Northern New England Rural EV Adoption Toolkit

Prepared for: The Nature Conservancy

April 2022

Table of Contents

veic

Executive Summary

The Nature Conservancy (TNC) has taken a leadership role in identifying barriers and developing solutions to reduce transportation sector carbon emissions and address mobility challenges for rural travelers in New England. Plug-in electric vehicle (EV) adoption is a powerful strategy to reduce emissions and can help reduce household transportation costs, but there are challenges to increasing adoption in rural areas.

Recent public opinion research sponsored by TNC focused on the Northern New England (NNE) region revealed many barriers to EV adoption including a general lack of awareness of EVs, concerns about availability of all-wheel drive and higher clearance vehicle types preferred in rural areas, lack of public charging infrastructure, and EV suitability in New England winters.

The materials detailed in this toolkit provide additional information on the benefits of EVs for rural drivers, analysis of EV market conditions in Northern New England, including Maine, New Hampshire and Vermont, and tools to address barriers and support greater EV adoption in rural NNE communities. The recommended tools cover policy, program and outreach activities and were supported by a literature review, interviews with individuals and groups working to reduce transportation emissions in NNE states. A brief outline of the recommendations is below.

Policy Tools

- Zero Emission Vehicle Regulations – technology forcing requirements for EVs that require automakers to make them an increasing share of their new vehicle sales
- EV Purchase Incentives – reduce the cost of an EV purchase
- Rural EV Charging Equity Policies – ensure rural area considerations are included in charging infrastructure development
- Building Code Requirements – support cost-effective EV charging installations
- EV Materials Sourcing and Recycling – ensure human rights concerns and environmental impacts associated with resource extraction and battery lifecycle are addressed

Programs

- EV Stakeholder Convening – helps coordinate action among diverse EV stakeholders
- EV Charging – support development of EV charging infrastructure
- EV Dealer Programs – support dealers on EV sales and service
- Fleet Electrification – increase use of EVs in municipal and business vehicle fleets

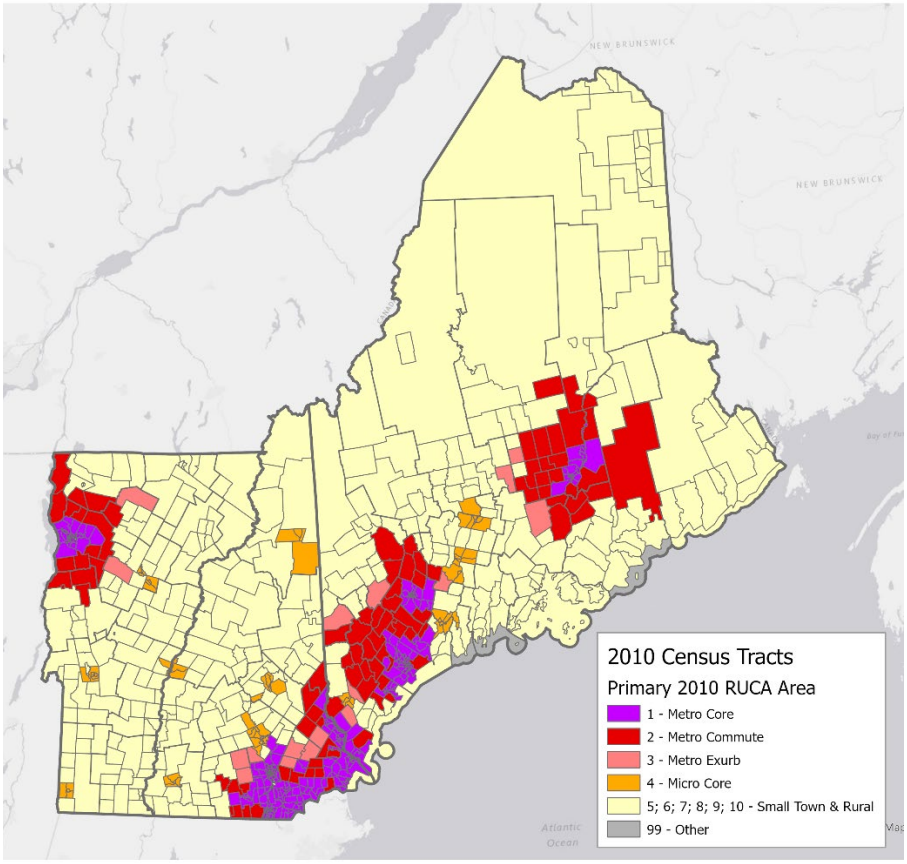
Education and Outreach

- Marketing Programs – overcome EV knowledge gaps among consumers
- EV Events – ride and drive events and other activities featuring EVs increase consumer experience and support purchases
- NGO Advocacy – non-governmental organizations supporting equitable transportation electrification through policy advocacy and member engagement

Northern New England Rural Transportation Overview

Communities in Maine, New Hampshire and Vermont display a range of land use settlement patterns influencing many aspects of life in the region. Households in more densely developed urban areas have greater access to transportation options, including walking, bicycling, and public transportation, and have shorter trips to work and services. The US Department of Agriculture uses Rural-Urban Commuting Area (RUCA) Codes to classify regions into ten primary categories ranging from rural to metropolitan areas based on population density, urbanization, and daily commuting patterns. Figure 1 below shows most of Northern New England's land area is classified according to RUCA's typology as either rural or small town, although the 62% of the region's population lives in non-rural areas as noted in Table 1.

Figure 1. Northern New England Rural-Urban Commuting Areas[1]



[1] USDA ERS 2010 Rural-Urban Commuting Area Codes are the most recent available, as it takes a few years for updates to occur following decennial census data releases. More information at: https://www.ers.usda.gov/data-products/rural-urban-commuting-area-codes/

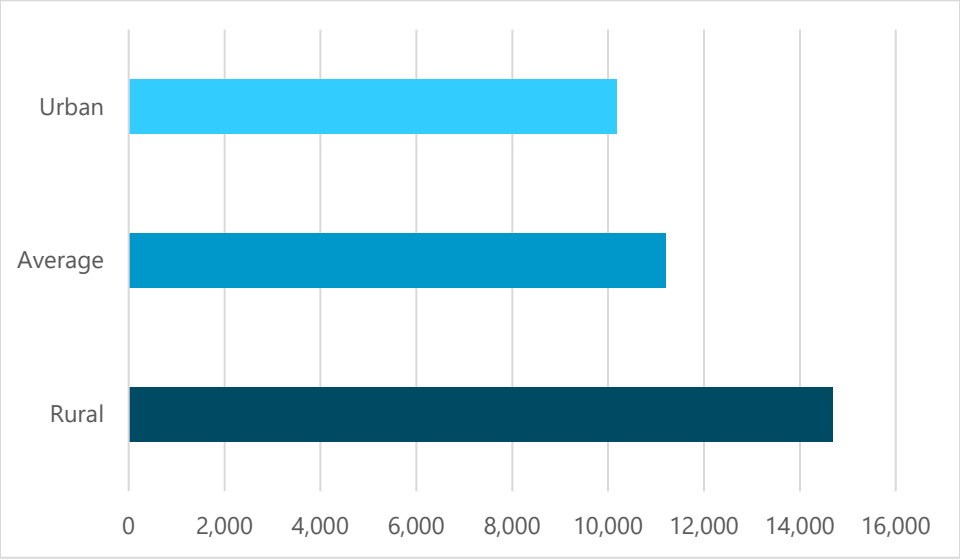
Table 1. Northern New England Rural Population Characteristics

State	2010 Population	% Rural Population	% Rural Land Area
Maine	1,328,000	40%	83%
New Hampshire	1,316,000	28%	75%
Vermont	626,000	56%	86%
Total	**3,270,000**	**38%**	**82%**

With so much of the region's land area classified as rural, and a sizable portion of the region's population (Table 1) living in these regions, it is critical for the unique qualities of rural communities be considered as strategies are developed to encourage greater EV deployment. The ability of all residents to adopt EVs is necessary to meet climate and energy goals. Further, rural EV adoption is an important equity consideration and will require targeted programs to ensure the benefits of EVs are available to all.

Rural drivers in New England drive nearly 45% more than those living in urban areas of New England. The 2017 National Household Travel Survey (NHTS) conducted by the Federal Highway Administration (FHWA), reported rural drivers drove 14,700 miles annually, compared to 10,180 miles driven by urban drivers (Figure 2).

Figure 2. Annual Vehicle Miles Traveled per Driver for New England States[2]



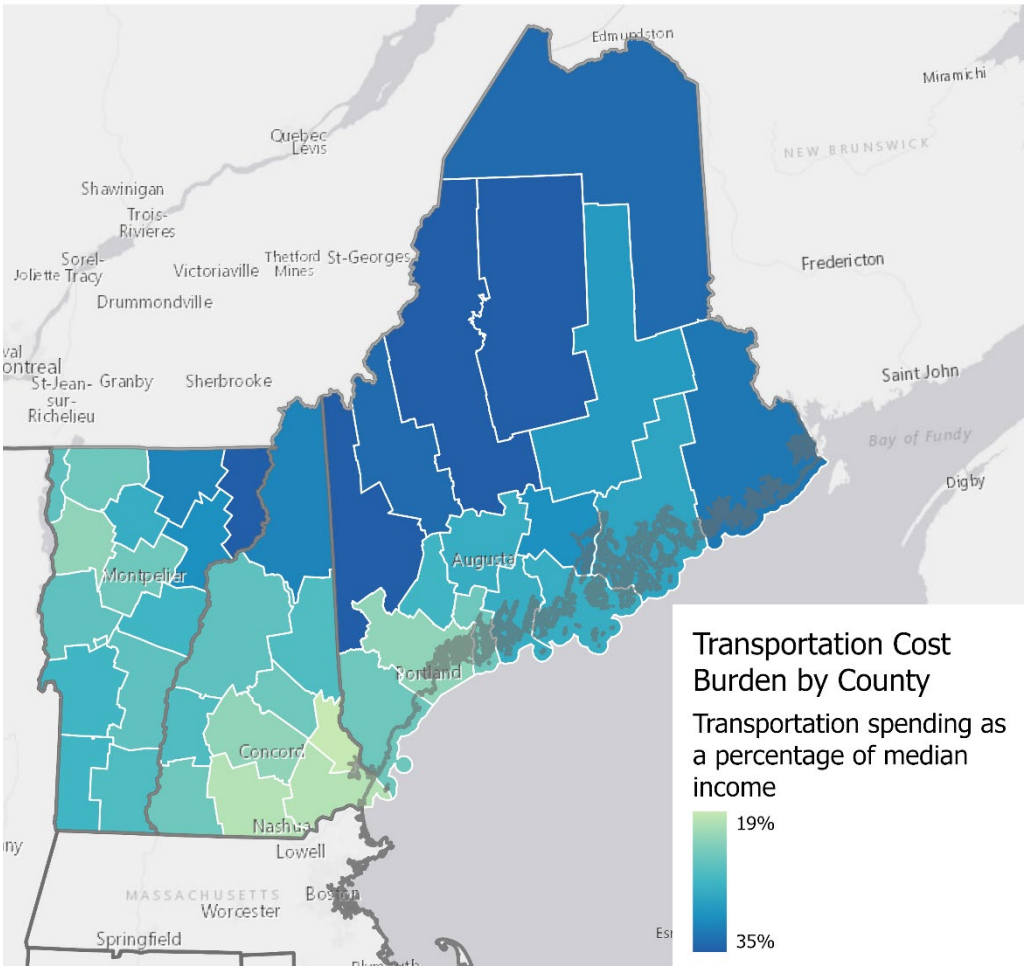
[2] US Dept of Transportation 2017 National Household Travel Survey New England Census Division Data https://nhts.ornl.gov/

Transportation cost burden, or the share of household income spent on transportation, tends to be highest in rural areas, due to two key factors:

1. Rural areas are characterized by lower household income; and
2. Rural households are more reliant on personal vehicles, resulting in higher vehicle miles traveled and higher spending on transportation.

For rural low-and-moderate income households throughout most of Northern New England, this cost burden can be crippling, making up more than 30% of household spending.[3]

Figure 3. Northern New England Transportation Cost Burden by County[4]



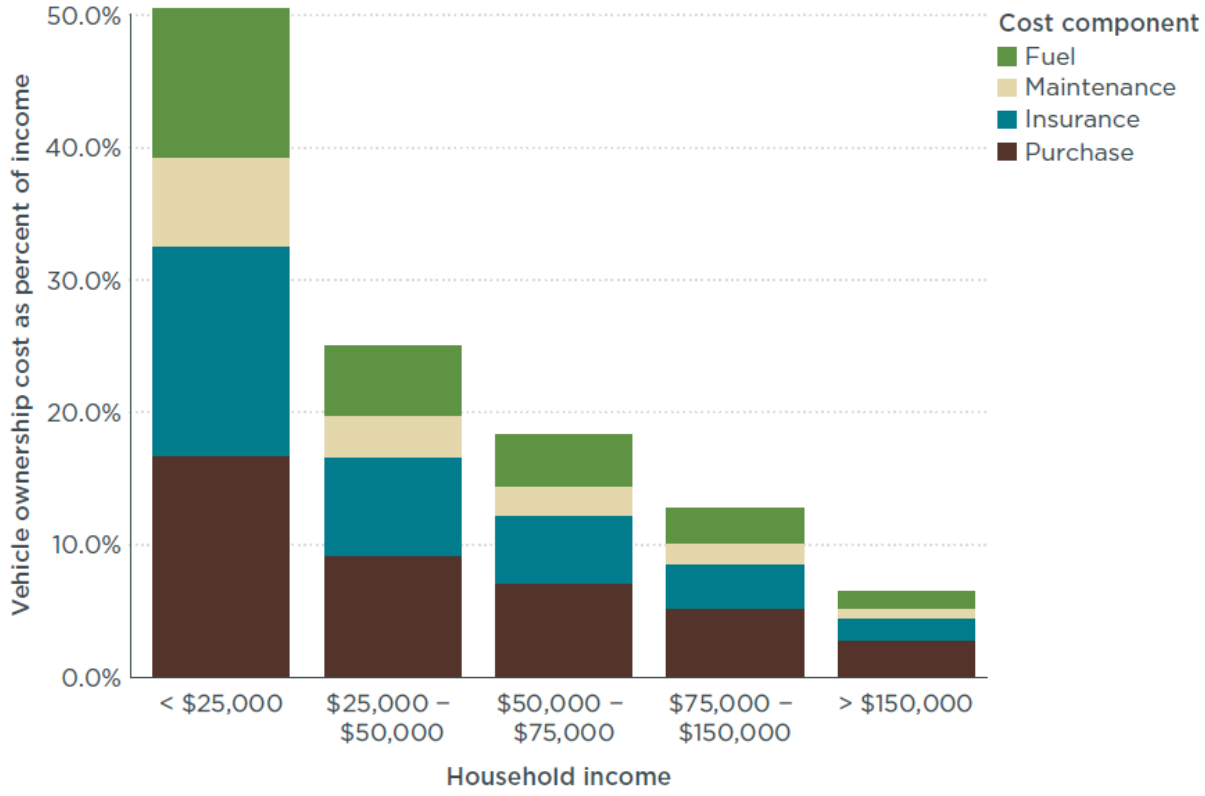
The Housing and Transportation Affordability Index, a tool developed by the Center for Neighborhood Technology (CNT), provides estimates of transportation cost burden by county. In this tool, transportation costs include costs associated with vehicle ownership (car payment, insurance) and operation (fuel and maintenance), as well public transit costs, when applicable.

[3] See Housing and Transportation Affordability Index: https://htaindex.cnt.org/map/
[4] Center for Neighborhood Technology 2017 H+T Index County Data. https://htaindex.cnt.org/download/data.php

Transportation cost burden is consistently high in northern and eastern Maine, where it approaches 35% of median household income. In nearly all counties of the three NNE states, transportation cost burden exceeds 20% (Figure 3).

In 2021, the International Council on Clean Transportation used national survey data available through FHWA and the Bureau of Labor Statistics to understand current vehicle expenditures by household income (Figure 4). For lower income households, vehicle costs require a two to three times greater share of household income relative to higher income households. EVs can dramatically reduce fuel and maintenance costs, approximately a third of total vehicle costs, substantially reducing the transportation cost burden of low-and-moderate income households. The study noted low-income households stand to benefit the most from EV adoption although they are currently less likely to purchase EVs due to their higher purchase price.

Figure 4. Total Cost of Gasoline-powered Vehicle Ownership as a Percent of Income[5]



[5] International Council on Clean Transportation. 2021. When might lower-income drivers benefit form electric vehicles? https://theicct.org/sites/default/files/publications/EV-equity-feb2021.pdf

Transportation Electrification Benefits

Reduced Transportation Cost Burden

Rural drivers are poised to reap significant benefits with a switch to an EV. As discussed above, rural households drive more miles, often in older, less efficient vehicles. This translates into more potential savings on fuel and maintenance if they were to switch to an EV. A 2020 report by the Union of Concerned Scientists (UCS) estimated fuel and maintenance savings for drivers in Maine and Vermont would range from $21,800 to $30,000 over the life of an EV, with rural households saving an additional 6-23% compared to urban households in those states. [6]

Climate benefits of EVs

EVs have zero tailpipe emissions. At 19.5 lbs greenhouse gas (GHG) emissions per gallon of gasoline,[7] an average vehicle efficiency of 23 miles per gallon, and 14,700 miles driven annually in rural areas of New England, EVs offer a potential reduction of 6.2 tons of tailpipe GHG emissions per vehicle. While the electricity generated to fuel EVs under current conditions produces some GHGs, total EV emission reductions (well-to-wheels) are nearly 80 tons per vehicle (Table 2) over the life of a vehicle, due to the region's relatively clean electric mix and high miles traveled for rural drivers.

