Conservation
Law Foundation

For a thriving New England

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Maine Board of Environmental Protection
Maine Department of Environmental Protection
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Subject: Proposed Chapter 128: Advanced Clean Trucks Program
Comments of Conservation Law Foundation

Dear Chair Lessard and Members of the Board of Environmental Protection:

Conservation Law Foundation (CLF)[1] thanks the Board of Environmental Protection ("Board") and the Department of Environmental Protection ("Department") for the opportunity to provide comments on the proposed Chapter 128, Advanced Clean Trucks Program. CLF strongly supports adoption of the proposed rule, which incorporates by reference California's Advanced Clean Trucks (ACT) regulation and would accelerate sales of zero-emission medium- and heavy-duty vehicles (MHDVs) in Maine.

To comply with the state's mandatory decarbonization targets, the Department must act urgently to reduce greenhouse gas emissions from the transportation sector, including MHDVs. Replacing fossil-fuel powered trucks with zero-emission varieties is necessary, and the ACT is the state's best path to do so. Fortunately, the ACT will do far more for Mainers than help meet the increasingly unignorable climate catastrophe: it will also improve health outcomes, reduce pollution in areas overburdened by diesel exhaust, and support the economy.

Maine is ready for this regulation. Although many have argued that the rule is premature, the ACT would gradually ensure that greater percentages of new zero-emission (including plug-in hybrid) MHDVs are made available in Maine, while significant portions of new MHDVs (never mind used) would continue to run on fossil fuels. We urge the Board and Department to adopt the ACT in 2023.

[1] Founded in 1966, CLF is a nonprofit, member-supported, regional environmental organization, working to conserve natural resources, protect public health, and promote thriving communities in New England. CLF protects New England's environment for the benefit of all people. We use the law, science, and markets to create solutions that preserve our natural resources, build healthy communities, and sustain a vibrant economy. CLF protects and promotes the interests of its 6,000 members, including more than 400 members in Maine.

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I. Maine Law Demands Adoption of the Advanced Clean Trucks Program this Year

A. Climate Change Is Here

Driven by increased human contributions to greenhouse gas (GHG) emissions, our environment is already experiencing the widespread effects of climate change—shrinking glaciers and ice sheets, shifting plant and animal geographic ranges, and extreme droughts, wildfires and rainfall plaguing communities worldwide.[2] In a new study published June 2023, scientists have found that even under a low-GHG-emissions scenario, Arctic summers could be ice-free in less than a decade.[3]

But given humans' role in causing the harmful effects of climate change, we can also act to avoid the most severe impacts. There is a linear relationship between the amount of CO_2 emissions and the increase in global surface temperature, so that every ton of CO_2 released into the atmosphere will worsen climate change.[4] It follows that every ton of CO_2 *not* released will lessen the impacts, so reducing emissions in the near term is imperative.[5]

The Intergovernmental Panel on Climate Change's recent report emphasized that "the extent to which current and future generations will experience a hotter and different world depends on choices now and in the near-term."[6] Maine is already experiencing the impacts of climate change. The University of Maine has warned that our state's "annual temperature has increased 3.2ºF in the last 124 years…[and] the six warmest years on record have occurred since 1998."[7] Now more than ever, it is crucial that Maine act to mitigate worsening impacts, including by reducing transportation emissions by electrification.

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[2] NASA, Global Climate Change, Vital Signs of the Planet, *Earth Will Continue to Warm and the Effects Will be Profound*, available at https://climate.nasa.gov/effects (last accessed June 26, 2023).
[3] R. Zhong, The New York Times, *Arctic Summer Could be Practically Sea-Ice-Free by the 2030s* (June 6, 2023) available at https://www.nytimes.com/2023/06/06/climate/arctic-sea-ice-melting.html (*citing* Yeon-Hee-Kim *et al.*, 14 Nature Communications 3139, *Observationally-Constrained Projections of an Ice-Free Arctic Even Under a Low Emission Scenario* (2023), available at https://doi.org/10.1038/s41467-023-38511-8).
[4] Intergovernmental Panel on Climate Change, *Climate Change 2021: The Physical Science Basis*, *Summary for Policymakers* (2021) at 28, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.
[5] *Id.* at 27-28.
[6] Intergovernmental Panel on Climate Change, *Climate Change 2023: Synthesis Report, Summary for Policymakers* (2023) at 7, available at https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf.
[7] University of Maine, *Maine's Climate Future 2020 Update* (2020) at 3, available at https://climatechange.umaine.edu/wp-content/uploads/sites/439/2020/02/Maines-Climate-Future-2020-Update-3.pdf.

B. The Proposed Rule is a Natural Outgrowth of Maine's Long-standing Commitment to Reducing GHG Emissions and Tailpipe Pollution

Maine has a history of dedication to combating the climate crisis. The Legislature first set statutory GHG emissions reduction goals in 2003 and tasked the Department with adopting a climate action plan and developing a lead-by-example initiative to help achieve its goals.[8] In 2019, the Legislature passed An Act to Promote Clean Energy Jobs and To Establish the Maine Climate Council (the "Climate Law"), which aligned the state's emissions goals with prevailing climate science and converted the goals to mandatory levels (the "mandatory climate targets").[9] The Legislature charged the Board with ensuring achievement of the state's mandatory climate targets, and directed it to adopt rules doing so, expressly designating those rules as routine technical pursuant to Title 5, chapter 375, subchapter 2-A.[10]

The Maine Climate Council, directed to update the state's Climate Action Plan by the end of 2020 and every four years thereafter,[11] developed *Maine Won't Wait: A Four-Year Plan for Climate Action* (the "Climate Action Plan"), setting forth numerous strategies for achieving the mandatory climate targets.[12] Both the Climate Action Plan and its outgrowth, the Clean Transportation Roadmap, emphasize Maine's need to aggressively pursue GHG reductions in the transportation sector, including from MHDVs.[13]

The state's history of protective tailpipe emissions standards goes back even further. The federal Clean Air Act establishes the framework for controlling mobile source emissions in the United States. While the law generally prohibits states from adopting their own emissions standards, it grants California a special exemption to do so as long as its standards are at least as protective as the federal ones.[14] Other states may deviate from the federal standards *only* by adoption of standards identical to California's.[15] Maine has long opted for this more stringent approach; the Legislature expressly authorized the Department to adopt California's vehicle emissions standards three decades ago.[16] This authority is bolstered by even longer-standing general grants of jurisdiction over emission standards and air quality.[17] The Department has exercised these authorities on numerous occasions. Maine first incorporated aspects of California's vehicle

[8] An Act to Provide Leadership in Addressing the Threat of Climate Change, P.L. 2003, ch. 237, § 1 (effective Sept. 13, 2003) (codified as amended at 38 M.R.S. §§ 574-577).
[9] 38 M.R.S. § 576-A(1)-(2), (3).
[10] *Id.* § 576-A.
[11] *Id.* §§ 577-A, 577(1).
[12] Maine Climate Council, *Maine Won't Wait: A Four-Year Plan for Climate Action* (Dec. 2020).
[13] Climate Action Plan at 41-42, 107; Governor's Energy Office, Governor's Office of Policy, Innovation and the Future, Cadmus, *Maine Clean Transportation Roadmap* (Dec. 2021) (the "Clean Transportation Roadmap") at 1.
[14] 42 U.S.C. § 7543.
[15] *Id.* § 7507.
[16] An Act Regarding Automobile Air Emission Standards, P.L. 1993, ch. 358, § 1 (codified as amended at 38 M.R.S. § 585-D).
[17] *See* 38 M.R.S. §§ 585, 585-A.

emission standards in 1993.[18] Today, the Department's rules incorporate numerous provisions of California regulations running through MY 2025.[19] Adoption of the ACT would be a continuation of this historic and ongoing practice.

C. The Board Must Adopt the Advanced Clean Trucks Program this Year to Reduce GHG Emissions 45% by 2030 and 80% by 2050

Maine's Climate Law requires the state to reduce gross annual GHG emissions at least 45% below 1990 levels by 2030 and at least 80% below 1990 levels by 2050, with an interim target in 2040 and a net-zero emissions requirement in 2045.[20] To support the state's plan for achievement, state consultants identified compliance pathways demonstrating the need for widespread transportation electrification, including for MHDVs: 12% zero-emission share of new heavy-duty vehicles sales by 2025; 55% by 2030, and 100% by 2050.[21]

The Board is responsible for ensuring compliance with the mandatory climate targets.[22] The regulations doing so must "be consistent with the climate action plan," "prioritize" GHG emissions by "sectors that are the most significant sources," and "be fair and equitable."[23] The Board has missed its September 2021 statutory deadline[24] and not adopted any rules to reduce emissions from the transportation sector, though the Department has reported repeatedly that cars and trucks are the biggest contributors of CO_2 emissions from fossil fuel consumption in the state.[25] The proposed rule is the state's best shot at reducing emissions from MHDVs and, as explained below, meets the Climate Law's statutory criteria. Thus, to fulfill its statutory obligation, the Board must adopt the Advanced Clean Trucks Program this year.[26]

[18] 06-096 C.M.R. ch. 127 (Feb. 17, 1993) (amended 1994).
[19] *See* 06-096 C.M.R. ch. 127, New Motor Vehicle Emission Standards; *see also id.* § 3 Incorporation by Reference.
[20] 38 M.R.S. § 576-A.
[21] Climate Action Plan at 107; *see also* Synapse Energy Economics, Inc., *Volume 3: Mitigation Modeling Consolidated Energy Sectors Modeling Results* (Nov. 9, 2020) at 7-13, available at https://www.maine.gov/future/sites/maine.gov.future/files/inline-files/ERG_MCC_Vol3_MaineEmissionsAnalysisSynapse_11-9-2020.pdf.
[22] 38 M.R.S. § 576-A (4).
[23] *Id.* § 576-A (4)(A), (B), (C).
[24] *Id.* § 576-A (4) ("Notwithstanding any provision of section 341-H to the contrary, by September 1, 2021, the board shall adopt rules to ensure compliance with the levels established. . .").
[25] Maine Department of Environmental Protection, Bureau of Air Quality, *Ninth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals* (2022) at 11.
[26] Failure to adopt the ACT within calendar 2023 would mean pushing back implementation to MY 2028, thereby losing out on a year of emissions reductions. Section 177 of the federal Clean Air Act authorizes states to adopt California's vehicle emissions standards if they are identical to California's standards, and so long as states provide vehicle manufacturers *at least two model years' lead time before enforcement*. 42 U.S.C. § 7507.

The Advanced Clean Trucks Program is "consistent with the Climate Action Plan"

The Board is obligated to adopt rules ensuring compliance with the state's mandatory climate targets.[27] These must be "consistent with the climate action plan."[28] The Board's adoption of the ACT would satisfy this criterion.

The very first strategy advanced by the state's Climate Action Plan is to "accelerate Maine's transition to electric vehicles."[29] The Plan describes the California standards as a "foundational policy for accelerating EV adoption,"[30] and calls for development of a "statewide EV Roadmap to identify necessary policies, programs, and regulatory changes needed to meet the state's EV and transportation emissions-reduction goals."[31] That document, the Clean Transportation Roadmap, explicitly calls for adoption of the ACT, explaining "[e]lectrifying MHDVs is critical for meeting Maine's 2030 and 2050" mandatory climate targets, and that implementation of California's programs in Maine would have a "profound impact on GHG emissions from the transportation sector."[32]

The Advanced Clean Trucks Program is "fair and equitable"

A central tenet of the Climate Law and Climate Action Plan is the advancement of equity through climate policies to "ensure communities and citizens who are often left behind can benefit from climate solutions by having access to opportunities and protection from threats."[33] The Climate Law directs the council to consider actions that "minimize deleterious effects, including those on persons of low income and moderate income," and that create opportunities for economic growth, especially in "rural and economically distressed regions" of Maine.[34] The Council is to "[e]nsur[e] equity for all sectors and regions of the State and that the broadest group of residents benefit . . . with consideration of economic, quality-of-life and public health benefits."[35] Consistent with that theme, the Board's rules ensuring compliance with the mandatory climate targets must be "fair and equitable."[36] The Maine Climate Council Equity Subcommittee introduced its recent report by explaining the rationale for this focus:

> In Maine and across the world, climate change poses the greatest threat to communities which are already marginalized. Low-income communities and communities of color, among others, are often already subject to both social and environmental harm—experiencing disparities in health outcomes, and

[27] 38 M.R.S. § 576-A (4).
[28] *Id.* § 576-A (4)(A).
[29] Climate Action Plan at 41.
[30] *Id.*
[31] *Id.*
[32] Clean Transportation Roadmap at 2, 53.
[33] Climate Action Plan at 6.
[34] 38 M.R.S. § 577(7)(B).
[35] *Id.* § 577(7)(C).
[36] 38 M.R.S. § 576-A (4)(C).

> inequitable access to healthy, efficient, and secure housing, potable drinking water, and reliable transportation.[37]

The impacts of climate change and air pollution affect all Mainers, but residents in low-income and Black, Indigenous, and people of color communities are especially vulnerable and often face the most severe impacts.

The ACT will advance fairness and equity by reducing toxic air pollution, which disproportionately impacts people of color as well as limited English-speaking households (complementary policies are necessary to ensure benefits reach these populations, *see* section V).[38] Fossil fuel vehicles emit nitrogen oxide (NOx) pollution, which contributes to the formation of both particulate matter pollution and ozone (i.e., smog).[39] Nationwide, MHDVs comprise approximately 6% of on-road vehicles, but generate nearly 60% percent of NOx emissions and 55% of particle pollution (including brake and tire particles).[40] These emissions are toxic and dangerous. In Maine, most vehicles are light-duty passenger cars and trucks, but MHDVs tend to travel more miles and use more fuel per mile. They therefore disproportionately contribute to the climate crisis as well as toxic air pollution linked to myriad negative health impacts including asthma, bronchitis, cancers, and premature deaths. At the same time, climate change increases temperatures leading to more days of extreme heat, which exacerbates the health risks associated with hazardous air pollution from our roads.

Adopting the ACT will help get diesel trucks off our roads. It is a crucial baseline step that Maine needs to take to advance towards more equitable transportation systems that don't poison our air. The health benefits of Maine's adoption of the ACT are further expounded in section IV below.

> *The Advanced Clean Trucks Program "prioritize[s] greenhouse gas emissions reductions by sectors that are the most significant sources"*

Consistent with the Climate Law, adoption of the ACT would also properly prioritize GHG reductions by the most significant sources and account for and give "significant weight" to GHG emissions reductions already achieved.[41] Tailpipe emissions are an appropriate focus of the Board not only because the transportation sector is responsible for nearly half of Maine's

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[37] Maine Climate Council, Equity Subcommittee, *Final Recommendations of the Equity Subcommittee of the Maine Climate Council* (2023) at 5.
[38] U.S. Environmental Protection Agency, *Study Finds Exposure to Air Pollution Higher for People of Color Regardless of Region or Income* (September 20, 2021), available at https://www.epa.gov/sciencematters/study-finds-exposure-air-pollution-higher-people-color-regardless-region-or-income; J. Liu, *et al*., *Disparities in Air Pollution Exposure in the United States by Race/Ethnicity and Income, 1990-2010*, 129 Environmental Health Perspectives 12 (2021) available at https://ehp.niehs.nih.gov/doi/10.1289/EHP8584.
[39] U.S. Environmental Protection Agency, *The Sources and Solutions: Fossil Fuels,* available at https://www.epa.gov/nutrientpollution/sources-and-solutions-fossil-fuels (last accessed Mar. 14, 2023).
[40] American Lung Association, *Zeroing in on Healthy Air* (Mar. 2022) available at www.lung.org/e.
[41] 38 M.R.S. § 576-A (4)(B), (C).

climate-disrupting emissions from fossil fuels,[42] but also because its emissions remain "relatively stable"[43] in contrast to other energy sectors that have shown marked reductions in emissions since 1990.[44] Maine's transportation emissions have dropped only 8% in that period.[45] Thus, the Climate Law calls for a focus on the transportation sector, and the proposed rule does so.

Maine law demands the Board adopt the Advanced Clean Trucks Program now

The state is taking important steps to prepare for the transition away from fossil-fuel powered vehicles. For instance, in 2017, then-Attorney General Mills won $5.1 million from Volkswagen and its affiliates for state environmental law violations, half of which was used to provide financial incentive programs to help public agencies and organizations that serve older people, low-income Mainers, and Mainers with special needs to purchase EVs.[46] In July 2022, Maine's Department of Transportation, Efficiency Maine Trust, and other state agencies developed a Plan for Electric Vehicle Infrastructure Deployment outlining how the state would use approximately $19 million in National Electric Vehicle Infrastructure funding approved by Congress in 2021.[47] This month, Recharge Maine, the state's initiative to develop a statewide network of public, high-speed EV chargers, announced awards of more than $6 million in additional National Electric Vehicle Infrastructure program funds to support the development of new chargers spanning Bangor, Augusta, and the stretch of U.S. Route 1 between Ellsworth and Freeport.[48]

Yet, despite this good work, and despite state-sponsored projections that the medium- and heavy-duty sector needs to rapidly decarbonize to achieve the state's mandatory climate targets, the Board did not "adopt. . . rules to ensure" this transition was underway by September 1, 2021, as directed by the Legislature.[49] If the missed statutory deadline was not reason enough to act with haste, the Clean Transportation Roadmap also shows there is no time to lose—it projects that, even if the ACT had been adopted *last* year, allowing earlier implementation (i.e. starting with MY 2026 instead of MY 2027), it would *still* not have been enough to hit the state's

[42] Clean Transportation Roadmap at 8.
[43] *Id.*
[44] Maine Department of Environmental Protection, Bureau of Air Quality, *Ninth Biennial Report on Progress Toward Greenhouse Gas Reduction Goals* (2022) at 12 (e.g., 53% drop by the industrial sector; 41% by the electric power sector).
[45] *Id.*
[46] Settlement funds were also used for the installation of public EV charging stations. Maine.gov, Governor's Energy Office, *Clean Transportation*, https://www.maine.gov/energy/initiatives/clean-transportation (last accessed August 17, 2023); Maine.gov, *Maine's VW Settlement* (2017) https://www.maine.gov/mdot/vw/docs/maine-vw-settlement-summary.pdf (last accessed August 17, 2023).
[47] MaineDOT, *Maine Plan for Electric Vehicle Infrastructure Deployment (Maine PEVID)* (July 2022) https://www.efficiencymaine.com/docs/pevid-2022.pdf (last accessed August 17, 2023).
[48] MaineDOT, *Recharge Maine Announces Planned Awards of More than $6 Million in Bids to Further Extend Maine's Electric Vehicle Charging Infrastructure*, News Release (August 1, 2023) https://www.maine.gov/tools/whatsnew/index.php?topic=DOT_Press_Releases&id=11496493&v=article2015 (last accessed August 17, 2023).
[49] 38 M.R.S. § 576-A (4).

transportation electrification goals, nor accordingly, the overarching mandatory climate targets (absent complementary approaches).[50]

The ACT is the Board's only proposal for cutting GHG emissions from MHDVs as the looming mandatory climate targets demand. Time is of the essence. Delaying adoption of the ACT endangers compliance with the mandatory climate targets and needlessly puts off significant public health and economic benefits.

II. The Board Should Adopt the Advanced Clean Trucks Program Under 38 M.R.S. §§ 585, 585-A and 585-D.

The Climate Law and Climate Action Plan in no way limit the Department's existing, broad authority to regulate emissions.[51] The Department's express authority to adopt and enforce motor vehicle emissions controls under Section 177 of the federal Clean Air Act is found in 38 M.R.S. § 585-D. The Department has regularly exercised that authority, including to incorporate by reference and amend California vehicle emissions standards from time-to-time. The Board should exercise its ample authority to adopt the ACT rule for all the reasons provided herein.

III. Maine Is Ready for the Advanced Clean Trucks Program.

The Department previously considered adoption of the ACT in 2021. At that time, CLF and many others commented in support of the rule, explaining why the state was ready and would benefit from its implementation. In the nearly two years since, circumstances have only improved, both in terms of state and national readiness as well as the progression of medium- and heavy-duty zero-emission technologies and markets. The rule's ample flexibility and time frame, the progressing market and declining costs, the state and region's expansion of charging infrastructure and the electricity grid, and comprehensive planning efforts will ensure the success of this program.

A. The ACT's Flexible Design Means Difficult-to-electrify Market Segments Will Not Be Rushed

If the August 17 public hearing is any indication, the record is no doubt rife with comments decrying the ACT because selected uses of MHDVs are unsuitable for electrification today. But that is no reason to reject the ACT. The architects of the rule carefully developed it in consideration of extensive analyses of medium- and heavy-duty markets and model availability, and with the expectation that many medium- and heavy-duty uses would remain fossil-fuel powered for the foreseeable future.

[50] Clean Transportation Roadmap at 31.
[51] *See* 38 M.R.S. §§ 585, 585-A & 585-D.

