

**Report of the 65<sup>th</sup> session**  
**Electric Vehicles and the Environment Informal Working Group (EVE IWG)**

Location: Ottawa, Canada  
Date: October 11-12, 2023  
Time: 09:00 – 17:00 EDT

Chairs: Mr. Michael Olechiw (United States of America)  
Ms. Panagiota Dilara (European Commission)

Vice-Chairs: Ms. Chen Chunmei (China)  
Mr. Nobunori Okui (Japan)

Secretariat: Mr. Leeson Guay (Canada)

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**Day 1 – October 11, 2023, 09:00 EDT**

1. Introduction, review of agenda, meeting recap

Documentation

- EVE-64-18e
- EVE-65-02e

Context

The EVE IWG co-chairs addressed members and welcomed everyone to the in-person meeting. Mr. Michael Safoutin stood in for Mr. Michael Olechiw during his absence from the session.

The co-chairs presented the meeting agenda to EVE IWG members, which can be seen below. The agenda was reviewed and adopted by the EVE IWG prior to beginning discussions. Modifications to the agenda occurred and have been reflected in EVE-65-22e.

Day 1 – October 11, 2023, 09:00 EDT

- Introduction, review of agenda, meeting recap
- UN GTR 22 – Analysis of tendency and feasibility for MPRs

- UN GTR 22 – SAE parameter update and Annex B comments
- UN GTR 22 – Comments on draft text
- UN GTR 22 – Finalize proposed changes
- UN GTR 21 – Test results and suggestions
- UN GTR 21 – Comments on draft text
- UN GTR 21 – Finalize proposed changes
- HDV GTR – Review of draft text and discussion of open items
- HDV GTR – Position on UBE/UBC measurement
- HDV GTR – Position and comments on draft text

Day 2 – October 12, 2023, 09:00 EDT

- Introduction, review of agenda
- UN GTR 22 – Effects of bi-directional charging on BEV degradation
- UN GTR 22 – Continue finalizing proposed changes
- UN GTR 21 – Continue finalizing proposed changes
- HDV GTR – Review of draft text and discussion of open items
- UN GTR 22 – A plan for enacting durability regulation of electric vehicles
- UN GTR 21 – Research on the system power of fuel cell electric vehicles
- UN GTR 22 – Durability of EV on-board battery
- EVE IWG terms of reference review and renewal
- Action item review and future planning

The EVE IWG secretariat briefly reviewed the *Report of the 64<sup>th</sup> EVE IWG session*, highlighting action items and key decisions from the discussions, held virtually, on September 19-20, 2023.

Discussion

The co-chairs reminded members of the targeted timeline to have a completed draft of amendments for the United Nations (UN) Global Technical Regulation (GTR) on Determination of Electrified Vehicle Power and In-vehicle Battery Durability for Electrified Vehicles submitted as a working document to the Working Party on Pollution and Energy (GRPE) by October 17, 2023. In addition, the

co-chairs reiterated that the UN GTR on Battery Performance and Durability of Electrified Heavy-Duty Vehicles (eHDV) is also targeting submission at the next GRPE session in January 2024, as an informal document. Recognizing this timeline, the primary goal for this EVE IWG session will be to finalize UN GTR 21 and UN GTR 22, followed by continued work on the draft UN eHDV GTR.

### Action Items

### Decisions

2. UN GTR 22 – Analysis of tendency and feasibility for MPRs

### Documentation

- EVE-65-03e

### Context

The Korean delegation provided a presentation on a research proposal looking into the tendency and feasibility of the minimum performance requirements (MPR) from UN GTR No. 22. Korea is looking to introduce a regulation based on UN GTR No. 22 and requires battery degradation data and analysis, including data reflective of end-user driving behaviours. The Korean delegation proposed doing this study with the use of local in-service taxis and offered insights into their proposed research plan.

### Discussion

The British delegation suggested that taxis are often subject to fast charging more often and questioned whether this will be taken into consideration during the testing. The Korean delegation outlined that at this time, Korea only has a few vehicles with high mileage. This includes taxis, which is why they are being used for testing, everything else remains under discussion at this time. The British delegation recommended that fast charging history be sought for the vehicles to inform the researching and testing.

The co-chairs expressed that there may be some confusion regarding how the data will inform discussion on UN GTR No. 22, as the values in the regulation have already been finalized and agreed upon. The co-chairs also mentioned that they are not sure this additional research would be required to introduce this regulation.

The Organisation Internationale des Constructeurs d'Automobiles (OICA) were unclear on the purpose of the research and questioned whether, through the methods described in UN GTR No. 22, if any correlation could come from this research. The Korean delegation mentioned that they were looking to focus on tendency and patterns but will get back to OICA on their question.

