

1 Pathways for Mitigation

2 Transportation – Summary Statement

3 Transportation – the movement of people and goods – is essential to the state’s economy and
4 Vermonter’s quality of life. The state’s rural character and low population density also means
5 that Vermonters depend primarily on cars and trucks to get them where they need to go.
6 Vermont’s auto-reliant system is fueled almost singularly¹ with carbon-intensive gasoline and
7 diesel, making transportation the largest source of climate pollution – equating to a full 40% of
8 the state’s greenhouse gas emissions.² The combination of our mostly rural nature, dispersed
9 land use patterns and heavy reliance on fossil-fueled vehicles is a significant reason why
10 Vermonters emit more greenhouse gasses per capita than any other state in New England.³ This
11 reality makes transforming the state’s transportation system essential to meeting the emissions
12 reduction requirements of the Global Warming Solutions Act. At the same time, creating a clean,
13 efficient, multi-modal system will also have economic, environmental, equity and public health
14 benefits.

15
16 Vermont’s reliance on liquid fossil fuels is a significant drain on our economy. Vermonters
17 collectively spend over \$1 billion on fossil fuels for transportation. Approximately 77% of those
18 dollars leave the state’s economy every year.⁴ In contrast, electricity purchases keep far more
19 dollars in Vermont. Over 60% of every dollar spent on electricity stays here.⁵ Moving to more

1

https://vtrans.vermont.gov/sites/aot/files/planning/documents/planning/The%20Vermont%20Transportation%20Energy%20Profile_2019_Final.pdf

[MJ2]https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2017_Final.pdf

² https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2017_Final.pdf

³ Page 11: https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_and_Forecast_1990-2016.pdf

⁴ https://www.eanvt.org/wp-content/uploads/2021/06/EAN-APR2020-21_finalJune2.pdf

⁵ EAN 2021 Progress Report: https://www.eanvt.org/wp-content/uploads/2021/06/EAN-APR2020-21_finalJune2.pdf

20 efficient, electric vehicles will keep more of the money we collectively spend on transportation
21 in the state’s economy and in Vermonters’ pockets.⁶

22
23 The proportionally higher per capita income costs for lower income Vermonters and high price
24 volatility in the current system also makes transportation a big equity issue.⁷ Lower-income
25 Vermonters spend a far greater proportion of their incomes on energy than upper income
26 Vermonters. Transportation costs – primarily through owning, operating and maintaining a
27 vehicle – equate to 45% of total energy expenditures for the average Vermont household. This
28 reality places a disproportionate economic burden on lower income Vermonters.⁸

29
30 How the current system serves people equally – or does not –is another important equity issue.
31 Many older Vermonters, youth, and people living with disabilities cannot drive, thus limiting
32 their ability to access jobs, services and community amenities without a multi-modal, integrated
33 transportation system. Research also highlights that the ownership of a vehicle is a significant
34 job access and retention issue for lower income Vermonters.⁹ This has long been true but also
35 underscored in the COVID-19 pandemic, when many low-income, frontline workers continued
36 to report in-person to work, often relying on costly, inefficient vehicles. Research has also
37 found that “possession of a driver’s license and a car was a stronger predictor of leaving public
38 assistance than even a high school diploma,” which speaks to the importance of vehicle access
39 and ownership as an important justice issue.¹⁰

40
41 The economic disparities and equity issues embedded in rural Vermont’s current transportation
42 system also present opportunities. Equitably accelerating the adoption of more efficient, electric
43 vehicles, expanding transportation choices and creating compact communities where Vermonters

⁶ https://www.ucsusa.org/sites/default/files/2020-11/rural-transportation-opportunities_0.pdf

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https://publicservice.vermont.gov/sites/dps/files/documents/Pubs_Plans_Reports/Legislative_Reports/2021%20Annual%20Energy%20Report%20Final.pdf

⁸ <https://www.encyclopedia.com/energy-and-environment/energy-and-environmental-issues/white-papers/2019%20Vermont%20Energy%20Burden%20Report.pdf>

⁹ https://ljfo.vermont.gov/assets/Uploads/9bc271c390/Reach-Up-Annual-Report_FINAL_2020.01.15.pdf

¹⁰ <https://www.sierraclub.org/sites/www.sierraclub.org/files/sce-authors/u2196/Arrive%20Together%20Transportation%20Access%20and%20Equity%20in%20Wisconsin.pdf>

44 can afford to live without a vehicle will have many benefits. Those benefits include collectively
45 saving Vermonters hundreds of millions of dollars every year; significantly reducing the high
46 energy burdens Vermonters currently carry; ensuring Vermonters of all incomes levels and
47 demographics can access more clean, affordable transportation options; and – individually and
48 collectively – improving public health outcomes by reducing exposure to the air pollutants
49 caused by the burning of gasoline and diesel and expanding active modes of transportation. ¹¹

50

51 Together, the strategies identified below will not only improve health outcomes, but set Vermont
52 on a course to dramatically reduce transportation-related carbon pollution and more equitably
53 shift to a cleaner, more efficient, multi-modal transportation system. This is a two-pronged
54 approach to make both vehicles and the transportation system more efficient by:

55 1. Replacing carbon intensive fuels (gas and diesel) with zero emission or low carbon fuels such
56 as electricity (noting that for medium to heavy duty vehicles in particular, there may be a limited
57 but important role for biofuels or hydrogen, especially in the near term).

58 2. Making both the vehicles and the transportation system more efficient; creating options for
59 Vermonters to drive less or use alternatives to the single occupancy vehicle to get where they
60 need to go, while also, importantly, increasing options for those who cannot drive.

