August 28, 2023

Via Electronic Filing

Maine Department of Environmental Protection Attn: Members of the Board of Environmental Protection 17 State House Station Augusta, Maine 04333-0017

## **RE: NRDC Comments on Proposed Advanced Clean Trucks Rule 2023**

These comments on the Advanced Clean Trucks (ACT) rule are submitted on behalf of the Natural Resources Defense Council (NRDC).

Dear Members of the Board of Environmental Protection,

NRDC is grateful for the opportunity to comment on the Advanced Clean Truck ("ACT") rule proposal. I extend my thanks to staff for their dedicated time and effort spent on the rulemaking. The ACT rule is technically feasible and cost-effective, and critical for protecting public health, addressing climate change, and developing the future of Maine's transportation and energy nexus.

Your work on this crucial regulation serves as a testament to Maine's commitment to a more sustainable and inclusive future. Adopting the ACT rule will expedite the shift to zero-emission medium and heavyduty vehicles (M/HDVs), simultaneously yielding substantial benefits to the State. These benefits include improved air quality, reduced greenhouse gas emissions, and a boost to economic activity. Moreover, the rule's adoption stands as a pivotal step for the Board to ensure the state achieves its ambitious climate change targets.

Given phased implementation of the standard, the array of existing and emerging zero-emission technologies, the supportive policy environment, and the increasingly favorable cost dynamics, the ACT rule is highly feasible and should be adopted.

## Maine Needs to Confront the Dual Challenges of Air Pollution and Climate Change

The pollution stemming from M/HDVs poses a dire threat to both Maine's public health and climate. The resulting harms disproportionately burden low-income communities and communities of color, which bear the brunt of localized truck pollution and often experience the most severe impacts of climate change. The time for decisive action is upon us.

<sup>&</sup>lt;sup>1</sup> Union of Concerned Scientists, Inequitable Exposure to Air Pollution from Vehicles in the Northeast and Mid-Atlantic, available at <a href="https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles">https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles</a>; American Lung Association, Transition to Zero-Emission Trucks Could Save Lives in Maine, available at <a href="https://www.lung.org/media/press-releases/transition-to-zero-emission-trucks-in-maine">https://www.lung.org/media/press-releases/transition-to-zero-emission-trucks-in-maine</a>

The adoption of the ACT Rule stands as a critical and urgent step to reduce dangerous pollution from Maine's M/HDVs. The ACT rule reduces harmful pollutants—particularly greenhouse gases—by establishing annual M/HD Zero-Emission Vehicle (ZEV) sales requirements. These sales requirements, varying across vehicle class, increase gradually over time, sending a clear market signal that the State, industry, and stakeholders can develop policy and drive investments. The benefits of this rule grows alongside the proliferation of ZEVs. By 2050, Maine's adoption of the ACT rule, would reduce CO<sub>2</sub> equivalent emissions by 12%, NOx emissions by 13%, and PM2.5 emissions by 10%.<sup>2</sup> While complementary policies must also contribute to accelerating the deployment of zero-emission M/HDVs, the ACT rule serves as the foundation of the ZEV transition by ensuring a consistent supply of vehicles sends a market signal to key stakeholders, affirming Maine's commitment to combatting air pollution and addressing the climate emergency.

The emissions benefits of transitioning to ZEVs will be further amplified by deep emission cuts happening in Maine's electricity sector. Maine's renewable portfolio standard (RPS) establishes the portion of electricity sold in the state that must be supplied by renewable energy sources. In June 2019, the state increased its RPS to 80 by 2030% and set a goal of 100% by 2050.<sup>3</sup> As every unit of electricity becomes cleaner, the fuel powering these vehicles follows suit, resulting in lower lifecycle emissions. These substantial reductions will markedly improve the lifecycle emissions profile of Maine's increasingly all-electric M/HD fleets. Complementary emission reductions in the utility and transportation sectors will play a pivotal role in magnifying the benefits of the ACT rule.

