Submitted by the EVE Secretariat

Informal Document EVE-77-05e
77th EVE IWG session: November 25-26, 2024

# Report of the 77th session
# Electric Vehicles and the Environment Informal Working Group (EVE IWG)

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| Location: | Virtual - Webex |
| Date: | November 25 – 26, 2024 |
| Time: | 05:30 – 08:00 EST |
| Chairs: | Mr. Michael Olechiw (United States of America)<br>Ms. Elena Paffumi (European Commission) |
| Vice-Chairs: | Ms. Chen Chunmei (China)<br>Mr. Nobunori Okui (Japan) |
| Secretariat: | Mr. Leeson Guay (Canada) |

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Day 1 – November 25, 2024, 05:30 EST

1. Introduction, review of agenda, and meeting recap

   Documentation

   - EVE-76-07e
   - EVE-77-01e

   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 – November 25, 2024, 05:30 EST

   - Introduction, review of agenda, meeting recap
   - HDV GTR – Comments on open items
   - HDV GTR – Specifications of bidirectional power supply
   - HDV GTR – Open items and discussion points

   Day 2 – November 26, 2024, 05:30 EST

   - Introduction, review of agenda
   - HDV GTR – Open items and discussion points…continued

- Closing remarks

The EVE IWG secretary briefly reviewed the *Report of the 76th EVE IWG session*, highlighting action items and key decisions from the discussions, held virtually, on November 05-06, 2024.

Discussion

Action Items

Decisions

2. HDV GTR – Comments on open items

Context
This item was set with the objective of enabling Organisation Internationale des Constructeurs d'Automobiles (OICA) to offer comments and positions on various outstanding topics of the electrified heavy-duty vehicle (HDV) global technical regulation (GTR) draft text

Discussion
OICA expressed that they have previously provided information and comments and that they will speak to items directly as the group moves through the HDV GTR draft text.

3. HDV GTR – Specifications of bidirectional power supply

Documentation

- EVE-77-04e

Context
The Japanese delegation offered a presentation on considerations for the specifications of bidirectional power supply requirements as part of Annex 3 measurement requirements for measuring devices.

Discussion
The drafting coordinator indicated that placeholder text exists in the draft text at this time, but it is unclear how much detail is required. The drafting coordinator requested clarification on whether the Japanese delegation was proposing these specifications for a generic system without being prescriptive or stringent at this time. The Japanese delegation indicated these specifications have been discussed with manufacturers and they can meet the requirements based on current developments in Japan. If these pose challenges in other regions, we would be open to modifications of the proposed values. For HDV specifications, we may need more robust discharge limits, as equipment capable of only 100 kWh may not suffice. The drafting coordinator suggested that they review the text to ensure that the requirements are in line with charging stations and for discharging at this moment we are simply using the passenger car requirements and feeding it back into storage or the grid. We will include a comment about discharge range for HDV as a tentative addition. We also need to ensure altitude and pressure conditions are regionally comparable.

OICA asked whether there were any labs or testing areas that are 700 meters above sea level as part of the proposed altitude requirement. The co-chairs supported this question, indicating they had a

similar thought, and it is unlikely. OICA commented that there is full recognition on their side that there is no standard drafted for bidirectional charging or power supplies. If the group wanted to put something into the text now, then it is likely that it would need to be revisited once standards have been set, to ensure consistency. In addition, specifying any power to a bidirectional system depends on the vehicle and the employed power system. Stating a requirement like constant power may limit the deployed technologies and possibilities in the future. The drafting coordinator highlighted that there is a Chademo based standard as well as other standards that are like what has been tentatively drafted for passenger cars. Once we have been able to discuss this further internally, we can come back to this topic and include further details, as needed.

The co-chairs asked the Japanese delegation whether the proposed parameters were all considered necessary for accuracy and measurement purposes. The Japanese delegation responded that the specifications were made as a minimum requirement for what to consider as part of this GTR. Normally, equipment will work or function properly, but testing should be done. This was a first proposal, but we are looking to open the discussion to know what other specifications may be required. The drafting coordinator indicated that the text has been annotated and once OICA has had a chance to discuss, we can revisit this to potentially include these specifications as a placeholder.

Action items

- OICA to discuss Japanese power supply specifications proposal, for discussion and decision at next EVE IWG session.

