Supplemental Information

for

Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules

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Background

This document includes technical support and supplemental information for the Agency of Natural Resources' Low Emission Vehicles and Zero Emission Vehicle proposed rules, which incorporate by reference California's Advanced Clean Cars II, Advanced Clean Trucks, the Low NOx Heavy-Duty (HD) Omnibus, and Phase 2 Greenhouse Gas emission standards for trucks and trailers. Supplemental information as referenced and required in the Economic Impact Statement, the Environmental Impact Statement, and Scientific Information Statement in the Standardized Rule Forms required by the Vermont Administrative Procedure Act is included herein.

Economic Impact Statement Supplemental Information

Summary of the rules

Emissions from mobile sources are the greatest contributor to emissions of criteria pollutants[1] and greenhouse gases (GHG) in Vermont, accounting for about 51%[2] of non-biogenic ozone precursor emissions (including nitrogen oxides (NOx) and volatile organic compounds) and approximately 40% of statewide GHG emissions. In this rulemaking, the Agency of Natural Resources (ANR) proposes to adopt or amend key regulations that reduce greenhouse gas and criteria pollutant emissions from passenger cars, light-duty trucks, and medium- and heavy-duty vehicles that are delivered for sale or placed in service in Vermont. This suite of rules includes the adoption of California's Advanced Clean Trucks Rule, the Low NOx Heavy-Duty Omnibus Rule, and the Phase 2 Greenhouse Gas Rule, and amendments to California's Advanced Clean Cars program which was originally adopted by Vermont in 2012[3] and incorporates previously adopted rules to control criteria and GHG emissions. The Advanced Clean Trucks Rule (ACT) requires the sale of at least 30% zero-emission trucks by 2030 (depending on vehicle classification). The Low NOx Heavy-Duty Vehicle Omnibus Rule (HD Omnibus) requires a 90% reduction in NOx emissions for model year (MY) 2027 engines. The Phase 2 Greenhouse Gas Rule (Phase 2 GHG) sets greenhouse gas emission standards for heavy duty trucks and truck trailers. Advanced Clean Cars II (ACCII) requires that all passenger car and light-duty truck vehicles delivered for sale by 2035 meet the definition of zero-emission vehicle and will further reduce smog-forming and GHG emissions from new internal combustion engine vehicles (ICEVs). For a more detailed summary of each rule and adopting authority, see the Regulation Summary Document.

Background and analysis

The proposed regulations will result in reduced NOx, PM2.5 and GHG emissions. Each of these pollutants presents a distinct set of challenges and risks to public health and the environment.

NOx are a group of highly reactive compounds that pose direct human health impacts, such as irritation of the respiratory tract, and the worsening or triggering of asthma.[4] These gases are also precursor pollutants that undergo complex chemical reactions in the atmosphere to form other air pollutants of

[1] Criteria pollutants are those classified as such pursuant to the Clean Air Act: Oxides of nitrogen, Sulphur dioxide, Carbon monoxide, lead, ozone, and particulate matter.

[2] EPA - 2017 National Emissions Inventory: https://www.epa.gov/air-emissions-inventories/2017-national-emissions-inventory-nei-data#dataq

[3] Prior to 2012, Vermont adopted California vehicle emissions standards that were later combined into California's Advanced Clean Cars program.

[4] EPA – Basic Information about NO2 webpage: https://www.epa.gov/no2-pollution/basic-information-about-no2

concern, such as PM2.5 and ground-level ozone (also known as smog). Breathing air with elevated concentrations of ozone is especially harmful to children, the elderly, and people of all ages who have asthma and other respiratory impairments. Breathing ozone can trigger a variety of health issues ranging from coughing to chest pain, to reduced lung function or damage.[5] NOx also contributes to the formation of acid rain[6] and visibility impairment (haze)[7] in Vermont.

PM2.5 is emitted directly from vehicle exhaust and formed through secondary reactions with NOx and other pollutants in the atmosphere. PM2.5 can be inhaled deeply into the lungs and transferred into the bloodstream resulting in significant health problems, such as reduced lung function, worsened asthma, non-fatal heart attacks, and premature death in individuals with heart or lung disease.[8]

GHGs contribute to climate change causing increased risks to public health and safety, food and water resources, infrastructure and ecosystems. Additional details on GHG emission impacts can be found in Environmental Impact Supplemental Information, below.

To complete a thorough and sophisticated analysis of the emissions and economic benefits and impacts of the suite of rules proposed, Vermont is collaborating with several other "Section 177 states" and the Northeast States for Coordinated Air Use Management (NESCAUM). This analysis uses models such as the MOtor Vehicle Emission Simulator (MOVES)[9], the CO-benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA)[10], and other tools to aid in understanding the how implementation of these rules will benefit Vermonters, and what economic impacts may result.

This Technical Support Document (TSD) also relies on the comprehensive analysis of costs and other impacts performed by the California Air Resources Board, and is extrapolated here to apply to Vermont and the expected impacts from the adoption of this suite of rules locally.

Affected parties

Costs and benefits to individuals: ACCII

The proposed regulation will benefit Vermonters mainly from the reductions in NOx resulting in reduced ozone exposure and reduced PM exposure from the secondary formation of NOx and PM2.5, improving Vermont air quality and reducing adverse health impacts. The reduction of GHG emissions, while being a global pollutant, will also benefit Vermont residents monetarily by reducing the future social costs of carbon emissions as discussed below.

The proposed ACCII regulation will reduce NOx, PM2.5, and GHG emissions. Reductions in NOx and PM2.5 emissions result in health benefits for individual Vermonters, including reduced instances of premature deaths, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits.

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[5] EPA – Health Effects of Ozone Pollution webpage: https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution

[6] EPA – Acid Rain webpage: https://www.epa.gov/acidrain

[7] EPA – Visibility and Regional Haze website: https://www.epa.gov/visibility

[8] EPA – Health and Environmental Effects of Particulate Matter (PM): https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm

[9] https://www.epa.gov/moves

[10] https://www.epa.gov/cobra

Using U.S. EPA's COBRA screening model, NESCAUM assisted Vermont in calculating the estimated economic value of the health benefits associated with the adoption of the proposed rules. Utilizing the COBRA model is generally consistent with EPA practice for estimating avoided health impacts and monetized benefits. The COBRA model estimates impacts to particulate matter (PM) air pollution concentrations, which are translated into health outcomes. Table 1 shows the estimated total cost savings from avoided premature deaths, avoided hospitalizations for cardiovascular and respiratory illnesses, and avoided emergency room visits due to a reduction in criteria pollutant emissions resulting from the proposed ACCII regulation for the year 2040 in Vermont, relative to the baseline. Note that this analysis does not include costs avoided due to reductions in GHG emissions. See below for a discussion of Social Cost of Carbon benefits resulting from GHG reductions associated with ACCII.

Proposed Regulations	**Valuation**	**Year**	**Total Costs Avoided**
ACC II	$2018	2040	**$276,000-621,000**

Table 1: Annual COBRA-estimated economic values of Vermont adopting ACCII, in US dollars for the year 2040. Total costs avoided are due to criteria pollutant emission reductions.