# The ACT rule is Both Feasible and Intentionally Designed for Flexibility

The development of the ACT rule involved a comprehensive integration of stakeholder input spanning several years, to ensure sufficient compliance pathways for vehicle manufacturers. The rule starts with a gradual trajectory, beginning with modest sales requirements that gradually increase. This approach allows ZEV technology to evolve in a manner aligned with the demands of more challenging-to-electrify fleets, the supporting ecosystem to mature, and the reduction of vehicle costs. The initial sales requirements exhibit a restrained increase: starting from adoption in 2023 to the first year of compliance in 2027, the sales requirement is merely 15-20 percent of sales, contingent upon the vehicle class.

Furthermore, the ACT rule incorporates a credit mechanism system that fosters voluntary early action and provides a substantial degree of compliance flexibility. Specifically, a manufacturer's annual M/HDV sales determine that manufacturer's deficit, which it must fulfil by retiring a corresponding number of credits. <sup>4</sup> Each sale of a ZEV generates a credit, capable of being stockpiled for up to five years, traded, or

<sup>&</sup>lt;sup>2</sup> Maine Department of Environmental protection, Ch. 128 Fact Sheet, Accessed 8/23/2023, available at https://www.maine.gov/tools/whatsnew/attach.php?id=11458246&an=1

<sup>&</sup>lt;sup>3</sup> State of Maine, Governor's Energy Office, Renewable Portfolio Standards, available at https://www.maine.gov/energy/initiatives/renewable-energy/renewable-portfolio-standards

<sup>&</sup>lt;sup>4</sup> The ZEV sales percentage requirements, and therefore the deficit generated by each vehicle sold, phase in at different rates for different weight classes: Class 2b-3 requirements phase in from 15% in model year 2027 to 55% in 2035, class 4-8 ramps up from 20% in 2027 to 75% in 2035, and class 7-8 tractors ramp up from 15% in 2027 to 40% in 2035. The deficit generated by each vehicle sale is adjusted by a "weight class multiplier," which range from 0.8 for class 2b-3 vehicles to 2.5 for class 7-8 tractors.

sold.<sup>5</sup> Under the ACT rule, the trading of zero-emission credit trading is permissible between manufacturers and among most truck classes, accounting for vehicle size. This mechanism allows manufacturers to transfer credits from truck segments primed for electrification to those that are less suited. These provisions facilitate multiple routes to compliance, streamlining the implementation process and rendering it more cost-effective.

Lastly, the ACT Rule has the flexibility to accommodate potential fluctuations in year-to-year vehicle sales. In response to requests from truck manufacturers, the ACT Rule accounts for unforeseen macroeconomic events by basing manufacturers' annual electric vehicle sales requirements on sales from the same year. This way, spikes or declines in purchases exert an immediate influence on the overall number of electric vehicles a manufacturer must sell. For example, if an economic downturn occurs, the sales requirements will diminish to reflect the challenges in production.

# Zero-Emission M/HD Vehicles Have Arrived and are Economically Viable

Zero-emission technologies are swiftly becoming accessible in all vehicle sizes and operational scenarios, with some already market-ready. As of October 2020, there were 20 zero-emission models commercially available across all bus types and class 2b-8 trucks.<sup>6</sup> By the close of 2022, this figure surged to a robust 544 total models available within these vehicle classes.<sup>7</sup> Manufacturer announcements corroborate the increasing presence of electric vehicle offerings, with numerous companies selling EVs in virtually all medium- and heavy-duty market segments by 2025, including a notable 58 percent of major OEMs.<sup>8</sup> The adoption and implementation of the ACT Rule will further amplify model availability, propelling economies of scale. A report by Ceres underscores that regulations like the ACT rule, which establish sales targets, will "lead to lower production costs by increasing sales and production volumes, which would further justify increased investment in infrastructure and incentivize the production of battery electric trucks in other classes." <sup>9</sup>

Standards like the ACT rule will also inspire technology advancements to bring down costs. "[A]dvancements in solid-state batteries could be revolutionary, and have significant potential to drive additional battery pack cost reductions in the future," with Bloomberg New Energy Foundation predicting that these "solid-state cells produced at scale could be manufactured at 40 percent of the cost

<sup>&</sup>lt;sup>5</sup> As with deficits, the number of credits generated by each ZEV sale is adjusted by a weight class multiplier. Class 7-8 tractor deficits can only be met with Class 7-8 tractor credits, but Class 7-8 credits generated by selling zero-emission vehicles can be used to fulfil deficits in the other classes. Additionally, near-zero emission vehicles (NZEVs)—vehicles capable of traveling a minimum distance fully electric—are also able to generate credits that can be used to meet a portion of manufacturer deficits through model year 2035.

