NATIONAL Aquaculture ASSOCIATION

September 9, 2024

William Charmley, Director
Assessment and Standards Division,
Office of Transportation and Air Quality
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460

RE: California State Motor Vehicle Pollution Control Standards; Advanced Clean Fleets Regulation; Request for Waiver of Preemption and Authorization
Docket EPA–HQ–OAR–2023–0589

Dear Mr. Charmley:

Please accept and act favorably upon the National Aquaculture Association[1] request to not grant a waiver to the State of California. The plain facts are zero emission work or transportation vehicles of capacity (load or tow), travel distance and reasonable cost are not available, those vehicles that are available are of significantly diminished capability and under extreme summer or winter temperatures battery performance is significantly reduced. This is not to imply we do not recognize, as conscientious environmental stewards, the absolute need to improve air quality.

We note the Administrator is charged by Congress within the Clean Air Act to assess whether 1) the necessary technology is available and 2) adopted regulations are at least protective of public health and welfare as are current federal standards. For both instances, California has not provided information to prove either requirement.

Capacity and Capability
Relative to available technology, we read with interest the California Air Resources Board summary of annual zero emissions truck sales data reported by manufacturers. The actual sales numbers are very modest. We also note the California Resources Board provided a list of available or planned trucks as a docket document, Reference 3t Appendix J to ISOR. There appears to be one long haul, over the road tractor by Volvo and no light and medium trucks available.

[1] The National Aquaculture Association (NAA) is a U.S. producer-based, non-profit trade association founded in 1991 that supports the establishment of governmental programs that further the common interest of our membership, both as individual producers and as members of the aquaculture community. For over 33 years NAA has been the united voice of the domestic aquaculture sector committed to the continued growth of our industry, working with state and federal governments to create a business climate conducive to our success, and fostering cost-effective environmental stewardship and sustainability.

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We request the Environmental Protection Agency complete, or require the State of California to complete, a technology capacity, capability and cost comparison (zero emission trucks versus currently available diesel and gasoline powered trucks). At a minimum the comparative technology analysis should consist of two parts:

1. A comparative capability assessment (load, tow, range), with hard data not projections, for zero emission and diesel/gasoline powered trucks to answer the fundamental question: Are zero emission trucks available that can perform for the agricultural sector.
2. A truck equivalence analysis estimating of the number of zero emission trucks needed to replace and perform at the same level of capability for each diesel or gasoline powered truck. Based upon our understanding of the capability of half-ton electric versus diesel or gasoline powered pickup (presented later in this letter) we believe the ratio may be 3 electric to 1 diesel/gas pickup to provide the same capacities and capabilities.

We request these analyses because the California Air Resources Board:

1. Did not respond to public comment noting the purchase of additional zero emission trucks will be required to match the capability and capacity of one diesel/gasoline truck (Reference 27a - Appendix A to Final Statement of Reasons**;** Appendix A Legal Comments and Responses).

2. Provided a Total Cost of Ownership Discussion Document, docket document Reference 3n Appendix G to ISOR, which explicitly assumed an equivalence in capability and capacity which is patently false and misleading**.** Their cost of ownership analysis should include the number of zero emission trucks required to replace one diesel/gasoline truck.

   The false assumption zero emission trucks, in any class, are equivalent to currently available diesel/gasoline trucks, agency has greatly underestimated the number and overall costs to the public of zero emission trucks needed for each phase for their rule for each class of truck (Reference 6d Appendix B: Updated Costs and Benefits Analysis; Reference 2 - Staff Report – ISOR - Staff Report: Initial Statement of Reasons). These documents must be revised to reflect the realities associated with the significantly reduced capacity and capability of zero emission trucks.

We believe a mandatory requirement to buy zero emission truck technology will trigger productivity losses in delivery of goods and services or the growing, processing, and delivery of food and fiber and will greatly increase the number of trucks farmers will have to purchase that will then be on the road, in for repairs, or parked to equal the capability of existing trucks.

Human Welfare
We also request the Environmental Protection Agency, or the State of California, complete an analysis of the impact of the zero-emission truck and transport regulations on human welfare. This analysis must be completed to assess the impact of the regulations on access and availability of reliably delivered and affordable 1) human transportation, 2) food and fiber, and 3) goods and services.