The ACT's trajectory and targets are premised on comprehensive market analysis

Based on the agency's recognition that the "future expansion of the medium and heavy-duty ZEV market is dependent on matching the suitability of zero-emission technologies with fleet operational needs,"[52] a comprehensive market assessment was conducted to inform development of the ACT. This analysis discusses the "suitability" of zero-emission MHDVs in the commercial space,[53] and builds on a market assessment that was initially developed by the Truck and Engine Manufacturers Association itself.[54] The assessment considers 87 market segments across four factors: weight ("loading")[55]; route/range[56]; charging/fueling infrastructure; and battery/vehicle space constraints.[57] Every market segment earned a suitability score for each factor, ranging from 1 for "highly suitable" for electrification to 10 for "poorly suitable."[58] These were averaged to assess a "quantitative suitability score" for every market segment.[59]

For example, logging trucks were one of the market segments considered. To no one's surprise, this segment was found to be "poorly suitable" for electrification (overall score of 7.75), earning: 10 for weight/loading; 1 for routes/range, while acknowledging that this was variable; 10 for infrastructure/charging, acknowledging that this was variable and included long off-road travel; and 10 for battery space constraints, indicating that space was constrained, and acknowledging ground clearance as an issue.[60] Another Maine concern—the snowplow—also (again, as expected) received poor marks, due to varied and unpredictable routes and inadequate time for recharging between missions.[61] In contrast, the "box truck – pickup & delivery (medium to heavy load >100 miles per day)" market segment received an average score of 2 (suitable for electrification) thanks to receiving a 3 for weight/loading, another 3 for routes/range (acknowledging variability), 1 for infrastructure charging (due to centralized routes) and 1 for

[52] California Air Resources Board (CARB), *Staff Report: Initial Statement of Reasons (ISOR), Appendix E: Zero Emission Truck Market Assessment* (Oct. 22, 2019) ("Truck Market Assessment") at 1, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/appe.pdf (Attachment A hereto).
[53] *Id.*
[54] *Id.*
[55] The assessment notes that some zero-emission MHDVs *could* increase weight compared to conventional vehicles, although, the powertrain of a diesel vehicle includes many components not present in electric powertrains, reducing the impact of a zero-emission powertrain on weight. Moreover, "some ground-up BEV designs are lighter than their conventional counterparts through use of lightweight composite materials." The assessment also acknowledges policies to mitigate heavier electric trucks, which could be considered in Maine as a complement to adoption of the ACT. Truck Market Assessment at 2.
[56] *Id.* at 2-3 ("While high daily range requirements occur, both the US and California Vehicle In-Use Surveys (VIUS) as well as EMFAC analysis and market studies show that, on average, most trucks travel less than 100 vehicle miles travelled per day (VMT per day). This implies that range limitations may not be the primary concern for a wide range of applications. In addition as larger fleets begin to purchase ZEVs, they will be a small percentage of the fleet and can use conventional vehicles to meet longer range needs until ZEV technology advances and infrastructure is built out to meet all of their needs.").
[57] *Id.* at 2-3.
[58] *Id.* at 3.
[59] *Id.* at 4.
[60] *Id.* at 44.
[61] *Id.* at 31.

battery space constraints.[62] That market segment was deemed suitable for electrification, whereas, a similar use case, but running >200 miles per day, received a poor score of 6 thanks to the longer routes and possibility of more remote charging needs.[63]

The results of this analysis were tallied by vehicle class:[64]

- Class 2b-3 (gross vehicle weight rating 8,500 to 14,000 lbs.—for instance, utility vans, box trucks for city delivery, step vans and full-size pickup trucks). About 30 percent of trucks in this category received a suitability score of 1 or 2 and are suitable for electrification.[65] This group of vehicles "is dominated by pickup trucks whose variable towing needs, and lack of space to mount battery systems or hydrogen tanks form the primary obstacles to electrification."[66] However, space constraints were not a "concern for vans within this segment, which accounts for approximately 30 percent of the Class 2b-3 vehicles, making them well-positioned for transition to zero-emission technologies."[67] Moreover, "[c]ommercial light-duty [zero-emission] pickup trucks are planned to be introduced to the market in upcoming years, and it is expected that improvement in battery technology and vehicle designs will make [zero-emission] pickup trucks in these higher weight classes more suitable."[68]
- Class 4-7 (gross vehicle weight rating 14,001 to 33,000 lbs. — for instance, large walk-in vans, refuse trucks, school buses, furniture delivery trucks, bucket trucks). This is a widely variable group in terms of "truck body configurations and applications."[69] About "70 percent of trucks in this category received a suitability score of 1 or 2 and have operational characteristics that are suitable for electrification."[70] "Centralized deployment, short, predictable routes and the flexibility to accommodate the weight and size of ZE powertrains cause this segment to stand out. These characteristics are reflected in the numerous ZEV options readily available on the market to replace existing conventional vehicles."[71]
- Class 8 (gross vehicle weight rating >33,000 lbs. — for instance, large tractor trailers). "The figures show that about 30 percent of trucks in this category received a suitability score of 1 or 2 and have operational characteristics that are potentially suitable for

[62] *Id.* at 16.
[63] *Id.* at 16.
[64] The assessment was released in October 2019, and consequently the findings are likely already somewhat outdated, considering the significant growth in the marketplace for zero-emission MHDVs in the intervening years. *See, e.g.,* Calstart, *Zero-Emission Technology Inventory Data Explorer*, available at https://globaldrivetozero.org/tools/zeti-data-explorer/(last accessed Aug. 26, 2023) (161 MHD ZEV models in 2021 up to 209 in 2023).
[65] Truck Market Assessment at 5.
[66] *Id.* at 7.
[67] *Id.*
[68] *Id.*
[69] *Id.*
[70] *Id.*
[71] *Id.* at 9.

> electrification."[72] "Vehicles in Class 8 are generally characterized by heavy loads, long and unpredictable routes, but many also operate short and predictable routes from centralized locations. Some examples include yard tractors and short-haul on-road tractors used for local delivery and drayage operations. Long-haul ZEVs are not expected to offer one-to-one replacements for conventional vehicles for some time . . ."[73]

The ACT does not require sales of zero-emission medium- and heavy-duty vehicles that are not suitable

As a result of the Truck Market Assessment, the ACT was designed to reflect that "a transition to ZEVs is more likely to begin with fleets that have predictable routes with daily [vehicle miles traveled] of under 100 miles, and have a centralized operation where infrastructure investments would likely to be installed."[74] Market segments that do not fall within those parameters are not expected to transition in the short-term—or at all; the Program is flexible, has a gradual transition, and maxes out well below fully zero-emission fleets. The ACT's design enables manufacturers to comply by addressing market segments most suitable for electrification and ensures that no clean vehicle is rushed into a job it's not ready for.

The ACT provides a gradual ramp up in zero-emission sales. The rule would first impact MY 2027, requiring 15% for class 2b-3 and class 7-8 tractors, and 20% for class 4-8.[75] These sales requirements increase through MY 2035 and beyond, when the requirement reaches 55% zero-emission share of new class 2b-3 MHDV sales, 75% of class 4-8, and 40% of class 7-8.[76] By stopping well short of 100% requirements, the vast majority of trucks on our roads even in 2035 will still be combustion-engine vehicles. The rule's architects explain, "manufacturers need to identify market segments they can compete in and offer competitive products that fleets will want to purchase. Broadly, vehicles used for local delivery appear better suited while work trucks present more challenges. Manufacturers most likely will not target market segments poorly suited for electrification and will instead focus on the ones that electrification is best suited for."[77] Incorporating the ACT into its own regulation, the Vermont Agency of Natural Resources explained, "the phase in of vehicles that will be delivered reflect the expected developments in supply, technology, application, and feasibility. Many automakers have made commitments related to the phase-in of EVs that are consistent with, or in some cases more stringent than, the proposed rule."[78] Moreover, the requirements are technology-neutral, meaning

[72] *Id.*
[73] *Id.* at 11.
[74] *Id.* at 4.
[75] 13 C.C.R. § 1963.1(b).
[76] *Id.*
[77] *See, e.g.,* CARB, *Advanced Clean Trucks Regulation, Final Statement of Reasons* (Mar. 2021) at 122, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fsor.pdf.
[78] Vermont Agency of Natural Resources, Department of Environmental Conservation, *Vermont Low Emissions and Zero Emission Vehicle Rule, Final Proposed Rule, Responsiveness Summary* (2022) at 8, available at https://dec.vermont.gov/sites/dec/files/aqc/mobile-sources/documents/Responsiveness_Summary.pdf (Attachment B hereto).

that electric as well as other zero-emission technologies are eligible for credits. And they include "near-zero-emission vehicles"—which, as the name suggests, are not zero-emission at all—and in fact have combustion engines supplemented with batteries.[79]

The regulation's credit and deficit accounting system adds to the program's flexibility. Credits and deficits don't need to match up one-to-one; a manufacturer who sells diesel snowplows, for instance, doesn't need to sell an equivalent number of zero-emission snowplows. Rather, deficits from Class 2b-3 and Class 4-8 vehicle groups can be met with zero-emission and near-zero-emission credits from any vehicle type,[80] with the exception that deficits from Class 7-8 tractor trucks must be met with credits from that same vehicle group.[81] Manufacturers can also bank, buy, sell, trade or otherwise transfer credits.[82] The use of weight class modifiers affords additional flexibility while maintaining emissions benefits.[83] The program design enables manufacturers to focus their efforts on the MHDVs most suitable for electrification. This means that Maine's fleets that are ready to electrify will have zero-emission options available to them,

[79] 13 C.C.R. § 1963(16).
[80] *Id.* §§ 1963.1, 1963.2.
[81] 13 C.C.R § 1963.3(3). CARB's responses to comments demonstrate the ACT's thoughtful balance of feasibility versus emission benefits in light of data and analysis with respect to the class 7 and 8 tractor vehicle group:

> Staff recognizes that long-haul will be one of the more challenging sectors to electrify. Staff evaluated that long-haul fleets are challenging to electrify in Appendix E to the Staff Report due to the range and infrastructure concerns associated with long-haul. Due to these challenges, staff proposed lower requirements in the Class 7-8 tractor requirements than in other categories. To the extent that some applications such as long-haul tractors trucks are not easy to electrify, manufacturers can focus their efforts elsewhere. Staff anticipates manufacturers can meet the requirements with drayage and short-haul trucks in the near-term and expanding to regional haul over time. . .
>
> Staff made changes to the regulation to allow a limited amount of credits to be used towards meeting tractor deficit requirements. . .The purpose of limiting the transfer of credits into the tractor group is to ensure that [zero-emission] Class 7 and 8 tractors are produced. Ensuring [zero-emission] tractors are deployed is critical to the regulation's goals as these vehicles are the largest emitters and are the most common vehicle for drayage operation. Allowing manufacturers to use non-tractor credits to meet their tractor requirement will increase the flexibility offered to them but would simultaneously reduce the amount of [zero-emission] tractors deployed. By allowing a limited number of credits to transfer from non-tractors to meet tractor-deficits, the proposal allows some flexibility to adjust to the market while ensuring [zero-emission] tractors are produced.

CARB, *Advanced Clean Trucks Regulation, Final Statement of Reasons* (Mar. 2021) at 113, 119-120, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fsor.pdf.
[82] 13 C.C.R § 1963.2.
[83] *See id.* §§ 1963.2(a), (b), 1963.1(b), table A-2.

while industries without viable clean technology alternatives will not be pressured to purchase inadequate vehicles.[84]

B. Clean Trucks and Vans Will Save Maine Businesses Money

Though upfront costs for electric trucks currently exceed those of their internal combustion engine counterparts, these costs are rapidly declining as component parts, particularly batteries, fall in price.[85] As markets progress and sales volumes increase (in part thanks to state adoption of the ACT), this race to cost parity will only hasten.

On a total cost of ownership (TCO) basis, clean fleets are on the precipice of major cost savings because electric MHDVs cost less to service, maintain, and fuel. TCO assessments include purchase prices, maintenance, energy, and infrastructure costs.[86] The National Renewable Energy Laboratory recently estimated that all zero-emission MHDVs in all vehicle classes will be cost-competitive with fossil fuel MHDVs on a TCO basis by 2035, with some reaching that point as early as 2026.[87] The same study concluded that some electric buses are already cost-competitive today.[88] M.J. Bradley & Associates found that electric vehicles may be cost-competitive with more than two-thirds of equivalent internal combustion MHDVs on a TCO basis by 2025.[89] And a Roush Industries study conducted last year concluded that by 2027, seven of the eight types of electric MHDVs analyzed would have a lower TCO than their fossil fuel

[84] *See, e.g., Vermont Responsiveness Summary,* supra note 78, at 9 ("Under the ACT regulation, new diesel heavy-duty trucks will continue to be available for sale in Vermont before and after 2035 while providing an increased choice for fleets when making decisions about what vehicle will best suit their needs. The ACT regulation includes flexibility for manufacturers to produce and sell new ZEVs into the market segments they deem to be most suitable for the products they manufacture, ensuring that manufacturers develop competitive ZEV products at price points that will meet fleet needs. . . Used vehicles are outside of the scope of the rules and used [internal combustion engine vehicles] will continue to be available for sale in Vermont.").

[85] M.J. Bradley & Associates, *Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness* (Aug. 2021) at 23, available at https://www.erm.com/globalassets/documents/mjba-archive/reports/2021/edfmhdvevfeasibilityreport22jul21.pdf ("Light-duty EV battery costs have fallen from over $1,100/kWh in 2010 to $156/kWh in 2019. Many analysts are projecting costs will continue to fall, to as low as $61/kWh in 2030; several major car companies have endorsed these estimates. While average battery costs for M/HD EVs have also fallen in the last 10 years they currently remain higher than costs for light-duty EVs, at approximately $375/kWh; this implies that there is currently about a 5-year lag between cost reductions for LD EV and M/HD EV batteries. Even if this lag continues, M/HD EV battery costs should still fall below $90/kWh by 2030 (76% reduction from today). It is likely that increased production volumes will cause this cost gap to close such that M/HD EV battery costs could fall below $70/kWh by 2030 (81% reduction)." (internal citations removed)).

[86] Roush Industries, *Medium and Heavy-Duty Electrification Costs for MY 2027-2030* (February 2022) at 36, available at https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/02/EDF-MDHD-Electrification-v1.6_20220209.pdf.

[87] National Renewable Energy Laboratory, *Decarbonizing Medium- & Heavy-Duty On-Road Vehicles: Zero Emission Vehicles Cost Analysis* (March 2022) at 18-23, https://www.nrel.gov/docs/fy22osti/82081.pdf (last accessed August 17, 2023).

[88] *Id.* at 19.

[89] M.J. Bradley & Associates, supra note 85, at 23 (projecting that electric MHDVs in vehicle classes representing 72% of the current fleet could achieve cost parity with equivalent fossil fuel vehicles by 2025).

equivalent.[90] In fact, the Roush study concluded that in cases where electric MHDVs have higher upfront costs, total cost parity is achieved within two years of vehicle purchase.[91]

Fleet operators around the country are investing in zero-emission trucks—and it's not for the climate benefits. Businesses such as Amazon have already committed to tens of thousands of preorders on new clean trucks, demonstrating their calculation that investment in zero-emission trucks is good for business.[92] Maine's fleets that choose to electrify will similarly enjoy the benefits to their bottom lines.

C. Zero-emission Medium- and Heavy-duty Technology Is Feasible and Will Perform in Maine

Maine's stone coast beauty may be unparalleled, but our cold climate and mountainous terrain—posing challenges for electric and combustion-engine vehicles alike—are not unique. Eight states have already adopted the ACT, and amongst them, states with elevations and winter weather that rival (or clearly exceed, in the case of altitudes) our own. Each of these states has assessed medium- and heavy-duty zero-emission markets, model availability, and feasibility, and determined that the technology is ready to support their local industries and businesses.

For instance, Vermont's Agency of Natural Resources concluded—despite the state's notoriously brutal winters and frigid temperatures—that the state is ready for the ACT:

> Not unique to electric vehicles, cold weather reduces efficiency of all vehicle types. Electric vehicles can be driven in both extremely hot and cold weather. Cold weather can reduce range, but with longer-range electric vehicles on the market, with a little planning this won't impact the vehicles' ability to get you where you need to go. Also, some auto makers are adding technologies that help control the temperature of the battery to counteract impacts from extremely hot or cold weather. Electric vehicles are already popular and feasible for drivers in the Northeast and East Coast and make up over 70% of all car sales in Norway.[93]

Vermont's Agency of Natural Resources was also not dissuaded by the state's famously mountainous landscape, explaining:

> Electric vehicles are designed to perform the same or better than the gasoline vehicles they replace. Electric vehicles have high torque which help them accelerate

[90] Roush Industries, supra note 86, at 18.
[91] *Id*. at 2.
[92] *See, e.g.,* Calstart, *Zeroing in on Zero-Emission Trucks – The Advanced Technology Truck Index: A U.S. ZET Inventory Report* (Jan. 2022) at 3, available at https://calstart.org/wp-content/uploads/2022/02/ZIO-ZETs-Report_Updated-Final-II.pdf; *see also* C. Domonoske, NPR, *From Amazon to FedEx, the Delivery Truck Is Going Electric* (Mar. 17, 2021) available at https://rb.gy/0q143.
[93] Vermont Responsiveness Summary, supra note 78, at 10.

> quickly and get up steep inclines. Today's vehicles have more electric range, leaving plenty of margin for mountain driving. And electric vehicles benefit from downhill driving which allows regenerative braking to put energy back into the battery, extending how far you can go.[94]

Colorado—no stranger to cold, mountainous roads—similarly concluded:

> Colorado, however, is not unique in having cold weather and mountainous topography. California and other states that have adopted ACT face these same issues. While lower phase-in standards allow greater use of vehicles in more benign environments, there is a growing body of medium and heavy duty vehicle data from vehicles operating in more challenging and low temperature environments, that is already impacting the design and operational procedures to be used as future model year sales requirements are introduced. Larger battery packs and preconditioning of vehicles and battery packs from off-board sources, as well greater use of technology including the use of heat pumps for environmental control, will all contribute to lessen impacts on range and performance. The Division expects that technologies will continue to improve over time, but even now medium and heavy duty electric vehicles are being used in cold and mountainous areas.[95]

Maine's weather and landscape may make electrifying certain uses more difficult than somewhere with a temperate climate and flat terrain, but the same could be said for transporting goods and operating MHDVs in general. Maine's conditions are not so unique that they warrant a different conclusion than that reached by other states with harsh winters and challenging topography.

D. Increasing Diversity of Models Will Make Zero-Emission Vehicles Suitable for a Growing Number of Uses Within the ACT's Time Frame

There are already over 200 zero-emission MHD models in production, development or demonstration, with models available for each major segment of the heavy-duty vehicle market, including school buses, delivery vans, box trucks, and tractor trailers.[96] And these numbers are only growing. As of January, vehicle manufacturers and battery makers had announced plans to invest $860 billion globally by 2030 in the transition to EVs, with nearly a quarter—$210

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[94] *Id.*

[95] State of Colorado, Air Quality Control Commission, *In the Matter of Proposed Revisions to Regulation Number 20, Rebuttal Statement of the Colorado Department of Public Health and Environment and Air Pollution Control Division* (Apr. 2023) at 5, available at https://drive.google.com/drive/folders/1m0IPsqlM45ycqJ9dZXF2pXPtuipAkcLa (APCD_REB.pdf) (internal citations removed).

[96] Calstart, *Zero-Emission Technology Inventory Data Explorer*, available at https://globaldrivetozero.org/tools/zeti-data-explorer/ (last accessed Aug. 26, 2023).

billion—to be invested in this country.[97] The passage of the Infrastructure Investment and Jobs Act[98] (IIJA) allowed $550 billion in new spending on investments in infrastructure upgrades, clean energy, transmission and power infrastructure upgrades, and more.[99] The Inflation Reduction Act[100] (IRA) has also provided historic funding to advance clean energy and climate change solutions. The following chart highlights the reach of the substantial federal funding of ACT-related priorities from IRA and IIJA programs:[101]

ACT-related Priority	Funding Benefit
Medium and heavy-duty vehicle manufacturing	Billions of dollars in tax credits, financial support available to build battery components, ZEVs, advanced technology vehicles, etc.
Procurement and bus programs	Tens of billions of dollars to help states, Tribes, local governments and businesses directly offset the cost of replacing heavy-duty trucks and buses with ZEVs
Charging and fueling	Tax credits to build charging networks in rural and underserved areas; deployment of hydrogen vehicle fueling facilities; billions of dollars for states to plan, build out charging infrastructure
Supply chain and workforce development	Tax credits and grants offering the ability to research, develop, and reuse batteries and battery components; IRA and IIJA programs focused on clean energy workforce, just transition, re-training
Emissions reductions and monitoring	Flexible funding, planning grants for states and communities to reduce carbon pollution emissions, capture air quality data, and track real-time air quality monitoring
State planning	Over $10B to states, including ME, to design their own approaches to tackling pollution; funding can be used to implement the ACT

[97] N. Gabriel, Atlas E.V. Hub, *$210 Billion of Announced Investments in Electric Vehicle Manufacturing Headed for the U.S.* (Jan. 12, 2023) https://www.atlasevhub.com/data_story/210-billion-of-announced-investments-in-electric-vehicle-manufacturing-headed-for-the-u-s/.
[98] Infrastructure Investment and Jobs Act, Pub. L. No. 117-58 (2021).
[99] ERM, *Electric Vehicle Market Update: Manufacturer Commitments & Public Policy Initiatives Supporting Electric Mobility in the U.S. & Worldwide* (April 2022) at 4, available at https://docs.google.com/viewerng/viewer?url=https://blogs.edf.org/climate411/files/2022/04/electric_vehicle_market_report_v6_april2022.pdf&hl=en.
[100] Inflation Reduction Act of 2022, Pub. L. 117-169 (2022).
[101] Information for this chart was adapted from Clean Air Task Force, *Federal Funding Programs to Support Advanced Clean Trucks Implementation: A Guide for States* (2023) at 2, available at https://cdn.catf.us/wp-content/uploads/2023/04/13154057/act-federal-funding-resource.pdf.

The U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy has launched the SuperTruck 3 Initiative, funding five manufacturers work to improve medium- and heavy-duty truck efficiencies and reduce emissions of freight transportation: PACCAR Inc. is developing eighteen Class-8 battery electric and fuel cell vehicles with advanced batteries, as well as a megawatt charging station; Volvo Group North America is developing a 400-mile-range Class-8 battery electric tractor-trailer with advanced aerodynamics, electric braking, EV-optimized tires, automation and route planning, as well as a megawatt charging station; Daimler Trucks North America, LLC is developing two Class-8 fuel cell trucks with 600-mile range, 25,000-hour durability, equivalent payload capacity and range to diesel; Ford Motor Company is developing five hydrogen fuel cell Electric Class-6 Super Duty trucks, specifically targeting cost, payload, towing, and refueling times that are equivalent to conventional gasoline trucks; and General Motors, LLC[102] is developing four hydrogen fuel cell and four battery electric Class 4-6 trucks.[103]

In sum, there are billions of private and public dollars invested in converting medium- and heavy-duty fleets to zero-emission vehicles. The Board can enable Mainers to be a part of this transition, and bring some of those investment dollars to our state by adopting the ACT and showing that we are committed to a zero-emission transportation future.

E. Maine's Electricity Grid Can Support Adoption of the ACT

Maine's electricity grid can support adoption of the full ACC II. Maine and the region are already preparing for an electrified future in which both the transportation and heating sectors are significantly decarbonized. The processes and analyses underway are identifying the best pathways for bolstering the grid as well as developing non-grid solutions to accommodate and manage additional electricity demand. Of course, forecasting future load and planning upgrades has long been a duty of utilities and regional transmission organizations. By setting a defined trajectory for transportation electrification, the ACT will aid these efforts by enhancing predictability; this will better enable utilities, regulators, and system operators to forecast, system plan, permit, and build-out infrastructure to accommodate growth. The Board can adopt the rule confident that state and regional entities with jurisdiction over the electricity grid will march ahead in tandem.

