November 14, 2022

National Highway Transportation Safety Administration
U.S. Department of Transportation
Docket Management Facility, M-30
1200 New Jersey Avenue SE
West Building Ground Floor, Room W12-140
Washington, DC 20590-0001
Docket No. NHTSA-2020-0079

RE: Improvements for Heavy-Duty Engine and Vehicle Fuel Efficiency Test Procedures, and Other Technical Amendments

Allison Transmission, Inc. ("Allison") is pleased to comment on the National Highway Transportation Safety Administration's ("NHTSA's") proposed Improvements for Heavy-Duty Engine and Vehicle Fuel Efficiency Test Procedures, and Other Technical Amendments.

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 is appreciative of the large effort that NHTSA and EPA have put forth to maintain and improve GEM. Allison would like to acknowledge and commend NHTSA and EPA for the recent improvements which ensure that vehicle OEMs requiring the use of the custom chassis provisions are not adversely affected by changes in the GEM model. It was recognized that there was an increase in the calculated FEL score for GEM version 3.5.1 for the custom chassis categories. GEM 3.8 attempted to correct this with adjustment factors, but were still significantly higher than the GEM 3.0 values. GEM 4.0 corrects

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the issue and produces custom chassis (calculated) values more in line with the levels of GEM 3.0 and the original 2016 rulemaking.

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

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 CO2 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.

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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.

In conclusion, Allison greatly appreciates the opportunity to submit these comments, and we further welcome any request for collaboration toward a mutually successful goal. 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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