

<b>WLTP Sub Group EV</b>	
<b>Date</b>	9 <sup>th</sup> to 11 <sup>th</sup> of March 2015
<b>Time</b>	9 <sup>th</sup> 13:00 to 17:00 CET 10 <sup>th</sup> 9:30 to 17:00 CET 11 <sup>th</sup> 9:30 to 12:00 CET
<b>Location</b>	JAMA Europe (Brussels)
<b>Title</b>	WLTP Sub Group EV Meeting — Minutes
<b>Working Paper Number</b>	WLTP-SG-EV-07-14

### Agenda

	OIL		
1		Welcome and adaption of agenda	
<p>Adaption of meeting minutes from last phone conference the 13<sup>th</sup> of February.            Comment from ACEA, regarding only one alternative solution if the combined approach does not work. To test and use worst case values can also be an alternative option.            European Commission (EC) means that the affect from electric components needs to be considered for the combined approach family.</p>			
2	#50 #55	RCB correction Phase specific calculation	WLTP-SG-EV-07-02 WLTP-SG-EV-07-03-rev1 WLTP-SG-EV-07-08 WLTP-SG-EV-07-10
<p>Discussion paper from JP. Same correction factor for interpolation family. Confirmed by Jama data.            But only one manufacturer, request from Subgroup EV that it needs to be evaluated with other manufacturer (comment: VW is running simulations on this which were not available for the Brussels meeting yet).</p> <p>Simulation by BMW confirms the approach with an error below 1 percent.            JP supports the results.            Vehicle H preliminary choice for determination of correction factor.</p> <p>T&amp;E would like to see results from uncorrected data because a small delta SOC with a small correction factor does not justify the approach. BMW explained during the meeting that this aspect has already been considered in Pune (WLTP-SG-EV-06-11e RCB correction_application_v2.pdf).</p>			
<p><b>Conclusion</b>            SG EV agrees for OI #50 on the approach with same correction factor for the interpolation family determined from vehicle H which is also covering the phase specific values for the charge-sustaining-test (OI #55) Will have a look at data from VW, but can start with drafting. VW data will be circulated to the group as soon as they are available.</p> <p>Regarding the second part of OI #55 (phase specific values for the CD test), for vehicles that do not have a complete test cycle in the CD test, two options are proposed by JP.            Either to conduct each phase test, or to test the vehicle according to annex 6. There it is</p>			

considered as a conventional vehicle (only test CS has to be conducted).

T&E means that the preconditioning needs to be reconsidered in order to have neutral SOC. That means that these vehicles are considered as NOVC-HEV.

One benefit for the manufacturer is the reduced test burden for the manufacturer.

There will be data for ranges for complete cycle but not for individual phases.

Sub Group EV agrees on not to use this alternative.

There is a need to agree on the way how to determine the ranges that are possible to determine. How big the problem is, depends on the number of these kinds of vehicles with such short range which cannot finalize the complete test cycle in the CD test, or for which the first cycle is the transition cycle.

### Conclusion

EC and JP accept that vehicles where the first cycle is the transition cycle will not have CD phase specific values for all individual CD phases, but will have phase specific values for phase which are driven in CD conditions.

It should be at the option of the manufacturer to determine the phase specific values which are not able to be calculated by conducting phase individual tests (e.g. L-L-L-...till end of test).

### Next step

...

JP provides the calculation formula for this specific condition. Drafting of GTR text.

3	#02	Interpolation family for the combined approach	WLTP-SG-EV-07-03 WLTP-SG-EV-07-10
	#56	Combined Approach	WLTP-SG-EV-04-02

#02:

JP proposes to add additional items to the family criteria for NOVC-HEV and OVC-HEV in addition to the items for conventional vehicles. JP proposal for family criteria for PEV is also presented (...).

EC is of the opinion that there is still missing additional criteria for operational strategies (control strategy). And for the number of electric motors. Point b) from the proposed criteria for PEV could be considered to be added and revised to reflect the concern from EC. JP will improve the proposal to the next meeting.

VW is preparing a proposal that will be presented in advance of the next meeting in Stockholm.

#56:

At the last phone conference there was a request that JP should provide results for validation that the combined approach works for OVC-HEV (especially regarding the case with start of the ICE). JP is of the opinion that since only EAER and R<sub>cd</sub> are required the interpolation method should work well. Who??? will have data from vehicle H and vehicle L and can interpolate for phases and complete cycle.

There can be a step in the interpolation line or a non-linearity depending on engine start in different phases for vehicle L and vehicle H.

One option could be to neglect this non-linearity for individual phases because the error is small. JP proposal is to use the average line between vehicle H and vehicle L for interpolation instead since JP can accept this tolerance due to the non-linearity. Another option would be to use the worst case values for phases.

Further it would be an option to test every single phase case, which in practice will be impossible.