While doomsday electrification scenarios assume unmitigated increases in peak electricity demand, relevant Public Utilities Commission (PUC) proceedings are underway to manage and facilitate this load growth. Because electric vehicles have flexible electricity demand (i.e. they can charge any time they are not being driven, and charging time is usually shorter than parking

[102] General Motors, LLC's project is also focused on the development of clean hydrogen via electrolysis, in addition to clean power for fast charging.
[103] Energy.gov, *DOE Announces Nearly $200 Million to Reduce Emissions from Cars and Trucks*, Press Release (November 1, 2021), available at https://www.energy.gov/articles/doe-announces-nearly-200-million-reduce-emissions-cars-and-trucks.

time), there are ample opportunities to adjust energy usage to match the supply of electricity at any given time. "Load shifting strategies are also easy to implement for electric utilities and for public consumers and allow for better integration of renewable energy."[104] Simply avoiding charging at peak times can reduce negative impacts on the grid, increasing efficiency and even reducing costs. By sending price signals to electricity customers, utilities can effectively shift charging to off-peak times when electricity demand is lower. This concept, which is pursued through time varying rates and other mechanisms, is being explored in rate design dockets at the PUC. For instance, the PUC recently approved rate designs for Central Maine Power and Versant Power to incent electric vehicle and heat pump load shifting.[105] In a subsequent rate-making and its follow on proceeding, the PUC and stakeholders are considering options to shift usage away from the summer peak; incentivize the use of heat pumps and other beneficial electrification heating technologies during winter; complement the incentives and programs offered by Efficiency Maine Trust; and target optimized use of electric vehicles and heat pumps, as well as time-of-use rate structure.[106]

Further, the PUC is assessing the current electricity grid and ways to meet future demand. In one docket, the PUC considers utility grid plans to assist in the cost-effective transition to a clean, affordable and reliable electric grid, including by identification of cost-effective near-term grid investments and operations needed to achieve the priorities.[107] Moreover, the PUC has conducted a comprehensive examination of the design and operation of the electric distribution system in Maine to accommodate the increasing integration and operation of distributed energy resources and the potential for a substantial increase in load resulting from climate change policies and initiatives encouraging electrification in the heating and transportation sectors.[108]

Maine is not alone in considering the needs of extensively electrified transportation and heating sectors. The regional transmission organization, ISO-NE, is conducting a 2050 Transmission Study assessing future summer and winter transmission needs due to electrification.[109] The study will develop roadmaps for addressing regional load increasing to as much as 57 GW in winter—that is, 2-3 times bigger than our current grid.[110]

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[104] California Air Resources Board, Public Hearing to Consider the Proposed Advanced Clean Cars II Regulations, Staff Report: Initial Statement of Reasons (Apr. 12, 2022), at 32, https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/accii/isor.pdf.
[105] *Maine Public Utilities Commission*, Commission Initiated Investigation into Transmission and Distribution Utility Rate Design to Promote State Policies, No. 2021-325.
[106] *Central Maine Power Company*, Request for Approval of a Rate Change – 307 (7/30/23), No. 2022-152.
[107] *Maine Public Utilities Commission*, Proceeding to Identify Priorities for Grid Plan Filings, No. 2022-322.
[108] *Maine Public Utilities Commission*, Investigation of the Design and Operation of Maine's Electric Distribution System, No. 2021-039.
[109] *See, e.g.,* ISO-NE, *2050 Transmission Study, Key Takeaways and Transmission Development Roadmaps* (July 25, 2023) https://www.iso-ne.com/static-assets/documents/2023/07/a10_2023_07_25_pac_2050_study.pdf.
[110] *Id.*

Part of planning for widespread vehicle electrification is also recognizing the enormous potential benefits of zero-emission MJDVs serving as distributed grid resources.[111] Renewable generation, including wind and solar, will feature prominently in low-carbon electricity systems. Battery storage will play an increasingly significant role in balancing intermittent supply and increasing demand. Electric vehicles are essentially electricity storage units on wheels, and therefore could be beneficial grid assets—potentially significant ones.[112] Electric school buses are particularly noted given their large batteries, predictable schedules, and extensive idle time. The possibility of electric vehicles providing grid services continues to be explored, but the Board should not overlook this facet of transportation electrification.

F. The ACT Gives Maine's Fleets and Dealerships Ample Time to Prepare

The Board should be skeptical of contentions that Maine won't be ready for implementation of the ACT, still several years away. Maine's businesses and fleets have been on notice that a transition to clean medium- and heavy-duty vehicles was imminent at least since development and publication of the Climate Action Plan in 2020, with its 2025, 2030, and 2040 goals for ZEV share of new heavy-duty vehicle sales (12%, 55%, and 100%, respectively).[113] Maine joined a Multi-state Medium- and Heavy-duty Zero Emission Vehicle Memorandum of Understanding that same year, agreeing to strive for 100% of new MHD sales to be zero-emission by 2050 and at least 30% by 2030.[114] The Clean Transportation Roadmap in 2021 expressly called for adoption of the ACT,[115] and the Department proposed adoption of the rule later that year. Meanwhile, fleets around the country are going electric, eight states have already adopted the ACT, and rulemakings are underway in another five.[116]

Moreover, the state has done an excellent job engaging stakeholders and ensuring that the state's transition away from a fleet of toxic diesel engines is informed by the concerns and experience of our state's fleet managers and operators. When members of the trucking industry asked for more time and process to think through, understand and plan for cutting emissions from MHDVs in the 2021 ACT rulemaking, the state listened. A nearly year-long stakeholder education and engagement effort, bringing fleet operators and managers together with electrification experts, is

[111] *See, e.g.,* Vermont Responsiveness Summary, supra note 78, at 11 ("There is potential for V2G integration to help supply electricity during peak hours, provide an extra power source during times when renewable energy sources, such as solar, are unavailable, and supply power during electrical outages. EV owners can be compensated for sending electricity back into the grid at peak demand events, thereby reducing demand.").
[112] C. Xu et al., Nature Communications, *Electric vehicle batteries alone could satisfy short-term grid storage demand by as early as 2030* (Jan. 17, 2023), available at https://www.nature.com/articles/s41467-022-35393-0.
[113] Climate Action Plan at 107.
[114] Multi-State Zero Emission Medium- and Heavy-Duty Vehicle Initiative, *Memorandum of Understanding* (Maine execution July 20, 2020), available at https://www.nescaum.org/documents/mhdv-zev-mou-20220329.pdf.
[115] Clean Transportation Roadmap at 2.
[116] Electric Trucks Now, *State are Embracing Electric Trucks,* available at https://www.electrictrucksnow.com/states (last accessed Aug. 23, 2023).

still underway.[117] Now the state is preparing to work with stakeholders on a Clean Transportation Roadmap for MHDVs, which will complement the ACT by addressing "concerns about grid, locations of charging infrastructure, and vehicle availability.[118]

We hope the Board and other state entities will continue these engagement efforts, because a successful transition of the MHD sector must be informed by the perspectives and insights of those who will ultimately put it in practice. But lack of preparation from Maine's fleets and dealerships[119] cannot excuse delayed adoption of this critical standard.

IV. The ACT Will Reduce Air Pollution Detrimental to Mainers' Health

Exposure to fossil fuel exhaust can lead to devastating health impacts[120] including asthma and respiratory impacts,[121] pregnancy complications and adverse reproductive outcomes,[122] cardiac and vascular impairments,[123] and heightened cancer risk.[124] Transportation pollution disproportionately impacts low-income and Black, Indigenous, and people of color communities who often live adjacent to freight hubs like highways and ports.[125]

An analysis by the International Council on Clean Transportation found that by adopting the ACT rule, Maine could reduce medium- and heavy-duty nitrogen oxide emissions by more than 20,400 U.S. tons, particulate matter emissions by more than 180, and CO_2e emissions by more 22 by 2050.[126] Maine can expect these emission reductions to lower the number of deaths, hospital visits, and sick days. The American Lung Association estimates that from 2020 to 2050,

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[117] Maine Board of Environmental Protection, *Staff Briefing on Transportation Related Matters* (July 20, 2023), at 9-10, available at https://www.maine.gov/dep/bep/calendar.html.
[118] *Id.* at slide 9, 11.
[119] Concerns about zero-emission MHDVs sitting on dealership lots are unfounded. Manufacturers do not earn zero-emission credits until vehicles are "sold to the ultimate purchaser." 13 C.C.R. § 1963.2(a). This assures manufacturers will produce vehicles for appropriate market segments and at competitive price points, "rather than allowing credits to accrue by simply delivering it to a [Maine] dealer and placing it on the dealer's lot." CARB, *Advanced Clean Trucks Regulation, Final Statement of Reasons* (Mar. 2021) at 201, available at https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2019/act2019/fsor.pdf.
[120] U.S. Center for Disease Control & Prevention, *Particle Pollution,* available at https://www.cdc.gov/air/particulate_matter.html (last accessed Mar. 15, 2023); Am. Lung Ass'n, *Nitrogen Dioxide (What Makes Outdoor Air Unhealthy)*, available at https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/nitrogen-dioxide (last accessed Mar. 22, 2023)
[121] Harvard Gazette, *Short-Term Exposure to Air Pollution Linked with Hospital Admissions, Substantial Costs*, (Dec. 23, 2019) available at https://news.harvard.edu/gazette/story/newsplus/short-term-exposure-to-air-pollution-linked-with-new-causes-of-hospital-admissions-substantial-economic-costs/.
[122] Frederica P. Perera, *Multiple Threats to Child Health from Fossil Fuel Combustion: Impacts of Air Pollution and Climate Change*, 125 Env't Health Persps. 141-43 (2017).
[123] Harvard Gazette, supra note 121.
[124] Perera, supra note 122, at 143, 145.
[125] *Id.* at 142.
[126] The International Council on Clean Transportation, *Benefits of Adopting California Advanced Clean Truck Program, Heavy-Duty Vehicle Omnibus Standards and a 100% Sales Requirement in Maine* (Sept. 2022), at 3-4, available at https://theicct.org/wp-content/uploads/2022/09/HDV-fact-sheet-ME-092122.pdf.

the cumulative potential health benefits of Maine's adoption of the ACT could include 54 premature deaths avoided, 785 asthma attacks avoided, and 4,180 lost workdays avoided, for monetary health benefits of $600,000.[127]

In short, while adoption of the proposed ACT rule is a positive step forward in cutting climate pollution, it is also crucial for cleaning up the air we breathe and improving the health of all Mainers.

V. Suggestions to Maximize the Climate, Public Health, and Economic Benefits of the Advanced Clean Trucks Program

As depicted in the Clean Transportation Roadmap, implementation of the Advanced Clean Trucks Program—even if it was adopted last year—would not be enough on its own to hit the MHD electrification goals projected to be necessary for compliance with the state's decarbonization benchmarks. We support development of the MHD clean transportation roadmap to bolster the ACT and hope the state will provide robust opportunities for meaningful engagement (for all stakeholders—not only fleet managers and operators). Participation by communities impacted by trucking pollution is imperative. An equitable, well-planned, and coordinated transition is critical. We hope this roadmap and development process will ensure that the state, utilities, businesses and other partners are thinking holistically about how to efficiently transition our fleets while best integrating the additional load into the electricity grid, and maximizing potential for batteries to serve as grid assets. And we hope that it culminates with specific, immediately actionable takeaways.

Moreover, we urge the Department and other state entities to undertake complementary actions that will target the benefits of the Advanced Clean Trucks Program to communities that suffer a disproportionate share of transportation pollution, which are often communities of color and low-income communities. These could include programs that focus zero-emission zones, rebates for targeted deployment, or mandates that focus emissions-reduction measures in environmental justice communities. In all instances, members of the prioritized communities should be involved in developing the programs that will best benefit them.

CLF also urges the Department to adopt strong complementary policies and programs as soon as possible. We encourage the Department to promptly consider adoption of additional nation-leading vehicle regulations from California.

[127] American Lung Association, *Delivering Clean Air: Health Benefits of Zero-Emission Trucks and Electricity*, at 8, https://www.lung.org/getmedia/e1ff935b-a935-4f49-91e5-151f1e643124/zero-emission-truck-report (assumes 100% new medium- and heavy-duty vehicle sales are zero-emission no later than 2040, and 100% non-combustion, renewable electricity generation by 2035).

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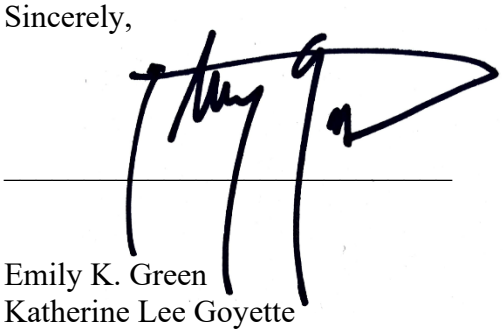
VI. Conclusion

The Board must adopt the Advanced Clean Trucks Program to advance the state toward the Climate Law's mandatory climate targets. Maine is ready for this rule, which will not only reduce greenhouse gas emissions, but will improve our air quality, advance environmental justice, and ensure that Maine maintains its position as a climate leader. CLF urges the Board and the Department to adopt this regulation within 2023 to facilitate compliance with the state's mandatory climate targets and enable Mainers to benefit from its other values as expeditiously as possible.

We thank you for the opportunity to comment on this rule.

Sincerely,



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- Attachment A: California Air Resources Board (CARB), *Staff Report: Initial Statement of Reasons (ISOR), Appendix E: Zero Emission Truck Market Assessment*

- Attachment B: Vermont Agency of Natural Resources, Department of Environmental Conservation, *Vermont Low Emissions and Zero Emission Vehicle Rule, Final Proposed Rule, Responsiveness Summary*

Attachment A

Appendix E
Zero Emission Truck Market Assessment

Table of Contents

Table of Figures

This appendix provides a market assessment and discusses the suitability of zero-emission vehicles (ZEVs) in the medium and heavy-duty commercial space.

A. Introduction

The future expansion of the medium and heavy-duty ZEV market is dependent on matching the suitability of zero-emission technologies with fleet operational needs. The California Air Resources Board (CARB) staff worked with various stakeholders during the rulemaking process, including the Truck and Engine Manufacturers Association (EMA), to help identify those truck market segments where the operational nature of ZEVs would be compatible with existing truck uses. EMA developed an initial assessment matrix of the suitability of battery electric applications for Class 2B through 8 commercial vehicles by identifying 87 market segments and 4 suitability factors to rank the compatibility of each market segment for electrification.

In addition to grading the suitability of ZEVs for each market segment, the assessment identified the general vehicle specifications needed by fleets that operate in each segment. The assessment also identified whether vehicles in each segment are built complete by manufacturers, or originally built as an incomplete vehicle (e.g., completed by a bodybuilder). Finally, the assessment includes estimates of the annual sales for each market segment, based on information provided by manufacturers derived from Polk registration data in California. The EMA sales numbers are generally consistent with 2016 and 2017 model year annual registrations in California.

CARB staff updated the suitability analysis to include effects of legislation and other sources of truck operational data and used quantitative method to assign a weighting factor representing the suitability for each vehicle market segment. CARB staff also extended the assessment to include fuel cell electric vehicles (FCEVs). This updated assessment was released by CARB staff as the "Advanced Clean Truck Market Segment Analysis[1]" which includes specific comments addressing all modifications CARB staff made to the original suitability factors developed by EMA. An abridged version of this assessment can be found in section E.

In addition, a more detailed overview of CARB staff's review and assessment of each suitability factor may be found in section B. CARB staff's final assessment and suitability results can be found in section C and section D.

The key findings from the "Advanced Clean Truck Market Segment Analysis" indicates that nearly 40 percent of sales may be suitable for transition into ZEV powertrains. The

[1]California Air Resources Board. ACT Market Analysis. February 22, 2019. https://ww2.arb.ca.gov/index.php/sites/default/files/2019-02/190225actmarketanalysis.xlsx

highest suitability for electrification are uses with predictable routes with daily VMT of under 100 miles, where weight or space is not compromised with the ZEV powertrain, and vehicles are expected to be in centralized operations where they return to base. The assessment identified that just over 70 percent of Class 4-7 vehicle sales are into markets that present a good fit for electrification today while roughly 30 percent of Class 2b-3 and Class 8 vehicles provide a good fit for electrification based on operational characteristics. These percentages are expected to increase as further advances are made in zero-emission technologies.

B. CARB Assessment of ZEV Suitability Factors

CARB staff reviewed the four suitability factors presented in the original EMA assessment and this section provides a detailed analysis of the changes made to each of these four suitability factors; weight, route/range, chagrining/fueling infrastructure, and battery/vehicle space constraints.

1. Weight

Battery-electric and fuel cell electric technology could reduce payload or increase weight compared to conventional vehicles depending on range needs, however AB 2061 allows for higher weights in California. AB 2061 which increases the weight limits by 2,000 lbs. for alternative fueled vehicles including zero emission vehicles[2]. The powertrain of a diesel vehicle includes many components not present in electric powertrains, (drivelines, transmissions and the engine) reducing the impact of a ZE powertrain on weight. In addition for some vehicle classes the owner has the option to use a higher weight class to account for any increased weight of ZEVs if necessary. Additionally, some ground-up BEV designs are lighter than their conventional counterparts through use of lightweight composite materials, as demonstrated by Proterra in their transit buses and by Chanje with their vans. In general, the hydrogen powertrain is less than that of a battery-electric powertrain for meeting higher range needs.

2. Route/Range

While high daily range requirements occur, both the US and California Vehicle In-Use Surveys (VIUS) as well as EMFAC analysis and market studies show that, on average, most trucks travel less than 100 vehicle miles travelled per day (VMT per day). This implies that range limitations may not be the primary concern for a wide range of applications. In addition as larger fleets begin to purchase ZEVs, they will be a small

[2]California Legislature. Assembly Bill No. 2061 Chapter 580. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2061)

percentage of the fleet and can use conventional vehicles to meet longer range needs until ZEV technology advances and infrastructure is built out to meet all of their needs. Staff assumed the range of FCEVs would be equivalent to conventional vehicles but that fueling would still primarily occur at the fleet yard.

3. Charging/Fueling Infrastructure

Centralized deployments, where vehicles return to a depot or similar location a night, is expected to be the primary situation where BEVs are initially used and where charging infrastructure can be installed. Charging at night over extended periods also results in lower cost charging during off-peak hours. Similarly, for FCEVs, staff also assumed hydrogen stations would initially be primarily installed in centralized yards except for vehicles in Class 2B-3 because they would likely be able to fuel at light duty hydrogen stations.

4. Battery/Vehicle Space Constraints

The original EMA assessment of battery and vehicle space constraints was generally accepted by workshop participants and no changes were made to the original assessment regarding suitability for space or weight constraints.

C. Final CARB Market Segment and Suitability Analysis

CARB staff released a final market segment and suitability analysis titled “Advanced Clean Truck Market Segment Analysis” to show the suitability of zero-emission (ZE) powertrains for each of the 87 market segments. The analysis reflects estimated suitability for existing ZEV vehicle technology. This assessment is based on four vehicle operating characteristics including the following:

- Weight,
- Route/range,
- Charging/fueling infrastructure access, and
- Battery/vehicle space constraints.

The characteristics for each market segment was ranked by assigning a number value to the suitability factors as follows:

- Poorly suitable characteristics were assigned a value of 10 (RED)
- Challenging suitability characteristics were assigned a value of 3 (YELLOW)
- Highly suitable characteristics are assigned a value of 1 (GREEN)

These values were then averaged for each market segment to assign each segment a value between 1 and 10, where the lowest values would suggest the highest suitability for electrification. Suitability scores that average above 5 have at least two characteristics identified with poor suitability factors and indicate that electrification with today's technology is not likely to be feasible for most of that market segment. Details of the analysis may be found in Section E of this document.

The market segment analysis does not account for ZEV model availability, costs, site specific issues that could impact infrastructure installations, normal truck replacement rates, fleet size, nor other factors that could impact the number of ZEVs that could be deployed.

D. Suitability Results

The market segment and suitability analysis indicates that nearly 40 percent of the 87 identified truck markets have a ZEV suitability score of 1 or 2, indicating that they are the most suitable segments to transition to ZE powertrains. This suitability assessment has similar results for BEV vs. FCEV, largely because infrastructure was assumed to be at central fleet yards. As expected the results show that a transition to ZEVs is more likely to begin with fleets that have predictable route with daily VMT of under 100 miles, and have a centralized operation where infrastructure investments would likely to be installed.

The suitability distribution for all BEVs and FCEVs are presented below in Figure D-1 and Figure D-2.

Figure D-1 - BEV Suitability Distribution by Score

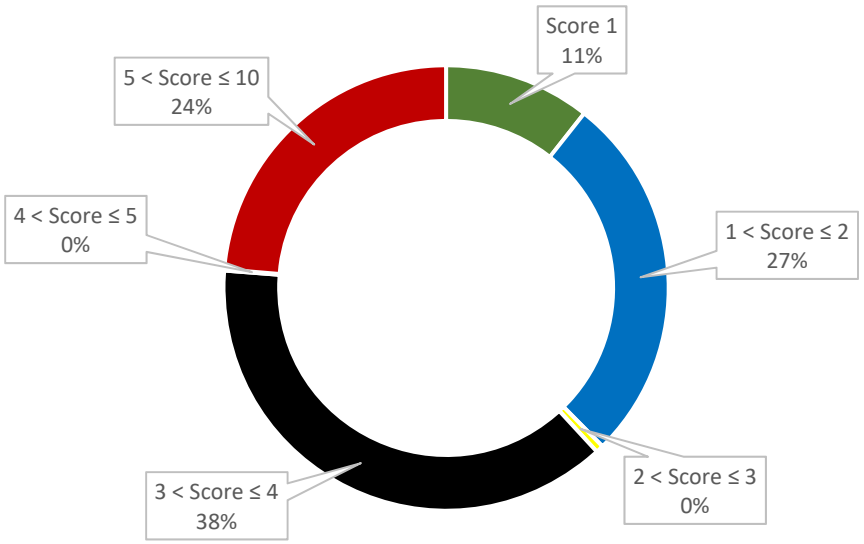
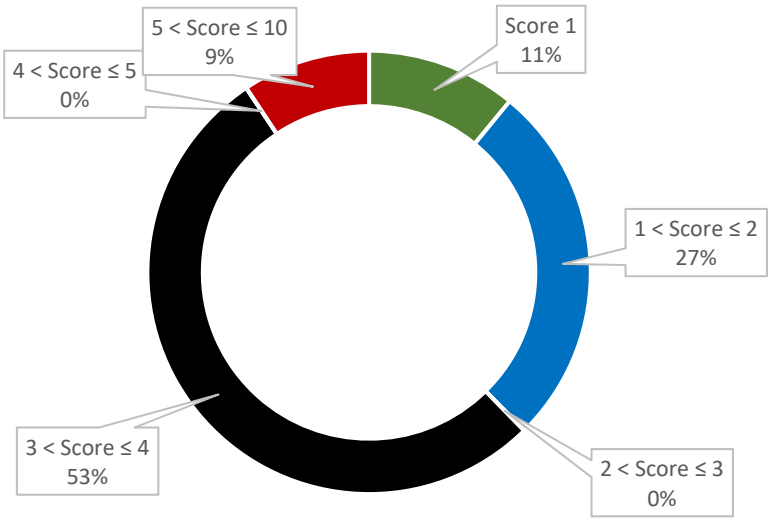


Figure D-2 - FCEV Suitability Distribution by Score



CARB staff also analyzed the suitability factors by weight class, grouping all 87 market segments into three weight categories as determined by the Gross Vehicle Weight Rating (GVWR) of the trucks that operate within each market segment. These categories are Class 2b-3, Class 4-7, and Class 8. The overall results of this assessment show that just over 70 percent of Class 4-7 vehicles received a suitability score of 1 or 2 and are good fits for electrification today while roughly 30 percent of Class 2b-3 and Class 8 vehicles are good fits. CARB staff believe that further advances in ZE technology will increase these percentages. The following is a detailed analysis of the ZE suitability factors for all three weight class categories.

a. Class 2b-3 (GVWR 8,500 to 14,000 lbs.)

Class 2b-3 covers roughly 75,000 California sales on an annual basis and consists of vehicles serving in both private and commercial roles. Figure D-3 and Figure D-4 summarize the suitability scores of Class 2b-3 vehicles from the market segment suitability analysis. The figures show that about 30 percent of trucks in this category received a suitability score of 1 or 2 and have operational characteristics that are suitable for electrification.

