

Report of the 74th session
Electric Vehicles and the Environment Informal Working Group (EVE IWG)

Location: HIBIKOKU CONFERENCE SQUARE
8th Floor, Hibiyaokusai Building, 2-2-3 Uchisaiwaicho,
Chiyoda-ku, Tokyo 100-0011, Japan

Date: September 18 – 19, 2024

Time: 09:30 – 05:00 JST

Chairs: Mr. Michael Olechiw (United States of America)
Ms. Elena Paffumi (European Commission)

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

Secretariat: Mr. Leeson Guay (Canada)

Day 1 – September 18, 2024, 09:30 JST

1. Introduction, logistics, review of agenda, meeting recap

Documentation

- EVE-73-09e
- EVE-74-03e

Context

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

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.

Day 1 – September 18, 2024, 09:30 JST

- Introduction, logistics, review of agenda, meeting recap
- Roadmap discussion
- HDV GTR – Drafting session update
- HDV GTR – Update to comments on draft text
- HDV GTR – Comments on open topics
- HDV GTR – UBE alternative test method proposal

- HDV GTR – Open items and discussion points
- Closing remarks

Day 2 – September 19, 2024, 09:30 JST

- Introduction, review of agenda
- UN GTR 22 – Comparison testing of high and low mileage BEV
- UN GTR 22 – Phase 3 comments and proposals
- UN GTR 21 – UNR transposition update
- UN GTR 21 – Proposal to apply system bench measurement to all vehicles
- UN GTR 21 – Proposal on highly integrated systems and fuel cell vehicles
- HDV GTR – Open items and discussion points
- Terms of Reference update
- Closing remarks

The EVE IWG secretary briefly reviewed the *Report of the 73rd EVE IWG session*, highlighting action items and key decisions from the discussions, held virtually, on July 09 - 10, 2024.

The Japanese delegation offered some opening remarks on meeting logistics including smoking rules, microphone function, washrooms, coffee and Wi-Fi connectivity.

2. Roadmap discussion

Documentation

- EVE-74-14e

Context

The co-chairs presented a document highlighting the EVE IWG's course of action going forward in terms of deliverables and proposed future meetings.

Discussion

The co-chairs highlighted that it was agreed at the previous EVE IWG session that there will be a meeting before the week of the 91st session of the Working Party on Pollution and Energy.

3. HDV GTR – Drafting session update

Documentation

- EVE-74-04e

Context

The drafting coordinator offered a brief overview of the previous drafting session, on July 16, 2024, which focused on the continued development of the draft global technical regulation (GTR) on in-vehicle battery performance and durability for electrified heavy-duty vehicles, speaking to some of the minor decisions that were made during the session and remaining draft text open questions.

4. HDV GTR – Update to comments on draft text

Documentation

- EVE-74-11e

Context

This item was set with the objective of enabling the Japanese delegation to present their positions on various open items for the draft eHDV GTR.

Discussion

The Japanese delegation stated that they do not need to present and can simply refer to their document as needed during the drafting discussions later in the 74th EVE IWG session.

5. HDV GTR – Comments on open topics

Documentation

- EVE-74-18e
- EVE-74-20e

Context

The Organisation Internationale des Constructeurs d'Automobiles (OICA) presented comments and feedback on the draft text of the eHDV GTR, in a lessons learned approach, following pilot phase testing.

OICA emphasized the following points:

- OICA would like to support any editing of square brackets, in a dedicated breakout session.
- Detailed discussions on the Alternative Method (C/D test) have not been completed and therefore must be discussed in Phase 2.
- Energy throughput minimum performance requirements (MPR) shall be monitored and adopted based on the monitoring results.

Discussion

The Japanese delegation questioned OICA's concern with square brackets and explained that the reason for these is because there is currently no consensus, and so compromised solutions are required through discussions during the EVE IWG sessions. Furthermore, when looking at the chassis dynamometer comment, it is an alternative method and so it is not a mandatory requirement, and we should be open to exploring other opportunities. Finally, monitoring of the energy throughput could lead to some confusion in an already confusing GTR text. OICA clarified that when there is no common ground, they anticipate discussing the square brackets to reach a conclusion. OICA added that their proposal regarding chassis dynamometer stems from the lack of experience in Europe (EU) and the United States of America (US) for certification. In response, the American delegation supplemented that their provisions default to engine or powertrain testing for emissions testing and for the second and third phase standards there is optional chassis dynamometer testing for off-cycle technologies. The co-chairs questioned OICA on their concerns with chassis dynamometer testing. Everything that is being looked at in the eHDV sector is new and so what specifically about chassis dynamometer testing is causing specific concerns. OICA clarified that there are technical concerns, and we do not all have experience with the system. For all the different configurations of eHDVs, you need to have a chassis dynamometer that can accommodate all these configurations. The accuracies of the chassis dynamometer are also different and meeting the various requirements and pass/fail

criteria need to be accurately defined for chassis dynamometer specifically. Component level certification is the current method and that is simply due to the complexity of the heavy-duty sector and the various configurations. Component level testing is the most efficient and effective method so from our experience we are not comfortable implementing the chassis dynamometer method. The Japanese delegation pointed out that as long as manufacturers have business in China or Japan, they will have to do testing on a chassis dynamometer so what is being said here does not align. The American delegation added that another aspect of their regulations is that the verification used incorporates a chassis dynamometer for in-use verification. Admittedly we have shied away from this because of the thousands of configurations available on the market but this whole GTR and process relates to whole vehicle system testing so we have essentially already agreed to step away from component level methods. OICA responded that in China and Japan it is the authorities doing the chassis dynamometer testing and not the manufacturers so this is something to consider. The products in Japan and China are of much lower production than the US and EU. Ultimately, we as manufacturers do not have chassis dynamometers so let us put this item off until the second phase of the eHDV GTR.