Table 2. Well-to-Wheels GHG Emissions for Gasoline and Electric Vehicles in Rural New England[8]

	Vehicle Well-to-Wheels GHG Emissions (tons)	
Fuel type	**Annual**	**Lifetime**
Gasoline[9]	7.5	93.6
Electricity[10]	1.2	14.8
EV Reduction	**-6.6**	**-78.8**

Emissions associated with electricity generation are projected to come down even further over time as the region shifts to an increasingly cleaner electricity mix. For example, UCS analysis of electric generation sources found an EV driving on average grid electricity in New England has

[6] UCS. Clean Transportation Strategies for Rural Communities in the Northeast and Mid-Atlantic States. Nov 2020. https://www.ucsusa.org/sites/default/files/2020-11/rural-transportation-opportunities.pdf
[7] US EPA. Greenhouse Gas Emissions from a Typical Passenger Vehicle. Mar 2018. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle
[8] Assumes 14,700 miles driven annually
[9] Assumes vehicle efficiency of 23 mpg: https://www.bts.dot.gov/bts/bts/content/average-fuel-efficiency-us-light-duty-vehicles; WTW Emissions factor of 23.5 lbs GHG/gallon: https://afdc.energy.gov/vehicles/electric_emissions_sources.html, see also: https://greet.es.anl.gov/
[10] EPA Emissions & Generation Resource Integrated Database (eGRID) Summary Data: https://www.epa.gov/egrid/summary-data

improved from a 75 MPG gasoline vehicle GHG equivalent in 2009 to a 122 MPG equivalent in 2019 – reducing annual EV GHG emissions by nearly 40% over this period.[11] All three NNE states have renewable portfolio standards in place that require electric utilities to procure increasing shares of low carbon renewable generation over the next 20-30 years.[12]

Health and Air Quality benefits

With zero tailpipe emissions, the health and air quality benefits of EVs are significant, especially for vulnerable populations, such as those with respiratory conditions like asthma and chronic obstructive pulmonary disease (COPD). The American Lung Association modeled a national transition to EVs and found each of the three NNE states stand to save millions in health benefits from large scale transportation electrification of light, medium and heavy-duty vehicles, totaling nearly half a billion dollars regionally by 2050 (Table 3). While the most severe air quality impacts are found in urban areas, there may still be significant health benefits to rural transportation electrification.

Table 3. Total 2050 Health Benefits by State[13]

State	Total 2050 State Health Benefits
Maine	$182 million
New Hampshire	$191 million
Vermont	$73 million
Northern New England Total	***$446 million***

Economic Opportunities

EVs present a unique opportunity for state and local economies. Little of the money spent on imported fossil fuels currently used to power transportation stays within the local economy. Analysis by the Southern Alliance for Clean Energy (SACE) estimates that approximately a third of spending on petroleum stays within local economies, while nearly 70% of spending on electricity is retained.[14] In NNE, where spending on imported fossil fuels is approximately $8.3 billion, annually, an estimated $5.8 billion flows *out* of local economies across the region, every year.[15] In addition to keeping more money circulated locally, a shift toward electrified transportation can put downward pressure on electric rates for all rate payers. A 2019 analysis of utility areas in

[11] UCS. Plug In or Gas Up? Why Driving on Electricity is Better than Gasoline. Jun 2021. https://blog.ucsusa.org/dave-reichmuth/plug-in-or-gas-up-why-driving-on-electricity-is-better-than-gasoline/
[12] Maine's RPS calls for 80% renewable generation by 2030 and a goal of 100% by 2050. NH is 25% by 2025 and VT is currently 75% by 2032, although Legislative discussions are underway that may increase this.
[13] American Lung Association 2021 Road to Clean Air Report**.** https://www.lung.org/clean-air/electric-vehicle-report
[14] Southern Alliance for Clean Energy. 2021. Retained Transportation Fuel Spending on the Southeast. https://cleanenergy.org/blog/electric-vehicles-could-add-47-billion-annually-to-southeast-economy
[15] VEIC. 2019. Advancing Clean Energy Investment in Northern New England. https://www.nature.org/content/dam/tnc/nature/en/documents/Clean_Energy_Investment_Report_2019.pdf

California found EVs generated more revenue for electric utilities than costs, especially when charging occurred during off-peak hours.[16]

EV Market Factors

EVs clearly offer a range of benefits, to local economies, our health, and the environment. However, they remain a relatively small share of Northern New England's vehicle fleet, approximately 0.6% across the region (Table 4). The American Council for an Energy-Efficiency Economy (ACEEE) publishes a State Transportation Electrification Scorecard annually to track progress states are making toward electrification of the transportation sector and reduced transportation GHG emissions. The scorecard considers a range of factors, including state incentives for EV deployment, grid optimization, EV equity, and state goals for EV and EVSE deployment. Vermont has both the highest level of EV market share among NNE states and the highest ACEEE Transportation Electrification ranking at 7th.

Table 4. EV Market Factors by State

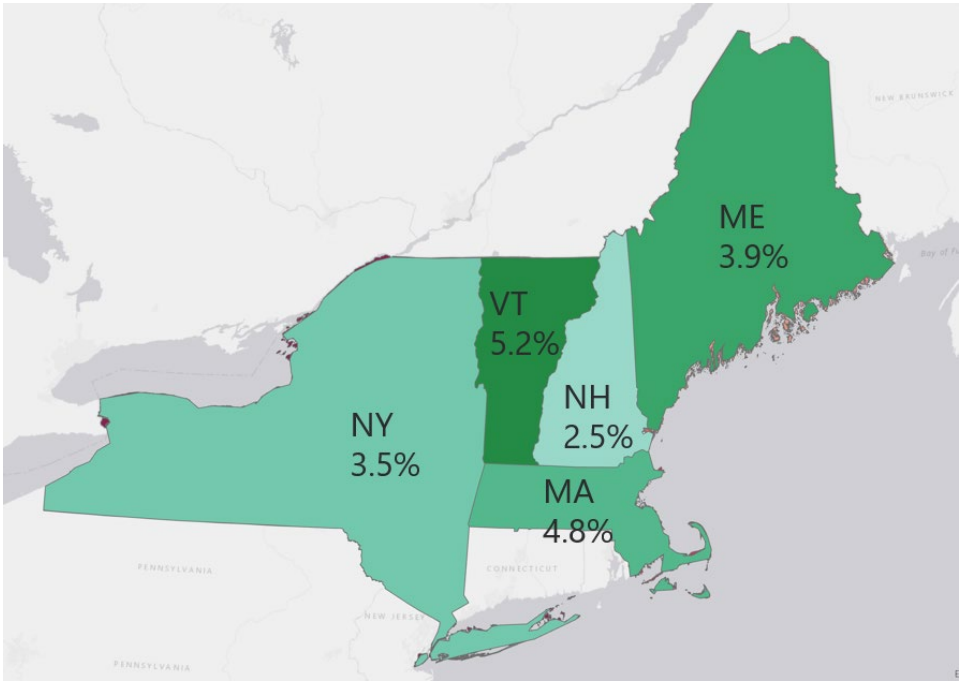
State	Registered Vehicles	# of New EVs sold to-date	Estimated EV Share of Registered Vehicles	EV Market Share 2021 Q1&2	ACEEE Transportation Electrification Ranking[17]
ME	1,130,100	5,873	0.5%	3.9%	17
NH	1,363,400	6,526	0.5%	2.5%	37
VT	620,400	6,422	1%	5.2%	7
Total	**3,113,900**	**18,821**	**0.6%**	**3.5%**	

Across the northeast region, EV market share is also highest in Vermont, where EV sales made up over 5% of all vehicle sales in the first half of 2021 (Figure 5). California leads nationally, with EVs making up nearly 12% of market share in the same timeframe.

[16] Synapse Energy Economics. 2019. Electric Vehicles are Driving Electric Rates Down: https://www.synapse-energy.com/sites/default/files/EV-Impacts-June-2019-18-122.pdf

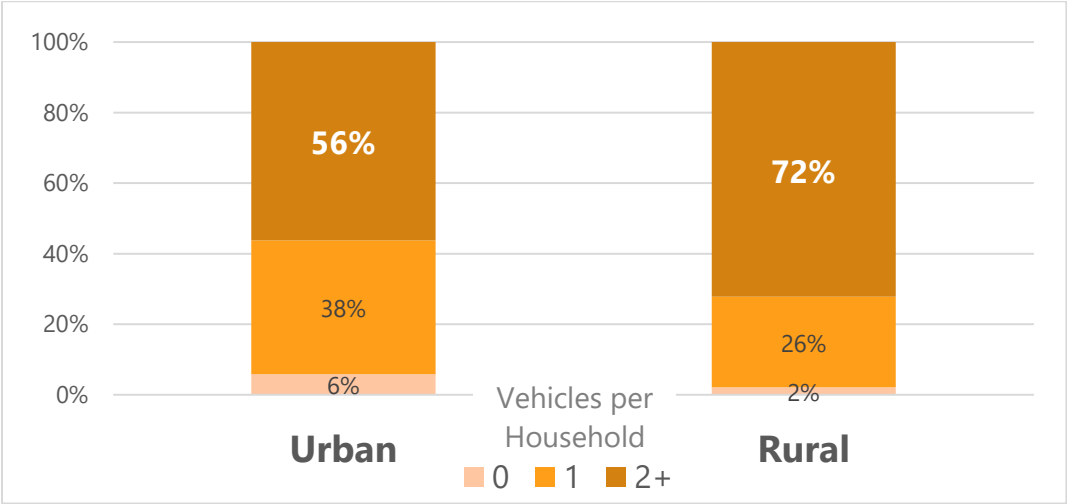
[17] ACEEE. 2021 State of Transportation Electrification Scorecard: https://www.aceee.org/research-report/t2101

Figure 5. EV Market Share by State, Jan-Jun 2021[18]



Further analysis of travel patterns and the vehicle fleet in NNE can inform plans for widespread EV deployment. An analysis of the National Household Travel Survey revealed nearly three quarters of households in rural areas in the region have access to at least two vehicles (Figure 6). It is often easier for these multi-vehicle households to consider electrification since in most cases these households do not need more than one "road trip" vehicle able to travel long distances where charging availability and reliability concerns may hold back an EV purchase.

Figure 6. Northern New England Vehicle Availability per Household[19]



[18] Alliance for Automotive Innovation. https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard
[19] US Dept of Transportation 2017 National Household Travel Survey Data for ME, NH, and VT: https://nhts.ornl.gov/

The upfront price of most EV models has tended to be higher than comparable gasoline vehicles (prior to incentives) and limited availability of EVs in the used market has led to the majority of existing EV owners being characterized by higher household incomes. It is estimated approximately 70% of current EV owners earn more than $100,000 annually.[20] By definition, low-and-moderate income (LMI) households have less disposable income, making them more price conscious than higher income households, and especially sensitive to the up-front costs associated with a purchase.

Long-term operating savings offered by EVs may be less compelling for LMI households or simply not accessible, putting plug-in options out-of-reach. Lower household incomes in rural areas highlight the transformative role of purchase incentives in equitably advancing EV ownership. It is important to note that EV tax credit incentives, such as the current federal plug-in vehicle tax credit, are often not as helpful for lower income households whose limited tax liabilities may prevent them from accessing the full value of the incentive.

Table 5. Plug-in Electric Vehicle Ownership Interest by Income[21]

	Plug-in Electric Vehicle Ownership Interest by Income Bracket			
	Total Support	Less than $50,000	$50k - $99,999	$100,000 or more
Statement				
Definitely planning on getting a PEV for next vehicle	*5%*	4%	5%	5%
Would consider for next vehicles	*31%*	28%	33%	34%
Some interest, but not for next vehicle	*27%*	26%	25%	30%
No interest for next vehicle	*37%*	42%	36%	31%

Interest in EV ownership, however, is not strongly linked to income according to a national survey conducted the Union of Concerned Scientists (Table 5), suggesting drivers at all income levels may be interested in an EV purchase. Additional research from Consumer Reports indicated 71% of US drivers would consider an EV purchase in the future, with Millennial driver interest at 78%, Gen X at 70%, and Baby Boomers at 66%.[22] This suggests that as EV availability grows, there are many drivers who would consider an EV option.[23] Cox Automotive similarly reported younger interested

[20] CNBC. Electric vehicle prices finally in reach of millennial, Gen Z car buyers. Oct 2019. https://www.cnbc.com/2019/10/20/electric-car-prices-finally-in-reach-of-millennial-gen-z-buyers.html
[21] Union of Concerned Scientist. 2019. Electric Vehicle Survey Findings and Methodology. https://www.ucsusa.org/sites/default/files/attach/2019/07/2019-EV-Survey.pdf
[22] Consumer Reports. Dec 2020. New CR survey finds the majority of consumers are interested in getting an electric vehicle. https://www.consumerreports.org/hybrids-evs/cr-survey-shows-strong-interest-in-evs-a1481807376/
[23] Union of Concerned Scientists Electric Vehicle Survey Findings and Methodology. https://www.ucsusa.org/sites/default/files/attach/2019/07/2019-EV-Survey.pdf

car buyers aged 25-34 only comprised 10% of existing EV owners but were most likely to view EVs positively.[24]

EV Availability

Many rural drivers in NNE tend to prefer higher ground clearance vehicles with all-wheel drive. As EV availability continues growing there are more models fitting this description coming into the marketplace. As of April 2022, there are about 60 different EV models available for sale in NNE states. Considering the rural preferences, Table 6 below lists 29 crossover, sport utility vehicle (SUV) and pickup truck EV models currently available with all-wheel drive, sorted by price.

Table 6. Crossover, SUV and Pickup Truck EV Models Currently Available with All-Wheel Drive

Make / Model	EV Type	Vehicle Type	Electric Range (miles)	PHEV Total Range (miles)	Base Price (MSRP)
Hyundai Tucson PHEV	PHEV	Crossover/SUV	33	420	$34,900
Subaru Crosstrek Hybrid	PHEV	Crossover/SUV	17	480	$35,845
Mitsubishi Outlander PHEV	PHEV	Crossover/SUV	24	320	$36,995
Hyundai Santa Fe PHEV	PHEV	Crossover/SUV	30	440	$39,500
Hyundai Ioniq 5	BEV	Crossover/SUV	220-303		$39,700
Toyota RAV4 Prime	PHEV	Crossover/SUV	42	600	$39,800
Kia EV6	BEV	Crossover/SUV	232-310		$40,900
Volkswagen ID.4	BEV	Crossover/SUV	280		$41,230
Ford Mustang Mach-E	BEV	Crossover/SUV	224-303		$43,895
Audi Q4 e-tron	BEV	Crossover/SUV	241		$43,900
Kia Sorento PHEV	PHEV	Crossover/SUV	32	460	$44,990
Polestar 2	BEV	Crossover/SUV	249-270		$45,900
Lincoln Corsair Grand Tour	PHEV	Crossover/SUV	28	430	$50,390
Volvo XC40 Recharge	BEV	Crossover/SUV	223		$51,700
Jeep Wrangler 4xe	PHEV	Crossover/SUV	22	370	$53,795
Volvo XC60 T8 PHEV	PHEV	Crossover/SUV	19	500	$54,250
Audi Q5 E PHEV	PHEV	Crossover/SUV	19	400	$55,400
Jeep Grand Cherokee 4xe	PHEV	Crossover/SUV	26	470	$58,095
Volvo C40 Recharge	BEV	Crossover/SUV	226		$58,750
BMW X5 xDrive45e	PHEV	Crossover/SUV	31	400	$63,700
Volvo XC90 T8 PHEV	PHEV	Crossover/SUV	18	520	$64,800
Tesla Model Y	BEV	Crossover/SUV	318		$64,990
Audi e-tron	BEV	Crossover/SUV	238		$65,900
Rivian R1T	BEV	Pickup Truck	314		$67,500
Lincoln Aviator Grand Tour	PHEV	Crossover/SUV	21	460	$68,680
Jaguar I-Pace	BEV	Crossover/SUV	234		$69,200
BMW iX	BEV	Crossover/SUV	305-324		$83,200
GMC Hummer EV	BEV	Pickup Truck	300-350		$110,295
Tesla Model X	BEV	Crossover/SUV	332		$114,990

[24] CNBC. Oct 2019. Electric vehicle prices finally in reach of millennial, Gen Z car buyers. https://www.cnbc.com/2019/10/20/electric-car-prices-finally-in-reach-of-millennial-gen-z-buyers.html

Pickup trucks are especially popular options among many rural households. Rivian recently started deliveries of the first mass produced electric pickup truck, the R1T. Ford is anticipated to start delivering their F-150 Lightning in 2022 and Chevrolet has opened pre-orders for the Silverado electric pickup due next year. Several more all-wheel drive electric pick-up trucks and other higher clearance EVs are anticipated to arrive in the next 1-3 years, including options shown in Table 7 below, sorted alphabetically by make and model. Many of the specifications are still to be determined (TBD), but all of the models are anticipated to offer at least 200 miles of electric range. Additional models are expected as automakers continue to develop new EV options.

