

Report of the 70th session
Electric Vehicles and the Environment Informal Working Group (EVE IWG)

Location: Virtual - Webex

Date: May 07 – 08, 2024

Time: 05:30 – 08:00 EDT

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 – May 07, 2024, 05:30 EDT

1. Introduction, review of agenda, and meeting recap

Documentation

- EVE-69-24e
- EVE-70-01e

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 – May 7, 2024, 05:30 EDT

- Introduction, review of agenda, meeting recap
- HDV GTR – Review of open and agreed items
- HDV GTR – Proposal on the use of UBC
- HDV GTR – Test procedure steps and boundary conditions
 - o Temperature
 - o Road grading/slope

Day 2 – May 8, 2024, 05:30 EDT

- Introduction, review of agenda
- HDV GTR – Review of open items
- HDV GTR – Test procedure steps and boundary conditions
 - o Break-off criterion
 - o Alternative method
- HDV GTR – Review of draft text and follow up topics
- Closing remarks

The EVE IWG secretary briefly reviewed the *Report of the 69th EVE IWG session*, highlighting action items and key decisions from the discussions, held in-person, on April 16-17, 2024.

Discussion

The European Commission (EC) mentioned that they may have some feedback to provide on the meeting report and will reach out directly to the secretariat for modification, if necessary.

Action Items

Decisions

2. HDV GTR – Review of open and agreed items

Documentation

- EVE-70-02e

Context

The drafting coordinator presented a document outlining the decisions made from the previous EVE IWG session in addition to further information and updates regarding various outstanding items in the electrified heavy-duty vehicle (eHDV) global technical regulation (GTR) draft text.

Discussion

The drafting coordinator noted that there are two versions of the draft eHDV GTR posted on the wiki page. The first incorporates the latest updates while the other incorporates the comments received to date. The comments have not yet been fully incorporated, but it is a work in progress.

Action items

- Drafting coordinator to continue to incorporate comments received into the eHDV GTR draft text.

Decisions

3. HDV GTR – Comments on open items

Documentation

- EVE-70-04e

Context

The Organisation Internationale des Constructeurs d'Automobiles (OICA) presented their position and comments regarding the outstanding topics, including temperature, road grading, break-off criterion and alternative test methods.

In addition, OICA put forward some questions regarding the outcomes of the previous EVE IWG session and some clarification requests on several topics, including:

- Chinese statistics on the battery swapping proposal,
- Alternative methods,
- Pilot testing phase,
- Transport Technology and Mobility Assessment (TEMA) model,
- Performance based models, and
- Family definitions.

Discussion

The drafting coordinator explained that the battery consumption values used in the TEMA model come from Vector. With regard to the battery sizes, we noticed that they are rather large for long haul. We had tried to take data and conduct simulations, comparing literature and market data on eHDVs, all of which can be found online. The International Council on Clean Transportation (ICCT) future forecast data was not used, but the first column of the data was used, as OICA indicated in their presentation. We found that most of the categories performed better except for the long-haul trucks. Through the simulations the worst-case scenario was used with increased workloads and several other worst-case factors. We can come back with more of the assumptions made in the TEMA model to clarify the analysis.

The co-chairs requested clarification on the alternative methods and whether it was the intention to incorporate this into the July 22, 2024, deadline for a working draft submission. The drafting coordinator clarified that it was not the intention to include the alternative method in the initial working draft submission; however, because the proposal was received from the Chinese delegation, the text has been included into the working draft for now. The Japanese delegation communicated that it was their understand that the alternative method will not be in the first phase of the eHDV GTR working draft and so this is a lower priority topic. The Japanese delegation also does not feel that full cycle equivalency values are an appropriate metric for the minimum performance requirements (MPR).

The co-chairs followed up with an inquiry into the proposed pilot testing phase and how this would be accomplished. Generally, it would be difficult to travel on short notice so would OICA be able to forward a proposal for testing in advance of June so that approvals may be sought. OICA explained that they would need to go about booking testing facilities now for the pilot tests, as they have limited availability and will work within OICA to put forward some proposed dates and locations.

OICA stated that they are focusing on energy throughput as a metric at this time; however, the presentation from China at the 69th EVE IWG session highlighted the importance of full cycle equivalencies. OICA feels that if going with a mileage metric, this may underestimate the power take-off (PTO) demand based on the equation that is currently in the draft text. There is no differentiation between mileage and age of the battery. We appreciate China's approach and they seem to have taken this throughput metric and suggested it as a cycle metric.

Action items

- Drafting coordinator to offer further clarification on the assumptions made within the TEMA model.
- OICA to offer further details on pilot phase testing logistics.

