October 19, 2022

National Highway Transportation Safety Administration
U.S. Department of Transportation
1200 New Jersey Avenue SE
West Building Ground Floor, Room W12-140
Washington, DC 20590-0001
Docket No. NHTSA-2022-0076

RE: Environmental Impact Statements: Model Years 2030 and beyond New Medium- and Heavy-Duty Fuel Efficiency Improvement Program Standards

Allison Transmission, Inc. ("Allison") is pleased to comment on the National Highway Transportation Safety Administration's ("NHTSA's") intended environmental impact statement (EIS) to analyze the potential environmental impacts of new fuel efficiency (FE) standards for model years (MYs) 2030 and beyond medium- and heavy-duty on-highway vehicles (MHDV) and some work trucks.

Headquartered in Indianapolis, Indiana with over 1,000 dealer and distributor locations in the United States, Allison is well-positioned to be part of this process. Our company 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; in addition, Allison's emerging eGen PowerTM electric e-Axles will offer bolt-in solutions compatible with current vehicle frames, suspensions, and wheel ends, compatible with full battery electric vehicles (BEV) and fuel cell electric vehicles (FCEV) as well as range extending hybrid applications. 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, utilities, fire, pick-up and delivery, distribution, bus, motorhomes, defense, and energy.

Allison agrees that for 2030 and beyond that zero emission vehicles (ZEVs) will serve many important roles in the heavy-duty commercial sector, particularly with respect to stop-and-go vocational vehicles provided that sufficient infrastructure exists to support the deployment of such vehicles. Likewise, Allison agrees that alternative fueled vehicles (i.e., natural gas, clean diesel, hydrogen, etc.) will continue to represent a large portion of new vehicles sold, and Allison fully embraces the opportunity to participate in shaping these standards to encourage greater fuel efficiency through the use of advanced conventional technologies. Our comments offered in this correspondence cover four critical topics:

- NHTSA Should Recognize Vehicle Productivity of Vocational Vehicles as a Means to Improve Fleetwide Fuel Economy,
- NHTSA, Along with EPA, Should Re-examine GEM Baselines and Apply Real-World Fuel Economy Enhancements to the Accuracy of the Model,
- NHTSA Should Consider Many Factors for Determining the Role of EVs in Phase 3 GHG,
- NHTSA Should Consider All Available Technologies to Achieve Fuel Efficiency Goals.

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NHTSA Should Recognize Vehicle Productivity of Vocational Vehicles as a Means to Improve Fleetwide Fuel Economy

- Vehicle productivity is a measure of how much work a single vehicle is able to accomplish in a given time. Vocational vehicle operators (e.g. refuse collection, cement mixer, drayage truck) value vehicle productivity highly, and will often prioritize productivity over fuel economy,
- Fortunately, improving productivity by reducing the number vehicles needed is a realistic method to positively impact fleetwide fuel economy, with the added benefit of reducing total embedded GHG emissions in the vehicles that are acquired,
- Some technologies promote greater productivity e.g. by improving vehicle acceleration and maneuverability, while others reduce productivity e.g. by reducing payload, thereby requiring more vehicles to move the same amount of cargo,
- Allison urges that NHTSA recognize vehicle productivity as a means to evaluate fleetwide fuel efficiency and to encourage technologies which improve vehicle productivity, as well as continue on the Phase 2 baseline of including fuel efficiency in the assessment.

NHTSA, Along with EPA, Should Re-examine GEM Baselines and Apply Real-World Fuel Economy Enhancements to the Accuracy of the Model

While the current version of GEM offers adequate modeling of emissions in vehicles, Allison believes that some changes to GEM could prove to be beneficial in improving the overall accuracy of the model. Allison is urging five changes that would promote further adoption of current vehicle technologies and strategies that improve FE but are currently under-utilized, as well as continue to enhance the accuracy of the modeled vs actual FE performance.

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First, Allison believes a study to re-baseline GEM is merited. There have been significant technological improvements since GEM was first conceived. Some of these technologies can be simulated within the current frame of the model while others cannot. Concurrently a study needs to be performed to verify prediction vs actual adoption rate of technologies on which GEM was originally based. For example, currently for vocational vehicles, GEM is divided into 3 weight groups: LHD (class 2b – class 5), MHD (class 6 – class 7), and HHD (class 8). It would be worthwhile to study the effectiveness of further sub-dividing and differentiating vehicles by class for a more accurate representation of FE performance by different vehicles of different weights. One suggestion, at a minimum, is to divide the LHD category into two groupings: class 2b/3 and class 4/5. Adjusting GEM's baseline would allow for accurate representation of both new and old technologies, and better alignment of FE with vehicle weight.