Table 7. Future Crossover, SUV and Pickup Truck EV Models with All-Wheel Drive Available

Make / Model	EV Type	Vehicle Type	Electric Range (miles)	Base Price (MSRP)
Cadillac Lyriq	BEV	Crossover/SUV	TBD	$58,795
Chevrolet Blazer	BEV	Crossover/SUV	TBD	TBD
Chevrolet Equinox	BEV	Crossover/SUV	TBD	$30,000
Chevrolet Silverado	BEV	Pickup Truck	TBD	$40,000
Dodge RAM 1500 EV	BEV	Pickup Truck	TBD	TBD
Ford F-150 Lightning	BEV	Pickup Truck	230-300	$41,000
GMP Sierra EV	BEV	Pickup Truck	TBD	TBD
Kia EV9	BEV	Crossover/SUV	TBD	TBD
Lordstown Endurance	BEV	Pickup Truck	TBD	$52,500
Lucid Air	BEV	Crossover/SUV	406-520	$77,400
Nissan Ariya	BEV	Crossover/SUV	265-300	$47,125
Subaru Solterra EV	BEV	Crossover/SUV	TBD	$45,000
Tesla Cybertruck	BEV	Pickup Truck	TBD	$40,000
Toyota bZ4X	BEV	Crossover/SUV	TBD	$42,000
Toyota Tacoma EV	BEV	Pickup Truck	TBD	$50,000

As of early 2022, automakers continue to grapple with microchip shortages which have significantly impacted vehicle production of all types, including EVs. There are indications the shortage will begin to ease in late 2022, but it could be a few years before these constraints are completely resolved. Many EV models may be difficult to find for purchase and/or subject to additional dealer price increases in the interim.

Access to EV sales and service in rural areas has lagged more urban communities. Some dealers in rural areas are reluctant to spend the $50,000 or more it can cost to purchase specialized EV service equipment, train technicians, and install charging. However, as EVs become more widespread growing numbers of new and used car dealers and independent repair shops in rural areas are getting qualified to handle EVs. As discussed in the toolkit solutions section below, programs to support EV dealers can improve availability of EVs.

Charging Infrastructure

Most EV drivers do 80% or more of their charging at home and/or workplaces if charging is available.[25] These locations offer greater convenience and lower pricing than most public charging options. However, availability of public charging infrastructure is critical to enable longer distance travel and to provide options for people who may not be able to charge up at home. Residential charging can be a challenge for those living in multifamily housing, those in urban areas without a dedicated parking space, and renters, who may be reluctant or unable to install equipment at a home they do not own.

EV charging is enabled through electric vehicle supply equipment (EVSE), which comes in three distinct levels:

1. **Level 1** – Level 1 charging uses the same 120 volt power found in standard household outlets and can be performed using equipment provided by EV automakers. Making this type of charging available can be as simple as using existing 120 volt outlets within 20 feet of vehicle parking. Level 1 charging typically adds 3-5 miles of range per hour of charging, so it may not be suitable for EV drivers traveling more than 50 miles per day. A recent US Energy Information Administration (EIA) survey estimated about half of homes in New England had access to a 120 volt outlet within 20 ft of where their vehicle was parked.[26]
2. **Level 2** – Level 2 charging uses 240 volt power to enable faster charging, usually offering 10-20 miles of range per hour of charging. Level 2 charging requires installation of an EVSE unit or 240V receptacle a Level 2 EVSE can plug into. Some homes may not have enough electric panel capacity to support an additional 240V circuit without a load management device or panel upgrade, and in some cases local electric distribution transformer upgrades may be needed, which may be billed to the customer depending on individual electric utility business practices.
3. **DC Fast Charging** – DC fast charging provides compatible vehicles with an 80% charge in 30-60 minutes by converting high voltage AC power to DC power for direct storage in EV batteries. This higher powered charging is much more expensive to install and operate, so fees associated with use tend to be much higher than what EV drivers might pay for home charging or comparable travel in a gasoline vehicle.

All automakers except Tesla have standardized to use the Society of Automotive Engineers (SAE) J-1772 plug connector for Level 1 and 2 charging. Tesla uses their own proprietary plug design, but they do have adapters available for Tesla drivers to plug into J-1772 equipment.

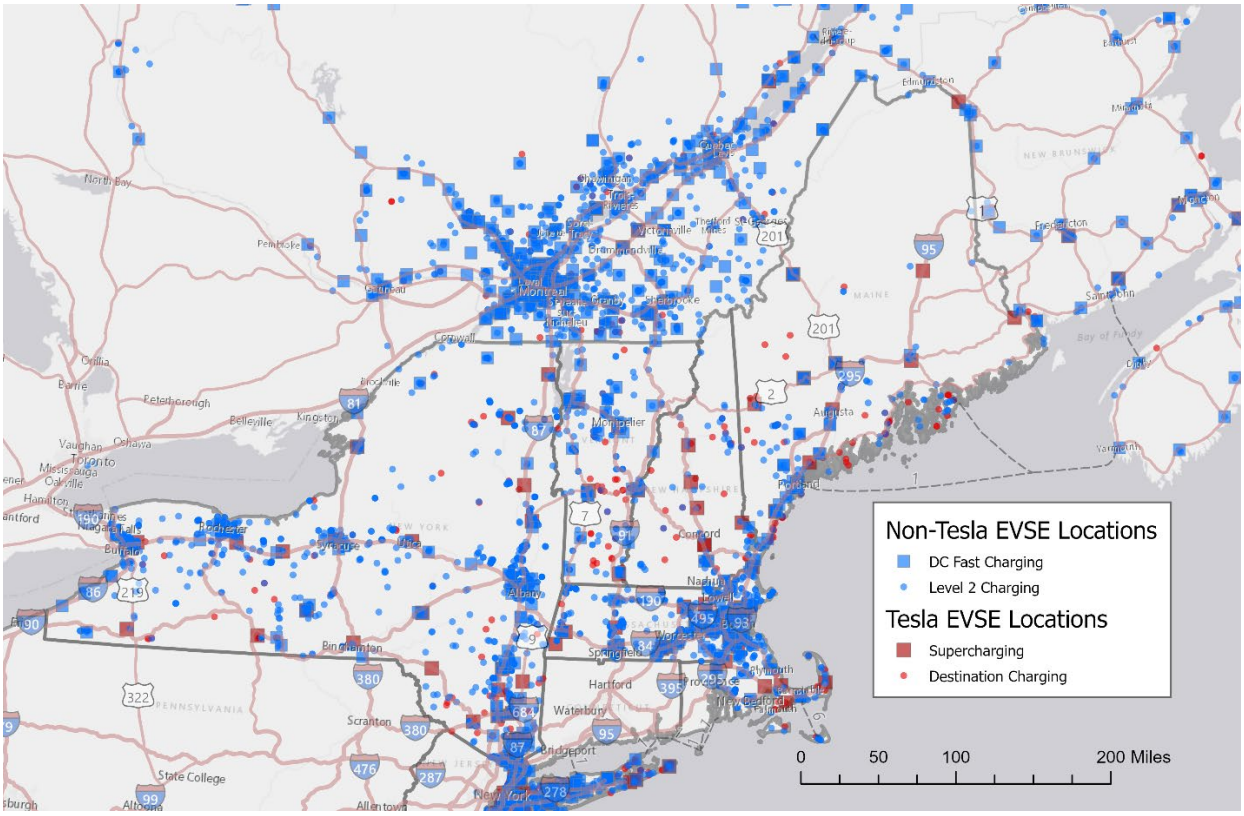
[25] US Dept of Energy. National Plug-in Electric Vehicle Infrastructure Analysis. Sept 2017. https://www.nrel.gov/docs/fy17osti/69031.pdf

[26] US EIA. 2015 Residential Energy Consumption Survey (RECS). May 2018. https://www.eia.gov/consumption/residential/data/2015/hc/php/hc2.7.php

For fast charging, most automakers use a variation on the J-1772 connector called the SAE combined charging system (CCS). Nissan and Mitsubishi use a different fast charging plug called CHAdeMO, although recent vehicle introductions from Nissan indicate they are migrating to the SAE CCS for new EV models starting with Ariya due to arrive in 2022. This suggests CHAdeMO vehicles will be less common in the future. Tesla also has an adaptor that allows drivers to use CHAdeMO equipment and they have announced a SAE CCS adapter. Importantly, there are no adapters available now that would allow non-Tesla drivers to access Tesla fast charging locations commonly referred to as Superchargers. Tesla has suggested they may open their network to other users in the future, but they have not made any formal announcements on how this might work in the United States.

Due to the charging plug compatibility issues described above it's important to distinguish between Tesla and non-Tesla charging infrastructure. Figure 7. Public EV Charging in ME, NH, VT, and Bordering StatesFigure 7 below shows Level 2 and DC fast charging locations for Tesla in red and non-Tesla EVs in blue.

Figure 7. Public EV Charging in ME, NH, VT, and Bordering States as of October 2021[27]

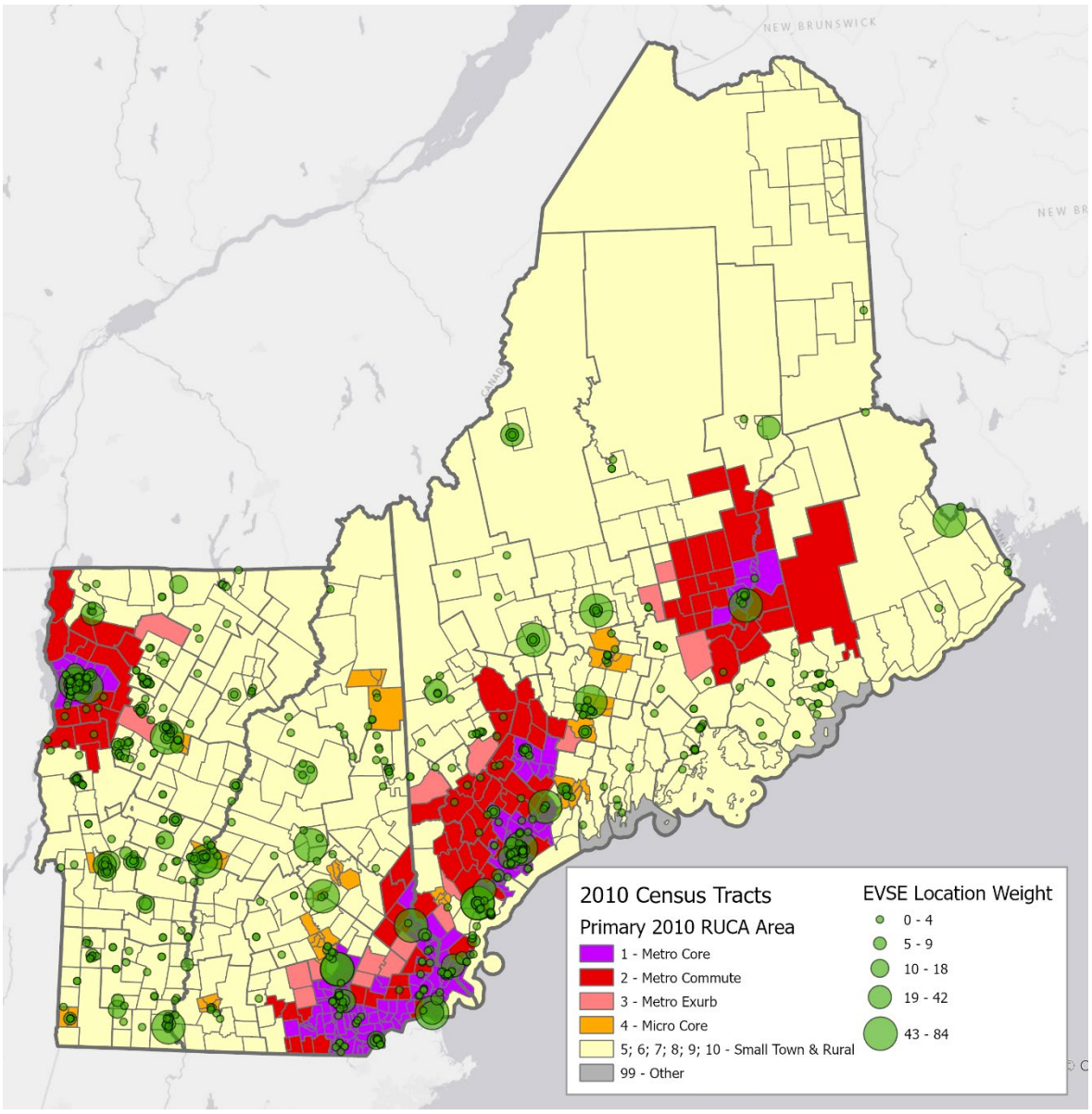


To better understand the current availability of charging in rural areas, a weighted measure of Level 2 and DC Fast Charging availability that treats each Level 2 charging port as a weight of 1, and each DC Fast Charging port as a weight of 7 (roughly the magnitude of the increase in

[27] US Dept of Energy. Oct 2021. Alternative Fuel Data Center Station Locator Database. https://afdc.energy.gov/stations

charging power most existing non-Tesla DC fast charging ports). Figure 8 below illustrates the weighting of EVSE locations in northern New England (including Tesla), overlaid on the RUCA areas described earlier, with the light-yellow areas representing more rural communities. Table 86 summarizes the split of weighted charging availability between rural and non-rural areas. The 41% weighted availability of charging in rural areas is commensurate with population, but the much higher proportion of land in rural areas (82%) is an indication there are rural areas with little to no public charging available, as is apparent on the map.

Figure 8. Weighted EVSE Locations in RUCA Areas[28]



[28] USDA 2010 RUCA Areas; US Dept of Energy Alternative Fuel Data Center October 2021 station locator data: https://afdc.energy.gov/stations

Table 8. Rural Public EV Charging Availability

State	% Rural Population	% Rural Land Area	% of Non-Tesla Ports in Rural Areas
ME	40%	83%	34%
NH	28%	75%	18%
VT	56%	86%	56%
Total	**38%**	**82%**	**41%**

Some states, including Vermont and Maine, have developed strategies to support building out charging infrastructure in rural areas that may not be as attractive for private investment.[29] Many states have leveraged the maximum of up to 15% of Volkswagen diesel settlement mitigation funds to support development of EV charging over the past five years, including in lower trafficked areas. Maine and Vermont have each put approximately $3 million towards EVSE installations through this work. New Hampshire has not yet spent much of their available funds, but the NH Dept of Environmental Services closed an RFP opportunity in February 2022 prioritizing EVSE installation along key travel corridors - awards are expected in spring 2022.[30] A 2019 report on the state of EV charging infrastructure in New Hampshire further noted:

> "*The economic case for installing EV charging infrastructure is in the money EV drivers spend at local businesses while charging, and not from the money spent on electricity at the charging station itself. Charging a car is not the same as fueling at a gas station. Drivers generally stop for longer periods of time to charge but do not have to supervise their vehicle while it is charging. This economically benefits nearby businesses as EV drivers stop for a meal, do some sightseeing, or shop while their car charges.*"

Indeed, in a survey of New Hampshire EV drivers, over 70% reported that patronizing local businesses while using public EVSE, typically spending between $20 and $40.[31]

[29] Maine Governor's Energy Office / Efficiency Maine. Maine Clean Transportation Roadmap - EVSE priority map. Dec 2021. https://www.maine.gov/future/initiatives/climate/cleantransportation

[30] New Hampshire Dept of Environmental Services. Volkswagen Mitigation Trust. Jan 2022. https://www.des.nh.gov/business-and-community/loans-and-grants/volkswagen-mitigation-trust

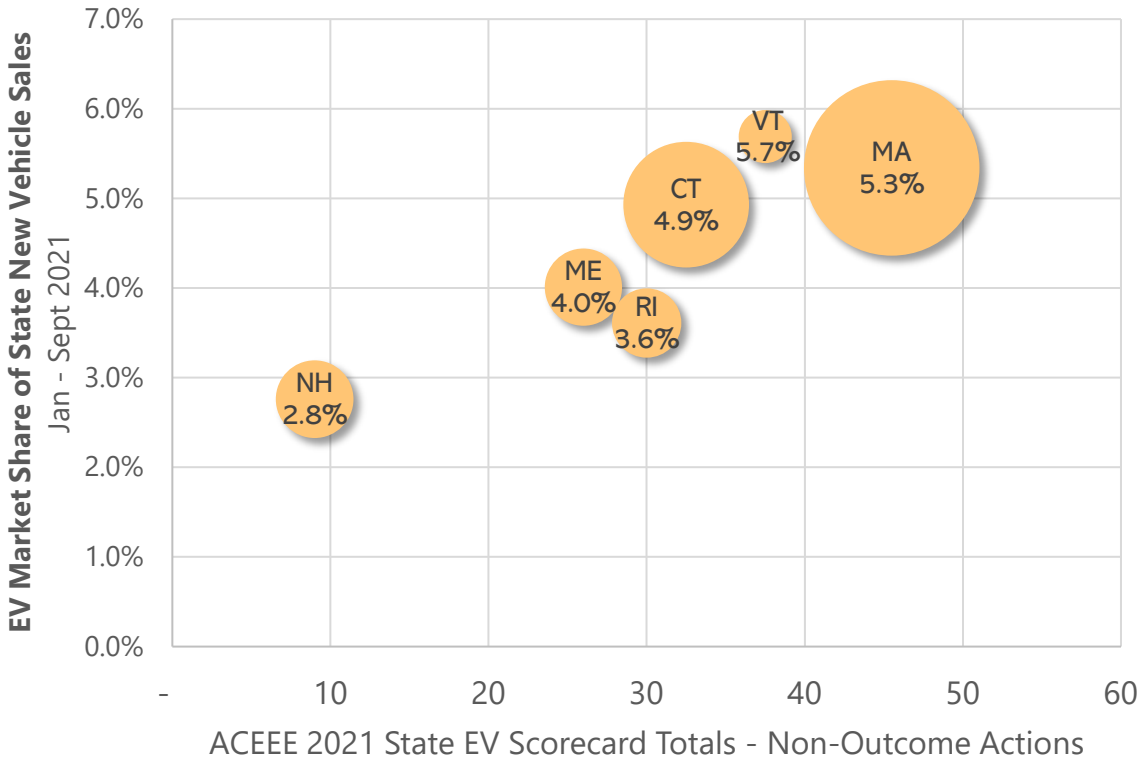
[31] New Hampshire Dept of Business and Economic Affairs. Evaluating Electric Vehicle Infrastructure in New Hampshire. July 2019. https://www.nh.gov/osi/resource-library/documents/nh-ev-infrastructure-analysis.pdf

EV Toolkit Solutions

Successful efforts to increase community EV adoption typically rely on a combination of factors. The term "market transformation" describes a systematic approach to identifying, implementing, and evaluating strategic market interventions to advance and normalize energy efficient technologies.[32] Market transformation can provide a helpful framework for transportation electrification as advocates and policy makers seek to remove EV barriers and ultimately transform the vehicle market to an extent where EV adoption is self-sustaining and the need for interventions is reduced.

