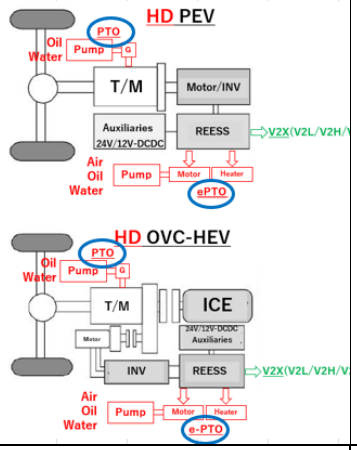
Extracts for Proposal for a new UN GTR on In-vehicle Battery Durability for Heavy Duty Electrified Vehicles **2024-08-19**

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2. Scope and application	This GTR applies to vehicles of categories 1–2 and 2, that have a technically permissible maximum laden mass equal or exceeding 3,855 kg, , that (a) are HD-PEV or HD-OVC-HEV vehicles, and (b) have an originally installed batteries as defined in this GTR. At the option of the Contracting Party, the minimum technically permissible maximum laden mass may be 3,500 kg for the relevant categories.	This GTR applies to vehicles of categories 1–2 and 2, that have a technically permissible maximum laden mass ~~equal or~~ exceeding 3,855 kg,~~,~~ that (a) are HD-PEV or HD-OVC-HEV vehicles, and (b) have an originally installed batteries as defined in this GTR. At the option of the Contracting Party, the minimum technically permissible maximum laden mass may be exceeding 3,500 kg for the relevant categories.	HDV GVW is not equal 3,855kg/3,500kg	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Definitions 3.17.	Power take-off (PTO) means a secondary engine shaft (or equivalent) that provides substantial auxiliary power for purposes unrelated to vehicle propulsion or normal vehicle accessories such as air conditioning, power steering, and basic electrical accessories.	*Power take-off (PTO)* means supplying power from the engine (ICE, motor) to operate auxiliaries equipment unrelated to vehicle traction or normal vehicle auxiliaries(24V/12V-DCDC), such as oil pumps, water pumps (for concrete mixers, garbage trucks, fire trucks etc.).	Based on the description of R49-07 definitio2.51., the description was made in accordance with this GTR. 	
Definitions 3.**		*Electrical Power take-off (ePTO)* means a directly REESS that provides substantial auxiliary power for purposes unrelated to vehicle propulsion or normal vehicle accessories (Heater, 24V/12V-DCDC) such as air pump, oil pump, water pump (fpr Cargo Thermal Control trucks, Refrigerator trucks, Cabin heater and air-conditioning etc…)	**Add paragraph"ePTO"**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Definitions 3.18	*"Total energy throughput during V2X and/or PTO and/*or non-traction purposes " means the total amount of energy in kWh discharged during V2X and/or PTO applications, which needs to be provided according to Annex 2.	*Delete*	**In the case of eHDVs, which are often equipped by bodybuilders with PTO and/or ePTO that consume energy outside of driving or V2X, manufacturers cannot record the energy consumption of PTO and/or ePTO separately. Therefore, manufacturers shall choose to verify by energy throughput rather than by virtual distance calculation.**	
4. Abbrevations		ePTO Electrical Power Take-Off	**Add "ePTO"**	
5.2. Battery Performance Requirements	..... [At the request of the manufacturer and for vehicles designed with V2X or not-traction purpose applications and PTO, the equivalent virtual distance calculated following the equation below will be reported by each vehicle.	*Delete*	**Don't use virtual distance**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
5.2. Battery Performance Requirements	If an energy throughput counter for V2X + PTO + not-traction purposes is available:	*Delete*	**Don't use virtual distance**	
5.2. Battery Performance Requirements	$\text{Virtual distance (km)} = \text{Odometer km} \times \left(\frac{\text{total energy throughput during V2X + PTO + not - traction purpose(MJ)}}{\text{total propulsion energy(MJ)}}\right)$	*Delete*	**Don't use virtual distance**	
6.3.1. Frequency of verifications	[until 5 or 8 years]	until 5 or 8 years	**Delete SB "[]"** **Sync with GTR22**	
6.3.1. Frequency of verifications	[At the option of the Contracting Party, the verification of the monitors shall not be mandatory if the annual sales of the monitor family are less than 5,000 vehicles in the market for the previous year.]	[At the option of the Contracting Party, the verification of the monitors shall not be mandatory if the annual sales of the monitor family are less than 1,000 vehicles in the market for the previous year.]	**In Japan, the total amount of HDVs is about a quarter of that of LDVs**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
6.4.1. Frequency of verifications	[Data shall be collected yearly] by the authorities from a statistically adequate sample of vehicles within the same battery durability family [selected randomly from a variety of climate conditions.]...[but in principle should not be less than 500]	[Data shall be collected yearly] by the authorities from a statistically adequate sample of vehicles within the same battery durability family [selected randomly from a variety of climate conditions.]...[but in principle should not be less than 500]	Delete SB"[]" Sync with GTR22	
6.4.2. Pass/Fail Criteria for the battery durability family	[more than 90]	more than 90	Delete SB"[]" Sync with GTR22	
6.5.	Part C: Verification of reported virtual distance or En-throughput counter	Part C: Verification of reported ~~virtual distance or En-~~energy throughput counter	In the case of eHDVs, which are often equipped by bodybuilders with PTO and/or ePTO that consume energy outside of driving or V2X, manufacturers cannot record the energy consumption of PTO and/or ePTO separately. Therefore, manufacturers shall choose to verify by energy throughput rather than by virtual distance calculation.	