The co-chairs requested clarification on how many vehicles would be used in the study. The Korean delegation stated that at least 10 vehicles would be used, but this is still under discussion, noting that the value is dependent on the cooperation of taxi drivers. The Korean delegation indicated that they would be compensating the taxi drivers for the use of their vehicles and that the number of vehicles may change, hopefully acquiring more than 10.

The Chinese delegation requested clarification on how many kilometers the vehicles will have for testing and how the mileage will be accumulated since in-use vehicles will be subjected to accelerated aging. The Korean delegation stated that the vehicles will have tiers of 50,000, 100,000, and 150,000 kilometers and will be in-use vehicles.

#### Action items

#### Decisions

### 3. UN GTR 22 – SAE parameter update and Annex B comments

#### Documentation

- EVE-65-04e

#### Context

An industry representative presented on the Society of Automotive Engineers (SAE) updates related to UN GTR No. 22 and parameter standardization activities. This presentation offered several updates and a continuation to what was presented at the 61<sup>st</sup> EVE IWG session in Ann Arbor. The presentation requested two updates to the UN GTR No. 22 text, including:

- Modifying the unit requirements from watt-hours to kilowatt-hours, specifically for Item 8 in Annex B.
- Proposing to remove or add “optional” for requirement for virtual mileage (V2X) ratio, specifically for Item 6 of Annex B.

#### Discussion

The Japanese delegation thanked the industry representative for the presentation and offered feedback on various items. The industry representative communicated that the language surrounding “optional” is tricky and that they will take this feedback and study it prior to bringing it forward. The industry representative also invited anyone interested to the consultation sessions for the SAE J1979 meetings. The co-chairs expressed that items in Annex 2 of UN GTR No. 22 are being finalized and asked not to provide comment until discussions are completed for the finalization of the regulation.

#### Action items

#### Decisions

### 4. UN GTR 22 – Comments on draft text

#### Documentation

- EVE-65-05e

### Context

A representative from OICA offered comment regarding the draft text in UN GTR No. 22, highlighting proposed changes to 6.4.2.1 pass/fail criteria for the battery durability family, as well as the onboard resolution of the state of certified range (SOCR) and state of certified energy (SOCE) in section 5.1.

### Discussion

### Action items

### Decisions

5. UN GTR 22 – Finalize proposed changes

### Documentation

- EVE-65-06e

### Context

This item was set with the objective of finalizing UN GTR No. 22 amendments for submission to the 90th GRPE session in January, 2024.

The drafting coordinator presented the latest draft version of the document and proceeded to address open items with the goal of reaching consensus for the final submission on October 17, 2023.

### Discussion

An industry representative indicated that in regard to the previous comment proposed by OICA, on the onboard resolution of SOCR and SOCE, as an 8-bit value particular attention must be paid to stating that it is rounded to the first decimal place. This value has seemingly been made purposefully with a coarse resolution of 0.3 or 0.4 which customers could be sensitive to. The co-chairs expressed that this was not a customer issue and perhaps the text could simply be a 0 to 100 value and noted that California regulations have it as 0.4. The industry representative indicated that the value will then have a 0.1 resolution but a 0.4 precision. The co-chairs suggested remaining ambiguous and leaving it up to the manufacturers to add resolution. The industry representative also indicated that the term “reported” poses some confusion. OICA commented that trying to make the value fit into bits will only complicate things and that they were supportive of what the drafting coordinator had revised in the text.

The British delegation indicated support for the MPR values of 65 % and 75 % for category 2 vehicles.

OICA requested clarification on the meaning of “optional values” in Annex 2. The drafting coordinator indicated that these optional values could be changed to, “values required for regional regulations” which offers more clarity.

The drafting coordinator indicated there is a need to address the issue of virtual distance verification and sought clarification from the Japanese delegation and OICA regarding their proposals. It was determined that text would be drafted in preparation for the second day of the 65<sup>th</sup> EVE IWG session, where this would be reviewed and discussed further. The drafting coordinator indicated that this text would not be finalized in the official formal document submission but may be submitted later on as an informal document, once a consensus is reached. OICA agreed with this approach and was supportive of leaving everything in square brackets, designating that it is still in drafting.

#### Action items

- Drafting coordinator to draft text for the second day of the 65<sup>th</sup> EVE IWG session on virtual mileage verification and secretariat to post new draft for the group prior to beginning discussions.
- Drafting coordinator to finalize UN GTR No.22 amended text and submit document to the GRPE on October 17, 2023.

#### Decisions

- Draft text on virtual distance verification to be put in square brackets for further discussion and submitted as an informal document, if consensus is reached prior to the 90<sup>th</sup> GRPE session.

