December 9, 2019

Ms. Mary Nichols
Chair, California Air Resources Board
1001 I Street
Sacramento, CA 95814

RE: Comments on Proposed Advanced Clean Trucks Regulation

Dear Ms. Nichols:

Allison Transmission, Inc. ("Allison") is pleased to comment on the proposed Advanced Clean Trucks (ACT) Regulation and elements of the proposed rule which could impact the market for advanced vehicle technologies, including hybrid and electric-drive systems produced by our company.

Allison is the world's largest manufacturer of fully automatic transmissions for medium- and heavy-duty commercial vehicles and is a leader in hybrid propulsion systems for city buses. With a market presence in more than 80 countries, Allison's products are specified by over 250 of the world's leading vehicle manufacturers and are used in a variety of applications including refuse, construction, fire, pick-up and delivery, distribution, bus, motorhomes, defense and energy. Allison is head-quartered in Indianapolis, Indiana and has over 1,000 dealer and distributor locations in the United States.

In 2014, Allison was the first electric hybrid-propulsion system to be certified for transit buses and coaches in California. The Allison H 40/50 EP retained this certification over the last five years and has achieved a fuel economy up to 25 percent greater than similar diesel buses. In 2019, Allison moved into fully electrified propulsion and connected vehicle technologies for medium- and heavy-duty vehicles. Allison's AXE Electric Axle Series™ offers a "bolt-in" solution for current vehicle frames, suspensions and well ends that features fully integrated electric motors and a multi-speed gearbox. The Electric Axle Series™ is compatible with full battery electric vehicles and fuel cell vehicles as well as hybrid applications. Thus, CARB's proposed rule is of great interest to our company and our customers and we appreciate the opportunity to provide our perspectives on your pending regulation.

Sincerely,

// signed electronically //
Barbara Chance
Director, Mobile Source Emissions
Regulatory Compliance

cc: Clerk of the Board

Allison Transmission Inc.
Comments on California Advanced Clean Trucks Regulation
12/09/2019

I. Introduction

As noted in the cover letter to these comments, Allison is not only the world's largest manufacturer or fully automatic medium- and heavy duty transmissions but is also a leader in hybrid propulsion systems. Since 2004, Allison has delivered more than 8,000 electric hybrid bus systems word wide, and Allison now serves transit systems in several major U.S. metropolitan areas, including Washington, D.C.

Allison was founded over 100 years ago by the co-founder of the Indianapolis Motor Speedway. Starting as a "simple machine shop," our company grew to approximately 2,700 employees and now has a commercial presence in 80 different countries. Allison has been at the forefront of vehicle propulsion systems for medium and heavy- duty vehicles and is heavily used in the vocational vehicle sector. As a result and driven by the needs of our customers, we have invested in continual technological improvement.

Most recently, Allison's pairing of its H40/50 with Flex EV has created a hybrid system that includes a purely electric extended range and zero-emissions with engine off operation. Thus, our company has a strong interest in CARB's proposed regulation which would impact not only this system, but many of our existing product lines and planned improvements. In our view, CARB's proposed regulation will effectively define what are considered to be "acceptable" technological approaches to reducing greenhouse gas ("GHG") emissions from medium- and heavy-duty vehicles in California for the next 15 years and most likely, well beyond that time.

This is, in part, due to the fact that the proposed regulation creates a sales mandate for Zero Emission Vehicles ("ZEVs") that qualifies some systems for emission credits, but not others. The proposed regulation also serves to "lock in" a specific powertrain certification protocol by linking this protocol to the vehicle sales mandate. Thus, while Allison is supportive of the transition to zero-emission technology, in some areas, we believe that the proposed regulation provides too rigid of a pathway to accomplish California's environmental policy goals.