Decisions

4. HDV GTR – Test procedure steps and boundary conditions

Documentation

- EVE-70-02e
- EVE-70-04e

Context

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

Discussion

Temperature

The Japanese delegation expressed that they do not understand OICA's messaging preconditioning and soak temperatures. OICA stated that the current 25-degree Celsius condition is achievable in a test room but outside of a test room it is a different scenario, such as when a test room is not applicable. We are looking to have prewarming capabilities outside a lab setting with an external heating device to raise the temperature of the battery to the appropriate conditions. Japan indicated that this seems to be a strange request since some vehicles have internal battery management systems that moderate temperature. Japan suggested simply eliminating the second point on test room availability. OICA expressed that this is not an option because it is required, how else will a battery be heated. Japan explained that in the consumer market a customer cannot have an external heater for the vehicle so why would this be included as part of a test. The EC asked how the effects of external heating on the battery are controlled. There are many options, but the point is that there needs to be normalized conditions and this becomes difficult to define with external heating devices. OICA stated that battery temperature and room temperature need to be distinguished. Our objective is to start with a uniform battery temperature. Many manufacturers have active thermal management systems to heat the battery to operating temperature, so in this case ambient temperatures are not that important. Warming a battery takes a lot of energy from the battery with

associated losses and so we are proposing heating the batteries with the use of a charger attached, ensuring consistency and not discriminating between battery temperature management systems. Japan mentioned that if measuring usable battery energy (UBE) discharged, there is no need to worry about battery losses. Measuring usable battery capacity (UBC) during charging as a metric for battery deterioration may cause problems. Overall, the contracting parties prefer UBE and a discharging event anyway. The drafting coordinator clarified that what is being discussed is the beginning portion of the test and that external heating is referring to an external heater, but a charger can assist in maintaining the charge of the battery. So, a charger may be used in cooperation with any onboard battery heating of the vehicle but no external heaters. OICA stated that after this clarification they believe they are aligned with the draft text proposal.

OICA expressed that there are many factors at play during the test procedure and how do we ensure the temperature remains consistent. If a driver has a break and is testing in cold temperatures, how do you maintain battery temperature in these northern climates during eight hours of testing. The Japanese delegation mentioned that this is why the contracting parties have been asking OICA to provide justifications. Light-duty vehicles (LDV) have well defined test procedures but compared to eHDV, the conditions are unique. If the unique conditions may generate more variability, we are happy to consider this variability inside of the five percent tolerance. A customer that uses their vehicle in the real world will have variability and we should accept the possible variability. The American delegation requested clarification on the length of driver breaks. The drafting coordinator clarified that the driver breaks are 10-minute intervals to not impact the battery temperature during the break. The Japanese reiterated their request for OICA to offer a concrete proposal on the temperature and whether the tolerance range needs to be expanded or not.

An industry representative raised a question regarding how OICA plans to precondition (discharge) in a test room without a chassis dynamometer, as this is usually done through driving. OICA stated that this is another one of their questions, as preconditioning doesn't seem possible in a test room without a dynamometer. The Japanese delegation suggested eliminating the preconditioning component if it is not possible for the manufacturers. The drafting coordinator clarified that the preconditioning for the test can be done in any manner prior to beginning the test. The industry representative expressed that this seemed unclear but they feel they now understood the procedure. The drafting coordinator suggested leaving this temperature topic open for the next meeting to allow everyone to ensure everyone has had a chance to review the proposal.

Road grading / slope

The American delegation stated that for the testing you can plan your route so conditions surrounding the road conditions are more easily controlled than other factors such as traffic or temperatures. If the beginning of the test is left wide open, then the grading could be left for the last 10 % of the state of charge. The verification of metrics can be done for the entire test or the last portion. It seems like the last portion of the test is the most important, so we do not want to force the test to end early. OICA suggested that the last 10 % does not give the full picture of the testing. The whole measurement needs to be checked throughout the test. The drafting coordinator stated that the proposal to apply the same conditions as the real driving emissions (RDE) requirements on

all the routes and tests seems like a good starting point, with the cumulative elevation gain being less than 1,200 meters / 100 kilometers.

Action items

- EVE IWG members to consider the temperature testing conditions and current text for decision at 71st EVE IWG session.
- EVE IWG members to consider the proposed text with regard to acceleration and road grading conditions for decision at the 71st EVE IWG session.

Decisions

Day 2 – May 08, 2024, 05:30 EDT

1. Introduction, review of agenda

Documentation

- EVE-70-01e

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.

Discussion

Action items

Decisions

2. HDV GTR – Test procedure steps and boundary conditions

Documentation

- EVE-70-02e
- EVE-70-04e

Context

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

Discussion

Break-off criterion

The EC commented that if driving is occurring at very low energy consumption, for example when driving slowly during a test, it could impact the break-off criterion of the test so would this still be an appropriate metric to use. The drafting coordinator indicated that this item is still open and so further consideration is possible. The EC mentioned that the cumulative UBE is a little different but ultimately a similar metric because the whole concept is the break-off. We want to identify the moment when electric propulsion is no longer used due to no more usable energy within the battery. If there is a lot of capacity installed, then it would achieve the limit earlier than if it had a capacity which was a lot lower. The EC is unsure whether this is what the group is looking to achieve.

