National Transportation Safety Board

Office of the Chair

Washington, DC 20594

June 11, 2024

Docket Management Facility M-30
US Department of Transportation
1200 New Jersey Avenue, SE
West Building, Ground Floor
Room W12-140
Washington, DC 20590-0001

Attention: Docket No. NHTSA-2024-0012

Dear Sir or Madam:

The National Transportation Safety Board (NTSB) has reviewed the National Highway Traffic Safety Administration's (NHTSA) notice of proposed rulemaking (NPRM) titled "Federal Motor Vehicle Safety Standards; FMVSS No. 305a Electric-Powered Vehicles: Electric Powertrain Integrity Global Technical Regulation No. 20, Incorporation by Reference," published at 89 *Federal Register* 26704 on April 15, 2024. In the notice, NHTSA proposes to establish Federal Motor Vehicle Safety Standard (FMVSS) No. 305a to replace FMVSS No. 305, "Electric-powered vehicles: Electrolyte spillage and electrical shock protection." The NPRM proposes manufacturer reporting requirements for standardized emergency response information; improvements for the performance and risk mitigation of the propulsion battery system, referred to as the Rechargeable Electrical Energy Storage System (REESS), for all road vehicles with the capability of traveling over 25 mph; and expanded applicability for heavy vehicles.[1] The NPRM also fulfills the goal to further harmonize with the Economic Commission for Europe 1998 Global Agreement that established Global Technical Regulation (GTR) No. 20, "Electric Vehicle Safety."[2]

The NPRM proposes compliance dates of 1 year for emergency response information and 2 years for the other requirements, after the date of publication of the final rule, with an additional year afforded to small-volume manufacturers, final-stage manufacturers, and alterers. It also proposes to permit optional early

[1] Heavy vehicles have a gross vehicle weight rating (GVWR) greater than 4,536 kilograms (10,000 pounds). FMVSS No. 305 is applicable only to light vehicles with a GVWR of 4,536 pounds or less.

[2] For more information, see GTR No. 20 on the US Department of Transportation National Transportation Library at https://rosap.ntl.bts.gov/view/dot/55584.

compliance. NHTSA intends to sunset FMVSS No. 305 after FMVSS No. 305a is finalized.

The safety risks of stranded energy and fire associated with high-voltage rechargeable batteries are well established, and the hazards of thermal runaway have been demonstrated from the increasing number of events around the world.[3] NTSB investigations of battery fires in light electric vehicles and transit buses illustrate the hazards that would be addressed by the proposed rulemaking. The NTSB strongly supports the proposed rulemaking, which would require vehicle manufacturers to submit to NHTSA their Emergency Response Guides (ERGs) and rescue sheets in a standard format, address the safety of first and second responders, add performance and risk mitigation requirements for high-voltage battery systems in all vehicles, expand the existing FMVSS No. 305 to include heavy vehicles, and encourage the harmonization with GTR No. 20. We are providing comments to encourage NHTSA to address postcrash safety of heavy vehicles in addition to heavy school buses, based on our experience with these and other vehicles, and to include low-speed electric vehicles (LSEVs) that operate on public roadways.

Requirements for Emergency Response Guides and Rescue Sheets

The proposed rulemaking would require manufacturers of vehicles equipped with REESS to submit ERGs and rescue sheets to NHTSA for easy access on the NHTSA website. It would also require the format to be as specified in the International Organization for Standardization (ISO) standard 17840, "Road vehicles — Information for first and second responders."[4] Further, NHTSA's proposed rulemaking would ensure that first and second responders have access to vehicle-specific information about extinguishing REESS fires and mitigating safety risks associated with stranded energy.

The NTSB supports this requirement, which NHTSA added as part of its battery initiative and in response to NTSB recommendations from the 2020 NTSB safety report *Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles*.[5] To encourage improved information to responders, we issued Safety Recommendation H-20-30 to NHTSA:

> When determining a vehicle's US New Car Assessment Program score, factor in the availability of a manufacturer's emergency response guide

[3] (a) Stranded energy is the energy remaining inside the REESS after a crash or other incident. (b) For more information, see www.evfiresafe.com, including section 02.1 EV fires – current data.