### 6. UN GTR 21 – Test results and suggestions

#### Documentation

- EVE-65-07e

#### Context

The Chinese delegation offered a presentation on bench test validation results with a pure electric vehicle (EV) and hybrid EV containing more than one electric propulsion machine. From their validation testing on hub and chassis dynamometers, the Chinese delegation offered several recommendations and comments, including:

- There is no specific speed resolution in the process of maximum power identification. We recommend setting the speed resolution at 5 km/h in determination of the maximum power, at which it's easier to identify the maximum power, because the power variation is not obvious under 1 km/h speed resolution.
- For vehicles that have a power distribution unit, the battery pack power is delivered to the Power distribution unit (PDU), then delivered to the direct current (DC) bus of the drive motor MCU, and the bus can be measured directly. In this case, is it acceptable to directly measure the power through the microcontroller unit (MCU) bus rather than by use the calculation of  $P_{REESS} - P_{DCDC} - P_{Aux}$ .

- For highly integrated multi-in-one systems, it's difficult to determine the K2 factor of transmission system when performing test procedure (TP) 2.
- Performing TP2 tests on a chassis dynamometer introduces rolling resistance. It is difficult to determine the coefficient of rolling resistance to account for this loss and makes it hard to determine K2. It is suggested to perform TP2 tests on a hub dynamometer.

### Discussion

The American delegation stated that if a laboratory has a wheel torque sensor, it can be used on the existing chassis dynamometer based on their experience and suggested that chassis dynamometers not be ruled out. The Chinese delegation indicated that it may save them time by using hub dynamometers.

OICA expressed that chassis dynamometer results are possible but may require additional work. With regards to the K factors, on-board data may not be a bad option and the chassis dynamometer speed recommendation is still under discussion internally.

The Japanese delegation commented that a 5 km/h speed resolution may not be appropriate and they prefer to remain at 1 km/h resolution.

The drafting coordinator offered some general comments, stating that there is still some information to come on these topics and in general, when looking at UN GTR No. 21, they are mostly concerned with addressing the changes that have already been brought forward and discussed. Regarding the Chinese delegation recommendations, the drafting coordinator feels that they will require further discussion but cannot be finalized at this moment. They suggested to proceed with the formal written document and if consensus can be reached on the Chinese delegation's new proposals, then it could be included as part of an informal document submission prior to the 90<sup>th</sup> GRPE session in January 2024. The Chinese delegation stated that they understand this position and that in future revisions to UN GTR No. 21, their proposals will be considered.

### Action items

### Decisions

- The Chinese delegation's new proposals for UN GTR No. 21 will be considered for amendment. If consensus can be reached it will be included as part of an informal document submission to the 90<sup>th</sup> session of the GRPE, otherwise it will be considered in a future phase of UN GTR No. 21 amendments.

## 7. UN GTR 21 – Comments on draft text

### Documentation

- EVE-65-08e

### Context

OICA presented a document outlining comments and feedback on the UN GTR No. 21 draft text, specifically offering text and justification to modify section 5.1.4.

#### Discussion

The drafting coordinator requested clarification on whether the proposal and comments were meant to be included as part of the working document or the informal document. OICA clarified that they would prefer it to be part of the working document if consensus can be reached. The drafting coordinator stated that there is no objection to the proposal from their perspective because the proposal is asking for more stringent requirements. The European Commission (EC) also expressed no issues with modifying the value of the temperature.

The drafting coordinator asked whether the requested 5% tolerance is found in another regulation. OICA stated that it is found in another regulation and 2% would be too strict. The EC commented that it sounds reasonable but that further evaluation will be required to monitor the effects of the proposed change.

#### Action items

#### Decisions

8. UN GTR 21 – Finalize proposed changes

#### Documentation

- EVE-65-09e

#### Context

This item was set with the objective of finalizing UN GTR No. 21 amendments for submission to the 90th GRPE session in January 2024.

The drafting coordinator presented the latest draft version of the document and proceeded to address open items with the goal of reaching consensus for the final submission on October 17, 2023.

#### Discussion

The drafting coordinator spoke of the accelerator pedal command and an issue where it is not usually used as a test input for UN GTRs. For the purpose of the test procedure, it is important that the accelerator pedal be at 100%. So perhaps this accuracy should be represented in the UN GTR. While drafting, the group assumed 1% accuracy would be enough, but it was an arbitrary decision. To prove that it is accurate at 1% would be difficult. Furthermore, the absence of a specified tolerance may lead to abuse of the value and procedure. An industry representative indicated that the actual precision on the accelerator pedal would be around 0.4 and so a 1% tolerance may not be an issue. It may be better to eliminate the tolerance all together or state in simple language that 100% throttle is equivalent to the 100% throttle request and leave it to the manufacturer to ensure



its accuracy. The drafting coordinator suggested that perhaps on-board data may be a good option here.