Second, Allison believes that many GEM technology improvement options should not be entered as a binary yes/no or one size fits all choice as an input. There are technologies that do not meet the current definitions provided to gain benefit from the current yes/no system, but are providing real-world FE benefits when in use. Allison's Neutral at Stop Standard feature is an example of a technology improvement feature that improves fuel efficiency and reduces conventional CO_2 emissions, but does not have this benefit reflected in an OEM's GEM score.

GEM's Neutral Idle (NI) capability recognizes only torque reduction at idle that is equivalent to full neutral, and thus, NI is incorporated in GEM with a binary yes-no selection. It is unfair to allow no benefit in the GEM logic to OEMs utilizing such features as Allison's Neutral at Stop Standard which utilizes approximately 70% torque reduction at idle to show efficiency gains at a partial credit of the GEM NI feature, while optimizing vocational productivity and therefore increasing adoption rates by end users. A modification of Neutral Idle technology within GEM to recognize this CO_2 reduction with a value between 0 and 1 or a high-medium-no setting. Clear requirements and definitions are needed to assign an approved partial credit.

Third, Allison believes additional duty cycles should be allowed within the model. The current use of the 3 cycles (Steady-state, 55-66, and ARB transient) delineated into different weightings for weight class and vocation does not accurately model the FE performance of many vocations.

For example, vocational applications like transit bus with lower average speed, more frequent stops, and technology advancements such as hybrid with all-electric-range can realize greater CO_2 benefits (and thus greater FE benefits) than reflected in GEM model. This results in an underestimation of FE.

Specifically, Allison's eGen Flex™ hybrid systems can realize up to a 25% benefit in fuel economy and CO_2 emissions, yet this performance is not recognized in GEM. Hybrid drive cycles include engine-off run time which is entirely out of scope of the current certification cycles. Transit agencies can use geo-fencing and green EV zone features to increase percentage of operating time where vehicle is moving, but engine is off.

The GEM model does not capture such effects when modeling fuel economy benefits because the GEM model instead reflects a mix of high speed 55-65 mph steady state cycles and ARB transient, compared with the transit-focused Manhattan cycle with top speeds of 25 mph. Neither custom chassis certification nor powertrain testing certification include operation cycles that reflect the real-world operation of transit buses or other unique drive cycles representative of vocational operation.

Fourth, Allison believes there should be a single shift schedule for automated transmissions (AT and AMT transmissions). Allison is appreciative of the incremental GEM improvements that have been made in this area. However, from detailed analysis of GEM, AMTs get beneficial treatment in some areas compared to ATs, specifically with NI being a post-processed credit instead of simulated within the transient cycle. Additionally, Allison recommends that NHTSA ensures that performance-related hardware differences are accurately characterized such as parked idle for all transmissions.

Fifth, one work-around to limitations and short-comings found in GEM is powertrain testing for advanced technology such as alternate transmission shift logic. However, powertrain testing has been found to not relieve the aforementioned issues of vehicle weight classification or unrepresentative duty cycle and adds complications of incremental compliance margins and significant test burden. For the purpose of certifying vehicles with advanced transmission shifting, powertrain testing does not meet the intended goals.

NHTSA Must Consider Many Factors for Determining the Role of EVs in Phase 3 GHG

In general, Allison agrees that zero emission vehicles (ZEVs) will serve many important roles in the heavy-duty commercial sector, however, Allison believes that considerable time is necessary to further validate vocational applications as they potentially move to ZEV technologies. Additionally, Allison believes that the need exists to further identify “bridge technologies” that may be available to assist in the transition away from internal combustion engines and vehicles.

In the context of this EIS, it should not be presumed that better integration of “conventional” technologies would detract from the longer-term development of ZEV technology, resulting in less overall fuel savings and emission reductions. Relying on the most advanced conventional technologies in addition to ZEV acquisition could offer the fastest route to improving fuel economy, ensuring that near-term gains are not “left on the table” in the run-up to greater ZEV adoption.

