WLTP

PEV Range test procedure : End of test criteria

Content

1 Present Situation : Summary

NEDC

- *Drive Cycle: One drive cycle*

  -NEDC

- *Required Test:*

  1. Range test (repeated NEDC cycle)
  2. Energy consumption test (2 NEDC cycles)

- *Not able to follow the drive cycle:* > 50 km/h , shall be driven with the accelerator control fully activated

- *Declaration:*

  -Pure electric range (km)

  -Energy consumption (wh/km)

WLTC

- *Drive Cycle: One drive cycle*

  -WLTC Class 3

- *Required test :*

  1. All Electric range & energy consumption (repeated over complete WLTC cycle)
  2. City Electric range & city consumption (repeated over low-mid part of WLTC cycle)

- *Not able to follow the drive cycle : See* Next slide

- *Declaration :*

  -All Electric Range (km)

  -Electric Energy consumption (wh/km)

  -City All Electric Range (km)

  -City Energy consumption (Wh/km)

1 Present Situation : End of test criteria for PEV

ECE/TRANS/180/Add.15 (page 213)

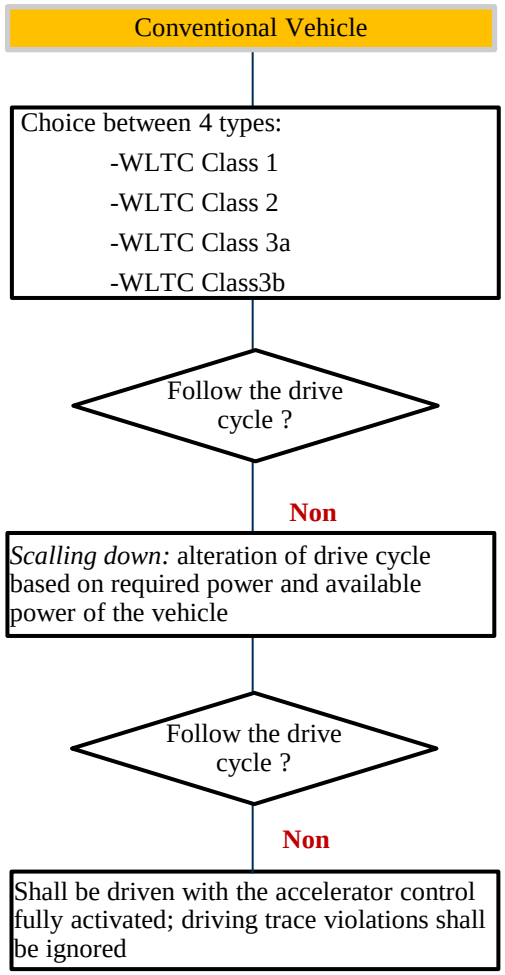
3.4.4.3.1.3. The end of the test occurs when the break-off criteria is reached.

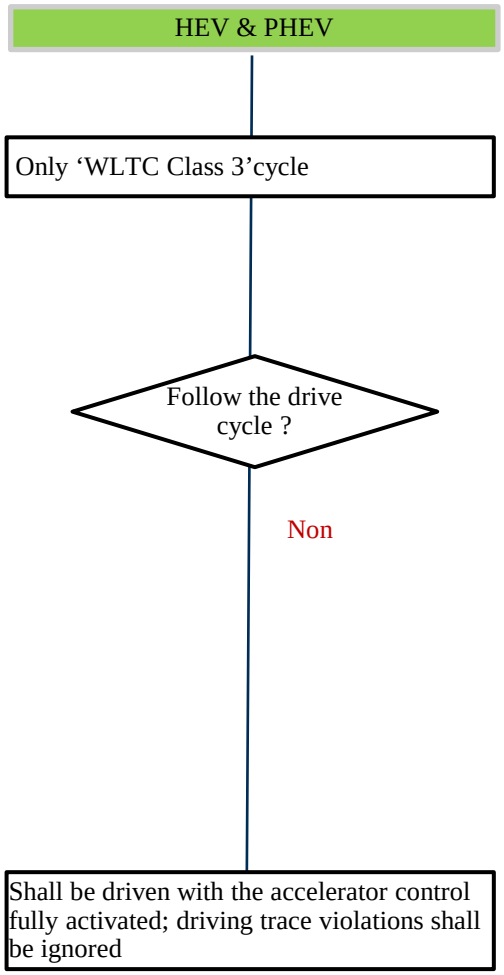
The break-off criteria shall have been reached when the vehicle deviates from the prescribed driving tolerance for four seconds or more. The acceleration controller shall be deactivated. The vehicle shall be braked to a standstill within sixty seconds.