The drafting coordinator highlighted that within the system bench proposal from the Japanese delegation, the term “readily available” needs to be addressed and that the EVE IWG is not yet prepared to allow a system bench for all vehicles at this point in time. The Japanese delegation questioned why it may be an option for some vehicles but not an option for all vehicles. The drafting coordinator elaborated, stating that it is because the group is not fully comfortable with the system bench yet. In a system bench, the vehicle could behave similarly or the same as a vehicle on a dynamometer, but confirmation is needed when defining it in the UN GTR. It must also be ensured that a false system bench is not being created to misrepresent the vehicle. The EC agreed with the drafting coordinator and stated that they are not in favour of introducing a system bench, but that they are willing to use it in a situation where dynamometer testing may not be possible. Defining the system bench properly is important and this needs to be discussed further. OICA commented that they feel that a system bench is a crucial component in the UN GTR if a vehicle cannot be tested another way. This could be used to test other vehicles, but it would require further verification and discussions.

#### Action items

#### Decisions

### 9. HDV GTR – Review of draft text and discussion of open items

#### Documentation

- EVE-65-12e
- EVE-65-13e
- EVE-65-14e

#### Context

This item was set with the objective of continuing discussions on the draft UN GTR on battery performance and durability of eHDVs, for submission, as an informal document, to the 90th GRPE session in January 2024.

The drafting coordinator presented the latest draft version of the document and proceeded to offer an overview of open items, prior to beginning discussions, with the goal of reaching consensus for final submission.

#### Discussion

OICA stated that the draft text looks good so far and that it is good, from their perspective, to have a chassis dynamometer testing alternative to verify the battery durability monitor. The co-chairs agreed and elaborated stating that this is not common practice and varies from UN GTR No. 22, however, it seems appropriate and will be dependent on proper validation.

Action items

Decisions

10. HDV GTR – Position on UBE/UBC measurement

Documentation

- EVE-65-10e

Context

The Japanese delegation gave a presentation updating their position and proposals on the useable battery energy (UBE) and useable battery capacity (UBC) measurement for eHDVs.

Discussion

An industry representative stated that they have concerns regarding the approach to using the world harmonized vehicle cycle (WHVC) because in the United States, the battery sizes are much larger and using the WHVC results in a very low current rate (c-rate). The industry representative expressed that going from an equivalent North American cycle, they do not feel they would ever reach a 0.3 charge/discharge c-rate. The drafting coordinator indicated that when discussing this, they were thinking of looking into the mission profiles to derive the c-rates from that. The Japanese delegation expressed that the WHVC is a widely recognized cycle under the GRPE so that is why that was referenced; however, if it does not work it can be adjusted accordingly, as the Japanese delegation communicated that they are flexible. OICA stated that perhaps it may be valuable to focus on certain c-rates and whether they can be applied to the tests being proposed.

The American delegation stated that UBE under discharge would be their preferred approach and reminded the EVE IWG that discussions are still needed to settle on a c-rate. The American delegation agrees with the proposal from OICA to look at comparable values to get a representative c-rate. They also agree that c/5 to c/3 seems to be the type of range they are between. They are not sure how to narrow it down further, unless perhaps flexibility is built into the regulation to allow manufacturers to specify their c-rate range. The Japanese delegation agreed with the American delegation citing that they have proposed the manufacturers provide the appropriate c-rate, but there is a need to have processes in place to stop manufactures from manipulating the values and results. The American delegation mentioned that perhaps the specification of an upper and lower bounds for the c-rate might help with this and prevent the manufacturers from manipulating it. The drafting coordinator stated that there are also some extra boundary conditions to consider in this, such as the end of a charge cycle, to not damage the battery.

Action items

Decisions

11. HDV GTR – Position and comments on draft text

Documentation

- EVE-65-11e

### Context

OICA presented a document outlining their comments on the draft eHDV UN GTR text, including information on Part A monitor verification as well as c-rate determination as part of Annex 3.

As part of the presentation, OICA also suggested holding breakout sessions on c-rate determination as well as other topics, as needed.

### Discussion

The co-chairs stated that based on the presentation, the onboard sensors need to be accurate for what is being proposed in addition to the battery management system (BMS), so that onboard data may be used. The American delegation requested clarification on what makes eHDV different from light-duty vehicles (LDV). An industry representative stated that passenger cars are a little different because of the battery configurations and the various battery chemistries. Overall, in eHDV there is much more variation, but even in the LDV sector, the onboard sensors need to be accurate. The American delegation stated that if this is already done for LDV, then why can it not be done for eHDV as well. Regardless, there is a need for validation of the onboard sensors in some capacity to be confident in the values being reported.