Notes:

1. COBRA version 4.0.
2. Discount rate of 3%.

The proposed ACCII regulations account for GHG benefits in terms of carbon dioxide (CO2) emissions avoided. The social cost of carbon (SC-CO2) is an estimate of the monetized value of long-term impacts (economic, health and environmental) from climate change as a result of a single metric ton increase in CO2 emissions in a given year. [11] For a discussion of the impacts of climate change, please refer to the Environmental Impact Statement starting on page 17. Estimates of the Social Cost of Carbon are calculated in four steps using specialized computer models: (1) Predict future emissions based on population, economic growth, and other factors, (2) Model future climate responses, such as temperature increase and sea level rise, (3) Assess the economic impact that these climate changes will have on agriculture, health, energy use, and other aspects of the economy, and (4) Convert future damages into their present-day value and add them up to determine total damages.[12]

This analysis utilizes the Vermont Climate Council recommended SC-CO2 values and discount rates, which is a method of placing a present value on costs or benefits that will occur at a future date, identified in the *Initial Vermont Climate Action Plan*.[13] Because the SC-CO2 is highly sensitive to the discount rates applied, the range of discount rates from 1% to 3% is used to illustrate the varying magnitude of possible economic outcomes, however, the Council determined it was reasonable to use the SC-CO2 value developed using the central discount rate of 2% for the Vermont Climate Action Plan.

[11] The National Academy of Sciences defines the Social Cost of Carbon as "an estimate, in dollars, of the present discounted value of the future damage caused by a metric ton increase in carbon dioxide (CO2) emissions into the atmosphere in that year or, equivalently, the benefits of reducing CO2 emissions by the same amount in that year."

[12] Resources for the Future, Social Cost of Carbon 101. https://www.rff.org/documents/2153/SCC_Explainer.pdf

[13] Vermont Climate Council, *Initial Vermont Climate Action Plan*, December 2021. https://climatechange.vermont.gov/sites/climatecouncilsandbox/files/2021-12/Initial%20Climate%20Action%20Plan%20-%20Final%20-%2012-1-21.pdf

Table 2 shows the estimated avoided social costs based on the GHG emissions reductions benefits from the proposed ACC II regulation from 2026 through 2050.

Table 2: 2026-2040 Statewide Estimated Avoided Social Cost of CO2 from ACCII vehicle rules

Year	3% Average Discount Rate		2% Average Discount Rate		1% Average Discount Rate	
	Value (2020$/metric ton CO_2)	Cost Avoided	Value (2020$/metric ton CO_2)	Cost Avoided	Value (2020$/metric ton CO_2)	Cost Avoided
2026	57	$1,120,057	131	$2,574,167	421	$8,272,704
2027	59	$3,143,369	132	$7,032,622	423	$22,536,355
2028	60	$5,859,615	134	$13,086,473	426	$41,603,266
2029	61	$9,107,725	136	$20,305,748	428	$63,903,383
2030	62	$13,103,796	137	$28,955,161	430	$90,881,164
2031	63	$18,104,944	139	$39,945,828	433	$124,435,566
2032	64	$23,756,056	141	$52,337,562	435	$161,466,946
2033	65	$30,003,907	142	$65,546,997	437	$201,718,574
2034	66	$37,055,282	144	$80,847,889	440	$247,035,215
2035	67	$44,637,440	146	$97,269,646	442	$294,473,859
2036	69	$53,215,702	147	$113,372,583	444	$342,431,474
2037	70	$60,891,694	149	$129,612,321	446	$387,967,081
2038	71	$68,280,353	151	$145,215,961	449	$431,801,103
2039	72	$75,327,513	152	$159,024,749	451	$471,843,169
2040	73	$81,995,546	154	$172,976,904	453	$508,821,673
TOTAL		$525,602,998		$1,128,104,609		$3,399,191,532

The proposed regulation will have an impact on individual vehicle owners in Vermont in the form of operation and ownership costs. These costs include the costs impacts of installing an electrical receptable for electric vehicles supply equipment (EVSE) for purchasers of ZEVs, fuel costs, difference in maintenance costs, registration costs, and insurance costs over a ten-year period. These costs are combined with the incremental vehicles prices to estimate the total cost of ownership (TCO) during the period of proposed regulation. An analysis[14] of the TCO for individual vehicle owners conducted by the California Air Resources Board concludes that operational savings will offset and incremental costs of the initial electric vehicle purchase. For example, a passenger car battery electric vehicle (BEV) with a 300-mile range will have initial annual savings occur in the first year for the 2026 model year technology. For the 2035 model year technology, the initial savings are nearly immediate and cumulative savings over ten years exceed $7,500. Cost trends differ for fuel-cell EVs (FCEVs) and plug-in hybrid EVs (PHEVs). Neither the FCEV nor PHEV technologies will have a payback within a ten-year period. As of the date of writing, the average price of a gallon of gasoline or diesel have reached record high levels in Vermont[15]. The TCO analysis conducted in California uses lower fuel prices that pre-date this price increase, therefore an updated analysis using today's average prices would show that the difference in TCO

[14] California Air Resources Board – Advanced Clean Cars II Initial Statement of Reasons, at Pg 144.
[15] See https://gasprices.aaa.com/?state=VT. As of June 15, 2022, the average price of a gallon of gasoline in Vermont was $5.05. The average price of a gallon of diesel was $6.14.

between a BEV and an ICEV is more beneficial for the BEV owner, with a likely sooner date for initial savings to occur.

	BEV (300-mile range)		FCEV	PHEV
	With home charger	No home charger		With home charger
Incremental vehicle price	$ 3,102	$ 3,102	$ 10,448	$ 4,681
Home Level 2 circuit (not including the charger)	$ 680			$ 680
Finance costs & sales tax (for incr veh price and Level 2 circuit)	$ 798	$ 655	$ 2,205	$ 1,131
Incremental Fuel costs	$ (5,068)	$ (3,306)	$ 8,670	$ (649)
Incremental Maintenance costs	$ (4,540)	$ (4,540)	$ (1,249)	$ (1,249)
Incremental Insurance	$ 631	$ 631	$ 2,124	$ 952
Incremental Registration	$ 758	$ 758	$ 952	$ 800
Total (10 years)	$ (4,267)	$ (3,216)	$ 21,416	$ 5,456
Initial annual savings	1 year	1 year	>10 years	>10 years

*Finance costs include a 5-year loan at 5-percent interest; operation and ownership costs over 10 years (~150,000 miles) shown as net present value for 2026 at a discount rate of 10-percent.

Figure 1: Total cost of ownership over 10 years for individual ZEV and PHEV buyer compared to baseline ICEV, 2026 MY passenger car in a single-family home.

Increasing access to ZEVs and clean mobility in low-income and frontline communities is of utmost importance. The proposed ACC II regulations will reduce exposure to vehicle pollution in communities that are often disproportionately impacted by motor vehicle pollution, such as near-roadway communities, by reducing emissions from ICEVs and accelerating the transition to ZEVs. Further, the proposed ZEV assurance measures will ensure these emissions benefits are long lasting and support the development of a robust used ZEV market. In addition, the ZEV regulation incentivizes automakers to invest in community carshare programs, produce more affordable ZEVs, and ensure that more used ZEVs are available. While the proposed ACC II regulations will advance equity, a whole-of-government approach is needed to maximize access, ensure affordability, and direct benefits to low-income and frontline communities. Thus, other policies and programs beyond ACC II will be needed in California and the Section 177 states to ensure these communities benefit from and have direct access to ZEVs.