Commented [JRC3]: From GTR 22 revision

Commented [JRC4]: OICA 69

The availability of customer vehicle for ISC is highly dependent on the customer as the vehicle is their tool for the business. It is unrealistic to assume the vehicle could be selected from any climate conditions to fulfill the legislation.
- How should the data collection happen exactly?
- What does a variety of climate conditions mean exactly?

Commented [JRC1]: From GTR 22 revision

Commented [JRC2]: OICA 69

The availability of customer vehicle for ISC is highly dependent on the customer as the vehicle is their tool for the business. It is unrealistic to assume the vehicle could be selected from any climate conditions to fulfill the legislation.
- How should the data collection happen exactly?
- What does a variety of climate conditions mean exactly?

Commented [JRC5]: Japan EVE 68
It depends on application of either "virtual distance" or "total km"

Commented [JRC8]: Japan EVE 68
It depends on application of either "virtual distance" or "total km"

Commented [JRC6]: GTR 22

Commented [JRC7]: EVE 69 to prepare also text for En-th verification

Commented [JRC9]: GTR 22

Commented [JRC10]: EVE 69 to prepare also text for En-th verification

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
6.5.1. Verrificatio procedure	A verification of the reported virtual distance/En-throughput counter is only required if the manufacturer is requesting to apply the equivalent virtual distance option. In order to verify the virtual distance/En-throughput read from the vehicle, a test shall be performed with adequate and representative use of the vehicle in V2X or non-traction purposes and PTO, if applicable, to verify whether the increase in virtual distance reported is accurate. The total discharge energy during this use or alternatively the total discharge energy of the vehicle (defined as the sum of the discharge energy while driving and while using the V2X , not-traction purpose and PTO) shall be measured in order to calculate the measured virtual distance. The verification procedure use case (including the minimum amount of discharged energy corresponding to at least 50 km virtual distance. If 50 km virtual distance cannot be reached with a fully charged battery, virtual distance required for verification shall be set to a value recommended by the manufacturer) shall be agreed and approved by the responsible authority.	A verification of the reported energy throughput counter is only required if the manufacturer is requesting to apply the energy throughput option. In order to verify the energy throughput read from the vehicle In order to verify the energy throughput read from the vehicle, the energy throughput to be verified shall be calculated using $UBE_{certified}$ in each applicable Table in Annex 4 and verified against the energy throughput read from the vehicleshall be agreed and approved by the responsible authority.	Don't use virtual distance	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Table 4 Step1-4	All	*Delete*	Don't use virtual distance	
6.5.2. Pass or fail of reported virtual distance	All	*Delete*	Don't use virtual distance	
6.5.3. Corrective measures for reported ~~virtual distance~~energy throughput	A fail decision for the sample means that the virtual distance calculators (algorithm) fail to report accurately the virtual distance of the system and appropriate action shall be taken by the manufacturer with the agreement of the responsible authority. This may lead to the requirement that the manufacturer repairs or replaces the faulty virtual distance calculator in all affected and future vehicles in the battery durability family, to correct already reported virtual distances for this family and to repeat the procedure for verification of Part C in order to confirm the pass or fail.	If the failure rate of a sample exceeds 10%, the manufacturer shall take appropriate action with the consent of the responsible authority. In this case, the manufacturer may be required to repair or replace the defective energy throughput calculator in all applicable and future vehicles in the battery durability family, correct the energy throughput already reported for this family, and repeat the Part C verification procedure could be required to be repeated.	Don't use virtual distance	

Commented [JRC11]: EVE 69 to prepare also text for En-th verification

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Figure 2 Flow chart for Part B : Verification of Battery Durability	[500]	*500*	**Delete SB "[]"** **Sync with GTR22**	
Annex 1 Vehicle Survey	**[Is the vehicle equipped with dynamic charging technology, such as, wireless power transfer, ground-rail, overhead trolley, overhead pantograph?** **If available, on average how often was a dynamic charging technology, such as, wireless power transfer, ground-rail, overhead trolley, overhead pantograph, used to charge the vehicle in a month?]**	**[Is the vehicle equipped with dynamic charging technology, such as, wireless power transfer, ground-rail, overhead trolley, overhead pantograph?** **If available, on average how often was a dynamic charging technology, such as, wireless power transfer, ground-rail, overhead trolley, ~~overhead pantograph,~~ used to charge the vehicle in a month?]**	**Delete "overhead pantograph", because pantagrapf means a device, doesn't mean dyanmic charging.**	
Annex 2		*. $UBE_{certified}$, [kWh]	**Add** To calculate energy throughput	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Annex 2	4. Total distance (sum of the distance driven as reported by the odometer and the virtual distance) [km], if applicable 5. Virtual distance (in km), if applicable 6.Total energy throughput in driving (propulsion system) [kWh], or in V2X and/or PTO and/or non-traction purposes [kWh], if applicable ..... 11. Total discharge energy while driving (propulsion system) [kWh], if available	*Delete*	Don't use virtual distance	
Annex 3 1. General	This annex describes the procedures for determining these parameters, in [paragraph 2.] and gives guidance on which measurements need to be performed on a vehicle selected in the Part A verification procedure.	This annex describes the procedures for determining these parameters, in ~~[~~paragraph 2.~~]~~ and gives guidance on which measurements need to be performed on a vehicle selected in the Part A verification procedure.	Delete SB "[]" Sync with GTR22	
1.1.1. Vehicle selection during type approval	[The vehicle selected during type approval to verify the SOCE monitor shall be a vehicle corresponding to the lowest energy demand configuration within Part B family.	~~[~~The vehicle selected during type approval to verify the SOCE monitor shall be a vehicle corresponding to the lowest energy demand configuration within Part B family.	Delete SB "[]" Sync with GTR22	

