander
 6. Middle Eastern or North African
 7. Hispanic or Latino
 8. Multi-racial or multi-ethnic
 9. Other (please describe) **[TEXT ENTRY BOX]**
7. How do you identify?
 1. Woman
 2. Man
 3. Non-binary
 4. Prefer to self-describe **[TEXT ENTRY BOX]**
8. How old are you?
 1. 18-24
 2. 25-34
 3. 35-44
 4. 45-54
 5. 55-64
 6. 65 or older

The State of Vermont Public Service Department thank you for your participation. If you'd like to know more about the EV incentive program and other resources visit [Drive Electric Vermont \(driveelectricvt.com\)](https://driveelectricvt.com).

The survey prize raffle will be on **March 30, 2023** we will contact the winners on the email we have on record. If you'd like to change your email on record, please contact barbara.dossantos@cadmusgroup.com.

Thank you!

Program Implementers Interview

Note: This is a guide, not a script. Interviewers will follow up on points of interest, skip questions that were previously answered, and engage in a conversation with program implementers.

A. Introduction & Interviewee Information

Thank you for joining us today. We are here to talk about the design and status of the Vermont Electric Vehicle Programs. These include:

- Renewable Energy Standard Tier III programs
- Statewide EV and MileageSmart incentives, and,
- Act 151-enabled program spending by the Energy Efficiency Utilities (EEUs).

The overarching purpose of this interview is to formally document and assess the implementation of the programs. Before we get started, do you have any questions for me?

A1. First, what [are/is] your role(s) at **[Entity]**?

A2. How long have you been involved with **[Entity's]** EV programs?

A3. What role(s), if any, did you have in the design of the programs?

[IF NONE: Is there someone else we should talk to who was involved with the initial program design? **[If so, capture name and contact information]**

Great. Next, we are going to move into detailed questions about the program. I'll ask you about the design, implementation, and then early lessons learned.

Note: Sections B-D are exclusive of each other and specific to the interviewee

B. Utility Tier III EV Programs

B.

B1. Program design

1. When did **[GMP/BED]** begin designing Tier III programs to encourage EV adoption? (for **[BED Only]**: we are not yet asking about Act 151 Programs)
2. Have there been any major program design changes since the beginning of the program? **[PROBE for changes and rationale]**

B2. Program component: **EV Incentives**

1. How was the EV incentive and rebate structure determined? Do you feel like the incentive caps and rebate levels are set at appropriate levels to meet program goals?
2. How often are your expenditure forecasts revised? Are expenditures in line with your current projections, running ahead, or running behind?
3. Have you heard feedback from customers that the incentives encouraged them to buy an EV? Or that limitations on the incentives prevented from buying an EV?
4. Do you have any insights on the administration of the incentive programs, or any suggestions for improving incentive implementation? Do you have a process flow diagram or a logic model that you would be willing to share with us?

B3. Program component: **EV Charger (EVSE) Incentives**

1. How was the EVSE incentive and rebate structure determined?
2. Do most EV drivers in your territory take advantage of the EVSE program? Are there any restrictions that deter participation?

B4. Program component: **EV Charging Rates**

1. Do you offer special rates for EV charging?
2. What percentage of EV drivers take advantage of these rates?
3. Do you feel the rates are set appropriately to encourage off-peak charging?

B5. Program component: **EV Outreach and Education**

1. Describe your efforts to increase public awareness of EVs.
2. Do you feel these efforts are increasing EV adoption in your service territory?
3. Do you have any quantifiable metrics of outreach effectiveness?
4. What feedback have you received from customers about these efforts?

B6. **Other Program components**

1. Are there other components to your EV programs? If so, what are they, and how do you feel they are working?
2. Overall, is the program achieving participation targets?
3. **[Burlington Only]** When did you begin developing Act 151 Programs? What is the status of these programs?

B7. **Interaction with Other Programs**

1. Have you heard feedback from customers about other Vermont EV programs, such as the state rebate or the dealer training initiatives?

B8. **Challenges**

1. What aspects of program implementation have been challenging so far?
2. What steps are being taken to overcome these challenges?

B9. **Lessons Learned**

- 1.Can you think of any implementation efficiencies that could lead to lower costs for the same impact?
- 2.Are there tools or strategies you think could make the program more efficient or easier to implement, or better or easier for participants?
- 3.Have there been any steps taken to implement these tools or strategies?

B10.Closing

- 1.What are you hoping to get out of the evaluation of these programs over the next few years?
- 2.Is there anything else you'd like to mention that we haven't already covered?

