Submitted by the EVE Secretariat

Informal Document EVE-61-27e
61st EVE IWG session: April 25 – 26, 2023

Report of the 61st Session
Electric Vehicles and the Environment Informal Working Group (EVE IWG)

Location:	Hybrid – Ann Arbor, Michigan, United States of America
Date:	April 25 – 26, 2023
Time:	09:30 – 17:30 EDT
Chairs:	Mr. Michael Olechiw (United States of America) Ms. Panagiota Dilara (European Commission)
Vice-Chairs:	Ms. Chen Chunmei (China) Mr. Hisakazu Suzuki (Japan)
Secretariat:	Mr. Leeson Guay (Canada)

Day 1 – April 25, 2023, 09:30 EDT

1. Introduction, review of agenda, and meeting recap

Documentation

- EVE-60-11e
- EVE-61-02e

Context

The EVE IWG co-chairs addressed members and welcomed everyone to the hybrid meeting, while outlining the in-person logistics including, security procedures, dinner plans and microphone testing.

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 – April 25, 2023, 09:30 EDT

- Introduction, review of agenda, meeting recap
- Roadmap discussion
- Overview of U.S.A. notice of proposed rulemaking – 2027+ light- and medium-duty vehicles
- UN GTR 21 – Japan comments on family definition
- UN GTR 21 – OICA measurement updates proposal
- SAE progress update – SAE J2908 Vehicle System Power Rating

- UN GTR 21 – HDV discussion
- UN GTR 22 – U.S.A. presentation on adoption challenges
- Warranty analysis – Commercial electric vehicle battery warranty analysis
- UN GTR 22 – OICA comments on MPR for Category-2 vehicles
- UN GTR 22 – ACEA comments on V2X definition
- UN GTR 22 – Japan proposals
- UN GTR 22 – Discussion on Annex 2
- UN GTR 22 – Drafting text
- SAE progress update - J1979DA and J1979-3 required data, standardization, ZEV standard, virtual odometer proposal
- Future research - Korea planned research on the system power of fuel cell electric vehicles
- Prioritization – Further developments for GTR 22 and 21

Day 2 – April 26, 2023, 09:30 EDT

- Introduction and review of agenda
- Overview of U.S.A. notice of proposed rulemaking – HDV Phase 3
- HDV GTR – Chinese presentation on HDV UBE vehicle testing.
- HDV GTR – Japanese presentation on HDV UBE measurement
- HDV GTR – OICA presentation on HDV testing procedures
- HDV GTR – EC presentation on draft test procedure and V2X
- HDV GTR – Japan comments
- HDV GTR – OICA input
- HDV GTR – V2X considerations
- Action items review
- Planning for future meetings

The EVE IWG secretary briefly reviewed the meeting minutes and outlined the action items from the 60th EVE IWG session, which was held virtually on March 24, 2023 and March 27, 2023.

Discussion

The European Commission (EC) expressed that they will send the secretariat comments for consideration, regarding the EVE IWG 60th meeting report.

Action Items

- EC to send comments on the 60th EVE IWG meeting report to the secretariat for consideration.

Decisions

2. Roadmap discussion

Documentation

Context

The EVE IWG co-chairs outlined the current state of EVE IWG deliverables, including Global Technical Regulation (GTR) 21, 22 as well as the new GTR on in-vehicle battery performance and durability of electrified heavy-duty vehicles (HDV).

Discussion

The co-chairs conveyed that for GTR 21 and 22, the intention is to submit amendments as formal working documents to the January 2024 session of the Working Party on Pollution and Energy (GRPE).

The co-chairs requested clarification on the submission deadline for formal working documents to the GRPE for January 2024. Mr. Francois Cuenot, Secretary of the Working Party on Pollution and Energy, indicated that the submission deadline for working documents will be October 17, 2023, for the January 2024 GRPE session.

The Japanese delegation requested clarification on whether there is intent to submit any informal documents to GRPE in June 2023. The co-chairs clarified that there is no intent to submit informal documents to GRPE in June as the GTR amendments and new HDV GTR may not be fully developed by that time. Moreover, the co-chairs also clarified that the battery performance and durability GTR on electrified heavy-duty vehicles (HDV) requires an informal document submission first, for feedback from the GRPE prior to the submission of a formal regulation as a working document to the following GRPE session for vote in June 2024.

The co-chairs proposed some future meeting dates throughout the summer and fall to meet the upcoming deliverable deadlines. The co-chairs asked that the secretariat develop a document outlining the deliverables and meeting proposals for review at the end of day 2 of the 61st EVE IWG session. The referenced document is EVE-61-26e.

Action items

- EVE IWG members to provide any comment on GTR 22 by June 30, 2023.
- Secretariat to develop a formal roadmap document to outline at the end of day 2 of the 61st EVE IWG meeting.

Decisions

- Comments on GTR 22 will be accepted until June 30, 2023.

3. Overview of U.S.A. notice of proposed rulemaking – 2027+ light- and medium-duty vehicles

Documentation

- EVE-61-03e

Context

The American delegation provided a presentation on the United Stated of America (U.S.A.) multipollutant standards notice of proposed rulemaking (NPRM) for light- and medium-duty vehicles for the 2027 and later model years. The presentation covered the timing of the rulemaking, proposed standards for greenhouse gas (GHG) and criteria pollutants, zero emission vehicle market penetration estimates, a cost-benefit analysis overview as well as projected emission impacts, as a result of the rulemaking.