<sup>&</sup>lt;sup>6</sup> EDF & ERM, Electric Vehicle Market Report at 33 (April 2022), available at https://blogs.edf.org/climate411/files/2022/04/electric\_vehicle\_market\_report\_v6\_april2022.pdf.
<sup>7</sup> Id.

<sup>&</sup>lt;sup>8</sup> Lowell & Culkin, MJ Bradley & Associates, Medium- And Heavy-Duty Vehicles: Market Structure, Environmental Impact & EV Readiness at 22, Figure 10, (July 2021), available at http://blogs.edf.org/climate411/files/2021/08/EDFMHDVEVFeasibilityReport22jul21.pdf.

<sup>&</sup>lt;sup>9</sup> Ceres, Electrifying Trucking: The Case for Ambitious Federal Emissions Standards and Policies (May 2022), available at https://www.ceres.org/resources/reports/electrifyingtrucking-case-ambitious-federal-emissions-standards-and-policies

of current lithium-ion batteries." <sup>10</sup> Research at leading U.S. universities holds the promise of revolutionizing battery chemistries, potentially resulting in substantial upfront cost reductions for EVs. However, the extent of this impact will be determined by the promulgation of policies like the ACT Rule that drive sales of EVs. Finally, significant advancements in range and efficiency in the intervening years can be expected, expanding suitability for a wider spectrum of zero-emission vehicle uses and classes.

Adoption of the ACT is a critical way for Maine to capture the economic benefits of the ZEV transition. By 2050, as the nation moves to zero-emission trucks, the public health benefits could reach \$735 billion due to cleaner air. <sup>11</sup> If Maine adopts the ACT, it can expect to capture \$600 million in public health benefits and would result in 54 avoided deaths, 785 avoided asthma attacks, and 4,180 avoided lost workdays. <sup>12</sup>

# Fleets Stand to Benefit and are Unlikely to Relocate

As a result of lower total ownership costs—driven by fuel and maintenance cost savings <sup>13</sup>—-Maine can expect significant net fleet savings by 2050 due to the ACT rule. <sup>14</sup> These benefits are corroborated by a recent study completed by Roush Industries, indicating that the total cost of ownership for several categories of M/HD vehicles –including Class 8 transit buses, Class 7 school buses, Class 8 garbage trucks and Class 3-7 shuttle buses and delivery trucks – will be less expensive than their diesel counterparts by 2027.

The Roush study's findings underscore the clear advantages tied to transitioning to zero-emission vehicles when considering purchase price, maintenance, energy/fuel, and infrastructure costs. According to the study, "maintenance costs are still present, but typically lower than [internal combustion vehicles] due to the lower complexity and fewer consumables such as engine oil and filters" and that "additional consumables such as brake pads and rotors last longer due to regenerative braking performed by the drive motors." As a result, the study indicates that the total cost of ownership for all vehicle types analyzed significantly undercuts that of the comparable diesel alternatives: at the lower end, the total

<sup>&</sup>lt;sup>10</sup> EDF & ERM, Electric Vehicle Market Report at 33 (Sept. 2022). Available at https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//2022/09/ERM-EDF-Electric-Vehicle-Market-

Report\_September2022.pdf?\_gl=1\*aigmdz\*\_ga\*MTQ5OTM0MDY5NS4xNjkzMjA0NzA5\*\_ga\_2B3856Y9QW\*MTY5 MzlwNDcwOC4xLjEuMTY5MzlwNDcyNi40Mi4wLjA.\*\_ga\_Q5CTTQBJD8\*MTY5MzlwNDcwOC4xLjEuMTY5MzlwNDcy Ni40Mi4wLjA.\* gcl au\*ODA2MzU3NDk1LjE2OTMyMDQ3MDk.