Since only used for customer information in JP, JP can accept this level of inaccuracy. In order to reduce the test burden, it should be possible to calculate values not only for specific phases but also for the city cycle. If calculation of city cycle values should be used in the GTR, the error for vehicles where the start of ICE is in different phases/cycles needs to be considered.

As there is not enough time left to validate the combined approach with testing for OVC-HEV there is a risk to be able to include it in phase 1b. Because of the non-linearity in the interpolation line a compromise can be to use worst case data when there is a non-linearity shown for electric energy consumption.

It was pointed out by the EC and the IG WLTP Co-technical secretary that the combined approach is a corner stone in WLTP and the ambition should be to use it even for OVC-HEV.

EC has the position that the validity of the combined approach needs to be established for specific phases, complete cycle and the city cycle. EC does not object to calculate phase specific values, although they will not be used in EU.

ACEA presentation from the meeting the 4th of July (WLTP-SG-EV-04-02) regarding combined approach.

T&E comment regarding brake regeneration strategy, and if this should be part of family definition.

ACEA responded that this is connected to the mode discussion (different modes can have different behavior) and this will be not a problem for the combined approach. More appropriate to discuss this when discussing the modes.

Next step is to once again reflect what parameters do have a problem within the combined approach.

JP requires the combined approach also for phase specific values EAER,  $R_{cda}$  and electric consumption. JP pointed out that these parameters will not be a problem with the combined approach in combination with the additional " $R_{cdc}$ "-family criteria (proposed by JP).

Regarding  $R_{cdc}$ , ACEA proposes that, if vehicle H and vehicle L have not the same value, it could be a solution to drive an additional CS test to have the same number of cycles. This will give the possibility to use the calculation. This still has to be evaluated.

In the current GTR text, four percent of the cycle energy demand coming from electric storage is the criteria for end of CD test.

ACEA proposes to adjust the wording so that it is possible to include one additional CS test for vehicle H.

As long as there is no additional test burden the approach for combined approach proposed by JP is also accepted by EC and ACEA.

There was a slight misunderstanding from the last web-audio-meeting of what kind of validation is necessary.

The request from ACEA was that JP shall show an example using the calculation formulas for phase specific values. For example (and especially) the case where start of ICE is in different phases/cycles.

One problem is that a big tolerance in accuracy for energy consumption in these cases needs to be accepted.

ACEA proposes additional criteria for the family as a solution for this problem. This problem is present both for phase specific values as for the complete cycle. In all other cases except this one with the start of ICE in different phases/cycles the combined approach works well for electrified vehicles (NOV/OVC-HEV and PEV).

**Conclusion**

Bilateral discussion between ACEA and JP to clarify the problem with start of ICE in different cycles.

A proposal to solve the problem will be presented at the next meeting.

The procedure of the combined approach for cases with a complete CD cycle is accepted (except for CD phase specific values as there is still validation necessary concerning the accuracy especially for the calculation of the AER<sub>city</sub>)

There is still need to revise the family criteria with respect to the phase specific values. In order to do this, JP asks ACEA to provide data to evaluate a proposal for family criteria for phase specific values.

Regarding the choice of the mid vehicle a tolerance of plus/minus 10 percent of the energy demand from the virtual mid vehicle can be accepted.

T&E comments that the choice of the mid vehicle needs to be considered in order to avoid flexibility.

It is proposed that the choice of the vehicle shall be done with the approval of type approval authority.

4	#51	Mode selectable switch (OVC-HEV)	WLTP-SG-EV-07-03-rev1 WLTP-SG-EV-07-09 WLTP-SG-EV-07-10
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To be in line with ICE, JP proposes to use the predominant mode for CS test Because in the current GTR it is described to use a charging balance neutral mode, but this is not clearly defined.

EC questions if the definition of predominant mode is applicable to EV. Answer is that it is not applicable with current GTR text.

Text proposal for the mode selection for the CD test is presented.

T&E is of the opinion that only one mode can have highest cycle energy. If a vehicle cannot follow the drive trace in CD mode it is likely that they cannot follow the trace in CS test. The part dealing with vehicles that cannot follow the drive trace is therefore deleted.

As the methodology how to handle a vehicle which has no predominant mode (1.2.6.5.2.4) needs to consider electrified vehicles as well, the text should be copied, inserted and revised in annex 8.

Question is raised: Is a different mode characteristic already a different mode? (as there can (per definition) only be **one** predominant mode)

**Provisional conclusion**

The predominant mode shall be used for CS and CD test. If there is no predominant mode in CD condition the most electric energy consuming mode shall be used in CD test. If there is no pre dominant mode in CS condition the same procedure as for ICE will be used.

Question concerning different mode characteristic is still open.

At the request of the manufacturer additional modes can be tested for range determination. Needs to discuss further regarding how to handle these values.

