

PEV Low temperature procedure update

Proposal EC-JRC

WLTP Subgroup EV
Web-meeting, February 5th, 2020

EU base scenario for the Low Temperature test

From COM 20190917 IWG WLTP SG-EV LowT TA approach.pdf

Initial driving

The customer arrives home at 18:00 hours; ambient temperature is -7°C. The car is driven at -7°C after having been parked at work place/shopping mall etc. at -7°C or indoor.

SoC of the battery not defined

Soaking/ charging

The PEV is connected to an electric charger, typically a home charging device.

Optionally: if there is price differentiation in grid electricity, the charging is delayed until [23:00 h.]

The vehicle is charged overnight, ambient temperature is -7°C. Charging power as defined GTR 15

Optionally: if there is a possibility to use grid power for battery heating while charging, this is switched ON

Driving conditions and auxiliary systems setting

The customer starts the vehicle at 7:00h and drives off (cold start, ambient temperature is -7°C).

Full charged battery assumed despite the car might have been at cold for many hours.

Auxiliaries (with the recommendations of the auxiliaries sub-group):

- Heating ON at least 21°C pointed to the front window (windshield), allow to draw in outside air. To define setting of the heating system (manual operation, automatic mode, air mass flow rate [kg/h, max etc.], flow direction etc.) within/with the support of the auxiliaries sub-group.
- If there is a windows defrost mode: Defrost ON (for 10 minutes)
- Fan speed: at start full off or lowest setting, at second idle (around 125 s) set fan to maximum. To be defined.
- Lights are switched ON
- All other auxiliaries are switched OFF

The car is parked at work place/shopping mall etc. at -7°C or indoor.

Inconsistent soak times or time between unplugging the vehicle and starting the test could result in undesirable variability in pre-test battery pack temperatures, potentially impacting test results (SAE J1634).

Some inputs to be measured during the test (to be defined)

- REESS Temperature at the start of the test to be specified; large impact on UBE at cold temperature
- Measured the energy consumption from the auxiliaries system? *scaling factor needed for high capacity heater installed on vehicles for Northern countries?*
- additional energy consumption for heating the battery
- Measuring the EC per phase?; the phase specific values might be used for calculating PER_{city}
- ...

Accuracy:

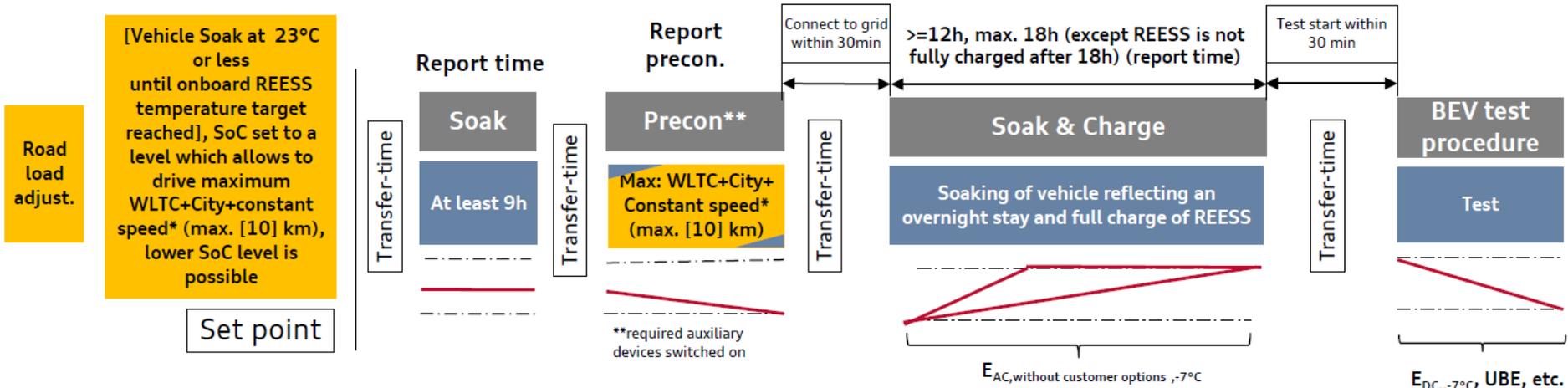
To revise the Table of accuracy of the instruments and measurement sensors at cold (Table A8/1 Annex 8 GTR 15)

Driving range ratio: setting a minimum requirement or reporting for customer information

$$PER_{Ratio} = \frac{PER_{-7^{\circ}C VehicleWorstScenario}}{PER_{23^{\circ}C VehicleWorstScenario}}$$

Test Procedure (PEV) – Shortened Test Procedure or Consecutive Cycle Procedure

Proposal for -7°C Procedure – mandatory: Base procedure with no customer based initiated action



Feedback from SG EV web-audio 11.12.:

- Requirement necessary that the level of SoC at the end of preconditioning shall be "same" than after test procedure
- Preconditioning at 23°C: Further evidence needs to be given that this has no impact on the test result
- Constant speed during precon needs to be linked to constant speed in test procedure
- Break-off-criterion for precon shall be defined
- Base procedure is mandatory and shall always need to be performed; optional procedure on next slides is only there for having procedure to evaluated the benefit of specific functions on the range value which will increase than
- Focus on mandatory procedure and not on additional procedure for the moment

- 23°C:**
- Road load adjustment
 - [Vehicle soak at 23°C or less until onboard REESS temperature target reached]
 - SoC set to a level which allows to drive maximum WLTC+City+constant speed* (max. [10] km), lower SoC level is possible