61

62 Electrification is a critical short-term priority. Electric vehicles are more energy efficient than
63 gas powered vehicles – costing far less per mile than a gas-powered vehicle to own and operate
64 over time.¹² For rural Vermont drivers, the economic benefits of an electric vehicle will also be
65 significant. A recent study estimated that a typical rural driver can save approximately \$1,500
66 every year by switching from a conventional gasoline car to a comparable electric vehicle, which
67 is even more significant over the life of the vehicle ¹³

68

69 Avoiding car trips, reducing car trip lengths and replacing car trips with clean and energy
70 efficient transit, biking and walking options, carpool and rideshare programs and other non-
71 vehicular strategies have economic, equity and public health benefits – while also having the

¹¹ https://www.healthvermont.gov/sites/default/files/documents/pdf/ENV_CH_Transportation-Health.pdf

¹² https://www.eanvt.org/wp-content/uploads/2021/06/EAN-APR2020-21_finalJune2.pdf

¹³ <https://www.ucsusa.org/about/news/rural-communities-could-benefit-most-electric-vehicles>

72 potential to be important pollution reduction measures to achieve the 2050 requirements. These
73 “vehicle miles traveled” reductions rely on compact community settlements and smart growth.
74 This will require short- and long-term investments in key community infrastructure and
75 affordable housing to create places where people want and can afford to live. More research is
76 required to quantify, measure and better reflect the greenhouse gas emissions benefits of
77 “transportation demand management” strategies but their value is clear, particularly related to
78 equity and public health benefits.

79

80 When it comes to public health, the pollution associated with transportation disproportionately
81 impacts disadvantaged communities, thus having unequal public health consequences and
82 burdens – especially in places where there are high levels of traffic and congestion. Decades of
83 advances in automobile emission control technologies have helped mitigate this, but
84 communities located in or near high traffic areas still experience increased health risks due to
85 emissions exposure to nitrogen oxides, sulfur dioxide, carbon monoxide, fine particulates,
86 volatile organic compounds and ground-level ozone. Exposure to these pollutants results in many
87 health effects, including cardiovascular impairment and disease and increased risk of cancer. In
88 addition, they also result in environmental impacts such as acid rain and reduced visibility.¹⁴

89

90 Transitioning to a cleaner transportation system can have real public health benefits. A recent
91 analysis by the American Lung Association found that residents in every region of the U.S. stand
92 to benefit from the elimination of on-road traffic pollution and clean, renewable electric
93 generation. It is estimated that, by 2050, a cleaner transportation system could net Vermont over
94 \$73 million in value from avoided premature deaths, asthma attacks and work days lost.¹⁵

95

96 The pathways and actions described below will help put Vermont on a path to significant climate
97 progress, respond to the diverse needs and interests of Vermonters and achieve many co-benefits
98 associated with their implementation. At a high level, the pathways include:

¹⁴ <https://www.ucsusa.org/sites/default/files/attach/2019/06/Inequitable-Exposure-to-Vehicle-Pollution-Northeast-Mid-Atlantic-Region.pdf>

¹⁵ <https://www.lung.org/getmedia/99cc945c-47f2-4ba9-ba59-14c311ca332a/electric-vehicle-report.pdf>

- 99 • Electrification of the light duty sector (autos, SUVs and light duty trucks) and the
100 charging infrastructure to support an efficient, integrated electric vehicle network.
- 101 • Electrification and lowering the carbon intensity of fuels in the heavy duty sector (mid
102 sized and heavy duty trucks and busses). This also includes the charging infrastructure to
103 support the electrification of medium-to-heavy duty vehicles.
- 104 • Reduction of vehicle miles traveled through the creation and utilization of multi-model
105 transportation options, such as transit, micro-transit, passenger rail, biking, walking, car
106 and ridesharing etc. This includes the enabling environment – and infrastructure – to
107 support it, which requires compact community settlements.

108

109 The transformation of our current transportation system will evolve over time and the process
110 will be iterative, but it must happen swiftly to achieve Vermont’s required greenhouse gas
111 emissions reductions. This will also rely on continuing to better understand the realities facing
112 Vermonters and, through that enhanced understanding, develop better public engagement
113 strategies, programs and policies to reflect their diverse needs and interests. Success will also be
114 incumbent upon helping Vermonters avoid prolonged reliance on fossil fuels. That means the
115 vehicle point of sale, purchase or lease is a critical moment. Policies, programs and public
116 engagement approaches should be designed to help people, communities and businesses avoid
117 locking into high-emitting fossil fueled vehicles that will be on the road for a decade or more.

118

119 The partnership and participation of all Vermonters in this transformation is essential. We have a
120 strong foundation today upon which to build to ensure we leave no one behind as we work
121 towards the necessary reductions in greenhouse gas emissions; improve access to multi-modal
122 transportation options; and leverage advances in technology in cost-effective, equitable ways.

123

124 **Pathway 1: Light Duty Electrification**

125 The emissions benefits of switching from fossil fueled to electric powered vehicles are clear.
126 Battery Electric vehicles (EVs) and Plug-in Hybrid light duty electric vehicles are well beyond
127 the research and development stage, they are being manufactured across the globe and available
128 for sale today in Vermont. Their deployment and use is supported by the state’s current
129 regulatory framework, federal leadership and the manufacturers’ commitments. Vehicle types

130 that are more suitable for the Vermont climate and landscape, like light-duty trucks and all-wheel
 131 drive vehicles, are becoming more readily available. Electric vehicles are an attractive
 132 alternative because they provide a similar level of transportation convenience as conventional
 133 vehicles, with the caveat that public charging availability needs to continue to grow. While EVs
 134 often cost significantly less to own and maintain over the lifetime of the vehicles, purchase or
 135 lease incentives are an important tool to reduce the often higher upfront costs of EVs. Catalyzing
 136 the dramatic acceleration of EV deployment will require re-evaluation and expansion of
 137 purchase incentives and similar mechanisms to facilitate widespread adoption, especially among
 138 low- and moderate-income families.