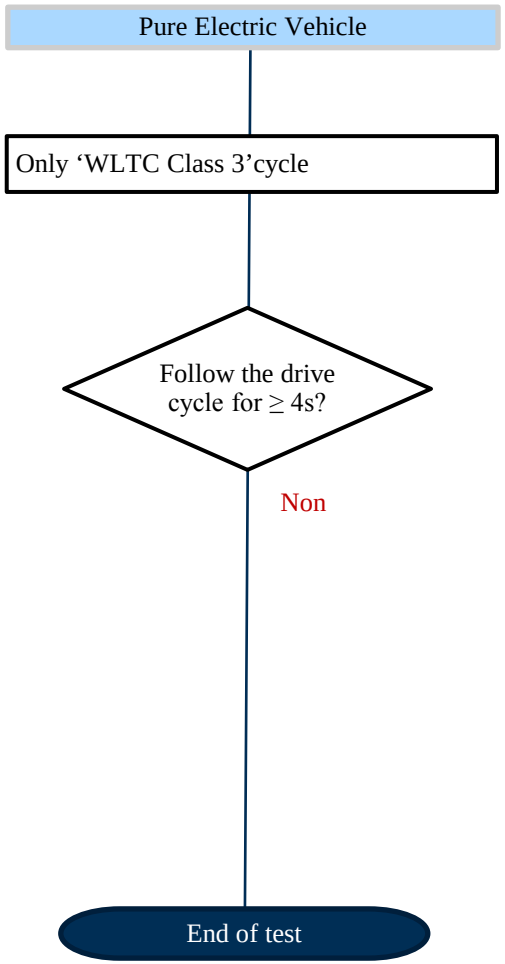
- *The criteria of '4 second' comes from the present Japanese regulation, where the maximum speed of JC08 is 81.6 km/h (much less than the maximum speed of 131 km/h of WLTC)*
- *The '4 second' criteria will not be a problem for Japan, as they are not going to use the 'extra high' phase (maximum speed of phase 'high' is 97.4 km/h)*