Costs and Benefits to Individuals: ACT/Low NOx HD Omnibus/Phase 2

The proposed ACT regulation will reduce NOx, PM2.5, and GHG emissions, while the proposed HD Omnibus regulation will reduce NOx and secondary PM2.5 formation since NOx is a precursor to secondary PM2.5 formation. The proposed Phase 2 GHG regulations will require heavy duty trucks and trailers to reduce greenhouse gas emissions. Reductions in NOx and PM2.5 emissions result in health

benefits for Vermonters, including reduced instances of premature deaths, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits.

Using U.S. EPA's COBRA screening model, NESCAUM assisted Vermont in calculating the estimated economic value of the health benefits associated with the adoption of the proposed rules. Utilizing the COBRA model is generally consistent with EPA practice for estimating avoided health impacts and monetized benefits. The COBRA model estimates impacts to PM air pollution concentrations, which are translated into health outcomes. Table 3 shows the estimated total cost savings from avoided premature deaths, avoided hospitalizations for cardiovascular and respiratory illnesses, and avoided emergency room visits due to the reductions in criteria pollutant emissions associated with the proposed ACT, HD Omnibus, and Phase 2 GHG regulations for the year 2040 in Vermont, relative to the baseline. Table 4 shows the estimated total avoided costs from avoided premature deaths, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits due to the reductions in criteria pollutant emissions associated with the proposed ACT, HD Omnibus, and Phase 2 GHG regulations for 2025 through 2050 in Vermont, relative to the baseline.

Table 3: Annual COBRA-estimated economic values of Vermont adopting ACT/Omnibus/Phase 2 Rules, in US dollars for the year 2040. Total costs avoided are due to criteria pollutant emission reductions.

Proposed Regulations	**Valuation**	**Year**	**Total Costs Avoided**
ACT/Omnibus/Phase 2 Rules	$2018	2040	**$304,000-685,000**

Table 4: 2025-2050 Statewide estimated Cumulative Health Impacts from ACT, HD Omnibus, and Phase 2 GHG Rules, in US dollars. Total costs avoided are due to criteria pollutant emission reductions.

Proposed Regulations	**Valuation**	**Years**	**Total Cumulative Costs Avoided**
ACT/Omnibus/Phase 2 Rules	$2018 (millions)	2025-2050	**$11-24M**

Notes on COBRA modeling:

1. COBRA version 4.0.
2. Emissions baseline year, Phase II Source-Receptor (S-R) Matrix and adjustment factors, and incidence and health effect functions for 2023.
3. Vermont population projection for 2025-2050 utilized the 2017 U.S. Census Bureau National Population Projections as a baseline, which was adjusted at the state and county levels using the COBRA population inventory database.
4. Valuation functions were projected for 2025-2050 using a linear model based on the COBRA valuation inventory database.
5. Discount rate of 3%.

The proposed ACT and Phase 2 GHG regulations account for GHG benefits in terms of carbon dioxide (CO_2) emissions avoided. The social cost of carbon (SC-CO_2) is an estimate of the monetized value of long-term impacts (economic, health and environmental) from climate change as a result of a single

metric ton increase in CO2 emissions in a given year. [16] For a discussion of the impacts of climate change, see the Environmental Impact Analysis on page 17. Estimates of the Social Cost of Carbon are calculated in four steps using specialized computer models: (1) Predict future emissions based on population, economic growth, and other factors, (2) Model future climate responses, such as temperature increase and sea level rise, (3) Assess the economic impact that these climate changes will have on agriculture, health, energy use, and other aspects of the economy, and (4) Convert future damages into their present-day value and add them up to determine total damages.[17]

This analysis utilizes the Vermont Climate Council recommended SC-CO2 values and discount rates, which is a method of placing a present value on costs or benefits that will occur at a future date, identified in the *Initial Vermont Climate Action Plan.*[18] Because the SC-CO2 is highly sensitive to the discount rates applied, the range of discount rates from 1% to 3% is used to illustrate the varying magnitude of possible economic outcomes, however, the Council determined it was reasonable to use the SC-CO2 value developed using the central discount rate of 2% for the Vermont Climate Action Plan. Table 5 shows the estimated avoided social costs based on the GHG emissions reductions benefits from the proposed ACT and Phase 2 GHG standard regulations from 2025 through 2050.

[16] The National Academy of Sciences defines the Social Cost of Carbon as "an estimate, in dollars, of the present discounted value of the future damage caused by a metric ton increase in carbon dioxide (CO2) emissions into the atmosphere in that year or, equivalently, the benefits of reducing CO2 emissions by the same amount in that year."

[17] Resources for the Future, Social Cost of Carbon 101. https://www.rff.org/documents/2153/SCC_Explainer.pdf

[18] Vermont Climate Council, *Initial Vermont Climate Action Plan*, December 2021. https://climatechange.vermont.gov/sites/climatecouncilsandbox/files/2021-12/Initial%20Climate%20Action%20Plan%20-%20Final%20-%2012-1-21.pdf

Table 5: 2025-2050 Statewide Estimated Avoided Social Cost of CO_2 from Medium- and Heavy-duty vehicle rules

Year	3% Average Discount Rate		2% Average Discount Rate		1% Average Discount Rate	
	Value (2020$/metric ton CO_2)	Cost Avoided	Value (2020$/metric ton CO_2)	Cost Avoided	Value (2020$/metric ton CO_2)	Cost Avoided
2025	56	$491,268	129	$1,131,670	418	$3,666,962
2026	57	$903,723	131	$2,076,977	421	$6,674,865
2027	59	$1,353,279	132	$3,027,676	423	$9,702,324
2028	60	$1,801,145	134	$4,022,558	426	$12,788,131
2029	61	$2,263,175	136	$5,045,768	428	$15,879,329
2030	62	$2,739,370	137	$6,053,124	430	$18,998,856
2031	63	$3,629,188	139	$8,007,256	433	$24,943,465
2032	64	$4,545,851	141	$10,015,078	435	$30,897,582
2033	65	$5,489,360	142	$11,992,141	437	$36,905,390
2034	66	$6,459,715	144	$14,093,923	440	$43,064,764
2035	67	$7,456,915	146	$16,249,396	442	$49,193,377
2036	69	$8,800,151	147	$18,748,147	444	$56,627,056
2037	70	$10,064,572	149	$21,423,160	446	$64,125,699
2038	71	$11,361,475	151	$24,163,137	449	$71,849,329
2039	72	$12,690,861	152	$26,791,818	451	$79,494,143
2040	73	$14,052,729	154	$29,645,483	453	$87,203,922
2041	74	$15,262,572	156	$32,175,151	456	$94,050,443
2042	75	$16,499,910	158	$34,759,811	459	$100,979,450
2043	77	$17,998,491	160	$37,399,461	461	$107,757,198
2044	78	$19,304,568	162	$40,094,103	464	$114,837,432
2045	79	$20,638,141	164	$42,843,737	467	$122,000,152
2046	80	$21,761,337	166	$45,154,773	469	$127,575,836
2047	81	$22,906,081	167	$47,226,117	471	$133,194,617
2048	82	$24,072,374	169	$49,612,575	472	$138,562,931
2049	84	$25,564,555	170	$51,737,790	474	$144,257,133
2050	85	$26,784,720	172	$54,199,669	476	$149,994,433
TOTAL	**$304,895,525**			**$637,690,498**		**$1,845,224,820**

The ACT and HD Omnibus regulations impose requirements on vehicle manufacturers to produce and sell vehicles that may have higher upfront costs. These costs are expected to be passed on to Vermont vehicle fleets and individuals who purchase these vehicles, resulting in indirect impacts to those entities and individuals. The Phase 2 GHG regulation imposes requirements on medium- and heavy-duty engines, vehicles, and trailer manufacturers, which results in increased compliance costs that are also expected to be passed on to Vermont vehicle fleets and individuals who purchase these vehicles and trailers. While there are no direct costs to individuals as a result of these regulations, the positive and

negative indirect impacts to small businesses, which may impact individuals that own fleets or a single medium or heavy-duty vehicle, are discussed below.

