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Docket Management Facility  
U.S. Department of Transportation  
1200 New Jersey Avenue S.E.  
West Building Ground Floor, Room W12-140  
Washington, DC 20590-0001

**RE: Docket No. NHTSA-2024-0012: Federal Motor Vehicle Safety Standards; FMVSS No. 305a Electric-powered Vehicles: Electric Powertrain Integrity Global Technical Regulation No. 20, Incorporation by Reference**

Dear Deputy Administrator Shulman,

On behalf of Hyundai Motor Company (“Hyundai”) and Kia Corporation (“Kia”), Hyundai America Technical Center, Inc. (“HATCI”) appreciates the opportunity to comment on the National Highway Traffic Safety Administration’s (“NHTSA”, “Agency”) April 14, 2024, Notice of Proposed Rulemaking (NPRM) on the establishment of Federal Motor Vehicle Safety Standard (FMVSS) 305a to improve electric vehicle safety and to require manufacturers submit standardized emergency response information. HATCI is the US-based research and development (R&D) center for both Hyundai and Kia.

With the current NPRM, the Agency has put forward a proposal to replace FMVSS 305 with FMVSS 305a to harmonize the FMVSS with Global Technical Regulation (GTR) No. 20: Electric Vehicle Safety (EVS). HATCI supports the Agency’s efforts to advance electric vehicle safety through this update, adopting a number of safety requirements and tests in an effort to harmonize US safety standards with the existing GTR. While commending the Agency’s initial efforts, HATCI has included suggestions and feedback for consideration to improve this noteworthy rulemaking, such as allowing component-level compliance testing and further harmonization with GTR No. 20. HATCI also supports providing standardized, concise, and instructive Emergency Response Guides (ERGs) to first and second responders. However, additional clarity is requested regarding the implementation of this requirement. Detailed comments are provided in the enclosure.

In addition to the comments herein, HATCI supports those provided to this docket by the Alliance for Automotive Innovation (“Auto Innovators”). HATCI appreciates the consideration of our feedback and looks forward to working with NHTSA as it updates FMVSS 305 and strives to help first and second responders. For questions related to these comments, please contact Stephanie Beeman (1-734-337-2500).

Sincerely,

Ric Willard  
Director, Regulation & Certification

Enclosure

**Comments of  
Hyundai America Technical Center, Inc.  
on the  
Federal Motor Vehicle Safety Standards; FMVSS No. 305a Electric-powered  
Vehicles: Electric Powertrain Integrity Global Technical Regulation No. 20,  
Incorporation by Reference**

**Docket ID Number: NHTSA-2024-0012**

**RIN 2127-AM43**

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The number of electric vehicles (EVs) offered for sale in the United States has continued to increase over the last decade.<sup>1</sup> Hyundai Motor Group has an established and growing presence in the EV space, recently claiming a US market share of over 11% across the Hyundai, Kia, and Genesis brands and the second most battery electric vehicle (BEV) sales in 2023.<sup>2, 3</sup> These models, currently built on the Electric-Global Modular Platform (E-GMP), encompass a wide range of vehicle sizes and functionalities including sedans, CUVs, and SUVs. The Group's E-GMP, known for its versatility through modularity and standardization, prioritizes safety and innovative design, while also supporting multi-rapid charging system and Vehicle-to-Load (V2L) functionality. Hyundai and Kia also offer a number of hybrid electric vehicles (HEVs) and plug-in electric vehicles (PHEVs). As efforts toward carbon neutrality continue, holistic vehicle safety will remain paramount to Hyundai and Kia.

The introduction of novel vehicle propulsion systems brings new safety challenges that automakers have met head-on to ensure their viability. The establishment of Federal Motor Vehicle Safety Standard (FMVSS) 305 "Electric-powered vehicles: Electrolyte spillage and electrical shock protection" set safety standards and requirements for the vehicle's propulsion battery aimed at mitigating electrical shock injury and death during normal operation as well as during and after a crash.