Figure D-3 - BEV Suitability, Class 2b-3

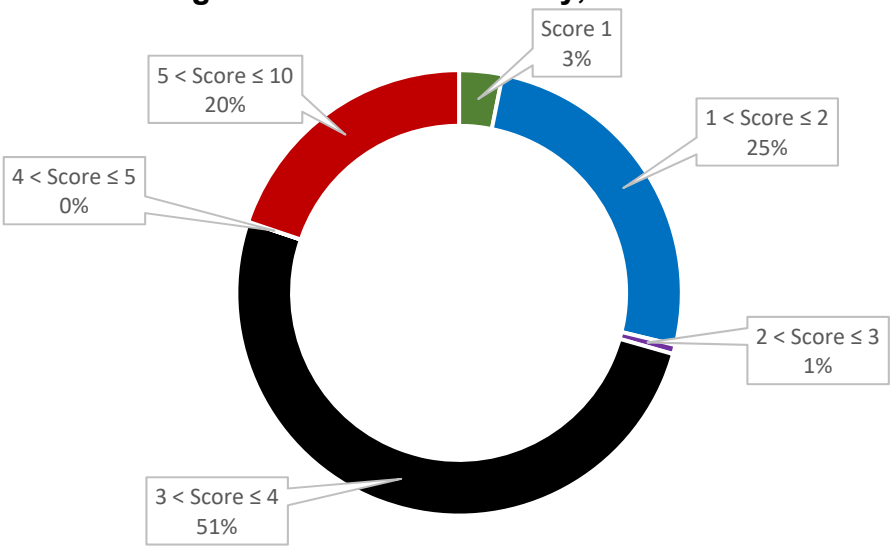
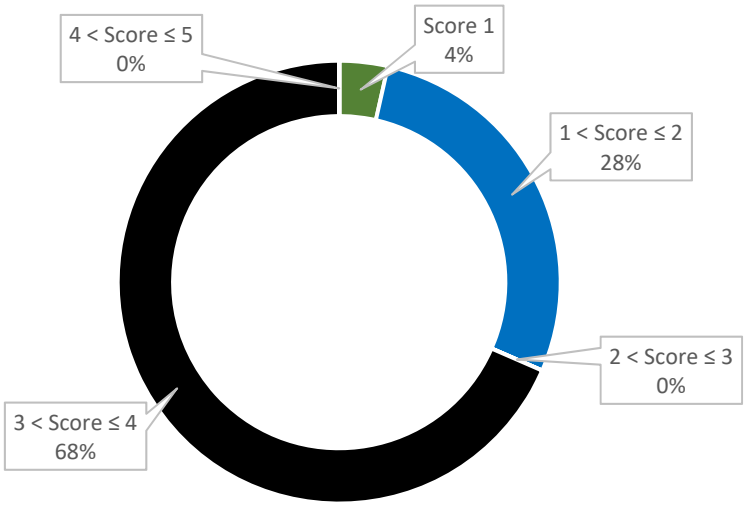


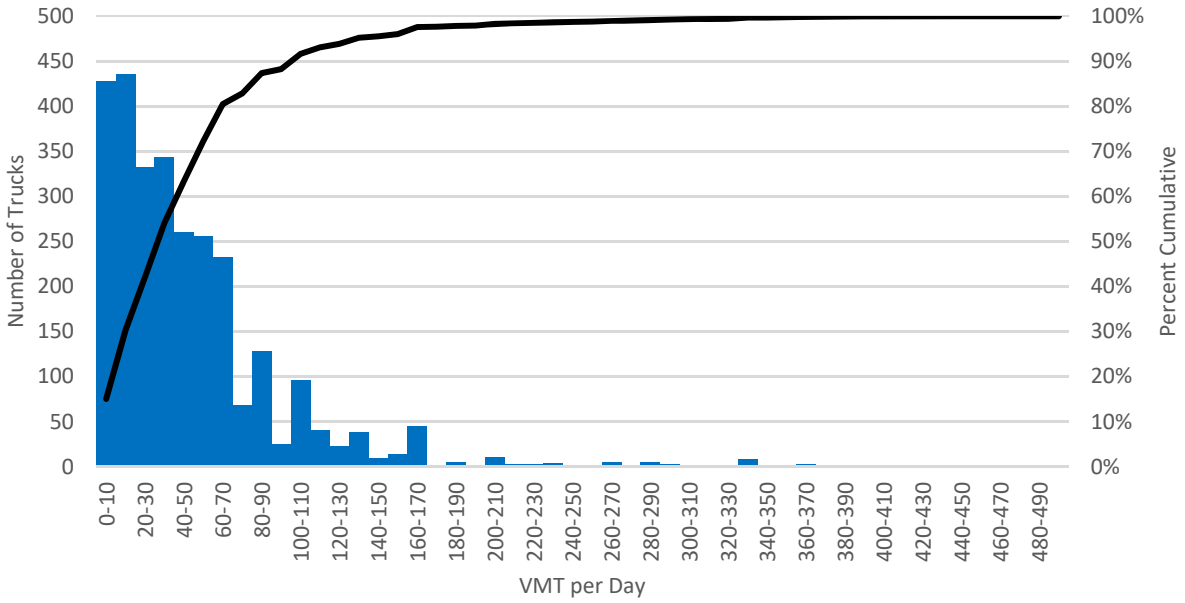
Figure D-4 - FCEV Suitability, Class 2b-3



The 2018 California Vehicle Inventory and Use Survey identifies that almost 90 percent of vehicles within Class 3 accrue less than 100 vehicle miles travelled (VMT) per day. The result of the California VIUS VMT for Class 3 vehicles is shown in Figure D-5. This conclusion is supported by the 2002 US VIUS[3], which identifies around 90 percent of vehicles in Class 3 as having less than 100 daily VMT.

[3]U.S. Census Bureau. 2002 Economic Census Vehicle Inventory and Use Survey Geographic Area Series. (web link: https://www2.census.gov/library/publications/economic-census/2002/vehicle-inventory and-use-survey/ec02tv-us.pdf)

Figure D-5 - Distribution of VMT per Day, Class 3, California VIUS



This population of vehicles is dominated by pickup trucks whose variable towing needs, and lack of space to mount battery systems or hydrogen tanks form the primary obstacles to electrification. Space constraints are not identified as a concern for vans within this segment, which accounts for approximately 30 percent of the Class 2b-3 vehicles, making them well-positioned for transition to zero-emission technologies. Commercial light-duty ZE pickup trucks are planned to be introduced to the market in upcoming years, and it is expected that improvement in battery technology and vehicle designs will make ZE pickup trucks in these higher weight classes more suitable.

b. Class 4-7 (GVWR 14,001 to 33,000 lbs.)

Class 4-7 vehicles account for nearly 19,000 sales annually in California and consist of a wide range of truck body configurations and applications. Figure D-6 and Figure D-7 summarize the suitability score for BEV and FCEV technologies in this vehicle segment. The figures show that about 70 percent of trucks in this category received a suitability score of 1 or 2 and have operational characteristics that are suitable for electrification.

Figure D-6 - BEV Suitability, Class 4-7

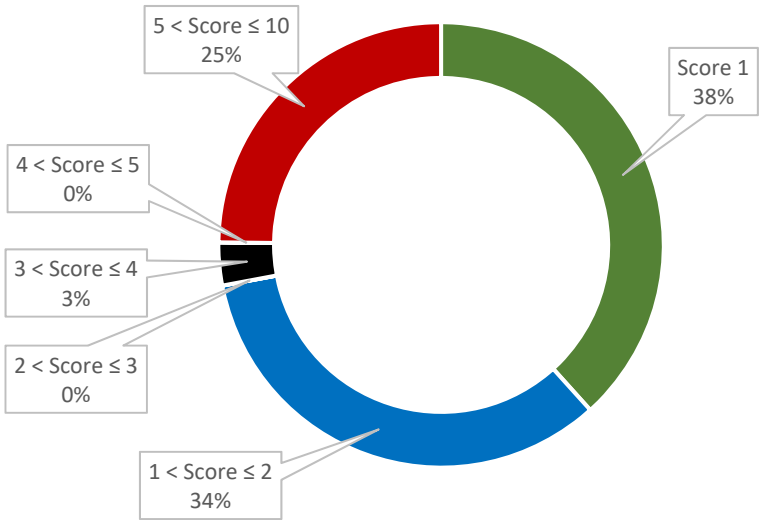
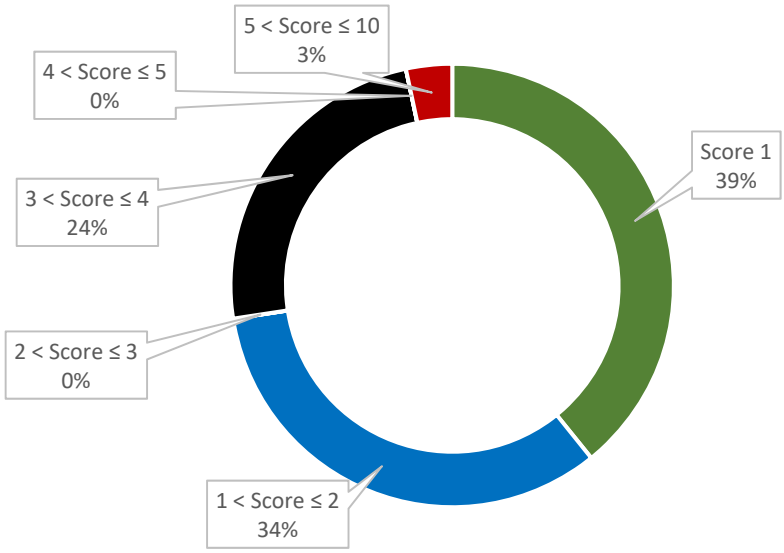
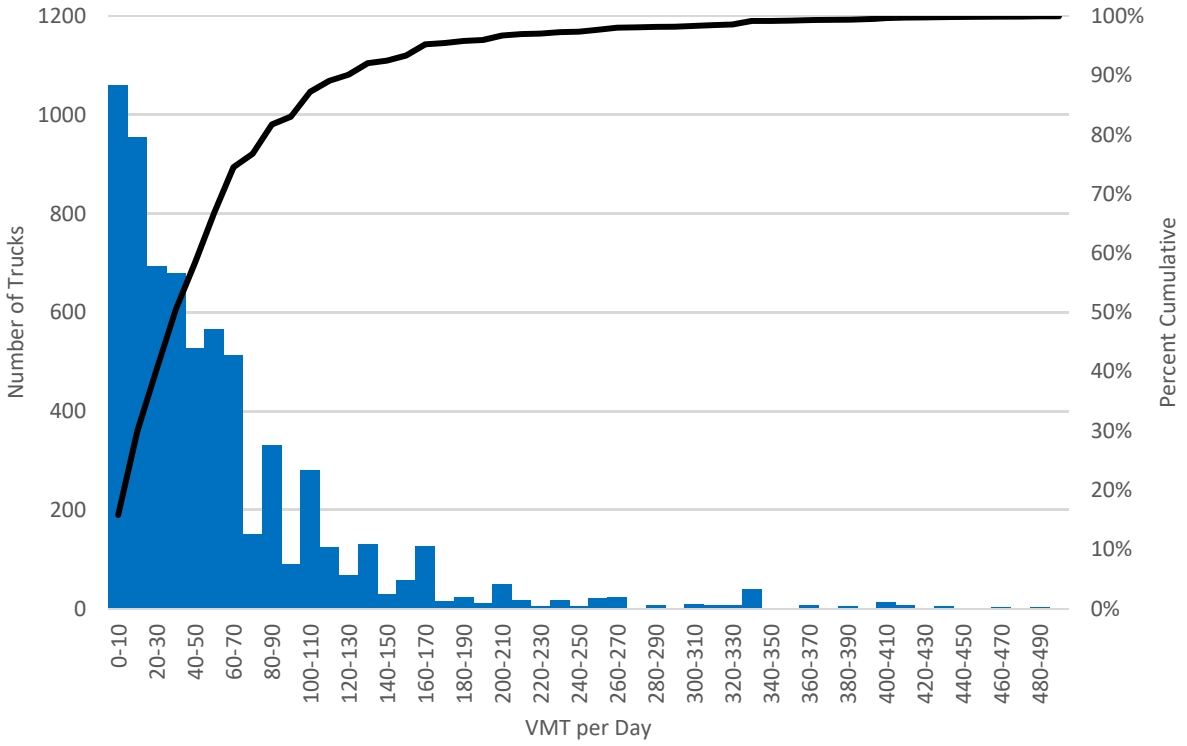


Figure D-7 - FCEV Suitability, Class 4-7



Vehicles in this segment are typically incomplete vehicles (such as cutaway van chassis) used by second stage manufacturers to customize the vehicles' utility to the individual needs of the customer. The California VIUS identifies that more than 80 percent of vehicles in these classes accrue less than 100 daily VMT. The results of the California VIUS is shown in Figure D-8. The US VIUS corroborates this finding and data collected indicates that almost 90 percent of vehicles in these weight categories accrue less than 100 daily VMT.

Figure D-8 - Distribution of VMT per Day, Class 4-7, California VIUS



Class 4-7 represents the segment with highest percentage of vehicles that are suitable for electrification. Centralized deployment, short, predictable routes and the flexibility to accommodate the weight and size of ZE powertrains cause this segment to stand out. These characteristics are reflected in the numerous ZEV options readily available on the market to replace existing conventional vehicles.

c. Class 8 (GVWR >33,000 lbs.)

Class 8 represents nearly 7,600 annual sales in California and consists of large tractors and some vocational vehicles. The results of the market segment analysis are shown in Figure D-9 and Figure D-10. The figures show that about 30 percent of trucks in this category received a suitability score of 1 or 2 and have operational characteristics that are potentially suitable for electrification.

Figure D-9 - BEV Suitability Distribution, Class 8

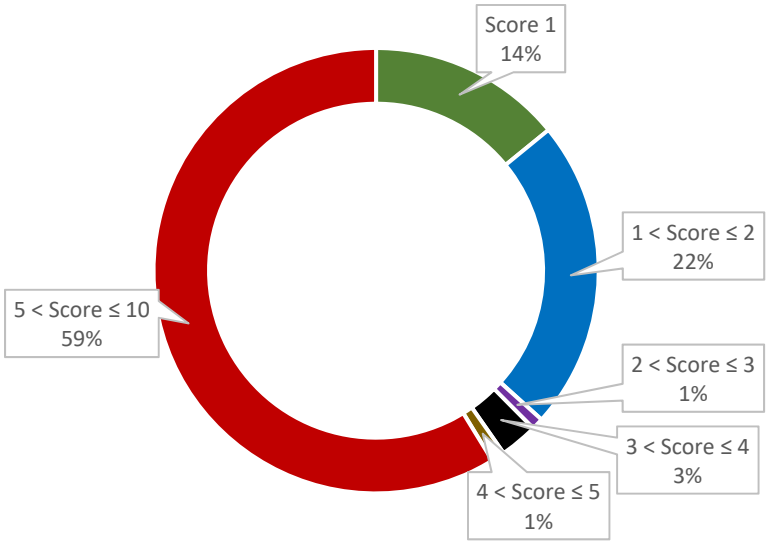
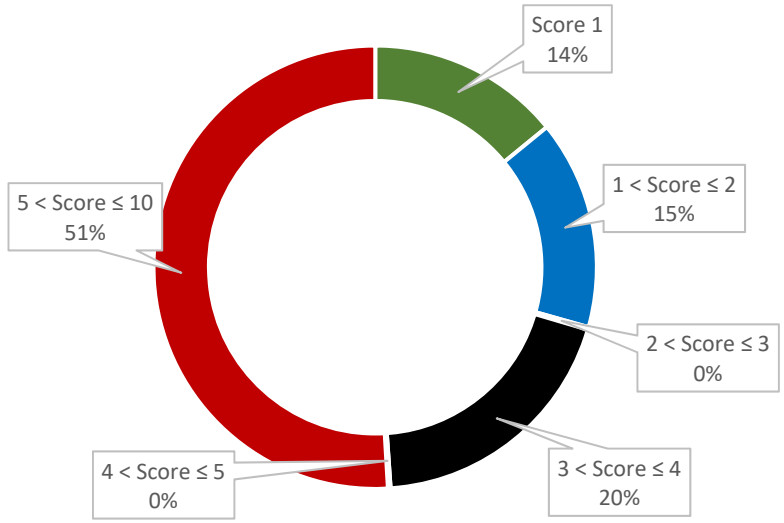
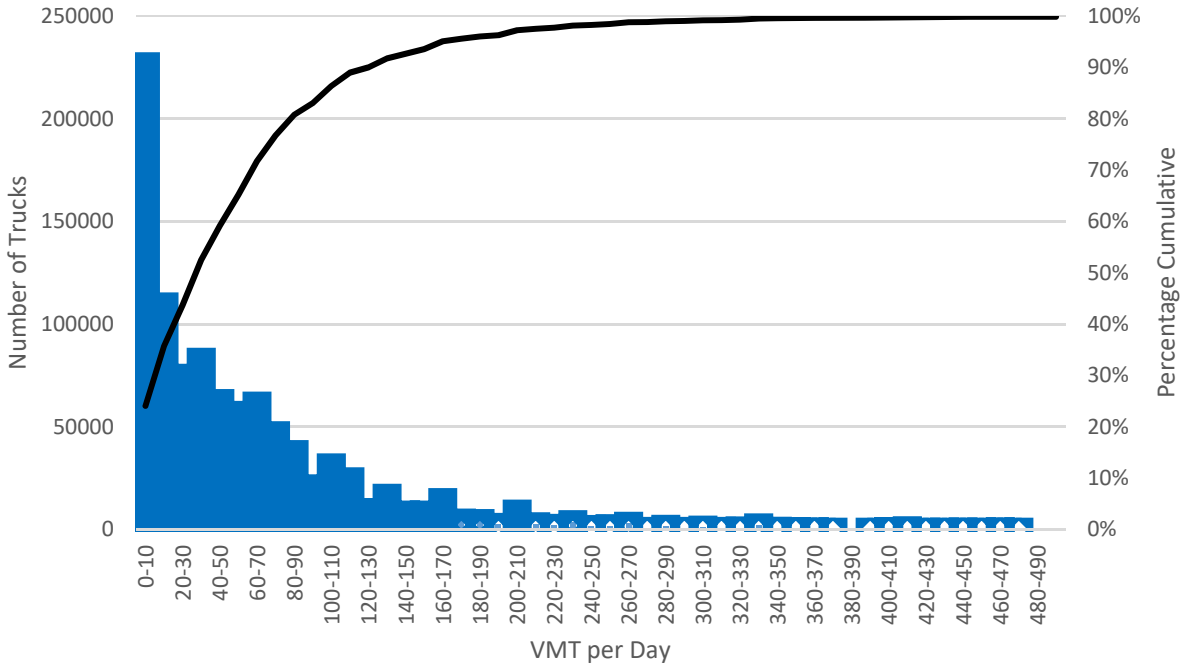


Figure D-10 - FCEV Suitability Distribution, Class 8



The US VIUS indicates that around 80 percent of the Class 8 population accrue less than 100 VMT. The results of the US VIUS is shown in Figure D-11.

Figure D-11 - Distribution of VMT per Day, Class 8, US VIUS



Vehicles in this market segment are operated in a variety of uses, ranging from a good to poor potential for electrification.

Vehicles in Class 8 are generally characterized by heavy loads, long and unpredictable routes, but many also operate short and predictable routes from centralized locations. Some examples include yard tractors and short-haul on-road tractors used for local delivery and drayage operations. Long-haul ZEVs are not expected to offer one-to-one replacements for conventional vehicles for some time due to limited at present. Class 8

E. Advanced Clean Truck Market Segment Analysis

1. Battery Electric Vehicle Suitability Table

Table E-1 - Battery Electric Vehicle Suitability Table

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
1	3.75	**Beverage Tractor**	8	123	I	Start at max load, diminish throughout day (Value=1)	Fixed, 100 miles per day (Value=3)	Centralized, at night (Value=1)	Constrained (Value=10)
2	1.5	**School Bus - Class C (Longer Rural Routes)**	4-7	87	C or I	Light (Value=1)	125 miles per day (Value=3)	Centralized, at night and during the day (Value=1)	Open (Value=1)
3	1	**School Bus - Class C (Shorter Urban Routes)**	4-7	608	C or I	Light (Value=1)	<75 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
4	1	**School Bus - Class C (Special Needs - ADA)**	4-7	87	C or I	Light (Value=1)	50-150 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
5	1.5	**School Bus - Class C (Long distance - Field Trip, special Events - just a bus)**	4-7	87	C or I	Light (Value=1)	125 miles per day Multiple uses, fixed and flexible routes (Value=3)	Centralized, at night and during the day (Value=1)	Open (Value=1)
6	1	**School Bus - Class Rear Engine (Transit Style) All**	4-7	226	C or I	Light to medium. Higher capacity. (Value=1)	Varied Occassional use on long routes (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
7	2	**Refuse, Automatic Side Loader (ASL), Residential Service**	8	400	I	Start light, end day at max load (Value=3)	Fixed, 75 miles per day. Occasional long routes (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)
8	2	**Refuse, Front Loader, Commercial or High Density Residential Service**	8	65	I	Start light, end day at max load (Value=3)	Fixed, 100 miles per day. Occasional long routes (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)
9	2	**Refuse, Rear Packer, Residential Service**	8	133	I	Start light, end day at max load (Value=3)	Fixed, 75 miles per day. Occasional long routes (Value=1)	Centralized, at night (Value=1)	Constrained