<sup>&</sup>lt;sup>11</sup> American Lung Association, Delivering Clean Air: Health Benefits of Zero-Emission Trucks and Electricity, available at https://www.lung.org/getmedia/e1ff935b-a935-4f49-91e5-151f1e643124/zero-emission-truck-report

<sup>&</sup>lt;sup>12</sup> American Lung Association, Transition to Zero-Emission Trucks Could Save Lives in Maine, available at https://www.lung.org/media/press-releases/transition-to-zero-emission-trucks-in-maine

<sup>&</sup>lt;sup>13</sup> Maine Governor's Energy Office, Maine Clean Transportation Roadmap, December 2021, available at https://www.maine.gov/future/sites/maine.gov.future/files/inline

files/Maine%20Clean%20Transportation%20Roadmap.pdf (see page 19); Cadmus Group, Maine Clean Transportation Roadmap, January 25, 2022, available at https://legislature.maine.gov/doc/7952 (see slide # 14).

<sup>&</sup>lt;sup>14</sup> Conservation Law Foundation, Sierra Club, Natural Resources Council of Maine, Petition to Require Maine Department of Environmental Protection Rulemaking to Adopt Advanced Clean Trucks Regulation Pursuant to 5 M.R.S. § 8055, available at https://www.clf.org/wp-content/uploads/2023/06/ACT-FINAL-PETITION-EXECUTED.pdf <sup>15</sup> Roush Industries, LLC, Technical Review of: Medium and Heavy Duty Electrification Costs for MY 2027-2030 at 39 (Feb. 2, 2022), available at https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files/2022/02/EDF-MDHD-Electrification-v1.6\_20220209.pdf

cost of ownership of a Class 7 delivery truck compared to its diesel equivalent is 12.7 percent lower, while the total cost of ownership of a Class 5 delivery truck and a Class 8 delivery truck are both upwards of 30 percent lower than the internal combustion engine alternative.

The Roush study's insights indicate that with the exception of Class 5 shuttles, the purchase price for all other categories would be lower than their diesel engine counterparts by 2027. Even for Class 5 shuttles, the incremental cost increase for the electric vehicle is marginal, at just 2 percent higher. Ongoing technological advancements will further improve the economics of transitioning to electric vehicles. According to the Roush report, advances in the energy density and efficiency of the battery "will reduce the battery back cost by greater than 13 percent." As the battery constitutes the largest portion of an electric vehicle's purchase price, this reduction will further reduce the overall cost of these vehicles. As economies of scale continue to expand, the pricing of charging technologies is also expected to decrease.

An update to the Roush study additionally found that as a result of the grants and incentives in the 2022 Inflation Reduction Act (IRA), electric freight trucks and buses will be less expensive than their combustion engine counterparts in every category by 2023 - i.e., immediately. In addition to reducing the purchase price of M/HD ZEVs, the IRA will also provide savings on charging equipment.<sup>17</sup>

Finally, there is insufficient evidence to suggest that Maine will suffer business losses to neighboring states due to its adoption of the ACT. To the contrary, as a growing number of Maine-based companies embrace the benefits of ZEVs and commit to decarbonizing their fleets, there is strong indication that the ACT will meet the burgeoning demand for ZEVs within the state. <sup>18</sup> The adoption of the ACT rule will bolster Maine's competitiveness in the evolving M/HD vehicle market. While some businesses might not immediately embrace the future of clean transportation, the ACT rule's phased timeline, flexible provisions, and focus on manufacturers rather than fleets offer numerous alternatives that precludes the need for business to leave the state.