HATCI is encouraged that NHTSA has proposed to further ensure the electrical safety of the propulsion battery by enhancing and expanding the existing FMVSS 305 provisions to be consistent with Global Technical Regulation (GTR) No. 20: Electric Vehicle Safety (EVS).<sup>4</sup> As NHTSA noted in the NPRM, this rulemaking activity fulfills NHTSA's obligation as a Contracting Party Member to the 1998 Global Agreement who voted in favor of GTR No. 20 to initiate the process to adopt the GTR as an agency regulation in the U.S.<sup>5</sup> With this proposed rulemaking, the Agency seeks to improve electric vehicle safety through prevention of electrical shock and prevention of catastrophic battery failure during normal operations and post-crash. Additionally, the Agency seeks to provide first and second responders with detailed and standardized emergency response guides (ERGs). These documents provide crucial

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<sup>1</sup> "Electric Vehicle Quarterly Report: Fourth Quarter, 2023", Alliance for Automotive Innovation.

<https://www.autosinnovate.org>

<sup>2</sup> Inside EVs, "Hyundai And Kia Now Own 11% Of America's EV Sales Through May 2024." (June 10, 2024) <https://insideevs.com/news/722788/hyundai-kia-record-ev-share-us-may2024/>. Accessed June 14, 2024

<sup>3</sup> Inside EVs, "Hyundai Motor Group Sold More EVs In The U.S. Than GM And Ford In 2023." (February 1, 2024) <https://insideevs.com/news/706975/automotive-group-us-bev-sales-2023q4/>. Accessed June 14, 2024

<sup>4</sup> GTR No. 20, <https://unece.org/fileadmin/DAM/trans/main/wp29/wp29wgs/wp29gen/wp29registry/ECE-TRANS-180a20e.pdf>.

<sup>5</sup> UNECE/TRANS/132 section 7.1

information to emergency responders when interacting with a crash involving an EV, which requires unique safety precautions compared to conventional vehicles with internal combustion engines (ICE).

EV propulsion battery safety requirements and testing procedures have been established in GTR No. 20 and incorporated in UNECE R100 to ensure an EVs safety systems and warnings function properly. In the current NPRM, NHTSA acknowledged their efforts to revisit further harmonization of FMVSS 305 with GTR No. 20. However, the proposal put forth in the NPRM deviates in some significant ways from the European requirements. HATCI commends the Agency for its initial efforts but encourages NHTSA to further harmonize with established international regulations. HATCI urges the Agency to incorporate requirements for technical documentation as part of a general regulation, rather than within an FMVSS. The ERG document requirements that the Agency has proposed are already followed by a majority of EV manufacturers and provided to the National Fire Protection Association (NFPA) as a public resource., HATCI encourages the Agency to provide additional clarity on this requirement by developing and publishing a clear process for submitting a vehicle's ERG to NHTSA and outlining the Agency's plan for migrating existing ERGs from the NFPA website database to one maintained by NHTSA. Requirements regarding the format and submission of ERGs should also be established in a general regulation, rather than an FMVSS. Each of these recommendations are elaborated upon in the subsequent sections.

## **I. Proposed Updates to FMVSS No. 305**

The Agency has proposed to adopt several requirements for an electric vehicle's Rechargeable Electrical Energy Storage System (REESS) from GTR No. 20. The Agency's proposal would apply FMVSS 305a to all passenger cars, multipurpose passenger vehicles, trucks, and buses, regardless of their gross vehicle weight rating (GVWR). The performance requirements, specifications, and corresponding test procedures established in this NPRM pertain to the safe operation of the REESS under normal vehicle operations and to the vehicle's warning systems which trigger in the case of a thermal event in the REESS. HATCI generally supports NHTSA's proposal to incorporate requirements and tests from GTR No. 20 into FMVSS 305a. However, HATCI requests the Agency take into consideration the following key points as it seeks to harmonize with established global regulations.

### ***A. Performance Requirements and Test Procedures for REESS Operations***

NHTSA has proposed to amend FMVSS No. 305 to include requirements for the safe operation of the REESS. The goal of the proposed requirements is to mitigate risks associated with REESS failure caused by operations outside of the manufacturer specified ranges (temperature, charge, and current). Damage that can occur outside of the manufacturer specified ranges may lead to increased risks of fire or occupant exposure to high voltage.