139

140 **1. Market-Driving Technology Forcing Regulatory Programs**

141 Vermont first adopted California’s Motor Vehicles Emission Standards, now known as
 142 Advanced Clean Cars (ACC), in the early 2000s pursuant to its authority under Section 177 of
 143 the Clean Air Act. The requirements of ACC are imposed directly on vehicle manufacturers and
 144 have pushed the industry to innovate and implement new technologies to meet the requirements
 145 of the rules and growing public demand. As these regulations are updated to require higher
 146 volumes of lower and no emitting vehicles be delivered to participating states, Vermont should
 147 amend its own rules to ensure the most stringent standards, identical to California’s program,
 148 will apply to Vermont. Adoption of ACC II in Vermont will contribute to a broader acceleration
 149 of EV manufacturing and deployment as more manufacturers are required to embrace vehicle
 150 electrification and innovation, thereby ensuring a diversity of vehicle choices are available to
 151 Vermonters. The sooner more of this vehicle technology and types of vehicles are available on
 152 the market, the lower the upfront costs to consumers of EV ownership.

153

154 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources		
a.	Action Details: Adopt California’s Advanced Clean Cars II (ACC II) Regulations (amending Vermont’s existing Low and Zero Emission Vehicle Regulations) beginning no later than Model Year 2026. ACC II includes, as proposed, a 100% ZEV sales requirement by 2035, more stringent criteria pollutant	Impact CAP modeling makes clear that vehicle electrification is one of highest pollution-reduction measures required to achieve the GWSA targets. CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state’s

<p>emissions standards, a robust vehicle durability standard, warranty provisions, battery state of health standardization, battery labeling, and availability of repair information to independent repair shops.</p>	<p>emissions reduction requirement. Amending Vermont’s Low and Zero Emission Vehicle regulations will be the primary driver in delivering electric vehicles to dealerships in Vermont. This program will allow for a faster transition to electric vehicles through increased availability than what would have occurred without amendments to the current program.</p>
	<p>Equity ACC II will build equity principals into compliance flexibility mechanisms for vehicle manufacturers. Increasing the availability and overall number of EVs generally will also help significantly drive down the cost of EVs over time and accelerate and expand the used EV market in Vermont, enabling increased consumer access to EVs.</p>
	<p>Cost-Effectiveness Electrifying the light duty fleet will be a relatively cost-effective approach to reducing greenhouse gas emissions. The adoption of ACC II is a low-cost action and a critical component of electrifying the light-duty fleet in Vermont.</p>
	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Reduction in criteria air pollutants - Lower vehicle maintenance and fuel costs - Enhanced vehicle consumer protection measures
<p>Timeline to Implement: Rules adopted no later than December 31, 2022</p>	<p>Technical Feasibility Yes</p>

155

156 **2. Light Duty Electric Vehicle Purchase Incentives**

157 Vermont launched a point-of-sale EV purchase incentive program in 2019, and authorization of
158 funding in subsequent years has allowed the program to continue to date. The incentive is
159 administered by Vermont Energy Investment Corporation’s Drive Electric Vermont (DEV)
160 program and helps to reduce the upfront costs associated with EV ownership. Additional

161 evaluation of the current program and consumer data research will inform necessary amendments
 162 to the current program in the form of incentive amounts, income eligibility, application to
 163 commercial and municipal fleets, and used EV purchases. Expanded and continued funding for
 164 upfront purchase incentives – with an important focus on helping lower-income, overburdened
 165 Vermonters to participate – will be critical to equitably increase EV adoption to the levels
 166 necessary to meet Vermont’s greenhouse gas reduction requirements.

167 **High (and consensus medium) Priority Actions**

Lead Implementer: Legislature, Agency of Transportation	
<p>a. Action Details: Expand and redesign Point of Sale Purchase Incentives for new and used Electric Vehicles and E-bikes. Specifically: determine the appropriate per vehicle incentive amount and dramatically increase number of incentives issued while cost-effectively driving uptake; apply incentives to used EV purchases, determine the dollar amounts and makeup of purchase incentive needed to achieve EV deployment and equity goals (if incentives are tiered, create income tiers instead of vehicle price tiers); expand eligibility for commercial and municipal fleet EV purchases.</p>	<p>Impact CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirements. Incentivizing EV purchases will be critical towards meeting EV deployment requirements to achieve emissions reductions.</p>
	<p>Equity The program will prioritize low and moderate-income families, as it does now. This goal and implementing program elements will be examined, adjusted and potentially increased as needed in the future to ensure broad, equitable access and participation.</p>
	<p>Cost-Effectiveness Modeling shows that electrifying the light duty fleet is a cost-effective approach to reducing greenhouse gas emissions. Additional investigation will be required during program redevelopment to help determine the incentive amounts necessary to drive EV adoption at the rates required. Even with relatively high incentive amounts per vehicle, those costs will be gradually recouped by consumers through lower fuel and maintenance costs over time.</p>
<p>Timeline to Implement: Continue the current incentive funding authorized in the 2021 Transportation Bill (T-Bill), concurrently</p>	<p>Co-Benefits:</p> <ul style="list-style-type: none"> - Reduction in criteria air pollutants