Commented [JRC12]: OICA EVE 69
4. Total discharging operating time (sum of the time driven as reported by the odometer and the other (i.e., PTO/V2X) time) (hours]
5. Total charging operating time (sum of the hour driven as reported by the odometer and the other (i.e., PTO/V2X/charging) time) (hours)
6. Total discharging time that C-rate was more than or equal to 0.5 (hours)

Commented [EP13]: EVE 65 GTR 22

Commented [JRC14]: PTO already added in March
N.B.
GTR 22 amendment EVE IWG 61 Ann Arbor , separate point: 11. Total discharge energy for non-traction purposes [Wh], if applicable

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
1.2. Measurement requirement	Measurement devices shall be of certified accuracy as shown in Table A3/1 traceable to an approved regional or international standard. [All the items in Table A3/1 of paragraph 1.2 of this annex, unless specified otherwise in the table, shall be measured and recorded at a frequency equal to 20 Hz for discharging and [10] Hz for charging.]	Measurement devices shall be of certified accuracy as shown in Table A3/1 traceable to an approved regional or international standard. [All the items in Table A3/1 of paragraph 1.2 of this annex, unless specified otherwise in the table, shall be measured and recorded at a frequency equal to 20 Hz for discharging and [10] Hz for charging.]	Delete SB "[]" Sync with GTR22	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Table A3/1	[Table A3/1 **Measurement items and required accuracy** *Item* | *Unit* | *Accuracy* | *Remarks* Electrical voltage | V | [±0.3 % FSD or ±1 % of reading] | Whichever is greater. Resolution 0.1 V. Electrical current | A | [±0.3 % FSD or ±1 % of reading] | Whichever is greater. Resolution 0.1 A Room/ambient temperature | K | ±1 °C, with a measurement frequency of at least 0.033 Hz Time | s | ± 10 ms; min. precision and resolution: 10 ms Vehicle speed | km/h | The total trip distance shall deviate by no more than 4 % from the reference distance | GPS or Sensor or ECU]	**Table A3/1** **Measurement items and required accuracy** *Item* | *Unit* | *Accuracy* | *Remarks* Electrical voltage | V | ±0.3 % FSD or ±1 % of reading | Whichever is greater. Resolution 0.1 V. External-measuring device Electrical current | A | ±0.3 % FSD or ±1 % of reading | Whichever is greater. Resolution 0.1 A External-measuring device Room/ambient temperature | K | ±1 °C, with a measurement frequency of at least 0.033 Hz | External-measuring device Time | s | ± 10 ms; min. | Precision and Resolution: 10 ms External-measuring device or ECU Vehicle speed | km/h | The total trip distance shall deviate by no more than 4 % from the reference distance | GPS or Sensor or ECU Notes: 1. External-measuring devices shall be calibrated. 2. The allowance for external-measuring devices and on-board sensors are determined by the respective regional approval authorities. If the deference is allowed by them at the type approval test, the manufacturer may use the value of the on-board sensor instead of the external-measuring device in type approval test, CoP, and ISC.	**Delete SB "[]"** **Sync with GTR22** **Add notes**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2.Test procedures	The cycles test method by using HD chassis dynamometer is...	The ~~cycles~~ test method by using HD chassis dynamometer is...	Measurements with the Chassis dynamometer are not limited to cycle tests	
Table A3/2	**HDV with bidirectional charging system** **Method 2** Virtual Round Trip Efficiency (VRTE) test Discharging and charging by a bidirectional power supply or charging station	**HDV with bidirectional charging system** **Method 2** ~~Virtual Round Trip Efficiency (VRTE) test~~ Discharging and charging by a bidirectional power supply or charging station	CP does not require it.	
Table A3/3	Table A3/3 Selection of the testing methods	Deleted	Details of HDV Dyno testing with similar driving characteristics have not been fully discussed yet. It will be discussed in the 2nd step. Therefore, it should still be listed as Alternative Method.	
2.1 Method 1	2.1 Method 1 HD-PEVs or HD-PVC-HEVs	For Methid 1, please check the draft by ACEA and comment.		
2.2 Method 2	2.2 Methid 2 HD-PEVs or HD-OCV-HEVs with bidirectional charging system			