ACEA will scrutinize the provisional conclusion and present a proposal in time before the next meeting.			
5	#52	End of range criteria for PEV	WLTP-SG-EV-07-03-rev1 WLTP-SG-EV-07-10
<p>Regarding PEVs that cannot follow the speed trace: There are three options proposed</p> <ul style="list-style-type: none"> <li>- One methodology to use the downscale method,</li> <li>- one methodology how to handle vehicles with capped speed or</li> <li>- SAE methodology with reference cycle.</li> </ul> <p>JP supports the downscaling method with the usage of peak power from the electric motor defined in R85 and capped speed but not lower than 120 km/h. JP does not support SAE method (SAE method means using the first cycle as a reference cycle).</p> <p>The open question is if a cycle modification according to SAE is allowed or not.</p> <p>JP means that the cycle modification according to SAE gives a benefit for the manufacturer and might allow a unfair competition.</p> <p>EC means that PEVs should follow the approach from ICE (downscaling method). Applying the downscale method with peak power which is well defined. For the regulator it is ok. Up to industry to show the case where it does not work.</p> <p><b>Conclusion</b> Agree to use the downscale method with peak power of electric motor defined in UN ECE R85. If the definition of the system power is available from the EVE the GTR needs to be amended. The amendment shall also be considered when planning phase 2 of WLTP.</p>			
6	# 58	PEV shorten test procedure (STP)	WLTP-SG-EV-07-03-rev1 WLTP-SG-EV-07-11
<p>Presentation of proposal. Discussion points.</p> <p>T&amp;E raised the question if STP is a mandatory requirement or just an alternative to current procedure. This will affect the range-limit for the usage of the STP, as proposed by JP.</p> <p>The speed for constant speed cycle is not yet justified. There is a strong need to evaluate the sensitivity of the constant speed on the usable battery energy (UBE).</p> <p><i>Philosophical discussion.</i> <i>Do we really need the range someday in the future? (compared with ICE where there is no request for range)</i> <i>In the future, with expected longer ranges, they will not be requested by customer (similar to the situation today with ICE vehicles which do not specify the range).</i></p> <p>Proposal that there should only be used one boundary condition for the range limit from where on STP shall be applied There shall also be only one STP, The ExH phase has always to be included in the procedure as it is possible to exclude ExH with calculation.</p> <p>There are advantages for the manufacturer not only regarding test burden. EV will have longer ranges in the future. STP gives the possibility to calculate the phase specific values as well as the city range. Furthermore, the repeatability is better because of shorter time demand for type 1 test procedure.</p>			

EC is of the opinion that vehicles should run a real cycle and calculate values from that. STP is an artificial cycle. This may cause manufacturers to design batteries with fast discharge which may not be reflected in real world driving.

It needs to be considered that the end of test criterion (ETC) will be a design criterion because it is affecting the range.

There is a big chance that ETC will be in ExH, but if the vehicle can pass the exH phase, this can extend the range significantly.

The first Low-phase will reflect cold start and low regenerative energy using the STP as well as using the current procedure, consecutive cycle procedure (CCP).

T&E propose to use same calculation procedure for the STP and for the CCP. This will assure that the values are the same at the boundary condition (range-limit) calculated by each of the two procedures.

Definition of boundary condition should reflect a number of consecutive cycles for vehicle high. Distinction between L-M-H and L-M-H-ExH. 4 consecutive cycles for L-M-H and 3 for L-M-H-ExH. Will give almost the same remaining energy after the 2nd cycle sequence before the last constant speed cycle in the STP starts. This energy will be approximately equal to the energy demand to drive one ExH.

T&E means that the STP should be mandatory to avoid cherry picking.

VW proposes that STP should be an alternative and not mandatory. .

If you use the same calculation for the both procedures with UBE it will give approximately the same result.

VW scrutiny its reservation and will come back with proposal regarding boundary condition at the next meeting.

Regarding duration of CSC<sub>E</sub> BMW means that the minimum duration cannot be defined to 5 km because it depends on the remaining energy in the REESS, can accept 3 km duration.

EC propose to base the duration on energy consumed.

JP will present a proposal at the next meeting. Ask ACEA to consider this also to the next meeting.

T&E also believes that brake energy recuperation strategy should be the same in all cycles. Maybe could be part of family definition.

In order to make sure that the procedure is not open for loopholes.

T&E propose that normalization of the actual speed trace also needs to be considered in order to avoid a longer range caused by the driving behavior.

ACEA means that the approach as proposed for ICE cannot be used for PEV e.g. due to the impact of recuperation. A normalization method for PEV needs to be developed and validated.

### **Conclusion**

If there is an agreement about the range limit as a boundary condition for the application of STP and CCP, a decision will be made at the next meeting.

JP will provide data regarding constant speed cycle before the next meeting.