The presentation explicitly stated that plug-in hybrid electric vehicles were not included in the proposal but will be included in the final rulemaking. It was also highlighted that this proposed rulemaking covers vehicles up to 1-ton trucks.

Discussion

Individuals from the American delegation asked if other topics may be discussed that fall outside of the docket, in addition to clarifying the length of time for the comment period on this NPRM. The American delegation reiterated that the comment period will last 60 days from publication in the Federal Registrar and that discussions on items that fall outside of the proposed docket may be discussed but will need to be documented and addressed separately.

The Alliance for Automotive Innovation request clarification on the warranty provisions and requirements. The American delegation clarified that the threshold for warranty is not defined and that there is no basis for failing the warranty provisions; however, there is a requirement to meet the durability requirements. The Alliance for Automotive Innovation requested further offline discussions.

The Korean delegation requested clarification on whether powertrain and power electronics were considered as part of the rulemaking. The American delegation confirmed that yes, these items were addressed in the rulemaking.

The Organisation Internationale des Constructeurs d'Automobiles (OICA) asked if the 5-year minimum performance requirement (MPR) for battery durability and the 8-year requirement was used. The American delegation stated that yes both the 5-year and the 8-year state of certified energy (SOCE) requirements were used.

OICA followed up asking how the regulations are differentiated between the United States Environmental Protection Agency (U.S. EPA) and the California Air Resources Board (CARB). The American delegation stated that there have not yet been any discussions between the U.S. EPA and CARB regarding the harmonization of regulations, such that if a manufacturer meets the requirements of one of these jurisdictions, it could preclude them from the requirement of meeting the other.

A representative from the industry commented that it would be advantageous to have standardization with SAE and CARB. The American delegation highlighted that these are the types of comments they are seeking in their NPRM comment period and encouraged everyone to please provide comments for consideration in the regulatory process.

Action Items

- Parties are encouraged to provide formal comments through the federal consultation system on the United Stated of America (U.S.A.) multipollutant standards notice of proposed rulemaking (NPRM) for light- and medium-duty vehicles for the 2027 and later model years.

Decisions

4. UN GTR 21 – Japan comments on family definition

Documentation

- EVE-61-04e

Context

The Japanese delegation provided a presentation concerning a counterproposal regarding the GTR 21 family definition. The Japanese delegation indicated that they accept the new family definition (e) with some minor modifications, which include:

- Removal of "number of cells" since it is covered by battery cell voltage in definition (d) and nominal voltage of the battery in definition (f).
- Removal of "etc." since it may lead to unnecessary confusion and several different interpretations.

The resulting text would read,

"*(e) Type of battery pack, including battery configuration (mode of connection);*"

Discussion

The American delegation raised the point of whether the number of cells and voltage, alone, is enough to define mode of connection to the battery. Cells and voltage do not define how the battery may be connected. The American delegation counter proposed with text designating battery pack configuration, number of cells in series and mode of connection. The Japanese delegation was agreeable with this proposal.

A representative from industry mentioned that there are already vehicles in production that are capable of dynamically setting system voltage in the powertrain. In the future, there could also be dynamic configurations for many of the specifications and characteristics of the vehicle, such that characteristics can be changed during operation. Therefore, industry suggested that it may not be appropriate to put these constraints on vehicle manufacturers.

OICA agreed with the Japanese proposal and raised that this GTR could increase testing burden significantly.

Action Items

- The GTR 21 drafting coordinator to incorporate the Japanese proposal into the GTR 21 text.

Decisions

- GTR 21, section 7, Definitions of families, paragraph (e) to read as follows, *"Type of battery pack, including battery configuration (number of cells in series, mode of connection);"*

5. UN GTR 21 – OICA measurement updates proposal

Documentation

- EVE-60-09e
- EVE-61-05e

Context

OICA presented a proposal on GTR 21 regarding the required intake manifold pressure measured using an external measuring instrument. OICA demonstrated that an instrument accuracy of +/- 50 Pa is not feasible for on-board engine control unit (ECU) sensors. OICA also indicated that both United Nations – Regulation (UN-R) 85 and GTR 21 results are within +/- 2 % of variation between the external measuring instrument and the ECU value.

OICA proposed that the required accuracy of +/- 50 Pa for the intake manifold pressure does not need to be met if the variation is within +/- 2 % by comparing the external sensor with the ECU values. The same on-board sensor system can be used for comparison of variation between GTR 21 and UN-R85, using values that meet the above requirements.

Discussion

The American delegation requested clarification on whether this proposal is a recommendation for incorporation into GTR 21. OICA clarified that it still needs to be discussed but that a +/- deviation could be modified in the GTR text. The American delegation stated that if the +/- 2 % deviation is met and a precedent exists for this, then this proposal is acceptable. The EC and OICA both referenced existing precedents in UN-R85. The American delegation indicated that it appears the requirements may be too strict for current vehicle capabilities and that including this proposal as an optional alternative in GTR 21 would make sense. The drafting coordinator agreed to draft GTR 21 text, aligning with the OICA proposal, for discussion at the next EVE IWG session.

The American delegation request further clarification on the degree of change in the results that would occur from having a 50 Pa as well as a +/- 2 % optional alternative. The concern expressed was that it could bias a manufacturer to use one method over the other. Other points of concern raised include regulatory authorities needing to be able to access and confirm the vehicle values at any time as well as power readings and other results being impacted due to the use of the +/- 2 % deviation. OICA pointed out that in a previous presentation from the Chinese delegation (EVE-60-09e), it was shown that should the inlet manifold pressure exceed 2 % variation, the power discrepancy will be less. The American delegation reiterated that they would like to see these test

procedure 1 (TP1) and TP2 results continue to be shown as evidence and that the physical effects of this change needs to be substantiated with more testing data.