1 Present Situation : End of test criteria for PEV

- *Pure electric vehicles are penalized compared to conventional vehicles*

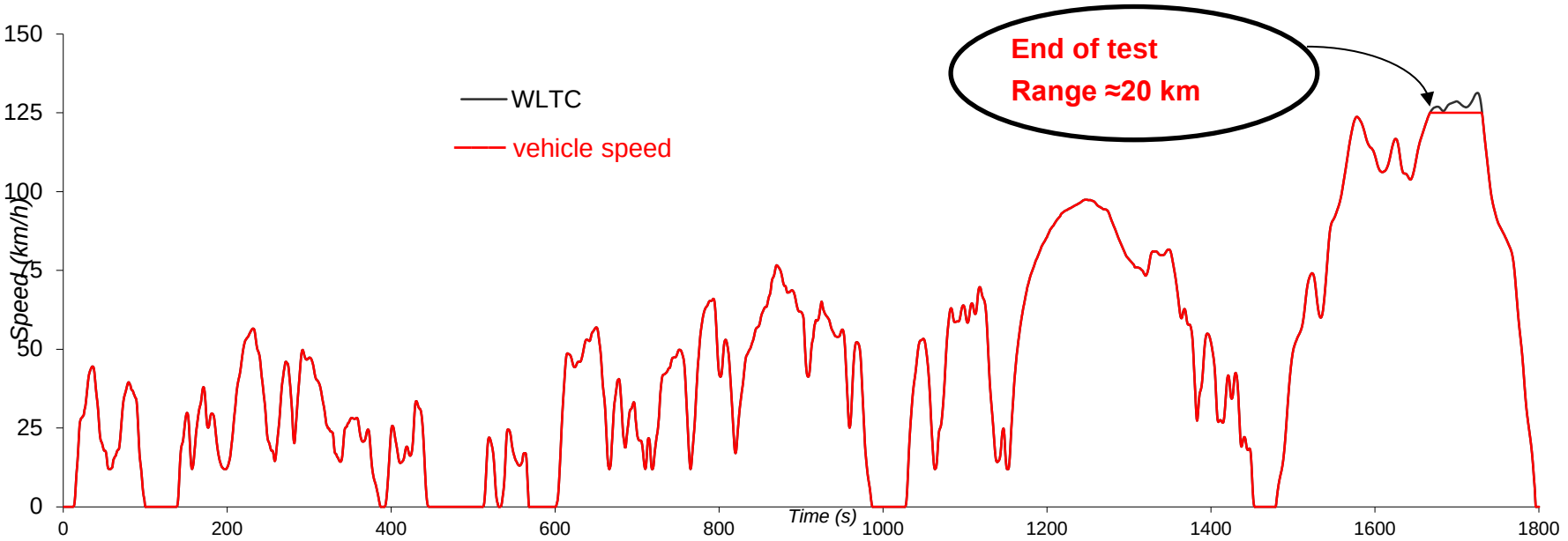






2 Problem with Light commercial vehicle : Impact of '4 second' end of test criteria

- *Pure electric vehicles are penalized compared to conventional vehicles (see slide 5)*
- *Most of 'Light Commercial Electric Vehicles' will be impacted by this criteria. These kind of vehicles are meant for urban but also for 'suburban' use (mostly limited to 110 km/h).*
- *Repeatability of electric energy consumption is not verified during the 'validation phase 2' for such kind of vehicle (not able to follow the drive cycle)*
- *Example of a vehicle with a maximum speed of 125 km/h will have a range ≈20 km*
- *Need to find a technology neutral solution for this issue*



3 Possible solutions

1. **UN –ECE Regulation R100:**
   - "At a speed over 50 km/h, when the vehicle does not reach the required acceleration or speed of the test cycle, the accelerator pedal shall remain fully depressed until the reference curve has been reached again."

     => A speed of 50 km/h is lower than the maximum speed of city cycle (Mid- 76.7 km/h)
2. **Downscaling :**
   - Downscaling is based on ratio of 'available power' to 'required power'.

     => This does not applicable to high power/high capacity battery vehicle with speed limits less than 131 km/h (slide 12)
3. **USA Regulation (SAE J1634):**
   - "Vehicles with a maximum speed capability that is less than the maximum speed on the drive cycle shall be operated at maximum available power (or full throttle) when the vehicle can not achieve the speed trace within the speed and time tolerance"

     => This criteria is agreed by ACEA members. This solves the problem of low speed vehicle better than the above two solutions.

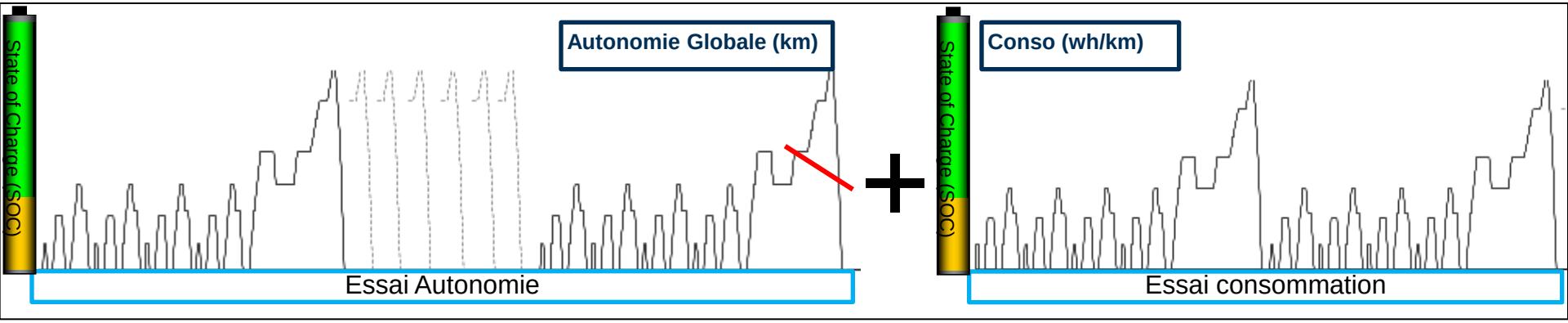
4 Final proposal (from ACEA)