	<p>analyze its effectiveness, using consumer and other data to scale the program – and the income-tiered program benefits -- with consideration of the anticipated future need-based EV deployment and equity goals. Use this analysis to strategically expand investments in future T-Bills.</p>	<ul style="list-style-type: none"> - Lower vehicle maintenance and fuel costs for consumers - Keeps significantly more dollars spent on vehicle fuel in-state - Improve access to cost-effective transportation for low-income families
<p>b.</p>	<p>Action Details: Continue to fund and expand Replace Your Ride and Mileage Smart programs in future state budgets and T-Bills. Amend program eligibility and parameters as data and analysis requires.</p>	<p>Technical Feasibility Yes</p> <p>Impact CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirements. Although these programs are not limited to battery electric vehicle deployment, they are a helpful tool in facilitating adoption of more fuel-efficient vehicles while also furthering equity goals.</p> <p>Equity These programs prioritize and/or limit eligibility to low-income individuals and families. These programs also improve access to more fuel-efficient vehicles for low-income families, helping to reduce household energy burdens.</p> <p>Cost-Effectiveness Electrifying the light duty fleet is a relatively cost-effective approach to reducing greenhouse gas emissions. Additional investigation will be required during program review to help determine the incentive amounts necessary to drive EV or fuel-efficient vehicle adoption at the rates required. Even with relatively high incentive amounts per vehicle, those costs will be gradually recouped by consumers through lower fuel and/or maintenance costs over time.</p>
	<p>Timeline to Implement: Immediately</p>	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Owning, operating and maintaining an EV costs less than a conventional vehicle and leads to savings on transportation, a significant household expense.

		<ul style="list-style-type: none"> - Air quality benefits associated with retirement of old vehicle (Replace Your Ride only) - Helps meet critical transportation needs of those in poverty (Mileage Smart)
Technical Feasibility Yes		
Lead Implementer: Legislature, Department of Motor Vehicles, Vermont Department of Taxes		
c.	<p>Action Details: Design and implement a vehicle efficiency price adjustment that’s linked to the “purchase and use” tax for new vehicles within a vehicle class. The program will help incentivize the purchase of more efficient new vehicles (electric vehicles in particular) and disincentivize purchase of less efficient vehicles. The program should be designed to mitigate potential impacts to low-income purchasers and business and commercial users who require certain vehicles and where no cost-effective, comparable electric or clean vehicle options are available. Program development should consider and weigh how it complements current EV purchase incentive programs so as to avoid duplicative or unnecessary incentives. This program should be revenue neutral and revenues should go exclusively to rebates within the program.</p>	<p>Impact CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirements. Although this vehicle price adjustment program would not be exclusive to EVs, adding an additional price signal to further incentivize the purchase of high efficiency or electric vehicles would help to speed the transition to EVs and more fuel-efficient vehicles in Vermont.</p> <p>Equity The program is limited to new car purchases and can be designed to exempt certain income levels and purchasers who require a certain class of vehicle for business and commercial use for which there may be no cost-effective, comparable, available alternative. Also, higher income earning Vermonters are the primary purchasers of new vehicles. This program’s singular focus on new vehicle purchases is intended to help address equity considerations. For Vermonters who require new vehicles for business use, it will be important to consider and potentially exempt any purchase for such purposes from the program.</p> <p>Cost-Effectiveness Electrifying the light duty fleet is a relatively cost-effective approach to reducing greenhouse gas emissions. Additional investigation will be required during program development to help determine the amounts necessary to drive EV adoption at the rates required and not</p>

		unnecessarily compete or duplicate other programs, such as EV purchase incentives. Even with relatively high price adjustment amounts per vehicle, those costs will be gradually recouped by consumers through lower fuel and maintenance costs over time.
	Timeline to Implement: Upon adoption of purchase and use price adjustment.	Co-Benefits <ul style="list-style-type: none"> - Reduction in criteria air pollutants. - Lower vehicle maintenance and fuel costs for consumers. - Keeps dollars spent on fuel in-state.
		Technical Feasibility Yes

168

169 **3. Public Investment in Electric Vehicle Supply Equipment (EVSE)**

170 The Vermont Agency of Transportation has worked hard towards the goal of deploying a Level 3
171 (DCFC) charger within 30-miles of every Vermont resident, helping to lay an important
172 foundation of EV infrastructure. However, there is much more to do to build an integrated,
173 seamless system. A lack of availability of public charging remains recognized as a deterrent to
174 consumers in making vehicle purchase choices. This is sometimes referred to as “range
175 anxiety.” While most charging occurs at home or at work, longer trips often require fast (DCFC)
176 and reasonably priced charging adjacent to highway corridors and within walking distance of
177 services – and those options need to increasingly be made available. Vermont is already leading
178 the nation in its per-capita EVSE deployment efforts through the work of an existing inter-
179 agency team but there is more to do to create a cohesive, strong, integrated charging network that
180 serves both rural Vermont and Vermonters living in multi-family and more urban environments.
181 State government’s role in this effort should be to continue to lead EVSE deployment efforts,
182 help municipalities, electric utilities, non-profits and the private sector determine the optimum
183 location and type of EVSE, and financially support purchase and installation of EVSE until it
184 becomes mainstream. In particular, expanding workplace, multi-family housing and rental unit
185 charging and the infrastructure needed to support it (which often lack garages or parking
186 adequate for at home charging) must also remain a significant priority. Efforts must include
187 addressing these charging needs with the understanding that public/private partnerships and the
188 role of the utilities in EVSE charging will complement and support greater deployment of and

189 benefits from expanding EVSE charging infrastructure across the state. Future discussions
 190 surrounding EV charging and rate design will also need to be informed by research and
 191 recommendations of the Interagency Task Group on Transportation User Fees, recognizing that
 192 transportation funding through gas tax revenues will decline as more drivers fuel their vehicles
 193 with electricity.