Action Items

- The GTR 21 drafting coordinator to develop draft text, aligning with the OICA proposal, for discussion at the next EVE IWG session.

Decisions

6. SAE progress update – SAE J2908 Vehicle System Power Rating

Documentation

- EVE-61-06e

Context

The American delegation had a representative from Argonne National Laboratory (ANL) present on the Society of Automotive Engineers (SAE) standard J2908, titled, *Vehicle Power and Rated System Power Test for Electrified Powertrains*, which provides test methods and determination options for evaluating the maximum wheel power and rated system power of vehicles with electrified powertrains. The presentation consisted of the history of the standards and how they came to be, in addition to some of the realizations and work done to get the regulation to the state it is at present day. The American delegation stepped through and highlighted various approaches and methods used in the standards and explained why these were implemented.

Discussion

The American delegation highlighted that within the powertrain there should exist a reference point to go about implementing both TP1 and TP2. Currently, in GTR 21 there does not exist a specific “K” value and manufacturers are relied upon to provide this value. Overall, it appears that the SAE is coming to the same realization as the EVE IWG. The presenter from ANL stated that they thought about implementing a set factor but have since backed down from that suggestion.

The American delegation also asked whether any bench testing was done on a four-wheel hub dynamometer. The ANL representative mentioned that they did use four-wheel hub dynamometers and that they should be used wherever possible over a chassis dynamometer.

A representative from industry asked whether there are any considerations for incorporating J2908 into the EPA requirements. The American delegation responded that there are currently not any plans to do so; however, they would encourage comments to be submitted to them through the NPRM consultation process and they will take it into consideration for the final rule.

Action Items

- Parties are encouraged to provide formal comments through the federal consultation system on the United Stated of America (U.S.A.) multipollutant standards notice of proposed rulemaking (NPRM) for light- and medium-duty vehicles for the 2027 and later model years.

Decisions

7. UN GTR 21 – HDV discussion

Documentation

Context

The purpose of this discussion was to determine to what extent GTR 21 should be amended to include text surrounding electrified heavy-duty vehicles (HDV) and what the motivation might be.

Discussion

The American delegation stated that there needs to be an understanding regarding the HDV GTR. The American delegation also highlighted that when the GTR 21 was initially developed, the intent was to classify light-duty vehicles (LDV) and has transitioned into an advertising standard for vehicle power, among other things. If GTR 21 is going to be used for determining HDV power, there needs to be a specific objective so that the outcome is different than what it was for LDVs.

The EC communicated that there was a suggestion put forward to have a GTR for HDV power determination as well, but this will require a dedicated dynamometer, which in itself is not straight forward. Beyond this, there will also be a need to instrument vehicles, which could pose a large challenge due to many different configurations because of the nature of HDV in comparison to LDV. For the two test procedures, we need to really think about how the HDVs can be instrumented effectively. The EC emphasized that there needs to be a review for feasibility as well as a specific need.

OICA stated that there needs to be a clear direction on why power determination is required for HDVs. If it is simply because LDV has a GTR, then this argument is likely not strong enough. OICA expressed that the EVE IWG needs to develop a concrete objective as to why a GTR is required for power determination of HDVs so that an implementation method can be developed. OICA also highlighted that the variance that exists for HDV is much greater than LDV and there does not appear to be a need for a HDV power determination GTR at this time. OICA recalled that in UN-R85 there are set provisions for power determination in trucks, which includes electric components.

The Japanese delegation stated that they do not have any comments at this time, as there has not yet been a discussion on this topic. The Japanese delegation offered to consider this and discuss amongst themselves and provide a stance at the next EVE IWG session.

The co-chairs indicated that there appears to be some confusion around this topic and that proposal may help to clarify the situation. The co-chairs requested that the EC prepare a presentation outlining the motivation behind a power determination GTR for HDVs for the next EVE IWG session.

Action Items

- The Japanese delegation will discuss the necessity of power determination for HDVs and provide a stance at the next EVE IWG session.

- The EC to prepare a presentation outlining the motivation behind a power determination GTR for HDVs

Decisions

8. UN GTR 22 – U.S.A. presentation on adoption challenges

Documentation

- EVE-61-07e

Context

The American delegation gave a presentation on the experience of integrating GTR 22 into the U.S EPA light- and medium-duty multi-pollutant NPRM. The presentation outlined that the April 14, 2022 version of GTR 22 was incorporated by reference with slight modifications, including naming conventions and provisions around state of certified range (SOCR) monitors and schedules for Type A testing, among others. The affected sections of the regulatory text were provided and the proposal elements were reviewed.

Discussion

The American delegation highlighted the definitions of battery electric vehicles (BEV) as well as plug-in electric vehicles (PEV), as they are different depending on jurisdiction.

The Korean delegation request clarification on the requirements for warranty and durability of the battery. The American delegation clarified that vehicles will not be recalled because the warranty provision is not met; however, the battery and vehicle components are required to operate for 8 years or 80,000 miles. This is separate from the MPRs, which have provisions for 5 years and 8 years. The warranty criteria and the MPR are not linked. If the MPR is not met, the regulation does not require a new battery to be provided to the customer and replaced.

