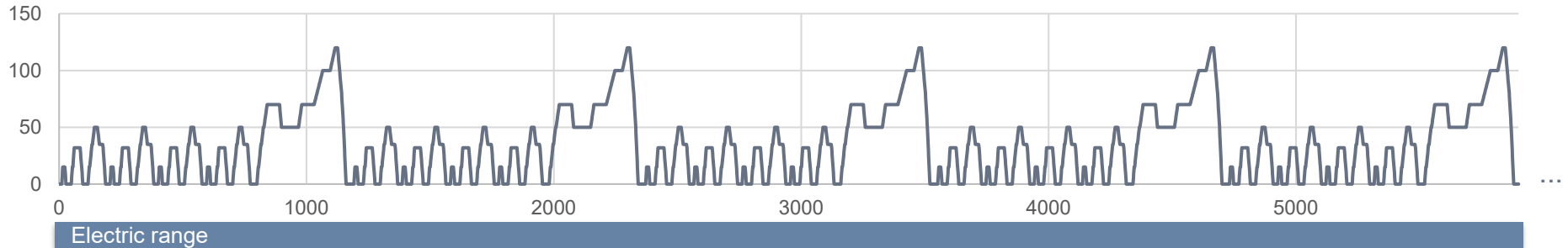

Informal document:

Shortened Test Procedure NEDC for PEV acc. to WLTP
(including adding PEV COP procedure alternative)

Status: 21.12.2020

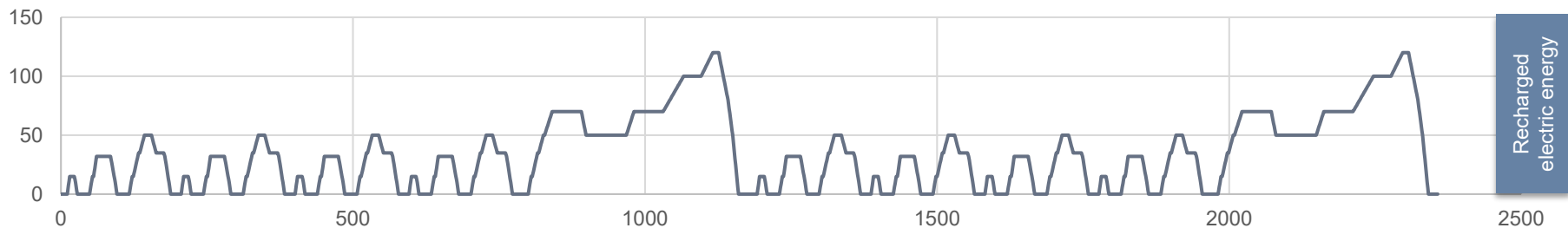
NEDC approach to determine range and consumption for PEVs

Today separate test for electric consumption and electric range



Approach:

- Determine the pure electric range based on consecutively driven NEDCs until the battery is discharged (i.e. 72cycles @ 800 km)



Approach:

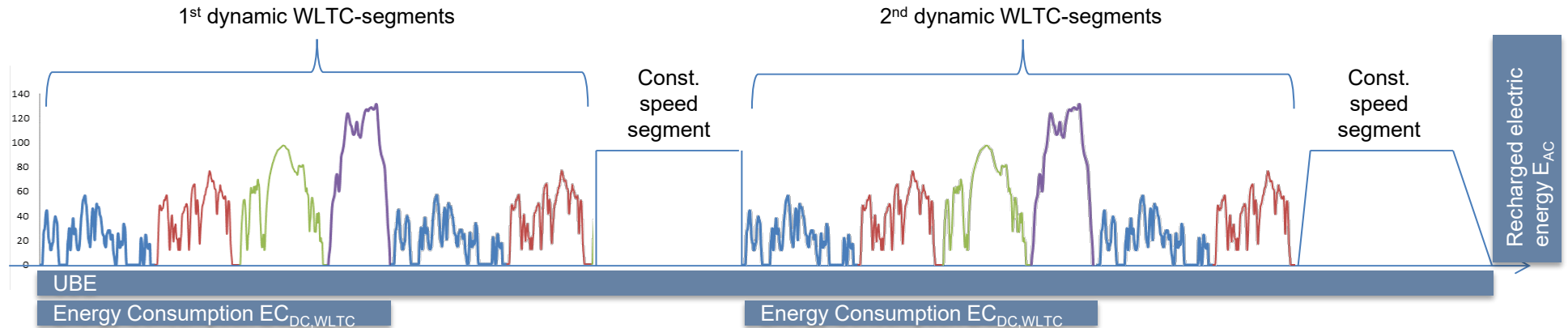
- Determine the electric energy consumption based on the recharged electric energy and the driven distance of two NEDCs