The co-chairs mentioned that the alternative test method has been discussed at length in the past and has also been a strong request from the Chinese and Japanese delegations, so we need to agree on a path forward before we continue drafting. The Chinese delegation stated that the eHDV dynamometer test method should be kept as an alternative method. It is not a main testing method so there should be no issues. We should keep this alternative test method in the draft text and continue discussions on its development. The US, China and Japan want the chassis dynamometer and if you want to sell product in China you need to follow our regulations, and we already have chassis dynamometers in our regulations. The European Commission (EC) indicated that they need to reflect on this further. Previously there was an idea to vaguely include it, then fully implement it and now there is suggestions that we want it out. As an alternative method, certainly it is important that we are not forced to use this sort of method. Having said that, all contracting parties see the need for this method so we feel we should not expel it from the regulations for phase one. The EC feels that the group should work to have it in the text as an alternative and continue to iron out the details in the second phase. Overall, the EU is supportive of the chassis dynamometer testing if we are not forcing it to be used in any case or situation. The co-chairs requested clarification on whether a chassis dynamometer is required in China or Japan. The Japanese delegation clarified that it is only necessary for homologation testing in their case. The American delegation commented that from their perspective, they should keep chassis dyno in phase one, and it should also be left to the contracting parties to set up the different road loading conditions. All these vehicles are going to vary in this respect, so this is something important to consider. OICA indicated that they would provide a decision tomorrow on chassis dynamometer inclusion.

The American delegation noted that there has been data presented from the technical specialist representatives but perhaps there is still some data to be shown. Could OICA please share all the data from the testing, either directly or in a separate breakout session. The co-chairs offered a follow-up on the data package request, and whether it would be possible to make this data publicly available, such as on the wiki page or elsewhere. OICA indicated that they would discuss internally and respond with how they may go about it and in what format the data can be provided for ease of processing. The technical services representative requested more data and results from the other pilot phase testing events, as they have not yet been presented in the EVE IWG sessions.

The Japanese delegation questioned OICA expressing, how can we go about resolving the problems raised, that were seen during the pilot phase testing. It is nice to run a test, but we need concrete proposed solutions to the issues raised.

The co-chairs requested clarification on whether the percentile approach of vehicles of a fleet failing the 90 % threshold, this indicates that the vehicle batch would then be compared against its usage and whether it would be considered as appropriately used, and not a bad or inconsistent batch. OICA requested that they would like to have a dedicated meeting with the Joint Research Council (JRC) and other interested to discuss the applicability of the same statistical method from light-duty vehicles being used for eHDV.

The EC stated that one element of the eHDV GTR that is unclear is how the group has landed on the different testing methodologies being proposed including the test track, on-road , bidirectional and alternative chassis dynamometer testing. The EC asked OICA to clarify whether there is a strong need for on-road testing. OICA clarified that for testing the point of focus is method 1a and 1b and there is a need for an alternative to 1a because of the lack of availability of closed test tracks. These are the main reasons for requesting open-road testing. The EC asked whether it would be possible to do testing at the manufacturer development test tracks or is it required to use a third-party test track. OICA stated that you cannot test a vehicle of a competitor at a manufacturers' test track. The EC rephrased the question, asking if conducting in-service conformity testing could be done on any manufacturers' test track under supervision of a designated official. The Swedish delegation commented that in many cases in-service conformity testing should be done without the manufacturers involvement and conduct the testing on a third-party test track. As a result, these independent test tracks are very limited in availability, and this is why we would consider the alternative. The EC mentioned that testing observation at the test track of a manufacturer could be another option, and this is a very common approach. There could be a technical service representative observing the testing. Regarding testing and bringing vehicles across the EU, it is understood that this is another reason but certainly we could look to reduce the burden in some way. The American delegation stated that they understand the challenge with getting vehicles across the country and there are also test tracks around the country, which are surely difficult to book. If the group feels it is necessary for having method 1b then perhaps we can base all requirements off method 1a and then if it is not possible, then we can look at method 1b.

The Japanese delegation pointed out that for the useable battery energy (UBE) and useable battery capacity (UBC), they are not denying UBC and for light-duty vehicles it has already been regulated using UBE so if OICA is proposing UBC then the group would need to consider this for the second phase of United Nations (UN) GTR No.22 and the second phase of the eHDV GTR. OICA clarified that the proposal they have put forward is with the intention to monitor the UBC and supporting data for any discrepancies in the provisions.

Action items

- OICA to internally discuss and provide response on the public sharing of pilot phase testing data.
- OICA to offer future presentations on the experience of other manufacturers' pilot phase testing.

6. HDV GTR – UBE alternative test method proposal

Documentation

- EVE-74-08e
- EVE-74-09e

Context

The Chinese delegation offered a presentation outlining a proposal to introduce a cycle test method through the use of a chassis dynamometer, in order to calculate the on-board state of certified energy (SOCE). The presentation also included UBE test results under various conditions.

Discussion

The drafting coordinator mentioned that the group can work to align the break-off criterion with other methods and use this as a common approach.

The Japanese delegation stated that they had expected the UBE under the different conditions may be the same. This is because even though the air conditioning is on or off, the energy will be counted as part of the UBE and even though rolling resistance is different between the three temperatures, the differences may add up to the same result. For these reasons they did not have much concern for the temperature changes, but these results make them a little nervous and perhaps there may be a need to reduce the temperature range on the test track. The Chinese delegation supplemented that this is a real test result with the same vehicle and the battery did not have good conditioning in the low temperature, so this is the reason for the lowest result here. The drafting coordinator commented that temperature does have an impact on the test result and that is why there is preconditioning as part of the test to ensure stability prior to beginning evaluation. The technical services representative commented that in soak and charge, the battery is heating and charging but needs this process needs to be done for a certain period. There are processes to this procedure, and it would be interesting to see more details on the battery temperature and impact on the UBE because it obviously has influence here. Perhaps the same testing could be looked at for light-duty vehicles, especially at negative seven degrees. Its surprising to see the results going from 99 % to 19 % in the results for SOCE.