For the ACT rule, individuals may see health benefits due to ZEVs displacing ICE vehicles and providing statewide, regional, and local emission benefits. Individuals are also likely to benefit from cost savings as a result of reduced fuel consumption and fuel costs. Cost savings are also likely due to the enhanced warranty requirements of ACT and the HD Omnibus Rules. These warranty provisions should result in longer useful life of the subject vehicles, and broader coverage of warranty-repairs within the subject vehicle's warranty period.

Costs and benefits to businesses, including small businesses: ACCII

Businesses that will be directly affected by the proposed regulation include light- and medium-duty vehicle manufacturers because they are entities directly regulated and required to comply. ZEV-only manufacturers are likely to directly benefit from the regulation because they do not manufacture ICEV and will be able to over comply and sell surplus credits to other manufacturers. Auto manufacturing is currently not occurring in Vermont. Businesses that may be indirectly affected, and likely exist in Vermont, are suppliers of Tier 1 components supplied directly to auto manufacturers, electric vehicle service providers, electric utilities, electric charging and hydrogen infrastructure providers.

Suppliers of Tier 1 components would benefit from increased opportunities created by the need to develop, sell, and support technology to decrease emissions from ICEVs. Many of these companies are also changing their business models to include components for vehicle electrification, as demand for conventional vehicle components declines.

The proposed regulation will increase the total amount of electric vehicle miles traveled in the state, and the charging of those electric vehicles will increase Vermont's overall electric load. Electric infrastructure needed to charge BEVs and PHEVs represents a significant area of expected increased load for electric utility companies, as traditional areas of growth have slowed due to energy conservation and energy efficiency efforts. Understanding the grid impacts of the additional load expected from electrification of the transportation system is an important consideration. The 2022 Vermont Comprehensive Energy Plan (CEP)[19] sets the goal of building a secure and affordable grid that can efficiently integrate, use, and optimize high penetrations of distributed energy resources to enhance resilience and reduce greenhouse gas emissions. The Plan further discusses the need for any grid investments that are in line with this goal to be evaluated, from the perspectives of the individual, the ratepayers collectively, and society more broadly, for cost-effectiveness. Understanding what is required to achieve this goal is foundational to the CEP, and will aid in Vermont transitioning away from GHG emitting technologies and towards electrification in a way that provides additional benefits to Vermonters. The Vermont-wide transmission operator (VELCO) releases a Long-Range Transmission Plan[20] every three years that incorporates various scenarios of building and transportation electrification with a requirement of the plan to meet mandatory reliability standards. This plan will help to better understand and implement any necessary grid modifications related to this increase in number of electric vehicles[21]. VELCO's 2021

[19] Vermont Comprehensive Energy Plan, Pg. 60, available at https://publicservice.vermont.gov/content/2022-comprehensive-energy-plan

[20] https://www.velco.com/assets/documents/2021%20VLRTP%20to%20PUC_FINAL.pdf

[21] Vermont Comprehensive Energy Plan, Pg. 65, available at https://publicservice.vermont.gov/content/2022-comprehensive-energy-plan

Plan finds that the transmission system has sufficient capacity to serve expected future demand for the first ten years of the 20-year planning horizon, but that load management is necessary to serve high electrification loads consistent with Vermont's total energy goals in the twenty-year planning horizon.

In addition to the electric utilities that will supply additional electricity to power BEVs and PHEVs under the proposed regulation, ZEV infrastructure businesses will benefit as well. This includes companies that manufacturer, install, operate, and maintain EV charging stations and hydrogen dispensing equipment. Electric Vehicle Supply Equipment (EVSE) providers, and hydrogen station operators will all benefit from increased demand for their equipment with home and public fueling stations. The Proposed Regulation will increase the total amount of electric vehicle miles travelled in the state, which in turn will likely increase utilization of charging and hydrogen stations across the state and lead to increased revenue for these businesses, making the business model for their investment more stable and predictable. This allows investor capital and venture capital funds to be accessed for increased deployment rates of ZEV infrastructure. Increased use of public charging stations may also have benefits to retail businesses operating or close to charging stations. Many charging stations are located in areas with available shopping, food, or other services such as dry cleaning. Additionally, Vermont businesses that are contracted to install stations will benefit from the rapidly growing network.

Typical passenger car rental businesses could see increasing incremental purchase costs for vehicles over the course of the regulation as stringency increases. At the same time, rental firms would benefit from operational savings due to the reduction in repair and maintenance costs. There may also be an increased cost for electricity depending on whether the rental business or the driver ends up bearing the costs of vehicle charging, though reduced gasoline usage leads to net fuel savings in nearly all cases.

ZEVs inherently have far fewer propulsion-related parts especially mechanical moving parts as electric motors and power electronics dominate the electric drive propulsion system instead of mechanical internal combustion engines and automatic transmissions comprised of mechanical components like valves, springs, and gears. As a result, it is expected that individual ZEVs will likely need fewer propulsion-related repairs than gasoline vehicles. While this will be a benefit to individual vehicle owners, the vehicle repair and maintenance service industry is estimated to see negative impacts, including dealerships that have service departments, as ZEVs become a greater portion of the fleet. This trend would suggest that the number of businesses providing the services may decrease along with the reduced demand.

Vehicle dealerships wishing to be certified for sales and service of zero emission vehicles may face costs imposed by their manufacturers for training and equipment but there is no requirement that every dealer be qualified to sell such vehicles, and this will end up being a business decision between dealers and manufacturers. Dealers may also incur costs associated with installing electric vehicle charging infrastructure.

The Proposed Regulation would provide operational savings to small businesses and small fleet owners, although the Proposed Regulation could increase initial vehicle prices and incremental costs on small fleet owners in the early years of the regulation. The proposed ZEV assurance measures would help owners of small fleets by eliminating or greatly limiting subsequent out-of-pocket costs for vehicle repairs during the time the vehicle is under warranty. In addition, the enhanced useful life and warranty reporting and battery warranty provisions would encourage manufacturers to produce more durable components, resulting in fewer failures and less downtime for the small fleet owner. Small businesses

would also benefit from the operational and fuel savings discussed above in (3)(a)(i). In an example analysis conducted by CARB[22], a cost example (Figure 2) for a small business that purchases a typical full-size light truck for business use is considered and the total cost of ownership analyzed over time. This result shows that the business owner breaks even at year six as annual savings accumulate sufficient to compensate for expenses. By the tenth year, the owner has saved nearly $5,500 in total ownership costs.