194 **High (and consensus medium) Priority Actions**

Lead Implementer: Legislature; Interagency EVSE Working Group (ACCD, VTrans, ANR, VDH, PSD)	
<p>a. Action Details: Continue to fund and support build-out of DCFC and Level 2 EVSE based on the EVSE Deployment Plan under development by Drive Electric Vermont pursuant to the Agency of Transportation’s Multipronged Vehicle Electrification Strategy and continue to coordinate regional efforts. Incorporate prioritization of multi-family and workplace charging and associated infrastructure availability into programs to be guided by equity principles and environmental justice mapping tools. Current funding includes VW Environmental Mitigation Trust and other funding available in the 2021 Transportation Bill. Available federal funding may be used as well as potential TCI-P revenue.</p>	<p>Impact CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirements. Charging infrastructure is a critical component in enabling EV adoption to increase consumer confidence and to reduce range anxiety. Dramatic increases in EV adoption rates will require significant additional buildout of public and workplace charging to enable the transition to electric vehicles.</p>
	<p>Equity The state will work with local public and private partners to improve EVSE accessibility for multi-family properties, rental property dwellers, and Vermonters living in rural areas.</p>
	<p>Cost-Effectiveness Electrifying the light duty fleet is a relatively cost-effective approach to reducing greenhouse gas emissions. Deployment of EVSE is a critical component of achieving these cost-effective reductions and installation of additional EVSE is a critical enabling factor in advancing electrification of the light-duty vehicle fleet.</p>

	<p>Timeline to Implement: Immediately.</p>	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Cost of charging will be kept low through focus on home charging, especially multi-unit dwelling properties. - Day time employee charging may be beneficial to electric load management. - Enabling action for light-duty fleet electrification and associated air pollutant and health benefits. - Utility load control benefits to balance and benefit the grid and ratepayers.
<p>Technical Feasibility Yes</p>		

Lead Implementer: Legislature; Public Utilities Commission

<p>a.</p>	<p>Action Details: Direct the PUC to consider and develop beneficial EV charging rates to incentivize EV adoption through lower fuel costs. Additional investigation and coordination with utilities is needed to inform the rate design and to ensure that the rate promotes and enables managed charging and the benefits a flexible EV load can bring to the grid. Discussion with utilities is also critical to inform the details of the rate itself and to incorporate lessons learned from existing EV specific rates. Further investigation into alternative demand charge designs for low utilization charging locations is necessary to help mitigate the barrier presented by demand charges to DCFC installations in low utilization rural areas for the near future.</p>	<p>Impact Implementing beneficial EV charging rates would be another financial incentive to help spur EV adoption. Setting EV specific charging rates that are lower than normal residential rates and based upon shared savings to incentivize EV adoption through even lower vehicle fuel costs as well as promote the ability of utilities to manage EV charging to lower the cost for all ratepayers. The flexibility that managed EV charging allows provides grid benefits that positively impact Vermont ratepayers.</p>
		<p>Equity EV specific charging rates would be available to all Vermonters and, if based upon shared savings for load control, lower costs for all customers. Having this additional financial incentive to help reduce overall vehicle costs for the consumer would be another factor to help overcome the currently higher upfront cost of EVs and allow for greater access to the EV market for everyone.</p>

		<p>Cost-Effectiveness Adoption of a beneficial EV rate design would be another, and more enduring, financial incentive that would help to increase EV adoption and through shared savings and load control help achieve cost savings for participants and all ratepayers.</p>
	<p>Timeline to Implement: Upon issuance of PUC order.</p>	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Promotes managed EV charging which provides load flexibility that benefits all Vermont ratepayers. - Vehicle electrification reduces emissions of criteria air pollutants which has associated health benefits.
		<p>Technical Feasibility Yes</p>

195

196 **4. Join the Transportation and Climate Initiative Program (TCI-P)**

197 For over a decade, Vermont has been a member of the Transportation and Climate Initiative, a
 198 regional collaboration of 13 Northeast and Mid-Atlantic states and the District of Columbia that
 199 seeks to improve the transportation system, develop the clean energy economy and equitably
 200 reduce carbon emissions from the transportation sector. The TCI jurisdictions are: Connecticut,
 201 Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New
 202 Jersey, New York, North Carolina, Pennsylvania, Rhode Island, Vermont, and Virginia. In
 203 December 2020, Massachusetts, Connecticut, Rhode Island, and the District of Columbia
 204 announced that they will be the first jurisdictions to launch the Transportation & Climate
 205 Initiative Program (TCI-P), a multi-state cap and invest, market-based program that reduces air
 206 pollution while investing \$300 million per year in cleaner transportation choices and healthier
 207 communities. It is important to note that the TCI-Program (TCI-P) is different than the
 208 Transportation and Climate Initiative (TCI). The TCI-P is the program which resulted from the
 209 10+ year collaboration among the 13 Northeast and Mid-Atlantic states and would be the
 210 mechanism that would – through the cap – reduce approximately 26% of transportation climate
 211 pollution across participating jurisdictions by 2032 and raise approximately \$20 million in
 212 annual revenue for Vermont. Vermont’s participation in TCI-P – critically, paired with a

213 complementary legislative policy action to drive strategic investments, foster a more equitable
 214 process and ensure greater equity outcomes – is an important tool to reduce transportation
 215 emissions and raise needed revenues to investment in actions detailed in this Light-Duty Vehicle
 216 Electrification Pathway.