## Zero-Emission M/HD Vehicles Can Demonstrate Strong Performance in Maine's Market and Geography

Critics of the ACT rule often contend that that zero emission M/HDVs are ill-suited for cold or mountainous environments. However, this argument is based on a misconception, as the notion that electric trucks and buses exclusively face challenges in cold weather is misleading. Diesel vehicles also experience decreased efficiency in cold temperatures, and despite advancements in diesel vehicle technology, diesel fuel can congeal in frigid conditions, leading to engine malfunctions without

<sup>&</sup>lt;sup>16</sup> *Id.* at 120

<sup>&</sup>lt;sup>17</sup> Roush, Inflation Reduction Act 2022 Impact Study at 7, 15 (Sept. 9, 2022). Available at https://www.edf.org/sites/default/files/2023-

<sup>05/</sup>Impact\_of\_IRA\_MHD\_Electrification\_Costs\_MYs\_2024\_and\_2027\_Roush.pdf

<sup>&</sup>lt;sup>18</sup> Some key fleet commitments include: Amazon: net zero carbon by 2040, FedEx: all parcel pickup and delivery vehicle purchases zero emission by 2030, Ikea: all deliveries zero-emission by 2025, PepsiCo: net zero emissions by 2040, Siemens: carbon neutral fleet in the US by 2030, Titan Freight: zero-emission fleet by 2030, Walmart: full electrification by 2040. Amazon, We are all in on The Climate Pledge: net zero carbon by 2040 (June 23, 2020)

intervention.<sup>19</sup> Just as solutions exist for diesel vehicles, strategies can be used to mitigate the reduction in range for electric trucks and buses, such as pre-heating the vehicle to extend their range.<sup>20</sup>

The successful operation of electric trucks and buses in in cold weather is becoming increasingly evident. For instance, Meijer has effectively tested semi-trucks in Michigan<sup>21</sup>, while in Colorado's mountains, Durango and Kremmling have successfully deployed electric school buses. Despite initial concerns about operating in cold weather, the schools found that "the electric school bus has great torque and performs well in cold weather climates." <sup>22</sup> These positive outcomes are not limited to specific areas; electric school buses have also proven successful in Alaska, Michigan, and Utah. In fact, "while the [Salt Lake City School District] saw its range drop around 18% in winter conditions due to an all-electric heater...they have, however, found that they can get around 16% additional range from regenerative braking." <sup>23</sup> Additionally, in North Carolina, the Eastern Band of Cherokee Indians' tribal schools found that electric school buses "performed well in mountainous terrain and benefits from the regenerative braking through which the bus battery can gain range when driving downhill." <sup>24</sup> The capabilities and advantages of electric vehicles in challenging environments are poised to grow stronger as technological advancements continue; indeed, an EV manufacturer in Canada is already working on an electric bus specifically built for cold weather. <sup>25</sup>

# Implementation of the ACT rule will be Supported by Substantial Federal Incentives

There are a wide variety of federal incentives available to help offset the higher upfront cost of electric vehicles and infrastructure. At the federal level, both the Infrastructure Investment and Jobs Act and the Inflation Reduction Act contain a multitude of measures aimed at facilitating decarbonization of the nation's most polluting sector, including:

• \$5 billion as part of the Clean School Bus program, with half of that money dedicated specifically for zero-emission school buses, as well as charging infrastructure

<sup>&</sup>lt;sup>19</sup> Heavy Duty Trucking, Keep your Diesel Fuel from Freezing this Winter, (Feb. 4, 2020), Available at https://www.truckinginfo.com/350359/keep-your-fuel-from-freezing-this-winter

<sup>&</sup>lt;sup>20</sup> DOE, Fuel Economy in Cold Weather, Available at https://www.energy.gov/energysaver/fuel-economy-coldweather#:~:text=Cold%20weather%20effects%20can%20vary,to%2034%25%20under%20these%20conditions

<sup>&</sup>lt;sup>21</sup> Liz Dominguez, RIS, Meijer Deploys All-Electric Semi-Trucks Following Successful Test Period (Dec. 19, 2022) Available at https://risnews.com/meijer-deploys-all-electric-semi-trucks-following-successful-testperiod

<sup>&</sup>lt;sup>22</sup> EESI, New Electric School Buses in Colorado Provide Safer, Cleaner, Cheaper Rides (Jan. 26, 2022), Available at https://www.eesi.org/articles/view/new-electric-school-buses-in-colorado-provide-safer-cleanercheaper-rides

<sup>&</sup>lt;sup>23</sup> Electric School Bus Initiative, All About Range, Safety and Reliability (Oct. 17, 2022), Available at https://electricschoolbusinitiative.org/all-about-range-safety-and-reliability

<sup>&</sup>lt;sup>24</sup> Electric School Bus Initiative, The Electric School Bus Series: How North Carolina's Eastern Band of Cherokee Indians is Planning for Seven Generations of Sustainability (Aug. 4, 2022), Available at https://electricschoolbusinitiative.org/electric-school-bus-series-how-north-carolinas-eastern-bandcherokee-indians-planning-seven.