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2.2.1.	[A bidirectional power supply is a power converter that can convert DC and AC power bi-directionally to any power system. It supports both DC and AC by mounting a bidirectional DC/DC converter and a bidirectional AC/DC converter inside.]	~~[~~A bidirectional power supply is a power converter that can convert DC and AC power bi-directionally to any power system. ~~It supports both DC and AC by mounting a bidirectional DC/DC converter and a bidirectional AC/DC converter inside.]~~	Delete SB"[]" From a technology-neutral perspective, specific comments have been deleted.	
2.2.1.1.	The test cell shall have a temperature set point of [25] °C. The tolerance of the actual value shall be within ±5 °C.	The test cell shall have a temperature set point of 23 °C. The tolerance of the actual value shall be within ±5 °C.	Delete SB"[]" Sync with GTR22(GTR15)	
2.2.1.3.	Soak area The temperature of the soak area shall be maintained at [25 °C ±5 °C].	Soak area The temperature of the soak area shall be maintained at 23 °C ±5 °C.	Delete SB"[]" Sync with GTR22(GTR15)	
2.2.1.4.	Required information	Delete?	GTR22 is not shown.	
2.2.1.5.	Required measurements … As an alternative to the use of voltage measurement devices, use of on-board measurement data is permissible if the accuracy and frequency of these data is demonstrated to the responsible authority to meet the minimum requirements for accuracy and frequency described in [paragraph 1.2. of this annex].	As an alternative to the use of voltage measurement devices, use of on-board measurement data is permissible if the accuracy and frequency of these data is demonstrated to the responsible authority to meet the minimum requirements for accuracy and frequency described in ~~[~~paragraph 1.2. of this annex.~~]~~	Delete SB"[]"	

Commented [JRC15]: To review the definiton

Commented [JRC18]: To review the definiton

Commented [JRC16]: OICA EVE 69

•What about other E/E components?

Commented [JRC19]: OICA EVE 69

•What about other E/E components?

Commented [JRC20]: TUV Nord
• At what voltage level shall be charged/discharged in cases where different vehicle-based voltage levels can be used. (400V vs. 800V vs …)
• Energy efficiency of OBC and further EE-components to be measured or neglected

Commented [JRC17]: TUV Nord
• At what voltage level shall be charged/discharged in cases where different vehicle-based voltage levels can be used. (400V vs. 800V vs …)
• Energy efficiency of OBC and further EE-components to be measured or neglected

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2.2.1.6.	Other information The manufacturer shall specify the normal operating range for each operational metric listed in [paragraph 2.2.2.1. of this annex]. [Regarding any VRTE operation mode (see paragraph 2.2.2.6. of this annex), the manufacturer shall provide a list of the deactivated devices and justification for the deactivation.]	Delete	GTR22 is not shown.	
2.2.2.1.	[The following operational metrics, if present, shall be monitored and recorded throughout the test: (a) battery temperature (minimum, maximum, as indicated by maximum temperature of battery cells, modules, or pack, as available), (b) battery state of charge (from BMS and dashboard), (c) battery cooling on/off, as available. The manufacturer shall specify the normal operating range for each operational metric.]	~~[~~The following operational metrics, if present, shall be monitored and recorded throughout the test: (a) battery temperature (minimum, maximum, as indicated by maximum temperature of battery cells, modules, or pack, as available), (b) battery state of charge (from BMS and dashboard), (c) battery cooling on/off, as available. The manufacturer shall specify the normal operating range for each operational metric.~~]~~	Delete SB"[]"	

Commented [JRC21]: OICA EVE 69

Commented [JRC22]: TUV Nord

Commented [JRC23]: OICA EVE 69

Commented [JRC24]: TUV Nord

2.2.2.5.	Vehicle and bidirectional charger installation and pre-conditioning The REESS of the vehicle shall be discharged, left stabilized for a minimum of 30 minutes and maximum 1h and then fully charged at normal charge before starting the test as specified in Figure A3/3. The manufacturer may recommend a longer stabilisation time if necessary to ensure stabilization of the high voltage battery. [The vehicle and the bidirectional charger shall be installed for the preconditioning if the first discharge of the battery is performed with a bidirectional system] The bidirectional charger shall be [conditioned] or [warmed up in accordance with the manufacturer's recommendations], as appropriated, so that the internal electrical systems may be stabilised. Auxiliary devices of the vehicle shall be switched off or deactivated during bidirectional charge. If necessary to operate properly the bidirectional charger, the vehicle's bidirectional charge operation mode shall be activated by using the manufacturer's instruction.	~~[~~The vehicle and the bidirectional charger shall be installed for the preconditioning if the first discharge of the battery is performed with a bidirectional system. The bidirectional charger shall be conditioned or warmed up in accordance with the manufacturer's recommendations, as appropriated, so that the internal electrical systems may be stabilised.~~]~~	**Delete SB"[]"**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	The manufacturer shall provide the responsible authority a list of the deactivated devices and justification for the deactivation. The bidirectional charge operation mode shall be approved by the responsible authority and the use of a bidirectional charge operation mode shall be recorded. The vehicle's bidirectional charge operation mode shall not activate, modulate, delay or deactivate the operation of any part that affects the battery energy throughput under the test conditions, [except for the internal battery heating-cooling system]. The manufacturer shall provide evidence to the responsible authority	~~[~~The vehicle's bidirectional charge operation mode shall not activate, modulate, delay or deactivate the operation of any part that affects the battery energy throughput under the test conditions, except for the internal battery heating-cooling system.~~]~~	Delete SB"[]"	