JP will present a proposal regarding duration of the constant speed cycles before the next meeting.

7	# 57	Utility Factor	WLTP-SG-EV-07-07-rev1
<p>Revised version of draft GTR proposal submitted by BMW. Include reference to specific version of SAE standard.          Proposal accepted by Sub Group EV.  <b>Next step</b>          Adoption to the GTR.</p>			
8	# 53	FCV test procedure	WLTP-SG-EV-07-05 WLTP-SG-EV-07-06
<p>Different options to measure the hydrogen consumption:          - gravimetric,          - pressure and          - flow method.</p> <p>Position not aligned between ACEA, EC and JP.          Proposal from JP is based on ISO/SAE but is modified for the GTR.</p> <p>For flow method the procedure is not modified and not validated by JP.</p> <p>JP supports the pressure and gravimetric method, ACEA supports all three.          EC questions why three methods are necessary.</p> <p>ACEA requests to include all three methods in GTR due to the flexibility and to support the development of new technologies.          Proposal that this can also be part of annex 9 (system equivalence).</p> <p>Propose that for phase 1b includes both gravimetric and pressure method and reserve place for flow method for development in future phases of WLTP. Include in annex 9 is more flexible alternative.</p> <p>As JP needs phase specific values for FCV, an advantage to use the flow method is that it technically possible to conduct online measurement. The other two methods are conducted after the test, therefore it needs for practical reasons four tanks to get phase specific values. .</p> <p>EC proposes a method that is used in EU for measurement of consumption, by measuring the water content of the exhaust emission.          According to DE, there is an issue regarding condensation of water that could possible influence the result.</p> <p>For phase 1b, it is proposed to include the three methods in the GTR and for phase 2 consider development regarding other methods for example the method presented by EC.</p> <p>One question is how to include the flow method in phase 1b.          ACEA means that type approval authority needs to approve the use of the flow method. This can be done if the manufacturer can prove the accuracy of the flow method using one of the other two methods; gravimetric or pressure method.          T&amp;E means that since FCV means new technology it can be relevant to specify one reference method to be used to show equivalency.</p> <p><b>Conclusion</b>          Sub Group EV proposes to include gravimetric and pressure method as equivalent methods and include flow method. Then the manufacturer needs to show the accuracy of the method.          EC propose to insert a revision clause to reflect technical development.          The measurement procedure could be introduced in annex 5 and used in the procedure</p>			

where needed. At the next meeting ACEA will propose the calculation methods to include OVC-FCV in the GTR (also including phase specific values).			
9		Drafting (reviewing items pointed by T&E and drafting coordinator )	WLTP-SG-EV-07-04 WLTP-SG-EV-07-12 WLTP-SG-EV-07-13 WLTP-SG-drafting-01-10
<p><b>Points in document from drafting coordinator.</b></p> <p>§ 1.6. Regarding gear shift prescription there are three options, generic based, Steven tool or GSI. Until there is determination of system power option three is the preferred option. Should include in the technical report that when there is a procedure for determination of system power this issue should be amended.</p> <p>§ 2.3.3. Should be "shall", relates to the complete cycle, not to the non-correction area.</p> <p>§ Regarding mode selectable switch will be included in proposal at the next meeting.</p> <p>§ 3.2.9.4.1. This issue has been revised by ACEA EV drafting TF. The redundant text is deleted.</p> <p>§ 4.2.1.3.3. Should be "if any of the following cases apply" Change: applies --&gt; apply. Otherwise accepted.</p> <p>ACEA EV drafting TF has already reworked many of the issues in the document from drafting coordinator. No need to go through them again.</p> <p>New structure of annex 8 in order to align with structure of GTR.</p> <p>The documents/comments from Iddo Riemersma from T&amp;E and Dr. Tappe from Bosch are already considered..</p> <p>Sub Group EV already established a task force to develop GTR text for the open issues for the SG EV.</p> <p>JP responsible for STP, and FCV.</p> <p>ACEA responsible for mode selectable switch.</p> <p>ACEA responsible for combined approach.</p> <p>ACEA responsible for downscale method for PEV.</p> <p>ACEA responsible for RCB correction</p> <p>JP responsible for phase specific calculation.</p> <p>Comment regarding the necessity of some of the calculation formulas for electric energy. If they are needed in further calculation or not.</p> <p>Formulas for fuel energy are also used for RCB correction for ICE; need to align this with annex 6 appendix 2.</p> <p><b>Conclusion</b></p> <p>Sub Group EV will adopt the version of annex 8 as proposed by ACEA drafting TF after scrutiny by members of Sub Group EV.</p> <p>In order to use this as base for drafting of other open issues for example STP, mode selectable switch, FCV and combined approach.</p> <p><b>Deadline for comments is the 1th of April 2015</b></p>			
10		AOB	
No other business.			