As shown in Figure 9 below, supportive EV policies enacted by New England states were quantified by ACEEE, including technology forcing regulations, incentive offerings, charging infrastructure programs, and promotional activities correlates with greater market share of EVs. The bubble size in this chart reflects 2020 population. Data suggests that even smaller states like Vermont can achieve relatively high EV market share in the right policy environment.

Figure 9. New England State Electric Vehicle Market Share by Promotion Actions and Population[33]



[32] ACEEE Transforming Energy Efficiency Markets: Lessons Learned and Next Steps. Report U1715. December 2017. https://www.aceee.org/sites/default/files/publications/researchreports/u1715.pdf

[33] Scores on horizontal axis based on EV policy and promotional activities from ACEEE 2021 State of Transportation Electrification Scorecard do not include the outcome-based component as that included market share

Evolving market conditions makes evaluating the effectiveness of EV market interventions more challenging, but research and stakeholder interviews identified 12 best practices to advance EVs in rural communities which are described in the policy, program and outreach sections below.

Policy Tools

Federal, state and local policies are a powerful means of accelerating the EV market and adoption. Policies send an important signal to EV manufacturers and charging station developers that states are serious about building a market for EVs, making them more likely to make EV models available for sale and support building out EVSE infrastructure. In addition, policies are critical to removing current barriers to EV adoption - including the upfront cost of vehicles and availability of public charging – and ensuring an equitable transition to EVs, including drivers living in rural and low-and-moderate income (LMI) households.

Zero Emission Vehicle Regulations

The Federal government regulates vehicle tailpipe emissions under the Clean Air Act. States are preempted from developing their own vehicle emissions regulations under federal law, but California has a federal waiver that allows them to develop more stringent vehicle emission standards. Section 177 of the Clean Air Act authorizes states to adopt California's standards. The current California regulations include the Advanced Clean Cars (ACC) program a component of which requires automakers to increase Zero Emission Vehicle (ZEV) production, including battery electric vehicles, plug-in hybrid vehicles and/or hydrogen fuel cell vehicles[34].

Automakers employ a variety of manufacturing and credit trading strategies to meet program requirements based on their overall vehicle sales. Current ACC regulations apply to vehicles produced through model year 2025. Maine and Vermont have elected to adopt these requirements, along with over 10 other states representing a significant share of the overall US vehicle market.

The California Air Resources Board (CARB) is now developing ACC II regulations for model year 2026 and beyond light duty vehicles. Changes proposed for the program include a 100% ZEV goal by 2035 which, if enacted in CA and adopted by other ZEV states, would require automakers to fully transform sales in the new light duty vehicle market by that time. ACC II will also likely benefit other aspects of ZEV adoption, such as providing greater clarity on EV battery health for used EV sales, standardizing charging plugs and potentially increasing EV uptake in underserved communities. Vermont's Climate Action Plan includes a recommendation to adopt ACC II and the

factors https://www.aceee.org/research-report/t2101; Bubble size based on 2020 US Census population; Market Share from Alliance for Automotive Innovation's Advanced Technology Vehicle Sales Dashboard https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard

[34] California Air Resources Board. Zero Emission Vehicle Program. https://ww2.arb.ca.gov/our-work/programs/zero-emission-vehicle-program/about

legislature will be considering this policy in 2022. Maine's Clean Transportation Roadmap also recommends adoption of ACC II.

California has developed similar ZEV regulations for heavy duty vehicles and fleets encompassed in the Advanced Clean Truck (ACT) rule enacted in June 2020.[35] Vermont's climate action plan and Maine's Clean Transportation Roadmap also include recommendations to adopt the ACT rule.

New Hampshire experiences reduced availability of EV models and lower automaker ZEV support as they are not currently a ZEV state. This is a significant contributor to the State's lagging EV market share compared to Maine and Vermont. The possible participation of New Hampshire in the ZEV program was referenced in stakeholder interviews informing this report, and could offer significant EV market benefits at relatively low cost to the State and consumers.

New Hampshire is not a ZEV state and has less availability of EV models and lower automaker support

While ZEV regulations are not exclusive to rural areas, their benefits extend across participating states and help increase availability of EV options in Northern New England. As ZEV requirements grow increasingly stringent in the future it will motivate automakers to increase availability of all-wheel drive and higher ground clearance vehicle options much desired by consumers in the region.

Adoption of ZEV regulations is usually supported by state agency staff, generally without significant agency budget increases. The CARB process of developing the clean car and truck standards includes cost/benefit analyses which ensure societal benefits of these programs are maximized.

EV Purchase Incentives

Research has consistently revealed high up-front purchase prices of EVs is a key barrier to adoption.[36] The success of incentive programs supports this finding. A survey of 80,000 EV rebate recipients across CA, CT, MA, and NY found 90% of recipients reported availability of a state incentive was an important factor in making an EV purchase decision.[37]

An example of the importance of incentives can be found in the state of Georgia's experience. Georgia offered a $5,000 incentive to battery EV (BEV) purchasers starting in 1998. Sales of BEVs accelerated as more affordable models became available in 2012 and at various points over the next few years Georgia was a leading market for EV sales as a result. The credit was rescinded by

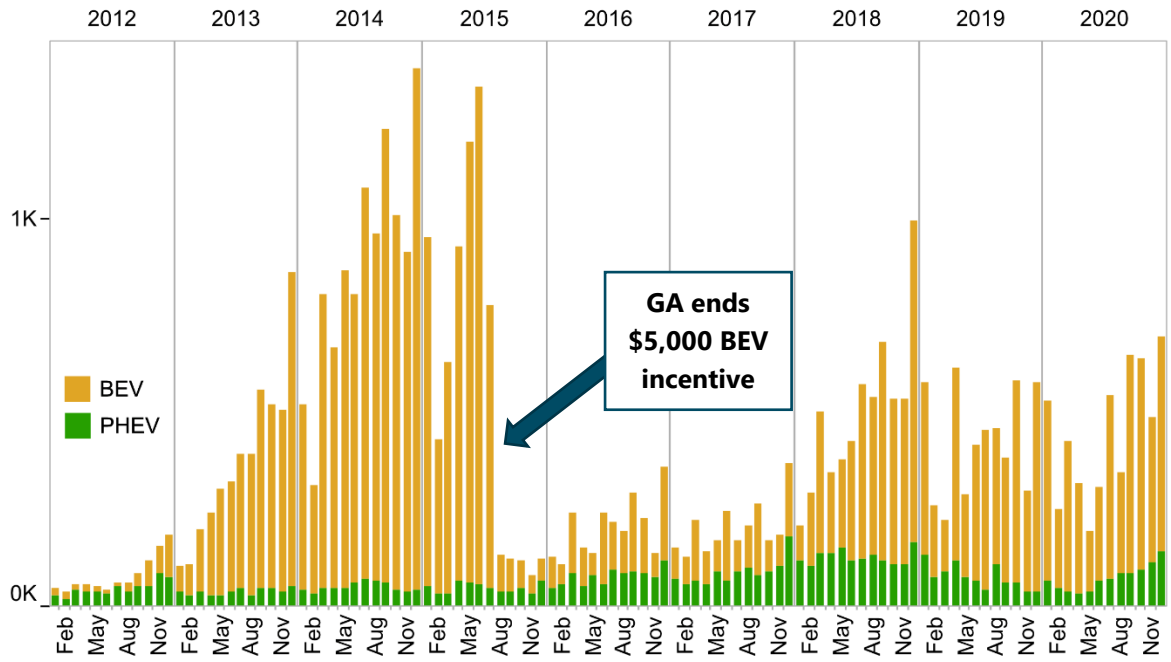
[35] California Air Resources Board. Advanced Clean Trucks. https://ww2.arb.ca.gov/our-work/programs/advanced-clean-trucks

[36] Union of Concerned Scientists. Surveying Consumers on Electric Vehicles. July 2019. https://www.ucsusa.org/EVsurvey2019

[37] Center for Sustainable Energy. Data from Electric Vehicle Rebate Programs: Vehicles, Consumers, Impact, and Effectiveness. 2021 https://energycenter.org/thought-leadership/research-and-reports/presentation-data-statewide-electric-vehicle-rebate

the GA legislature in June 2015. The chart in Figure 10 below shows five years later the EV market still had not fully recovered, illustrating the importance of not removing market transforming actions before conditions warrant.

Figure 10. Georgia Monthly EV Sales, 2012-2020[38]



Incentive Program Design to Address Equity

Thoughtful program design can support lower income and other disadvantaged groups. Offering larger incentives for lower income EV buyers can particularly benefit rural drivers who tend to have lower incomes than those living in more metropolitan areas.

In general, limited incentive dollars can be directed to low and moderate income (LMI) purchasers through vehicle eligibility price caps and/or personal income caps. Vehicle eligibility caps have proven effective at targeting incentives and require less administrative burden to states and applicants than income requirements. Vermont and Maine are among several states offering incentive "adders", or higher incentives for qualifying lower income EV purchasers recognizing they may need additional support. Extending incentive eligibility to include used EVs is also helpful to lower-income purchasers.

Rebates or vouchers that reduce the price of the vehicle and the amount needed for financing are preferable to tax credits, which may not be as helpful for LMI purchasers with lower tax liabilities. Offering rebates at the point of sale, rather than through a mail-in rebate, is also important

Incentives applied at the point of sale are better for lower income EV buyers

[38] Alliance for Automotive Innovation. Advanced Technology Vehicle Sales Dashboard. https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard

for LMI EV purchasers who may have more difficulties bridging the time between an EV purchase or lease and when a mail-in rebate is processed.

The Greenlining Institute developed **Electric Vehicles for All: Equity Toolkit**, which provides additional guidance on designing EV incentive programs to support LMI households. EV Hybrid Noire has also developed an equity-centered **E-mobility Public Policy Toolkit** with helpful guidance on these issues.

Vehicle scrap and replace incentive programs also offer opportunities to more quickly transition away from fossil fuels and retire older, higher polluting vehicles that are typically owned by lower-income households. These programs provide an incentive to retire a high-polluting vehicle by trading it in and having the vehicle permanently put out of service. The resulting incentive can then be used to purchase a new or used EV or support other clean mobility options, such as transit passes, car sharing memberships, or bicycle purchases. The Vermont legislature appropriated $1.5 million to establish a pilot scrap and replace program called "Replace Your Ride". The program is anticipated to launch in 2022 and is modeled after a California program.[39]

Table 9. Available EV Purchase Incentives by State (as of Q1 2022)

State	Available EV Incentives
ME	1. Federal tax credit for new vehicles up to $7,500 2. **State incentives** up to $5,500 for new and used EV purchases
NH	1. Federal tax credit for new vehicles up to $7,500 2. No state incentives 3. Some utility incentives, up to $1,000 for new or used EV
VT	1. Federal tax credit for new vehicles up to $7,500 2. **State incentives** up to $5,000 for new and used EV purchases 3. Electric utility incentives up to $2,500

Used EV Incentives

Providing incentives for used EVs is also an important policy to make EVs more affordable to low-income households. Market research in Vermont shows about two-thirds of annual vehicle sales are used vehicles.[40] Similar to gasoline vehicles, used EVs cost significantly less than a new purchase. Availability of used EVs is growing as the market continues to mature, but supplies are still very low compared to conventional gasoline vehicles. Although used EV availability is limited,

[39] South Coast AQMD. Replace Your Ride program. https://xappprod.aqmd.gov/RYR/Home

[40] Energy Action Network. Transportation Electrification in Vermont. Aug 2019. https://www.eanvt.org/featured-news/transportation-electrification-in-vermont/

many states and regions are supporting lower income household purchases of used EVs though incentives.

Some policymakers have expressed concerns offering incentives on used EVs could result in the same vehicle receiving two or more investments of public funds. However, used EV incentives are an effective way to increase access to EVs among low-income households and help ensure the benefits of EVs are more equitably distributed. Consumer education on used EV performance and range should be addressed (see education and outreach programs below) to ensure buyers make informed decisions about whether a used EV, particularly older EV models with lower battery range, would meet their transportation needs. Maine and Vermont currently offer used EV incentives for income-qualified residents.

These state incentive programs require significant public investments. Maine has $5 million in funding available for EV incentives and the Maine Clean Transportation Roadmap suggested annual investments in the program would need to increase from $10 million in 2022 to $16.5 million in 2025.[41] Vermont has appropriated $4.75 million for the State incentive program for new EVs since the 2019 launch, and an additional $1.25 million toward used high efficiency vehicles, including EVs, through the MileageSmart program. Additional funds to continue and expand these offerings are proposed in the FY2023 transportation bill.

Utility EV Purchase Incentives

Electric utilities may also support EV purchases through incentives. For example, the State of Vermont has encouraged utilities to support beneficial electrification, including EVs, by obligating electric utilities to offset their customer's fossil fuel use through "Tier III" of the Vermont Renewable Energy Standard.[42] The result is nearly all utilities in Vermont offer an EV purchase incentive of $500-2,900 depending on the utility and type of EV. Utilities may also support charging equipment and/or installations as part of a package of purchase incentives.

Utility EV incentives and related "beneficial electrification" programs are generally justified. Off-peak charging of EVs can increase the load factor of existing electric distribution systems – essentially moving more energy through same infrastructure and helping put downward pressure on utility rates.[43] Utilities can leverage knowledge gained through EV programs to support enrollment in programs like time-of-use rates and other offerings that help motivate EV drivers to charge at times when the grid benefits are maximized. Many utilities have gone beyond vehicle incentives to develop comprehensive transportation electrification plans for consideration by

[41] Maine Clean Transportation Roadmap. https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/Maine%20Clean%20Transportation%20Roadmap.pdf
[42] Vermont Dept of Public Service. Tier III Renewable Energy Standard. https://publicservice.vermont.gov/content/tier-iii-renewable-energy-standard
[43] Smart Electric Power Alliance. EV Managed Charging Incentives and Utility Program Design. Dec 2021. https://sepapower.org/knowledge/ev-managed-charging-incentives-and-utility-program-design/

regulators covering charging, vehicle incentives, line extensions and other issues with equity considerations integrated throughout.[44]

Rural EV Charging Equity Policies

Although most EV drivers charge at home most of the time, a robust public EVSE network spanning rural and urban areas in NNE is critical to advancing EV adoption. The business case for EVSE investments is often less compelling in NNE's rural areas, meaning private EVSE operators are less likely to support installations in these areas without significant funding support. Equitable EVSE investment for those living and traveling through rural areas can be ensured through policies supporting EVSE installations in these areas. These may include:

1. Federal EV Corridor Designations: federally designated alternative fuel corridors should include highways in rural areas. This will help ensure these corridors have robust DC Fast Charging locations available a minimum of every 50 miles along designated highways as federal infrastructure funds are invested to build out corridor charging.[45]
2. State EV Charging Goals: states can also establish additional policies supporting EVSE development. For example, Vermont enacted goals to have fast charging available within 5 miles of every interstate highway exit and every 50 miles along State highways in the 2021 transportation bill. The bill also required the Vermont Agency of Transportation to annually track progress toward these goals until they are met.[46]
3. Support for electrical upgrades for LMI homeowners: There are currently limited incentives and funding opportunities supporting home EVSE installation. Programs that do exist are generally offered by utilities and limited to covering EVSE equipment costs, which are often a fraction of the total cost to install charging. More comprehensive support for LMI households to make electrical infrastructure upgrades for home charging installations would help rural EV drivers access the lowest cost, most convenient home charging options. Supportive policies could expand state and utility EVSE assistance programs to include electrical service upgrades, including distribution network transformers and other "make ready" work that often disproportionately burdens LMI homeowners wanting to charge an EV at home.