We would note that the comments we file today are not only reflective of our decades-long experience in vehicle transmissions -- but in the very real challenges of integrating hybrids and EVs into the medium- and heavy-duty commercial market. We have direct experience in the magnitude of this challenge and understand well the technological, economic and market barriers in bringing new products to market. From this experience, we believe CARB can move forward, but must do so based on thorough and solid analysis of technological and commercial opportunities and, equally important,

corresponding limitations that take into account inevitable variations in the market's response to new systems.

II. CARB Must Carefully Consider Impact of Proposed Rulemaking on Vocational Vehicle Market

A. While EV Market is Developing, the Feasibility and Timing for ZEV Technology will Vary Considerably Among Different Vehicle Types

Allison is supportive of the emerging heavy duty EV market. But we would caution against making a broad assumption that Class 4 to 8 vocational vehicles possess, in all cases, "operational characteristics that are more suitable for electrification." ISOR at 1-9. Class 4 to 8 vocational vehicles vary widely in terms of commercial requirements, operating parameters and purchasers. A "work truck" is primarily designed around the function it is designed to serve and it may operate in widely different use patterns.

Allison is the largest supplier of transmissions for vocational vehicles in North America. We routinely capture and analyze actual work day duty cycles for numerous different vocations. In support of EPA's Phase 2 GHG rule, Allison randomly selected 240 North American duty cycles covering vocations such as Airport Refueler; Bus (Transit, Commuter, Shuttle, Tour Coach, School), City Delivery (Armored Car, Beverage, Van, Walk-In Van), Construction (Concrete Mixer, Dump, Snow Plow, Equipment Hauler), Farm, Straddle Carrier, Line Haul, Log Hauler, Oil Field (Draw Works, Pumping), Refuse (Landfill, No Landfill, Recycling, Transfer), Utility (Municipal Maintenance, Public Utility, Street Sweeper), Wrecker, and Dock Spotter. These duty cycles averaged 7.6 hours in length and generally represented a full workday of operation.

The stop time data for a representative sample of the data for these vehicles is summarized below. While not comprehensive of the entire vocational vehicle sector, this data does provide some indication of the wide variance in actual vehicle use experienced by this sector:

Vocation	% Time stopped in Drive*	% Time stopped in Neutral*	Total % Time stopped
Transit Bus	24.1	12.1	36.2
Refuse	11.5	34.5	46
City Delivery	3.9	11.9	15.8
Concrete Mixer	5.2	58.3	63.5
Dump Truck	4.3	21.2	25.5
School Bus	12.1	24.6	36.7
Tour Coach	3.4	17.1	20.5

* This data does not differentiate between stopped in traffic and parked.

By comparison, CARB's assessment of ZEV suitability factors focused on weight, route/range, charging/fueling infrastructure and battery/vehicle space constraints.[1] With regard to the actual use of a vehicle, it appears that California concentrated solely on daily range requirements and average daily travel patterns.[2] Allison would not dispute the importance of any of these factors, but would submit that additional analysis of actual, daily use patterns of vocational vehicles and the work performed by such vehicles would enhance CARB's analysis of the ability of the market to move to ZEV technology.[3] While CARB's analysis predictably and accurately scored some vocational vehicles (*e.g*., concrete mixers scored at the high-end (*i.e*., less suitable) range for electrification), more refined analysis could provide additional insight into the ability of various market segments to transition to EV technology as well as uncover vocational vehicle types that may be substantially less suitable for electrification.

CARB's proposed rule also wields a somewhat blunt regulatory instrument. For example, CARB proposes to exclude Class 7-8 tractors from the 50% sales mandate applied to other vehicle classes (instead, imposing 15% sales requirement by 2030) while at the same time including scores of diverse vocational vehicles within this much larger mandate. While imposing lesser ZEV sales requirements may be directionally appropriate given the large number of Class 8 long haul vehicles that are in near-continuous use, the Advanced Clean Truck Market Segment Analysis adopts generalized and overly simplistic conclusions. For example, the analysis indicates that "just over 70 percent of Class 4-7 vehicles are *good fits* for electrification today while roughly 30 percent of Class 2b-3 and Class 8 vehicles are *good fits*."[4] CARB simply does not have enough quantitative data to make such qualitative assessments.