OICA asked, should a durability family fall out of compliance, are all credits lost and is there any option to bring the family back into compliance and regain those lost credits. The American delegation indicated that this is a point that needs to be clarified but they feel this resolution should exist for manufacturers.

OICA requested clarification on whether the U.S. EPA multi-cycle test is the only option for determining the usable battery energy (UBE) of a vehicle or if a single cycle test may also be used. The American delegation stated that they do not think it is exclusively a multi-cycle test but will need to confirm with the drafting team.

The United Kingdom (UK) delegation sought confirmation on why SOCE monitors are not present for Class 2b and 3 vehicles. The American delegation outlined that those values have not been specified because the data is not yet sufficiently available to make a specific value determination.

OICA mentioned that discussions are still on-going regarding GTR 22 Annex 2 values and was wondering if these discussions were going to be taken into consideration. The American delegation

confirmed that necessary adjustments will be made, stemming from current discussions on GTR 22 Annex 2 values.

Action Items

Decisions

9. Warranty analysis – Commercial electric vehicle battery warranty analysis

Documentation

- EVE-61-08e

Context

The UK delegation presented a warranty analysis of commercial vehicles spanning light duty, N2 category and heavy duty. The warranty analysis consisted of 66 vehicle models that were eligible for grants under the electric vehicle subsidies offered by the UK, which require a battery degradation warranty.

It was found that,

- All vehicles used a mileage or vehicle age metric in their offered warranty;
- Most LDV warranties were similar to passenger cars and matched the 70 % MPR from GTR 22;
- HDVs used different warranty metrics like charge cycles or total energy usage;
- More data is required and results should not be taken in isolation in setting future MPRs.

Discussion

OICA asked whether the usage of N1 category vehicles was considered in the analysis, because it appears that the vehicles analyzed follow a similar usage pattern to passenger vehicles. The UK indicated that they have not looked at the usage patterns of the individual vehicles as the information was submitted anonymously, so the actual usage pattern is not known.

The American delegation highlighted that the warranty appears to be based on distance and time travelled and not virtual mileage (V2X) accumulation. The UK delegation indicated that this is correct and due to the way data was submitted, not enough information is known to determine whether the vehicles possessed V2X loads like refrigeration units.

The co-chairs mentioned that when the EVE IWG initially set the MPR for GTR 22, the analysis included modelling work, warranty data as well as other publicly available data. The UK indicated that at this time, there is limited value in conducting warranty analysis and this type of warranty analysis will need to be performed again in the coming years as more offerings become available. The co-chairs communicated that there will be several delivery vehicles coming out and the EVE IWG would be interested in hearing from vehicle manufacturer representatives on their delivery style vehicles, understanding that limited data is available at this time.

OICA pointed out that the UK subsidy for which this study was based required manufacturers to offer a warranty of at least 70 % battery degradation at 5 years. OICA expressed concern that vehicles not

meeting this required threshold have not been included in the warranty analysis. The UK delegation thanked OICA for this observation and stated that they would verify the data used.

The EC requested clarification on whether the presented warranties are equivalent to what is being offered for passenger cars. The UK delegation clarified that although broadly it may be true, very few companies had offered a 5-year warranty at 80 % battery degradation as a first stage.

The American delegation commented that the warranty incentives may have been predicated on the MPR. OICA then explained that a warranty is not exclusive to one group like research and design; it takes into consideration many other factors before offering something to the customer base. The American delegation suggested that Amazon is a logistics-based company and would know their duty-cycles and delivery requirements well enough to provide data to a delivery vehicle manufacturer to develop their vehicles. An industry representative stated that they are unable to share this data; however, a request may be made to Amazon.

Action Items

Decisions

10. OICA comments on MPR for Category-2 vehicles

Documentation

- EVE-61-09e

Context

OICA presented a proposal of energy throughput for monitoring of the MPR for category-2 vehicles in GTR 22. OICA stated that light commercial vehicles have a different battery usage than passenger cars, which requires reflection in the MPR. In prior meetings OICA proposed the metric of energy throughput (Wh) as appropriate to assess the extended usage of a battery in a category-2 vehicle. OICA outlined that the preferred approach for them would be a combination of the Euro 7 proposal and the addition of an optional energy throughput metric. OICA also highlighted that the GTR on HDVs should be developed, keeping in mind possible synergies with category-2 vehicles.

Discussion

The EC asked how OICA proposes to fix the limits for incomplete vehicles and what value may be appropriate for the energy throughput metric. OICA expressed that much more discussion is required to provide a specific value and that it needs to be a guarantee of how an incomplete vehicle will be used. OICA elaborated that for normal or extended use, vehicles may be bound by the way the battery is being used; however, for commercial vehicles there is no guarantee and so we do not know the appropriate values or the energy required for the V2X application.

The American delegation inquired about what might be a reasonable input considering energy consumption and the values in the set equation. An industry representative suggested the use of a watt-hour per hour metric because the energy throughput would average over the useful life of the vehicle. The industry representative alternatively offered that the energy throughput could be

included as part of V2X, differentiating between traction use and driving use. The energy can then be measured and converted to a virtual mileage value. The co-chairs exclaimed that this is useful information and good to know that the onboard system could differentiate between energy used for ancillary devices and energy used for traction and provide a complete mileage value.