[44] Western Resource Advocates. Overview of Utility Transportation Electrification Plans. April 2022. https://westernresourceadvocates.org/publications/overview-of-utility-transportation-electrification-plans-best-practices-and-good-examples-from-across-the-country/

[45] Information on FHWA's alternative fuel corridor designations and related funding opportunities is available at: https://www.fhwa.dot.gov/environment/alternative_fuel_corridors/

[46] Vermont EV charging policy goals were established in Section 30 of Act 55, enacted in June 2021: https://legislature.vermont.gov/bill/status/2022/H.433

Building Code EV Charging Requirements

The most cost-effective time to install EVSE is when it can be bundled into a larger construction project. Research on this issue in California found potential savings of $7,000-8,000 per EVSE port if commercial lots were built to support future charging installations.[47] Vermont has modest requirements for EV installation and readiness included in the State building energy code. The Maine Clean Transportation Roadmap included a recommendation to advance EV-ready building codes at the local level. New Hampshire also included a stakeholder recommendation to implement EV-ready code requirements in their 2019 EV strategy report.

Adding and strengthening these requirements, especially as they apply to multifamily housing development where EVSE retrofits are more difficult, will be critical to support future EV drivers with the most affordable options for charging at home versus public charging which is typically more expensive.

EV Materials Sourcing and Recycling

EVs offer major reductions in tailpipe and greenhouse gas emissions. However, production of EV battery packs and other vehicle components currently requires mineral and energy inputs beyond what is needed for internal combustion engine vehicle production. Concerns were raised by stakeholders in interviews informing this toolkit on these issues, including the sourcing of battery raw materials like lithium, cobalt, and nickel from disadvantaged communities, including areas with significant indigenous populations.[48] Regions with mineral reserves should consider equity issues related to their extraction and work to reduce impacts of this activity through environmental and social justice measures, such as encouraging participation in the Initiative for Responsible Mining's certification process.[49]

States can also work with the federal government to develop additional policies to minimize these production impacts by obligating automakers and/or their battery suppliers to ethically source minerals, increase manufacturing efficiency and ensure battery materials are recycled at the end of their useful life.[50]

Novel battery technologies, such as solid-state cells, are in development. If these new approaches to energy storage are able to scale into widespread production they should increase longevity of EV battery packs with lowered need for critical minerals.

---

[47] California Air Resources Board. EV Charging Infrastructure: Nonresidential Building Standards. 2019. https://ww2.arb.ca.gov/sites/default/files/2020-08/CARB_Technical_Analysis_EV_Charging_Nonresidential_CALGreen_2019_2020_Intervening_Code.pdf

[48] Volts. Minerals and the Clean Energy Transition. 2021. https://www.volts.wtf/p/minerals-and-the-clean-energy-transition

[49] Initiative for Responsible Mining. https://responsiblemining.net/

[50] Union of Concerned Scientists. Electric Vehicle Battery Recycling. Feb 2021. https://www.ucsusa.org/resources/ev-battery-recycling

Programs

The EV policies detailed above provide important long-term frameworks to support EV market growth. However, there are many additional opportunities to promote EVs and coordinate efforts. The programs described below include stakeholder coordination, charging infrastructure development, EV dealer programs and fleet vehicle electrification activities. Funding and administration support can be a mix of public, private and ratepayer sources, depending on the specific activities and available resources at state and local levels.

Stakeholder Convening

It takes many actors to develop and support the variety of EV programs and market interventions described in this toolkit. Drive Electric Maine, New Hampshire and Vermont stakeholder programs have provided opportunities to coordinate and accelerate EV market activities, share information, and support policy development. In 2016, the Drive Electric Vermont (DEV) program was recognized as a national model by the US Dept of Energy, which noted in its case study "The Drive Electric Vermont Program has proven successful in expanding the acceptance and utilization of PEVs in a rural, cold weather environment."[51] DEV has had a clear influence on Vermont's market share lead in the northeast. The US DOE case study noted the following elements as critical success factors for DEV's work:

- High-Level State Buy-in: DEV was started as a partnership between the State of Vermont and VEIC and the state continues to be a significant funder of the program. This support from policymakers increases visibility and helps gain buy-in for the program.
- Central Hub and Point of Contact: Offering a one-stop source for stakeholder assistance and communications is essential. An important element of the program is the **DEV website**, which is a hub for consumers and potential EV buyers to learn more about the benefits of EVs, available incentives, charging station locations, and EV models on the market.
- Early and Broad Stakeholder Involvement: Support has to come from multiple sources and partnerships that offer different resources and constituencies, and provide expanded reach. Stakeholders who regularly participate in DEV include electric utilities, energy efficiency utilities, auto dealers, automakers, charging station providers, advocacy organizations, and state agency staff.
- Car Dealerships: It is important to work with auto dealers to ensure they are aware of PEV options and charging infrastructure, and to partner extensively to support their sales, including development and outreach on vehicle incentive programs.
- Outreach and Education: DEV is recognized by the State and other stakeholders as the lead entity supporting EV outreach and education in the state. This is a critical function needed

[51] US Dept of Energy. Drive Electric Vermont Case Study. 2016. https://www.energy.gov/sites/prod/files/2016/06/f32/Vermont%20Case%20Study.pdf

to increase EV adoption and Drive Electric coalitions are well-positioned to play this role. A good outreach and education strategy focuses on the consumer journey raising public awareness, getting early adopters on board with new PEV models, and supporting the transition to more consumers as the market matures.

- Clean Cities: Clean Cities Coalitions in all three NNE states serve as force multiplier for technical assistance, education and outreach, and incentives. Maine Clean Cities, Granite State Clean Cities and Vermont Clean Cities all make significant contributions to state-based Drive Electric coalitions.

Charging

Public Charging

Consumers consistently rank limited charging availability as one of the top barriers to an EV purchase. This concern is more prevalent among rural drivers, who are traveling long distances for work and access to community services. Rural areas present challenges to private sector investment in public charging infrastructure where use of chargers may not be sufficient to create a viable business opportunity without external support. Targeting a portion of public investments in charging infrastructure to rural regions helps create a visible and comprehensive network, relieving concerns about availability of chargers, and encouraging EV adoption among rural travelers.

EVSE also creates economic value for nearby businesses: 70% of NH EV drivers spend money while using public EVSE. Rural areas that rely on outdoor recreational tourism can also benefit from installation of public chargers. Many ski resorts and other travel and tourism destinations are offering Level 2 EVSE, and more will be needed as EV adoption continues to grow.

With these benefits and challenges to EVSE development in rural areas, states can direct funding to priority regions or sectors. As an example, the Vermont Agency of Commerce and Community Development has supported an EVSE grant program since 2014. The specifics of the program have changed as the state's EV market has developed. Initially, the program focused on public EVSE in designated downtowns in the state. More recently, it addressed coverage gaps in the state's EVSE network and in 2022, will focus on EVSE installations at multifamily affordable housing units.[52] Program funds have come through State general funds, Volkswagen (VW) diesel mitigation funds and federal American Recovery Plan Act (ARPA) funds.

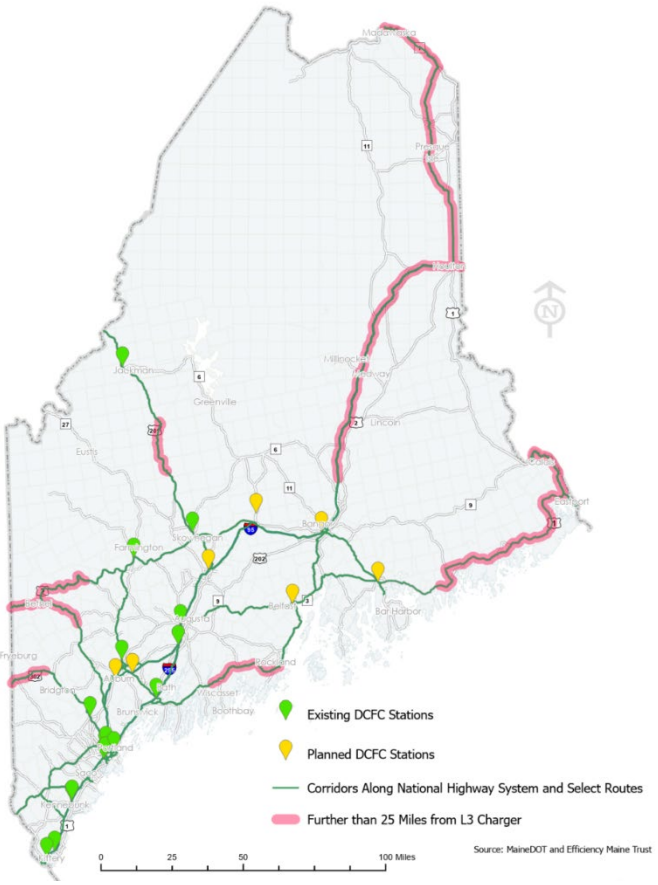
[52] Vermont Agency of Commerce and Community Development. EVSE Grant Programs. https://accd.vermont.gov/community-development/funding-incentives/electric-vehicle-supply-equipment-evse-grant-program

Efficiency Maine also provides rebates to government and non-profit entities for the purchase of Level 2 EVSE and has supported development of fast charging infrastructure at key locations across the state leveraging similar funding sources.[53]

Maine, New Hampshire, and Vermont are already supporting public charging investments along highway travel corridors with VW Settlement funds. Each state intends to fully expend the 15% maximum allowed by the settlement for EVSE. Efficiency Maine is responsible for distributing these funds in Maine and has prioritized investments in rural communities and rural highway corridors as shown in Figure 11 to the right.[54]

The federal IIJA will bring millions more to each state to support public and community charging investments. The initial focus is on ensuring robust DCFC availability along federally designated alternative fuel corridors, with potential options for charging in other locations as those corridors are built out to federal guidelines. These funds will provide states with further opportunities for investments in rural areas that may not be otherwise be served by private charging companies.

Figure 11. Maine Existing and Planned DC Fast Charging Locations Supported by State Programs



Electric utilities have also supported public charging in rural areas through incentive and rate offerings. In many cases these will require approval by state utility regulators. that do not overly penalize high power, low utilization fast charging equipment with peak power demand charges. Many commercial utility customers are subject to these charging and they can add many thousands of dollars to the annual cost of owning and operating fast charging, even with relatively low use anticipated over the next few years in rural areas.

[53] Efficiency Maine. Electric Vehicle Supply Equipment Initiative**.** https://www.efficiencymaine.com/at-work/electric-vehicle-supply-equipment-initiative/

[54] Maine DOT and Efficiency Maine Trust. DC Fast Charging analysis presented to Maine Climate Council Transportation Working Group. 2021.

Workplace Charging

Areas with high rates of EV adoption are characterized by widespread availability of both public and workplace charging, as well as a high availability of EV models. Access to workplace charging is particularly important to rural residents who may have long commutes. The US Department of Energy found employees with access to charging at work were six times more likely to drive an EV than the average. The Alternative Fuel Data Center provides resources for employers considering workplace charging: **https://afdc.energy.gov/fuels/electricity_charging_workplace.html**

If enacted, the building code EV charging requirements described in the policy section above will help bolster workplace charging at new developments.

Existing properties can benefit through state and utility incentive and technical assistance programs as more employees request their employers consider adding charging to facilities. Public sector employers, such as schools and local government offices can help lead by example by installing charging and will provide important backup charging options in the case of local power outages in rural communities. Forth Mobility is leading several programs related to workplace charging, including the Electric Vehicle Adoption Leadership (EVAL) certification program: **https://forthmobility.org/why-electric/workplacecharging**

Multifamily Charging

According to the 2019 American Community Survey, approximately 25% of housing units in Northern New England are multifamily dwellings, a total of about 337,000 units across Maine, New Hampshire and Vermont, including many rural areas across these states. The majority of these units are renter-occupied (84%). Although there can be challenges associated with EVSE installations in multifamily buildings, targeted grant and technical assistance programs administered by state and local governments can ensure that renters and everyone living in multifamily buildings have the option of EV ownership.

The Vermont legislature allocated $1 million for a Multiunit Dwelling Electric Vehicle Charging Grant Program[55] in FY 2022. The program will provide grants up to $80,000 per site and $300,000 per applicant. Prioritization will be given to affordable housing applications.

Many utilities across the country are providing multifamily EVSE programs. A few examples in New England include:

- **Eversource's Connecticut EV Rebate Program** covers up to 50% of the cost for level 2 equipment and installation, and 100% of "make-ready" work for costs related to electrical service to the charging equipment location. Properties can receive up to $40,000, with locations in disadvantaged communities qualifying for the largest incentive amounts.

[55] VT Agency of Commerce & Community Development. Multi-unit Dwelling EVSE program. March 2022. https://accd.vermont.gov/multiunit_dwelling

- **Burlington Electric Department's Multifamily EV Charging Program** covers 75% of the cost to install charging at multifamily properties, up to a limit of $1,750 per charging port. This initiative started with a successful pilot of EV Match's technology for reserving and billing for charging as part of the city's Net Zero Energy planning process.
- **National Grid's Massachusetts EV Charging Station Program** offers up to 100% of the electrical infrastructure and charging equipment costs for multifamily properties and other public and workplace locations.

EV Dealer Programs

As discussed in the EV Market Factors section above, EV dealers can be challenged in making the necessary investments to sell and service EV models, particularly lower volume dealers that may be found in rural NNE locations. One unfortunate result of these challenges and the relative newness of EVs is consumer dissatisfaction with the EV knowledge and experience of their local dealers. The Sierra Club has reported on knowledge gaps and other dealer issues that have hindered EV sales over the past several years.[56] Automakers and dealers are making efforts to expand EV availability and training programs, but there is still a strong case that many rural dealers could benefit from programs designed to accelerate their EV efforts.

Plug-in America has developed their **PlugStar** program to offer EV-specific training opportunities for participating dealerships, a certification program consumers can reference to find knowledgeable dealers, and in some cases a "mid-stream" dealer incentive to motivate more dealer staff interest in EV sales. A 2021 PlugStar program evaluation found dealers in the program were selling 20% more EVs than non-participating peers and much higher customer satisfaction with the purchase process.[57] The program is expanding through a partnership with the National Auto Dealers Association (NADA).[58]

Another example in NNE is the **2021 expansion of Efficiency Vermont's energy efficiency utility** to support an EV dealer program that provides participating new and used car dealerships with support for:

- Dealership infrastructure costs, including charging equipment, service equipment, technician training and related activities at 50% of the cost, up to $20,000 per year;
- Dealership EV sales training;
- Marketing support, including contributions toward EV dealer marketing campaigns;

[56] Sierra Club. Rev Up Electric Vehicles – A Nationwide Study of the EV Shopping Experience. Nov 2019. https://sc.org/revup

[57] Plug-in America. PlugStar Evaluation Report. June 2021. https://pluginamerica.org/about-us/plugstar-evaluation-report/

[58] NADA. Dealership Electric Vehicle Education Program Announcement. March 2022. https://www.nada.org/Enhancing-EV-Education/

- In-store displays and collateral to help educate customers; and
- $600 dealer incentives per EV sold, with at least half going to the salesperson, covering up to 40 sales per dealership annually.

Funding support for these programs has come from a variety of public and private sources, including dealers and dealer associations, ratepayer investments associated with utility programs, and State investments. The cost is highly variable depending on the specific program elements and funding opportunities, but can start at less than $20,000 for basic dealer EV sales training offerings.

Fleet Electrification

Policies that encourage or require electrification of public and private fleets are a good way to increase awareness of EVs, increase driver experience with EVs through use of pooled vehicles, and extend the benefits of electrification to rural areas. For example, school buses operate and are highly visible in rural regions.

State and municipal governments can lead by example by establishing policies to integrate EVs into their fleets. With a broad range of light duty models on the market, fleet pool vehicles are immediate opportunities for electrification. Public fleets are not eligible for federal tax credits so procurement policies may need to be adjusted to allow for leasing options for fleet vehicles which provide opportunities to transfer available tax credits through the leasing entity.

State Volkswagen Settlement programs have been an important source of funding for medium- and heavy-duty fleet electrification and particularly electrification of transit and school buses. State Beneficiary Mitigation Plans (BMP) can help overcome barriers to adoption of electric vehicles and serve as a catalyst for electrification. The Vermont legislature, for example, required that VW Settlement funds be directed to electrification projects only.

The BMP cost share structure has provided states with an important tool to prioritize fuel types. Given that most electric vehicles are more expensive to purchase than other conventional and alternative fuel options, equalizing BMP-funded cost share requirements across all fuel types can serve to discourage electric vehicle adoption and promote diesel and propane. Maine, New Hampshire, and Vermont have prioritized bus replacements as a mitigation activity and electric transit buses and school buses are readily available on the market. The VW Environmental Mitigation Settlement allows for up to 100% funding for public bus replacements, regardless of fuel types. However, to stretch VW funds, and have applicants demonstrate a commitment to projects, all three states currently require some cost share. To encourage electrification projects, cost share structures should at least equalize what an applicant would pay among the eligible fuel technologies and ideally make EVs more cost competitive. Another approach is to require applicants to cover the cost of what they would pay for a diesel replacement, with VW Settlement funds covering the incremental cost of the vehicle.