[4] For more information, see https://www.iso.org/standard/78461.html.

[5] See https://www.nhtsa.gov/battery-safety-initiative and *Safety Risks to Emergency Responders from Lithium-Ion Battery Fires in Electric Vehicles*, NTSB/SR-20/01. Use the CAROL Query to search safety recommendations and investigations.

> and its adherence to International Organization for Standardization standard 17840 and SAE International recommended practice J2990.

Safety Recommendation H-20-30 is currently classified Open—Unacceptable Response; however, NHTSA's proposed rulemaking would address the recommendation by requiring vehicle manufacturers to create and submit ERGs and rescue sheets in the ISO 17840 format, making the need for an incentive obsolete. SAE (formerly Society of Automobile Engineers) standard J2990 recognized the limitations of nonstandard formats for responder information and therefore also recommended using ISO 17840.[6] SAE J2990 also considers potential hazards and suggests common procedures to mitigate the risks.

The NTSB is pleased that NHTSA is proposing to require that vehicle manufacturers submit to NHTSA their ERGs and rescue sheets, as well as establishing a NHTSA-controlled central website for this information. We believe that this is a better approach than incorporating the information as part of the New Car Assessment Program, as we had originally recommended. Submitting the required information in the standard ISO 17840 format will ensure that first and second responders have quickly accessible and consistent information on the safe handling of electric-powered vehicles in emergencies and for towing and storage.

Also in our 2020 safety report, we issued Safety Recommendation H-20-32 directly to 22 individual manufacturers of electric vehicles equipped with REESS:

> Model your emergency response guides on International Organization for Standardization standard 17840, as included in SAE International recommended practice J2990, and incorporate vehicle-specific information on (1) fighting high-voltage lithium-ion battery fires; (2) mitigating thermal runaway and the risk of high-voltage lithium-ion battery reignition; (3) mitigating the risks associated with stranded energy in high-voltage lithium-ion batteries, both during the initial emergency response and before moving a damaged electric vehicle from the scene; and (4) safely storing an electric vehicle that has a damaged high-voltage lithium-ion battery.

Safety Recommendation H-20-32 is classified Closed—Acceptable Action for 16 of the 22 manufacturers, and the remaining six manufacturers are working on implementing the recommendation.

Although we have received excellent feedback on and responses to Safety Recommendation H-20-32 from most manufacturers, the FMVSS will ensure compliance from all manufacturers fielding vehicles in the United States. The proposed requirements in FMVSS No. 305a closely mirror GTR No. 20, which

[6] For more information, see https://www.sae.org/standards/content/j2990_201907/.

established a worldwide standard and has been widely implemented by manufacturers of light and heavy electric vehicles and electric school buses.

The NTSB applauds NHTSA's efforts to establish a central website for the responder information. Because the information currently resides on the National Fire Protection Association (NFPA) website and was located there during our investigations and publication of our final report, we encourage NHTSA to work with NFPA to redirect users to the new source of information.

NHTSA requested comments on whether to place the emergency response information requirements in FMVSS No. 305a or in a separate regulation. The NTSB's 2020 safety report identified the need for improved information to be provided to emergency responders. We believe that the responder information requirements are straightforward enough to be included in this proposed rulemaking and should not be delayed for a separate regulation. Further, NHTSA requested comments on the format and layout of the information in accordance with the different parts of ISO 17840, which was recommended in Safety Recommendation H-20-32. We believe that ISO 17840 has an established format and layout that serves the need. In addition, NHTSA requested comments on whether the electric vehicle ERGs and rescue sheets currently on the NFPA website should be included in NHTSA's centralized web location. We believe that it is important to include the legacy information from the NFPA website because responders interact with vehicles in the field and therefore from previous model years, and manufacturers often group similar models into common guidance to reduce duplication.