OICA questioned whether the certification test in China will be method 1 or method 2 and the in-use test will then be done on a dynamometer. The Chinese delegation expressed that it is the same as what it is for light-duty vehicles, certification is for new vehicles and in-use will be done on old vehicles. The same test methods are used for both. The drafting coordinator mentioned that it is up to the region to select the method they would like to use but it should be the same method as done at certification. OICA asked for clarification. The drafting coordinator asked whether there is a need to use the same test method for certification and in-service conformity. If we are using the dynamometer then we cannot use the dynamometer for the conformity check, so the text here needs to be revisited. The drafting coordinator highlighted the draft text that indicates the same test method must be applied at certification to the applicable SOCE family being observed as part of the in-service testing. The EC commented that they feel it is appropriate to always have the track testing available and they feel the paragraph in question can be deleted from the text and leave the responsibility to the regions to decide what to do. If the text remains, then there would be a need to remove the chassis dynamometer option because there would be no way to enforce it in the EU.

OICA stated that based on the pilot phase testing they are convinced the paragraph should remain in the text so that a family can retain the same certification and in-service verification procedure. The American delegation commented that they agree equivalency is necessary because of the limitation of different regions. Data needs to be used to ensure repeatability and equivalency but there has been no data to support that discrepancies exist for certain testing combinations. The Japanese delegation stated that the same test method means nothing. If testing temperatures are different, the results may be different. If the same test is being done, then the same conditions also need to be ensured. The drafting coordinator reiterated that this is why preconditioning and soak of the battery is important. There needs to be certainty that the preconditioning and soak requirements ensure accuracy between testing methods and runs. The technical services representatives supported maintaining the text in the GTR as there has not been enough evidence on equivalence between the different testing methods. It could work for 1a and 1b but there are still different boundary conditions. It might even work to give the choice of testing with method 1a and 1b but even with this there is not enough data. When it comes to method 2 and the alternative method, it would not be appropriate to delete this from the GTR text. The American delegation requested clarification on why the regenerative capabilities are being turned off during the testing. China clarified that in their testing the brake regeneration is not turned off and it is working. The American delegation suggested that from this perspective then, there is no difference between chassis dynamometer and method 1 and 2 testing. OICA expressed that they are supportive of leaving the text as is and they would need to consider whether they support leaving the decision to the regions. During the development of the second phase, perhaps a regional requirement can be added if there is data supporting a difference. If there is no testing equivalency data between method 1, 2 and chassis dynamometer there should be hesitancy in allowing them to be compared. The group agreed that the same testing method will be used for certification testing and in-service conformity testing unless there is an agreement between the regional authority and the manufacturer.

Action items

- Drafting coordination to consider revising the selection of test method table.

Decisions

- The same certification and in-service conformity testing shall be used unless there is an agreement between the manufacturer and the regional authority.

7. HDV GTR – Open items and discussion points

Documentation

- EVE-74-04e
- EVE-74-05e
- EVE-74-06e
- EVE-74-07e
- EVE-74-11e

Context

This item was set with the objective of discussing and resolving outstanding topics of the eHDV GTR draft text.

The drafting coordinator returned to items that were discussed at the previous EVE IWG session, reiterating what was discussed, what remains outstanding and verifying whether any further developments have been made since the previous session.

Discussion

Metrics, MPRs and optional annex

The drafting coordinator contributed a presentation on minimum performance requirements and tables to be included in a potential optional annex of the eHDV GTR. The values used in the tables were coming from previously proposed values from China, EC, Japan and OICA.

The Japanese delegation asked whether the values presented included those from OCIA and Japan. The values presented for category 2 in blue lettering were previously rejected at an internal Japanese meeting which included Japan Automobile Manufacturers Association (JAMA), so why is it being brought forward again during the session, it will certainly get rejected again. OICA stated that Japan may have rejected it in the first discussion round but are all the other parties prepared to reject it as well. There under 16-ton vehicles are run in other countries outside of Japan so maybe they will have a different opinion. The EC commented that the 5-year proposal seems like it would be lowering the standards in addition to another 8-year proposal. So is there a reason for adding another proposal instead of harmonizing the values suggested from the other contracting parties. The EC continued that in their regulations they require an 8 year and a 10-year option so those values need to be included in the optional annex, but the inclusion of other values can be discussed. OICA expressed that they feel this is a good starting point.

OICA asked what the values in the square brackets indicate. The drafting coordinator clarified that those values are the worst-case conditions resulting from the Transport Technology and Mobility Assessment (TEMA) model simulations. The idea is to pick the worst-case conditions and drop it a further 5 % to ensure a margin of error is included.

OICA asked whether there is an expectation of manufacturers to monitor energy throughput for years or kilometers or both. The drafting coordinator mentioned that it could be an idea to check the calendar age and mileage. OICA reiterated that this seems to be a good starting point and that these values can be revisited in the second phase, especially considering the vehicle calendar aging.

The EC asked China whether they want to do an 8-year target and 400,000 km. Is this a value that is already being used in Chinese regulations. The Chinese delegation responded that it was simply an initial suggested target value.

The Japanese delegation commented that they have concerns over the challenge of the target values and feel that in the first phase excessive challenging targets should be avoided. The drafting coordinator reiterated that they make use of worst case scenario modelling results, for example the input of megawatt chargers, even though they are not yet on the market, have a large impact on the battery. So these projected values are relatively lenient already, based on our worst-case assumptions, and other input parameters can be considered in the modelling, if necessary.

Definitions

OICA pointed out that the draft text makes use of equations that include the various definitions, so the equations likely need to be determined before settling the definitions.

The definition of 'battery' as it pertains to heavy-duty vehicles was agreed to remain consistent with UN GTR No. 22, specifically referring to the battery system as a whole. This aligns with the terminology used for light-duty vehicles and resolves any prior ambiguity.