Such a high level, qualitative conclusion does not consider all relevant factors and conditions affecting vehicles within each class. Instead, it utilizes a scoring mechanism (point system) where each point is considered to be of equal value. But the vocational vehicle market is not linear or segmented into equivalent abilities to electrify so that relative scoring is representative of relative ability of particular vehicles to electrify. Indeed, CARB admits that announced plans for ZEVs do not guarantee that ZEVs will be produced in sufficient quantity to meet ACT mandate. ISOR at 1-13. And CARB acknowledges that ZEVs are in "early stages of commercial development in the medium and heavy duty space." *Id.* at I-14. CARB also indicates that it needs more information on individual fleet operations, having received a 1 percent response rate to a 2018 survey. *Id*. at II-7.

In part, CARB attempts to address this data deficiency through the proposed large entity reporting requirement. But rather than seek additional information *now* or prior to the

[1] Appendix E Zero Emission Truck Market Assessment at 2-3.

[2] *Id*. at 2-3.

[3] CARB acknowledges that "ZEV model availability, costs, site specific issues could impact infrastructure installations, normal truck replacement rates [and fleet size.]" *Id*. at 4. But the analysis still concludes that 70% of Class 4-7 vehicles have operational characteristics that are *suitable* for electrification. *Id.* at 7 (emphasis added). Such a broad conclusion should be supported by more meaningful data and analysis of actual vehicle design, function and other items, such as auxiliary loads.

[4] Analysis at I-17 (emphasis added).

finalization of this regulation, CARB is proposing to finalize the sales mandate and new reporting obligations concurrently.[5] CARB should instead consider obtaining additional data and analysis on the suitability of ZEVs for different market sectors prior to finalizing a sales mandate, thus allowing the Board to more precisely tailor any ZEV sales mandate that ultimately adopted.

While a ZEV sales mandate could theoretically be tailored after CARB approval (or perhaps, even retroactively) the very existence of such a mandate sends a strong market signal. CARB should work from the outset to ensure that the market signal delivered by the Advanced Clean Trucks Regulation is based on thorough consideration of the technical, economic and operational challenges that still remain for integration of ZEVs into the vocational vehicle fleet.[6]

B. Mandatory Use of ZEPCert and Exclusion of Hybrids Will Inhibit Development of Vehicle and Component Technology

On June 27, 2019 the California Air Resources Board adopted the Zero-Emission Powertrain Certification Regulation ("ZEPCert"). The Final Regulation Order for ZEPCert provides for voluntary certification of MY 2021 (and subsequent MYs) all-electric and hydrogen fuel-cell powertrains.[7] At the time this regulation was approved, CARB indicated that ZEPCert was "optional"[8] and that CARB "would not dictate which certification pathway a manufacture would be required to use."[9]

Voluntary use of ZEPCert, however, appears to be largely illusory. CARB has already taken actions that effectively make ZEPCert mandatory. For example, CARB has already included ZEPCert within the Zero-Emissions Airport Shuttle Bus program ("ZEAS").[10] Beginning in 2026, ZEPCert will be mandatory for all vehicles that are part of the program. And since ZEAS ultimately imposes a 100% purchase requirement that did not exist prior to the adoption of the regulation, manufacturers will have no choice but to utilize powertrain testing/certification for these vehicles.

It appears that CARB is also pursuing this same methodology with respect to the pending regulation. It does so in several incremental steps:

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[5] Even while the sales mandate would not become effective until MY 2024, finalization of this requirement will impose nearly immediate planning requirements for those manufacturers who anticipate being regulated.

[6] CARB should not simply assume that the vocational vehicle ZEV market will grow similar manner to transit bus market which has distinct markets and vehicle applications and access to different subsidies than the more diverse, private vocational vehicle market.