Requirements for REESS Safety During and After Water Exposure, Normal Vehicle Operation, and Low-Speed Vehicles

The rulemaking proposes new requirements for REESS safety and risk mitigation for all vehicles, regardless of GVWR, that have a working voltage greater than or equal to 60 volts direct current or 30 volts alternating current, excluding only low-speed vehicles that travel at a speed of 25 mph or less.[7] Although the current FMVSS No. 305 contains some requirements for normal vehicle operations, it has no requirements for mitigating risk from REESS faults or fire.[8] The proposed requirements would establish protection levels during and after water exposure and during normal operations to protect the REESS against various faults. The

[7] As defined at 49 *Code of Federal Regulations* 571.3, a *low-speed vehicle* refers to a motor vehicle (1) that is 4-wheeled, (2) whose speed attainable in 1.6 kilometers (1 mile) is more than 32 kilometers per hour (20 mph) but not more than 40 kilometers per hour (25 mph) on a paved level surface, and (3) whose GVWR is less than 1,361 kilograms (3,000 pounds).

[8] The existing normal operational requirements include items such as protections against exposure to high voltage, proper markings and connectors, proper charging, electrical isolation, and mitigating driver error (preventing inadvertent active driving mode).

requirements would also provide protection from thermal propagation in the event of a single-cell thermal runaway (SCTR) due to an internal short circuit.

Rather than tests or other performance criteria, FMVSS No. 305a would require manufacturers to submit documentation to NHTSA, at NHTSA's request, that identifies all known safety hazards, describes the manufacturer's risk mitigation strategies for these safety hazards, and, if applicable, describes how the manufacturer provides a warning to address a safety hazard. This documentation would address safety risk mitigation associated with charging and discharging during low temperatures, safety risks from SCTR, and how warnings are provided if there is a malfunction of vehicle controls that manage REESS safe operation. The proposed requirement for REESS safety is accomplished through documentation measures. This method is also used in GTR No. 20.

The NTSB fully supports the addition of REESS safety for non-crash conditions and is pleased that NHTSA has expanded the requirements for virtually all electric vehicles that operate on public roads. The 2024 NTSB investigation report *Fire on Battery Electric Transit Bus* illustrated the importance of REESS safety during normal operations and in heavy vehicles, as it identified moisture intrusion into the high-voltage lithium-ion battery system of electric transit buses as causing REESS damage and resulting in fire during normal operation.[9] The NTSB is also pleased that NHTSA's proposed changes will harmonize with GTR No. 20 and address previous gaps in identifying potential hazards and risk mitigation for the REESS of virtually all electric vehicles.

NHTSA has invited comments regarding low-speed vehicles to ensure a level of protection against shock and fire, particularly during normal vehicle operation. The NTSB's investigation of a collision involving a Navya Arma autonomous electric shuttle that occurred in Las Vegas, Nevada, on November 8, 2017, shows the potential for collision risk associated with these low-speed vehicles, especially for collisions involving other large commercial vehicles. Although the collision did not involve REESS failure or fire, it demonstrated how unintended outcomes can occur.[10] The shuttle was powered by two batteries: an 80-volt traction battery that stored the energy needed to operate the vehicle's electric motor, and a 12-volt backup battery. The NTSB's review of the incident and vehicle documentation showed that local responders were not aware of the shuttle's operation or the safety needs for these types of electric vehicles. As a result, the NTSB provided local responders with information on the basic procedures in case of a fire to the shuttle.

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[9] See *Fire on Battery Electric Transit Bus, Hamden, Connecticut, July 23, 2022*, NTSB/HIR-24/03.

[10] See *Low-Speed Collision Between Truck-Tractor and Autonomous Shuttle, Las Vegas, Nevada, November 8, 2017*, NTSB/HAB-19/06.

Because the risks and potential hazards are well established and because NHTSA's proposed operational requirements involve appropriate safety planning and no performance measure or tests, these requirements could be readily applied to LSEVs that operate on public roadways in NHTSA's jurisdiction. The NTSB does not see a reason to exclude these vehicles from the safety benefits of the proposed FMVSS No. 305a, which does not include crash testing.

Proposed Expansion to Include Heavy School Buses for Postcrash Requirements

The NPRM proposes to expand FMVSS No. 305 to improve electric vehicle safety and harmonize it with many aspects of GTR No. 20. The postcrash, REESS safety, and water exposure/normal operational requirements are proposed to apply to light vehicles and heavy school buses.[11] However, other heavy vehicles are proposed to be exempt from the postcrash requirements, as discussed in the next section.