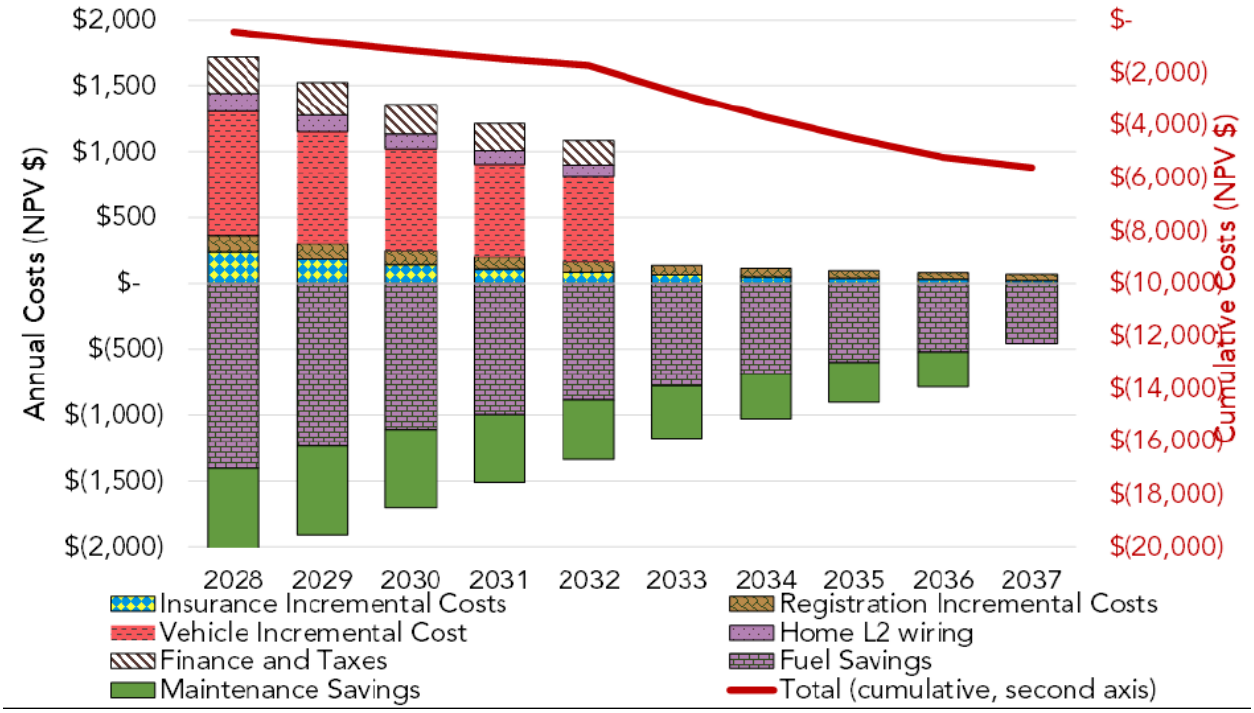

Figure 2: Small business light-duty fleet total ownership cost example.

Costs and benefits to businesses, including small businesses: ACT/Low NOx HD Omnibus/Phase 2 *Advanced Clean Trucks*

Manufacturers sell trucks to trucking fleets who operate the vehicles and incur costs following the point of sale including taxes, fueling, maintenance, midlife costs, and registration fees. Adding electric trucks to their fleet will also cause fleets to incur costs relating to EVSE, infrastructure, maintenance bay upgrades, workforce training, and other transitional costs.

The proposed ACT Regulation is likely to increase the supply of ZEVs and will provide another vehicle option for fleets to consider in meeting their needs. Individual businesses that have operations that are well suited for using ZEVs will likely be able to lower their total cost of ownership by taking advantage of the operational cost savings of battery-electric vehicles. Reduced costs to the overall state's trucking fleet are forecast as the operational cost savings of the ZEVs likely outweigh the potential infrastructure and vehicle prices. Amortizing the vehicle and infrastructure investments will help with these companies' cash-flow to realize positive cash-flow shortly after purchase.

[22] Standardized Regulatory Impact Assessment for Advanced Clean Cars II, CARB, at page 102. Available at: https://dof.ca.gov/wp-content/uploads/Forecasting/Economics/Documents/ACCII-SRIA.pdf.

Figure 3 illustrates an example where a reference fleet purchases 20 Class 4-5 trucks in 2024 for usage in last mile delivery applications over twelve years.[23] The costs for 20 diesel vehicles, 20 battery-electric vehicles and the difference between them is shown. The costs over the twelve-year period are lower for the battery-electric fleet as compared to the diesel fleet; however, the upfront capital expenses are significantly higher for the BEV fleet. Access to capital or financing will be critical for fleets to take advantage of the overall savings of BEVs.

Cost line items	**Diesel**	**Battery-Electric**	**Difference**
Amortized Vehicle Price	$ 1,270,361.00	$ 1,747,840.00	$ 477,479.00
Sales Tax	$ 93,280.00	$ 135,896.00	$ 42,616.00
Amotized EVSE Cost	$ -	$ 104,315.00	$ 104,315.00
Amotized Infrastructure Upgrades	$ -	$ 417,261.00	$ 417,261.00
Charger Maintenance	$ -	$ 120,000.00	$ 120,000.00
Fuel Costs	$ 2,220,329.00	$ 947,961.00	$ (1,272,368.00)
Maintenance costs	$ 1,914,913.00	$ 1,436,185.00	$ (478,728.00)
Midlife Costs	$ -	$ 259,200.00	$ 259,200.00
Maintenance Bay Upgrades	$ -	$ 20,000.00	$ 20,000.00
Transitional Costs and Workforce development	$ -	$ 12,564.00	$ 12,564.00
Registration Fees	$ 245,823.00	$ 232,840.00	$ (12,983.00)
Total	**$ 5,744,706.00**	**$ 5,434,062.00**	**$ (310,644.00)**

Figure 3: Example of Advanced Clean Trucks Fleet Cost over a 12-year period.

The proposed ACT Regulation will increase the number of ZEVs deployed, which will in turn increase the amount of electricity supplied by utility providers. Increased electricity usage from ZEVs provides an opportunity for a number of benefits to the utilities, their customers, and the overall grid itself. Electric vehicles are capable of shifting load to off-peak periods, stabilizing voltage frequency, and potentially reducing the use of temporary frequency regulation through emergency generators, while also increasing overall demand, creating a more efficient, highly utilized grid with storage potential. Studies have found that light-duty ZEVs provide a benefit to all utility customers as their electricity utilization drives down rates for all other ratepayers[24].

There is no expected direct cost on small businesses, defined as businesses having 3 or fewer medium- and heavy-duty vehicles, under the ACT Regulation. No manufacturers or fleets who are regulated under this rule are considered to be small businesses. Small businesses who operate trucks will not be required to purchase zero-emission trucks but may independently decide to do so. This may enable cost savings for small businesses due to electric trucks' lower cost of operation.

Vehicle dealerships wishing to be certified for sales and service of zero emission vehicles may face costs imposed by their manufacturers for training and equipment but there is no requirement that every

[23] California Air Resources Board – Advanced Clean Trucks Initial Statement of Reasons, at Pg IX-33.
[24] M.J. Bradley and Associates, MJB&A Analyzes State-Wide Costs and Benefits of Plug-in Vehicles in Five Northeast and Mid-Atlantic States, 2017. (https://www.mjbradley.com/reports/mjba-analyzes-state-wide-costs-and-benefits-plug-vehicles-five-northeast-and-mid-atlantic).

dealer be qualified to sell such vehicles, and this will end up being a business decision between dealers and manufacturers.