4. HDV GTR – Open items and discussion points

Documentation

- EVE-77-02e

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

*Vehicle soak and charge*
The Japanese delegation recalled that during the last EVE IWG session, the group agreed to follow manufacturer recommendations for vehicle soak and charge. The text here may not be valid if first discharging with a specific breakoff criterion, following the manufacturers recommendations. If doing a charge afterwards it may not reach the fully charged state based on the breakoff criterion specified. The American delegation stated that there does not appear to be an issue with the language because a fully charged battery is talking about the end state not the amount of charge going into the battery – “Record the charge current and voltage and the elapsed time required to

reach a fully charged battery". The drafting coordinator added a comment to the text, to consider further whether to leave the text, as break-off criterion during pre-conditioning is not prescribed. OICA requested clarification on whether they were discussing the soak and charge requirements for the 6 to 36 hours. Looking at the diagram showing the test procedure, it specifies a soak time of 30 minutes. The drafting coordinator mentioned that between moving the vehicle to the testing cell and starting the charge, some time may pass, which is why the soak and charge process is combined in the text. Initially, the soak and charge steps were separate but combining them simplifies the process. OICA stated that HDVs differ significantly from light-duty vehicles (LDV). LDV often use low power direct current (DC) charging, while HDV generally uses high power DC charging. OICA commented that high powered charging is offered on some vehicles while others may only have DC fast charging capabilities, so the charging times could be quicker than expected and perhaps faster than the stated 6 hour minimum. Could we consider eliminating the minimum 6-hour lower limit because high power DC charging often does not take six hours and imposing a minimum time might unnecessarily delay testing if the battery and vehicle get cold again. Perhaps each manufacturer should decide based on their strategy and specifications. The drafting coordinator suggested that priority should be on ensuring the battery is in good condition. Using high powered charging requires stabilization after a full charge process to avoid impacting battery condition. If we remove the minimum we would need to account for the stabilization period. The Japanese delegation stated that if the charging power affects the useable battery energy (UBE), for the purposes of the testing and procedure, such conditions should be avoided. OICA commented that modern technology allows high power charging during mid-range state of charge levels while tapering off at the end to protect battery performance. This ensures accurate UBE measurements. Charging should be done according to manufacturer specifications, which could be provided to independent testing bodies. What we are saying is that 6 hours may be a bit long for some of the existing products. We would say we should remove the minimum value of 6 hours but keep the maximum time of 36 hours so a manufacturer can decide what to do. Perhaps the manufacturer can provide the specifications to the authority. The American delegation indicated that they want to be sure that there are not unique test procedures for each vehicle being tested. We are not opposed to removing the 6-hour minimum charge time but this new text we are talking about is getting a little prescriptive. If this is the direction we are going, then we should be listing the specific requirements and not doing something unique as per manufacturer instructions. Having flexibility is okay but it does not make sense for a manufacturer to be able to specify a certain test procedure since we are looking to replicate real-world use. The Japanese delegation supported the American perspective stating that testing procedures should not rely on manufacturer prescribed conditions. Manufacturers can decide on time durations or prioritize accuracy over time if needed. Any additional steps should align with ensuring the onboard system's accuracy. The drafting coordinator modified some of the text to reflect the discussion with comments indicating two options, the first being leaving the 6-hour minimum with manufacturer recommendations and second option being removing it entirely as long as the 36-hour maximum offers sufficient flexibility.

The drafting coordinator continued to explain the text around fully charged vehicle status and the potential need to plug and unplug to ensure a 100 % charge, that may not be realized due to battery protection in the vehicle. OICA commented that this approach works and aligns with existing practices and helps avoid incomplete charges during testing. The Japanese delegation suggested that perhaps the battery temperature stability should be given a temperature range rather than a generic statement that says the soak and charge time could be extended to stabilize the battery. OICA stated

that they understand Japan's concerns and feel it would be useful to keep the paragraph about battery temperature checks and the option to extend the soak and charge time. This ensures that the battery is in proper condition. OICA suggested that the vehicle signals could be monitored to ensure a fully charged battery. The Japanese delegation commented that following manufacturer recommendations is key, however, without specific criteria for which parameters indicate a full charge, these recordings may waste resources. If we are keeping the paragraph, there needs to be clear thresholds and specific actions based on data. The drafting coordinator highlighted a comment made previously that the temperature equilibrium range of +/- 7 degrees Kelvin per hour may be appropriate in determining whether the overall battery temperature has stabilized.

*Method 1a test*
The drafting coordinator highlighted the section and explained that the test procedure prescribes that the vehicle must start the test within one hour of being disconnected from the grid to avoid rebalancing. This includes discharging the battery at characteristic regional speeds, with payloads in agreement with responsible authorities. The drafting coordinator proposed removing square brackets from the state of charge and +/- 7 km/hr. OICA commented that this seems fine and for practical purposes will work on the test track but narrowing this range further could pose challenges. The range and tolerances will need to be aligned with the break-off criterion that still requires finalization. The drafting coordinator accepted the changes and added a comment to verify with the break-off criterion once finalized.