The Agency has proposed to adopt, without modification of the performance requirements of GTR No. 20, the Overcharge Protection, Over-discharge Protection, Overcurrent Protection, External Short-circuit Protection, and Low-temperature Protection tests. The Agency has proposed to adopt, with some modification from GTR No. 20, the Over-temperature Protection test. Specifically, NHTSA proposed to remove the vehicle soaking requirement for vehicle-level testing. HATCI is not opposed to this modification. In general, HATCI supports harmonization with these tests since they are well established internationally, and it will minimize unnecessary research and development efforts that new and different operational tests would require. However, for all of the aforementioned tests, NHTSA has proposed to only conduct these at the vehicle-level.

### Component-Level Testing

Deviating from the GTR No. 20, NHTSA has elected not to propose component-level testing as a compliance option for evaluating the safe operation of the REESS. Rather, NHTSA has only proposed that tests be conducted at the vehicle-level. Adopting a provision which permits testing at the component-level would enable manufacturers to develop and iterate on REESS design and safety systems more rapidly versus the full vehicle-level tests that are proposed. Limiting testing to the vehicle-level may require additional lead time during the engineering and testing processes.

With regard to the Over-temperature Protection test, HATCI recommends fully harmonizing with GTR No. 20 and allow the utilization of a convective oven or climatic chamber for component-level testing.<sup>6</sup> While NHTSA has attempted to reduce the test time and burden by removing the vehicle soaking requirement for vehicle-level testing, permitting component-level testing in this scenario will further reduce the test burden without detriment to the assessment of safety performance. Additionally, component-level testing will allow for additional tests to be conducted in parallel due to the reduced space required compared to a full vehicle on a dynamometer.

Overall, permitting component-level testing would not diminish the safety performance of the REESS. Component-level and vehicle-level testing provide comparable assessments and NHTSA's proposal to require vehicle-level testing only does not materially enhance vehicle safety. Broadly, HATCI supports adopting the requirements and tests established in GTR No. 20 but would recommend NHTSA adopt the provisions therein that allow manufacturers to conduct component-level tests.

### ***B. Mitigating Risk of Single Cell Thermal Runaway***

The Agency has proposed a documentation requirement based on elements of GTR No. 20, ISO-6469-1: Amendment 1 2022-11,<sup>7</sup> and ISO-26262.88.<sup>8</sup> Within the prescribed documentation and reporting, a manufacturer must provide information regarding the efforts that were made to develop a system that can identify an internal short-circuit and the mitigation strategies for potential safety complications associated with single cell thermal runaway (SCTR) and propagation.

HATCI supports NHTSA's proposal to require manufacturer submitted documentation on the risk assessment and mitigation strategies for SCTR rather than establish a specific performance test requirement. As noted by NHTSA in the NPRM, REESS technology is evolving too rapidly for a performance test to be both feasible and practical at this time. The Agency suggests that "the assessment and validation of these strategies may involve a combination of physical testing and simulations at the component level and/or full vehicle level." HATCI appreciates that NHTSA's proposal acknowledges the diverse and complex means by which this can be achieved, and supports the flexibility afforded to manufacturers to test and validate their systems.

It is notable that the reporting requirement put forward by NHTSA exceeds those in GTR No. 20, wherein a manufacturer must submit documentation for only the "active driving mode," and proposes two additional vehicle operation modes be included as well. The two additional proposed vehicle operation modes are

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<sup>6</sup> GTR20 6.2.8.3. and 6.2.8.4

<sup>7</sup> ISO 6469-1: Third Edition 2019-04 Amendment 1 2022-11, "Electrically propelled road vehicles – Safety specifications – Part 1: Rechargeable energy storage system (RESS)"

<sup>8</sup> ISO 26262: 2018, "Road vehicles – Functional safety"

referred to as the “external charging mode,” where the charge connector is connected to the vehicle charge inlet, and the “parking mode,” where the vehicle power is turned off, the vehicle propulsion system is not operational, and the vehicle is stationary. HATCI is opposed to the addition of the two new operation modes as they are unlikely to add material safety benefits, while unnecessarily increasing the test and documentation burden. The state of being parked or connected to an external charging source are not uniquely relevant to thermal propagation caused by a short-circuit from inside a single cell.