C. *Drive Electric Vermont/Efficiency VT:*

C1.Program design

- 1.When did **[DRIVE ELECTRIC VT/Efficiency VT]** begin designing state programs to encourage EV adoption? (we are not yet asking about Act 151 Programs)
- 2.Have there been any major program design changes since the beginning of the program? **[PROBE for changes and rationale]**

C2.Program component: **EV Incentives**

- 1.How was the EV incentive and rebate structure determined? Do you feel like the incentive caps and rebate levels are set at appropriate levels to meet program goals?
- 2.How often are your expenditure forecasts revised? Are expenditures in line with your current projections, running ahead, or running behind?
- 3.Have you heard feedback from customers that the incentives encouraged them to buy an EV? Or that limitations on the incentives prevented from buying an EV?
- 4.What feedback about electric vehicles have you heard from the customers who ultimately decided to buy a conventional vehicle?

C3.Program component: **EV Outreach and Education**

- 1.Describe your efforts to increase public awareness of EVs.
- 2.Do you feel these efforts are increasing EV adoption in your service territory?
- 3.Do you have any quantifiable metrics of outreach effectiveness?
- 4.What feedback have you received from customers about these efforts?

C4.Program component: **Dealer Training**

- 1.Describe your efforts to increase dealership knowledge of EVs.
- 2.Do you feel these efforts are increasing EV adoption in your service territory?
- 3.What feedback have you received from customers about these efforts?

C5.**Other Program components**

- 1.Are there other components to your EV programs? If so, what are they, and how do you feel they are working?
- 2.Overall, is the program achieving participation targets?
- 3.When did you begin developing Act 151 Programs? What is the status of these programs?

C6.**Interaction with Other Programs**

- 1.Have you heard feedback from customers about other Vermont EV programs, such as the utility programs?

C7.**Challenges**

- 1.What aspects of program implementation have been challenging so far?
- 2.What steps are being taken to overcome these challenges?

C8.Lessons Learned

- 1.Can you think of any implementation efficiencies that could lead to lower costs for the same impact?
- 2.Are there tools or strategies you think could make the program more efficient or easier to implement, or better or easier for participants?
- 3.Have there been any steps taken to implement these tools or strategies?
- 4.Do you have data – either rigorous or anecdotal – on how EVs are driven in Vermont? That is, to what extent are the EVs supported by Vermont incentives displacing gasoline?

C9.Closing

- 1.What are you hoping to get out of the evaluation of these programs over the next few years?
- 2.Is there anything else you'd like to mention that we haven't already covered?

D. MileageSmart:

D1.Program design

- 1.Was **[CAPSTONE COMMUNITY ACTION]** involved in designing the MileageSmart program?
- 2.Have there been any major program design changes since the beginning of the program? **[PROBE for changes and rationale]**

D2.Program component: **Used HEV/EV Incentives**

- 1.How was the incentive and rebate structure determined? Do you feel like the incentive caps and rebate levels are set at appropriate levels to meet program goals?
- 2.How often are your expenditure forecasts revised? Are expenditures in line with your current projections, running ahead, or running behind?
- 3.What percentage of the incentive expenditures go to each of the following – conventional hybrids, plug-in hybrids, or battery electric vehicles?
- 4.What feedback have you heard from the customers who bought used electric vehicles?
- 5.What feedback about electric vehicles have you heard from the customers who ultimately decided to buy a conventional hybrid?

D3.Program component: **EV Outreach and Education**

- 1.Does **[CAPSTONE COMMUNITY ACTION]** conduct EV education and outreach? If so, what do you feel are the strengths of this program? What are the challenges?
- 2.Do you have any quantifiable metrics of outreach effectiveness?

D4.Program component: **Dealer Interactions**

- 1.Given the flexibility of used car prices, do customers express any concerns that a rebate on a used vehicle will lead to the dealership increasing the price? How might such concerns be alleviated?

D5.Challenges

- 1.What aspects of program implementation have been challenging so far?
- 2.What steps are being taken to overcome these challenges?

D6.Lessons Learned

- 1.Can you think of any implementation efficiencies that could lead to lower costs for the same impact?

2. Are there tools or strategies you think could make the program more efficient or easier to implement, or better or easier for participants?
3. Have there been any steps taken to implement these tools or strategies?

D7. Closing

1. What are you hoping to get out of the evaluation of these programs over the next few years?
2. Is there anything else you'd like to mention that we haven't already covered?