The Canadian delegation offered additional images and supplementary content, from the discussion that will be in a presentation on day 2 of the 65<sup>th</sup> EVE IWG session, regarding how testing is done in Canada. They communicated that eHDV is complicated and onerous to test and that necessary safety precautions need to be in place. It would be nice to simply rely on the onboard data but that is not how testing is done from an agency's perspective, it is usually done directly. In research projects, typically two clamps are put on positive and negative to cancel shield currents, but this does not necessarily work on all vehicles. Another option in LDV is a manual safety disconnect and a current loop that is not shielded. This could be another option for eHDV testing. The co-chair suggested that it seems necessary to validate onboard signals and data to ensure accuracy, and asked if it would be possible for manufacturers to have testing taps built into the vehicles. An industry representative stated that doing anything over the road requires another qualification process and is burdensome to manufacturers. In general, they would like to find a way to easily test vehicles that anyone could do. What Canada has presented from their perspective seems quite valid. The EC expressed that the use of external equipment does not solve the issue because the internal data needs to be validated. OICA reiterated that in general they agree that there is a need to develop a verification process, but it must be determined how to go about doing this, while avoiding invasive processes. The EC communicated that performing a discharge test for an event on a vehicle and comparing the onboard data to an external measurement and then reperforming the test seems to raise alarms for defeat devices. It is feasible but may be subject to potential issues when used for regulatory purposes.

The Japanese delegation stated that they are prepared to accept UBC and the discharge test procedure as verification of the battery durability monitor. The co-chair communicated that current is easier to measure than voltage and as a result the group had suggested that UBE would be a viable option while avoiding the most onerous process of getting voltage measurements from external

sources. The co-chairs stated that it is possible to specify that voltage can be read from the BMS because it would be relatively safe to say that those values need to be accurate. The American delegation stated that their preference is for UBE and they are in favour of dropping UBC as an option. The EC also supported the American delegation in dropping UBC as an option and moving forward with UBE. The Canadian delegation reiterated that perhaps there can be voltage and current terminals added to the vehicles so that these measurements can be taken easily, but some uncertainty exists with how burdensome this may be for manufacturers.

Action items

Decisions

**Day 2 – October 12, 2023, 09:00 EDT**

1. Introduction, review of agenda

Documentation

- EVE-65-02e

Context

The EVE IWG co-chairs addressed members and welcomed everyone to the in-person meeting.

The co-chairs presented the meeting agenda to EVE IWG members. The agenda was reviewed and adopted by the EVE IWG prior to beginning discussions. Modifications to the agenda occurred and have been reflected in EVE-65-22e.

Discussion

Action items

Decisions

2. UN GTR 22 – Effects of bi-directional charging on BEV degradation

Documentation

- EVE-65-16e

Context

The Canadian delegation presented a document highlighting results of recent testing of battery electric vehicles subject to bidirectional charging and vehicle aging. The study found that,

- Bidirectional charging can be designed to the battery in regions of its state of charge (SOC) and at c-rates that promote capacity retention.
- The effects of bidirectional charging may be lost in noise of the different SOC operations zones for each vehicle and/or the effects of mileage accumulation and calendar aging.

Discussion

The co-chairs stated that the study is interesting because in the adoption of UN GTR No. 22, the V2X parameters were perhaps too lenient based on the results of this research. The EVE IWG assumed that V2X would have a similar degradation to driving but that does not seem to be the case here. The Canadian delegation mentioned that although they agree that this is an academic exercise and not necessarily what exists in a real-world scenario, since the bidirectional charging could be much

more aggressive, it does show that vehicle to grid activities can be controlled to maintain the SOC or SOH of a vehicle.

The co-chairs requested further insight into any anecdotes on vehicles sitting in storage at varying temperatures at 100% or 90% SOC. The Canadian delegation mentioned that storing battery electric vehicles (BEV) was a bit of an oversight at the time but in the future, they are looking to vary the SOC in storage to evaluate the degradation effects further. The co-chairs stated that this is likely a good representation of how a typical consumer may use and store their vehicle so it may not necessarily be an oversight but rather representative of how vehicles may be treated by their consumers. It is also felt that the V2X equation cannot be taken to the warranty realm. OICA commented that customers behave differently and this has been studied significantly by the manufacturers. Aging is a significant factor where customers do not use their vehicles which sit and degrade. OICA does not feel that Canada and the United States are representative of how European customers use their vehicles and we think that more data and information is required before arriving at conclusions.

An industry representative commented that they feel this study indicates that more research is needed. When building a framework, they highlight the need to think at the limit and the agnostic of chemistries. UN GTR No. 22 is visionary and as a team it should be recognized that the EVE IWG has a domain which is mileage for the UN GTR and the next step will be to explore the utility domain of V2X and work with manufacturers to build out this utility. It would be great to work with Canada on follow up studies for research and development purposes and to inform policy. The Canadian delegation also expressed an interest in working with industry on further testing. The EC also mentioned that they have conducted a lot of work with Canada and used their information and analysis to develop models to inform the regulations and suggests that they can exchange the results and incorporate this into the modeling.

#### Action items

#### Decisions

3. UN GTR 22 – Continue finalizing proposed changes

#### Documentation

- EVE-65-20e

#### Context

This item was set with the objective of finalizing UN GTR No. 22 amendments for submission to the 90th GRPE session in January 2024.