NHTSA tentatively concluded that adopting postcrash requirements for heavy school buses is appropriate because existing system-level tests were developed for fuel system integrity, and because the costs were justified due to the passenger-carrying operations of the school buses. The current heavy school bus test uses a moving contoured barrier traveling at speeds up to 30 mph and striking the school bus at any point and angle.

The postcrash requirements include electric shock protection, which can be satisfied through low voltage; electrical isolation; protective barriers; or low energy for capacitors.[12] An additional requirement for fire safety proposes a prohibition of fire or explosion for a 1-hour post-test period for system-level crash tests.

FMVSS No. 305 was originally focused on postcrash safety, requiring vehicles with high-voltage sources to protect vehicle occupants, rescue workers, and others who may come in contact with the vehicle after a crash. The standard required that during and after specified crash tests, high-voltage sources in the vehicle must either be electrically isolated from the vehicle chassis or be at a safe level to avoid electric shock.

The NTSB fully supports the rulemaking to expand the scope beyond light vehicles. The crashes we have investigated demonstrate that crash events are a mechanism of thermal runaway and fire through battery damage, and they pose risks from stranded energy remaining in the REESS after the crash. Crash events are

[11] *Light vehicles* are passenger cars and multipurpose passenger vehicles, trucks, and buses with a GVWR of 4,536 kilograms (10,000 pounds) or less; heavy school buses have a GVWR above 4,536 kilograms (10,000 pounds).

[12] The low-energy option had been previously debated and declined for earlier revisions to FMVSS No. 305. NHTSA reversed its opinion on this issue, as described in the NPRM.

certainly not isolated to light vehicles, and the large size of heavy vehicle batteries poses proportional risks. A primary reason for including heavy school buses in the postcrash requirements of the proposed rulemaking is the established system-level fuel integrity tests that exist for school buses. These were developed due to the operations of school buses transporting children.

The NTSB applauds NHTSA for expanding the postcrash requirements and making full use of the system-level requirements that exist for heavy school buses so that these vehicles will be subject to the full intent and scope of FMVSS No. 305a.

Heavy Vehicles Excluded from Postcrash Requirements

NHTSA's proposed FMVSS No. 305a excludes heavy vehicles, other than school buses, from postcrash requirements; the stated justification is that these vehicles are exempt from the fuel system integrity requirements of FMVSS No. 301 for conventionally fueled heavy vehicles and FMVSS No. 303 for heavy vehicles using compressed natural gas. This exclusion is primarily because heavy vehicles do not have established vehicle crash tests or system-level tests that would provide a postcrash means of evaluating the REESS as installed in the vehicle. The NTSB has considerable experience investigating crashes involving heavy vehicles where a postcrash fire resulting from damage to the heavy vehicle's fuel system caused injuries and fatalities to occupants of the heavy vehicle, including motorcoach occupants, and other vehicles. We have issued safety recommendations focused on improving the crashworthiness of truck-tractor side-mounted fuel tanks to prevent catastrophic tank ruptures and limit postcollision fuel spillage, and to develop and promulgate an updated standard.[13] In another example, the catastrophic rupture of a truck-tractor's fuel tank released fuel that sprayed into the interior of a motorcoach, resulting in a fire that caused fatal and serious injuries to numerous motorcoach occupants.[14]

These same crash circumstances and hazardous outcomes apply to heavy electric vehicles. The NTSB is disappointed that NHTSA has not proposed a method of accounting for crash-damaged REESS in heavy vehicles. We acknowledge that system-level requirements have not been established for heavy vehicles other than school buses. Applying the heavy school bus requirements to other heavy vehicles would not be feasible without significant design changes to the vehicles. However, it is also clear that the risks and hazards associated with REESS systems in heavy vehicles exist postcrash, and in many ways are more critical for the larger vehicles. The smoke generated during a thermal runaway event poses risks to any persons nearby

[13] See HWY16MH019.aspx (ntsb.gov), *Agricultural Labor Bus and Truck-Tractor Collision at US-98-363 Intersection Near St. Marks, Florida, July 2, 2016*, and HWY21MH009.aspx (ntsb.gov), *Multivehicle Crash and Postcrash Fire on Interstate 65, June 19, 2021*.