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
10	2.5	**Refuse Hauler (roll on/roll off)**	8	65	I	50% laden, 50% unladen, highly variable from lightly loaded to grossed out. (Value=3)	Variable, up to 250 miles per day (Value=3)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)
11	1	**Step Van - Parcel Delivery**	4-7	1985	I	Light (Value=1)	Fixed, 50 miles per day (Value=1)	Centralized, at night (Value=1)	Open (Value=1)
12	1	**Step Van - Municipal Fleet**	4-7	298	I	Can be heavy (like electrician or plumber) (Value=1)	Can be highly variable, local some days potentially to many sites around municipality in same day (Value=1)	Centralized, at night Can have a need for emergency service (e.g., storms) that force long drives and long hours away from charging (Value=1)	Open (Value=1)
13	1.5	**H-D Van - Parcel Delivery Class 2B-3)**	2B-3	951	I	Light (Value=1)	50-300 miles per day, Medium route variability (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
14	1.5	**H-D Van - Parcel Delivery (Class 4,5)**	4-7	1985	I	Light (Value=1)	50-300 miles per day, Medium route variability (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)
15	2	**H-D Van - Contractor**	2B-3	11854	C	Heavy (Value=1)	50-150 miles per day, High route variability (Value=1)	Some central dispatch, many go with driver o/n (Value=3)	Constrained (Value=3)
16	1	**H-D Van - Shuttle**	2B-3	1116	I	Light (Value=1)	50-300 miles per day, Medium route variability (Value=1)	Centralized, but 24/7 operation (Value=1)	Open (Value=1)
17	2	**H-D Van - Refrigerated**	2B-3	70	I	Heavy (Value=1)	200-300 miles per day. Refrigeration reduces range, High route variability (Value=3)	Centralized, at night (Value=1)	Constrained (Value=3)
18	1	**H-D Van - School Bus**	2B-3	70	I	Light (Value=1)	65 miles per day, Low route variability (Value=1)	Centralized, at night (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
19	6	**H-D Van - Motor Home**	2B-3	29	I	Heavy (Value=1)	300-450 miles per day, High route variability (Value=10)	Dispersed, or infrastructure dependent (Value=10)	Constrained (Value=3)
20	1	**Box Truck - Pickup & Delivery (Fixed Light <100 Miles per Day)**	4-7	3075	I	Light (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
21	2	**Box Truck - Pickup & Delivery (Medium to Heavy Load >100 Miles per Day)**	4-7	1538	I	Medium to heavy (Value=3)	Variable >100 miles per day (Value=3)	Centralized (Value=1)	Open (Value=1)
22	6	**Box Truck - Pickup & Delivery (Medium to Heavy Load >200 Miles per Day)**	4-7	1538	I	Medium to heavy (Value=10)	Variable >200 miles per day (Value=10)	Centralized or remote (Value=3)	Open (Value=1)
23	1.5	**Box Truck - Leasing (Daily Rental)**	4-7	152	I	Light (Value=1)	Variable <100 miles per day (Value=1)	Centralized or remote (Value=3)	Open (Value=1)
24	1	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	228	I	Light to medium (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
25	1	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	228	I	Medium to heavy (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
26	2	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	76	I	Medium to heavy (Value=3)	Variable >100 miles per day (Value=3)	Centralized (Value=1)	Open (Value=1)
27	3.75	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	76	I	Medium to heavy GVWR limited (Value=3)	Variable >200 miles per day (Value=10)	Centralized (Value=1)	Open (Value=1)
28	1	**Straight Truck Pickup & Delivery (Heavy Load >100 Miles per Day)**	8	1069	I	Heavy (Value=1)	Variable >100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
29	1.5	**Box Truck - Refrigerated**	4-7	390	I	Medium to heavy load (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Constrained if equipped with diesel TRU (Value=3)
30	1	**Flatbed - Stake/Platform**	4-7	370	I	Variable (Value=1)	Variable (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
31	1.5	**Regional Tractor - Short Haul**	4-7	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)
32	1.5	**Regional Tractor - Short Haul**	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)
33	2	**Regional Tractor - Medium Haul**	4-7	200	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=3)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
34	2	**Regional Tractor - Medium Haul**	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=3)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
35	8.25	**Regional Tractor - Long Haul**	4-7	100	C	Variable (Value=3)	Variable, >200 miles per day (Value=10)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained - short wheelbase, fairings (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
36	8.25	**Regional Tractor - Long Haul**	8	300	C	Heavy (Value=3)	Variable, 200-500+ miles per day (Value=10)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained (Value=10)
37	2	**Port Drayage**	8	120	C	Heavy (Value=1)	Variable, 100-500 miles per day (Value=1)	Variable / Centralized, depending on owner. Multiple shift operations impact charging times (Value=3)	Constrained - short wheelbase (Value=3)
38	3	**Pickup Truck - Agriculture**	2B-3	500	C or I	Variable--dependent on type of agriculture. (Value=3)	Assume set routes, <100 miles per day, may have extended idling. Likely extended operation (Value=3)	Centralized (Value=3)	Constrained (Value=3)
39	5.5	**Pickup Truck - Contractor**	2B-3	5000	C or I	Moderate to heavy (Value=1)	Variable (Value=1)	Variable (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
40	6	**Pickup Truck - Towing**	2B-3	3000	C or I	Heavy (Value=1)	Variable--expect several will have long distance (~500 mile) routes. Towing will significantly shorten available EV range. (Value=3)	Variable (Value=10)	Constrained (Value=10)
41	5.5	**Pickup Truck - 4WD Off Road**	2B-3	5000	C or I	Light to moderate (Value=1)	Variable--expect some will have long distance routes. (Value=1)	Variable--off road usage will likely be away from EV grid. Off-highway usage and extended operation will make charging impossible for extended offroad operation. (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
42	5.5	**Pickup Truck - PTO Equipped**	2B-3	1500	C or I	Moderate to heavy (Value=1)	Assume set routes, <100 miles per day, may have extended idling. (Value=1)	Variable (Value=10)	Constrained (Value=10)
43	7.75	**Line Haul Tractor**	4-7	500	C	Heavy (Value=10)	Variable; 500+ mile days (Value=10)	Variable (Value=10)	Open (Value=1)
44	7.75	**Line Haul Tractor**	8	3000	C	Heavy (Value=10)	Variable; 500+ mile days (Value=10)	Variable (Value=10)	Open (Value=1)
45	10	**Logging**	8	5	C	Heavy (Value=10)	Variable (Value=10)	Variable, Long off-road travel (Value=10)	Constrained, ground clearance (Value=10)
46	7.75	**Concrete Mixer**	8	70	I	Typically 50% empty, 5-% grossed out (Value=10)	Highly variable (Value=10)	Centralized, at night (Value=1)	Highly constrained due to body equipment and weight (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
47	10	**Concrete Pumper**	8	37	I	Due to weight of pumping equipment the vehicle is always heavily loaded (Value=10)	Highly variable (Value=10)	Vehicle may remain at construction site for multiple days (Value=10)	Highly constrained (Value=10)
48	4.25	**Mining Hauler**	8	15	I	Heavy (Value=10)	Fixed (Value=1)	Centralized; Long off-road travel (Value=3)	Constrained (Value=3)
49	4.75	**Mining Service**	8	15	C	Medium – fixed (Value=3)	Variable (Value=10)	Centralized; Long off-road travel (Value=3)	Constrained, due to body (Value=3)
50	7.75	**Heavy Equipment Transport**	8	110	C	Heavy (Value=10)	Variable (Value=10)	Variable (Value=10)	Open (Value=1)
51	1.5	**Utility/Lube Service**	4-7	76	I	Can be heavy (like electrician or plumber) (Value=1)	Can be highly variable, local some days potentially to many sites around municipality in same day (Value=1)	Centralized, at night Can have a need for emergency service (e.g., storms) (Value=3)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
52	10	**Oil Field Rig Mover**	8	14	C	Extremely high (Value=10)	Highly variable (Value=10)	May be enroute/onsite multiple days (Value=10)	
53	10	**Oil Field Well Servicing**	8	110	I	Always loaded at or near GVWR (Value=10)	Highly variable (Value=10)	Mixed locations, could need to charge during peak times Many of these vehicles are for off-road use only. (Value=10)	Constrained (Value=10)
54	1.5	**Tow/Wrecker**	4-7	250	I	Variable (Value=1)	Variable, <100 miles per day (Value=1)	Centralized when not in use (Value=1)	Constrained. Need space for bed/hoist and hydraulic mechanisms between the frame rails where batteries would be installed (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
55	1.5	**Farm Service - Truck**	2B-3	119	I	Heavy (almost like a dump truck) May be restricted on weight due to heavy produce and need to operate in ag fields (Value=1)	Fixed, but can be long distance from farm to city (Value=1)	Centralized but in rural area at night (Value=3)	Open (Value=1)
56	6.5	**Farm Service - Tractor**	8	90	C	Heavy (almost like a dump truck) May be restricted on weight due to heavy produce and need to operate in ag fields (Value=10)	Fixed, but can be long distance from farm to city (Value=3)	Centralized but in rural area at night (Value=3)	Constrained (short wheelbase) (Value=10)
57	4.25	**Tanker Truck - Liquids or Gases**	8	44	I	Start at max load, may diminish throughout day (Value=3)	Fixed, but can be long distance from depot to destination (Value=3)	Centralized, at night (Value=1)	Constrained due to effort to maximize payload (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
58	8.25	**Car Carrier - Class 8**	8	123	I	High (Value=10)	Variable (Value=10)	Variable (Value=10)	Constrained (Value=3)
59	1.5	**Car Carrier - Class 6/7 (Roll Back)**	4-7	150	I	Variable (Value=1)	Variable, local (Value=1)	Centralized Variable origin and destination pairs (Value=1)	Constrained (Value=3)
60	3.75	**Utility Service - Private (Class 8)**	8	87	I				
61	3.75	**Utility Service - Private (Class 6-7)**	4-7	143	I	High (Value=1)	Variable (Value=1)	Variable + remote Extended operation off road (Value=10)	Constrained (Value=3)
62	3.75	**Utility Service - Private Trouble Truck (Class 4-5)**	4-7	277	I	Medium to heavy (Value=1)	Variable (Value=1)	Variable + remote Extended remote operation (Value=10)	Constrained (Value=3)
63	2	**Utility Service - Public (Class 8)**	8	87	I				
64	2	**Utility Service - Public (Class 6-7)**	4-7	143	I	High (Value=1)	Variable (Value=1)	Variable Extended operation off road (Value=3)	Constrained (Value=3)
65	2	**Utility Service - Public (Class 4-5)**	4-7	277	I	Medium to heavy (Value=1)	Variable (Value=1)	Variable Extended remote operation (Value=3)	Constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
66	6	**Recreational Vehicle**	4-7	2500	I	Variable (Value=3)	Expected long distance routes (Value=10)	Non-centralized (Value=10)	Open (Value=1)
67	1	**Airport Service**	2B-3	1167	I	Light (Value=1)	Set routes, <100 miles per day (Value=1)	Centralized, Close proximity to charging infrastructure (Value=1)	Open (Value=1)
68	5.5	**Rail Service**	2B-3	100	I	Light (Value=1)	Expected long distance routes (Value=10)	Centralized (Value=1)	Constrained. Need physical space to mount rail wheels, lift mechanism, and upfitter body. (Value=10)
69	1	**Shuttle Bus**	4-7	331	I	Variable, light (Value=1)	Fixed <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
70	1.5	**Armored Car**	4-7	100	I	Variable (depends on drop-off or pick-up work) (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained. Armor plating and security defenses would take up underbody battery storage opportunities (Value=3)
71	3.25	**Mobile Laboratory**	4-7	81	I	Variable (depends on use requirements) (Value=1)	Variable, <100 miles per day (Value=1)	No central charging available when in use Occasional use on long routes and dependent on deployment needs (Value=10)	Open (Value=1)
72	8.25	**Digger Derrick**	4-7	52	I	High (Value=10)	Variable (Value=10)	Extended operation off road (Value=10)	Constrained (Value=3)
73	6	**Construction Dump**	8	342	I	50% laden (typically to GVWR), 50% unladen (Value=10)	Highly variable, but typically 150-250 miles per day (Value=10)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
74	1.5	**Municipal Dump**	4-7	44	I	50% laden, 50% unladen, mixed light to heavy (Value=1)	Variable, 50 miles per day (Value=1)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)
75	1.5	**Yard Tractor - Purpose Built (Warehouse/Rail)**	8	84	C or I	Heavy (65K - 85K lbs). Light-duty cycle. Load on/load off (Value=1)	<100 miles per day, <1 route (Predictable), 8-10 hours per day Accessory loads: high heating and cooling requirements, hydraulics to raise and lower 5th wheel	Centralized, at night and during the day (Value=1)	Constrained, for shorter wheelbase (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
76	2	**Yard Tractor - Purpose Built (Port)**	8	21	C or I	Heavy (120K 0 140K lbs.). Load on/Load off (Value=1)	<200 miles per day, 1-2 mile routes (predictable), >10 hours per day Accessory loads: high heating and cooling requirements, hydraulics to raise and lower 5th wheel (Value=1)	Opportunity charging but port dependent. May need to remove from fleet for charging. Constrained for port applications due to hours of operation (Value=3)	Constrained for shorter wheelbase. (Value=3)
77	3.75	**Mobile Command Center**	4-7	27	I	Moderate heavy fixed load (Value=1)	Mostly short, unpredictable (mission dependent) (Value=1)	Generally centralized, may need to be charged while on mission; there may not be enough time for recharge between missions (Value=10)	Somewhat constrained (Value=3)
78	5.5	**H-D Van - Emergency**	2B-3	223	I	Heavy (Value=1)	50-150 miles per day, High route variability (Value=1)	Dispersed, or infrastructure dependent (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
79	5.5	**Ambulance**	4-7	128	I	Light (Value=1)	Mostly short, unpredictable (mission dependent) (Value=1)	Centralized, opportunity charging when possible; need to be fully charged and ready with no notice (e.g., conventional vehicles have quick disconnect air hoses to keep air brake tanks full, and similar would be required for electrical); there may not be enough time for recharge between missions	Constrained (due to equipment installation) (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
80	8.25	**Fire Truck**	8	159	I	Start at high/max load, may diminish slightly throughout day (Value=3)	Mostly short, unpredictable (mission dependent). May be fueled by wet hose when operating continuously at a fire site. (Value=10)	Centralized, opportunity charging when possible; need to be fully charged and ready with no notice (e.g., conventional vehicles have quick disconnect air hoses to keep air brake tanks full, and similar would be required for electrical); there may not be enough time for recharge between missions (Value=10)	Constrained (due to equipment installation) (Value=10)
81	6	**Snow Plow**	8	92	I	Start at max load, diminish throughout day (Value=1)	varied, unpredictable (weather dependent) (Value=3)	Centralized, opportunity charging when possible; there may not be enough time for recharge between missions	Constrained (due to equipment installation) (Value=10)
82	1.5	**Crane**	4-7	100	I	Light (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
83	1.5	**Dump**	4-7	200	I	Variable (depends on use requirements) (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
84	1.5	**Refuse/Recycling**	4-7	200	I	Start light, end day at max load (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
85	1.5	**Shredder**	4-7	100	I	Start light, end day at max load (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
86	3.75	**Pickup Truck - Personal Use**	2B-3	38000	C	Moderate Limited cargo carrying capacity to offset battery pack weights. Most people upgrade to the class 2b-3 pickup over a class 2a pickup for either load carrying or towing needs. (Value=1)	Variable; Towing will significantly shorten available EV range. (Value=3)	Centralized charging at residence/business (Value=1)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
87	1.5	**H-D Van - Passenger**	2B-3	6198	C	Light (Value=1)	Variable (Value=1)	Centralized charging at residence/business (Value=1)	Constrained (Value=3)

Table E-2 - California Sales per Battery Electric Vehicle Suitability Score

Class	Score 1	1 < Score ≤ 2	3 < Score ≤ 4	4 < Score ≤ 5	5 < Score ≤ 10	All
2B-3	2,353	19,192	38,000	0	14,852	74,897
4-7	7,436	6,555	604	0	4,818	19,413
8	1,069	1,710	210	74	4,452	7,580
Total	10,858	27,457	38,814	74	24,122	101,890

2. Fuel Cell Electric Vehicle Suitability Table

Table E-3 - Fuel Cell Electric Vehicle Suitability Table

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Fueling Infrastructure	Vehicle Space Constraints
1	3.25	**Beverage Tractor**	8	123	I	Start at max load, diminish throughout day (Value=1)	Fixed, 100 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained (Value=10)
2	1	**School Bus - Class C (Longer Rural Routes)**	4-7	87	C or I	Light (Value=1)	125 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
3	1	**School Bus - Class C (Shorter Urban Routes)**	4-7	608	C or I	Light (Value=1)	<75 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
4	1	**School Bus - Class C (Special Needs - ADA)**	4-7	87	C or I	Light (Value=1)	50-150 miles per day (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
5	1	**School Bus - Class C (Long distance - Field Trip, special Events - just a bus)**	4-7	87	C or I	Light (Value=1)	125 miles per day Multiple uses, fixed and flexible routes (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
6	1	**School Bus - Class Rear Engine (Transit Style) All**	4-7	226	C or I	Light to medium. Higher capacity. (Value=1)	Varied Occassional use on long routes (Value=1)	Centralized, at night and during the day (Value=1)	Open (Value=1)
7	3.75	**Refuse, Automatic Side Loader (ASL), Residential Service**	8	400	I	Start light, end day at max load (Value=3)	Fixed, 75 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained (Value=10)
8	3.75	**Refuse, Front Loader, Commercial or High Density Residential Service**	8	65	I	Start light, end day at max load (Value=3)	Fixed, 100 miles per day. Occasional long routes (Value=1)	Centralized, at night (Value=1)	Constrained (Value=10)
9	3.75	**Refuse, Rear Packer, Residential Service**	8	133	I	Start light, end day at max load (Value=3)	Fixed, 75 miles per day. Occasional long routes (Value=1)	Centralized, at night (Value=1)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
10	2	**Refuse Hauler (roll on/roll off)**	8	65	I	50% laden, 50% unladen, highly variable from lightly loaded to grossed out. (Value=3)	Variable, up to 250 miles per day (Value=1)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)
11	1	**Step Van - Parcel Delivery**	4-7	1985	I	Light (Value=1)	Fixed, 50 miles per day (Value=1)	Centralized, at night (Value=1)	Open (Value=1)
12	1	**Step Van - Municipal Fleet**	4-7	298	I	Can be heavy (like electrician or plumber) (Value=1)	Can be highly variable, local some days potentially to many sites around municipality in same day (Value=1)	Centralized, at night Can have a need for emergency service (e.g., storms) that force long drives and long hours away from charging (Value=1)	Open (Value=1)
13	1.5	**H-D Van - Parcel Delivery Class 2B-3)**	2B-3	951	I	Light (Value=1)	50-300 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)
14	1.5	**H-D Van - Parcel Delivery (Class 4,5)**	4-7	1985	I	Light (Value=1)	50-300 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
15	2	**H-D Van - Contractor**	2B-3	11854	C	Heavy (Value=1)	50-150 miles per day (Value=1)	Some central dispatch, many go with driver o/n (Value=3)	Constrained (Value=3)
16	1	**H-D Van - Shuttle**	2B-3	1116	I	Light (Value=1)	50-300 miles per day (Value=1)	Centralized, but 24/7 operation (Value=1)	Open (Value=1)
17	1.5	**H-D Van - Refrigerated**	2B-3	70	I	Heavy (Value=1)	200-300 miles per day. Refrigeration reduces range (Value=1)	Centralized, at night (Value=1)	Constrained (Value=3)
18	1	**H-D Van - School Bus**	2B-3	70	I	Light (Value=1)	65 miles per day (Value=1)	Centralized, at night (Value=1)	Open (Value=1)
19	3.75	**H-D Van - Motor Home**	2B-3	29	I	Heavy (Value=1)	300-450 miles per day (Value=1)	Dispersed, or infrastructure dependent (Value=10)	Constrained (Value=3)
20	1	**Box Truck - Pickup & Delivery (Fixed Light <100 Miles per Day)**	4-7	3075	I	Light (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
21	1.5	**Box Truck - Pickup & Delivery (Medium to Heavy Load >100 Miles per Day)**	4-7	1538	I	Medium to heavy (Value=3)	Variable >100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
22	3.75	**Box Truck - Pickup & Delivery (Medium to Heavy Load >200 Miles per Day)**	4-7	1538	I	Medium to heavy (Value=10)	Variable >200 miles per day (Value=1)	Centralized or remote (Value=3)	Open (Value=1)
23	1.5	**Box Truck - Leasing (Daily Rental)**	4-7	152	I	Light (Value=1)	Variable <100 miles per day (Value=1)	Centralized or remote (Value=3)	Open (Value=1)
24	1	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	228	I	Light to medium (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
25	1	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	228	I	Medium to heavy (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
26	1.5	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	76	I	Medium to heavy (Value=3)	Variable >100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
27	1.5	**Box Truck - Leasing (Fixed Customer and Application)**	4-7	76	I	Medium to heavy GVWR limited (Value=3)	Variable >200 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
28	1	**Straight Truck Pickup & Delivery (Heavy Load >100 Miles per Day)**	8	1069	I	Heavy (Value=1)	Variable >100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)
29	1.5	**Box Truck - Refrigerated**	4-7	390	I	Medium to heavy load (Value=1)	Variable <100 miles per day (Value=1)	Centralized (Value=1)	Constrained if equipped with diesel TRU (Value=3)
30	1	**Flatbed - Stake/Platform**	4-7	370	I	Variable (Value=1)	Variable (Value=1)	Centralized (Value=1)	Open (Value=1)
31	1.5	**Regional Tractor - Short Haul**	4-7	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)
32	1.5	**Regional Tractor - Short Haul**	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained - short wheelbase (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
33	1.5	**Regional Tractor - Medium Haul**	4-7	200	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
34	1.5	**Regional Tractor - Medium Haul**	8	400	C	Variable, up to 80K GCW (Value=1)	Variable, 100-300 miles per day (Value=1)	Centralized, at night. Multiple shift operations impact charging times (Value=1)	Constrained, short wheelbase (Value=3)
35	6	**Regional Tractor - Long Haul**	4-7	100	C	Variable (Value=3)	Variable, >200 miles per day (Value=1)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained - short wheelbase, fairings (Value=10)
36	6	**Regional Tractor - Long Haul**	8	300	C	Heavy (Value=3)	Variable, 200-500+ miles per day (Value=1)	Future retail charging network? Multiple shift operations impact charging times (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
37	2	**Port Drayage**	8	120	C	Heavy (Value=1)	Variable, 100-500 miles per day (Value=1)	Variable / Centralized, depending on owner. Multiple shift operations impact charging times (Value=3)	Constrained - short wheelbase (Value=3)
38	2	**Pickup Truck - Agriculture**	2B-3	500	C or I	Variable-- dependent on type of agriculture. (Value=3)	Assume set routes, <100 miles per day, may have extended idling. Likely extended operation (Value=1)	Centralized (Value=1)	Constrained (Value=3)
39	3.75	**Pickup Truck - Contractor**	2B-3	5000	C or I	Moderate to heavy (Value=1)	Variable (Value=1)	Variable (Value=3)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
40	3.75	**Pickup Truck - Towing**	2B-3	3000	C or I	Heavy (Value=1)	Variable--expect several will have long distance (~500 mile) routes. Towing will significantly shorten available EV range. (Value=1)	Variable (Value=3)	Constrained (Value=10)
41	5.5	**Pickup Truck - 4WD Off Road**	2B-3	5000	C or I	Light to moderate (Value=1)	Variable--expect some will have long distance routes. (Value=1)	Variable--off road usage will likely be away from EV grid. Off-highway usage and extended operation will make charging impossible for extended offroad operation. (Value=10)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
42	3.75	**Pickup Truck - PTO Equipped**	2B-3	1500	C or I	Moderate to heavy (Value=1)	Assume set routes, <100 miles per day, may have extended idling. (Value=1)	Variable (Value=3)	Constrained (Value=10)
43	5.5	**Line Haul Tractor**	4-7	500	C	Heavy (Value=10)	Variable; 500+ mile days (Value=1)	Variable (Value=10)	Open (Value=1)
44	5.5	**Line Haul Tractor**	8	3000	C	Heavy (Value=10)	Variable; 500+ mile days (Value=1)	Variable (Value=10)	Open (Value=1)
45	7.75	**Logging**	8	5	C	Heavy (Value=10)	Variable (Value=1)	Variable, Long off-road travel (Value=10)	Constrained, ground clearance (Value=10)
46	5.5	**Concrete Mixer**	8	70	I	Typically 50% empty, 5-% grossed out (Value=10)	Highly variable (Value=1)	Centralized, at night (Value=1)	Highly constrained due to body equipment and weight (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
47	7.75	**Concrete Pumper**	8	37	I	Due to weight of pumping equipment the vehicle is always heavily loaded (Value=10)	Highly variable (Value=1)	Vehicle may remain at construction site for multiple days (Value=10)	Highly constrained (Value=10)
48	4.25	**Mining Hauler**	8	15	I	Heavy (Value=10)	Fixed (Value=1)	Centralized; Long off-road travel (Value=3)	Constrained (Value=3)
49	2.5	**Mining Service**	8	15	C	Medium – fixed (Value=3)	Variable (Value=1)	Centralized; Long off-road travel (Value=3)	Constrained, due to body (Value=3)
50	5.5	**Heavy Equipment Transport**	8	110	C	Heavy (Value=10)	Variable (Value=1)	Variable (Value=10)	Open (Value=1)
51	1.5	**Utility/Lube Service**	4-7	76	I	Can be heavy (like electrician or plumber) (Value=1)	Can be highly variable, local some days potentially to many sites around municipality in same day (Value=1)	Centralized, at night Can have a need for emergency service (e.g., storms) (Value=3)	Open (Value=1)
52	7	**Oil Field Rig Mover**	8	14	C	Extremely high (Value=10)	Highly variable (Value=1)	May be enroute/onsite multiple days (Value=10)	