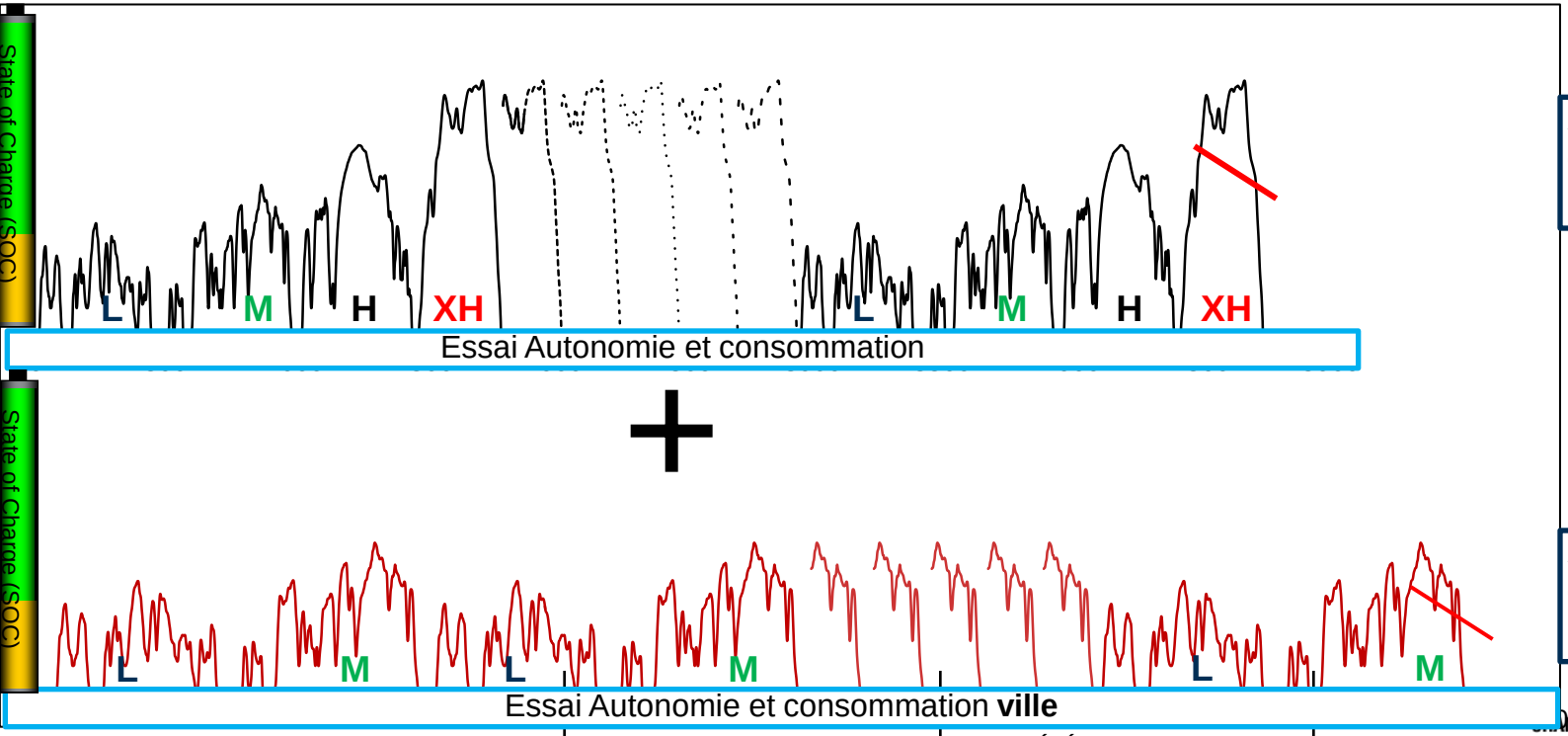
add the following text in addition to 3.4.4.3.1.3. to annex 8

- For vehicles that are not capable of meeting the prescribed speed vs. time relationship of the applicable WLTC drive cycle for the initial drive cycle (i.e., the first drive cycle that begins with the vehicle fully-charged) and operated at maximum available power, the test terminates when the following criterion is satisfied: 1) when the vehicle, while operated at maximum available power or “full throttle”, is unable to reproduce the best-effort speed vs. time relationship established by the vehicle in the first WLTC drive cycle of the test. The applicable drive tolerances for the best-effort trace are provided given in Section 1.2.6.6. of Annex 6 (+/- 2 km/h, +/- 1 sec).
- Note: The speed tolerance violation criteria given in Section 1.2.6.6. of Annex 6 do not apply to the best-effort trace for low-power vehicles