Action Items

Decisions

11. ACEA comments on V2X definition

Documentation

- EVE-61-10e

Context

The European Automobile Manufacturers Association (ACEA) presented comments regarding the definition of V2X and its harmonization with other existing standards. ACEA outlined the difference in the definition in V2X with other regulators such as CARB. To ensure a consistent description within regulation and to align with standardization work in SAE, ACEA proposed:

- *V2X means, traction batteries energy supplied to off board usage during propulsion system non-active operation, such as V2G (Vehicle to Grid) for grid stabilization by utilizing traction batteries, V2H (Vehicle to Home) for utilizing traction batteries as residential storage for local optimization or emergency power sources in times of power failure, and V2L (Vehicle to Load, only connected loads are supplied) for use in times of power failure and/or outdoor activity in normal times.*

- *Total discharge energy during V2X means the total amount of discharged energy during V2X which needs to be provided according to Annex 2*

Discussion

The co-chairs of the EVE IWG requested clarification on whether the proposed slides are meant to suggest that items in GTR 22 should be revisited. OICA clarified that there may be a potential idea to reopen this item in GTR 22 and it also relates to OICA's presentation on MPR.

An industry representative raised that the market is very weight sensitive and manufacturers will size batteries based on the weight of a vehicle and the power takeoff (PTO) usage. For the HDV sector, there may be some extremely weight sensitive applications with extreme PTO usage and batteries with large energy throughputs but very low mileage. The industry representative suggested that if metrics remain in distance and time, this could result in manufacturers increasing capacity and weight and oversizing batteries to meet the MPR. The American delegation recognized this point and questioned the appropriate MPR values, stating that perhaps there is a threshold and ratio of loading that might generate new requirements or different classifications.

Action Items

Decisions

12. UN GTR 22 – Japan proposals

Documentation

- EVE-61-11e

Context

The Japanese delegation presented comments and recommendations regarding the revisions of GTR 22. The Japanese delegation outlined the values added as part of Annex 2, the treatment of V2X and PTO, as well as the on-board V2X (and PTO) verification method.

Discussion

The EC expressed some concern surrounding the PTO definition. OICA proposed discussing later using their slide deck for Annex 2 materials.

OICA requested time to review the Japanese proposals.

Action Items

- OICA to review and discuss the Japanese GTR 22 proposals.

Decisions

13. UN GTR 22 – Discussion on Annex 2

Documentation

- EVE-61-12e
- EVE-61-13e

Context

The drafting coordinator presented the draft text for GTR 22 and went through the document outlining changes throughout, including in the V2X equation on page 17, definitions 3.24 and 3.25 for energy throughput and values listed in Annex 2.

OICA presented a proposal regarding the wording of value 10 in Annex 2 relating to the average battery temperature.

Discussion

The American delegation requested a closer look and explanation of the V2X equation on page 17. The drafting coordinator indicated that in the equation, the aim is to account for non-traction the same way as V2X. OICA mentioned that if the equation is to be written this way, there may be a need to lower the MPR, but this will need to be discussed first.

The drafting coordinator proceeded to Annex 2 of GTR 22 and highlighted the need for total discharge energy for non-traction purposes as well as including total energy throughput as an optional value, left to the discretion of the manufacturers.

The co-chairs sought clarification of whether the MPR values proposed are still uncertain. OICA expressed again that the MPR values may not be suitable if vehicles now have the additional non-traction loads considered.

The co-chairs stated that the concept of energy throughput seems to be quite confusing. OICA clarified that everything appears to be getting rolled into non-traction that is not included in V2X operation and is not a normal loading condition, such as refrigeration loads, etc..

OICA presented their proposal regarding average battery temperature in Annex 2. The co-chairs agreed with the proposal and the proposed text was included in the GTR 22 draft text.

Action Items

- The drafting coordinator to send the secretariat the modified GTR 22 draft text for posting on the EVE IWG wiki page.

Decisions

- A consensus was reached on the modification of the virtual distance equation to include non-traction total discharge energy.

- A consensus was also reached regarding the inclusion of parameters 9 through 12 in Annex 2 to be read from vehicles.

- A consensus was reached regarding the inclusion/modification of definitions 3.24 and 3.25, specific to energy throughput and total discharge energy for non-traction purposes in category-2 vehicles.

14. UN GTR 22 – Drafting text

Documentation

- EVE-61-13e

Context

This item was addressed as part of the previous agenda topic.

Discussion

Action Items

Decisions

15. SAE progress update - J1979DA and J1979-3 required data, standardization, ZEV standard, virtual odometer proposal

Documentation

- EVE-61-14e
- EVE-61-15e

Context

Industry representatives provided a presentation on the SAE updates related to GTR 22 as well as a virtual odometer proposal accounting for V2X usage. The SAE updates included information on zero emission vehicle (ZEV) diagnostics and repair standardization (J1979-3). The second presentation outlined a proposal on a virtual odometer reading to account for V2X usage, including an overview of the system, an equation, and proposed text.

Discussion

The co-chairs of the EVE IWG suggested to the group that an action item be created to respond to the industry representative's presentation questions. The co-chairs indicated that they would lead the response.

The co-chairs of the EVE IWG mentioned that there is currently no requirement for the manufacturers to provide a customer facing metric for V2X, only the state of health (SOH) monitor. The co-chairs expressed that it will be interesting to see what manufacturers choose to do going forward regarding customer facing metrics. OICA stated that they are unsure whether manufacturers should be showing customers two separate mileages, as it could lead to confusion.

The co-chairs expressed that the V2X proposal goes into a lot of detail that may not be required at this time; however, it is good to understand the mechanics of how things may be implemented. This may also be relevant to the implementation of HDVs and help inform discussions on future work there.