The drafting coordinator presented the latest draft version of the document and proceeded to address the open items with the goal of reaching consensus for the final submission on October 17, 2023.

#### Discussion

The Japanese delegation requested clarification on how the pass/fail decision found in the draft text of Part C impacts the pass/fail decisions of Part B. The drafting coordinator stated that this will require further review and consideration.

OICA requested clarification on the outcome should a vehicle fail Part C. The drafting coordinator indicated that the virtual mileage would need to be corrected in every instance. OICA responded that they feel this may need to be reviewed further.

The drafting coordinator explained that edits and a final UN GTR No. 22 document will be posted to the EVE IWG wiki page, upon completion and prior to submission to GRPE on October 17, 2023.

The co-chair of the EVE IWG and the drafting coordinator for UN GTR No. 22 informed the EVE IWG, at the end of the discussion, that they will be departing the working group for a new position.

#### Action items

- Drafting coordinator to provide updated draft of UN GTR No. 22 based on the discussions from the 65<sup>th</sup> EVE IWG session, to the secretariat for posting on the EVE IWG wiki page, prior to submission to GRPE on October 17, 2023.

#### Decisions

- EVE IWG co-chair and drafting coordinator to be leaving for a new employment opportunity.
4. UN GTR 21 – Continue finalizing proposed changes

#### Documentation

- EVE-65-21e

#### Context

This item was set with the objective of finalizing UN GTR No. 21 amendments for submission to the 90th GRPE session in January 2024.

The drafting coordinator presented the latest draft version of the document and proceeded to address the open items with the goal of reaching consensus for the final submission on October 17, 2023.

#### Discussion

#### Action items

- Drafting coordinator to provide updated draft of UN GTR No. 21 based on the discussions from the 65<sup>th</sup> EVE IWG session, to the secretariat for posting on the EVE IWG wiki page, prior to submission to GRPE on October 17, 2023.

#### Decisions

5. HDV GTR – Review of draft text and discussion of open items

Documentation

- EVE-65-12e
- EVE-65-13e
- EVE-65-14e

Context

This item was set with the objective of continuing discussions on the draft UN GTR battery performance and durability of eHDVs, for submission, as an informal document, to the 90th GRPE session in January 2024.

The drafting coordinator continued to present the latest draft version of the document and proceeded to offer an overview of the open items, with the goal of reaching consensus for final submission.

The drafting coordinator suggested organizing a breakout group session to resolve some of the outstanding issues on c-rate.

Discussion

OICA stated that in relation to the MPRs for the draft UN GTR on eHDV, they feel that it is important to maintain energy throughput as an option. OICA requested clarification on whether all three parameters will be maintained or if some of the parameters will be dismissed. The EC stated that with regards to the Euro 7 proposal, it is necessary to maintain age and mileage as parameters and further discussions will be required on how to integrate energy throughput. It is also important to note that mileage is the only utility parameter that can be verified. OICA expressed that it is their understanding that when one of the vehicles surpasses any of these MPRs, it would be disqualified from testing. The American delegation stated that this is their understanding based on their standards and warranty requirements. Adding a third parameter, such as energy throughput would be another means of disqualifying a vehicle from testing.

OICA commented that there are vehicles that exist on construction sites that never make the mileage parameter but will have enormous energy throughput loads and would also need to meet the age requirements. The American delegation commented that in general they do not see value in adding a third parameter like energy throughput if it is not going to be used to disqualify a vehicle. The EC communicated that they have issues with energy throughput because it cannot be independently verified and must go through the manufacturer. The vehicles with high energy throughput would also likely be subject to high virtual mileage values in the regulation and so it is difficult to accept energy throughput as a parameter at this time. The American delegation stated that if we are accepting energy throughput as an MPR, then they do not feel there is a need for virtual mileage in the regulation. In the United States, there is a requirement to have an hour counter on the engines and perhaps this may be a way to verify energy throughput. The EC stated that in Europe it is not required to have an engine hour counter. The Japanese delegation stated that



they do not think the removal of energy throughput or virtual mileage should be done at this time. The EC suggested that if OICA would like to bring forward the option of energy throughput, the contracting parties need a proposal explaining how these values can be verified externally, at which time this option can be seriously considered. OICA stated that they feel the verification will not be an issue and they will discuss this further and develop a presentation for the 66<sup>th</sup> EVE IWG session.

The American delegation request comment on whether there is a need for an MPR in the UN GTR. Perhaps a metric can be defined, and verification can be outlined but a specific value could be left to the regional jurisdictions when adopting the regulation. The EC stated that in Euro 7, there is specific reference to the UN GTR and its values, so this may be a difficult proposal, but we will consider it as an option and come back with a response.