Background Information
Within the United States approximately 6,000 aquafarms annually sell $2.7 billion of farmed seafood, live and processed, as well as live fish for recreational fishing and restoring at-risk fish populations, live bait, and fish and invertebrates, like marine corals, for the aquarium hobby. These farms contribute $4 billion in economic activity to rural inland and coastal communities and 60% of the farms are small and family owned. The 150 California fish and shellfish farms are of the same nature, productivity and needs as are aquafarms nationally.

We request the waiver not be granted. As farmers, including California aquafarmers, we use heavy duty pickup trucks and local and long-haul trucks to transport live fish, farmed seafood (live and processed), farm equipment, feed, and other inputs to customers, within the farm, to the farm, or between farms. In addition, live fish are transported by local delivery and long-haul trucks in tanks aerated by compressed oxygen. Live fish are delicate. Their metabolism does not stop during transport. Stocking density is critical as is the shortest possible delivery time. The delivery of live fish could not be halted to charge batteries and the current range estimations, whether actual or theoretical, are inadequate to load, transport and deliver live fish in a safe, efficient manner that protects animal health and provides adequate animal care. **Readily available, reliable, and cost-effective transport is critical to our farmers.**

Granting the waiver will severely impact typical farm operations, increase operational costs, and close farms. As a performance metric, currently gasoline or diesel-powered heavy duty pickup trucks offer greater than twice the capacity to carry products (70 cu ft vs 29 cu ft), three times the towing capacity (32,000 pounds vs 11,000 pounds) and three times or more the travel distance (350 miles vs 100 miles) compared to electric pickups. There are no electric powered local trucks of 26,000 gvw or long-haul trucks available. Notably, available half-ton electric pickups prices are comparable to three-quarter ton and one ton diesel or gasoline pickups.

The cost analyses provided by the California Air Resources Board, Reference 3n Appendix G to ISOR and Reference 6d Appendix B**,** presents a cost analysis favorable to zero emission vehicles; however, a favorable outcome is entirely predicated upon a Low Carbon Fuel Standard (LCFS) credit. This credit is a market-based mechanism entirely dependent upon the projected sales of vehicles not currently available and the sales of unavailable vehicles in estimated quantities to meet the phase in of the rule. The LCFS numbers are a fiction employed to project a favorable cost analysis. The agency should revise these analyses to provide a range of LCFS

credits that can be realistically expected going forward. Based upon agency reported vehicle sales and the availability of vehicles, the current cost analyses are false and misleading.

For at least the last decade, a plethora of research has pointed to the diminished capability of lithium-ion (Li-ion) batteries under extreme low or high temperatures. Examples being Lu et al. 2013; Yuksel and Michalek. 2015; Lindgren and Lund 2016; Sanguesa et al. 2021; Szumska and Jurecki, 2021; Senol et al. 2023. The perception of California as having a climate of year-round pleasant temperatures is negated by the temperature extreme data available here: Climate of California - Wikipedia.

Yuksel and Michalek (2015) captured perfectly the challenges with battery electric vehicles: "Battery performance depends strongly on temperature. At cold temperatures, battery efficiency, discharge capability, and available energy decrease. In addition, battery internal resistance increases, decreasing the power that can be drawn from the battery. Battery performance increases with temperature rise, but batteries also degrade faster at high temperatures, increasing thermal management requirements."

The recent review by Seno et al. (2023) noted the variety of challenges which are of critical concern to rurally located farms mandated to use zero emission vehicles:

- "…existing literature assumes that EVs [electric vehicles] operate under optimal driving conditions, namely 21.5◦C optimal temperature when they show their best performance. However, under low (e.g. less than 5◦C) or high temperatures (e.g. more than 30◦C), the performance of EVs significantly degrades as a sizable portion of the stored energy is used for heating (or cooling the battery) and the driver's cabin."
- "…EV charging durations are adversely affected by low-temperature conditions. Low temperatures influence EV battery's electrochemical structure. As a result, accelerated internal chemical reactions affect EV performance and safety. To maintain its safety, Battery Management System (BMS) limit the charging rate when the battery is cold. Therefore, the charging rate of DC fast chargers is considerably reduced under low temperatures. The charging times could be doubled, thereby negatively impacting the schedule of EV drivers and EV fleets under low temperatures (less than -10◦C)."
- A study conducted at the Faraday Institute for one year considered the storage state of charge (SoC) and storage temperature. "This study considered eight different storage SoC (from 0% to 100% with equal increments) and three different storage temperatures (25◦C, 40◦C and 50◦C). According to monthly electrochemical check-up measurements, Li-ion cells with 70–80% SoC degrade the fastest at all temperatures. Cells stored at 80% SoC had the worst capacity preservation, with relative capacities reaching around 94%, 92%, and 90% after a year for cells stored at 25◦C, 40◦C and 50◦C, respectively. As the temperature rises from room temperature, the capacity of the cells decreases. Capacity degradation rate and temperature dependencies for cells show different results below or above 60% SoC. Cells held at 0% SoC have the best capacity retention and the

most negligible temperature dependence for the one year studied, while cells maintained at 100% SoC do not indicate the fastest capacity reduction, but they produce internal short circuits when the temperature is above 40◦C."