Action Items

- EVE IWG co-chairs to lead on response document to SAE updates presentation by industry.

Decisions

16. Future research - Korea planned research on the system power of fuel cell electric vehicles

Documentation

- EVE-61-16e

Context

The Korean delegation gave a presentation outlining research underway on the system power of fuel cell electric vehicles, namely, as part of the hydrogen bus safety evaluation technology and

equipment development research. The Korean delegation stated that many manufacturers are developing commercial fuel cell electric vehicles (EV) and suggests that the two test methods found in GTR 21, TP1 and TP2 do not apply to fuel cell EVs.

The Korean delegation proposed developing a GTR for fuel cell EVs and offered to introduce the research and supplementary content at a future EVE IWG meeting, potentially targeting the 65th EVE IWG session on Oct 11-12, 2023, in Ottawa, Canada.

Discussion

Action Items

- Korean delegation to prepare presentation and proposal on GTR 21 fuel cell EVs for discussion at EVE 65 in Ottawa, Canada.

Decisions

17. Prioritization – Further developments for GTR 22 and 21

Documentation

Context

The co-chairs mentioned that most of the topics for GTR 21 and 22 were covered and the plan is to deliver amendments to these GTRs as working documents to the January 2024 session of GRPE, with a submission deadline of October 17, 2023.

The co-chairs offered EVE IWG members the opportunity to raise any specific urgences on any of the topics from these two GTRs or any other topics that may have been missed.

Discussion

No comments or further points of discussion were offered.

Action Items

Decisions

Day 2 – April 26, 2023, 09:30 EDT

1. Introduction and review of agenda

Documentation

- EVE-61-02e

Context

The EVE IWG co-chairs addressed members and welcomed everyone back for the second day of the 61st EVE IWG session.

The co-chairs briefly presented the meeting agenda for day two of the 61st EVE IWG session. The agenda was reviewed and adopted by the EVE IWG prior to beginning discussions.

The co-chairs asked whether anyone had anything they wished to discuss from day 1, prior to beginning day 2 discussions.

Discussion

Action Items

Decisions

2. Overview of U.S.A. notice of proposed rulemaking – HDV Phase 3

Documentation

- EVE-61-17e

Context

The American delegation presented an overview of the U.S.A. NPRM on HDV phase 3. The presentation included background material as context, including authorities, the objective, and previous phases. The presentation also included the changes made in the new proposed phase, highlights of the proposal, technical analysis and projections, emissions impacts, costs, and public participation.

Discussion

The co-chairs reiterated that the American delegation is referencing work coming out of the HDV GTR materials, future EVE work and seeking comment on the proposed HDV NPRM phase 3 test procedures. The American delegation also highlighted for EVE IWG members that the HDV phase 3 NPRM proposes a SOH monitor but not MPRs. The co-chairs clarified that the intention of the EVE IWG is to submit a draft HDV GTR informally to the January 2024 session of GRPE and this timeline may be a little too late to inform an American final rule publication in December 2023.

The EC requested more time to be able to review the American HDV phase 3 NPRM prior to asking further questions.

The American delegation also mentioned that there are credits that exist within the NPRM for energy saving technologies, adaptive controls and driver assistances. Technologies such as automation have not been included explicitly; however, there are opportunities for manufacturers to earn off-cycle credits for advanced technologies.

Action Items

Decisions

3. HDV GTR – Chinese presentation on HDV UBE vehicle testing

Documentation

- EVE-61-18e

Context

The Chinese delegation gave a presentation on testing of a HDV for UBE measurement. The presentation included an energy consumption test method proposal that the Chinese delegation would like to have added to the HDV GTR. The reasoning provided included that the test cycle method can measure the available battery energy UBE in accordance with the actual use of the vehicle. The SOCE also reflects the attenuation of the vehicle battery more accurately.

Discussion

An industry representative commented that the proposed approach by the Chinese delegation seems to have much more variability in results and burden on manufacturers. The current setup is much easier for regulators to audit. The industry representative elaborated stating that the proposal is less repeatable and more complicated. The American delegation pointed out that it appears the Chinese delegation are looking to develop a test procedure that more accurately replicates real-world usage. The Chinese delegation referred everyone to the disadvantages of the current test procedure outlined in their presentation.

The EC commented that the testing proposal is in a laboratory setting and not necessarily real-world. The proposed approach becomes quite difficult to implement because it needs to be appropriate for everyone, knowing that this type of chassis dynamometer testing is extremely expensive and lacks availability. The EC expressed interest in the research work and a comparison between the current test procedures and this new Chinese proposal. An industry representative questioned whether the test cycles, on the new proposal as well as the current procedures, are repeatable. The industry representative also stated that they would be interested in seeing supporting data before committing to a change.

The co-chairs expressed that now is a good time to discuss these options as the HDV GTR is not finalized.

The American delegation requested clarification on whether this test proposal is being put forward as a replacement or as a possible alternative to the current testing procedures. The Chinese delegation clarified that it would suggest it as an alternative and that this type of testing should not be excluded from the process.

The co-chairs asked the Chinese delegation when they think they could provide test results for their proposed method and experiences on repeatability of the proposed test. The Chinese delegation stated that they will provide roadmap for how their research testing will play out over the coming months, at the next meeting.

OICA expressed that they do not wish to have multiple tests and that this would be considered a large burden and have significant cost considerations.