The Drafting coordinator stated that there is a need to know the consumption over a distance and not always knowing the road conditions makes this challenging. This will need to be thought through further. The co-chairs expressed a similar concern as the EC, supporting the idea that due to the power element of the first proposal, the dependence on the combustion engine running in a hybrid electric vehicle is due to enough power being available at a specific time, so there is some uncertainty whether this is an appropriate metric. The American delegation expressed that if under controlled conditions, then the power demand is consistent and the metric can be set based on energy coming from the battery until the grade can no longer be maintained, resulting in the metrics falling apart due to the heavy reliance on road load power demand. Other influences could be the weather conditions. In the United States there is a reference to Society of Automotive Engineers J2711, which has also been included in the heavy-duty phase three rulemaking. Overall, there is not much experience with these types of systems because they are not widely sold in the United States. The EC suggested a test associating mechanical energy required and relating the electrical energy of the system. The American delegation suggested continuing the test and using post processing to determine at which exact point the conditions have not been met and theoretically triggered the break-off.

The drafting coordinator communicated that they would think about experiences with light-duty vehicles. The Japanese delegation commented that they do not feel there is a perfect solution even through LDV testing, variability is required. If we are using external equipment to determine break-off criterion how do we verify the break-off point is accurate. OICA stated that for LDV this is criteria you need to show, so the authority could ask for how the algorithms work or any other related vehicle data. The vehicle will stop whenever it feels it needs to stop and there are many influences on the break-off criterion. During operation the vehicle will give warnings on reduced power to the operator and perhaps the values of when the vehicle will begin to shutdown can be set by the manufacturers for their specific systems. The Japanese delegation requesting clarification of whether OICA was suggesting using onboard data to evaluate the criterion. Onboard data is problematic for the authority because it is difficult to confirm if the values are correct. The EC stated that there are differences between LDV and eHDV in that the break-off criterion is not perfectly defined for LDV, leaving the implementation to the individual manufacturers. Overall, it does not really matter because what is being evaluated is the battery capacity and UBE. For LDV we use the exact same cycle but for eHDV different cycles are used and there are influences from battery aging and cycle choices. OICA highlighted that the in-service test is only to verify the monitors. The EC communicated that they agree but if the sensors are overestimating the UBE, then the result will be incorrect due to the dependence on the sensors. For hybrids there is an additional element of uncertainty because through a change in driving behaviour there is a way to change the break-off result. The drafting coordinator suggested discussing the break-off criterion internally and come to the next EVE IWG session with proposals.

An industry representative commented that there needs to be an equivalence between the four second rule and stationary driving. If the authority wanted to perform a test with the four second rule and another authority wants to deviate and choose a stationary approach, there needs to be a declaration from the manufacturer that the vehicle warning is equivalent. When it comes to the warning indicator, there are several levels but there needs to be assurance of the correct warning

level by the manufacturers. The drafting coordinator confirmed that a sentence will be added to the draft text to include an equivalency between four seconds and stationary operation for safety reasons.

Steps of test procedure

The drafting coordinator highlighted the steps of the test procedure and confirmed with agreement from EVE IWG members that the fourth bullet on current rate range, would be removed

The co-chairs mentioned that the requirement to have the same test for certification and in-service conformity (ISC) was identified by OICA and that continuity should be maintained here. OICA expressed that because method 1a is a closed track and 1b is on road in traffic, there will always be different boundary conditions and metrics. The American delegation requested information confirming a bias between method 1a and 1b testing. There is likely not a bias but there will certainly be greater variability. If using method 1b for certification testing, then maybe the same procedure needs to be used for ISC. Tolerances are likely needed for the testing and greater on-road test may need to be accepted. The co-chairs stated that this is becoming a matter of managing variability between testing and ideally method 1a and 1b have the same conditions but in the real world they will not be, due to various considerations and safety concerns. OICA commented that they agreed with the American delegation with method 1a having more control while method 1b will be susceptible to breaks, traffic, and other uncertainties. In Europe industry will have a declaration for the beginning of life and then in-service testing will follow. If testing is required for the beginning of life, then the in-service testing should match. The Japanese delegation questioned why OICA wants to have the requirement for the same testing procedure when the boundary conditions could be completely different with such large variability. OICA clarified that test methods need to be the same and the boundary conditions need to be as similar as possible. The EC mentioned that normally at type approval testing needs to be done with a witness official but because of the new declaration procedure, this is no longer required. In addition, we do not feel that the draft text needs to differentiate between UBE certified and UBE declared. The drafting coordinator suggested revisiting the requirement for identical testing for certification and ISC, as it may add additional burdens. The co-chairs reiterated that overall, there is concern regarding variability between test methods and that OICA feels there needs to be consistency between certification and ICS testing while the American delegation is communicating that the variability needs to be recognized through some metric such as tolerances on the testing procedures. There does not seem to be any clear direction at this time but there are certainly some ideas here.