217 Federal infrastructure funds will soon become available to states for clean transportation
 218 investments. Rather than reducing the need for TCI-P, this federal spending will make TCI-P
 219 even more critical as a source of state or local matching funds (20% match required) for federal
 220 grant programs available through the Build Back Better Act.

221

222 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources; Legislature	
<p>a. Action Details: Vermont joins TCI-P as a participating jurisdiction through adoption of the TCI-P Model Rule. Regulated entities (Fuel suppliers) will need to purchase and surrender CO2 allowances equal to the amount of fuel that they deliver for sale in Vermont. Allowances will be purchased at auction and Vermont will have agency over how auction proceeds are spent, investing in actions that prioritize and benefit disadvantaged communities and reduce emissions.</p> <p>The Legislature should enact a complementary policy that goes further to ensure equity outcomes (establish an expanded equity board, direct a minimum/significant investment in low income, rural, overburdened and underserved communities, e.g. 70%) and have funds go to transportation related or efficient transportation enabling investments. Consider a firewalled fund.</p>	<p>Impact TCI-P is an umbrella program, the proceeds of which will fund the actions in this Pathway and others in the CAP.</p>
	<p>Equity The TCI-P MOU requires a 35 percent minimum investment in low income, overburdened communities and the creation of an Equity Advisory Body. To go further to ensure better process and equity outcomes, there is also a bill being drafted for introduction in the 2022 legislative session that will require a yearly review by a broad stakeholder group and substantially more TCI-P revenues directed to low income, rural, historically disadvantaged communities.</p> <p>Cost-Effectiveness Revenue from TCI-P can be used to implement the actions outlined in this Pathway. Electrifying the fleet is a relatively cost-effective approach to reducing greenhouse gas emissions.</p>
<p>Timeline to Implement: Immediately.</p>	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Emissions reductions achieved through a coordinated regional approach.

		<ul style="list-style-type: none"> - Incentivizes regulated entities to lower carbon intensity of fuel delivered for sale. - Improving public health outcomes.
		Technical Feasibility Yes

223

224 **5. Educate drivers on benefits of electrification and other transportation**
 225 **options to reduce vehicle miles traveled (VMT)**

226 A critical component of the transition to electric vehicles is to implement timely and targeted
 227 education about not only the environmental and public health benefits of driving an electric
 228 vehicle, but the difference in maintenance and fueling requirements, charging infrastructure
 229 utilization (at home and publicly accessible), cost savings, and how to reduce the need to use
 230 single-occupancy transportation options. Incorporating this information and training into student
 231 driver education courses, and making training available to already licensed drivers, will help
 232 drivers be more confident and prepared in their choice to purchase and drive an EV. This
 233 component to initial and ongoing driver education and outreach efforts would be complimentary
 234 and would not be included in testing required to obtain vehicle operating licenses or other
 235 credentials associated with operation of motor vehicles.

236 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources, Agency of Education, Legislature		
a.	Action Details: Fund implementation and further enhancement of a complimentary unit within Vermont's driver education curriculum to educate student drivers about electric and high efficiency transportation options, as well as how to reduce VMT via use of other transportation options, as well as increase funding for EV education and buyer assistance support currently being offered by Drive Electric Vermont.	Impact CAP modeling indicates that approximately 170,000 EVs will need to be deployed by 2030 in order to achieve the state's emissions reduction requirement for 2030. Adequate and effective new and existing driver education will lead to increased uptake in EV deployment necessary to reduce emissions.
		Equity Education opportunities will be made available at no cost and will be integrated into existing driver education requirements for ease of access. EV education, information and buyer assistance support – including via Drive Electric Vermont or otherwise – will be

		translated to ensure non-English speakers can access the information.
		Cost-Effectiveness Because many education opportunities for driver training are already being deployed, an EV component of the existing curriculum could be added with minimal costs. The Drive Electric Vermont infrastructure and network also offers a solid foundation upon which to build.
	Timeline to Implement: Immediately.	Co-Benefits <ul style="list-style-type: none"> - Reduction in criteria air pollutants. - Lower vehicle maintenance and fuel costs for consumers. - Keeps dollars spent on fuel in-state.
		Technical Feasibility Yes

237

238 **Pathway 2: Heavy Duty Electrification**

239 Medium and heavy-duty trucks and buses contribute 14%of transportation emissions in Vermont.
240 Reducing diesel emissions, such as particulate matter and nitrogen oxides has known health
241 benefits. Medium and heavy-duty vehicle technology has been deployed internationally, and
242 while there are challenges associated with replacing diesel power with electric, certain
243 applications are being further developed and implemented. The purchase price of these vehicle
244 types remains high compared to the upfront cost of conventional vehicles. Vermont has funded
245 and implemented medium and heavy-duty electric vehicle pilot programs, including school and
246 transit bus deployments and upcoming deployments of electric waste haulers, electric utility
247 vehicles, and delivery vehicles. Vermont works closely with other states to coordinate a regional
248 and national approach to deployment of medium and heavy-duty electric vehicles, as well as
249 efforts to address excessive idling, research and development, and investigation of less carbon
250 intensive and renewable fuels such biofuels. Note that this pathway includes not only
251 deployment of electric vehicle technology, but also the development and future deployment of
252 hydrogen fuel-cell vehicle technology, which is viewed as another fuel-switching pathway for
253 medium and heavy-duty vehicles.