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
53	7.75	**Oil Field Well Servicing**	8	110	I	Always loaded at or near GVWR (Value=10)	Highly variable (Value=1)	Mixed locations, could need to charge during peak times Many of these vehicles are for off-road use only. (Value=10)	Constrained (Value=10)
54	1.5	**Tow/Wrecker**	4-7	250	I	Variable (Value=1)	Variable, <100 miles per day (Value=1)	Centralized when not in use (Value=1)	Constrained. Need space for bed/hoist and hydraulic mechanisms between the frame rails where batteries would be installed (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
55	1	**Farm Service - Truck**	2B-3	119	I	Heavy (almost like a dump truck) May be restricted on weight due to heavy produce and need to operate in ag fields (Value=1)	Fixed, but can be long distance from farm to city (Value=1)	Centralized but in rural area at night (Value=1)	Open (Value=1)
56	5.5	**Farm Service - Tractor**	8	90	C	Heavy (almost like a dump truck) May be restricted on weight due to heavy produce and need to operate in ag fields (Value=10)	Fixed, but can be long distance from farm to city (Value=1)	Centralized but in rural area at night (Value=1)	Constrained (short wheelbase) (Value=10)
57	3.75	**Tanker Truck - Liquids or Gases**	8	44	I	Start at max load, may diminish throughout day (Value=3)	Fixed, but can be long distance from depot to destination (Value=1)	Centralized, at night (Value=1)	Constrained due to effort to maximize payload (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
58	6	**Car Carrier - Class 8**	8	123	I	High (Value=10)	Variable (Value=1)	Variable (Value=10)	Constrained (Value=3)
59	2	**Car Carrier - Class 6/7 (Roll Back)**	4-7	150	I	Variable (Value=1)	Variable, local (Value=1)	Centralized Variable origin and destination pairs (Value=3)	Constrained (Value=3)
60	3.75	**Utility Service - Private (Class 8)**	8	87	I				
61	3.75	**Utility Service - Private (Class 6-7)**	4-7	143	I	High (Value=1)	Variable (Value=1)	Variable + remote Extended operation off road (Value=10)	Constrained (Value=3)
62	3.75	**Utility Service - Private Trouble Truck (Class 4-5)**	4-7	277	I	Medium to heavy (Value=1)	Variable (Value=1)	Variable + remote Extended remote operation (Value=10)	Constrained (Value=3)
63	2	**Utility Service - Public (Class 8)**	8	87	I				
64	2	**Utility Service - Public (Class 6-7)**	4-7	143	I	High (Value=1)	Variable (Value=1)	Variable Extended operation off road (Value=3)	Constrained (Value=3)
65	2	**Utility Service - Public (Class 4-5)**	4-7	277	I	Medium to heavy (Value=1)	Variable (Value=1)	Variable Extended remote operation (Value=3)	Constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
66	3.75	**Recreational Vehicle**	4-7	2500	I	Variable (Value=3)	Expected long distance routes (Value=1)	Non-centralized (Value=10)	Open (Value=1)
67	1	**Airport Service**	2B-3	1167	I	Light (Value=1)	Set routes, <100 miles per day (Value=1)	Centralized, Close proximity to charging infrastructure (Value=1)	Open (Value=1)
68	3.25	**Rail Service**	2B-3	100	I	Light (Value=1)	Expected long distance routes (Value=1)	Centralized (Value=1)	Constrained. Need physical space to mount rail wheels, lift mechanism, and upfitter body. (Value=10)
69	1	**Shuttle Bus**	4-7	331	I	Variable, light (Value=1)	Fixed <100 miles per day (Value=1)	Centralized (Value=1)	Open (Value=1)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
70	1.5	**Armored Car**	4-7	100	I	Variable (depends on drop-off or pick-up work) (Value=1)	Variable, <100 miles per day (Value=1)	Centralized, at night (Value=1)	Constrained. Armor plating and security defenses would take up underbody battery storage opportunities (Value=3)
71	3.25	**Mobile Laboratory**	4-7	81	I	Variable (depends on use requirements) (Value=1)	Variable, <100 miles per day (Value=1)	No central charging available when in use Occasional use on long routes and dependent on deployment needs (Value=10)	Open (Value=1)
72	6	**Digger Derrick**	4-7	52	I	High (Value=10)	Variable (Value=1)	Extended operation off road (Value=10)	Constrained (Value=3)
73	3.75	**Construction Dump**	8	342	I	50% laden (typically to GVWR), 50% unladen (Value=10)	Highly variable, but typically 150-250 miles per day (Value=1)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
74	1.5	**Municipal Dump**	4-7	44	I	50% laden, 50% unladen, mixed light to heavy (Value=1)	Variable, 50 miles per day (Value=1)	Centralized, at night (Value=1)	Somewhat constrained (Value=3)
75	1.5	**Yard Tractor - Purpose Built (Warehouse/Rail)**	8	84	C or I	Heavy (65K - 85K lbs). Light-duty cycle. Load on/load off (Value=1)	<100 miles per day, <1 route (Predictable), 8-10 hours per day (Value=1)	Centralized, at night and during the day (Value=1)	Constrained, for shorter wheelbase (Value=3)
76	3.25	**Yard Tractor - Purpose Built (Port)**	8	21	C or I	Heavy (120K 0 140K lbs.). Load on/Load off (Value=1)	<200 miles per day, 1-2 mile routes (predictable), >10 hours per day (Value=1)	Opportunity charging but port dependent. May need to remove from fleet for charging Constrained for port applications due to hours of operation (Value=1)	Constrained for shorter wheelbase. Constrained for port applications due to hours of operation (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
77	1.5	**Mobile Command Center**	4-7	27	I	Moderate heavy fixed load (Value=1)	Mostly short, unpredictable (mission dependent) (Value=1)	Generally centralized, may need to be charged while on mission; there may not be enough time for recharge between missions (Value=1)	Somewhat constrained (Value=3)
78	3.75	**H-D Van - Emergency**	2B-3	223	I	Heavy (Value=1)	50-150 miles per day (Value=1)	Dispersed, or infrastructure dependent (Value=3)	Constrained (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
79	3.25	**Ambulance**	4-7	128	I	Light (Value=1)	Mostly short, unpredictable (mission dependent) (Value=1)	Centralized, opportunity charging when possible; need to be fully charged and ready with no notice (e.g., conventional vehicles have quick disconnect air hoses to keep air brake tanks full, and similar would be required for electrical); there may not be enough time for recharge between missions (Value=1)	Constrained (due to equipment installation) (Value=10)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
81	3.25	**Snow Plow**	8	92	I	Start at max load, diminish throughout day (Value=1)	varied, unpredictable (weather dependent) (Value=1)	Centralized, opportunity charging when possible; there may not be enough time for recharge between missions (Value=1)	Constrained (due to equipment installation) (Value=10)
82	1.5	**Crane**	4-7	100	I	Light (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
83	1.5	**Dump**	4-7	200	I	Variable (depends on use requirements) (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
84	1.5	**Refuse/Recycling**	4-7	200	I	Start light, end day at max load (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)
85	1.5	**Shredder**	4-7	100	I	Start light, end day at max load (Value=1)	Average <70 miles per day (Value=1)	Centralized (Value=1)	Limited (Value=3)

Index	Quantitative Suitability Score	Market Segment	Class	Annual CA Sales	Complete/ Incomplete	Loading	Routes/Range	Infrastructure/ Charging	Battery Space Constraints
86	3.75	**Pickup Truck - Personal Use**	2B-3	38000	C	Moderate Limited cargo carrying capacity to offset battery pack weights. Most people upgrade to the class 2b-3 pickup over a class 2a pickup for either load carrying or towing needs. (Value=1)	Variable; Towing will significantly shorten available EV range. (Value=1)	Centralized charging at residence/business (Value=3)	Constrained (Value=10)
87	1.5	**H-D Van - Passenger**	2B-3	6198	C	Light (Value=1)	Variable (Value=1)	Centralized charging at residence/business (Value=1)	Constrained (Value=3)

Table E-4 - California Sales per Battery Fuel Cell Electric Vehicle Suitability Score

Class	Score 1	1 < Score ≤ 2	3 < Score ≤ 4	4 < Score ≤ 5	5 < Score ≤ 10	All
2B-3	2,472	19,573	47,852	0	5000	74,897
4-7	7,610	6,484	4,667	0	652	19,413
8	1,069	1,156	1,466	15	3859	7,580
Total	11,151	27,213	53,985	15	9,511	101,890

F. Reference List

The following documents are the technical, theoretical, or empirical studies, reports, or similar documents relied upon in proposing these regulatory amendments, identified as required by Government Code, section 11346.2, subdivision (b)(3). Additionally, each appendix references the documents upon which it relies, as required by Government Code, section 11346.2, subdivision (b)(3).

1. California Air Resources Board. ACT Market Analysis. February 22, 2019. https://ww2.arb.ca.gov/index.php/sites/default/files/2019-02/190225actmarketanalysis.xlsx
2. California Legislature. Assembly Bill No. 2061 Chapter 580. (web link: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB2061)
3. U.S. Census Bureau. 2002 Economic Census Vehicle Inventory and Use Survey Geographic Area Series. (web link: https://www2.census.gov/library/publications/economic-census/2002/vehicle-inventory and-use-survey/ec02tv-us.pdf)

Attachment B

Vermont Low Emissions and Zero Emission Vehicle Rule
Final Proposed Rule
Responsiveness Summary

Table of Contents

Administrative Procedure Act Requirement

This Responsiveness Summary meets the Agency of Natural Resources' (ANR) obligations under the Vermont Administrative Procedure Act to consider fully all written and oral submissions concerning the proposed rule and issue an explanation on why the agency overruled the arguments and considerations against the rule. Specifically, "[w]hen an agency decides in a final proposal to overrule substantial arguments and considerations raised for or against the original proposal or to reject suggestions with respect to separate requirements for small businesses, the final proposal shall include a description of the reasons for the agency's decision." 3 V.S.A. §841(b)(2).

Background and Opportunities for Public Comment

On August 12, 2022, ANR filed the Proposed Rules with the Secretary of State's office. Following the filing, ANR hosted a series of five public events pursuant to its obligations under the Vermont Global Warming Solutions Act (GWSA), 10 V.S.A. §593(c), including an informational meeting on the proposed medium- and heavy-duty truck regulations for stakeholders. ANR also held two public hearings on

September 21 and 23, pursuant to its obligations under the Administrative Procedures Act, 3 V.S.A. §840. Verbal comments were made and recorded at all of the above events and hearings. Audio files of the recordings of the above public events are available from ANR upon request. Written comments were solicited and collected via email, mail, and fax. Written comments were collected from a total of 340 individuals and entities, and are included in this filing.

Written and verbal comments received are categorized below into sections that represent the subject area of the comment received. Due to the volume of comments received and recorded, and the fact that many commenters raised similar or the same arguments and considerations for or against the original proposal, ANR has paraphrased similar comments and provides responses in the following Responsiveness Summary.

Note that many of the public comments received are considered "out of scope" of the regulation. However, ANR, along with its state Agency partners, has responded to these comments in this summary recognizing that they are in the scope of the broader implications of the direct and indirect impacts of the proposed rule on Vermont's transportation fleet and sector.

Acronyms

Advanced Clean Cars II (ACCII)

Advanced Clean Truck (ACT)

Agency of Natural Resources (ANR)

Argonne National Laboratory (ANL)

Capacity, Energy, Loads, and Transmission (CELT)

Clean fuels standard (CFS)

Direct current fast charger (DCFC)

Electric vehicle (EV)

Environmental justice (EJ)

Environmental Protection Agency (EPA)

Fine particulate matter (PM2.5)

Greenhouse gas (GHG)

Global Warming Solutions Act (GWSA)

Gross Vehicle Weight Rating (GVWR)

Internal combustion engine vehicles (ICEVs)

Long-Range Transmission Plan (LRTP)

Near zero emission vehicles (NZEV)

Nitrogen oxide (NOx)

Northeast States for Coordinated Air Use Management (NESCAUM)

Plug-in hybrid vehicles (PHEV)

Social cost of carbon (SC-CO2)

Total cost of ownership (TCO)

Vehicle to Grid (V2G)

Vermont Electric Power Company (VELCO)

Zero emission vehicle (ZEV)

Comments and Responses

General Comments

Comment-G1: The majority of comments received were generally supportive of the rules, as proposed, citing concerns about climate change, air quality, and the benefits of phasing-in/transitioning to electric vehicle technology as a way to mitigate the impacts of climate change and improve air quality, specifically from the transportation sector in Vermont. Many commenters requested that ANR implement the proposed rules as soon as possible. Some commenters, that represent the auto manufacturing industry, commented that their vehicles currently being manufactured are proof that the proposed regulations are achievable. Many commenters feel that transitioning to EVs represents a cost savings when compared to the total cost of ownership of owning a conventional fossil fueled vehicle.

Response-G1: ANR acknowledges these comments. No changes were made in response to these comments.

Comment-G2: Some commenters support the rules as proposed due to their significant positive impact on public health and in protection of the 63,000 Vermont adults and children that suffer from asthma.

Response-G2: ANR acknowledges this comment and agrees that the proposed rule will have a significant positive impact on the health of Vermonters.

Comment-G3: One commenter is concerned that the rules focus too heavily on reducing petroleum use to power motor vehicles, and that there is not enough policy focused on climate change being caused primarily by population growth.

Response-G3: ANR agrees that policies to reduce emissions from the transportation sector cannot be restricted to fuel switching. ANR works with its agency partners including, the Agency of Transportation (VTrans), the Agency of Commerce and Community Development, and the Department of Public Service, to identify and implement policies that increase efficiency of our transportation system and reduce the number of vehicle miles traveled in the state. A focus on coordinating land-use, transportation, and

environmental policy will be critical to ensure emissions continue to go down despite potential increases in population. No changes were made in response to this comment.

Comment-G4: One commenter thinks electrification of transportation should be driven by innovation, research and efficiency, and not regulations and prohibitions.

Response-G4: Historically, the Low and Zero Emission Vehicle rules have been considered "technology forcing", meaning that they require automakers to incorporate emission reduction technology into the vehicles they manufacture to meet air quality goals in the participating states. Overtime, as consumer demand for cleaner vehicles has increased and advancements in battery technology and vehicle efficiency have progressed, automakers have made commitments regarding vehicle production and sales that now mirror ANR's proposed rules. Therefore, ANR regards these proposed rules as a codification of the commitments that automakers have already made, and therefore the rules regarding vehicle electrification are being driven by innovation, research and efficiency. No changes were made in response to this comment.

Comment-G5: Some commenters are concerned that if they purchase a vehicle outside of Vermont, that they won't be able to register it in Vermont.

Response-G5: Since the adoption of this program over 20 years ago, all new motor vehicles up to 14,000 pounds Gross Vehicle Weight Rating (GVWR) must be California certified in order to be registered in Vermont regardless of where they are purchased. Used vehicles – or those not meeting the definition of "new" – can be purchased in or outside of Vermont and registered in Vermont regardless of California certification. Under the proposed rules, the applicability of this requirement expands to cover heavier vehicles; therefore, light-, medium- and heavy-duty vehicles that meet the definition of "new" – having 7,500 miles or less on the odometer – will need to be certified by California in order to be sold and registered in Vermont. Starting with MY2026, new heavy-duty trucks purchased outside of Vermont and subsequently registered must be California certified.

Note that California certified new diesel heavy-duty trucks will continue to be available for sale in Vermont beyond 2035, and California certified new light-duty gasoline vehicles will continue to be available for sale until 2035. California certification is also not required for emergency vehicles, new purchases made by nonresidents prior to establishing Vermont residency, inherited vehicles, vehicles exclusively for off-highway use, and other exempted vehicles listed in Section 5-1103 (b) and (c).

Travel of purchasers to other states is currently taking place for a number of reasons unrelated to whether the vehicle is a zero emission vehicle (ZEV), plug-in hybrid electric vehicle (PHEV), or internal combustion engine vehicle (ICEVs). Buyers may purchase a vehicle over state lines for a number of reasons including convenience (*i.e.*, the closest dealer to the buyer may be located in another state) or to find a specific make, model, or different cost. No changes were made in response to this comment.

Comment-G6: One commenter asserted that other states are declining to adopt similar amendments to their motor vehicle emissions standards.

Response-G6: Eighteen states have adopted motor vehicle emission standards that are more stringent than the federal government's standards. To date, Vermont is joined by California, Massachusetts, New York, Oregon, and Washington in undergoing a rulemaking process to adopt the ACCII amendments. California, Colorado, North Carolina, Massachusetts, New Jersey, New York, Oregon, and Washington have adopted, or are in the process of adopting, the medium- and heavy-duty truck rules. No changes were made in response to this comment.

Comment-G7: One commenter thinks that vehicles delivered pursuant to the proposed rule should be designed to be accessible to all persons.

Response-G7: ANR appreciates this comment and agrees that physical accessibility is important. Physical accessibility requirements of motor vehicles, however, are outside of the scope of this regulation. Standards related to physical accessibility are within the jurisdiction of the Federal Department of Transportation. No changes were made in response to this comment.

Comment-G8: Some commenters note that the language of the rule and statements made in the summary documents indicate that the rules require that individuals and businesses buy electric vehicles (EVs), or in other words, there is a "sales" requirement. This is inconsistent with ANR's statements that this rule only applies to automakers.

Response-G8: The Advanced Clean Cars II (ACCII) regulation imposes requirements on vehicle manufacturers to produce and deliver for sale ZEVs in Vermont, while the Advanced Clean Truck (ACT) regulation imposes requirements on vehicle manufacturers to produce and sell ZEVs in Vermont. Individuals and businesses are not required to purchase electric vehicles under the proposed regulations. Under the ACCII rule, new ICEVs will be available for sale in Vermont until model year 2035 and under the ACT regulation new diesel heavy-duty trucks will continue to be available for sale in Vermont before and after 2035 while providing an increased choice for fleets when making decisions about what vehicle will best suit their needs. The ACT regulation includes flexibility for manufacturers to produce and sell new ZEVs into the market segments they deem to be most suitable for the products they manufacture, ensuring that manufacturers develop competitive ZEV products at price points that will meet fleet needs. Used vehicles are outside of the scope of the rules and used ICEVs will continue to be available for sale in Vermont. Based on this comment, ANR has revised the technical support document, entitled *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules,* and *Regulation Summary Document* to further clarify that the ACCII and ACT regulations impose requirements on vehicle manufacturers and that individuals and businesses are not required to purchase electric vehicles.

Comment-G9: Some commenters are concerned that if a dealer's lot is required to have a certain percentage of zero-emission trucks for sale, when a dealer sells all the diesel trucks on their lot, the ACT regulation would not allow for them to then sell additional diesel trucks if there is a demand for them and, as a result, Vermont businesses needing a truck after the allotment of diesel trucks are sold will be forced to purchase a ZEV.

Response-G9: The above scenario is inaccurate because the ZEV sales structure used under the ACT regulation is comprised of a credit and deficit system that includes flexibility that can be used to avoid

such a scenario. Selling diesel trucks into Vermont generates deficits, while selling ZEVs or NZEVs (near zero emission vehicles) into Vermont generates credits. Credits can be banked and traded, and manufacturers having more deficits than credits in a given model year are provided additional time to comply as they must make up the deficit by the end of the following model year. In addition, the credit and deficit system uses weight class modifiers, which allow for heavier vehicles that produce more emissions to generate more deficits and, as ZEVs, generate more credits. The use of weight class modifiers gives manufacturers flexibility and maintains emissions benefits. A manufacturer also has the option of using credits from a weight class to make up deficits in other weight classes. Also, manufacturers can choose to build ZEVs in one weight class or across all weight classes. No changes were made in response to these comments.

Comment-G10: With the recent setbacks in implementing the Transportation Climate Initiative Program in the Northeast, and the lack of any other clear policy or regulatory tools to achieve certain and significant pollution reductions in the transportation sector, adopting the Rules in a timely fashion is critical to meeting Vermont's emissions requirements.

Response-G10: ANR acknowledges this comment. The adoption of the proposed rules is a cornerstone in the Transportation sector emission reduction strategy in Vermont's Climate Action Plan. Emission reductions expected via the adoption of the proposed rules is included in the technical support document, entitled *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules*. Pursuant to the GWSA, ANR is required to adopt these rules by December 1, 2022.

Comment-G11: Enacting the Rules will reduce the sources of toxic air pollution, providing meaningful benefits to Vermonters.

Response-G11: ANR acknowledges this comment and agrees that the proposed rules will reduce the emission of GHGs and air contaminants and will result in improvements in public health and air quality.

Comment-G12: One commenter requested that ANR adopt a fleet reporting requirement for Advanced Clean Trucks in a subsequent 2023 rulemaking.

Response-G12: ANR considered adding a fleet reporting requirement, as other jurisdictions have done, to better understand the number and size of fleets with five or more vehicles in Vermont. A reporting program of any size requires additional staff resources, as well as administrative tools and information technology (IT) resources. For example, Oregon stood up a reporting program with their ACT rule that required the addition of two full-time employees (FTEs) to their existing staff. Similarly, New Jersey estimates they will need five additional FTEs. Currently, ANR's Mobile Sources Program does not have capacity to implement or manage a reporting requirement. ANR hopes that, with additional resources, a reporting program can be implemented in the future. No changes were made in response to this comment.

Comment-G13: Comments were made requesting that ANR modify the early action credit program in Advanced Clean Trucks to limit it to only one year before the rule is enforced. Conversely, one

commenter requested the rule be revised to allow for automakers to generate early compliance credits as early as model year 2023 under ACT, instead of 2024 as currently proposed.

Response-G13: Early action credits allow EV makers to begin earning compliance credits ahead of the formal regulatory obligation and incentivize accelerated deployment of EVs in the state. As a result, reductions in air pollution and greenhouse gas emissions are realized sooner, which include important benefits for public health and Vermont's climate goals. Additionally, growing the zero-emission truck industry more quickly to large-scale production will help to move costs down the cost curve.
To be consistent with California and incentivize early EV deployment in Vermont, ANR is revising the proposed rule to allow manufacturers to earn early compliance credits starting in model year 2023 under the ACT regulation. Early credits may be earned starting in model year 2021 in California in advance of the 2024 model year start date. Similarly, with this revision, early credits may be earned in model year 2023 in Vermont in advance of the 2026 model year start date. The 2023 start date for early credits in Vermont now reflects the interval between California and Vermont adoptions. This change has been made to Section 40-106(a)(11) of the proposed rule.

Comment-G14: One commenter recommends that Vermont take additional steps beyond this rulemaking, including implementing a clean fuels standard (CFS) and establishing durable and effective EV purchase incentives that includes medium-duty vehicles.

Response-G14: ANR, in coordination with other state agencies and the Vermont Climate Council, continues to investigate the feasibility and cost-effectiveness of other greenhouse gas (GHG) emission reduction policies to compliment the proposed rules. ANR acknowledges that complimentary policies, especially incentive programing for all vehicle weight classes, will be necessary to ensure that vehicles delivered to Vermont are placed in service, and ideally replace a conventional vehicle, to realize the emission reduction benefits outlines in the technical support document. No changes were made in response to this comment.

Comment-G15: One commenter stated that the proposed rules should not be adopted until: at least one half of the member states of Northeast States for Coordinated Air Use Management (NESCAUM) have adopted the rules, the federal government has adopted rules that are the same as ANR's proposed rules, and California has demonstrated that their rules are workable within their electric infrastructure.