E. Vermont Department of Transportation:

E1. Program design

1. Was **[VTrans]** involved in designing any of the utility EV programs or state EV programs?
2. If so, what was the role of **[VTrans]**?
3. Have there been any major program design changes since the beginning of the program? **[PROBE for changes and rationale]**

E2. Program component: **EV Rebates**

1. How have EV incentive and rebate structures been determined? Do you feel like the incentive caps and rebate levels are set at appropriate levels to meet program goals?
2. How often are your expenditure forecasts revised? Are expenditures in line with your current projections, running ahead, or running behind?
3. What feedback have you heard from the customers who bought either new or used electric vehicles?
4. What feedback about electric vehicles have you heard from the customers who ultimately decided to buy a conventional vehicle?
5. Do you have any insights on the administration of the incentive programs, or any suggestions for improving incentive implementation? Do you have a process flow diagram or a logic model that you would be willing to share with us?

E3. Program component: **EV Outreach and Education**

1. Does **[VTrans]** take part in EV education and outreach activities? If so, what do you feel are the strengths of this program? What are the challenges?
2. Do you have any quantifiable metrics of outreach effectiveness?

E4. Challenges

1. What aspects of program implementation have been challenging so far?
2. What steps are being taken to overcome these challenges?

E5. Lessons Learned

1. Can you think of any implementation efficiencies that could lead to lower costs for the same impact?
2. Are there tools or strategies you think could make the program more efficient or easier to implement, or better or easier for participants?
3. Have there been any steps taken to implement these tools or strategies?
4. Do you have data – either rigorous or anecdotal – on how EVs are driven in Vermont? That is, to what extent are the EVs supported by Vermont incentives displacing gasoline?

E6. Closing

1. What are you hoping to get out of the evaluation of these programs over the next few years?

2. Is there anything else you'd like to mention that we haven't already covered?

Those are all our questions for today. Thank you so much again for your time, we really appreciate it. Have a great rest of your day!

Market Participants Interview

Note: This is a guide, not a script. Interviewers will follow up on points of interest, skip questions that were previously answered, and engage in a conversation with program implementers.

C. Introduction & Interviewee Information

Thank you for joining us today. We are here to talk about the design and status of the Vermont Electric Vehicle Programs, how they can benefit auto dealerships, and how they can be improved.

These programs include:

- EV rebates for customers;
- Dealer training programs;
- Dealer incentives for EV sales;
- Dealer support for capital improvements; and,
- EV education and outreach programs.

The overarching purpose of this interview is to formally document and assess the implementation of the programs. Before we get started, do you have any questions for me?

E7. First, what [are/is] your role(s) at **[Dealership Name]**?

E8. How long have you been at **[Dealership Name]**?

D. EV Rebates (both Utility and State)

F.

F1.Rebate Structure

- 1.Do you feel like the EV incentive caps (on both MSRP and income) and rebate levels (in terms of dollar amount) are set at appropriate levels to increase EV adoption? Would you recommend any changes?
- 2.Have you heard feedback from customers that the incentives encouraged them to buy an EV? Or that limitations on the incentives prevented from buying an EV?

F2.Rebate Process

- 1.Does the current system for processing EV rebates (both utility and state) work well for your dealership? Would you recommend any changes?

G. *Dealer Training Programs*

G1.Have you participated in any EV dealer training programs conducted by Efficiency Vermont?

- 1.**[If C1 is Yes]** Did this program increase your knowledge of EVs and ability to answer buyer questions?
- 2.**[If C1 is Yes]** Was this program a useful complement to manufacturer training, providing Vermont-specific information, or was it redundant?
- 3.**[If C1 is Yes]** Do you have any suggestions for the training program?

H. *Dealer Incentive Programs*

H1.Does your dealership receive incentives for EV sales through Efficiency Vermont?

- 1.**[If C1 is Yes]** Do you have any suggestions for the incentive program?

I. *Dealer Capital Improvement Programs*

I1.Does your dealership receive incentives for capital improvements (such as EV chargers or maintenance shop upgrades) through Efficiency Vermont?

- 1.**[If C1 is Yes]** Are these incentives set at an appropriate level?
- 2.**[If C1 is Yes]** Do you have any suggestions for the capital improvement program?

J. *EV Education and Outreach Programs*

J1.Does your dealership participate in EV education and outreach programs sponsored by Drive Electric Vermont, or Efficiency Vermont, or the Utilities?

- 1.**[If F1 is Yes]** What is the nature of your participation (for example, do you provide vehicles for ride-and-drive events)?
- 2.**[If F1 is Yes]** Do you have any suggestions for EV education and outreach efforts?

K. *Closing*

K1.Is there anything else you'd like to mention that we haven't already covered?

Those are all our questions for today. Thank you so much again for your time, we really appreciate it. Have a great rest of your day!