The Infrastructure Investment and Jobs Act (IIJA) provides significant investments in bus electrification. It establishes a $5 billion Clean Electric School Bus program. EPA is responsible for developing this competitive program and more details are expected later in 2022. However, states, local school districts and school bus contractors can start to get positioned by educating decision-makers about electric school bus technology and planning to integrate electric buses into their fleets. The Federal Transit Administration administers the Low and No Emission Vehicle Program, which has been providing funding for electric bus projects since 2016. This program received a large increase in funding through the IIJA. The FTA administers an annual competitive grant process to support transit electrification projects. State transportation agencies and transit authorities will need to have electrification plans in place to be eligible for funding, which is a change from prior years.

Clean Cities Coalitions are excellent resources for fleet operators interested in making the switch to an electric vehicle. A growing number of utilities are also offering customers with vehicle fleets access to technical assistance programs to help them electrify. This type of support can be included in utility electrification plans noted in the purchase incentive discussion above as National Grid has done in New York, Massachusetts, and Rhode Island.[59]

Education and Outreach

The growing availability of EV models, media coverage, and automaker marketing programs have expanded broad consumer awareness of EVs. Market research conducted in 2021 by The Nature Conservancy and Efficiency Vermont found the majority of rural drivers in NNE have some awareness of EV technology, but most do not have direct personal experience.[60] [61]

Efforts to advance EV adoption will require significant education and outreach to prospective car buyers to increase familiarity with EV technology and motivate a purchase. This is especially true for rural NNE drivers who may need additional guidance on winter operation, charging availability, vehicle choices and other issues commonly neglected by auto industry efforts. The final three toolkit items detailed below cover recommendations for marketing programs, outreach events and the role of non-governmental organizations in advancing EV adoption.

Marketing Programs

Marketing programs are critical to build awareness and move consumers toward an EV purchase decision process. A common marketing framework, the purchase decision funnel, is shown in Figure 12 below. Each step along this process can be supported by different marketing techniques integrated into a broad campaign. Market research can support the development of these

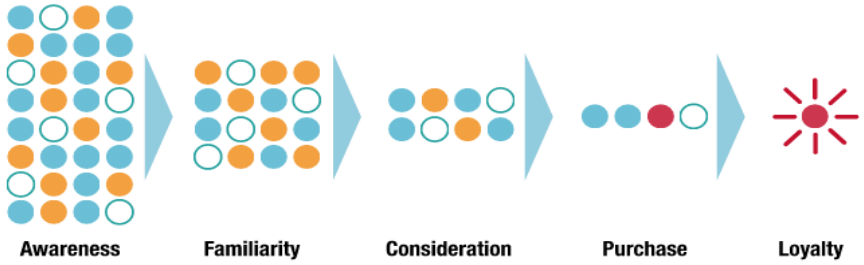
[59] National Grid. Fleet Advisory Services Program. https://www.nationalgridus.com/ev-fleet-hub/Get-Started/Fleet-Advisory-Services-Program

[60] Efficiency Vermont. Are Vermonters Ready to Drive Electric? Nov 2021. https://www.efficiencyvermont.com/online-trainings/are-vermonters-ready-to-drive-electric

[61] New Bridge Strategy. The Nature Conservancy Qualitative Research among Rural New Englanders regarding Electric Vehicles. Apr 2021.

campaigns by identifying consumer knowledge gaps and leverage points to target strategies, tactics and messaging that will resonate with car buyers.

Figure 12. The Consumer Purchase Decision Funnel [62]



Research conducted by VEIC and The Nature Conservancy shows there are many misconceptions about EV performance and charging, gaps in knowledge of EV cost of ownership, and perceived barriers to EV adoption. Rural NNE EV drivers often have increased concerns on EV battery range, winter performance, and availability of EV models in their areas.

This work also found lower income and black, indigenous and people of color (BIPOC) drivers may have additional concerns that can be addressed through marketing programs. For example, ensuring non-English speaking drivers can access information on EV offerings through translated materials or other support services. Interviews with BIPOC drivers also discovered distrust that EV incentive programs would actually be available when they wanted to purchase an EV. Local community-based organizations (CBOs) who are trusted messengers can be critical partners in addressing these and other related issues. For example, Capstone Community Action is administering the State of Vermont's **MileageSmart** incentive program lower income Vermonters interested in purchasing a used EV or other high efficiency vehicle.

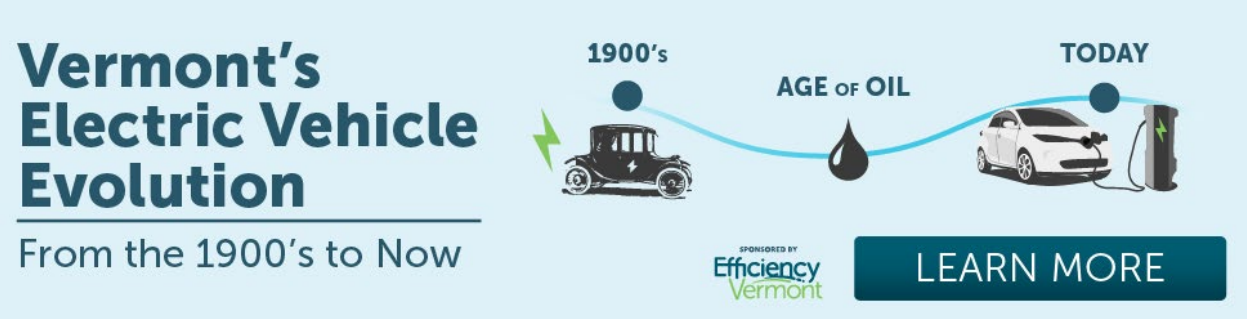
Consumer insights gained through research can help tailor marketing campaigns to address rural-centric issues, familiarizing local drivers with the benefits of EVs and availability of affordable models to boost purchase consideration for their next vehicle.

Drive Electric Vermont has developed and executed annual marketing campaigns since 2016. For most of this time, limited dollars for implementing the campaign led to a focus on lower cost social media marketing tools. In 2021, Efficiency Vermont launched a statewide EV marketing campaign as a complement to the EV dealer programs described above. The multi-faceted campaign included television, radio, print, web and social media ads directing consumers to the DEV website and promoting EV incentives. An example ad used in the campaign is shown in Figure 13 below. As a result of these and other efforts traffic to the DEV website reached over 33,000 users in the first quarter of 2022 compared to the same period in 2021, a 130% increase in activity.

[62] McKinsey Quarterly. The consumer decision journey. Jun 2009. https://www.mckinsey.com/business-functions/marketing-and-sales/our-insights/the-consumer-decision-journey

This data can be shared with policy makers and other stakeholders to demonstrate the efficacy of investing in marketing to promote EVs and EV programs.

Figure 13. Efficiency Vermont EV Campaign Web Advertisement



Efficiency Maine has also supported EV marketing programs through EV program funding derived from the 2019 New England Clean Energy Connect (NECEC) settlement approved by the Maine Public Utilities Commission.[63] Figure 14 below is pulled from a video prepared as part of this effort, which covers the benefits of EVs to Maine households and communities as well as their growing availability. Additional assets are available on the Efficiency Maine website to help prospective EV buyers and current owners understand how to find and use public chargers and operate their vehicle.

Figure 14. Efficiency Maine EV Campaign Video

[63] Efficiency Maine. Efficiency Maine Debuts Electric Vehicle Educational Video Campaign. Sep 2021. https://www.efficiencymaine.com/efficiency-maine-debuts-electric-vehicle-educational-video-campaign-ev-how-to-guidebook-and-newly-redesigned-ev-web-resources/

Costs for these campaign activities can vary widely depending on the available funding. Even if no funding is available many rural EV advocates can still leverage free social media and news outlets to help spread the word. Community email lists may also be a way to help spread the word about local EV demonstration events and similar activities. Coordinating EV marketing efforts through regional or statewide programs like Drive Electric coalitions helps ensure the most effective use of funding and provides opportunities for auto dealers, community organizations and other stakeholders to lend support.

Ride and Drive Events

Many consumers do not have first-hand experience with EV models available today. Electric vehicle demonstration events provide an important opportunity to increase EV awareness and support adoption. Ride and drives are in-person events designed to demystify EVs, and may be especially beneficial in rural areas where exposure to EVs can be limited. Local EV owners often have opportunities to share their experience, which can be very helpful in addressing NNE consumer concerns about winter use of EVs and charging availability.

Ride and drive events often leverage larger local events, such as markets, energy fairs or local festivals to include an EV component to take advantage of larger audiences without significant additional marketing investments. Employers can also host events for their employees.

Two major national events encourage local organizers across the country to host EV events - **National Drive Electric Week** in September and **Drive Electric Earth Day** in April are both supported by the same group of national sponsors. The event websites linked above provide excellent resources to community groups interested in organizing EV events and serve as a central clearinghouse to coordinate and market events to prospective car buyers.

NGO Advocacy

Nongovernmental Organizations (NGOs) have long supported the transition to cleaner transportation options, particularly on issues related to public engagement and research that informs policy development.

Stakeholders interviewed for this rural EV toolkit process supported NGOs like The Nature Conservancy, Sierra Club, Clean Energy NH, Natural Resources Council of Maine and many others to continue their work supporting EV adoption, citing their efficacy in policy advocacy and ability to engage with their supporters on EV issues of importance.

NGOs interested in ramping up their EV work may benefit by connecting with peers and other stakeholders, such as statewide Drive Electric groups, to understand where contributions would be most effective.

Conclusion

Plug-in electric vehicles offer many benefits for individual drivers and northern New England communities, including drastic reductions in greenhouse gas and other harmful tailpipe emissions and significant operating cost savings. Rural drivers stand to reap significant savings by making the switch to an EV.

The policies, programs and outreach tools described above were selected based on interviews, research and experiences supporting EV adoption in rural NNE communities. As the EV industry continues to evolve at a rapid pace some of the recommended approaches may also change with time. Achieving a widespread transformation to transportation electrification is urgently needed to reduce climate changing emissions and will require multiple actions on many fronts to achieve success. This is especially true when considering equity-based approaches that will help ensure rural, lower income households are able to fully participate in this transition.

Policymakers, non-governmental organizations, community activists and individual drivers can all contribute the activities described in this toolkit. Additional EV opportunities may develop based on local conditions, funding availability or other considerations. Thoughtful coordination on EV initiatives through drive electric stakeholder groups will ensure these efforts are done in the most impactful and efficient way possible.

Appendix

Stakeholder Engagement Summary

VEIC conducted 10 one-hour interviews with a total of 16 participants in Maine, New Hampshire, and Vermont. The purpose of the interviews was to identify barriers to rural EV adoption in each state, identify successful clean energy or EV programs that have been implemented in rural communities, including related programs such as residential solar, and solicit input on replicability of best practices surfaced in the literature review.

Organizations interviewed included:

Maine

- ***Efficiency Maine***
- ***Center for Ecology Based Economy***
- ***Northern Maine Development Coalition***
- ***Darling's Auto Group***

New Hampshire

- ***Grappone Automotive Group***
- ***New Hampshire Department of Environmental Service***
- ***New Hampshire Electric Co-op***

Vermont

- ***Vermont Agency of Transportation***
- ***Vermont Council on Rural Development***
- ***Capstone Community Action***
- ***Gedakina (Native American Leadership Development Organization)***

Regional

- ***Revision Energy***
- ***Northeast States for Coordinated Air Use Management***

Methodology

- Interviews were semi-structured. Respondents were guided through topics but allowed to provide their unique open-ended responses.
- Respondents were selected to represent a cross-section of professionals doing work related to EVs throughout New England:

- Sustainable energy advocates and program implementers
- Transportation agency
- Utility staff
- Social justice advocate
- Car dealers

Key Interview Findings

- Rural community members have varied perspectives on EVs, including enthusiasm, concern related to practicality in rural environments, and cultural barriers related to environmentalism and vehicle types.
- Despite the challenges of using EVs in rural areas, most respondents believe they have the potential to benefit their communities economically and environmentally.
- Incentives and hands-on experience with EVs are seen as keys to increasing EV ownership.
- Top barriers include upfront cost, range for long rural travel, driving performance in poor conditions, and access to inventory and maintenance.
- Respondents supported NGOs like The Nature Conservancy in supporting EV adoption, citing NGOs efficacy in advocacy, engagement, and research to inform policy.

Key Benefits of owning an EV in rural areas

- ***Climate***
- ***Local economy/tourism***
- ***Residents' finances***
- ***Air quality***

Barriers to EV adoption in rural areas:

- ***Upfront cost***
- ***Charging availability***
- ***Range***
- ***Consumer knowledge***
- ***Winter driving***
- ***Vehicle types***
- ***Local inventory / ZEV***
- ***Access to maintenance***
- ***Materials and energy***

Proposed Solutions

Programs to support EV adoption

- ***Incentives***
- ***Test drive events***
- ***Education***
- ***Easy to use programs***
- ***Workplace charging***

Communication Considerations

- ***Find the right message for the audience***
- ***Make education resonate with people's lives***
- ***Make easy asks***

Stakeholder Engagement Report

Detailed feedback received through VEIC's stakeholder engagement is included in the slides on the following pages.

The Nature Conservancy
Rural EV Adoption Toolkit

Stakeholder Engagement Findings

October 21, 2021

Method

- 10 one-hour interviews with a total of 16 participants.
- Interviews were semi-structured. Respondents were guided through topics but allowed to provide their unique open-ended responses.
- Respondents were selected to represent a cross-section of professionals doing work related to EVs throughout New England:
  - Sustainable energy advocates and program implementers
  - Transportation agency
  - Utility staff
  - Social justice advocate
  - Car dealers

Method

Respondents included representatives of the following organizations:

Maine

- Efficiency Maine
- Center for an Ecology-Based Economy
- Northern Maine Development Coalition
- Darling's Auto Group

New Hampshire

- Grappone Automotive Group
- New Hampshire Department of Environmental Service
- New Hampshire Electric Co-op

Vermont

- Vermont Agency of Transportation
- Vermont Council on Rural Development
- Capstone Community Action
- Gedakina (Native American Leadership Development Organization)

Regional

- Revision Energy
- Northeast States for Coordinated Air Use Management

Key findings

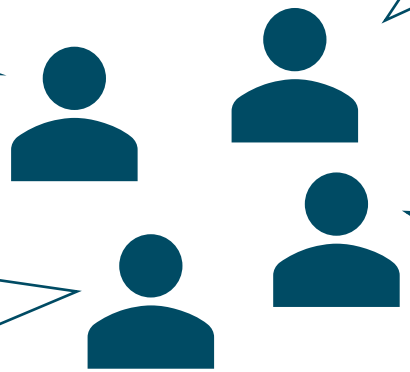
- Rural community members have varied perspectives on EVs, including enthusiasm, concern related to practicality in rural environments, and cultural barriers related to environmentalism and vehicle types.
- Despite the challenges of using EVs in rural areas, most respondents believe they have the potential to benefit their communities economically and environmentally.
- Incentives and hands-on experience with EVs are seen as keys to increasing EV ownership.
- Top barriers include upfront cost, range for long rural travel, driving performance in poor conditions, and access to inventory and maintenance.
- Respondents supported NGOs like The Nature Conservancy in supporting EV adoption, citing NGOs efficacy in advocacy, engagement, and research to inform policy.

Drivers of EV adoption

Interest in EVs among rural residents varies. Some higher-income environmentally-oriented community members own an EV or are interested in them. Many others are skeptical or believe EVs are not a good fit for them.

"It's that early adopter class, people who are motivated by the environmental benefits... and can afford to make the choice."

"Your car is a representation of who you are and people have a wariness about wearing an environmental commitment on their sleeve."



"There are misconceptions that EVs don't perform as well in some of these rural environments. And there's still range anxiety."

"We have mostly better off, better educated people who are driving electric vehicles... with any new technology it's well-off people who can afford the upfront price and risk of obsolescence and failure."

Drivers of EV adoption

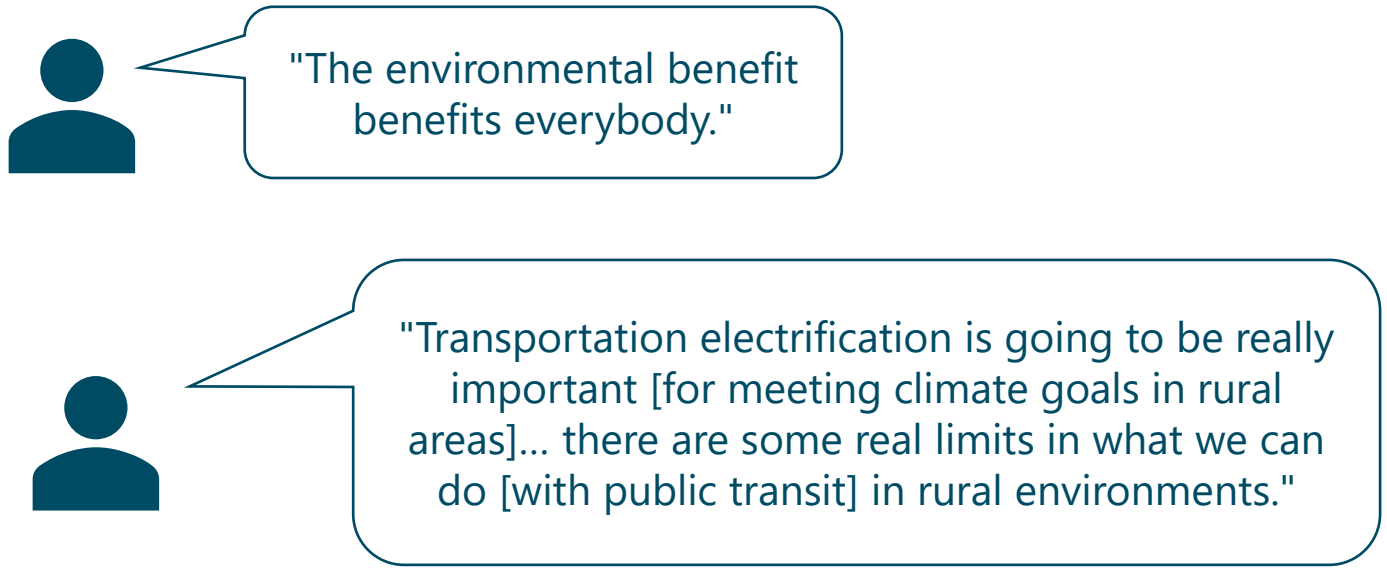
Benefits of EV use in rural areas were identified as:

Climate | Local economy/tourism | Residents' finances | Air quality

Drivers of EV adoption

Benefits of EV use in rural areas were identified as:

Climate Local economy/tourism Residents' finances Air quality



Drivers of EV adoption

Benefits of EV use in rural areas were identified as:

Climate **Local economy/tourism** Residents' finances Air quality

"We want to be a modern economy [and] accommodate through travelers and tourists."