The Japanese delegation provided comment stating that for a Part A family, they feel that if a vehicle has different requirements and testing procedures, it should have a different family. This is to say that the testing procedure should be based on the vehicle type.

The drafting coordinator showed the vehicle survey for LDVs and explained that it will need to be adopted for heavy-duty vehicles. The co-chairs stated that they feel the section on vehicle use may not be necessary for the heavy-duty survey.

#### Action items

- EVE IWG secretariat and drafting coordinator to coordinate the setup of a breakout session on c-rate for the draft text of the eHDV UN GTR.
- OICA to develop a presentation on energy throughput and its verification method for the 66<sup>th</sup> EVE IWG session.
- EC to consider the possibility of having no MPRs in the eHDV UN GTR, and instead defining the metrics and verification process and leaving standards to the regional jurisdictions upon adoption of the regulation.

#### Decisions

6. UN GTR 22 – A plan for enacting durability regulation of electric vehicles

#### Documentation

- EVE-65-15e

#### Context

The Korean delegation offered a presentation on their plan to enact an electric vehicle battery durability regulation, targeting 2027. The Korean delegation indicated that they wish to discuss the need for universal battery identification numbers.

#### Discussion

The co-chairs requested clarification on the purpose of the identification number on the batteries and whether it would be exclusive to Korea or would it be used globally as vehicles travel around. The Korean delegation clarified that it would be similar to a VIN number on a vehicle so that each battery has its own unique identifier. OICA stated that for the purpose of this UN GTR No. 22, they do not understand why there would be a need for a battery identification number because the vehicles are classified into fleets and identified by model.

The co-chairs asked whether the European battery regulation makes use of identifiers. OICA explained that it does for traceability reasons and recyclability. For passenger vehicles at the moment, the battery durability is harmonized to not confuse consumers.

The co-chairs stated that when UN GTR No. 22 was adopted in the United States, modification was required specific to the United States jurisdiction and so this may be a similar situation where Korea may wish to adapt UN GTR No. 22 to include battery identification numbers for their regulations.

#### Action items

#### Decisions

7. UN GTR 21 – Research on the system power of fuel cell electric vehicles

#### Documentation

- EVE-65-18e

#### Context

The Korean delegation offered a presentation on fuel cell electric vehicles (FCEV) and their use of UN GTR No. 21 to conduct a power determination of their test vehicle. The Korean delegation proposed developing a UN GTR on FCEVs and perhaps amending UN GTR No. 21 to include the necessary provisions.

Based on the testing results, the Korean delegation proposed that:

- For the TP1 test method, the component loss equation can be generalized.
- For TP2 test method, drive train loss must be considered when calculating system power test conditions.
- For TP2 test method, hub dyno testing without tire loss is recommended, and test conditions for equalization of rolling resistance must be considered.

#### Discussion

Japan expressed their interest in exploring the expansion of the scope of UN GTR No. 21 to include FCEVs.

The drafting coordinator indicated that at the time of the development of UN GTR No. 21, there were not many FCEVs, so this is why it was not included. The co-chairs requested input on whether anyone had perspectives from those who certify vehicles, whether there is a need for power determination of FCEVs. The EC communicated that for UN GTR No. 15 there was a direction to accommodate FCEVs. As a result, the EC feels that this would also be a necessity for UN GTR No. 21 as well. The Korean delegation's testing was done on a heavy-duty vehicle which is interesting and perhaps there may be a future need for a power determination regulation for heavy-duty vehicles. The co-chairs indicated support for looking into the need for FCEVs in UN GTR No. 21 and further presentations from the Korean delegation on how this may be incorporated, specifically.

#### Action items

- EVE IWG to consider FCEVs in UN GTR No. 21.

#### Decisions

8. UN GTR 22 – Durability of EV on-board battery

#### Documentation

- EVE-65-17e

#### Context

The Chinese delegation gave a presentation on the durability of the battery on-board electric vehicles, specifically bringing attention to:

- The importance of studying and figuring out a more accurate way of reflecting the actual vehicle durability, meaning that more data needs to be collected and analyzed for SOCE accuracy and verification.
- The importance of taking into consideration the actual requirements for different vehicle application scenarios and battery life when setting the age and driving range-based requirements.
- The possible calculation error of SOCE/SOCR when setting the MPR.

#### Discussion

OICA expressed that there is already an accuracy requirement for UN GTR No. 22 and that they do not fully understand the proposal from China or where they would like to go with this, in terms of next steps. The co-chairs stated that they are in agreement with OICA comments. Overall, the EVE IWG has had a lot of discussions on what would be the best parameter between SOCE and SOCR. The EVE IWG also included an MPR in the regulation because there are generally expectations that passenger cars, that are marketed to consumers, last 8 years and 160,000 kilometers. In the United States, the regulations are such that vehicles have a useful life of 195,000 miles associated with greenhouse gas emission credits. The Chinese delegation indicated that there appears to be a misunderstanding on how the regulation is applied and they apologize for this.