Regarding UBE_{charge} OICA suggested that the definition can be kept. Japan commented that if the UBE needs to be measured, the first discharge of UBE needs to be very precise, especially if interested in checking the amount of charged energy. OICA stated that there is no detailed procedure but there is a charging power limit so it should not have a large impact on the procedure and that is why we are supportive of keeping this parameter. Japan indicated that if OICA is in agreement, then so is Japan. The technical services representative mentioned that during soak and charging the signals are measured anyway according to the eHDV draft text, but the question is if the calculation of UBE_{charge} will be necessary for further evaluation. OICA commented that if monitoring energy is desired there is a need for amp-hours and voltage, but the problem is due to the different battery configurations resulting in different internal losses. This is the reason why OICA has been proposing the use of capacity, because it is more accurate and this is why we are looking to monitor both UBC and UBE. Japan asked for clarification on why UBE is required during the charging process. OICA clarified that it will be used as a comparison to the UBE that is discharged, for correlation and to look for cell relaxation and ensure no false charging situations occur. The Japanese delegation paraphrased that OICA is looking to ensure they have an excuse for a failed test. The American delegation commented that they are okay having these other parameters and collecting their data but the only metric that matters is $UBE_{discharge}$. OICA expressed that this is why they are asking to simply monitor it. The American delegation commented that OICA has already shown data for various unfavourable scenarios in the case of a failing test. We can monitor these values again and again to show it but it does not matter to what the regulation states and the data that actually matters. If this is something you want to monitor then by all means go ahead a monitor these extra values but we should not need to make it a part of the regulation or mandatory and this should not be another way of trying to reopen the discussion on UBC. The Japanese delegation agreed that UBE_{charge} is not a core part of the regulation and can be deleted. The drafting coordinator agreed to remove the definition of UBE_{charge} since it is not a mandatory parameter and does not need to be described in the GTR.

The drafting coordinator indicated that the definitions of "gross vehicle weight" and "gross combination weight" are not standard for GTRs or UN Regulations. From the correct references the "gross vehicle weight" will be replaced with "gross vehicle mass" (GVM) and "gross combination weight" with "gross train mass" (GTM) to align with the official definitions. The EC supplemented that GVM and GTM definitions come from special resolution No.1.

Regarding Power Takeoff (PTO) and PTO-operation, the drafting coordinator highlighted that PTO refers to energy used for operating external machinery (e.g., hydraulic systems), separate from auxiliary systems such as climate control or lighting, which are integral to the vehicle but not part of propulsion. The drafting coordinator questioned how the proportion of the energy throughput for propulsion can be determined. OICA expressed that when measuring from the inverter to the electric machines, the propulsion energy can be monitored and determined in this way. The drafting coordinator recalled that, the original idea was to separate all energy throughput not related to

propulsion to determine virtual distance. However, there was feedback that a unique sensor is not available to differentiate the contributions. As a result, there are currently two proposed equations, where one assumes an energy throughput counter or sensor is available, which measures non-driving energy;. The other calculates the virtual distance by measuring all energy used, then proportionally dividing the energy used for propulsion from the total. If using the second equation, there may be no need to define PTO. On the other hand, it could still be relevant in the future. The EC asked what occurs in a situation where something does not move very much for propulsion purposes, it could generate some strange values when looking at the virtual distance equation. OICA suggested that it likely would not be a concern because the vehicle would drive so little that even if resulting in a high multiplier it would be multiplied against a small mileage value on the odometer. The American delegation pointed out that if using the virtual distance equation, it could result in all non-propulsion energy being counted, including things like air conditioning and other minor auxiliaries. The virtual distance calculation will exclude auxiliary systems such as climate control for truck. However, for certain vehicles like urban buses where auxiliary systems represent a significant portion of energy consumption, a standard value may be applied to adjust the calculation. OICA suggested that a set factor could be used to represent the estimated climate control functions and other minor auxiliaries. The technical services representative questioned whether the denominator of the virtual distance equation should use total energy throughput instead. The American delegation commented that they feel the equation needs to be studied further and the remaining definitions need to be revisited, for example PTO in a traditional sense means loads off a vehicle. But in a cement mixer, for example, it is built into the vehicle itself so then it would not necessarily be PTO in the traditional sense. It may be appropriate to clarify what is meant by each of these so as to not encounter a situation where some auxiliaries are accidentally included in the evaluation. With that said, we do like the equation in that it defines the propulsion energy and separates it in a manner where there is no a need to look at the other items that have nothing to do with propulsion. The group just needs to be careful and ensure that everyone understands what this means, specifically that all other things will be included in the virtual distance calculation. The group needs to be careful in going about defining propulsion energy to avoid any confusion.

Regarding maximum normal charging power, The American delegation commented that the ultra-fast charging and mega-watt charging is not well defined here and perhaps it would be best to avoid using these terms altogether. The manufacturer could recommend the charging power and perhaps this could be the charging power to use if it is not too slow that it never reaches full charge or too fast where it is detrimental to the battery. OICA commented that they feel it would be important to include a word like daily to represent a normal and usual charging level. The EC provided some supplementary text from the optional Annex 13 of UN GTR No.15, "Application of a normal charge: normal charging is the transfer of electricity to an electrified vehicle with a power of less than or equal to 22 kW. Where there are several possible methods to perform a normal AC charge (e.g. cable, induction, etc.), the charging procedure via cable shall be used. Where there are several AC charging power levels available, the highest normal charging power shall be used. An AC charging power, lower than the highest normal AC charging power, may be selected if recommended by the manufacturer and by approval of the responsible authority." OICA proposed that a mix of the discussed options should be used. The drafting coordinator suggested, "The battery shall be fully charged at a power less than or equal to the manufacturers recommendation for normal charging."

Action items

- EVE IWG members to review the remaining open definitions and carefully consider the definition of PTO and the associated virtual distance equations.

Decisions

- Battery definition was agreed, to remain consistent with UN GTR No. 22, specifically referring to the battery system.
- The definition of UBE_{charge} was removed as it is not a mandatory parameter and does not need to be described in the GTR.
- Gross vehicle weight and gross combination weight will be replaced by gross vehicle mass (GVM) and gross train mass (GTM) to align with previously defined terms.

8. Closing remarks

Context

This item was set with the objective of closing the meeting for the day.

The co-chairs thanked the Japanese delegation and quickly outlined the high-level topics that will take place on the second day of the 74th EVE IWG session.

Day 2 – September 19, 2024, 09:30 JST

1. Introduction, review of agenda

Documentation

- EVE-74-03e

Context

The EVE IWG co-chairs addressed members and welcomed everyone to the virtual 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.

The co-chairs also provided a quick highlight to the group regarding the reception that would take place following the meeting.