Annexe

Electric Vehicle: Summary

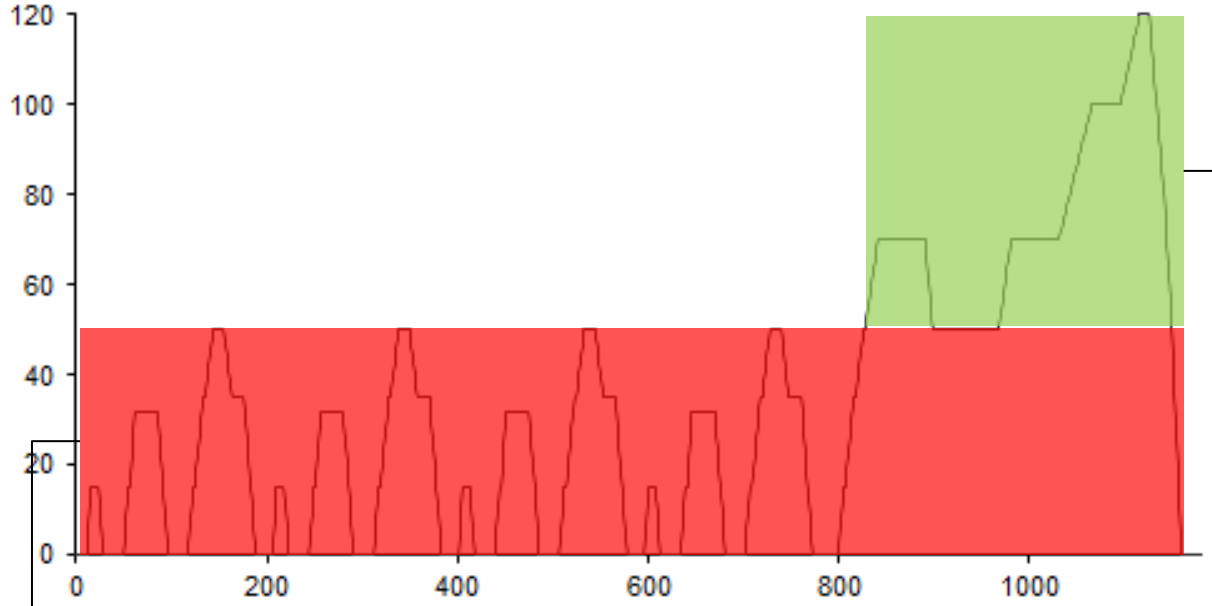




All Electric Range (km)
Conso= E_{AC}/ AER

AER City (km)
Cons City= E_{AC}/ AER City

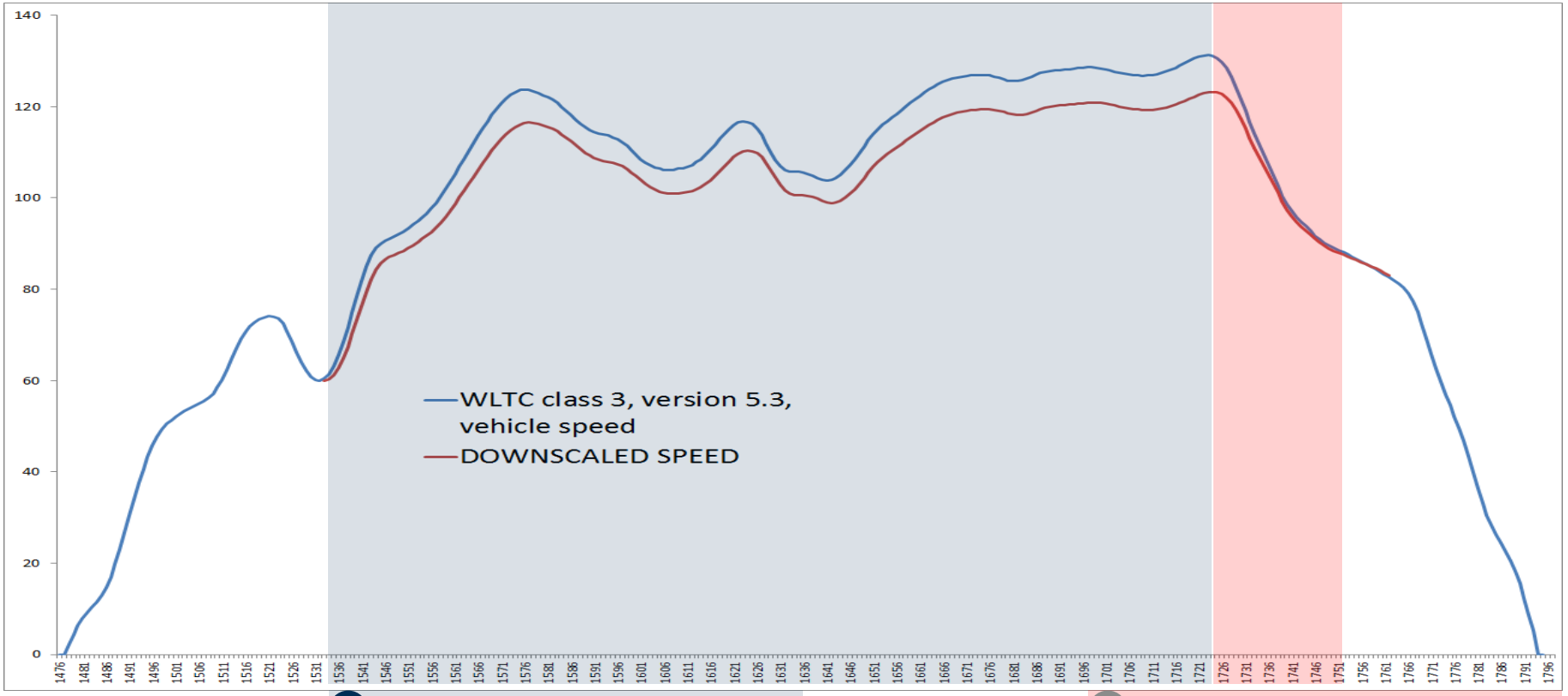
Electric Vehicle: NEDC end of test criteria