HD Omnibus/Phase 2

Medium- and heavy-duty engine/vehicle manufacturers are the regulated entities under the HD Omnibus Rule. Because these manufacturers are located outside of Vermont, ANR assumes those manufacturers would pass the direct compliance costs onto the Vermont vehicle fleets that purchase the California-certified vehicles and engines that are subject to the HD Omnibus Rule. Typical businesses are defined here to be Vermont fleets with four or more medium- and heavy-duty vehicles (GVWR >10,000 pounds). The actual cost impact on fleets would depend on the number of new California-certified heavy-duty vehicles that fleets would purchase during the lifetime of this cost analysis. A lifetime analysis including initial purchase price increase, lifetime Diesel Exhaust Fluid (DEF) consumption for NOx control, lifetime savings from warranty, net lifetime cost impact, and percent increase in lifetime cost from the assumed purchase price is presented in Figure 4[25].

Engine MY	Lifetime Net Cost Per Vehicle	Lifetime Net Cost of 20 Vehicles
2024	$2,839	$56,780
2027	$5,317	$106,340
2031	$5,814	$116,280

Figure 4: Lifetime Cost Analysis of 20 Medium Heavy-Duty Diesel Trucks

Similar to typical fleets, the actual cost impact on smaller businesses and their fleets would depend on the number of new California-certified heavy-duty vehicles that fleets would purchase during the lifetime of this cost analysis. As shown in Figure 4 above, for a small fleet that would buy one new medium heavy-duty diesel (MHDD) vehicle with a 2024, 2027, or 2031 MY engine, the net lifetime vehicle cost due to the HD Omnibus is estimated to be $2,839, $5,317, or $5,814, respectively.

The HD Omnibus Rule impacts new vehicle dealerships by requiring that new on road heavy-duty engines and vehicles for sale in Vermont meet California emissions standards. By aligning Vermont's requirements with other states in the region (Massachusetts and New York), dealerships will benefit from the ability to continue to trade vehicles with dealers in those states.

Costs and benefits to schools and school districts: ACCII

ACCII does not provide for the direct regulation of schools or school districts. To the extent schools or school districts have passenger cars and light duty trucks as part of their school transportation fleet, these entities should experience the same net benefit as described above when considering the total cost of ownership of a BEV when replacing an ICEV.

[25] California Air Resources Board – HD Omnibus Initial Statement of Reasons, at Pg. IX-52.

Costs and benefits to schools and school districts: ACT/Low NOx HD Omnibus/Phase 2

ACT, the HD Omnibus, and the Phase 2 rules do not provide for the direct regulation of schools and school districts. As most school districts have heavy-duty buses in their fleet, these entities are likely to experience the same cost savings and net lifetime vehicle cost as explained above in the discussion on the impact of these rules on medium- and heavy-duty fleets. Early adoption of school bus electrification has been identified as critical in reduction of children's exposure to criteria pollutants emitted by traditional fossil-fueled school buses. Several state and federal incentive programs for school bus replacement are currently available and are likely to be expanded in the future. Vermont has been a leader in investigating the feasibility of electric school buses in operation in a cold climate and rural setting via our on-going Electric School and Transit Bus Pilot project.

Alternatives to rule as proposed

As discussed above, the only alternative that ANR considered is to not amend Advanced Clean Cars or adopt Advanced Clean Trucks, the Low NOx HD Omnibus, or the Phase 2 Greenhouse Gas rules. Pursuant to Section 177 of the Clean Air Act, Vermont's adoption of California's motor vehicle emission standards must be identical to California's rules. Therefore, if Vermont does not adopt or amend these rules, this will result in a reversion to the federal motor vehicle emission standards, which are less stringent and would represent significant regulatory backsliding. It would also stall or stifle the progress Vermont has made in reducing criteria pollutant emissions and greenhouse gas emissions as a result of implementation of these rules. All of the benefits articulated in this document, including public health benefits shown via the COBRA model results (see Pages 4 and 8), the emission reduction benefits shown in the Environmental Impact Analysis (see Pages 19-20), and the avoided costs associated with climate change shown via the Social Cost of Carbon analysis (see Pages 6 and 10) would potentially be lost if Vermont chose not to adopt the rule amendments proposed. Also, states that do not participate in Advanced Clean Cars are less likely to receive cleaner and electric vehicles from auto manufacturers, so Vermonters would also have reduced access to these types of vehicles.

Environmental Impact Statement Supplemental Information

Impact on Climate change and Air Quality

The *Initial Vermont Climate Action Plan* released in December 2021 includes a section devoted to understanding climate and climate change in Vermont. The key messages from the Climate Action Plan include the following:

- Across Vermont, the 11-year period of 2010-2020 was the warmest since records began in 1895, with the warmest winter and summer seasons occurring in the 2000-2020 period.
- Vermont's average annual temperature has increased over 2.5°F from the 1970s [1960s] to 2010s and over 3°F from the end of the last century.
- The rate of warming has increased through the last 120 years and is currently around +0.5°F a decade.
- Warming is having a number of notable effects, such as the lengthening of the growing season, less reliable winter snow cover, and shifting peak energy usage to the summertime.
- Seasonal temperature trends show the winter season warming nearly twice as fast [over 1.5 times faster] as the annual average, increasing over 4°F from the 1960s to the 2010s.
- Other observed seasonal shifts include an expanding warm season causing longer falls and winter to have more false starts, and more temperature fluctuation within seasons.
- Backward or false springs (during which snow and freezing rain can occur in April-June after the normal progression of warming temperatures) continue to be observed, even with the observation that freeze-free seasons are longer.
- As Vermont's climate warms there has been an observable shift in temperature extremes. Heat waves are becoming more likely while cold waves are decreasing. Evidence for this from Burlington shows a steady decline in cold waves peaking around nearly 6 per year in the 1970s to less than 2 per year in the 2010s. Heat waves have generally increased from around 3 to 4 per year in the 1960s/1970s to over 7 per year in the 2010s.
- Since the mid-2000s, a below average number of very cold nights (defined as nighttime temperatures of 0°F or less) have also been observed in winter, with a near to above average annual number of warm nights in the 2000-2020 period.
- As Vermont's climate warms, the overall amount of precipitation is also increasing. Warmer temperatures produce increased evaporation of water vapor from nearby bodies of water, resulting in a greater potential for weather systems to produce higher amounts of precipitation. In general, increases in annual precipitation changes are relatively small, on the order of +0.5" to +1.0" a decade, with the greatest increases in precipitation occurring during the winter season.
- Extreme precipitation (defined as greater than 2" over 24 hours) has also trended above the long-term average since 1995. These trends are reflected in the increases in stormflow between 1950-2006 as well as the increasing magnitudes of the 1% (100-year return interval) storms across timescales from 1 hour to 1 day.
- The Vermont Department of Health has documented the combined influence of warmer winters and longer warm seasons as contributing to both a more hospitable environment for blacklegged ticks, as well as their hosts, white-footed mice. There has been an exponential increase in probable Lyme disease cases between 1990 and 2016, with Vermont

and Maine being the states with the highest increases in actual reported case rates since 1991

Cause

The Intergovernmental Panel on Climate Change (IPCC) released "AR6 Climate Change 2021: The Physical Basis"[26] as part of the Sixth Assessment Report (AR6) process. This report states that human influence on the climate system is now an established fact. "It is unequivocal that the increase of CO_2, methane (CH_4) and nitrous oxide (N_2O) in the atmosphere over the industrial era is the result of human activities and that human influence is the principal driver of many changes observed across the atmosphere, ocean, cryosphere and biosphere."