The American delegation provided some insight into their research and testing, specifically that they found, during drive cycles such as the ones presented by the Chinese delegation, there exists a lot of transient cycles that can not be repeated with any great level of accuracy. Instead, the American delegation decided to utilize a steady state point, which is much more repeatable. The American delegation also expressed that the power demands could exaggerate inaccuracies and that if a drive cycle is arbitrary, then the UBE becomes arbitrary.

Action Items

- The Chinese delegation to present a roadmap regarding their future HDV UBE research testing as well as their motivation and rationale for chassis dynamometer testing.

Decisions

4. HDV GTR – Japanese presentation on HDV UBE measurement

Documentation

- EVE-61-19e

Context

The Japanese delegation presented an overview of their current research and testing of HDV UBE. From initial testing, the Japanese delegation have found that a charge/discharge test (bidirectional charging) can offer a solution in determining HDV UBE, considering complexity of in-service testing. The Japanese delegation also expressed that further study is needed on discharge patterns, specifically cycle repetition and constant power applications.

Discussion

The EC asked the Japanese delegation what the frequency of data acquisition was, noting that there was a proposal made in GTR 15 with overnight charging. The Japanese delegation stated that they will discuss and provide a response.

The American delegation requested clarification on the c-rate of the cycle test and was it compared against other constant discharge tests. The Japanese delegation indicated that this is shown in the

presentation as a c-rate of 0.5 and a power of 24.3 kW. The EC mentioned that they would like to provide a presentation later regarding power estimates, to remain in the regular charging threshold and the timing required to charge the batteries. The EC feels that charging large batteries at a rate of c/3 may be too much and a rate of c/5 may be more appropriate. The Japanese delegation communicated that they may be able to designate a c-rate range.

OICA requested clarification on which parameters the Japanese delegation are using to calculate HDV UBE. The Japanese delegation clarified that they are using ampere-hours and voltage, which generates integrated watts, which will be demonstrated in their future presentation.

OICA pointed out that there is a drop in c-rate at certain points in the test. The Japanese delegation stated that this was due to a larger power demand causing a voltage droop and driving a cutoff in the test.

The Chinese delegation asked whether this was a new or used vehicle and why a gradient exists in the test procedure. The Japanese delegation mentioned that it was a 7-year-old vehicle with 6,000 km. They also stated that the gradient profile exists because this is what is required under the World Harmonized Vehicle Cycle (WHVC) test cycle.

Action Items

- The Japanese delegation to report on the latest progress of their HDV UBE measurement testing at the next EVE IWG session as well as measurement techniques.

Decisions

5. HDV GTR – OICA presentation on HDV testing procedures

Documentation

- EVE-61-20e

Context

OICA presented a document outlining adaptations of GTR 22 for HDV specific purposes, which included definitions, certification testing, in-service verification testing and stance on V2X in HDV. OICA expressed that they are planning to deliver test results in one of the summer EVE IWG sessions before presenting a conclusion at the EVE session in Ottawa in the fall.

Discussion

The American delegation highlighted that a charge and discharge test was the original idea for a test; however, with the proposal from OICA it appears that the group appears to be deviating from this approach. The American delegation is requesting a response on the motivation behind deviation. OICA clarified that a deviation is being proposed due to the observations in vehicle testing that are being made between OICA as well as the Japanese. OICA feels that it is a challenge to try to incorporate all requirements for all markets and use cases.

The American delegation stated that a charging test has potential but how is it ensured that energy is not going to another source. OICA mentioned that the level of the battery will always remain true and it may simply take a longer time to charge but will be accurate in the battery.

The American delegation asked where the values will be measured? OICA stated that the values will come from the battery management system (BMS) and ampere-hours in the battery.

An industry representative asked everyone whether it is appropriate to report the usable battery capacity (UBC) from the BMS system. The American delegation was uncertain about this; however, it was indicated that energy is what matters and whether the path it is being taken from has been compromised. If it is repeatable and verifiable then it may be fine. The American delegation indicated that they would need to discuss this information further.

Action Items

Decisions

6. HDV GTR – EC presentation on draft test procedure and V2X

Documentation

- EVE-61-21e
- EVE-61-22e
- EVE-61-23e
- EVE-61-24e

Context

The drafting coordinator presented the following documents, outlining progress on the HDV GTR draft text.

- A tracking sheet outlining progress and open issues related to the drafting of the new HDV GTR.
- A working draft document of the HDV GTR text, which included new proposed text for Annex 4.

The EC then presented several documents including:

- A presentation on updates towards the draft test procedure for capacity fade in electrified HDVs.
- A presentation on updates, inputs and open issues towards the electrified HDV V2X and PTO virtual mileage concept.

Discussion

The co-chairs requested clarification on the draft GTR text and whether it includes what has been discussed during the EVE IWG session. The drafting coordinator clarified that the text includes what has been discussed previously but has not been updated with discussions that have taken place during the 61st EVE IWG session.

The American delegation asked whether it would be appropriate to introduce a charging event to start, followed by multiple discharge events. The drafting coordinator commented that they felt it

would be best to completely discharge the battery and then recharge it to full capacity for stabilization prior to beginning the discharge events.

The drafting coordinator highlighted that test repetitions as well as normal charging power are open issues and feedback on these would be appreciated.

An industry representative requested clarification on whether the discharge event would be done bi-directionally. The drafting coordinator clarified that it was their intention to enable bi-directional capabilities such that the battery can be tested inside the vehicle.

OICA proposed that there be undefined charging up to a certain rate and then a defined discharge to a specific state of charge (SOC), followed by another charging event. The drafting coordinator expressed that this would need to be considered further.