2.2.2.5.	This first battery discharge, referred to as pre-conditioning, shall be performed according to manufacturer's recommendation or given power or C-rate within the range of the characteristic regional speeds without requirements on the ambient temperature. The manufacturer will guarantee that the REESS is as fully depleted as possible by the discharge test procedure. The end of discharge criterion is reached when the break-off criterion is met. [The break-off criterion is reached when [an indication to stop the system appears on the instrument panel], or [the system cannot maintain the set power any longer]. [(exceeds the tolerance defined as the power corresponding at the minimum speed of Method1a or 1b for 4 consecutive seconds or more)] [If the discharge is performed driving the vehicle, in case of HD-PEV,, the break-off criterion is reached when the vehicle exceeds the driving speed tolerance or experiences a driving power cut for 4 consecutive seconds or more. If the HD-PEV does not experience a decrease of driving speed or a driving power cut for vehicle design, or the	This first battery discharge, referred to as pre-conditioning, shall be performed according to manufacturer's recommendation or given power or C-rate within ~~the range of the characteristic regional speeds without~~ requirements on the ambient temperature. ~~[~~The break-off criterion is reached when an indication to stop the system appears on the instrument panel, or the system cannot maintain the set power any longer.~~]~~ ~~[(exceeds the tolerance defined as the power corresponding at the minimum speed of Method1a or 1b for 4 consecutive seconds or more)]~~ ~~[If the discharge is performed driving the vehicle, in case of HD-PEV,, the break-off criterion is reached when the vehicle exceeds the driving speed tolerance or experiences a driving power cut for 4 consecutive seconds or more.~~ ~~If the HD-PEV does not experience a decrease of driving speed or a driving~~	**There is no effect of speed due to regional characteristics (Method 2 is without vehicle movement)** **Delete SB"[]"** **There is no driving mode in Method 2, therefore the following has been deleted.**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	battery cannot be depleted on the road for safety reason, the remaining battery depletion shall be completed by on-board auxiliary systems 1up to a specific warning indication on the vehicle dashboard to stop the discharge, defined by manufacturer for this specific purpose. The break-off criterion is reached when this warning indication is displayed on the dashboard. The manufacturer shall provide the list of warning indications to the responsible authority. 2up to the deactivation of the powertrain, i.e., no driving mode/traction is possible as not enough power is left to move the vehicle. The break-off criterion is reached when the deactivation of the powertrain is reached. 3Alternative is to introduce a voltage value see comment The manufacturer shall provide evidence to the responsible authority after the test that this requirement is fulfilled.]	~~power cut for vehicle design, or the battery cannot be depleted on the road for safety reason, the remaining battery depletion shall be completed by on-board auxiliary systems~~ ~~1up to a specific warning indication on the vehicle dashboard to stop the discharge, defined by manufacturer for this specific purpose. The break-off criterion is reached when this warning indication is displayed on the dashboard. The manufacturer shall provide the list of warning indications to the responsible authority.~~ ~~2up to the deactivation of the powertrain, i.e., no driving mode/traction is possible as not enough power is left to move the vehicle. The break-off criterion is reached when the deactivation of the powertrain is reached.~~ ~~3Alternative is to introduce a voltage value see comment~~ ~~The manufacturer shall provide evidence to the responsible authority after the test that this requirement is fulfilled.]~~		