"Charging infrastructure… makes your community more accessible and welcoming to visitors… there's some economic benefits to that for communities."

"Electric vehicles keep money keeping circulating in the economy because they aren't relying on fuel extracted outside of the state."

"[Fleets] would see a huge drop in fuel costs right off the bat. They'd also see a drop in maintenance budgets."

Drivers of EV adoption

Benefits of EV use in rural areas were identified as:

Climate | Local economy/tourism | **Residents' finances** | Air quality

"Saving money over time, not having to pay for gas and not dealing with a vehicle that's going to break down or have problems that an internal combustion engine would."

"[Rural residents] travel longer distances than other users do…. They stand to benefit even more from the economics of owning an EV… they're saving more on fuel and they're saving more on maintenance costs."

Drivers of EV adoption

Benefits of EV use in rural areas were identified as:

Climate | Local economy/tourism | Residents' finances | **Air quality**

Respondents were divided on air quality

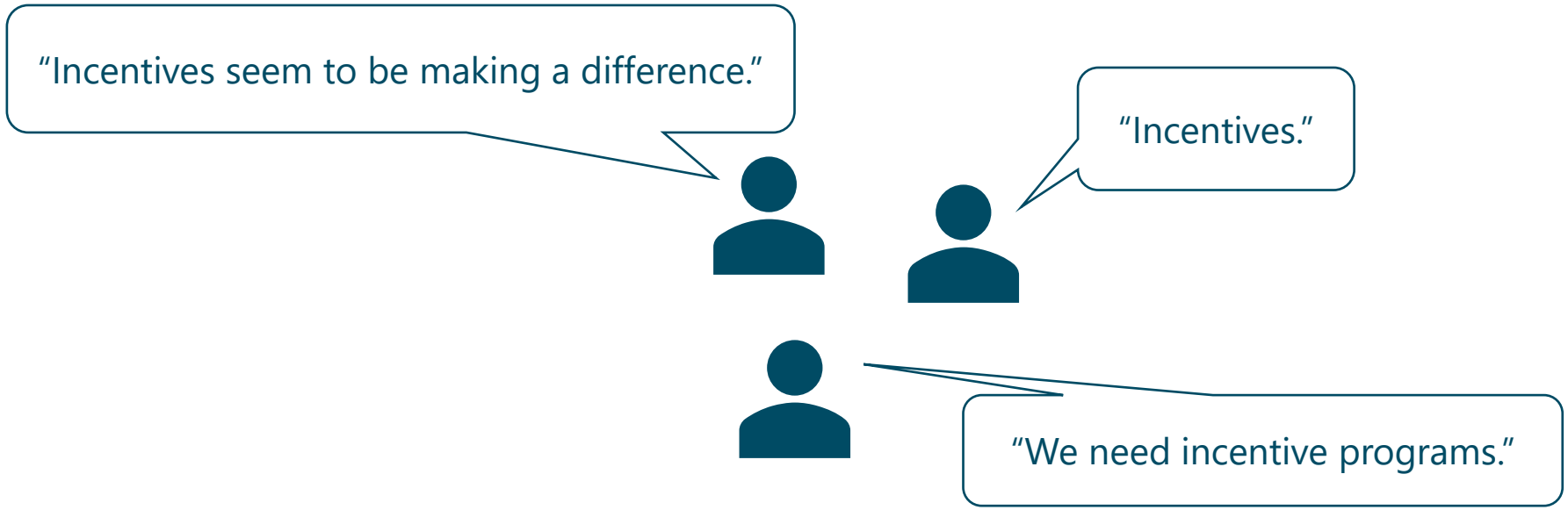
"Air quality would be a benefit we all experience."

"We don't have air quality issues, so when you start talking about fossil fuels from an air quality standpoint... you'd get laughed out of the room."

Drivers of EV adoption

Incentives, education, and personal experience create demand for EVs.

Incentives were almost universally discussed as boosting interest in EVs...

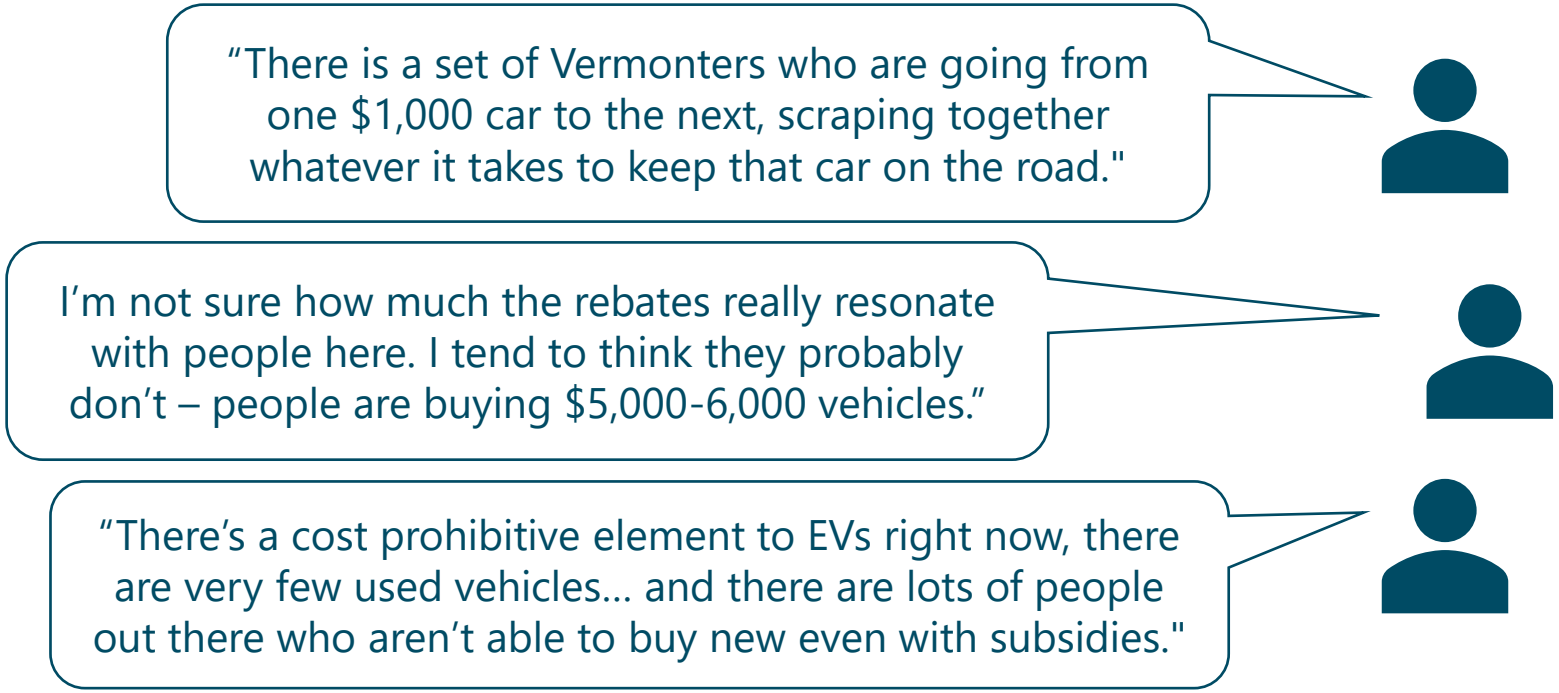


Drivers of EV adoption

<u>Incentives</u>, education, and personal experience create demand for EVs.

Incentives were almost universally discussed as boosting interest in EVs...

but not among residents in the habit of buying inexpensive used cars.



Drivers of EV adoption

Incentives, education, and personal experience create demand for EVs.

Correcting misconceptions and addressing concerns was seen as important.

Drivers of EV adoption

Incentives, education, and personal experience create demand for EVs.

Events providing hands-on experiences with EVs and the chance to talk with EV owners can support interest in EV ownership.

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- **Upfront cost**
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy

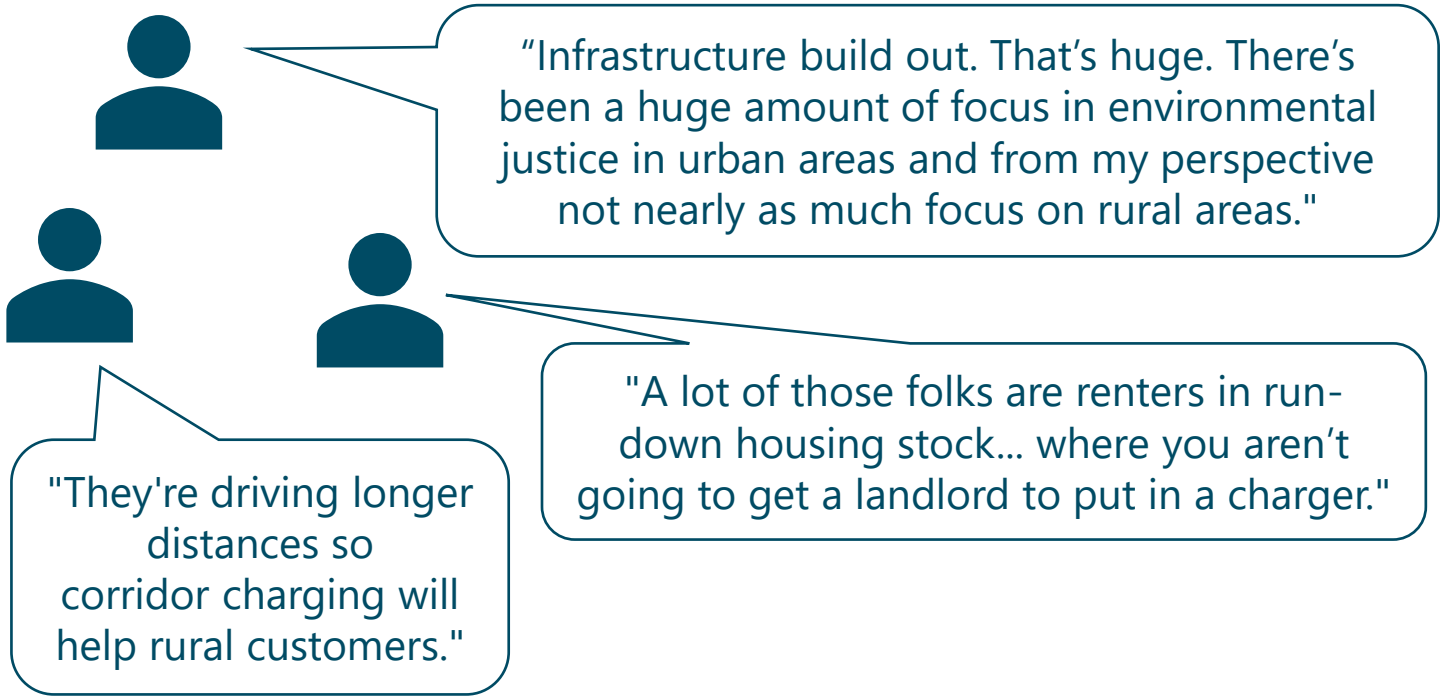
"There's a cost prohibitive element to EVs right now… there are lots of people out there who aren't able to buy new even with subsidies."

"It's going to require real programmatic efforts to get those into the hands of people who can't afford them."

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- **Charging availability**
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy



Barriers to EV adoption

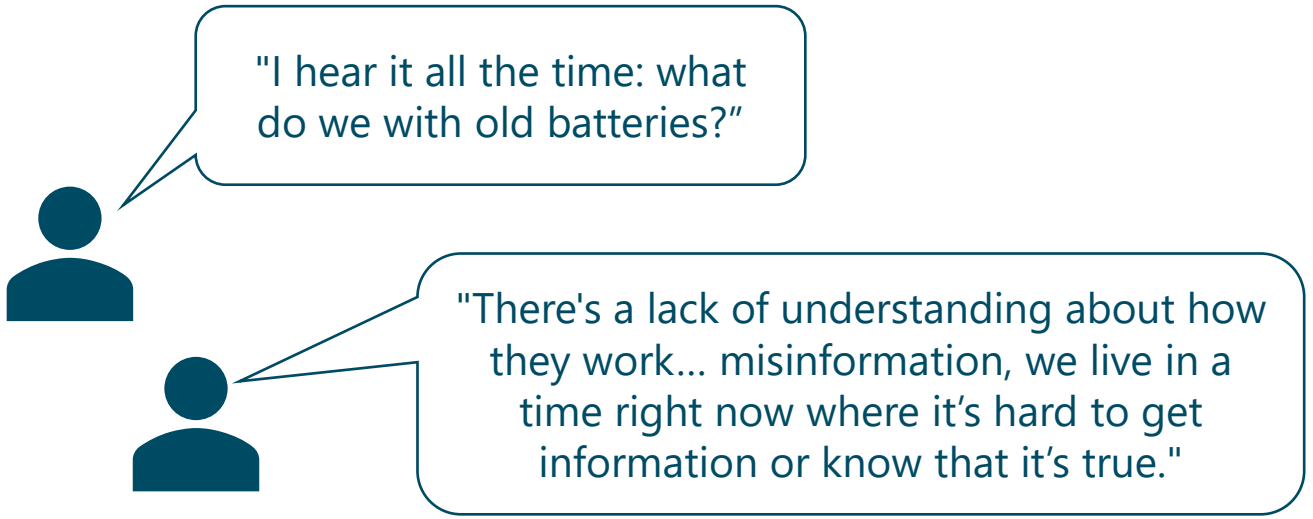
Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- Charging availability
- **Range**
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

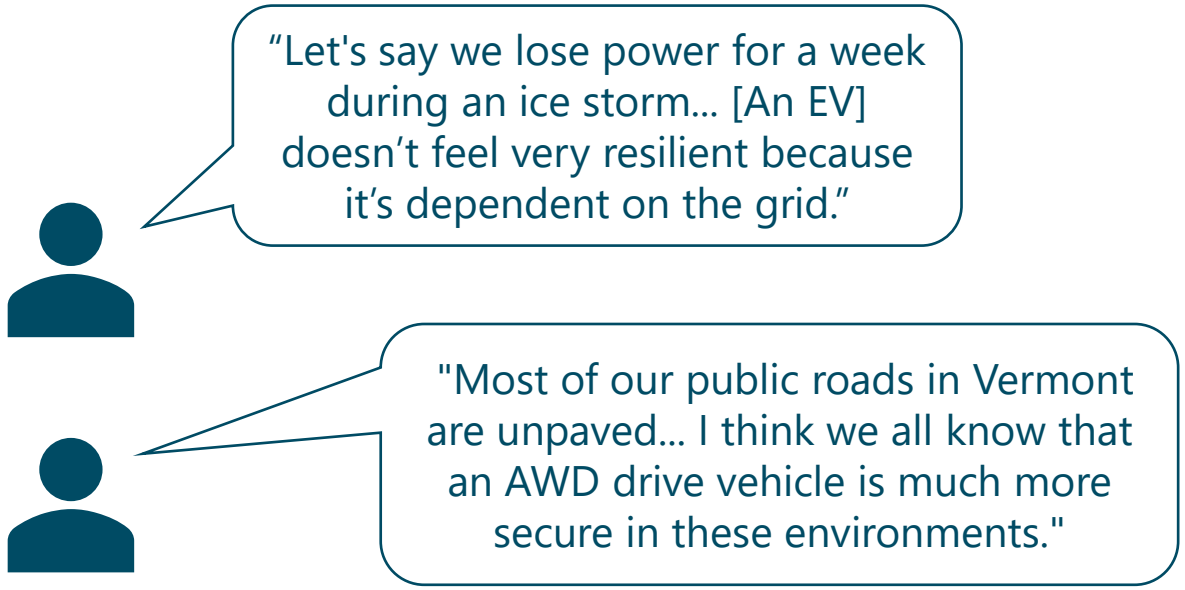
- Upfront cost
- Charging availability
- Range
- **Consumer knowledge**
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy



Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

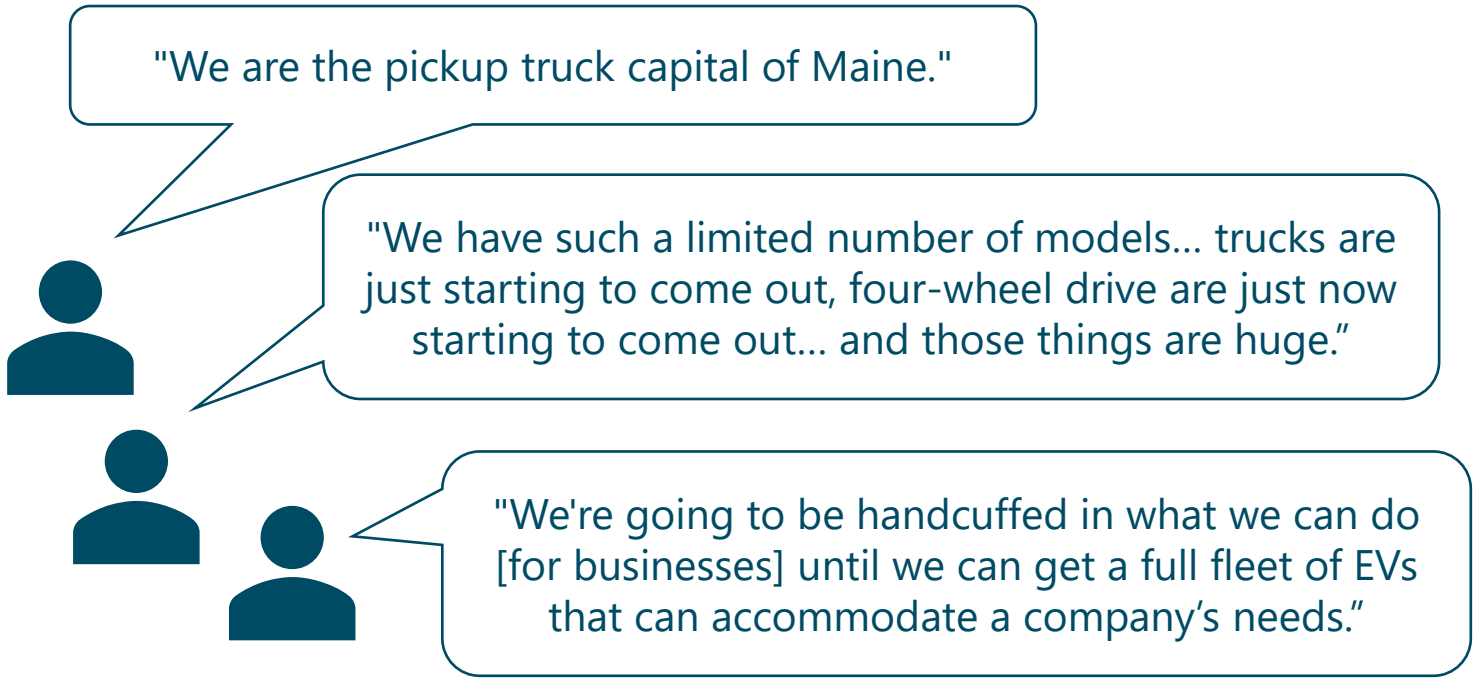
- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- **Winter driving**
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- Materials and energy



Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

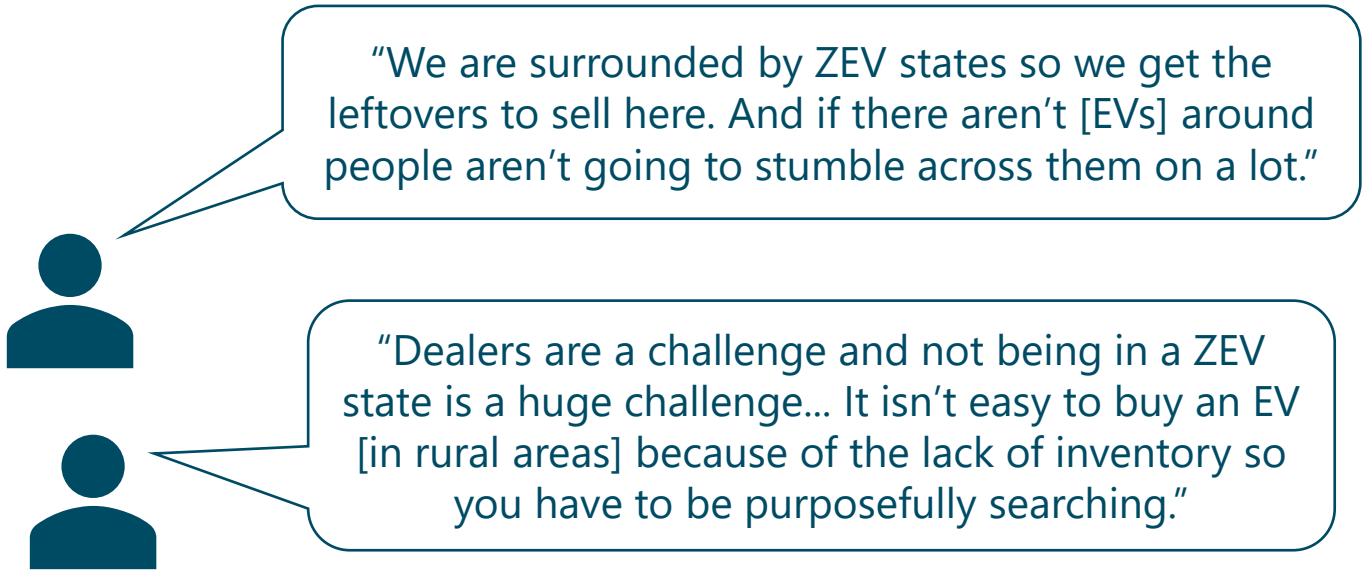
- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- **Vehicle types**
- Local inventory / ZEV
- Access to maintenance
- Materials and energy



Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- **Local inventory / ZEV**
- Access to maintenance
- Materials and energy

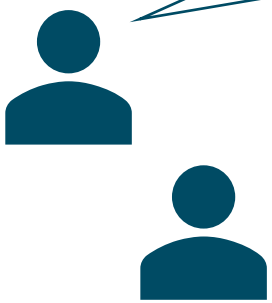


A car dealer predicts the supply chain issues causing vehicle shortages will resolve in early 2022.

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- **Access to maintenance**
- Materials and energy



"For rural customers who have always had their work done at the shop down the street… do those folks have the training to work on electric vehicles? If a rural customer is an hour and half to the dealership… if they're having an issue, how do they get it there?"

"What happens to mechanics and the workforce that serve [combustion] vehicles? Now you have to have a whole series of trainings [about EVs]… GM or Ford might be doing that, but what about the Citgo down the road where 80% of their revenue comes from oil changes?"

Barriers to EV adoption

Many challenges for EV ownership in rural areas came to respondents' minds.

- Upfront cost
- Charging availability
- Range
- Consumer knowledge
- Winter driving
- Vehicle types
- Local inventory / ZEV
- Access to maintenance
- **Materials and energy**

"We cannot afford to continue to get electricity from Hydro Quebec because they keep displacing indigenous nations... We're using children in China [to procure materials for EV batteries]... We're digging up [Native American] reservations [to mine materials for EV batteries]."

Programs to support EV adoption

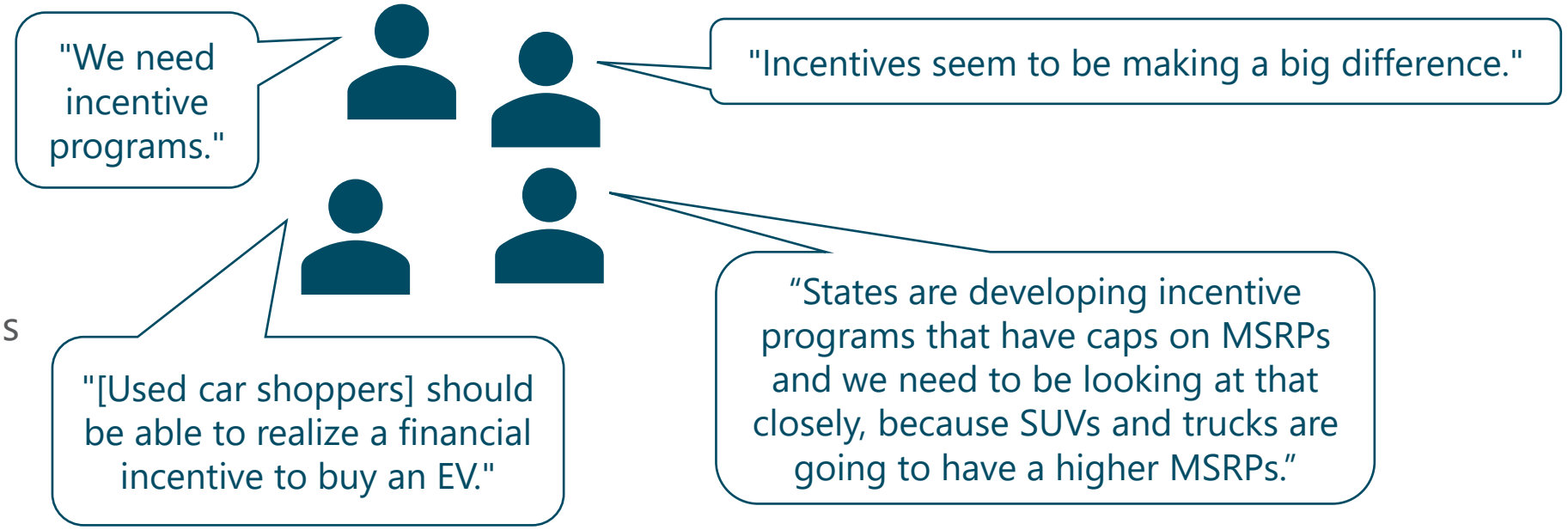
Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine).

- **Incentives**
- Test drive events
- Education
- Easy to use programs
- Workplace charging

Programs to support EV adoption

Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine, Efficiency Vermont).

- **Incentives**
- Test drive events
- Education
- Easy to use programs
- Workplace charging



Programs to support EV adoption

Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine, Efficiency Vermont).

- Incentives
- **Test drive events**
- Education
- Easy to use programs
- Workplace charging

"You have to get the butts in the seats…. It makes them understand [EVs are] like a regular vehicle."

"[Test drive events with owners] are probably one of the best ways… The owners are the best promoters of the technology, even more so maybe than our incentive."

Programs to support EV adoption

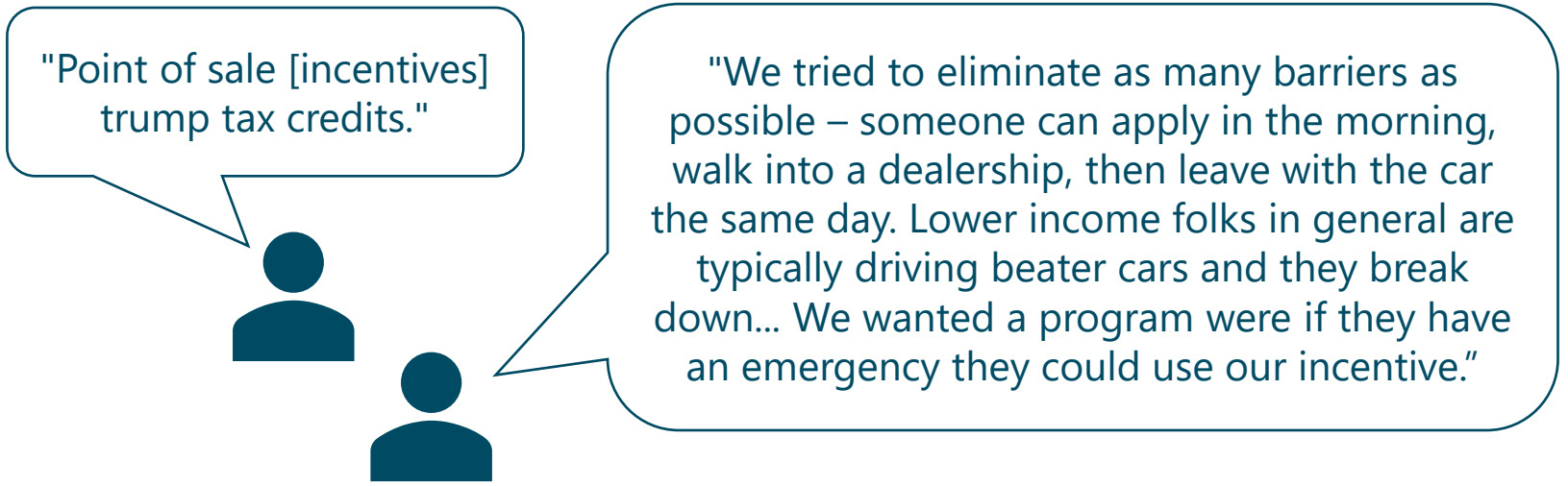
Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine, Efficiency Vermont).

- Incentives
- Test drive events
- **Education**
- Easy to use programs
- Workplace charging

Programs to support EV adoption

Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine, Efficiency Vermont).

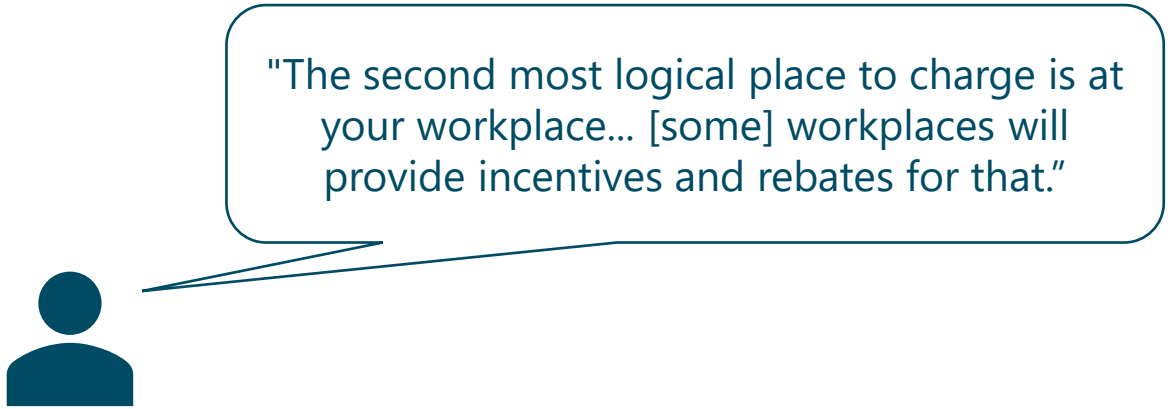
- Incentives
- Test drive events
- Education
- **Easy to use programs**
- Workplace charging



Programs to support EV adoption

Programs that decrease cost, increase familiarity, and reduce challenges related to charging are effective. Respondents frequently referenced incentive programs offered by their local energy efficiency program (e.g., Efficiency Maine, Efficiency Vermont).

- Incentives
- Test drive events
- Education
- Easy to use programs
- **Workplace charging**



Programs to support EV adoption

NGOs are widely seen as having an important role, particularly related to public engagement and doing research that can inform policy.

"Government agencies don't have the bandwidth for research… and the NGOs can provide metrics to help make policy."

"The more voices the better."

"That will be a key thing, [NGOs] ability to educate the population."

"The NGO community in general plays a really important role in terms of advocacy and awareness… States are sometimes constrained by what they can do by the politics. And NGOs are free to really advocate in a robust way and that's really important."

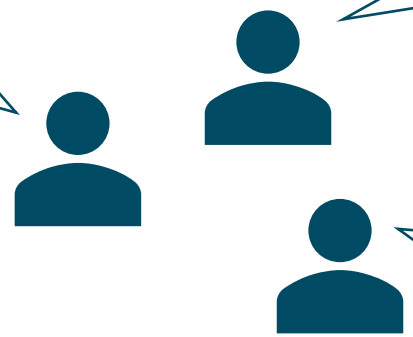
Programs to support EV adoption

NGOs are widely seen as having an important role, particularly related to public engagement and doing research that can inform policy.

Some respondents cautioned that support from NGOs or governments should take certain factors into consideration.

"[Some demand for infrastructure] comes from people from outside of the region moving here… I'm not sure why a town would want to put in a charging station for someone who just paid $300,000 for a camp on a lake."

"One of the concerns we here is that we're going to get these shoved down our throats. I'm all for choice… I know cars and fuel are subsidized, but I get nervous about subsidies for any vehicle or fueling."



"Not without educating people as to the issues that EVs are going to cause" [related to materials and generation] and continuing the research to solve those problems."

Other recommendations

Find the right message for the audience

- "The new Ford Mustang - it's a compelling vehicle, it's fast and it's looks good…. Can we figure out ways to accentuate the functionality of these things and perhaps deemphasize some of the [environmental] benefits?"
- "Barre [Vermont] has a proud tradition of cars… it's part of Barre's identify [with Thunder Road]. How do you capitalize on that? How do you talk with Thunder Road about creating an EV category? You can go onto YouTube and see people in stripped down Teslas drag racing internal combustion engines… and beating them. That kind of performance aspect might be a part of bridging that."

Make education resonate with people's lives

- "Give Vermonters case studies of how different EVs could fit into their lifestyle."

Make the easy asks

- EVs can be a particularly good fit in a two-vehicle household paired with an internal combustion vehicle.