The co-chairs expressed that due to tight timelines, perhaps it is best to approach issues in parallel rather than in series to speed things along.

The American delegation expressed that many options are possible but ultimately supporting data and justification are required for every simplification step in the testing.

The co-chairs stated that if the American delegation has any specific notes, questions, or items to bring forward to the group, to please provide them to the secretariat for incorporation into the meeting minutes or a future meeting.

The American delegation commented that at this time, energy is being measured at the onboard battery pack of the vehicle, integrating current and multiplying it with voltage. It is recognized that this adds complexity due to measurements being taken at different locations, but it is manageable.

The co-chairs highlighted that OICA has advocated for energy throughput, moving away from a mileage metric. The co-chairs asked the American delegation whether a threshold exists for LDVs and certain HDV applications where most of the energy consumption is used for other work, understanding that for LDV, applications may be relatively homogenous in comparison to HDV applications. The American delegation stated that using energy throughput simplifies things and energy from the battery pack is a desirable metric to use, but there are still many questions around how this data will be used, specifically towards durability requirements.

Action Items

- American delegation to provide any specific notes, questions, or items for the group, to the secretariat for incorporation into the meeting minutes or inclusion in a future meeting.

Decisions

7. HDV GTR – Japan comments

Documentation

- EVE-61-25e

Context

The Japanese delegation presented comments on the HDV GTR, specifically, considering the unique configuration and functionalities of HDVs, discussions are underway on the possibility of applying a battery energy throughput method instead of a mileage metric for MPR criteria. Japan indicated that they plan to continue to collect market data for initial analysis by August 2023.

Discussion

Japan requested that the EC provide information regarding discharge energy for V2X and PTO as well as vehicle odometer. The EC communicated that they would investigate their data and provide Japan with the requested information.

The drafting coordinator indicated that updates to the HDV GTR tracking sheet of open issues will be incorporated with discussions that have taken place at this EVE IWG session.

Action Items

- The drafting coordinator to update HDV GTR open issue tracking sheet with discussion items from the 61st EVE IWG session.

Decisions

8. HDV GTR – OICA input

Documentation

- EVE-61-20e

Context

OICA outlined the last slide of their presentation on V2X position. OICA holds that based on expert discussions, it is not feasible to differentiate all the separate vehicle internal energy flows and OICA would prefer to apply the whole battery energy/capacity throughput instead of mileage for MPR criteria.

Discussion

OICA mentioned that they would appreciate the usage of energy throughput as an additional parameter and perhaps there is a way to differentiate between different vehicle classes. Ultimately OICA would like to keep this as an open issue for now.

The co-chairs recommended a breakout session on HDV metrics be organized to discuss this matter further, in advance of the next HDV drafting group meeting.

Action Items

- Secretariat to organize a breakout session on HDV metrics for the week of May 8, 2023.

Decisions

9. HDV GTR – V2X considerations

Documentation

Context

This item was set aside to discuss any outstanding matters on V2X that groups may wish to highlight as part of the HDV V2X considerations for draft text development.

Discussion

The drafting coordinator highlighted that there were some comments in Part B on families in the HDV GTR and was wondering if there are any further comments on this.

OICA stated that within the draft text there was a compromise that was reached regarding the title for Part B: Verification of Battery Durability, to include “at least”. The American delegation mentioned that they do not make use of a catch-all clause, but instead allow manufacturers to define their own durability families. The American delegation also stated that they may have some feedback on the HDV GTR family definitions at an upcoming meeting. The drafting coordinator indicated that drafting on this title will be held as an open issue, so that the American delegation may provide their feedback.

Action Items

- American delegation to provide feedback on HDV GTR family definitions at an upcoming EVE IWG session.

Decisions

10. Action items review

Documentation

Context

The secretariat reviewed the rough meeting minutes and outlined the action items going forward to the next EVE IWG session. The EVE IWG members provided further action item input, as needed.

Discussion

Action Items

- The Secretariat to organize a meeting within the leadership group to coordinate agenda for the next meeting as well as address open issues, where possible.

- EVE IWG members to read suggested edits on GTR 22 and provide comments before June 30, 2023.

- Japan to have bilateral discussion with EC to bring forward concrete draft text for GTR 22.

- EVE IWG members to provide harmonization comments regarding GTR 22 and California before June 30, 2023.

Decisions

11. Planning for future meetings

Documentation

- EVE-61-26e

Context

The co-chairs and the secretariat presented a document outlining the intended deliverables going forward, proposed dates for future EVE IWG sessions, as well as proposed dates for the HDV GTR drafting group.

Discussion

The UK delegation requested clarification on why EVE sessions between September and October are occurring so close together. The co-chairs expressed that there are several conflicts that exist and so the items landed this way.

Action Items

Decisions

- Amendments to GTR 21 to be submitted as a formal document to GRPE in January 2024, deadline for submission is October 17, 2023.

- Amendments to GTR 22 to be submitted as a formal document to GRPE in January 2024, deadline for submission is October 17, 2023.

- Draft HDV GTR to be submitted to GRPE in January 2024 as an informal document.

- Draft HDV GTR to be submitted to GRPE in June 2024 as a formal document.

- Future EVE IWG sessions scheduled as follows:
    - May 30, 2023 (in-person)
    - July 18-19, 2023 (virtual)
    - September 19-20, 2023 (virtual)
    - October 11-12, 2023 (in-person)

- HDV GTR drafting group session scheduled for May 15, 2023.