2. UN GTR 22 – Comparison testing of high and low mileage BEV

Documentation

- EVE-74-21e

Context

The Canadian delegation offered a presentation on the comparison of identical battery electric vehicles (BEV), the first with low mileage around 21, 553 km and the second with high mileage around 184,400 km. The testing looked to compare energy consumption and UBE between the two vehicles. The results indicated that:

- The low mileage vehicle lost 8 % UBE over 7 years primarily due to calendar aging.
- The high mileage vehicle lost 20 % UBE over the same timeframe but had higher vehicle miles traveled.
- The onboard charger of the high mileage vehicle exhibited higher energy transfer losses than the 2016 and 2023 low mileage vehicle tests.

Discussion

OICA asked what the reference point for the grid was when comparing grid charging and the vehicle discharging, to evaluate the losses. The Canadian delegation responded that the point is the electric vehicle supply equipment (EVSE), or grid to charging station. OICA then pointed out that this means the losses from the charging station as well as the vehicle have been included in the data. The Canadian delegation agreed. OICA requested that if testing like this is done in the future for eHDV, it would be nice to introduce a measurement device between the charger and the interface of the battery to see the energy flows, while accounting for the losses. The Canadian delegation agreed that it would be interesting to see the energy losses from the charger as this would be a loss of money from a customer. OICA asked whether the same EVSE was used for both vehicle tests. The Canadian delegation explained that the same EVSE was used and typically in their testing, the comparing direct current out to the alternating current in is around 14-15%, so the result is not so unexpected.

A technical expert asked whether the additional losses in recharge could be related to cell balancing and maintenance, as compared to when new. It would be interesting to look at the instantaneous

efficiency since there can be some odd things going on in a full charging cycle. The Canadian delegation commented that they noticed one of the onboard chargers was starting to go on the high mileage vehicle and needed to eventually be replaced.

The American delegation asked whether the data shown is an average result. The Canadian delegation explained that yes, it is. In addition, they noticed during the charging events that after several minutes to hours there are bumps of energy being sent from the grid to the onboard battery or being absorbed by the battery. The American delegation indicated that the low mileage vehicle seems to display efficiencies that are in line with the US rulemaking. The EC stated that the results from the research are also very similar to what they have measured, and offered to share and compare the data.

A technical services representative asked if the state of charge was taken care of during the stationary phase. The Canadian delegation indicated that they do not have the history at the moment but working to get this data to confirm that it was stored adequately, which they believe that it was.

The secretariat for the Automotive Lifecycle Assessment Informal Working Group (A-LCA IWG) asked whether the Canadian delegation would be interested in presenting some of these results to the 17th A-LCA IWG session next week. The Canadian delegation expressed interest in the request and the secretariat for the EVE IWG offered to put the two parties in touch to coordinate a future presentation at the A-LCA IWG.

The Canadian delegation offered to all EVE IWG participants that if there is interest in this sort of testing, especially with eHDVs, to please get in touch with the Canadian delegation to collaborate on future testing.

Action items

- Secretariat to provide email to the Canadian delegation and the secretariat of the A-LCA IWG for them to efficiently coordinate a presentation at the upcoming 17th A-LCA IWG session.
- EVE IWG members interested in battery durability testing, to reach out to the Canadian delegation to coordinate future research testing.

3. UN GTR 22 – Phase 3 comments and proposals

Context

This item was set with the objective of having an open discussion on topics that might be of interest to EVE IWG members, concerning UN GTR No. 22.

Discussion

The co-chairs suggested that it may be a good idea to think about any changes that would better fit into the US regulatory structure and harmonization with the California Air Resources Board (CARB), perhaps taking this as an action item. The American delegation commented that this approach would make sense to them and that they have incorporated the first version of UN GTR No. 22 into their regulations, not the second phase. From the US perspective, it might be a good idea to

optionally follow the latest version of UN GTR No. 22 and consider the ramifications of making this as an optional alternative. OICA asked how this might be implemented, such as through a guidance document. The American delegation responded that they would likely accept comments and from there, several corrections would be proposed. We are at the point of leaning towards taking comment for following UN GTR No. 22. Ultimately, there is no real drawback for us, as it is not an issue of giving anything up. Because there are additional provisions in the second phase, it would just need to be carefully reviewed to ensure that there are not any considerations that may not be immediately clear to us at this time.

The British delegation indicated that they are considering transposing UN GTR No. 22 into a UN Regulation, similar to what OICA is doing with UN GTR No. 21. They would be interested in hearing any comments on this action as well as future work for the third phase of UN GTR No. 22. The Japanese delegation have no plans of discussing the third phase at this time but are interested in looking at the comparison of state of certified energy (SOCE) and state of certified range (SOCR) and presenting the findings. The chair of the Working Party on Pollution and Energy (GRPE) commented that it is not in our mandate so it becomes a relevant question which can certainly be raised at the next GRPE session in October to see how to go about doing this. In the EU, UN GTR No. 22 will be put directly into the requirements of Euro 7.

The Chinese delegation commented that at the moment they are drafting a regulation that incorporates UN GTR No. 22 and they feel that some of the technology details should be considered including range testing methods, testing discharge for virtual distance and other similar things. Once their regulation is drafted, they would like to offer a presentation on findings and lessons learned. The drafting coordinator suggested that there be an action item to update the Terms of Reference (ToR) to reflect updating UN GTR No. 22 based on lessons learned from implementing countries.

OICA raised that they are currently discussing the date of manufacture of vehicles and sometimes dates cannot be finalized when leaving production. AS a result, this can pose a few issues and we are wondering whether there is the possibility to change the date of manufacture of the vehicle to be the date of installation of the battery in the vehicle. The American delegation indicated that they are experiencing similar issues in the US with chip shortages, calendar aging, and various other concerns that are impacted by the date of manufacture.

Action items

- EVE IWG members to consider changes that would fit into US regulatory structure and improve harmonization with CARB.
- Secretariat to modify ToR to reflect updating UN GTR No. 22 in the third phase based on lessons learned from countries implementing the regulations.

Decisions

4. UN GTR 21 – UNR transposition update

Documentation

- EVE-74-16e

- EVE-74-17e

Context

OICA presented a document highlighting progress made to date on the transposition of UN GTR No. 21 to a new UN Regulation.