NHTSA has requested feedback on whether the proposed documentation requirement would be better placed in a general regulation, as opposed to in the proposed FMVSS No. 305a. HATCI recommends the Agency move the documentation requirement to a general regulation as opposed to including it in an FMVSS. Inherently, it is difficult to fully compose and evaluate the required documentation in objective terms. Minor or subjective, yet remediable, inquiries or revision requests and other inconsequential errors could be inordinately difficult to resolve within the framework of an FMVSS. As such, these documentation requirements would be better established within a general regulation.

### ***C. Warning Requirements***

NHTSA has proposed a risk mitigation approach for addressing the safety of a vehicle’s electrical system. This includes two warning requirements, one for a thermal event and one for a vehicle control malfunction. Visual and audio-visual warnings are required in existing global regulations and provide drivers with potentially critical safety information. HATCI is encouraged by the Agency’s proposal to include these types of warnings. Specific feedback on each of the warning requirements is provided below.

#### ***Thermal Event Warning***

NHTSA references in this NPRM the potential ways a thermal event within the REESS could occur and emphasizes that a thermal event “presents an urgent safety situation.” GTR No. 20 requires a vehicle to provide a warning if a thermal event is detected in the REESS, which is verified through manufacturer submitted documentation. The Agency has decided not to harmonize with this reporting requirement and instead proposes a performance test to evaluate the warning. The test includes inserting a heater within the REESS, reinstalling the REESS into the vehicle, and activating the heater. The audio-visual warning must activate within three minutes of the heater being turned on in the REESS. HATCI opposes the proposed performance test to evaluate the warning and recommends NHTSA harmonize with GTR No. 20 Phase 1. Further review is still needed to validate thermal propagation tests, which are ongoing in GTR No. 20 Phase 2. HATCI also suggests the Agency reconsider their proposed warning activation time. It may be more appropriate to measure the time to diagnose a thermal event from the point at which the thermal runaway condition occurs in the targeted cell. Additionally, it should be clarified as to whether the system would pass the test if no thermal runaway were to occur.

NHTSA decided not to specify the thermal event audio-visual warning characteristics in the NPRM. HATCI agrees that manufacturers should be afforded flexibility in how to best communicate safety information and warnings to drivers in these circumstances and when considering other vehicle audio and visual warnings.

#### ***Warning in the Event of Operational Failure of REESS Vehicle Controls***

The Agency has proposed a documentation requirement that is similar to, but not fully harmonized with GTR No. 20, for a warning in the event of operational failure of the REESS vehicle controls. In addition to

those established in GTR No. 20, NHTSA proposed two additional requirements that must be included in the documentation:

1. Validation test results from the manufacturer to confirm a visual warning is displayed in the presence of a REESS operation vehicle control malfunction; and,
2. A description of the manufacturer review or audit process and results of any final review, which evaluated the technical content, completeness, and truthfulness of the submitted documentation.

HATCI supports the proposed documentation approach. This approach allows manufacturers to outline how they have considered the safety risks associated with operational failures. These documents may also prove to be particularly insightful for better understanding EV safety as REESS technologies rapidly evolve. As previously stated, HATCI recommends NHTSA move the documentation requirement to a general regulation as opposed to including it in an FMVSS.

#### ***D. Water Exposure Requirements***

NHTSA has proposed to incorporate several aspects of the GTR No. 20 physical water test requirements. The “vehicle washing test” and the “driving through standing water test” have been included, with some modifications. However, the Agency has proposed not to adopt two other water exposure requirements from GTR No. 20, waterproofing certification and an electrical isolation loss warning system. HATCI generally supports NHTSA’s proposal to adopt the physical water tests but opposes the proposal not to include the electrical isolation loss warning system compliance option from GTR No. 20. HATCI recommends the Agency harmonize with GTR No. 20 and UNECE R100 where the electrical isolation loss warning system is allowed as a compliance option that would fulfill the “protection against water effect.”<sup>9</sup> A decrease in the electrical isolation in a vehicle can occur for various reasons, one of which being from water. In these situations, an operating system that detects electrical isolation loss is a way to ensure driver safety and should be considered a compliance option.