Greenhouse gas emissions from motor vehicles in Vermont

Motor vehicles and other mobile sources in Vermont are the largest source of a number of air pollutants in the state. These pollutants include, but are not limited to, nitrogen oxides (NOx) and volatile organic compounds (VOCs), which are precursors to ground level ozone formation (smog), carbon monoxide (CO), particulate matter (specifically $PM_{2.5}$), and greenhouse gases (GHGs). For information on the impacts of criteria pollutant emissions in Vermont, please refer to the discussion above in the Economic Impact Statement Supplemental Information. Impacts of greenhouse gas emissions are also explained above. Greenhouse gas emissions from mobile sources make up approximately 40% of Vermont's total GHG emissions profile, or 3.43 million metric tons of CO_2 equivalent (CO_2e) in 2018, with light-duty vehicles accounting for over 70% of that total and the heavy-duty fleet contributing approximately 12%[27].

Although Vermont is a relatively small state it has one of the highest rates of GHG emissions per capita in the Northeast driven by high per capita vehicle miles traveled[28]. In order to meet the mandatory GHG reductions set forth in the Vermont Global Warming Solutions Act of 2020 dramatic emissions reductions from the transportation sector, and especially from light and medium duty on-road vehicles, will be required. Reductions from the sector can be achieved through multiple strategies, but reducing criteria pollutant and greenhouse gas emissions via electrification of the vehicle fleet plays a critical role due to the general rural nature and non-centralized development patterns in the state.

GHG and Criteria pollutant emission reductions

ACCII

To understand the impact these regulations could have on passenger car and light-duty truck emissions in Vermont, Vermont partnered with NESCAUM and the International Council on Clean Transportation (ICCT) who commissioned Sonoma Technology, Inc. (STI) to estimate the cumulative avoided nitrogen

[26] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

[27] Vermont DEC, 2021: Vermont Greenhouse Gas Emissions Inventory and Forecast 1990 – 2017: https://dec.vermont.gov/sites/dec/files/aqc/climate-change/documents/_Vermont_Greenhouse_Gas_Emissions_Inventory_Update_1990-2017_Final.pdf

[28] Energy Action Network (EAN), 2020: 2019 Annual Progress Report for Vermont: https://www.eanvt.org/wp-content/uploads/2020/03/EAN-report-2020-final.pdf

oxides (NOx), fine particulate matter (PM2.5) and carbon dioxide equivalent (CO2e) emission reductions beginning in 2025 from the Advanced Clean Cars II Rule.

Table 6, below, estimates the cumulative emission reduction benefits of the zero-emission vehicles first sold in Vermont over various time periods. Since the current ACCII proposal requires 100% ZEV sales by 2035, emissions benefits are only modeled until 2040. Additional modeling to project emissions benefits further to 2050 could be conducted in the future.

Table 6: Cumulative Avoided Emissions of GHG, NOx and PM from ACCII Rule

Avoided Passenger car and light-duty truck emissions, 2025-2030			
	NOx (short tons)	PM2.5 (short tons)	CO2e (million metric tonnes)
ACCII	(51)	(5)	(0.53)
Avoided Passenger car and light-duty truck emissions, 2025-2035			
	NOx (short tons)	PM2.5 (short tons)	CO2e (million metric tonnes)
ACCII	(236)	(25)	(2.89)
Avoided Passenger car and light-duty truck emissions, 2025-2040			
	NOx (short tons)	PM2.5 (short tons)	CO2e (million metric tonnes)
ACCII	**(655)**	**(64)**	**(7.69)**

ACT/ Low NOx HD Omnibus / Phase 2

To understand the impact these regulations could have on medium- and heavy-duty vehicle emissions in Vermont, Vermont partnered with NESCAUM and the International Council on Clean Transportation (ICCT) who commissioned Sonoma Technology, Inc. (STI) to estimate the cumulative avoided nitrogen oxides (NOx), fine particulate matter (PM2.5) and carbon dioxide equivalent (CO2e) emission reductions beginning in 2025 from Advanced Clean Trucks, the HD Omnibus Rule, and the Phase 2 GHG Rule.

Table 7[29], below, estimates the emission reduction benefits of the zero-emission vehicles first sold in Vermont, whether or not the vehicle remains registered in Vermont through the end of its life. All sales that comply with ACT requirements are credited to the ACT, regardless of whether those zero-emission vehicles would have been sold without such regulation.

Table 7: Avoided Emissions of GHG, NOx and PM from ACT, HD Omnibus, and Phase 2 GHG Rules

Avoided Medium- and Heavy-Duty Emissions, 2020-2040			
	NOx (short tons)	PM2.5 (short tons)	CO2e (million metric tonnes)
ACT	(1,820)	(16)	(1.22)
HD Omnibus[30]	(1,710)	-	-
Phase 2 GHG Stds	-	-	(0.22)
Full Harmonization	(3,010)	(16)	(1.41)
Avoided Medium- and Heavy-Duty Emissions, 2020-2050			

[29] The ICCT and STI - Benefits of adopting California medium- and heavy-duty vehicle regulations under Clean Air Act Section 177 (https://theicct.org/publication/state-level-hdv-emissions-reg-fs-dec21/)

[30] Only NOx emissions benefits were quantified for this program. This is because technologies that reduce NOx (e.g., an improved selective catalytic reduction [SCR] catalyst) are expected to have minimal impact on particulate matter (PM) and greenhouse gas (GHG) emissions.

	NOx (short tons)	PM2.5 (short tons)	CO2e (million metric tonnes)
ACT	(5,590)	(44)	(3.77)
HD Omnibus	(4,330)	-	-
Phase 2 GHG Stds	-	-	(0.41)
Full Harmonization	**(8,190)**	**(44)**	**(4.07)**

Emissions reductions in the context of the requirements of 10 V.S.A. §578

The GWSA requires that Vermont reduce greenhouse gas emissions by 26% by 2025, compared to the 2005 baseline emissions, 40% by 2030, compared to the 1990 baseline, and 80% by 2050, compared to the 1990 baseline. The suite of proposed rules does not take effect until 2026, so emissions reductions from these rules have been evaluated in the context of the 2030 emissions reduction requirement. While the GWSA does not mandate a specific level of emission reductions for the transportation sector alone, it does require that the Climate Council consider each sector's proportional contributions to GHG emissions in Vermont when making decisions about actions and strategies to adopt in the Climate Action Plan and its amendments. Based on the sector proportionality analysis conducted by the Vermont Climate Council in the *Initial Climate Action Plan*, Vermont would need to reduce its transportation GHG emissions to 2.06 MMTCO2e by 2030. Assuming that transportation emissions from 2021, preliminarily estimated to be 2.93 MMTCO2e, will represent Vermont's baseline transportation emissions in 2030, Vermont would need to reduce transportation GHG emissions by 0.87 MMTCO2e by 2030 to meet the sector's proportional reduction target. ANR maintains 2021 emissions data as the 2030 baseline emissions due to a high level of uncertainty in emissions trends following the COVID-19 pandemic and a variety of factors including but not limited to increased auto-manufacturer EV commitments, record fuel prices, manufacturer supply chain issues, and expected increases in VMT. As depicted in Figure 5 below, emissions reductions from the proposed suite of rules are estimated to be 0.23 MMTCO2e in 2030, leaving a "gap" of 0.64 MMTCO2e in the transportation sector for 2030 emissions reductions. It is important to note that the anticipated reductions shown here assume that the vehicles that manufacturers are required to deliver to Vermont are all registered and operated (placed in service) in Vermont. Complimentary policies, such as vehicle purchase incentives and EV charging infrastructure deployment, will be necessary to ensure that vehicles required to be delivered in Vermont are placed in service in Vermont. Otherwise, the emissions reductions discussed here will not be realized via the regulatory requirements of this suite of rules.