Additionally, Allison believes that NHTSA should equally consider ZEV and non-ZEV technology in arriving at any modification in the stringency of Phase 3 standards in the heavy-duty sector. The nascent nature of the ZEV MHDV markets makes adoption rates uncertain and difficult to factor into stringency thresholds. As a result, Allison believes that NHTSA should use conservative estimates for future market penetration of ZEVs in the MHDV sectors. Allison is seeing wider adoption of non-ZEV fuel saving technologies as a result of the Phase 2 rule, and as these conventional fuel saving technologies continue to gain acceptance in the MHDV market through the Phase 2 rule, NHTSA should sharpen the projections for adoption in the Phase 3 timeline. Across the widely varied vocations of the MHDV space, Allison sees some vocations/fleets will be early ZEV adopters and some vocations/fleets will be very late ZEV adopters due by the particular work missions those vehicles are built to perform. Plainly put, Allison believes a holistic view of the ZEV and non-ZEV technologies coupled with realistic adoption rates is a far better approach than a singular assumption that ZEV uptake should drive updated stringency numbers. Allison is concerned that over-reliance on ZEVs in stringency modeling could result in at least implicit pressure for OEMs to pursue ZEVs as the sole methodology for meeting more stringent standards with respect to this EIS. NHTSA must strive for stringency standards that are realistic and enforceable.

Finally, Allison believes that NHTSA should focus on well-to-wheel GHG emissions over the life of the vehicle. In past rulemakings, NHTSA has focused on fuel economy and tailpipe GHG emissions which are clearly important factors, but upstream GHG emissions for HD ZEVs should be factored into the equation as well. The overall GHG emissions impact of a ZEV is tied to the carbon content of the electricity used to produce the vehicle and charge its batteries; this carbon content has a real impact on net climate benefit. While this proposed EIS does not address this issue and the relative effect of upstream emissions from electricity generation, as ZEV adoption continues to grow, those upstream contributions become a significant contributor to the overall GHG emissions for a ZEV.

NHTSA Should Consider All Available Technologies to Achieve Fuel Efficiency Goals

NHTSA must strive for a regulatory environment that encourages industry innovation to develop best technology for customer needs and environmental targets over the long-term. Such an environment may require an assessment and balancing of near-term priorities to improve fuel savings and reduce GHGs with longer term goals to ensure that the best technology choices are available and sustainable overall goals are achieved. Different technological approaches can result in different environmental benefits within different timeframes. NHTSA should not mandate (or preclude) in the EIS the ability for industry to utilize different technological options such as vehicle electrification or alternative fuel pathways like clean diesel or hydrogen. Rather, NHTSA should promote the necessary matching of the right technology to the designated vocational application. For example, requiring the adoption of ZEVs for well-suited applications can minimize the unintended consequences of constraining fleets' and operators' choices in replacing older, less fuel efficient vehicles. When fleets have the option of selecting appropriate technologies for the desired vocation, then fuel savings and carbon emissions are optimized for the fleet as a whole.

NHTSA must keenly analyze this larger picture for the development and deployment of vehicles in the vocational vehicle sector where several factors (e.g., the carbon content of electricity used, the production process for hydrogen, the availability of charging/fueling stations) can determine the level of overall emissions and fuel economy. In some cases, longer timeframes may be necessary to allow for full development and market confidence in different equipment and fueling approaches, but these longer timeframes would result in better overall environmental outcomes. In addition, it is essential to fully validate new technologies in vocational vehicle applications prior to commercial sale. Further consideration of the timeframes and effort involved in transition to more fuel efficient, cleaner medium- and heavy-duty vehicles will pay off in the end; it will help obtain the most cost-effective selections for vehicle owners while ensuring that fuel efficiency and emission reductions can be sustained.

In conclusion, Allison greatly appreciates the opportunity to submit these comments to the intended EIS, and we further welcome any request for collaboration toward a mutually successful goal. Thus, as NHTSA proceeds to a finalize the EIS, Allison believes that the EIS should retain flexible compliance

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mechanisms that allow for individualized responses based on a vehicle's intended commercial use. While substantial progress in improving fuel economy performance is possible and may be economically practicable in many vehicle sectors, accounting for different vocational vehicle types and applications is essential. Allison is committed to working with NHTSA during the EIS development and finalization. If there are any questions concerning this submission, please contact Barbara Chance at 317-242-1203 or at Barbara.Chance@allisontransmission.com.

Respectfully submitted,

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