[14] See HWY14MH009.aspx (ntsb.gov), *Truck-Tractor Double Trailer Median Crossover Collision with Motorcoach and Postcrash Fire on Interstate 5, Orland, CA, April 10, 2014*.

or in the affected vehicles. NTSB investigations have found that fires in heavy vehicles have resulted in thermal injuries and fatalities for the vehicle occupants as well as occupants of other vehicles.

GTR developers shared these concerns and established alternative methods for evaluating the robust design of the REESS and its mounting into any vehicle, including heavy vehicles. NHTSA references the GTR working group experts' determination that no objective test procedures currently exist to evaluate safety risk mitigation designs or operations of warning of a malfunction of vehicle controls in a manner that is not design-restrictive. However, GTR No. 20 allows testing for mechanical integrity and mechanical shock to evaluate the REESS as a substitute for crash testing. The mechanical integrity test applies a quasistatic load of 100 kilonewtons on the REESS to approximate contact loads that may occur in a crash. The mechanical shock test accelerates the REESS on a sled system to evaluate the REESS safety performance and mounting integrity. These component-level tests constitute an established and applicable standard for heavy vehicle REESS that is not design-restrictive.

NHTSA's rationale for not adopting the component-level tests from GTR No. 20 is that a system-level evaluation is better than a component-level test. NHTSA also cites the expense of conducting tests and the consideration that heavy truck manufacturers produce vehicles in relatively low volumes, making them more cost-sensitive. Further, NHTSA references a study suggesting that the crash pulses established for the mechanical shock test may not represent current vehicles, with a concern that the level may be too low.

Considering these points, NHTSA states that even in the absence of postcrash testing requirements, the agency tentatively concludes that meeting requirements for normal operations and for REESS, as a starting point, will enhance the safety of heavy vehicles. NHTSA requests comments on the tests for mechanical integrity and mechanical shock, and would like commenters to provide data to substantiate their positions.

The NTSB is concerned that feasible solutions are being overlooked. The first solution for postcrash evaluation of heavy vehicle REESS would be to adopt the component-level tests as allowed in GTR No. 20. NHTSA's rationale for not adopting this solution is uncompelling. Regardless of regulatory requirements, manufacturers must develop and establish appropriate REESS crash-protection designs. Therefore, they are already making an investment to accomplish the same goal, and minimum performance standards in FMVSS No. 305a would be beneficial. Choosing to simply exclude most heavy vehicles from component tests that approximate the intended system-level evaluations and are not design-restrictive is unnecessary; further, doing so places the United States at a disadvantage compared to countries that have adopted these GTR provisions. Although NHTSA's inclusion of heavy vehicles in the

operational and REESS safety requirements is an appropriate starting point, it is one that is already behind the state-of-the-art for addressing the increasing number of demonstrated hazards as more of these vehicle types rapidly enter the market.

The second feasible solution—which is less desirable than allowing the component tests but at least could accomplish some measure of evaluation for heavy vehicle REESS crash protection—would be to adopt a similar documentation approach as used for assessing the more abstract aspects of REESS safety. Again, manufacturers are obligated to establish some benchmark to field a design. They could be required to submit documentation with a rationale explaining how they determined that the battery case, its mounting to the vehicle, and other REESS features would be reasonably safe in a crash.

Summary

The NTSB strongly supports the proposed rulemaking that would require vehicle manufacturers to submit to NHTSA their ERGs and rescue sheets in a standard format, address the safety of first and second responders, add performance and risk mitigation requirements for high-voltage battery systems in all vehicles, expand the existing FMVSS No. 305 to include heavy vehicles, and encourage the harmonization with GTR No. 20. We are providing comments to encourage NHTSA to address postcrash safety of heavy vehicles in addition to heavy school buses, based on our experience with these and other vehicles, and to include LSEVs that operate on public roadways.

Sincerely,

Jennifer Homendy
Chair

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