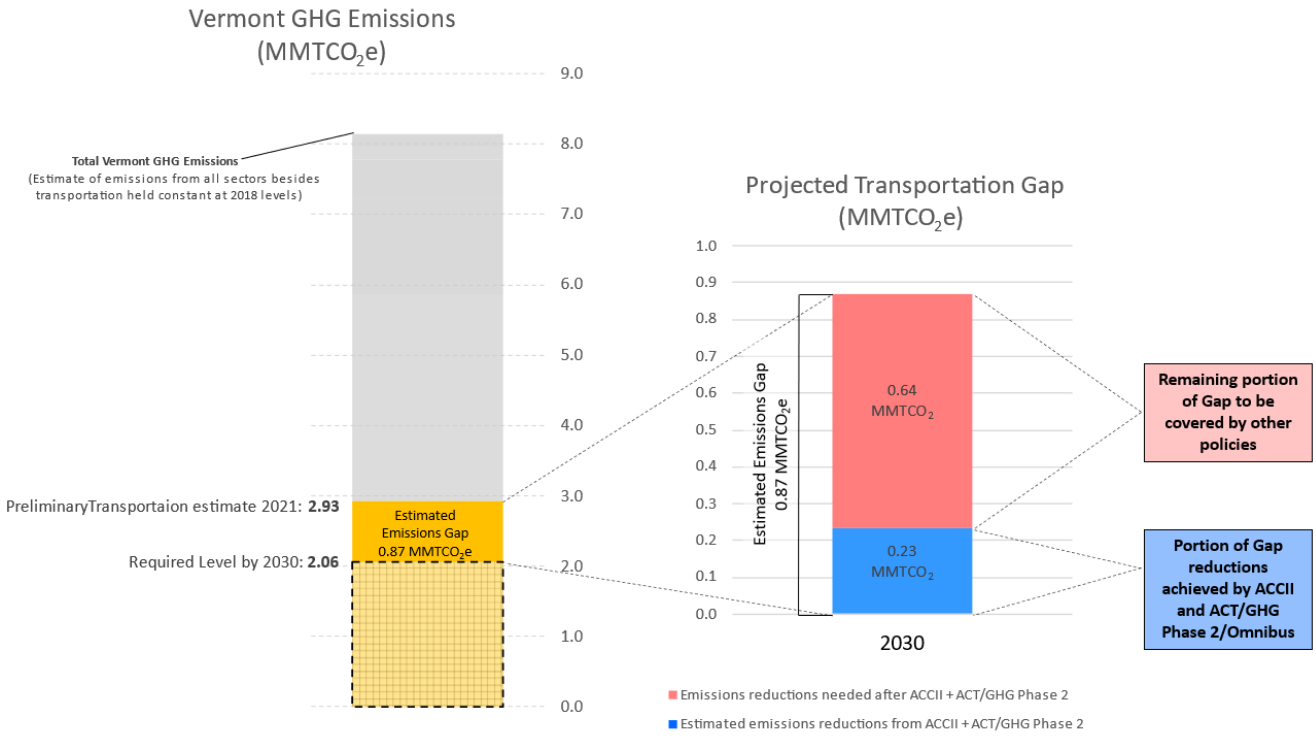

Figure 5: Estimation of ACCII, ACT, and Phase 2 Rules' Impact on Emissions in the Transportation Sector in 2030

Impacts on water quality

Increasing temperatures pose economic effects due to water contamination impacts and those related to heat waves. In terms of the former, beach closures in Vermont are the result of a combination of increased water temperatures and increased nutrient loads. There is no dollar estimate that specifically informs the climate change component, but Vermont spends tens of millions of dollars each year to address water quality contaminants in our large lakes.[31] Reductions of emissions from motor vehicles will help to mitigate the impacts of climate change, and therefore will have positive impacts to water quality in Vermont.

Impacts on forest and agricultural land use and recreation

Climate change has impacted the duration and frequency of several natural hazards that impact land use and recreation in Vermont. These include severe storms, winter storms, drought, flooding, wildfires, air pollution, ground-level ozone, temperature extremes, localized winds, and biotic elements (insects and disease)[32]. While mitigation of air contaminants from motor vehicles, including greenhouse gases will help to mitigate the impacts of climate change, implementation of adaptation and resilience strategies will also be a critical component of addressing climate change in Vermont.

[31] Initial Vermont Climate Action Plan, 2021, Page 29.
[32] Initial Vermont Climate Action Plan, 2021, Page 18.

Other Impacts

As indicated in California's Initial Statement of Reasons,[33] the proposed standardized battery labeling requirements included in ACCII are anticipated to support battery recycling and reuse, helping to reduce the need for additional mining to supply critical energy materials for ZEV batteries in the amounts needed to displace ICEVs. Moreover, traction batteries are contained in many different types of vehicles, contain unique chemistries and hazardous materials, and may present a liability at the end of life. Proper labeling thus assists with safe handling and disposal. Besides assuring owners that ZEV batteries will function as intended and not become liabilities, the labeling requirements will promote secondary uses and reduce disposal costs by providing reliable, complete information about the physical characteristics of the batteries. This will reduce lifecycle costs for ZEVs, assuring they are cost effective, and thus making it more likely they will be cost-competitive with conventional vehicles and will reduce emissions as intended.

[33] California Air Resources Board – Advanced Clean Cars II Initial Statement of Reasons, at Pg 85.

Scientific Information Statement Supplemental Information

List of material incorporated by reference (IBR)

Proposed Rule Record, available at: https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii

Title 13 California Code of Regulations available at: https://govt.westlaw.com/calregs/Index?transitionType=Default&contextData=%28sc.Default%29

Title 17 California Code of Regulations available at: https://govt.westlaw.com/calregs/Index?transitionType=Default&contextData=%28sc.Default%29

Summary of record and documentation developed by CARB

Initial Statements of Reason and Standardized Regulatory Impact Assessments

Advanced Clean Cars II, available at: https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/isor.pdf

Advanced Clean Trucks, available at: https://ww3.arb.ca.gov/regact/2019/act2019/isor.pdf

Low NOx HD Omnibus, available at: https://ww3.arb.ca.gov/regact/2020/hdomnibuslownox/isor.pdf

Phase 2 GHG Rules, available at: https://www.arb.ca.gov/regact/2018/phase2/isor.pdf

Other materials cited in Supporting Documents

The ICCT and STI - Benefits of adopting California medium- and heavy-duty vehicle regulations under Clean Air Act Section 177, December 2021, available at https://theicct.org/publication/state-level-hdv-emissions-reg-fs-dec21/

The ICCT and STI – Benefits of adopting California Advanced Clean Cars II regulations in Vermont, June 2022, available upon request from the Agency of Natural Resources