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2.2.2.6.	If the soak and charge is performed in a soak area or test cell the soak area temperature during soak shall be as specified in [paragraph 2.2.1.3. of this annex]. It is allowed to operate a battery internal [pre-warming] system if available, recording the energy consumption for all the soak and charge duration. External [pre-warming] systems, different from charging stations, are not allowed.	If the soak and charge is performed in a soak area or test cell the soak area temperature during soak shall be as specified in ~~[~~paragraph 2.2.1.3. of this annex.~~]~~ It is allowed to operate a battery internal ~~[~~pre-warming~~]~~ system if available, recording the energy consumption for all the soak and charge duration. External ~~[~~pre-warming~~]~~ systems, different from charging stations, are not allowed.	Delete SB"[]"	
	The battery shall be charged at full with the highest normal charging power available according to vehicle specification [≤150kW] . by the bidirectional charging system or a charging station. [Record the charge current and voltage and the elapsed time required to reach the fully charge battery.]	The battery shall be charged at full with the highest normal charging power available according to vehicle specification ~~[≤150kW]~~ . by the bidirectional charging system or a charging station. ~~[~~Record the charge current and voltage and the elapsed time required to reach the fully charge battery.~~]~~	No upper limit specification is necessary. Delete SB"[]"	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	The vehicle shall be soaked for a [minimum of 6 hours and a maximum of 36 hours] to ensure temperature stabilization of the high voltage battery. [In the case in which the charge is performed with the bi-directional power supply the battery shall be charged at full at constant power/C-rate equal or less than C/5, according to operating limits or the highest normal charging power available according to vehicle specification [≤150kW].	The vehicle shall be soaked for a ~~[~~minimum of 6 hours and a maximum of 36 hours~~]~~ to ensure temperature stabilization of the high voltage battery. ~~[~~In the case in which the charge is performed with the bi-directional power supply the battery shall be charged at full at constant power/C-rate equal or less than C/5, according to operating limits or the highest normal charging power available according to vehicle specification ~~[≤150kW]~~	Delete SB"[]" No upper limit specification is necessary.	
	[Fully charged battery status shall be reached. If the battery is recharged with a charging station and the selected power/c-rate charging does not allow to reach the full charged status of the battery due to battery protection systems, it is allowed to complete the charging by applying a slower charging unplugging and plugging again the vehicle with/without waiting time between the two charges.]	~~[~~Fully charged battery status shall be reached. ~~If the battery is recharged with a charging station and the selected power/c-rate charging does not allow to reach the full charged status of the battery due to battery protection systems, it is allowed to complete the charging by applying a slower charging unplugging and plugging again the vehicle with/without waiting time between the two charges.]~~	Delete SB"[]" Since the method may differ depending on the manufacturer, there is no need to describe the specific method.	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	[The temperature of the battery shall be checked before starting the test. It is allowed to extend the soak and charge time to stabilise the temperature of the battery] [If the soak and charge is performed in a soak area, the vehicle shall not receive unjustified exposure to other temperatures but if that is unavailable this time should in any case be limited to a maximum of [10] minutes.] [To monitor the operating metrics and perform additional conditioning as necessary is allowed to maintain the operating metrics within the normal operating temperature ranges].	~~[~~The temperature of the battery shall be checked before starting the test. It may allow ~~is allowed~~ to extend the soak and charge time to stabilise the temperature of the battery~~]~~ ~~[~~If the soak and charge is performed in a soak area, the vehicle shall not receive unjustified exposure to other temperatures but if that is unavailable this time should in any case be limited to a maximum of ~~[~~10~~]~~ minutes.~~]~~ ~~[To monitor the operating metrics and perform additional conditioning as necessary is allowed to maintain the operating metrics within the normal operating temperature ranges].~~	**Delete SB"[]"** **Coordination with the approval authority is required.** **Requirements for maintaining within the operating temperature range differ depending on the manufacturer, so there is no need to describe the specific method.**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
2.2.2.7.	Method 2 bidirectional charging system test The actual test run shall start within a period of 1 hour after the disconnection of the vehicle from the grid, otherwise the preconditioning and charge shall be repeated. If the same instrument is used both for charging and discharging the battery of the vehicle, the actual test run shall start within a period of 1 hour after the setting of the bi-directional charging system in the discharging mode, with or without the disconnection of the system according to the operational instruction of the system]. [The test shall be carried out with a power range derived from the regional characteristic speed and payload per Gross Vehicle Mass (GVM) and Gross Train Mass (GTM) in agreement with the responsible authorities as in Method 1a.]	Method 2 bidirectional charging system test The actual test run shall start within a period of 1 hour after the disconnection of the vehicle from the grid, otherwise the preconditioning and charge shall be repeated. If the same instrument is used both for charging and discharging the battery of the vehicle, the actual test run shall start within a period of 1 hour after the setting of the bi-directional charging system in the discharging mode, with or without the disconnection of the system according to the operational instruction of the system .~~]~~ ~~[~~The test shall be carried out with a power range derived from the regional characteristic speed and payload per Gross Vehicle Mass (GVM) and Gross Train Mass (GTM) in agreement with the responsible authorities as in Method 1a.~~]~~	Delete SB"[]"	
	The end of discharge criterion is reached when the break-off criterion is met. [The break-off criterion is reached when, or [the system cannot maintain the set power any longer].	The end of discharge criterion is reached when the break-off criterion is met. ~~[The break-off criterion is reached when, or [the system cannot maintain the set power any longer].~~	Method 2 has no driving mode, so it has been deleted.	