- 7°C:**
- Soak of the vehicle for at least 9h; time of soak needs to be recorded
 - SoC set at 23°C shall allow to drive "WLTC+City+Constant Speed* (with max. distance of [10] km)" maximum with required auxiliary devices switched on, less preconditioning shall be possible
 - Preconditioning [can be] done at -7°C [but also 23°C (in case of 23°C: same proceeding like ATCT)]: Preconditioning drive of "WLTC+City+Constant Speed* (with max. distance of [10] km)" (to simulate a drive home) maximum (less shall be possible), required auxiliary devices switched on reflecting user behavior and taking into account cabin isolation & other technology; length of Constant speed segment shall reflect a defined max. distance → after preconditioning: REESS fully depleted
 - Soaking and charging of vehicle (until REESS fully charged but for at least 12h, time needs to be recorded), measurement of recharged energy $E_{AC,without\ customer\ options,-7°C}$ at -7°C
 - Test procedure at -7°C with required auxiliary devices switched on
 - To be discussed: required values to be calculated at -7°C

*same constant speed as type 1 in all parts of type 6 procedure

EC-JRC comments

Vehicle transfer to the soak area within [10] minutes

[Or directly placed in the soak area if no need to set the SoC]

Soak @ -7C for at least 9h

[Initial SoC of the REESS to be defined]

The REESS shall not be charged during the soak period

Vehicle transfer from the soak area This shall be done without any unjustified delay and in any case within [10] minutes

Preconditioning @ -7C

Constant speed during preconditioning needs to be linked to constant speed in test procedure

Break-off-criterion as defined for type 1 test for PEV (3.4.4.2.3. of Annex 8)

Connection to grid shall be done without any unjustified delay, and in any case within [30] minutes. During that time the vehicle shall not receive unjustified exposure to temperatures higher than -7 °C but if that is unavoidable this time should in any case be limited to a maximum of [10] minutes.

Soak and charge @ -7C

The REESS shall be charged with the same charge power as for the Type 1 test, unless it can be justified that there are physical limitations that need to be observed.

According to paragraph 2.2.3 of Appendix 4 of Annex 8 *Application of a normal charge Normal charging is the transfer of electricity to an electrified vehicle with a power of less than or equal to 22 kW AC. Where there are several possible methods to perform a normal AC charge (e.g. cable, induction, etc.), the charging procedure via cable shall be used.* [...]

Report time and E_{AC}

Vehicle transfer shall be done without any unjustified delay and in any case within [10] minutes. During that time the vehicle shall not receive unjustified exposure to temperatures higher than -7 °C but if that is unavoidable this time should in any case be limited to a maximum of [10] minutes

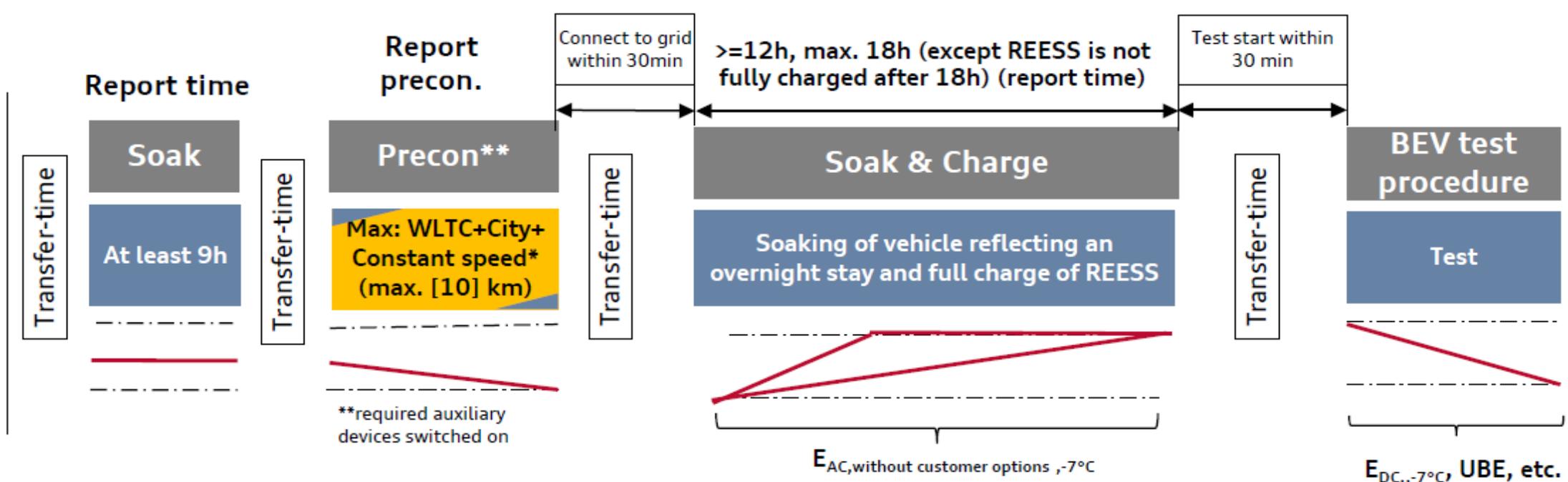
Test procedure @ -7C

CCT or STP @-7C according to the proposed flow chart in slide 5 of 191211_draft_update_proposal_Low-Temperature-Test_ACEA_with_comments_SG_EV.pdf (see next slide)

To be defined initial SoC of REESS

The initial SoC shall be set to a level which allows to drive maximum WLTC+City+ constant speed* (max. [10] km)

[Initial SoC setting @ 23C]



- Preconditioning at 23°C: Further evidence needs to be given that this has no impact on the test result.
- Base procedure is mandatory and shall always be performed

Test Procedure (PEV) – Procedure determination

Procedure selection flow chart – option 1 (with existing procedures)