Response-G15: Vermont has worked closely with NESCAUM states in adopting and implementing motor vehicle emission standards since the 1990s. All but one of the NESCAUM states, and 18 states in total, have adopted some of California's regulatory programs, and several have already or are currently updating their rules to be consistent with ANR's proposed rules. President Biden's Executive Order (EO) No. 14037, *Strengthening American Leadership in Clean Cars and Trucks*, establishes new federal targets increasing the percentage of all new passenger car and light truck sales that are ZEVs. The EO directs the Environmental Protection Agency (EPA) to coordinate setting standards with California, "as well as other States that are leading the way in reducing vehicle emissions, including by adopting California's standards." This EO is a supportive of California's ZEV standards and the language in the EO suggests that the states adopting California's standards may be better positioned to ensure their state priorities are considered in federal policies. While California has made statements about the feasibility of its rule,

the opportunity for revisions to the proposal will occur during periodic reviews to evaluate rule applicability and feasibility. Vermont will participate in those review opportunities. Further, delay in rules adoption would cause a delay in the modeled air quality and public health benefits that ANR anticipates will result from the proposed rules. No changes were made in response to this comment.

Technology

Comment-T1: The requirements of the rule are being implemented too quickly. There are not enough EVs available (light, medium, or heavy-duty) and not enough charging infrastructure to support EV adoption.

Response-T1: ANR acknowledges that shifting the way in which we power and fuel our modes of transport is a massive and significant undertaking. These rules support this transition by requiring automakers to manufacture and deliver more electric vehicles to Vermont in a phased and measured manner spanning a thirteen-year period. For both Advanced Clean Cars II and Advanced Clean Trucks, the phase in of vehicles that will be delivered reflect the expected developments in supply, technology, application, and feasibility. Many automakers have made commitments related to the phase-in of EVs that are consistent with, or in some cases more stringent than, the proposed rule. It also reflects the fact that EV fueling infrastructure is not yet as prevalent as gasoline or diesel fueling infrastructure. For ACT, a total phase in of EV technology is not contemplated in the proposed rule. The percent of EV trucks that automakers will deliver is capped at 75%, which represents the most stringent percentage as applied to a limited range of weight classes. And even then the 75% requirement for automakers will not take place until 2035.

Comment-T2: Some commenters noted EV technology concerns for medium- and heavy-duty vehicles including reduced payload due to increased vehicle weight, long charging times, and limited range. State of the art heavy duty electric vehicle technology does not come close to performing the daily requirements of a feed truck, particularly in Vermont. Cold temperatures, hilly roads and onsite delivery demands will quickly reduce heavy duty truck performance to well below required performance rates. Further, recharging times, even if recharging infrastructure is available, would require hours per day to recharge in contrast to minutes per day for diesel refueling. Other commenters indicated heavy-duty electrification may not be appropriate for certain applications such as milk-hauling, logging trucks, grain trucks, and sap trucks. One commenter noted that ANR is forcing the use of heavy-duty electric vehicles in the commercial truck industry before the technology has proven to be available, effective, economically competitive, and practically appropriate.

Response-T2: The proposed ACT regulation imposes requirements on vehicle manufacturers to produce and sell on-road ZEVs in Vermont and does not impose requirements on fleets to make EV purchases. The proposed rules do not apply to off-road equipment. Equally important to note is that the regulation does not prescribe requirements specific to vocation; therefore, manufacturers are free to decide which vehicles they should electrify based on business drivers specific to the manufacturer such as product portfolio and customer base. Because the proposed regulation does not obligate manufacturers to sell EVs to vocations that are not well-suited for electrification, it is highly unlikely that manufacturers will focus their product offerings to fleets poorly suited for electrification. Accordingly, heavy-duty EV

adoption is expected in well-suited fleets first, and then broadening over time as costs decline and fleet experience with the technology improves.
Under the ACT regulation, new diesel heavy-duty trucks will continue to be available for sale in Vermont before and after 2035 while providing an increased choice for fleets when making decisions about what vehicle will best suit their needs. The ACT regulation includes flexibility for manufacturers to produce and sell new ZEVs into the market segments they deem to be most suitable for the products they manufacture, ensuring that manufacturers develop competitive ZEV products at price points that will meet fleet needs. Used vehicles are outside of the scope of the rules and used ICEVs will continue to be available for sale in Vermont. No changes were made in response to these comments.

Comment-T3: Some commenters are concerned that there is limited vehicle availability for both EVs (all-wheel and 4-wheel drive models, in particular) and ICEVs.

Response-T3: Vehicle supply, both EV and ICEV types, is lower than normal currently due to pandemic recovery and associated supply chain issues. Supply of EVs is expected to increase as manufacturers ramp up production to meet demand, supply issues are alleviated, and to meet the increasing stringency of the ZEV sales requirements of the proposed rule. Pick-up trucks, sport utility vehicles (SUVs) and hatchbacks with two-wheel drive and four-wheel drive options are available in EV models now, with even more coming in the next year or two to meet a variety of applications and needs. To see models currently available in Vermont, visit: https://www.driveelectricvt.com/find-your-ev/compare-models. No changes were made in response to this comment.

Comment-T4: Plug-in hybrid vehicles (PHEV) should be counted towards an automaker meeting its annual ZEV percent sales requirement.

Response-T4: Manufacturers can meet a portion of their annual ZEV requirement under ACCII and ACT with PHEVs, note that ACT refers to PHEVs as Near Zero Emission Vehicles (NZEV). No changes were made in response to the comment.

Comment-T5: PHEVs should NOT be counted towards an automaker meeting its annual ZEV percent sales requirements.

Response-T5: PHEVs are powered by both an internal combustion and battery-electric powertrain, which have the ability to operate as a zero-emission vehicle for some distance. These vehicles are considered a bridge technology, especially as applied in ACT, which will help the advancement of the full ZEV market by electrifying more challenging sectors and supporting the ZEV supply chain. Under ACCII, up to 20% of a manufacturer's ZEV requirement can be met with PHEV values in a given model year and under ACT, up to 50% of a manufacturer's ZEV requirement can be met with NZEV credits. The amount of PHEV credits that can be used in a given model year to meet a manufacturer's ZEV requirement are capped to preserve emissions reductions achieved while providing for a level of compliance flexibility. No changes were made in response to this comment.

Comment-T6: The range of an EV is reduced in colder temperatures, reducing range and efficiency of the vehicle.

Response-T6: Not unique to electric vehicles, cold weather reduces efficiency of all vehicle types. Electric vehicles can be driven in both extremely hot and cold weather. Cold weather can reduce range, but with longer-range electric vehicles on the market, with a little planning this won't impact the vehicles' ability to get you where you need to go. Also, some auto makers are adding technologies that help control the temperature of the battery to counteract impacts from extremely hot or cold weather. Electric vehicles are already popular and feasible for drivers in the Northeast and East Coast and make up over 70% of all car sales in Norway.

Electric vehicles are designed to perform the same or better than the gasoline vehicles they replace. Electric vehicles have high torque which help them accelerate quickly and get up steep inclines. Today's vehicles have more electric range, leaving plenty of margin for mountain driving. And electric vehicles benefit from downhill driving which allows regenerative braking to put energy back into the battery, extending how far you can go. No changes were made in response to this comment.

Purchase cost and Total Cost of Ownership

Comment-TCO1: Some commenters have concerns regarding the upfront vehicle cost for an EV being more than a conventional ICE vehicle. One commenter stated that for medium- and heavy-duty vehicles, the cost of owning an EV includes battery replacement costs. Some commenters are concerned that the rules will reduce affordability of vehicles and reduce the choice consumers have when purchasing a vehicle.

Response-TCO1: ANR acknowledges that a significant barrier to EV adoption *today* is the increased upfront cost of an EV compared to a conventional fossil-fuel powered vehicle. However, as the cost of batteries continues to drop, the price of a battery-electric vehicle will eventually become the same as a combustion engine vehicle. And while, for now, the up-front cost is higher, ANR's analysis in the *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules* shows that the "total cost of ownership" or "TCO" of an EV compared to a conventional vehicle can be lower due to lower fuel and vehicle maintenance costs. There are also several incentive programs available in Vermont and from the federal government that help to bring the upfront costs of EVs down to be comparable to conventional vehicles, and in some cases less expensive[1].

Across all vehicle weight classes, ACCII and ACT will mean that consumers have *increased* choice when making decisions about what vehicle will best suit their needs. For passenger cars and light-duty trucks, the phase-in proposed in ACCII reflects the fact that EV technology will be appropriate and feasible for most applications of these types of vehicles. For medium- and heavy-duty vehicles, the phase-in proposed in ACT reflects the fact that EV technology and its application across all uses of these types of vehicles will take longer. For heavier vehicles, ANR recognizes that EV technology may not be feasible for all applications in the time horizon (up to 2035) contemplated by ACT, and that's why the rule still allows automakers to deliver conventional vehicle technologies to Vermont indefinitely. The proposed rule will give consumers and fleet owners access to electric vehicles in order to recognize the significant total cost of ownership savings associated with EVs compared to conventional vehicles.

[1] Drive Electric Vermont Incentives: https://www.driveelectricvt.com/incentives

Comment-TCO2: One commenter believes the potential profits seen from vehicle to grid should be considered in ANR's cost analyses.

Response-TCO2: ANR considers vehicle to grid (V2G) to be a developing opportunity where unused power from the vehicle is put back into the electric grid. There is potential for V2G integration to help supply electricity during peak hours, provide an extra power source during times when renewable energy sources, such as solar, are unavailable, and supply power during electrical outages. EV owners can be compensated for sending electricity back into the grid at peak demand events, thereby reducing demand. Currently there are multiple pilots underway in Vermont and ANR will continue to consider benefits from V2G as the technology evolves. No changes were made in response to this comment.

Comment-TCO3: Some commenters expressed concerns regarding uncertainty about the cost of electricity and Vermont's GHG emissions from electricity going up with vehicle electrification.

Response-TCO3: The residential price of electricity depends on a combination of costs related to generating power, ensuring sufficient generation and transmission capacity, maintaining poles, wires, and the crews that service them, and other factors. These electricity price components will move in different directions with additional EV charging and the net effect is unclear. Unrelated factors are most impactful on the price of electricity, such as the price of natural gas used for a portion of New England's power generation and the outcome of capacity auctions used to ensure sufficient generation resources.

Looking solely at its effects, additional EV charging will have upward rate pressure on generation (because more generation will be required), unknown rate pressure on capacity and transmission costs (because much charging will occur outside peak hours), and unknown rate pressure on distribution system costs (because existing fixed costs and the cost of system upgrades will be balanced by additional electricity sales occurring during off-peak hours).

While the net effect on electricity price is unknown, it is likely that the equivalent cost of fueling a vehicle with electricity will remain lower than the cost of fueling with gasoline or diesel. Again, it should be emphasized that off-peak load growth through EV charging will be a minor factor in the price of electricity compared to external factors such as market power prices influenced by national natural gas prices and the interconnection of additional price-competitive generation resources (namely off-shore wind). No changes were made in response to this comment.

Comment-TCO4: The increased cost of electricity that businesses must bear in order to charge these vehicles, the cost of which has only been increasing in recent years, will drive up the cost of goods and services in Vermont, especially for small businesses.

Response-TCO4: ANR has evaluated and included "total cost of ownership" analyses as part of the economic analysis that show that the most significant savings in owning and operating an EV comes from saving money on the cost of fuel. Operating a vehicle using electricity is less expensive than operating a vehicle with gasoline or diesel. The price of electricity tends to be less volatile, and is regulated by the Public Utilities Commission in Vermont. The price of fossil fuels is more volatile than electricity, is unregulated, and is subject to frequent market impacts. Any costs related to electrical

upgrades to accommodate home vehicle charging have been taken into account in ANR's TCO analysis in the *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules*. No changes were made in response to this comment.

Comment-TCO5: Some commenters are concerned that the maintenance and upkeep costs of an EV are higher, especially considering battery replacement costs.

Response-TCO5: The costs of maintenance and scheduled repairs for ZEVs and PHEVs are expected to be lower than that of an equivalent ICEV. The Argonne National Laboratory (ANL) has provided estimates of incremental maintenance costs that are below that of an ICEV based on vehicle technology type and miles driven.[2] For battery electric vehicles (BEVs), a type of ZEV, the average cost of maintenance and planned repairs is approximately 40% lower than a gasoline passenger car, for example, due to fewer oil changes, oil filters, timing belts and other replacement parts (spark plugs and oxygen sensors, for example). The per-mile maintenance savings for this analysis was extracted from the ANL study for passenger vehicles of each drivetrain type and then adjusted using incremental vehicle costs to estimate the per mile savings for the other vehicle types.

Estimated incremental maintenance costs for each vehicle classification and powertrain type, in dollars per mile (values in parentheses are negative values, indicating savings relative to a comparable internal combustion engine vehicle):

Vehicle Types	Average dollar per mile savings 2026 - 2035
BEV – Passenger Car	(0.040)
BEV – Light Duty Truck 1	(0.039)
BEV – Light Duty Truck 2	(0.053)
BEV – Medium duty vehicle	(0.091)
PHEV – Passenger Car	(0.007)
PHEV – Light Duty Truck 1	(0.009)
PHEV – Light Duty Truck 2	(0.007)
PHEV – Medium Duty Vehicle	(0.007)

While the cost of battery replacement may be incurred, it is important to note that the durability and warranty requirements of the proposed rule ensure that consumers will not have to bear the cost of a battery replacement in advance of the battery's useful life within the warranty period. No changes were made in response to this comment.

Alternatives to the Regulation

Comment-A1: Some commenters think that consideration should be given to other fuel types including renewable fuels, alternative fuels, low-carbon fuels and technologies for on-board capture of combustion-related carbon dioxide.

Response-A1: The goal of the proposed ACT regulation is to accelerate the widespread adoption of zero-emission medium- and heavy-duty vehicles to reduce harmful vehicle emissions. Alternative,

[2] ANL 2021 Report: *https://publications.anl.gov/anlpubs/2021/05/167399.pdf*

renewable, and/or low carbon fuels may play a role in furthering reduction of vehicle emissions under the Low-NOx Omnibus regulations, which is part of ANR's proposed rule package. Provisions that allow manufacturers to earn credit for deploying cleaner internal combustion engines earlier than required or engines meeting more stringent emissions standards than required are included in the proposed Low-NOx Omnibus regulation. These credit opportunities are open to any fuel type cleaner engine and the advances already made by natural gas and propane engines that currently certify to CARB's optional reduced nitrogen oxide (NOx) standard (0.02 g/bhp-hr) provide a substantial head-start toward complying with all the proposed requirements as compared to other engines. Commenters' concerns about the rules not supporting or accommodating alternative fuel technologies is addressed in the proposed Low-NOx Omnibus regulation, therefore no changes were made in response to this comment.

Further, Vermont's Climate Action Plan does include the use of alternative fuels to decarbonize Vermont's fleet, but strategies including fuel shifting shouldn't exclude electrification[3]. From a cost-per-ton of emission reduction perspective, strategies to increase use of these alternative fuels are comparably more costly to implement based on the cost-per-ton of emissions reduced than the deployment of electric vehicles at the scale we need to meet our GHG reduction requirements in the Global Warming Solutions Act.[4]

Electric Vehicle Supply Equipment (EVSE)

Comment-EVSE1: Some commenters are concerned about the cost of installing EV charging infrastructure, both for individuals and businesses, and some are concerned that chargers available today are not reliable and experience too much "down time".

Response-EVSE1: The most convenient and affordable place for private, passenger vehicles to charge is expected to be at home, where vehicles are often parked overnight for many hours at a time. Charging a car at home can be as easy as plugging in the convenience cord that comes with an electric vehicle into a 110 Volt plug. This type of charging is known as Level 1 and can provide about 3-6 miles of range for each hour a car is plugged in. When plugged in overnight a Level 1 charge may provide enough range to meet shorter daily driving trips. However, if your daily driving distances are longer, and you need a faster charge to fully re-charge your battery every night, you may want to install a Level 2 charger at your home which provides about 14-35 miles of range per hour of charging. Many electric utilities in Vermont offer free or subsidized Level 2 chargers with the purchase of an EV[5]. With the new Advanced Clean Cars II proposal, starting with model year 2026, electric vehicles will be required to come with a convenience cord that can charge at both Level 1 and 2 and will reduce the cost for home charging. Installing EV charging in private or public parking lots, such as workplace parking lots, multiunit residential parking lots, and public parking lots can be more challenging and expensive to install. To help overcome these cost barriers and ensure access to a network of chargers that can meet all EV driver's

[3] Vermont Initial Climate Action Plan, 2021: https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/Initial%20Climate%20Action%20Plan%20-%20Final%20-%2012-1-21.pdf.

[4] Vermont Pathways Marginal Abatement Cost Curve Report, 2022: https://outside.vermont.gov/agency/anr/climatecouncil/Shared%20Documents/MAC%20Curve%20Deliverable%20Memo%20Clean%20Version.pdf.

[5] https://www.driveelectricvt.com/incentives#charging

charging needs, both at home and when on the go, Governor Scott and the Legislature have allocated $10 million in funding to help reduce the cost of installing charging stations in multiunit residential properties, workplaces, and public attractions.

Vermont is on the fast track to build out both electric vehicle charging stations with policies, investments, and regulatory streamlining, to ensure everyone can charge and refuel when and where they need to. Publicly funding chargers also have to comply with "up time" requirements and have to adhere to higher standards related to accessibility and interoperability. To ensure a successful transition to electric transportation, Governor Scott and the Legislature allocated millions to zero-emission vehicles to help make these vehicles more affordable and convenient for all Vermonters, while building out the infrastructure and charging stations needed to facilitate this transition. Incentives and grants are now or soon to be available for multi-unit dwelling owners and employers to provide access to charging at apartment buildings and workplaces. No changes were made in response to these comments.

Comment-EVSE2: Some commenters are concerned that there is not enough EV charging infrastructure. Some also would like to see more investments in charging infrastructure in designated downtown areas and at workplaces. Also, commenters are concerned about availability of charging if you do not have a garage or if you don't own your home.

Response-EVSE2: Vermont is building out a network of electric vehicle charging stations with policies, investments, and regulatory streamlining, to ensure everyone can access reliable, convenient, and affordable charging options when at home and around town, and when traveling longer distances. While the investments made to date have resulted in one of the highest numbers of chargers per capita, 114 charging ports per 100,000 people, the State recognizes the network needs to continue expanding.

Governor Scott and the Legislature have allocated $10 million to support the build out of electrical infrastructure and charging stations in multiunit residential properties, workplaces, and community attractions, including Vermont's downtowns. Incentive programs that reduce the cost of installing EV charging in these locations will soon be available. This program is building on a $1 million pilot program to provide residents of multiunit residential properties access to home EV charging. The pilot program funds have been fully obligated and are expected to result in 84 new Level 2 charging ports at 37 different affordable multiunit residential properties across the state, providing access to home charging for over 6,000 Vermont households.

To support the buildout of fast charging that meets EV drivers need to re-charge more quickly when traveling longer distances, the State has set a goal to have a direct current fast charger (DCFC) within 1 mile of every interstate exit, and within 25 miles of the next DCFC on the State highway network. In support of achieving this goal, Governor Scott and the Legislature have allocated $2 million in fiscal year (FY) 2023. The State will also receive $21.2 million over the next 5 years from the Federal Highway Administration. This network of public DCFC chargers can provide 30-90 miles of range per 10 minutes of charging. No changes were made in response to these comments.

Comment-EVSE3: Some commenters are in favor of EVs being standardized to only use one type of charging cable.

Response-EVSE3: ANR agrees that standardized charging cables provide certainty and convenience to consumers and will continue to work with other jurisdictions and stakeholders to promote more standardization related to EV charging. With the new Advanced Clean Cars II proposal, starting with model year 2026, electric vehicles will be required to come with a convenience cord that can charge at both Level 1 and 2 and will reduce the cost for home charging.

Currently, Vermont requires that all publicly funded EV chargers be equipped with both a CHAdeMO and a SAE CCS connector so most cars can access the charging station. No changes were made in response to this comment.

Comment-EVSE4: One commenter noted that the time it takes a business to charge vehicles during a delivery is lost time and money.

Response-EVSE4: The ACT regulation imposes requirements on vehicle manufacturers to produce and sell ZEVs in Vermont. Businesses are not required to purchase electric vehicles under the proposed regulations. Under the ACT regulation new diesel heavy-duty trucks will continue to be available for sale in Vermont before and after 2035 while providing an increased choice for fleets when making decisions about what vehicle will best suit their needs. The ACT regulation includes flexibility for manufacturers to produce and sell new ZEVs into the market segments they deem to be most suitable for the products they manufacture, ensuring that manufacturers develop competitive ZEV products at price points that will meet fleet needs. Used vehicles are outside of the scope of the rules and used ICEVs will continue to be available for sale in Vermont.

Many vehicles, depending on their use and application, will not need to re-fuel during the day. For example, delivery vans are an application considered to be well-suited for electrification because they tend to serve predictable routes, generally travel less than 100 miles per day roundtrip, and return to a centralized fleet depot, which enables fleet operators to strategically deploy vehicles and manage vehicle charging operations. Today, there are more than 20 electric cargo and/or step delivery vans on the market with estimated ranges from 105-210 miles.

ANR anticipates that businesses will determine when and where regular dwell times occur so that drivers and staff are not “on the clock” when trucks or other delivery vehicles are charging. This planning could potentially result in saved time and money, as well as safer driving conditions with reduced risk to drivers. No changes were made in response to this comment.

Comment-EVSE5: One commenter noted that if the expansion and availability of charging is not keeping pace with the increase in EVs then the requirement to deliver 100% light-duty EVs by 2035 under Advanced Clean Cars II should be adjusted. There should be an independent study on a continuing basis to be sure, not just that highways and large workplaces are charger ready, but the side streets of Burlington for the low wage worker in a basement apartment or the trailer on a rural road.

Response-EVSE5: Vermont participates in a number of multi-state workgroups on air quality and climate change issues and will continue to work closely with California and the other Section 177 States on reducing motor vehicle emissions standards. The opportunity for revisions to the adopted rule will occur

during periodic reviews to evaluate rule applicability and feasibility. Vermont will participate in those review opportunities, and availability of charging will likely be a consideration. No changes were made in response to this comment.

Electric Grid Impacts

Comment-EG1: Some commenters are concerned that Vermont's power grid cannot handle the additional demand for electricity that EVs will require. One commenter stated that the proposed rules should not be adopted until the Vermont Comprehensive Energy Plan and the Vermont Electric Power Company (VELCO) Long-Range Transmission Plan demonstrate that the electrical infrastructure in Vermont will be adequate to handle the electrical vehicles being added to the system.

Response-EG1: Significant load planning takes place at the regional, state, and utility level, with updated forecasts and analyses completed every 1-3 years. These planning efforts use market data, technology adoption curves, and third-party input to understand the future mix of load and generation resources impacting the electric grid. Each plan informs equipment and infrastructure upgrades that are implemented to ensure the grid operates in a reliable and cost-effective manner.

ISO New England, the independent regional grid operator, prepares an annual long-term forecast for electricity demand in each state, including demand for EV charging. The 10-year projections are published in its annual Capacity, Energy, Loads, and Transmission (CELT) Report, and are used in power system planning and reliability studies. ISO New England's Regional System Plan, last updated in 2021, summarizes system needs for generation resources and transmission facilities. Sufficient resources are expected through 2030 (the time horizon of the plan). The plan anticipates new resource development (namely on- and off-shore wind, solar, and battery resources) and identifies transmission system investments needed to improve reliability and reduce congestion. The report accounts for state policy initiatives and increasing electrification of heating and transportation loads.