	The UBEdischarge is the total discharged energy calculated as described in [paragraph 4. of this annex]. The HD-PEV and HD-OVC-HEV shall be connected to the mains within 120 minutes after coming to a standstill], if required. [The REESS shall be fully charged with a defined [constant power/C-rate] equal or less than C/5 according to operating limits or the highest normal charging power available according to vehicle specification ≤150kW.] The end of charge criterion is reached when a fully charged REESS or assembly of REESS is detected by the on-board or external instruments. If the selected power/C-rate charging does not allow to reach automatically the full charged status of the battery due to battery protection systems, it is allowed to complete the charging by applying a slower charging power/C-rate with/without waiting time between the two charges The UBEcharge is the total charged energy calculated as described in [paragraph 4. of this annex]. The full cycle efficiency is calculated by dividing the UBEdischarge by the UBEcharge.	The UBEdischarge is the total discharged energy calculated as described in ~~[~~paragraph 4. of this annex.~~]~~ The HD-PEV and HD-OVC-HEV shall be connected to the mains within 120 minutes after coming to a standstill~~]~~, if required. ~~[~~The REESS shall be fully charged with a defined constant power/C-rate equal or less than C/5 according to operating limits or the highest normal charging power available according to vehicle specification ~~≤150kW.]~~ The end of charge criterion is reached when a fully charged REESS or assembly of REESS is detected by the on-board or external instruments. If the selected power/C-rate charging does not allow to reach automatically the full charged status of the battery due to battery protection systems, it is allowed to complete the charging by applying a slower charging power/C-rate with/without waiting time between the two charges The UBEcharge is the total charged energy calculated as described in ~~[~~paragraph 4. of this annex.~~]~~ The full cycle efficiency is calculated by dividing the UBEdischarge by the UBEcharge.	**Delete SB"[]"** **Delete SB"[]"** **No upper limit specification is necessary.** **Delete SB"[]"**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	[The test Method 2 is performed on new vehicles within a family, if applicable, to determine the UBEcertified, defined as [UBEdischarge. cert] The test Method 2 is performed on [aged vehicles within a family] to determine the UBEmeasured, defined as [UBEdischarge,meas]. The SOCEmeasured is derived according to paragraph [6.3.2. of this GTR] For HD-OVC-HEV the internal combustion engine shall not operate during the duration of the test.	~~[~~The test Method 2 is performed on new vehicles within a family, if applicable, to determine the UBEcertified, defined as ~~[~~UBEdischarge. cert~~]~~ The test Method 2 is performed on ~~[~~aged vehicles within a family~~]~~ to determine the UBEmeasured, defined as ~~[~~UBEdischarge,meas~~]~~. The SOCEmeasured is derived according to paragraph ~~[~~6.3.2. of this GTR~~]~~ For HD-OVC-HEV the internal combustion engine shall not operate during the duration of the test.	**Delete SB"[]"**	
2.3.	Alternative method	All SB[]	**Alternative methods will be discussed in detail in Phase 2. Therefore, the General Test Requirements and subsequent sections will be deleted (they should be added in Phase 2).**	
2.3.1	Constant and/or transient cycles test method by using HD chassis dynamometer	All SB[]	**Same as above**	
2.3.1.1.	General test requirements	All SB[]	**Same as above**	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
	In the Alternative Method the battery shall be depleted by a cycles test method by driving the vehicle on a HDV chassis dynamometer as per this paragraph after pre-conditioning. This method allows both constant speed test and transient condition test on HD chassis dynamometer. The road load dyno setting, the measurement points together with the test cycle must be identical at type approval and during in-service testing Part A verification for the SOCE monitor family concerned.	All SB[]	Same as above	

Article	COM proposal, regulation text v21	OICA proposal, regulation text (proposals in blue)	OICA comments	Observations
Annex 4 (optional annex) Table 1	Table 1 **Battery Energy based (SOCE) MPR for Category 2 vehicles not exceeding 16 tonnes**	Table 1 **Battery Energy based (SOCE) MPR for Category 2 vehicles not exceeding 1620 tonnes**	**Original MPR conditions are deleted, and 2 new conditions 5 years/150,000km and 8 years/240,000km with energy throughput [kWh] condition are added.** **Change GVW range.**	
Annex 4 (optional annex) Table 2	Table 2 **Battery Energy based (SOCE) MPR for Category 2 vehicles exceeding 16 tonnes**	Table 2 **Battery Energy based (SOCE) MPR for Category 2 vehicles exceeding 1620 tonnes**	**Same as above**	

Table 1
Battery Energy based (SOCE) MPR for Category 2 vehicles not exceeding 16 tonnes

*Battery energy based MPR for **Category 2 vehicles not exceeding 16 tonnes***	*HD-OVC-HEV*	*HD-PEV*
From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]		
6 yr, 150 000 km	70%	70%
8 yr, 300 000 km		
8 yr, 400 000 km		
10 yr, 300 000 km		
10 yr, 375 000 km		
15 yr, 250 000 km		

Table 1
Battery Energy based (SOCE) MPR for Category 2 vehicles not exceeding 1620 tonnes

*Battery energy based MPR for **Category 2 vehicles not exceeding 16 tonnes***	*HD-OVC-HEV*	*HD-PEV*
From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]		
5 yr or 150 000 km or Energy throughput <1,100 cycles*$UBE_{certified}$> kWh	75%	75%
6 yr, 150 000 km	70%	70%
8 yr or 240 000 km or Energy throughput <1,760 cycles*$UBE_{certified}$> kWh	65%	65%
8 yr, 300 000 km		
8 yr, 400 000 km		
10 yr, 300 000 km		
10 yr, 375 000 km		
15 yr, 250 000 km		

Table 2
Battery Energy based (SOCE) MPR for Category 2 vehicles exceeding 16 tonnes

*Battery energy based MPR for **Category 2 vehicles exceeding 16 tonnes***	*HD-OVC-HEV*	*HD-PEV*
From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]		
6 yr, 150 000 km	70%	70%
8 yr, 600 000 km		
10 yr, 700 000 km		
12 yr, 700 000 km		
15 yr, 875 000 km		

Table 2
Battery Energy based (SOCE) MPR for Category 2 vehicles exceeding 1620 tonnes

*Battery energy based MPR for **Category 2 vehicles exceeding 16 tonnes***	*HD-OVC-HEV*	*HD-PEV*
From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]		
5 yr or 150 000 km or Energy throughput <1,400 cycles*$UBE_{certified}$> kWh	75%	75%
6 yr, 150 000 km	70%	70%
8 yr or 240 000 km or Energy throughput <2,240 cycles*$UBE_{certified}$> kWh	65%	65%
8 yr, 600 000 km		
10 yr, 700 000 km		
12 yr, 700 000 km		
15 yr, 875 000 km		