The drafting coordinator pointed out the acceleration and deceleration requirements during speed changes, indicating that the text offers flexibility through recommendation rather than requirement. The American delegation asked whether it makes sense to remove the range on the acceleration and deceleration to be simply +/- 1 km/hr/s. The technical services representative indicated that they were in support of this change and feel it is necessary. However, there are concerns regarding the consistency of speeds between certification and in-service conformity testing. Having speeds that are not aligned between the two tests could result in different break-off points, so should these speeds be consistent across testing. The drafting coordinator suggested that specifying a range rather than identical target speeds makes sense since speeds between the two tests could vary by +/- 7 km/hr. The Japanese delegation stated that defining a specific target speed for both certification and ISC is impractical but a specified tolerance range like +/- 7 km/hr makes sense. OICA requested clarification on whether the target speed should be applied uniformly to all vehicles or vary depending on vehicle type, gross vehicle mass and other defining parameters. The drafting coordinator clarified that it would go by vehicle category and family and the target speed at certification and in-service conformity testing should align with the specified speed tolerance for consistency. The technical services representative stated that consistency is critical for fairness and if target speeds differ significantly between certification and in-service conformity, it could bias the results. A clear range would mitigate these concerns. The drafting coordinator clarified that the text will specify target speeds remaining consistent across certification and in-service conformity within a defined range, speed values will vary base don vehicle category and family, and the smooth acceleration and deceleration should be smooth with a recommended tolerance of +/- 1km/hr/s. The Japanese delegation and OICA both agreed with this approach.

The Japanese delegation highlighted that during certification testing one representative configuration from a family would be tested and the manufacturer would then not be required to

test every vehicle configuration. The Japanese delegation requested clarification on whether target testing speeds or power requirements differ across configuration and how portable testing would align with the certification requirements. OICA stated that they have raised similar concerns, that if manufacturers need to perform additional testing for each configuration, it increases the testing burden. When choosing vehicles for testing in Part A and Part B, should manufacturers be selecting vehicles with the lowest installed energy for testing or is this impractical during in-service verification. The drafting coordinator recalled that the current text specifies vehicle selection criteria for testing. Certification testing typically involves selecting representative configurations, but in-service testing may involve random customer vehicles, which adds variability. The Japanese delegation stated that Part B families should have unique UBE values. Testing should compare the measured UBE to the certified value for that specific family. Multiple battery configurations within the same family will complicate the process. OICA commented that HDVs differ significantly from LDVs as they often have customer specific configurations. Therefore, a scalable framework is needed to balance testing feasibility with regulatory requirements. The American delegation requested clarification on why target speeds vary so greatly within a family. Should the vehicles with similar purposes not follow consistent speed ranges. OICA clarified that HDVs often vary based on customer demands, with different installed energy capacities. This variability complicates setting universal target speeds. The Japanese delegation suggested that each Part B family should correspond to one UBE value. Certification tests must verify this, but running multiple tests for different configurations within the same family would increase complexity and cost. OICA stated that variability in battery configurations and chemistry will impact durability and aging. Certification test should monitor these differences over time but a balance between testing burden and practical implementation is critical. Part B is not about absolute UBE values, but rather the state of certified energy (SOCE) which compares the UBE at the beginning of life to subsequent measurements. This ratio-based approach reduces dependency on specific UBE values but still requires monitoring for consistency. The Japanese delegation reiterated that Part B families include multiple configurations, and certification may require testing two or three battery configurations to ensure accurate UBE values. Without this, market deterioration rates may not be adequately captured.

Decisions

- The square brackets were removed from state of charge and +/- 7 km/h in the Method 1a test section.

Day 2 – November 26, 2024, 05:30 EST

1. Introduction, review of agenda

Documentation

- EVE-77-01e

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.

2. HDV GTR – Open items and discussion points…continued

Documentation

- EVE-77-02e

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

The draft coordinator picked up where things were left off the previous day.

Discussion

*Method 1a test*
OICA commented that the new proposed text under section Method 1a looks great and they are prepared to move on to other topics. The American delegation stated that the vehicle speed can have a tangible result during testing because the speed drops as you deplete the battery and are approaching 0 % state of charge (SOC). It would be useful to have a speed that is reflective of real-world conditions but at the same time repeatable. Having a lower speed could change the result of the test since it will not drop out at the same point in time and is therefore not reflective of real-world conditions.