254 **1. Market Driving, Technology-Forcing Regulatory Programs**

255 Vermont’s regulation of emissions from medium and heavy-duty vehicles has been limited
 256 compared to the regulation of light-duty vehicle emissions. Recent proposals and newly adopted
 257 regulatory programs from California have presented an opportunity to continue our coordination
 258 with other states to reduce emissions from medium and heavy-duty vehicles. The rules outlined
 259 below encompass a comprehensive rule package to reduce greenhouse gas emissions through
 260 electrification and cleaner engine standards and increase efficiency and engineering of medium
 261 to heavy duty trucks to cause lower emissions of greenhouse gases and traditional air pollutants.
 262 The state should pursue available funding and use to mitigate the high upfront costs of medium
 263 and heavy-duty electric vehicles and hydrogen fuel-cell technology development.

264 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources	
<p>a. Action Details: Adopt California Air Resources Board Advanced Clean Trucks Rule (an increasing percent ZEV sales requirement for manufacturers), Low NOx Omnibus Rule (includes a more stringent NOx emission standard and lengthened useful life and warranty), and Phase II GHG Rule for Truck Trailers beginning no later than Model Year 2025. Fund incentives for medium and heavy-duty electric fleet purchases.</p>	<p>Impact CAP modeling indicates that approximately 50,000 medium and heavy-duty EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirement for 2030.</p>
	<p>Equity Reductions in these emissions through electrification would benefit communities that are disproportionately impacted by poor air quality related to transportation emissions.</p>
	<p>Cost-Effectiveness This is a technology forcing regulation, and therefore the costs of compliance directly impacts manufacturers of MHD vehicles. Also, because manufacturers do not receive compliance credit for a vehicle until it is placed in service, manufacturers will need to support dealers and fleets in Vermont to make purchase and operation of these vehicles feasible in order to meet their compliance obligation.</p>
<p>Timeline to Implement Immediately.</p>	<p>Co-Benefits</p> <ul style="list-style-type: none"> - Reduction in criteria air pollutants.

		<ul style="list-style-type: none"> - Lower vehicle maintenance and fuel costs for owners and operators. - Keeps more dollars spent on fuel in-state.
		Technical Feasibility Yes

265

266 **2. Electrify medium and heavy-duty vehicle auxiliary systems**

267 Many medium and heavy-duty vehicles in Vermont are equipped with auxiliary systems that run
 268 off of the combustion engine power, and therefore increase the vehicle’s emissions when they
 269 are in operation. While fully electric options for some of these specialty vehicles are becoming
 270 available on the market, retrofitting existing vehicles that still have a long remaining useful life
 271 to electric auxiliary systems will be an important step towards meeting our emissions reduction
 272 requirements in the short term and while the medium and heavy-duty electrification
 273 transformation takes place.

274 **High (and consensus medium) Priority Actions**

Lead Implementer: Legislature, Agency of Natural Resources		
a.	Action Details Fund programs that incentivize electric auxiliary systems, such as (but not limited to) hybrid-electric bucket trucks and electric transport refrigeration units and programs that incentivize installation of electrified parking spaces in truck loading/unloading zones.	Impact CAP modeling indicates that approximately 50,000 medium and heavy-duty EVs will need to be deployed by 2030 in order to achieve the state’s emissions reduction requirements. Electrifying vehicle auxiliary systems can be a bridge towards electrification while conventional vehicles are still being used, but with electric auxiliary power.
		Equity Reductions in these emissions through electrification would benefit communities that are disproportionately impacted by poor air quality.
		Cost-Effectiveness While the upfront cost of fully electric medium and heavy-duty vehicles will be a barrier to early adoption, mitigating emissions from auxiliary power systems can be a cost-effective way to achieve emissions reductions while the transition to fully electric vehicles in this sector occurs.

	Timeline to Implement Immediately.	Co-Benefits <ul style="list-style-type: none"> - Reduction in criteria air pollutants - Lower vehicle maintenance and fuel costs for owners/operators - Keeps dollars spent on fuel in-state
		Technical Feasibility Yes

275

276 **3. Join the Transportation and Climate Initiative Program (TCI-P)**

277 For a detailed description of this Strategy, please see Pathway 1: Light Duty Electrification,
 278 Strategy (4), above. Vermont’s participation in TCI-P -- critically, paired with a complementary
 279 policy to drive strategic investments, foster a more equitable process and ensure greater equity
 280 outcomes – is an important tool to reduce transportation emissions and raise needed revenues to
 281 investment in actions detailed in this Heavy-Duty Vehicle Electrification Pathway.

282 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources; Legislature		
a.	Action Details: See Action Details in Pathway 1, Strategy 4.	Impact See Impacts from Pathway 1, Strategy 4. Equity See Equity from Pathway 1, Strategy 4. Cost-Effectiveness See Cost-effectiveness from Pathway 1, Strategy 4.
Timeline to Implement: Immediately.		Co-Benefits <ul style="list-style-type: none"> - See Co-benefits from Pathway 1, Strategy 4.
		Technical Feasibility Yes

283

284 **Pathway 3 Reduction in Vehicle Miles Traveled (VMT)**

285

286 While the quantitative emissions reductions benefits of reducing VMT requires additional
 287 modeling, it can be assumed that reducing the number and length of car trips is possible by
 288 growing state and local investment in transit, micro-transit, rail, bike and pedestrian
 289 infrastructure, and other transportation services beyond the single occupancy vehicle will have a

290 beneficial impact on emissions. These transportation modes also have known public health,
 291 equity and other co-benefits. Increasing the use of these modes is contingent on several factors
 292 including service that mimics the convenience of driving, and is safe, reliable, and feasible for
 293 users who cannot drive, including people living with a disability. Use of these modes tends to be
 294 most feasible in urban and village areas where the land use density is adequate and is less
 295 feasible in dispersed rural contexts. Long term reduction of transportation emissions is also
 296 contingent on the commitment at the local, regional and state levels of supporting the state’s
 297 smart growth land use goals through infrastructure investment.