<table>
<tr><th>Article</th><th>COM proposal, regulation text v21</th><th>OICA proposal, regulation text (proposals in blue)</th><th>OICA comments</th><th>Observations</th></tr>
<tr><td>Annex 4 (optional annex)
Table 3</td><td>Table 3
Battery Energy based (SOCE) MPR for Category 1-2 vehicle not exceeding 5 tonnes
<table><tr><th>Battery energy based MPR for Category 1-2 vehicle not exceeding 5 tonnes</th><th>HD-OVC-HEV</th><th>HD-PEV</th></tr><tr><td>From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]</td><td></td><td></td></tr><tr><td>6 ys, 150 000 km</td><td>70%</td><td>70%</td></tr><tr><td>8 ys, 160 000 km</td><td></td><td></td></tr><tr><td>8 ys, 300 000 km</td><td></td><td></td></tr><tr><td>10 ys, 200 000 km</td><td></td><td></td></tr></table></td><td>Table 3
Battery Energy based (SOCE) MPR for Category 1-2
wo-seatbelt vehicles ; All segments
w-seatbelt vehicles: not exceeding 14 tonnes
<table><tr><th>Battery energy based MPR for Category 1-2 vehicle not exceeding 5 tonnes</th><th>HD-OVC-HEV</th><th>HD-PEV</th></tr><tr><td>From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]</td><td></td><td></td></tr><tr><td>5 yr or 150 000 km or Energy throughput <1,100 cycles*UBE_{certified} kWh</td><td>75%</td><td>75%</td></tr><tr><td>6 ys, 150 000 km</td><td>70%</td><td>70%</td></tr><tr><td>8 yr or 240 000 km or Energy throughput <1,760 cycles*UBE_{certified} kWh</td><td>65%</td><td>65%</td></tr><tr><td>8 ys, 160 000 km</td><td></td><td></td></tr><tr><td>8 ys, 300 000 km</td><td></td><td></td></tr><tr><td>10 ys, 200 000 km</td><td></td><td></td></tr></table></td><td>Same as above</td><td></td></tr>
<tr><td>Annex 4 (optional annex)
Table 4</td><td>Table 4
Battery Energy based (SOCE) MPR for Category 1-2 vehicle exceeding 5 tonnes but not exceeding 7.5 tonnes
<table><tr><th>Battery energy based MPR for Category 1-2 vehicle exceeding 5 tonnes but not exceeding 7.5 tonnes</th><th>HD-OVC-HEV</th><th>HD-PEV</th></tr><tr><td>From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]</td><td></td><td></td></tr><tr><td>6 ys, 150 000 km</td><td>70%</td><td>70%</td></tr><tr><td>8 ys, 300 000 km</td><td></td><td></td></tr><tr><td>8 ys, 500 000 km</td><td></td><td></td></tr><tr><td>10 ys, 375 000 km</td><td></td><td></td></tr><tr><td>15 ys, 240 000 km</td><td></td><td></td></tr></table></td><td>Table 4
Battery Energy based (SOCE) MPR for Category 1-2
w-seatbelt vehicles: exceeding 14 tonnes
<table><tr><th>Battery energy based MPR for Category 1-2 vehicle exceeding 5 tonnes but not exceeding 7.5 tonnes</th><th>HD-OVC-HEV</th><th>HD-PEV</th></tr><tr><td>From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]</td><td></td><td></td></tr><tr><td>5 yr or 150 000 km or Energy throughput <1,400 cycles*UBE_{certified} kWh</td><td>75%</td><td>75%</td></tr><tr><td>6 ys, 150 000 km</td><td>70%</td><td>70%</td></tr><tr><td>8 yr or 240 000 km or Energy throughput <2,240 cycles*UBE_{certified} kWh</td><td>65%</td><td>65%</td></tr><tr><td>8 ys, 300 000 km</td><td></td><td></td></tr><tr><td>8 ys, 500 000 km</td><td></td><td></td></tr><tr><td>10 ys, 375 000 km</td><td></td><td></td></tr><tr><td>15 ys, 240 000 km</td><td></td><td></td></tr></table></td><td>Same as above</td><td></td></tr>
<tr><td>Annex 4 (optional annex)
Table 5</td><td>Table 5
Battery Energy based (SOCE) MPR for Category 1-2 vehicle exceeding 7.5 tonnes
<table><tr><th>Battery energy based MPR for Category 1-2 vehicle exceeding 7.5 tonnes</th><th>HD-OVC-HEV</th><th>HD-PEV</th></tr><tr><td>From start of life to years or km, whichever comes first and kWh in monitoring [and additional lifetime]</td><td></td><td></td></tr><tr><td>6 ys, 150 000km</td><td>70%</td><td>70%</td></tr><tr><td>8 ys, 600 000 km</td><td></td><td></td></tr><tr><td>10 ys, 300 000km</td><td></td><td></td></tr><tr><td>10 ys, 700 000km</td><td></td><td></td></tr><tr><td>12 ys, 700 000km</td><td></td><td></td></tr><tr><td>15 ys, 875 000km</td><td></td><td></td></tr></table></td><td>Delete</td><td>Same as above</td><td></td></tr>
</table>