The drafting coordinator reviewed the text relating to full cycle efficiency and $UBE_{charge}$ recalling that the group had initially included the $UBE_{charge}$ definition and the calculation for full cycle efficiency, however charging after discharging is optional. Therefore, including full cycle efficiency might not be relevant. If charging is not mandatory, then it would be inconsistent to require full cycle efficiency reporting. The drafting coordinator proposed deleting the related text. The American delegation agreed stating that if the value is not used in the test procedure, then it can be removed, but leaving it as optional does not hurt either. The EC commented that including the calculation as optional could work and ensures we do not lose the concept for future use. Preserving full cycle efficiency as an optional metric secures its potential utility for future updates to the GTR, addressing evolving testing needs without enforcing immediate inconsistencies. The drafting coordinator noted that the text will be updated to reflect the two options discussed, remove entirely or amend the text to make $UBE_{charge}$ and full cycle efficiency optional.

*Method 1b: Discharge by driving on the road*

The drafting coordinator outlined the differences between the two testing procedures, Method 1a focusing on test track procedures at constant speed with defined tolerances and surface specifications, while method 1b involves road testing with urban and highway conditions. The American delegation requested clarification on why the text around “no airstrip surface” is necessary, as it could limit practical testing options. Removing the airstrip-specific restriction enhances the relevance of the test conditions by aligning them with practical, real-world driving environments. The drafting coordinator suggested that the text be clarified to require a surface that is representative of current urban and highway road surfaces while removing the airstrip related text.

*Method 1a: Test sequence*

OICA raised that the running temperature of the battery has an impact on battery performance and for HDV, longer drives will be expected that will necessitate driver breaks, so it would be important to monitor the battery temperature during the breaks so that the technical service can make note incase there is any impact to testing results. This could be used as an explanation for vehicle performance while post processing the information, so it would be good in our view to have the data stored on the side somewhere. The Japanese delegation asked what occurs if the temperature exceeds a threshold. Without predefined criteria or tolerance levels, the data might lack actionable meaning. OICA clarified that the recorded temperature would serve as supplementary data for technical services. For instance, if voltage and current anomalies occur after a break, the technical service can reference the temperature to analyze whether it contributed to the deviation. I agree that there would be a need to define clear thresholds or criteria for when a test should be repeated. The Japanese delegation suggested that if temperature monitoring is required, concrete thresholds or tolerances should be provided. What deviation from the expected range would trigger a test to be redone. OICA indicated that there could be a collaboration with the technical services to define acceptable temperature ranges and criteria. If the temperature falls outside of this range, it could trigger a repeat of the soak, recharge or vehicle test. However, it is important that technical authorities determine whether the temperature is within operational parameters. The American delegation requested clarification on how the technical services would know what is acceptable without predefined operational windows and thresholds. OICA clarified that the data would be recorded and stored for later reference. The technical services representative stated that they would not go as far as stating that the battery temperature would be a strict criterion for determining the failure of a test. The battery will have a huge thermal mass, and the battery fluctuations can likely be neglected but monitoring it does not necessarily hurt as it offers more help from a data perspective. If the manufacturer has more than one driver, and the in-service conformity testing only has one driver, it may be a good option to monitor the battery temperature just in case, to note any differences over the course of the driver break. The Japanese delegation suggested that if a result occurs that was not favourable or expected then the temperature can be pointed to as a source of error and a reason to redo the testing. The technical services representative indicated that they do not have an exact answer for this. The Japanese delegation followed up that if there is no exact answer then this should not be a consideration. There is a testing procedure, and the temperature has been defined. If the temperature is within that range, then the test result is acceptable, otherwise it is redone. If the temperature is monitored and obtain a result, then what is done with the temperature data. Seems like it would be a waste of resources and time. The technical services representative stated that temperature should not be a strict exclusion criterion for test validity, but

instead could act as a reference to ensure the battery behaves normally while contextualizing results. The temperature monitoring values should not invalidate a test unless thresholds are clearly defined.
The drafting coordinator communicated to the group that everything that has been discussed within method 1a will be reflected in method 1b and method 2, as applicable.

*Method 2: Discharge by a bidirectional power supply system*
*General test requirements*

The drafting coordinator suggested removing after preconditioning text to allow flexibility, as preconditioning might already occur elsewhere, such as via driving and mandating its sequence may become too restrictive. The American delegation indicated that they would be in favour of keeping the language as is, with the addition of a reference to power to provide more clarity on operational limits.