298

299 **1. Increase state, regional and local capacity to plan for VMT reduction and**
 300 **implement sustainable transportation strategies.**

301 **High (and consensus medium) Priority Actions**

Lead Implementer: Legislature, Vermont Agency of Transportation, regional and local partners	
a. Action Details: Require VTrans to create a <i>State Sustainable Transportation Implementation Plan</i> , including: <ul style="list-style-type: none"> • The GHG reduction cost effectiveness of Smart Growth strategies which could reduce VMT in the Vermont context and how that compares to other GHG reduction strategies which Vermont could deploy. • Understanding and quantifying the effect of Smart Growth on VMT in Vermont • Establishing of State VMT targets • The level of investment across modes needed to contribute towards long & short-term emissions, equity and other goals. This could include funding to grow existing programs & increase availability and use of transit, micro-transit and other transportation choices. • Continuing to fund and provide technical assistance to RPCs and municipalities through the Transportation Planning Initiative. In addition to the current program’s 	Impact VMT The state currently lacks information regarding how land use affects transportation emissions and the transportation investment necessary to reduce emissions by shortening trips, reducing single occupancy vehicle trips and increasing transit options and other services, and the associated infrastructure. More research and better metrics will be required. It is possible and the State should seek to quantify, measure and adjust programs and policies to realize potentially essential pollution reduction benefits needed to achieve 2050 emissions reduction requirements.
	Equity Transit and other services and modes that replace vehicle trips are essential to the those that can’t afford to own or operate a vehicle.
	Cost-Effectiveness VMT reduction measures are relatively cost-ineffective compared to other transportation

<p>priorities, transportation sustainability will be incorporated as a goal within Regional Transportation Plans and Municipal Plans and in order for evaluation and inclusion of affordable and effective methods of reducing GHG emissions from transportation such as expanding transit service, building bike and pedestrian facilities, locating EV charging equipment and more.</p> <p>The <i>State Plan</i> shall evaluate and incorporate if founds to be feasible, affordable, and effective at reducing GHG emissions:</p> <ul style="list-style-type: none"> - Free fares for users of public transit. Encourage Public Transit Provider Boards of Directors to continue to offer fare-free transit to all public transit users following the conclusion of the SFY22 fare free programming funded by the Legislature. - A multi-year plan to increase the availability and use of transit and micro-transit, based on industry recommended deployment standards for route deployment, to achieve a more robust, integrated public transportation system following the conclusion of the SFY22 fare free programming funded by the Legislature. - Expanding and improving Amtrak/rail and inter-city bus service - Actions to enhance the delivery of the State's Complete Streets legislation, maintain and expand transportation trails, and continue to advance the implementation of the 2021 Bicycle & Pedestrian Strategic Plan and other bike/ped funding programs. 	<p>emission reduction pathways in contrast to vehicle electrification, but the long-term growth of non-single occupancy vehicle transportation and the associated land use patterns will result in numerous economic, social and environmental benefits and potentially significant essential pollution reduction benefits over time.</p>
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	Timeline to Implement: Immediately	Co-Benefits <ul style="list-style-type: none"> • Increased equity in transportation options. • Improved public health outcomes from active transportation. • Air quality and other environmental benefits
		Technical Feasibility Yes

302

303 **Pathway 4 Lower the carbon intensity of fuels**

304 While Vermont is working to electrify vehicles to achieve emission reduction requirements,
305 combustion vehicles and equipment, especially in the heavy-duty vehicle sector, will remain on
306 and off Vermont roads for years to come. Production and deployment of combustion vehicles is
307 likely to continue until at least 2035 for the light duty sector and may continue for additional
308 years for heavy duty vehicles and equipment. Many heavy-duty vehicles have long “useful”
309 lives, meaning they could continue to be operated for decades after electrification options are
310 available and feasible. Therefore, increasing efficiency of combustion vehicles and equipment,
311 and lowering the carbon intensity of the fuels that these vehicles use, remains a critical
312 component of the State’s near-term strategy to reduce emissions in the transportation sector.
313 Lower carbon fuels, like biofuels, could play an important role, especially in the near-term, to
314 reduce emissions from combustion vehicle use while developments and additional deployments
315 of medium to heavy duty electric vehicles are made.

316

317 **1. Join the Transportation and Climate Initiative Program**

318 For a detailed description of this Strategy, please see Pathway 1: Light Duty Electrification,
319 Strategy (4), above. TCI-P requires fuel suppliers that deliver gasoline and diesel fuel for final
320 sale in Vermont to purchase carbon allowances available for sale at auction and surrender those
321 credits equal to the emissions from the fuel delivered for sale. The number of allowances
322 available for sale on the regional market is capped, and reduced over time, to achieve regional
323 emission reductions. One way for a fuel supplier to reduce their compliance obligation is to
324 supply lower carbon intense fuels for sale in participating jurisdictions.

325 **High (and consensus medium) Priority Actions**

Lead Implementer: Agency of Natural Resources; Legislature		
a.	Action Details: See Action Details for Pathway 1, Strategy 4.	Impact See Impacts details for Pathway 1, Strategy 4.
		Equity See Equity details for Pathway 1, Strategy 4.
		Cost-Effectiveness See Cost-effectiveness for Pathway 1, Strategy 4.
	Timeline to Implement: Immediately.	Co-Benefits - See Co-benefits for Pathway 1, Strategy 4.
		Technical Feasibility Yes

326

327