Test repetitions

Japan requested clarification from OICA on why they are proposing test repetitions for test method 2. OICA clarified that as an internal discussion with manufacturers and due to some uncertainties it would be best to keep this as an option in method 2 for now. The American delegation stated that test method 2 is a more repeatable process than the other test methods so if it is removed for method 1 it should be removed for method 2 as well. OICA stated that they are flexible on this request, as they do not have a strong opinion. The drafting coordinator agreed that the test procedure of method 2 would be more stable and having repetitions will lead to the requirement for

determining how to produce a result, whether it be an average, highest or lowest value, among other considerations. OICA expressed they would verify internally and come back at the next EVE IWG session with a decision.

Family definitions

The Japanese delegation questioned the Part A and B family definitions, requesting clarification on why Part A e) refers to a highest normal power, perhaps this can be removed. An industry representative commented that it was stated “normal” because this highest normal charging power in the test procedure and it has an influence on the battery condition and results in extra test equipment burden if we remove the term “normal” for testing.

The Japanese delegation suggested revising the battery characteristics and descriptors outlined in Part A f).

The Japanese delegation raised that for Part B h) there is a declaration of highest charging power and questioned why this does not exist for LDVs. The drafting coordinators suggested that perhaps this item could be reopened as part of United Nations (UN) GTR 22.

Alternative method

OICA expressed that the focus should be on method 1 and 2 and leaving chassis dynamometer testing for phase 2 of the regulation. The drafting coordinator highlighted that the question of trailers and battery replacement can also be moved to the second phase. The EC asked whether trailers are even considered within the EVE IWG mandate. The American delegation commented that they are having issue regulating trailers at this time so perhaps the discussion surrounding trailers requires further discussion. The EC commission agreed that trailer are a lower priority and that they are not covered at this time under the new Euro 7 regulations. The drafting coordinator suggested that contracting parties discuss internally to determine whether they are content with passing these items to phase 2 of the eHDV regulation development.

Action items

- EVE IWG members to discuss break-off criterion internally and bring proposals to the next EVE IWG session
- Drafting coordinator to add sentence to eHDV GTR draft text regarding four second rule and stationary equivalency.
- EVE IWG to consider the requirement for a declaration of highest charging power for the Part B family definitions.
- OICA to confirm whether test repetitions for test method 2 are necessary or not at the 71st EVE IWG session.

- Contracting parties to confirm positions on the delay of items to the second phase of the eHDV GTR development, including trailers, alternative testing methods, and battery replacement provisions.

Decisions

- The range of c-rate will be removed from the steps of the test procedure but remain open for test method 2 at this time.

3. HDV GTR – Discussion on MPR and metrics

Documentation

Context

This item was set with the objective of continuing the discussion on minimum performance requirements and metrics within the eHDV GTR.

This item was excluded due to time constraints.

Discussion

Action items

Decisions

4. HDV GTR – Review of draft text and follow up topics

Documentation

- EVE-70-03e

Context

This item was set with the objective of reviewing the draft text and setting topics for the 71st EVE IWG session.

This item was excluded due to time constraints.

Discussion

Action items

Decisions

5. Closing remarks

Documentation

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 secretariat brought attention to the new informal task force on electric mobility (e-mobility) which was approved by the Working Party on Transport Trends and Economics (WP.5) at its 36th session in September 4-6, 2023. The secretariat explained that the first session of this informal task force will occur at 13:00 central European time on May 29, 2024, and encouraged EVE IWG members to participate if this topic was of interest to them. Further to this information the secretariat indicated that they would be sending out an email with further details on this new informal task force.

The secretariat suggested that due to this new e-mobility informal task force occurring on the same day as the EVE session on May 29, 2024, perhaps the EVE IWG session could be shifted to May 27-28, 2024, or shortened on May 29, 2024 to enable participation in the e-mobility informal task force. The American delegation indicated that they have a national holiday on May 27, 2024. OICA indicated that Germany has a national holiday on May 30, 2024. The co-chairs suggested a shortened EVE IWG session on May 29, 2024, to accommodate the e-mobility informal task force session.

Action items

- Secretariat to send out an email with further details on the e-mobility informal task force.
- Secretariat to modify 71st EVE IWG session to have a shortened session on May 29, 2024.

Decisions

- 71st EVE IWG session to occur May 28-29, 2024, with a shortened session on May 29, 2024, to enable participation in the 1st session of the informal task force on e-mobility.