The proposed “vehicle washing test” harmonizes with all of the requirements established in GTR No. 20 including water nozzle characteristics, water pressure, and post-test electrical isolation requirements. The Agency has proposed to expand the test procedure to include the vehicle underbody. HATCI acknowledges the Agency’s rationale for including the vehicle underbody in the test. However, HATCI opposes the inclusion of the vehicle underbody in the test unless a clearer and more repeatable test is established. NHTSA has included the water nozzle size and outlet pressure requirements but has not specified a spray distance nor spray angle. The potential variation in these factors would result in a lack of test consistency and reproducibility of results. HATCI requests the Agency establish a clear test procedure, including distance and angle of the spray, to ensure consistent testing and reproducible results.

The proposed “driving through standing water” test harmonizes with nearly all of the requirements established in GTR No. 20, including pool depth and length, vehicle speed, and post-test vehicle isolation. NHTSA has proposed a maximum total test time, including the periods spent outside of the pool, of less than five minutes compared to a maximum total test time of 10 minutes in GTR No. 20. HATCI is neutral on the Agency’s proposal to adopt the GTR No. 20 “driving through standing water” test with the specified modifications.

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<sup>9</sup> UNECE R100 5.1.4.4.

## **II. GTR No. 20 Provisions Not Proposed for Inclusion**

Several tests or requirements present in GTR No. 20 were intentionally omitted by the Agency when developing the current NPRM. Specifically, REESS vibration requirements and test procedure, REESS thermal shock and cycling requirements and test procedure, the low state-of-charge (SOC) telltale, and REESS fire resistance requirement were omitted. The Agency offers an explanation for each decision.

NHTSA cites in the current NPRM the United States Hazardous Materials Regulations (HMR) as being more stringent than the REESS vibration requirements and REESS thermal shock and cycling requirements of GTR No. 20.<sup>10</sup> Therefore, those tests would not address any additional safety needs. HATCI agrees with NHTSA's rationale for not including these two tests given the current adherence to existing, more stringent US regulations.

HATCI also agrees with the Agency's rationale for not requiring a low SOC warning. Manufacturers already provide this warning to the driver as a corollary to the low-fuel warnings for ICE vehicles. Furthermore, the Environmental Protection Agency (EPA) Multipollutant Emissions Standards Final Rule for MY27+ requires manufacturers to install a battery state-of-health (SOH) monitor, which estimates, monitors, and communicates the vehicle's state of certified energy (SOCE) as defined in GTR No. 22, and which can be read by the vehicle operator.<sup>11</sup> The California Air Resource Board (CARB) Advanced Clean Cars II (ACC II) also includes standardization requirements for display of battery SOH and battery charge rate to the vehicle user.<sup>12</sup>

As it pertains to the fire resistance test in GTR No. 20, NHTSA cites research done by Transport Canada showing that the short duration of this test would not result in REESS explosion as the main reason it was not proposed in this NPRM.<sup>13</sup> HATCI supports NHTSA's decision not to include the REESS fire resistance test within FMVSS 305a.

## **III. Emergency Response Information to Assist First and Second Responders**

In an emergency situation where an EV is involved in a crash, safety is paramount for both the occupants and emergency responders when they arrive on location. Due to the differences in vehicle and battery design, vehicle specific documentation of battery and high voltage component locations can provide first and second responders with the information they need to safely and effectively manage an emergency situation. Manufacturers had published vehicle specific emergency response guides (ERGs) for their vehicles in order to aid first and second responders when interacting with an EV and many updated their ERGs following a recent National Traffic Safety Board (NTSB) recommendation.