*Cooling fan*
OICA commented that for the cooling fan section can likely be kept and the text regarding dynamometer could be deleted since it is a bidirectional test occurring in method 2. Maybe it is worth including some text to emphasize that cooling fans might still be necessary for scenarios involving prolonged discharges in heavy-duty battery tests, where internal battery management systems may not fully mitigate temperature rise. Including this flexibility ensures the test environment remains adaptable to diverse vehicle configurations.

*Bidirectional power supply system*
The drafting coordinator suggested defining what is meant by a bidirectional power supply system to avoid limiting technology advancements and implementations. A broader definition prevents stifling innovation, allowing manufacturers to adopt cutting-edge technologies while maintaining compliance. This flexibility fosters technological progress and ensures the GTR remains relevant as industry standards evolve. Modifications were proposed to avoid over-prescriptions, such as mandating internal components like DC-DC converters.

*Method 2 test*
The drafting coordinator reviewed the text outlining Gross Train Mass (GTM) and the derivation of power range from the regional characteristic speed and payload. OICA commented that an immediate question comes to mind, in that, how do you relate the power and derive it from speed and payload. You may be able to relate it using a representative mass on a flat road at constant speed while accounting for air drag and rolling resistance. There could be a general rule of thumb developed since the typical HDV would vary greatly and the provisions should be comparable to method 1a. This approach strikes a balance between specificity and adaptability, ensuring that representative scenarios are tested while allowing for variations across vehicle configurations. By aligning this with Method 1a's general framework, we maintain consistency across test procedures, making them both practical and comprehensive. The American delegation stated that more specifics can be helpful but there may not be a need to go too far down this path because the consistency between the methods could be established by not becoming overly prescriptive.

3. Closing remarks

Documentation

- EVE-77-03e
- EVE-77-05e

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

Discussion

*UN GTR No. 22 transposition*
The drafting coordinator raised that the submitted version of UN GTR No. 22 to the Working Party on Pollution and Energy (GRPE) has been posted to the wiki page with modifications accounting for some of the edits and discussions that have been on going in the HDV GTR drafting process. It was suggested that for the transposition to a UN Regulation, this would be an appropriate version of UN GTR No. 22 to reference. OICA expressed that they have no comments at this time but will review the document and come back with anything later.

*Roadmap*
The EVE IWG Secretariat presented a roadmap outlining the upcoming deadline for the 92nd GRPE session as well as future EVE IWG meetings. The co-chairs requested clarification on the 92nd GRPE submission deadline. The HDV GTR drafting coordinator outlined that the deadline is December 31st, 2024, as shown in the presentation, however the group is looking to target an earlier submission before the holidays, on December 20, 2024.

*EVE IWG session – Ispra, Italy*
The EC communicated that there will be a formal invite sent out to the group for the hybrid meeting in Ispra, Italy. If there are EVE IWG members interested in participating in-person, please ensure that you complete the registration form in advance of the set deadline. There will be no exception due to security considerations. A travel schedule is being requested for all in-person registrants because a shuttle is being coordinator to pick up participants from the airport, train station and/or hotel. If a visa is required, please get in touch as soon as possible with the EC organizing group or the EVE IWG Secretariat.

*Future EVE IWG sessions*
The Secretariat raised the question of having an in-person only session prior to the 92nd GRPE session. OICA requested clarification on why an in-person only session is being proposed. The EVE IWG Secretariat suggested that by this time most of the work should be completed in advance of the 92nd GRPE session and most of the EVE IWG members will be participating in person to Geneva, so an in-person only session may be appropriate. Furthermore, there is limited availability at the Palais, and if a hybrid session is preferred, a separate venue will need to be coordinated. The Japanese delegation commend that if we require a large meeting before the 92nd GRPE session, then we have big problems. The co-chairs requested that a room be booked for in-person participation only March 24, 2025, in Geneva, Switzerland at the Palais des Nations. The EC suggested that leading up to the 92nd GRPE session, it may be beneficial to have a placeholder for 1 or two meetings, to wrap up any final, last minute, items.

Action items

- EVE IWG members to register for in-person participation at EVE IWG hybrid meeting in Ispra, Italy before January 20, 2025, without exception.

- EVE IWG Secretariat to coordinate a meeting at the Palais des Nations for in-person only participation, on March 24, 2025.

- EVE IWG Secretariat to put a placeholder for an EVE IWG meeting following the Ispra, Italy session and before the March 24, 2025, session in Geneva, Switzerland.