In comparison to UN GTR No. 21 the new UN Regulation contains the following updates:

- Inclusion of declared values and tolerances of 5 % between measurement and “declared values” (compared to 2% / 4% for UN-R85)
- Inclusion of “equivalent methods” for the derivation of loss factors
- Inclusion of correction factors for atmospheric conditions in case of testing by third parties
- Inclusion of identifiers of families
- Inclusion of information document and test report
- Inclusion of COP requirements

Discussion

The Japanese delegation highlighted that during the drafting sessions, they had already provided comments, and they appreciate that OICA is incorporating them into the informal document. There was one item where OICA has modified the tolerance by 5 % from UN Regulation-85 but I do not think that we had agreed to modify this value at the end of the drafting session. The EC confirmed that they recall that it was not agreed upon yet. The Japanese delegation stated that there were discussions and explanations, but there was not agreement. The UN GTR No. 21 drafting coordinator indicated that they have been assuming throughout the process that the transposition is not requiring much technical expertise and design but rather its more of a clerical exercise, ensuring that the differences between a GTR and a UN Regulation are addressed. OICA commented that they want to keep everything in the regulation as it is and they have help on this front now. The co-chairs suggested that if OICA requires technical assistance the drafting coordinator is available, otherwise this exercise of a transposition is a little outside of our scope of work.

5. UN GTR 21 – Proposal to apply system bench measurement to all vehicles

Documentation

- EVE-74-15e

Context

The Japanese delegation, with the help of Japanese automakers, presented a proposal to allow the use of a system bench for all vehicles subject to UN GTR No. 21 provisions. The Japanese delegation explained the system bench and a recap of the lab tour that took place prior to the 74th EVE IWG session. In summary, the Japanese delegation has:

- Completed the loophole risk study among the requirements to guarantee the utilization of the system bench.
- Demonstrated the same level of accuracy when using the System Bench compared with the other methods.
- Expect to achieve same level of accuracy for other HEV systems, as long as “robust logic” is confirmed.

Discussion

The drafting coordinator stated that when considering the whole situation, and the system bench specifically, rather than a full vehicle this is a prototype or production vehicle, is there any reason why a system bench would not perform the same as a production vehicle. Secondly, once a system bench has been used, how can the system bench performance be verified to match the production vehicle performance, characteristics and specifications. The main question here is how system bench implementation be verified. OICA commented that the principle is the same and everything in the report stays the same since it replicates a homologation test. If the method is acknowledged as good and it can reproduce the results on a dyno, there should be no issues. The co-chairs expressed that given the data and observation of the test, a certification authority could perform a test to verify the vehicle and see whether the values lineup. The Swedish delegation indicated that in the EU, market surveillance exists so they will take the vehicle and do testing on the dynamometer, so in a way this verification does exist. We are supportive of this method and for including it in UN GTR No. 21 for all vehicles

The drafting coordinator reiterated that UN GTR No. 21 allows for the system bench now, but does the group want to open this up to all possible vehicles and not only those that are too powerful for a dynamometer. From an editorial standpoint, it would be quite simple to include in UN GTR No. 21. We just need to agree as a group if this is what we would like to move forward with. The EC commented that they are still discussing internally about this and will report back on a position for the EU and member states. OICA expressed that the system bench is heavily utilized in the heavy-duty sector, so we would agree with the inclusion of system bench into UN GTR No. 21.

The co-chairs suggested that this could be a great flexibility of manufacturers and requested clarification regarding whether all of the presenting manufacturer's hybrid vehicles have a system bench. The manufacturer responded that not all of their vehicles currently have a system bench, but they are working to develop everything.

The co-chairs asked whether for similar hybrid electric vehicle architectures and platforms, whether the parameters can be modified slightly to provide further efficiencies through the system bench method. The manufacturer indicated that they are not yet sure as they are still early in development of this method but are hopeful this is the case.

The co-chairs asked for this to be an action item at a future meeting, to decide whether allowing the use of a system bench for all vehicles would be appropriate to include in UN GTR No. 21. The Japanese delegation recalled that for wind tunnel testing there was a similar hesitancy for measuring aerodynamics of vehicles, but ultimately ended up being a good way forward, and we feel this is likely the case here too.

Action items

- The EC to discuss internally and report back on decision regarding the allowance of system bench testing for all vehicles in UN GTR No. 21.
- Secretariat to include this as an item at a future meeting to determine whether the EVE IWG is comfortable moving forward with including a system bench as part of the amendments in the third phase of UN GTR No. 21.

6. UN GTR 21 – Proposal on highly integrated systems and fuel cell vehicles

Documentation

- EVE-74-10e

Context

The Chinese delegation offered a presentation requesting an amendment to the measurement of K1 value for highly integrated electric drive systems in UN GTR No. 21. Furthermore the Chinese delegation also proposed the inclusion of fuel cell electric vehicles be added to UN GTR No. 21 in the next phase. Both proposals included test results to support the request.

Discussion

OICA asked what China is directly measuring with the fuel cell vehicle to get the results. The Chinese delegation indicated that they are treating the fuel cell stack as an additional battery.

The drafting coordinator requested clarification of whether the electric drive system being put in an environmental chamber is to avoid cooling needs. The Chinese delegation indicated that this was not the case and that they are measuring the instantaneous temperature carefully. It appears that everything came out fine.

7. HDV GTR – Open items and discussion points

Documentation

- EVE-74-04e
- EVE-74-05e
- EVE-74-06e
- EVE-74-07e
- EVE-74-11e

Context

This item was set with the objective of discussing and resolving outstanding topics of the eHDV GTR draft text.

The drafting coordinator returned to items that were discussed at the previous EVE IWG session, reiterating what was discussed, what remains outstanding and verifying whether any further developments have been made since the previous session. This was a continuation of open items from the first day of the 74th EVE IWG session.

Discussion

Purpose of the GTR

The drafting coordinator indicated that this section has been open for many EVE IWG sessions without further comment so perhaps it can be closed. OICA stated that the language surrounding method could be changed because there are several methods in the GTR draft text, so it may be appropriate to make method plural.

Scope and application

A technical representative stated they feel batteries should be made singular due to the context and definitions section.

Text surrounding small volume manufacturers and special purpose vehicles has been accepted on the basis that regions will make the determination on their own. Comments will remain in the draft text as reference.