The Agency has proposed a requirement that an ERG be developed for each EV that follows a standardized format depending on the vehicle type. Light vehicles would follow ISO-17840-1:2022(E) and heavy vehicles would follow ISO-17840-2:2019(E). The ERG layout would follow the template layout and format of ISO-17840-3:2019(E) and the Agency has proposed a requirement that the ERG information be linked and aligned to the corresponding rescue sheet to support "the quick and safe action of emergency

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<sup>10</sup> 49 CFR Parts 171 to 180 and 49 CFR 173.185

<sup>11</sup> 89 FR 27842

<sup>12</sup> Section 1962.5, Title 13, California Code of Regulations

<sup>13</sup> <https://wiki.unece.org/download/attachments/29884786/EVSTF-07-02e.pdf?api=v2>

responders.” Additionally, NHTSA has proposed the ERGs must provide “in-depth information related to electric vehicle fire, submersion, leakage of fluids, towing, transportation, and storage.” Finally, NHTSA has proposed to require manufacturers submit their ERGs to be published on the NHTSA website (NHTSA.gov).

HATCI agrees with NHTSA on the importance of these documents and their public availability. Both Hyundai and Kia currently provide ERGs, formatted in accordance with the aforementioned ISO 17840, to be accessible on the NFPA website. The NTSB issued Safety Recommendation H-20-32 in 2021, encouraging EV manufacturers to update their vehicle ERGs to meet the requirements and formatting specifications of SAE Recommended Practice 2990 and ISO 17840, and provide the ERGs to the NFPA website. The NTSB confirmed that Hyundai and Kia satisfied Safety Recommendation H-20-32 in 2022.

NHTSA has proposed a provision within this NPRM to require manufacturers to submit a vehicle’s ERG to NHTSA prior to certification of the vehicle. HATCI generally supports this proposal but requests additional information. Firstly, it is unclear the method by which the Agency plans to have manufacturers submit these documents and how the Agency intends to process the submissions. Further, it should be clarified whether NHTSA’s proposal intends to replace the NFPA’s housing of information or if manufacturers may be expected to submit the ERGs to multiple locations. It is important to consider that end users may have become accustomed to navigating to the NFPA website to obtain the desired information. HATCI believes that a well-planned system for filing and housing EV ERGs can and will aid first and second responders when attending to distress calls involving EVs.

NHTSA has requested feedback on whether the proposed documentation requirement for the ERGs would be better placed in a general regulation, as opposed to in the proposed FMVSS No. 305a. HATCI recommends the Agency move the documentation requirement to a general regulation as opposed to including it in an FMVSS.

#### **IV. Proposed Compliance Dates**

NHTSA has proposed separate effective compliance dates for the updated EV safety requirements and emergency response documentation. As proposed, the compliance date would be two (2) years after the publication of the final rule in the Federal Register for the REESS requirements and testing and one (1) year after publication of the final rule for manufacturers to provide emergency response information.

Regarding the compliance date for REESS safety requirements, a sufficient number of proposed provisions deviate from GTR No. 20 such that additional time may be required to meet the updates FMVSS 305a. Also, as NHTSA noted in the NPRM, heavy vehicle manufacturers would be newly subject to electric system integrity requirements and will need time to assess their vehicles’ conformance to the updated rule requirements, implement appropriate design and production changes, and assess and document risk mitigation strategies. Therefore, HATCI recommends a longer lead time of three (3) years for the REESS safety requirements. HATCI supports the proposed compliance date for the emergency response information.



## **V. Conclusion**

HATCI appreciates the work by NHTSA in developing this NPRM and its efforts to collect stakeholder feedback on this worthy initiative. EV propulsion battery safety is an important component of overall vehicle safety for the vehicle occupants and other road users. Additionally, providing a central location for all vehicle ERGs will facilitate the distribution of crucial vehicle information to first and second responders when attending to an EV emergency. Amending and expanding federal regulation to enhance EV safety and to require manufacturers submit specific documentation should be done judiciously. HATCI encourages the Agency to consider comments and recommendations herein as it continues the rulemaking process. Hyundai and Kia remain committed to vehicle safety and look forward to working with NHTSA on this and other matters.