[7] 13 CCR §1956.8(a)(8).

[8] Staff Report: Initial Statement of Reasons ("ISOR"), Proposed Alternative Certification Requirements and Test Procedures for Heavy-Duty Electric and Fuel-Cell Vehicles and Proposed Standards and Test Procedures for Zero Emission Powertrains, Dec. 31, 2018 at ES-1.

[9] *Id*. at 11.

[10] 17 CCR 95690.5(c), referencing the Enhanced Electric and Fuel-Cell Certification Procedures contained in 17 CCR §95663. *See also:* Final Statement of Reasons for Rulemaking; Including Summary of Comments and Agency Response, Proposed Alternative Certification Requirements and Test Procedures for Heavy-Duty Electric and Fuel-Cell Vehicles and Proposed Standards and Test Procedures for Zero-Emission Powertrains.

- Pursuant to §1963.2(h), beginning in MY 2024, in order to receive Zero Emission Vehicle ("ZEV") credits, ZEVs over 14,000 GVWR and incomplete ZEVs between 8,501 and 14,000 GVWR must comply with 13 CCR §1956.8 and 17 CCCR §95663. As recently amended by CARB, these sections establish the ZEPCert program.

- Pursuant to §1963.1(a)(1), any deficits generated in 2024 and subsequent MYs must be matched with same number of ZEV and NZEV credits. Thus vehicle manufacturers and component suppliers will effectively have no choice but to comply with ZEPCert since credits form the means of compliance with the ACT Regulation. In fact, a manufacturer must make up any credit deficit by March 31st of the following MY. *See* §1963.3(b). A manufacturer is unable to roll-forward any credit deficits that were caused by not using ZEPCert in a prior year into a succeeding year.

Allison believes that this regulatory structure will have two important and counterproductive impacts. First, mandating ZEPCert combined with the broader sales mandates contained in the regulation will unnecessarily inhibit technology development. Second, the regulation results in hybrid vehicles generating negative credits, a result that effectively picks winners and losers in the transition to cleaner forms of transportation -- a result that we believe is directly at odds with making steady improvement in reducing the emissions of greenhouse gases.

i. ZEPCert Testing Mandate Inhibits Technological Development

CARB adopted ZEPCert to establish more "robust" certification procedures for heavy duty electric and fuel-cell vehicles. CARB intended the certification procedure "to bring about greater transparency, consistency, and stability to the market . . . [and] help reduce variability in the quality and reliability of HDEVs and HDFCVs" and to increase information provided to consumers.[11] As noted above, however, ZEPCert was presented an analyzed as an "alternative certification pathway for HDEVs and HDFCVs" that was "optional."[12]

Specifically, CARB claimed that "[w]hile the pathway would include more robust certification requirements, staff's proposal would not dictate which certification pathway a manufacturer would be required to use."[13] Additionally, CARB claimed that '[t]he intent of the proposed ZEPCert regulation is not to establish a mandatory certification process, but to create a framework that would support both new, 'cutting-edge' technologies (i.e., technologies earlier along the commercialization arc) as well as technologies that have demonstrated commercial viability."[14]

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[11] ISOR, Proposed Alternative Certification Requirements and Test Procedures for Heavy-Duty Electric and Fuel-Cell Vehicles and Proposed Standards and Test Procedures for Zero Emission Powertrains, Dec. 31, 2018 at 10.

[12] *Id*. at 11.

[13] *Id*.

[14] *Id*.

Less than 1 year later, CARB is contradicting a major part of its rationale for adopting ZEPCert. ZEPCert will effectively become a "mandatory certification process" for manufacturers subject to the new sales mandate. Instead of a flexible framework that might allow for other certification options to demonstrate the degree of GHG emission reduction, CARB is reverting to a "one-size-fits-all" approach to regulation.