OICA commented that regarding the sentence about trailers and semi-trailers, the technology is coming so this is something that we need to keep in the text, therefore we would be supportive of agreeing to this text. The American delegation said they do not disagree about trailers, but it seems to be an odd place to political statements, perhaps it can be addressed elsewhere, so long as it is clear that this GTR text does not apply to trailers. The British delegation agreed with the US, stating that this text should not be in the regulation, but it could be in the technical justification that accompanies the submission of the regulation. The American delegation reiterated that there is a place for ensuring the performance of trailers is set but not sure this is the place for this commitment. The co-chairs indicated that this is clear but do we have any grounds to explore this in the future given that it is, by definition, its own vehicle already. OICA expressed that trailers have been included in UN GTR No. 20 and it needs to be addressed specifically because of this. Trailers have their own traction battery and putting this in the technical rationale and report makes sense but the sentence in the GTR text is misleading. The American delegation commented that they feel it can be a simple statement indicating that the GTR does not apply to electrified trailers. OICA commented that the whole point of the GTR is to ensure good user experience through UBE so why would we want to exclude trailers when they are looking to achieve a similar objective. The group agreed to shift the discussion on trailers to the technical justification document instead of having text within the scope of the regulation. However, should trailers be considered in the future, the scope would be revised to include a statement on trailers, accordingly.

Definitions

The PTO definition is still open because it applies to the equations that are referenced in the text.

OICA commented that they feel the definition of originally installed battery can be expanded to include shape and configuration details. The American delegation suggested that this is not required because any change would fall under tampering. The Swedish delegation indicated that during market surveillance activity, if it is seen that the battery has been modified it will not be used for official testing. The EC communicated that we need to ensure the vehicle is in the original shape that it was manufactured and given to the customer. Once a conformity test is done, everything needs to be the same to conduct verification testing. The Swedish delegation reiterated, in-service conformity and market surveillance verify the condition of the vehicle during certification and how it was when acquired for testing. If the vehicle has been manipulated, then it cannot be used for conformity testing. The co-chair mentioned that OICA indicated at one time that a vehicle could have configurable batteries installed in a vehicle based on customer needs, like adding batteries to a vehicle after it has been shipped to the customer. If a vehicle is shipped with one battery but later on more are added, then this vehicle could not be tested. The American delegation commented that they are in agreement and want to ensure OICA that a vehicle will not be tested if it has been modified from its original condition that it was delivered to the customer. The drafting coordinator

suggested that everyone is in agreement so perhaps this definition can be removed, and the exclusion criteria can be included in another section like the vehicle survey of Annex 1.

Abbreviations

The drafting coordinator highlighted that depth of discharge (DoD) is mentioned in several parts of the document but there is a disagreement on whether the term should remain or be removed. The Japanese delegation indicated that DoD perhaps should be retained in certain sections given its impact on battery performance measurement. The group agreed that the DoD abbreviation will be removed from sections where it is unnecessary, but the document needs to be checked to ensure consistent usage throughout.

The drafting coordinator mentioned that the State of Charge (SOC) abbreviation appeared inconsistently in the draft text, sometime read from the dashboard, vehicle reporting which causes confusion. There is need for alignment of its use in the text. The group agreed that the document will be updated to ensure that SOC is correctly referenced in the same context throughout the text.

Annex 3 - Method 1a discharge by characteristic regional speeds on test track

OICA expressed that they will discuss and get back to the group at the 75th EVE IWG session regarding the deletion of text in this section. At this time, they have no objections. The Japanese delegation suggested that if OICA would like to keep any text, that supportive data and a concrete text proposal be provided.

The EC commented that they feel this whole section needs to be rewritten as items are still referring to old tables that no longer exist and it has essentially been inherited from UN GTR No 22.

The American delegation commented that in the US, a monitor exists without minimum performance requirements.

Family definitions

The American delegation commented that if we want to allow two different methods for testing, then, (e) test method for vehicle type, should not be included in the definitions. OICA responded that something cannot be allowed because data does not exist. We feel that we should not have different testing methods. The Japanese delegation questioned how during homologation testing the regional authority will know how the manufacturer has certified the vehicle. OICA suggested that this is common to have a technical report on the vehicle and it will be known how it was tested and certified. However, we still need to consider vehicles that were certified with method 1a and others with method 1b and how statistically this would work. The technical services representative agreed with OICA in that the vehicle testing needs to clear and identical to what was used for certification and in-service conformity. If this is done sufficiently in the text then the text in the family criteria can be deleted. The Japanese delegation stated that if something is tested on a chassis dynamometer in China, how will with EU go about testing it. The drafting coordinator deleted the draft text in family definitions Part A, as agreed by the group.

The American delegation stated that the declared maximum charging power in Part B family definitions can be deleted as well because there is a line permitting a technical justification agreement between parties.

The EVE IWG to consider the applicable equations for virtual distance.

Part A: Verification of SOCE monitor - Frequency of verifications

The Japanese delegation indicated that based on the testing region, Part A verification deviation might be different and could cause confusion. The American delegation commented that if we want 5 years or whatever the MPR in Annex 4 will be, then the values of 5 year or 8 year cannot be moved. No strong position about the lowest value used here but maybe it needs to be based off the MPR. OICA suggested that it could be left to the contracting party to determine. The text until 5 or 8 years is meant to be a maximum so if the frequency is left with the authorities, then the frequencies will be defined by the authority and be done until 5 or 8 years old. The EC commented that in the EU this will be linked to the MPR in the text. The Swedish delegation raised that the frequency needs to be defined at the contracting party level. For the authority, we have it in the implementing act so we will need to define it ourselves. The EC agreed that both frequencies need to be defined in the implementing act and the UN Regulation. The AMERICNA delegation indicated that they are okay to refer to the Annex 4 MPRs and dropping the 5 or 8 year requirement since it will need to be defined anyway. The drafting coordinator confirmed that the group agrees to refer to Annex 4 for testing frequency, and has agreement with regional authority, where the regional authority means the larger EU.