Required to follow the drive cycle trace
Violations is not ignored

Trace violations is acceptable if full power is used

Electric Vehicle: Example of application Downscaling



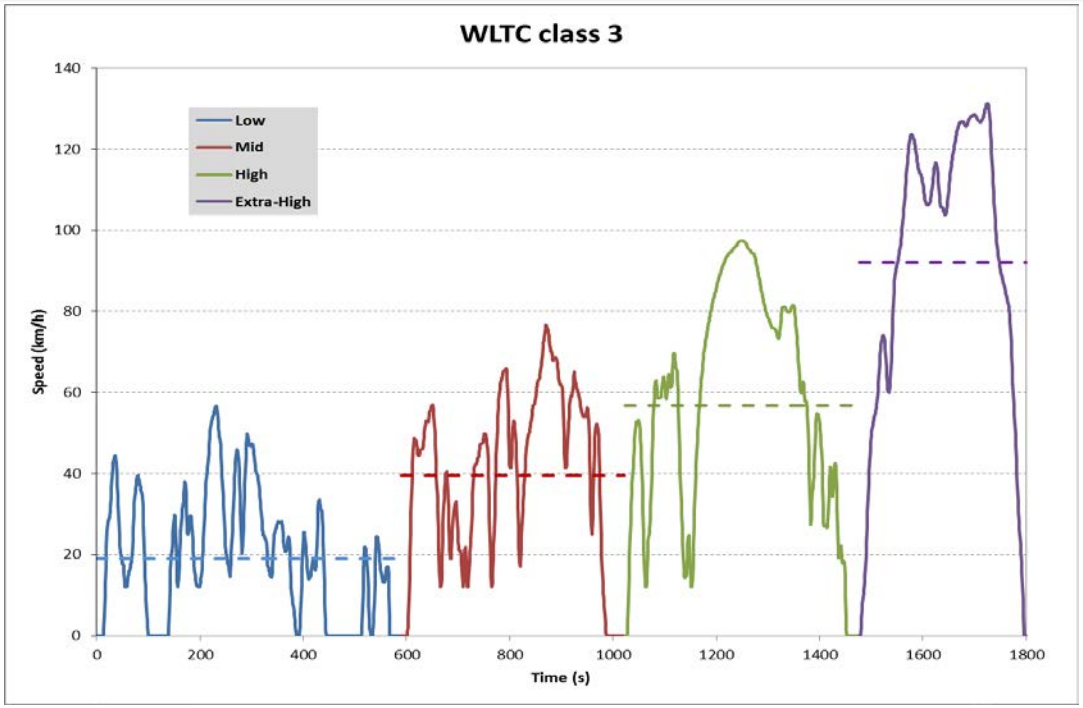
1 Between1533s to 1724s

- **Application of downscaling factor**

2 Between 1725s to 1762s

- **Deceleration from peak speed**

4 Alternative proposal



- Renault propose to add the following text in addition to 3.4.4.3.1.3. to annex 8
  - “Above the average speed of the cycle phase, when the vehicle does not reach the required acceleration or speed of the test cycle, the accelerator pedal shall remain fully depressed until the reference curve has been reached again.”
- The average speed of the phases are as follows: Low -18.9 km/h, Mid- 39.5 km/h, High- 56.6 km/h, Extra high- 92.0 km/h.