### Action items

### Decisions

## 9. EVE IWG terms of reference review and renewal

### Documentation

- EVE-65-19e

### Context

This item was set with the objective of presenting the draft Terms of Reference (ToR) document for the EVE IWG. The ToR requires renewal in January 2024 and will be presented to the GRPE at its 90<sup>th</sup> session to extend the EVE IWG's mandate.

The secretariat went through the draft ToR document and highlighted the updated format, as well as areas for clarification, specifying sections 3 and 5.

The secretary indicated that a draft version of the document has been posted on the EVE IWG wiki page.

The secretariat requested that feedback be provided directly to them before the next EVE IWG meeting in December 2023.

### Discussion

OICA commented that they wish to have the swappable battery items removed from the ToR as it has been handled by the European battery regulation and would result in a conflict and become overly complex to develop and coordinate. The Chinese delegation suggested keeping the option to investigate swappable batteries as a separate UN GTR and adding it as an example to section 3.4 of the ToR. The co-chairs expressed that they were comfortable with the language of considering, in relation to swappable batteries and that if a new UN GTR is desirable in the future, this will need to be requested through GRPE and AC.3.

The Japanese delegation spotted an error and requested that the system bench references be moved to UN GTR No. 21.

The Japanese delegation requested the removal of chassis dynamometer testing references from section 3.1 of the ToR, in reference to HDV GTR items. The drafting coordinator stated that it seems appropriate to at least leave it in for now with soft wording because the EVE IWG has not yet decided whether chassis dynamometer testing will be part of the regulation.

### Action items

- EVE IWG members to provide feedback and input to the secretariat on the draft ToR before the next EVE IWG session in December 2023.

- The secretariat to incorporate feedback from EVE IWG members into the ToR document for the next meeting.

### Decisions

## 10. Action item review and future planning

### Documentation

#### Context

This item was set with the objective of reviewing the recorded action items and for EVE IWG members to communicate whether other action items may be necessary or have been missed.

The secretariat communicated to the EVE IWG, the recorded action items

#### Discussion

#### Action items

- The Korean delegation proposed April 15-16, 2024, for an in-person EVE IWG session in Seoul, Korea, and will verify if shifting the date to April 16-17, 2024, is possible.
- The Japanese delegation has proposed to host an in-person EVE IWG meeting in the fall of 2024 and will provide a date and location in a future meeting.
- The secretariat to send out a poll regarding the upcoming EVE IWG meeting, which is tentatively set for the week of December 4-7, 2023.
- The drafting coordinator and the secretariat to coordinate participation and meeting time for HDV breakout sessions on c-rate and potentially other topics, if required, in preparation for an informal document submission to the 90<sup>th</sup> GRPE session in January 2024.
- The drafting coordinator and the secretariat to organize a drafting group session for eHDV GTR, if necessary.
- The Canadian delegation to send the secretariat EVE-65-16e in a non-confidential format so that it may be posted publicly for EVE IWG members.
- The secretariat to work with the GRPE secretariat to organize an in-person EVE IWG session alongside the 90<sup>th</sup> session of GRPE, in January 2024. The EVE IWG session has been tentatively set for January 9, 2024, at 14:30 – 17:30 local time.
- The drafting coordinator for UN GTR No. 21 to submit to the GRPE secretariat, by October 17, 2023, amendments as a working document, for vote at the next session.
- The drafting coordinator for UN GTR No. 22 to submit to the GRPE secretariat, by October 17, 2023, amendments as a working document, for vote at the next session.

- The secretariat to upload the latest versions of the draft eHDV GTR, UN GTR No.21 and UN GTR No.22, to the wiki page under the 65<sup>th</sup> EVE IWG session.
- EVE IWG members to provide feedback and input to the secretariat on the draft ToR before the next EVE IWG session in December 2023.
- The secretariat to submit the new Terms of Reference document to the GRPE secretariat, as an informal document, for consideration at the next session.
- The secretariat to remove all references to normal usage indices in the Terms of Reference document prior to submission to the 90<sup>th</sup> session of GRPE.
- EVE IWG members to consider the possibility of a UN GTR for heavy-duty vehicle power determination.
- EVE IWG members to continue to consider the possibility of a UN GTR on FCEVs.
- Drafting coordinator to draft text for the second day of the 65<sup>th</sup> EVE IWG session on virtual mileage verification and secretariat to post new draft for the group prior to beginning discussions.
- OICA to develop a presentation on energy throughput and its verification method for the 66<sup>th</sup> EVE IWG session.
- EC to consider the possibility of having no MPRs in the eHDV UN GTR, and instead defining the metrics and verification process and leaving standards to the regional jurisdictions upon adoption of the regulation.

#### Decisions