The drafting coordinator suggested remove square bracket from the annual sales exception less than 5000 vehicles, as it is a leniency to industry that they requested. The EC indicated that 5000 does seem to be a large value. The American delegation suggested that the value acts as a prompt to divide things up and the contracting authority has the option. The Co-chairs suggested that the value itself does not matter because it appears to be an option that allows the contracting party to begin considering the option. The Japanese delegation stated that this value would not work for them because their market is usually around 1000 so they would potentially exclude everything. The EC suggested terminating the sentence at “mandatory” without an associated sales value, but instead referring to the small volume manufacturer term. OICA suggested that there needs to be consideration for a manufacturer that has a bad annual sales year. The drafting coordinator explained that this will need to be discussed further but can include a reference to previous annual year sales.

Statistical Method for pass/fail decision for a sample of vehicles

OICA suggested having a breakout session on this topic for further considerations and whether it is necessary for the eHDV sector. The EC stated that they will look into this further and get back to the group.

Part B: Verification of Battery Durability - Frequency of verifications

The drafting coordinator indicated that the value 500 has been agreed upon by all. Text will be added to include “if applicable, reflecting the pass-fail criteria incase there is no associated MPR.

Pass/Fail criteria for the battery durability family

OICA indicated that the MPR and declared performance requirement (DPR) have very conservative values, so they are okay with deleting the text but retaining language around monitoring phase. The

American delegation felt that the text in questions serves as another prompt, so it does not really need to be there as it is the contracting party responsibility to implement.

Annex 1 – Vehicle survey

The drafting coordinator noted that there needs to be an action item to look into the exclusion criteria for vehicle testing.

The EC proposed to delete the average fuel consumption metric in the vehicle survey. The Co-chairs expressed that the survey was based on vehicle requirements that may have been carried over accidentally so maybe the fuel consumption is not needed for the eHDV sector. OICA requested that this metric have square brackets, and they will get back to the group on this topic.

Under the question of whether “the vehicle was charged adequately in the last month” the American delegation commented that the use of kilometres as a metric for battery conditions may not be accurate in the eHDV context and perhaps should be changed to a percentage value instead. This was agreed on by the group

Annex 2

OICA requested clarification on whether it matters where the values are read on the vehicle and what the resolution of the data is. The drafting coordinator indicated that a note will be made to consider this further. The American delegation mentioned that typically the standard is defined and the precision determines how you round but in general there is no rounding intermediate values and at the end values are compared to the set standard. OICA suggested perhaps linking to the Society of Automotive Engineers (SAE) requirements.

Annex 3 - Vehicle selection

OICA commented that when selecting a vehicle you do not get to cherry pick which vehicles you choose, it is more of a request and the customer decides whether they want to donate it for testing. So the lowest energy demand is not really an option we can target.

Annex 3 - Measurement requirements

The group agreed that the frequency requirements could be deleted as the measurement and accuracy specifications would be listed in the associated table.

Action items

- OICA to provide confirmation on the deletion of material in Annex 3 subsection 2.1 – Method 1a discharge by characteristic regional speeds on test track.
- EVE IWG members to consider the applicable equations for virtual distance.
- EVE IWG members to consider the exclusion criteria of the vehicle survey in Annex 1.
- OICA to confirm the need for the average fuel consumption metric as part of the vehicle survey.

Decisions

- The language surrounding method in the purpose section of the eHDV GTR draft text was changed to become plural due to several methods existing in the GTR.
- Batteries were made singular in the scope section due to the context and definitions section.
- Text surrounding small volume manufacturers and special purpose vehicles in the scope section has been accepted on the basis that regions will make the determination on their own.
- The group agreed to remove mention of trailers from the scope and shift the text to the technical justification that will accompany the draft eHDV GTR text upon submission. Should trailers be incorporated into the eHDV GTR text in the future, the scope would be revised accordingly.
- Originally installed battery definition was removed and the exclusion criteria will be included in Annex 1 reflecting that a vehicle that is not in its original state cannot be considered for in-service testing for the purposes of this eHDV GTR.
- The DoD abbreviation will be removed from sections where it is unnecessary, while ensuring consistent usage throughout the draft eHDV GTR text.
- The eHDV GTR draft text will be updated to ensure that SOC is correctly referenced in the same context throughout.
- Draft text in family definitions Part A, has been deleted as agreed by the group.
- The declared maximum charging power listed in the Part B family definitions was agreed to be removed because there is a line permitting a technical justification agreement between parties.
- Testing frequency of the SOCE monitor will be in referenced to Annex 4, accompanying an agreement with the regional authority.
- Vehicle sample size for the frequency of verification of battery durability, was agreed as 500.
- Additional text will be added to include “if applicable”, reflecting the pass-fail criteria in case there is no associated MPR.
- Text regarding corrective measures for a failing battery durability family was agreed to be deleted as it serves more as a prompt for authorities.
- Kilometer metrics to condition the battery under Annex 1 were agreed to be changed to a percentage value.
- Frequency requirements in measurement accuracy portion of Annex 3 to be deleted, as the measurement and accuracy specifications are to be listed in the associated table in the section.

8. Roadmap revisited

Documentation

- EVE-74-14e

Context

The leadership team revisited the roadmap presentation, specifically the proposed future meeting dates.

Discussion

No opposition was received to any of the proposed dates of future EVE IWG sessions, spanning to the end of the 2024 calendar year.

Decisions

- Secretariat to move forward with proposed dates of EVE IWG sessions

9. Terms of Reference update

Documentation

- EVE-74-12e
- EVE-74-13e

Context

This item was set aside for a discussion on modifications that have been made to the ToR document and to discuss other items to be added to future phases of UN GTR No 21, 22 and eHDV.

Discussion

The co-chairs suggested that because many other countries are developing regulations utilizing UN GTR No.22 perhaps instead of listing them it can just become a generic statement of implementing lessons learned to the GTR in the third phase.

OICA suggested changing the new item concerning motorcycle battery range to be useable battery energy, instead.

Action items

- Secretariat to update the ToR and post the updated version to the wiki page.

10. Closing remarks

Context

This item was set with the objective of closing the meeting and looking forward to the next, addressing logistics and miscellaneous topics.

Discussion

The co-chairs thanked the Japanese delegation for hosting a lovely event and reminded everyone of the reception that will be taking place following the in-person event.