- "…the available energy of a Li-ion battery at −20◦C is 70% of its value for the same current at room temperature. According to studies conducted in Canada, the range of the EV decreases by 1.1 km with each 1-degree reduction in temperature (in Celsius). These studies also observed that the vehicle range decreases by 20% for −7◦C compared to 20◦C."
- "In rural areas, this additional [EV charging] demand causes undervoltage problems due to the feeders' length and the cables' small cross-section. The unbalance in distribution phases leads to energy losses and increases the heating of network equipment. A significant power quality issue in voltage and current harmonics is observed due to AC/DC conversion in EV chargers. Many power electronic devices connected to the grid increase the harmonic emissions in the system. Thus, the erratic charging behaviour of EV users will cause power quality issues in power systems in terms of harmonics, voltage levels, and phase unbalances."

Our members report their rural power suppliers are entirely unable to meet projected demand to charge the number of electric trucks needed to replace current truck numbers.

A solution to the negative impact temperature extremes is to manage battery temperature. Çetin et al. (2022) set the stage for their recent review by noting:

> "Lithium-ion (Li-ion) batteries are widely preferred in EVs due to their high energy density and long service life. Lithium battery packs, like other batteries, have a high sensitivity to temperature. The imbalance in temperature distribution inside the battery pack can cause different electrochemical behaviors, electrically unstable cells, and chemical deteriorations that may occur in battery cells significantly affect battery performance. The optimum operating temperature for Li-ion batteries is in the range of 15°C to 35°C. Normally, the maximum temperature difference (MTD) between the cells should be kept at 5°C. At operating temperatures below the optimum range, a decrease in the power and energy of the batteries was observed. In addition to poor performance, the aging rate of batteries increases, especially at temperatures below 0°C. At operating temperatures above the optimum range, depending on the overheating of the batteries, serious problems such as decreases in capacity and performance and self-discharge occur. A strong and effective cooling and heat dissipation system is necessary for the design of the battery pack for lithium cells. For this reason, BTMSs [battery thermal management system] are needed to keep the temperature of the battery pack in the optimum range, to ensure the battery pack's thermal uniformity, and to balance the charge/discharge state."

Unfortunately, Çetin et al. reported that none of the BTMS types such as active or passive, series or parallel, heating or cooling, internal or external, air or liquid or phase change material, or hybrid strategy combining multiple methods, are commercially feasible for extreme temperatures because of thermal conductivity, size, weight, temperature distribution within the battery array, or cost limitations. A table within their paper is reproduced below.

Table 2. Comparison of air, liquid, and phase change material (PCM) cooling BTMSs

	Thermal Conductivity	Structure Complexity	Compactness	Weight	Uniform temperature distribution	Coolant viscosity	Cost	Maintenance
Air	M	L	H	L	L	L	L	L
Liquid	H	M	L	H	M	M	M	M
PCM	L	H	L	H	H	H	H	H

L stands for low, M stands for medium, and H stands for high.

We request that the Environmental Protection Agency or the State of California complete battery performance and power grid analyses to inform the waiver request.

In summary, we oppose granting the waiver. We know as truck buyers and truck users the California regulations cannot be met by the farming community for a lack of 1) available technology of the capability and capacity in the form of zero emission trucks suitable for fish and shellfish farmers, and 2) a sufficient rural electric power infrastructure. State of California provided truck sales data indicates as much; however the analyses they did provide does not address three critical questions as to whether these trucks provide serviceable alternatives under all temperatures versus existing diesel and gasoline powered trucks used by the farming community, how many additional zero emission trucks would have to be purchased to replace current vehicles, and what are the real costs, not as influenced by optimistic market-based credit and tax credit assumptions, to purchasing, using and maintaining zero emission trucks.

If you or your staff have questions or comments, please do not hesitate to contact us.

Sincerely,

Sebastian Belle
President

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