<sup>&</sup>lt;sup>25</sup> Electrive, Canada's Letenda presents cold-weather electric bus (Feb. 28, 2022), Available at <a href="https://www.electrive.com/2022/02/28/canadian-company-presents-cold-weather-electric-bus/">https://www.electrive.com/2022/02/28/canadian-company-presents-cold-weather-electric-bus/</a>.

- 1 billion in grants for Class 6 and 7 zero-emission vehicles
- \$7.5 billion in formula and discretionary funding for the build-out of public EV charging infrastructure
- Tax credits that can help bring down the cost of assets, including 45W tax credits for commercial zero-emission vehicles and 30C tax credits for charging/refueling infrastructure
- Funds for transit buses through expansion of the Low and No-Emission grant program; and
- Programs with funds that, while broader in scope, contemplate the use of funds for zeroemission transportation (e.g., the Congestion Mitigation and Air Quality Improvement program,
  creation of the Greenhouse Gas Reduction Fund, and expansion of the Diesel Emissions
  Reduction Act, all of which can be leveraged for the purchase of zero-emission vehicles and
  supporting equipment).

Studies demonstrate that these incentive programs have a deep and positive impact of the upfront cost of these vehicles, furthering the economic feasibility of purchasing zero-emission trucks and buses. For example, the consulting group ERM found that IRA grants and credits will further deployment. According to that report, "grants alone could increase the number of ZEV sales by over 74,000 vehicles between 2023 and 2031" and "found that the purchase price for a wide range of commercial ZEVs will reach parity with comparable diesel or gas vehicles at least 5 years and as much as 12 years earlier than would occur without the credit, and as early as 2023 for many ZEVs." Even under the more conservative assumptions contained within a recent ICCT report, tax credits were found to, along state policies like the ACT, facilitate a share of heavy duty vehicles in the market of 47-56 percent. In a nutshell, incentives take the price parity that was already predicted for many vehicles as early as 2027 will become favorable much earlier with the incentives embedded within federal legislation. Any state programs that focus on incentivizing medium- and heavy-duty ZEVs in Maine will only make that equation more attractive.

## **Embrace the ACT Rule to Secure Public Health and Economic Benefits**

NRDC commends your dedicated efforts on this pivotal rulemaking. NRDC wholeheartedly support Maine's adoption of the ACT rule in 2023. This rule holds the potential to propel Maine towards its statutory climate targets, fortify its economic landscape, and curtail the detrimental impact of air pollution on public health.

Sincerely,

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<sup>&</sup>lt;sup>26</sup> EDF & ERM, Electric Vehicle Market Report at 22 (Sept. 2022), available at https://blogs.edf.org/climate411/wp-content/blogs.dir/7/files//2022/09/ERM-EDF-Electric-Vehicle-Market-

Report\_September2022.pdf?\_gl=1\*aigmdz\*\_ga\*MTQ5OTM0MDY5NS4xNjkzMjA0NzA5\*\_ga\_2B3856Y9QW\*MTY5 MzlwNDcwOC4xLjEuMTY5MzlwNDcyNi40Mi4wLjA.\*\_ga\_Q5CTTQBJD8\*MTY5MzlwNDcwOC4xLjEuMTY5MzlwNDcyNi40Mi4wLjA.\* gcl au\*ODA2MzU3NDk1LjE2OTMyMDQ3MDk.

<sup>&</sup>lt;sup>27</sup> ICCT, Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States (Jan. 2023), available at https://theicct.org/wp-content/uploads/2023/01/ira-impact-evs-usjan23.pdf

# NRDC