Mandating a single pathway to certification also brings with it additional limitations. Additional costs and regulatory burdens CARB identified in connection with ZEPCert include the costs associated with powertrain battery testing ($7,500 per test), scan tool updating, new onboard efficiency and battery information, new application procedures, revision of owner's manuals and labeling..[15] CARB projected that costs would range from $1,802 to $706 per vehicle in years 2021 to 2025[16] and be of a different nature than the burden imposed by the current federal and previous California Phase 2 requirements.

The natural and logical result of increasing testing burdens for certain types of vehicles is to create an additional barrier to the adoption of new technologies. And whatever the actual level of additional costs imposed by ZEPCert turns out to be, a manufacturer of a new electric or fuel-cell vehicle will also need to take into account additional requirements such as:

- Development of diagnostic and repair manuals and service tools;
- The need to provide for the display of various vehicle-related information;
- Additional warranties specific to powertrain components;
- Additional reporting requirements, including any changes to monitoring and diagnostic systems (which also must be extensively described in initial applications for certification) and;
- The need to create new certification families based on changes to monitoring and diagnostic systems.[17]

This presents particular barriers in the vocational vehicle category given numerous vehicle configurations and use patterns. In this sector, additional certification requirements could realistically provide a disincentive to the development of HDEVs and HDFCVs for certain uses especially where sales, in California, are not sufficient to justify the additional time and effort to obtain ZEPCert. Thus, rather than attracting new manufacturers to serve the California market, the application of ZEPCert could actually reduce the number of vendors operating in the state in some vehicle categories.

[15] *Id.* at 16-18.

[16] *Id*. at 37. It should be noted that CARB also received comments indicating that it significantly underestimated the costs of ZEPCert. Specifically, commenters estimated costs to comply with the regulation could range from $500,000 to $5,000,000 for one powertrain and one vehicle certification family. Comments of the Truck and Engine Manufactuers Association at 7. https://www.arb.ca.gov/lists/com-attach/4-zepcert2019-Wz5VPgBgBwsDf1cy.pdf.

[17] *See* Appendix A – Proposed Regulation Order; *see also* TEMA Comments at 8-12.

ii. CARB Should Eliminate Disincentives to Hybrid Vehicles

While the proposed regulation would extend partial credits to near-zero-emission hybrids ("NZEVs"), "vehicles that cannot operate part-time as a pure ZEV are not considered to be 'near zero.'"[18] Thus, despite providing emission benefits and serving as a proving ground for electric technology in various commercial vehicle applications, hybrids that are not NZEVs effectively generate *negative* credits for the purpose of complying with the proposed ACT regulation. Specifically, as Allison interprets the proposed regulation, sale of these hybrid vehicles would need to be offset by credits generated from ZEVs and NZEVs starting with MY 2024 on the same basis as non-hybrid vehicles.

This regulatory treatment of heavy-duty hybrids is unwarranted and counterproductive to achieving ongoing reductions in GHG emissions. First, the emission benefits of non-NZEV hybrids are completely discounted with respect to comparable "conventionally-fueled" vehicles. Any benefits to the environment from reduced GHG emissions from purchasing and operating hybrids simply "don't count" even while they contribute to the state's overall goal of reducing such emissions.

CARB offers no explanation for this disparate and illogical treatment of hybrids, but instead argues that reductions from cleaner combustion technology are already accounted for with respect to other existing programs. Thus, CARB concludes there is no need to account for such reductions within the ACT regulation.[19] But heavy-duty hybrids can and do have the ability to make further reductions in air pollutants if they displace non-hybrid vehicles. And California will lose such benefits if there is no compliance benefit to purchasing a hybrid vehicle versus a conventional vehicle of any degree of fuel efficiency. CARB should therefore, at minimum, account for the amount of displaced GHGs that result from the operation of hybrids versus comparable conventionally-fueled vehicles.