VELCO, Vermont's transmission system operator, works with the Vermont System Planning Committee to forecast changes in electric load and model the ability of Vermont's grid to accommodate electric demand under various scenarios. The results are published in the Long-Range Transmission Plan (LRTP) updated every three years; the most recent LRTP was published on July 1, 2021, and looks out 20 years. The plan concluded that Vermont's transmission system has sufficient capacity for expected demand through 2030, and that—by managing 75% of EV load to reduce charging during peak periods—significant transmission upgrades would not be needed. This is also true through 2040, even when considering a higher-than-expected rate of electrification of the transportation and heating sectors. Three distribution utilities already offer EV load management programs, and all utilities will be required to offer rates for EV management by June 30, 2024 (per Act 55 of 2021). The Department of Public Service estimates that 31% of residential EV charging is currently managed and this percentage is consistently growing.

In addition, each electric distribution utility completes an Integrated Resource Plan to meet the need for electricity in a safe, reliable manner with the lowest possible economic and environmental costs. These plans are also updated every three years and account for recent and projected trends in electric loads and economic activity. Distribution utilities monitor equipment capabilities as load grows and anticipate

which substations and circuits will require upgrades. Infrastructure investments do incur costs, but load growth moderates rate impacts by spreading expenses across additional electricity sales. EV charging is typically a flexible load that can be scheduled when the grid is less stressed and wholesale electricity costs are below average. Although early in development, some Vermont distribution utilities have begun testing vehicle-to-grid energy storage services that may further reduce ratepayer costs and improve system reliability.

The LRTP also found that many distribution substation transformers may not require upgrades to accommodate electrification load growth. Comprehensive analysis by the distribution utilities of all circuits to determine their load hosting capacity has not yet been conducted, but it is believed that many existing roadside power lines will be sufficient. The capacity and availability pole-top service transformers is a key consideration. Upgrades of these transformers may be necessary for some households that wish to connect electric vehicles, and global supply chain issues currently cause delays in obtaining them. However, protocols are in place and in development to address this issue.

While electricity demand and transmission are outside the scope of this regulation, ANR did consider these impacts and consulted with the Department of Public Service in developing the proposed rule. These impacts are within the jurisdiction and purview of the Department of Public Service. No changes were made in response to this comment.

Comment-EG2: Some commenters are concerned that Vermont's power grid is not reliable enough to be used to reliably fuel our vehicle fleet.

Response-EG2: Response EG-1 addresses generation, transmission, and distribution system adequacy in relation to serving EV loads. In terms of service interruptions, the Public Utility Commission regulates electric service quality including reliability and outages. According to the U.S. Energy Information Administration's reliability metrics, during 2020, on average, Vermont customers incurred 1.9 outages lasting 2 hours and 15 minutes each, equating to a total outage time of 4 hours and 16 minutes (known as the System Average Interruption Duration Index, or SAIDI).

This value varies by location and is susceptible to variation based on major weather events (such as wind or ice storms) that occur on a less-than-annual basis but cause significant damage. During 2017, a year which included major windstorms in May and in October, customers of the two largest utilities (Green Mountain Power and Vermont Electric Coop) experienced an average total outage time of 14 hours and 23 minutes across 2.5 outages over the course of the year.

It should be noted that, when a power outage occurs, gas stations in the affected area are typically unable to serve consumer demand for gasoline as electricity is used to pump gasoline from on-site storage tanks into the customer's vehicle. With adequate weather forecasting, storm preparation, and communications, such as is conducted by the distribution utilities, it should be possible for EV owners to ensure that their vehicles are fully charged prior to a significant weather event. While grid reliability is outside the scope of this regulation, ANR did consider these impacts and consulted with the Department of Public Service in developing the proposed rule. No changes were made in response to this comment.

Batteries – Recycling and Environmental Impacts

Comment-B1: Many commenters are concerned about the materials used in electric vehicle batteries and how used batteries will be handled at the end of their life. Some commenters are also concerned about the energy needs, environmental harms, and human rights issues associated with mining battery materials, and availability of those materials. Some commenters are supportive of automakers that have already developed battery technology to transition away from materials that are of concern, and others noted that battery research and development should focus on using other alternatives and end-of-life considerations such as recycling and reuse of materials.

Response-B1: The proposed Advanced Clean Cars II regulation includes durability requirements for batteries that lead to reduced battery degradation and therefore less battery replacements. This has a benefit of reducing battery manufacturing impacts of facility emissions and sourcing of raw minerals, as well as slowing down the need for battery recycling and reuse activities.

Regarding the energy needs and environmental impacts of producing an EV battery, and how that compares to emissions and impact from a fossil fuel vehicle, ANR conducted a life-cycle analysis that shows that the life-cycle emissions of an EV is lower than an ICEV. See the discussion of life-cycle emissions in *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules* on Page 28.

Electrification of the on-road vehicle fleet will likely result in increased demand for lithium, among other semiprecious metals, such that global supply may not be capable of meeting this demand. There are also likely potential adverse environmental effects from increased mining activity of lithium and other semi-precious metals. Vermont cannot, without speculating, predict the location of these impacts or account for the regulatory environment that may be capable of reducing impacts from these activities. For instance, mining activities that occur overseas in countries that may have fewer regulations in place to mitigate environmental impacts are beyond Vermont's authority to mitigate or regulate. Nevertheless, these potential impacts are identified and discussed here.

The Agency recognizes that its rules and regulations related to the use of zero-emission technology may induce new demand for various metals including lithium, graphite, cobalt, nickel, copper, manganese, chromium, zinc, and aluminum; however, Vermont's rules are not solely responsible for an increase in demand for these metals. The federal government recently enacted legislation providing significant support for ZEVs. The Inflation Reduction Act of 2022 provides significant tax credits for new and used ZEVs and electric vehicle charging infrastructure. It provides an advanced manufacturing tax credit for production of critical minerals used in ZEV batteries, appropriates $500 million for "enhanced use" under the Defense Production Act to incentivize critical mineral production. It authorizes the Department of Energy to commit up to an additional $40 billion in loan guarantees (on top of an existing program of $24 billion) for innovative technologies - which includes projects that avoid GHGs and other air pollutants or that employ new or improved technologies. Various international efforts are also underway to electrify the mobile-source sector pursuant to commitments made in the European Union, United Nations (UN) Paris Accord, Kyoto Protocol, and by members of the Under2 Coalition, among others. It is also important to note that ICEVs require aluminum alloys, magnesium, iron, and steel, which are all metals that already require extensive mining with similar physical impacts to the

environment, including loss of habitat, agricultural resources, and forests; water, air, and noise pollution; and erosion.

Retired battery systems can be used in several ways based on their physical characteristics, state of health, and performance, or they will be recycled or disposed if no longer useable. Some battery modules removed from vehicles can be refurbished and reused directly as a replacement battery pack for the same model vehicle. Battery recycling is improving and will continue to improve overtime. New industries are developing ways to recover the most valuable materials from batteries with the intention of reuse. They are also looking at a closed-loop battery production process in which batteries are recycled, remanufactured and returned to the same factory.

Also, the proposed Advanced Clean Cars II regulation would require manufacturers of ZEVs, plug-in hybrid-electric vehicles, and hybrid-electric vehicles to include a label on the vehicle battery that provides key information about the battery system. This will ensure that used batteries can be sustainably and properly managed at their end of life and critical battery materials are efficiently recovered. All of this will help reduce the need for additional mining to supply critical energy materials for ZEV batteries in the amounts needed to displace internal combustion vehicles.

In some cases, after use in a vehicle, lithium battery packs could deliver additional years of service in a stationary application. Examples include backup power for homes or cellular towers as well as for large buildings like sports arenas or electric utility grids. Second-life batteries reduce the demand for newly mined materials used in the production of new energy storage batteries. No changes were made in response to this comment.

Comment-B2: One commenter has concerns about EVs being safe, and specifically references EV battery fires.

Response-B2: Electric vehicles meet the same safety standards as ICEVs. In fact, a gasoline car is more likely to catch on fire than an electric vehicle. A recent study found that fully electric vehicles, were deemed far safer than both hybrids and gas cars; they are far less likely to catch fire, with just 25.1 fires per 100,000 sales. That's compared to 3,474 hybrid fires and 1,529 internal combustion engine fires per 100,000 sales respectively. No changes were made in response to this comment.

Environmental Justice

Comment-EJ1: ANR should immediately begin developing and implementing programs that will be eligible for Environmental Justice (EJ) credits under the ACC II Rule. The Agency should also continue to develop and fund complementary policies and programs. ANR should commit to immediately beginning work and engagement with community members and environmental justice organizations to develop and implement EJ programs that will be eligible for these programs.

Response-EJ1: ANR plans to begin developing criteria for the review and approval of Clean Mobility Programs that will be eligible for EJ credits post-rule adoption.

Comment-EJ2: Some commenters think that the proposed Environmental Justice Credit provisions of the rule would commodify low-income communities while increasing the financial and environmental burdens of those communities. One commenter thinks that Environmental Justice Credits should be allowed but should be valued in a way that makes up for the shortfalls in emission reduction that will occur due to fewer vehicles being delivered.

Response-EJ2: ANR's approach to environmental justice in this proposal is multi-faceted. The significant pollution reductions from the proposal as a whole will reduce exposure to vehicle pollution in communities throughout Vermont, including in low-income and disadvantaged communities that are often disproportionately exposed to vehicular pollution. ZEVs can also be cheaper to own and maintain, reducing transportation costs that comprise a disproportionate share of the spending for lower-income Vermonters. Further, the ZEV assurance measures, such as minimum warranty and durability standards, will ensure these emissions benefits are realized and long-lasting, while supporting more reliable ZEVs in the used vehicle market. Durable and better performing used ZEVs can help increase access to clean vehicle technologies for communities that may not be buying new vehicles, but which do need reliable mobility options. Vermont's many incentive programs, though beyond the scope of this proposal, also further enhance ZEV access. As part of this overall portfolio approach to equity measures, the proposed rule also includes regulatory flexibilities that will further enhance ZEV access. Optional Environmental Justice Credits may be awarded to manufacturers under the ZEV regulation who help increase affordable access to ZEVs for disadvantaged communities as part of the portfolio of equity approaches described above.

The Environmental Justice Credits would be a distinct category under the ZEV regulation where vehicle values earned can be banked, traded, and used in the 2026 through 2031 model years, further speeding affordable ZEV access in these communities during the critical early years of the program. The proposal includes a 5% cap on EJ Credits that could be used in any given year to fulfill a manufacturer's annual ZEV requirement under the regulation. After the 2031 model year these optional EJ Credits would expire. The EJ Credits are aimed at providing manufacturers additional vehicle values for voluntary actions that would help achieve more equitable outcomes and that would increase access and exposure to ZEV technologies for underserved communities.

Under the proposal, EJ Credits can be earned in two ways: 1) Allowance for ZEVs and PHEVs remaining in Vermont after leasing term. A 2026 through 2028 model-year ZEV or PHEV could earn an additional 0.25 or 0.20 vehicle value, respectively, after the vehicle is registered for operation on public roads in Vermont beyond its first qualifying lease term and placed with a household located in a disadvantaged community. 2) Discounted ZEVs and PHEVs placed in a community-based Clean Mobility Program. 2026 through 2031 model-year ZEVs and 6-passenger (or more) PHEVs that are sold at a minimum discount of 25% off of the manufacturer's suggested retail price to a community-based Clean Mobility Program could earn an additional 0.50 and 0.40 vehicle ZEV credit value, respectively. Eligible Clean Mobility Programs will be determined eligible via a set of criteria developed by ANR in coordination with VTrans and other community stakeholders after the rule is adopted. Existing programs may be eligible if they meet the qualifying criteria.

Environmental justice and equity have been taken into consideration for the deployment of medium- and heavy-duty electric vehicles as well. Earlier in 2022, seventeen U.S. states, the District of Columbia, and the Canadian province of Quebec worked together through the Multi-State ZEV Task Force, a coalition facilitated by the Northeast States for Coordinated Air Use Management, to produce a bold *Action Plan* for accelerating a transition to zero-emission trucks and buses[6]. To inform the development of the *Action Plan*, the ZEV Task Force directly engaged many public and private sector experts, partners, and stakeholders—including equity and environmental justice organizations, truck and bus manufacturers, industry and technology experts, charging and fueling providers, utility companies, public and private fleet representatives, commercial financing experts, and environmental advocates. The ZEV Task Force also received public comments on the draft *Action Plan*. Vermont intends to adopt its own Action Plan stemming from the multi-state plan, which will undergo its own stakeholder engagement process and will be informed by the equity and environmental justice considerations incorporated into the multi-state plan. No changes were made in response to these comments.

Comment-EJ3: As there are only limited EJ provisions in the ACC II regulation, Vermont—as part of its engagement with community members and environmental justice organizations—must continue to develop and fund complementary policies and programs that will ensure the benefits of a transition to zero-emission vehicles are realized by all Vermonters, especially those who have been historically overburdened with transportation pollution, by building on the work done to stand up initiatives like MileageSmart, Replace Your Ride, and the multi-unit dwelling EVSE grant program.

Response-EJ3: This past year, the legislature has continued to build upon the State's cleaner transportation incentive programs with its highest levels of investment ever--$12 million for the Incentive Program for New EVs, $3 million for MileageSmart, $3 million for Replace Your Ride, $55,000 for the eBike Incentive Program and another $10 million for community charging and to extend the pilot program for charging at affordable Multiunit Dwellings. (Act 185: Bill Status H.740 (Act 185) (vermont.gov)) All income-sensitized, the programs have provided even greater benefits to households with lower incomes and now have funding to extend well beyond previous one-time appropriations. The existence and performance of such targeted programs in Vermont helps ensure that all Vermonters will benefit from these proposed rules.

VTrans is currently working on two analyses to help enhance transportation and incentive programming to better serve low-income residents. The *Transportation Equity Framework* recognizes that equitable transportation investments have not always been prioritized, resulting in disparities in transportation access from community to community, and will guide VTrans in how investments and services are carried out throughout the state. Also, VTrans is working with its contractor implementing the vehicle purchase incentive programs to optimize these programs to meet both climate and equity goals. No changes were made in response to this comment.

[6] https://www.nescaum.org/documents/multi-state-medium-and-heavy-duty-zero-emission-vehicle-action-plan/

Comment-EJ4: These rules will give higher-income Vermonters access to EVs and a cleaner environment while the positive economic, health and environmental impacts will not be felt by lower-income Vermonters and communities for many years, if ever.

Response-EJ4: See responses to other environmental justice comments, above. The provisions of the proposed rule are designed to benefit all Vermonters, by improving air quality in areas disproportionately impacted by harmful motor vehicle emissions, and with a specific focus on making EVs more accessible to lower income communities. Facilitating a robust used EV market sooner and incentivizing automakers to deliver affordable EVs will make this technology accessible and improve air quality. Enhanced durability and warranty requirements and state and federal incentives also better serve and prioritize lower income motorists. No changes were made in response to this comment.

Workforce Development

Comment-WF1: Some commenters support electric vehicle adoption as a way to attract and train a new generation of auto technicians to Vermont to support operation and maintenance of EVs. Commenters also want Vermont to invest in the next generation of auto technicians and support them through the transition.

Response-WF1: ANR agrees that training and equipping automotive technicians to be ready and able to service electric vehicles is a component of the broader economic opportunity that accompanies the adoption of initiatives and technologies to reduce air pollution and greenhouse gas emissions. Preparing and training the Vermont workforce for this transition is a critical component of ensuring that EVs are properly maintained and cost-effective for consumers. Some federal funding via the Inflation Reduction Act may be available to help directly support this type of workforce training in the future. Additionally, VTrans is using funds to implement a study that identifies workforce development needs related to EV charger installation and maintenance, as well as EV repairs. ANR also supports the automotive workforce through free trainings related to the diagnose and repair of motor vehicle emissions technology, and this training could be expanded upon to also focus on electric vehicle and hybrid technologies. No changes were made in response to this comment.

Comment-WF2: Some commenters expressed concerns about workforce impacts to the vehicle repair industry relating to independent repair shops' ability to access EV repair information and tools.

Response-WF2: ANR agrees that to determine a vehicle's need for repair and conduct subsequent needed repairs properly, automotive repair technicians need to be able to access vehicle data, diagnostic tools, and manufacturer developed diagnostic and repair information. Following the earlier adoption of service information requirements by California, Massachusetts and the U.S. EPA, auto manufacturers have voluntarily provided access to all repair information nationwide over the past decade. However, these earlier California and the U.S. EPA service information requirements have not pertained to ZEVs and now in this proposed ACCII regulation, CARB is requiring the access and disclosure of repair information and tooling for ZEVs. More specifically, for ZEVs, the scope of the required information is for all propulsion-related parts to ensure that, at a minimum, a vehicle can be repaired to make such that it can continue to be operated as a ZEV. Manufacturers must provide repair information and make available the necessary tooling to non-dealer repair shops. This requirement ensures that

independent technicians have access to basic information needed to help diagnose and repair vehicles, which further supports consumer confidence in purchasing new and used ZEVs. Therefore, ANR is modifying the proposed rule to include CCR, title 13, section 1969, Motor Vehicle Service Information - 1994 and Subsequent Model Passenger Cars, Light-Duty Trucks, and Medium-Duty Engines and Vehicles, and 2007 and Subsequent Model Heavy-Duty Engines in the incorporation by reference table in §40-201 of the proposed rule.

Economic Impacts

Comment-E1: Some commenters are concerned about how Vermont will fund the maintenance of its roads and bridges if less motorists are paying the fuel tax because of the broader use and adoption of electric vehicle technology and fewer vehicles paying fuel tax.

Response-E1: In 2021, VTrans studied the possibilities for implementing a road usage charge for light-duty EVs in recognition of this issue. Like all states, Vermont is currently losing fuel tax revenue due to the increasing efficiency of all vehicles, but this will grow exponentially as the transportation sector electrifies. The 2021 study recommended that Vermont investigate further the feasibility and cost-effectiveness of implementing a mileage-based user fee for light-duty PEVs through the State's existing vehicle inspection system. Work has begun on this second assessment phase in full preparation for higher EV adoption and associated revenue losses. The results of that study are documented in the final report: Final Report of VT RUC_vfinal (vermont.gov). While funding for road maintenance is outside the scope of this regulation, ANR did consider these impacts and consulted with the VTrans in developing the proposed rule. No changes were made in response to this comment.

Comment-E2: ANR's economic impact statements regarding the direct and indirect impacts of the proposed rule are inadequate. Stakeholders should have an opportunity to evaluate the data, costs, and assumptions underlying such its analysis before ANR finalizes its proposed rulemaking.

Response-E2: As a general matter, ANR's economic analysis is based on data, modeling, and assumptions sourced and developed with internal and outside expertise. Pursuant to the Vermont Administrative Procedure Act, ANR is required to disclose to the public the economic impact of the proposed rules, as well as scientific information and materials incorporated by reference in the proposed rules. ANR included the discussion and analysis required in the APA in the rulemaking forms and additional technical supporting documents that accompany the proposed rule. The data, costs, and assumptions are all included or cited in the above-mentioned documentation and has been available for public review since August 12, 2022. No changes were made in response to this comment.

Comment-E3: One commenter is concerned with the cost that will be incurred by our generation if we do not take steps today to mitigate climate change.

Response-E3: Such costs were considered as part of ANR's economic impact analysis of this rule. The estimated reduction of GHG emissions resulting from the adoption of these regulations will benefit Vermont residents monetarily by reducing the future social costs of carbon emissions. 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. Adoption of ACCII provides an estimated cost savings of more

than $1.1 billion by 2040, while adoption of the medium – and heavy-duty truck regulations provide an estimated cost savings of more than $600 million by 2050. A more detailed discussion is included in the *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules*.

Additionally, the proposed rule will reduce NOx and fine particulate matter (PM2.5) emissions, which will result in health benefits for Vermonters, including reduced instances of premature deaths, hospitalizations for cardiovascular and respiratory illnesses, and emergency room visits. The estimated total health cost savings from due to a reduction in criteria pollutant emissions resulting from the proposed ACCII regulation for the year 2040 in Vermont ranges from $373,000 to $840,000. The estimated total health cost savings from due to a reduction in criteria pollutant emissions resulting from the proposed medium – and heavy-duty truck regulations ranges from $11 million to $24 million by 2050. A more detailed discussion is included in the *Supplemental Information for Vermont's Low Emission Vehicle and Zero Emission Vehicle Proposed Rules*. No changes were made in response to this comment.

Legal and Procedural

Comment-LP1: Some commenters note that the rule process should be more transparent, the rule text and associated public events should be made available in languages other than English, and the public should be made more aware of the impacts of the rule. Another commenter stated that the rule process did not allow for public input because the rule must be "identical" to California standards.

Response-LP1: ANR is committed to providing all Vermonters meaningful and equitable access to its programs, services, and activities. The public engagement process for this rulemaking was conducted consistent with the Vermont Administrative Procedure Act, the Global Warming Solutions Act, ANR's Interim Limited English Proficiency Plan, and the latest proposed Language Access Plan which describes how the agency provides language access services. ANR's public engagement process for this rulemaking also incorporated feedback collected during several meetings of the Vermont Climate Council Transportation Task Group, Just Transition Subcommittee, and the Interagency Committee on Administrative Rules (ICAR). Throughout the process, ANR's website included the schedule for public events, information about the proposed rules and supplemental materials, and notice of the availability of language access services. The RSVP page for the public meetings also included public notice of language access services. ANR did not provide the rule text in languages other than English because ANR did not receive requests for language translation. After filing the proposed rule, ANR hosted more public meetings than required by law, including five in-person meetings around Vermont, one virtual public hearing, and one virtual stakeholder meeting for businesses and fleet owners impacted by the medium- and heavy-duty rules. While the Clean Air Act requires the rules to be "identical" to California, there are aspects of Vermont's proposed rules that can and have been changed based on public comment, for example see Response-WF2 and Response G-13. No changes were made in response to these comments.

Comment-LP2: Some commenters stated that ANR does not have legal authority to adopt the rules.

Response-LP2: ANR has legal authority to adopt the rules pursuant to the Vermont Air Pollution Control Law, 10 V.S.A. §§ 554, 558, 567; the federal Clean Air Act, 42 U.S.C. § 7507, and the Global Warming

Solutions Act, 10 V.S.A . § 593(b). The Vermont Air Pollution Control Law allows the ANR Secretary to set emission control requirements on sources of air contaminants in Vermont and specifically to control such emissions from motor vehicles through the prescription of requirements for the use of equipment that will reduce or eliminate emissions. Vermont law also allows the use of vehicle registration and inspection as an enforcement mechanism for these rules. *See* 23 V.S.A. Ch. 7, 10 V.S.A. §567. The federal Clean Air Act allows states to adopt and enforce any model year standards relating to control of emissions from new motor vehicles and engines, so long as such standards are identical to California's standards, are adopted at least two years before commencement of the model year, and the adopting jurisdiction has a plan approved pursuant to Part D of the Act. States may adopt these rules prior to EPA granting a waiver to California under Clean Air Act Section 209(b). Once EPA has granted a waiver to California, Section 177 states may enforce standards to control motor vehicle emissions using certification, inspection, registration, or some other approval process. The Global Warming Solutions Act requires ANR to adopt these rules by December 1, 2022 because the rules were included in the Climate Action Plan adopted by the Vermont Climate Council in December 2021. No changes were made in response to these comments.

Other changes to the rule text

Section 40-102(b), Incorporation by Reference, of the proposed rule was changed to clarify the scope of applicability of the rules as it relates to auto manufacturers that produce different volume of motor vehicles. The term "low volume" was added to the list of manufacturer types to ensure consistency with the definitions used in the Advanced Clean Trucks rule.

No other changes were made to the proposed rule text.