Second, CARB's assessment of the potential ZEV market is focused on assuming that there are or will be widely available, direct replacements for conventional vehicles with ZEVs or vehicles that use ZEV technology in medium- and heavy-duty commercial applications. In supporting this assertion, CARB indicates that "nearly every established truck manufacturer has announced plans for zero-emission vehicles ranging from vans to tractors in the early 2020s."[20] CARB also relies on a market analysis with respect to four vehicle and operational parameters.[21]

But such high-level information and market projections do not account for the real world of commercial trucks buses and other heavy-duty vehicles. The heavy duty market is segmented and subject to different economic pressures; there are numerous submarkets for medium- and heavy-duty vehicles which operate with different economic

[18] Initial Statement of Reasons at I-11.
[19] *Id*. at I-11-12.
[20] Id. at I-13.
[21] Appendix E Zero Emission Truck Market Assessment.

realities. CARB does not account for the complexity of this market and vehicle applications and ignores areas where hybrids could offer a preferable economic and environmental solution to ZEVs and conventional vehicles. The regulatory structure of the proposed mandate tilts in all cases towards ZEV technology without a correspondingly fulsome explanation of why this direction is correct for all applications or even for the percentage of sales requirements that are established.

V. Conclusion

Allison respects California's prerogatives to address climate change and to try and move aggressively to achieve reductions in GHGs from the heavy duty sector. We do not challenge the long-term goals of CARB's effort to reduce the emission of carbon dioxide and other GHGs from the transportation sector. Allison also does not question the long-term viability of vehicle electrification; our company is moving along with many others in this direction.

At the same time, CARB is proposing to establish a decade-long regulatory framework under which the transition to less carbon intensive transportation will take place in the medium- and heavy-duty vehicle sector. As a regulatory instrument, CARB has chosen a sales requirement applying to large manufacturers doing business in the state, a year-over-year increase in percentage requirements and an explicit certification protocol that must be followed, along with numerous other reporting and implementation requirements.

CARB should recognize that such a regulatory approach could greatly benefit from additional fine-tuning. And such fine-tuning should occur at the front end of the process, not after additional information is gathered from manufacturers already subject to an impending sales mandate.

CARB properly recognizes that there are "challenges" to ZEV deployment, including the upfront cost of ZEVs, the need for investment in fueling and recharging infrastructure, limits on the operational characteristics (and the potential use) of ZEVs, and the possibility for technological variations as ZEVs become more widely produced.[22] However, CARB does not, in all cases, come to the correct conclusions about how these challenges can be overcome and when they should be addressed. Thus, Allison would suggest that CARB make at least three alterations to the currently proposed rule:

- CARB should complete additional, more refined analysis of the ZEV market and potential ZEV applications in the heavy duty sector before proceeding to finalize the proposed regulation. In specific, CARB needs to more closely analyze the vocational vehicle sector and examine additional factors in order to determine how quickly a transition to ZEV technology can occur within different classes and types of vocational vehicles.

[22] ISOR at I-14 to I-17.

- ZEPCert should not be mandatory as part of this regulation. Instead, CARB should retain ZEPCert as an alternative certification method, in accordance with how the regulation was originally finalized earlier this year. If the predicted market benefits of ZEPCert are as significant as CARB has predicted, then manufacturers will move to adopt this certification method where it makes the most economic and technological sense. Otherwise, wide application of ZEPCert could increase the costs of the ZEV transition and inhibit technological development. Both results would be contrary to effective regulation.

- As opposed to categorically excluding all non-NZEV vehicles from earning credits, all hybrid technologies should be placed on an equal regulatory footing. CARB should eliminate the current negative crediting of hybrids and instead provide that hybrids may earn credits based on their relative reduction in GHGs.

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Allison appreciates the opportunity to submit these comments and stands ready to provide any additional information or input that CARB may require. Should you require additional information or further explanation of our comments, you may contact us through the following personnel:

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