Necessities to update the procedure:

- Considering a PEV with 900 km NEDC range 82 consecutive NEDC Cycles (27 hours) will be necessary. With respect to the drive trace tolerances and a break time of max. 15 min this procedure is not feasible anymore.
- Considering a PEV with 900 km NEDC range the SOC Level after 2 NEDCs is almost 100 % → Risk that the vehicle will not recharge, this procedure is not feasible anymore.

WLTP approach to determine range and consumption for PEVs

Idea from WLTP: “Harmonized cycle” for electric energy consumption and electric range



Approach:

- Determine the electric energy consumption based on two dynamic WLTC-segments
- Determine the usable battery energy (UBE) based on dynamic and constant speed segments
- Calculate the pure electric range (PER)

Benefit:

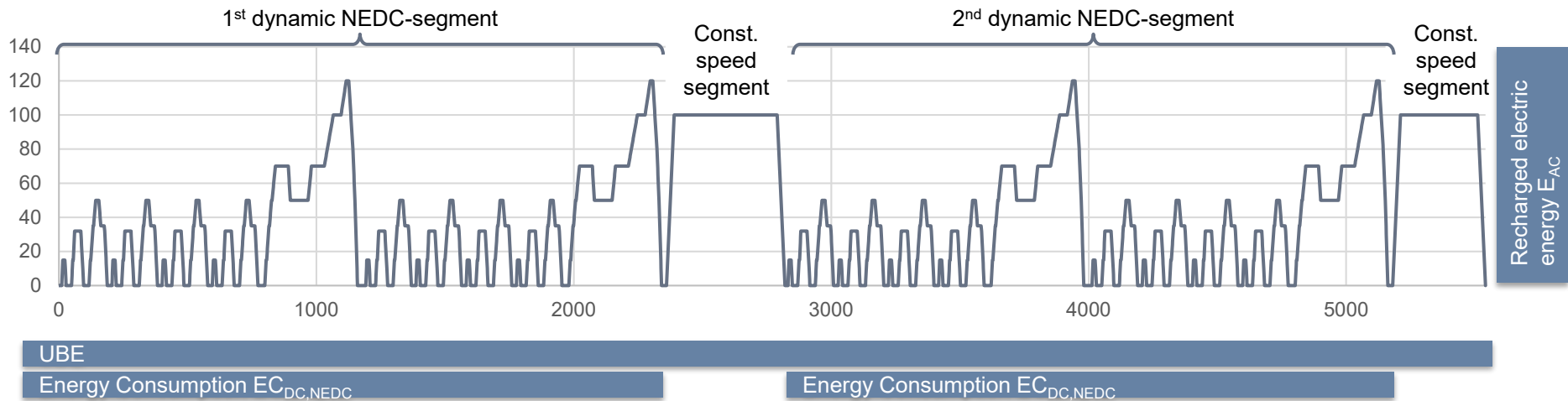
- Reduced dyno capacity demand due to faster discharging of the battery during constant speed segments
- Reduced risk of speed trace violations due to significantly less amount of WLTCs

Idea behind making the proposal:

- “Copy&Paste” the procedure benefits to the UN-R101-world

PEV proposal to determine range and consumption in NEDC

Proposal: Introduction of the NEDC shortened Test Procedure



Approach:

- Determine the electric energy consumption based on four NEDC-cycles
- Determine the usable battery energy (UBE) based on dynamic and constant speed segments to calculate the pure electric range (PER)

Actions in R101:

- Adjust Annex 7 and Annex 9 of R101

ANNEX 7

METHOD OF MEASURING THE **ELECTRIC RANGE AND** ENERGY CONSUMPTION OF VEHICLES POWERED BY AN ELECTRIC POWER TRAIN ONLY

ANNEX 9

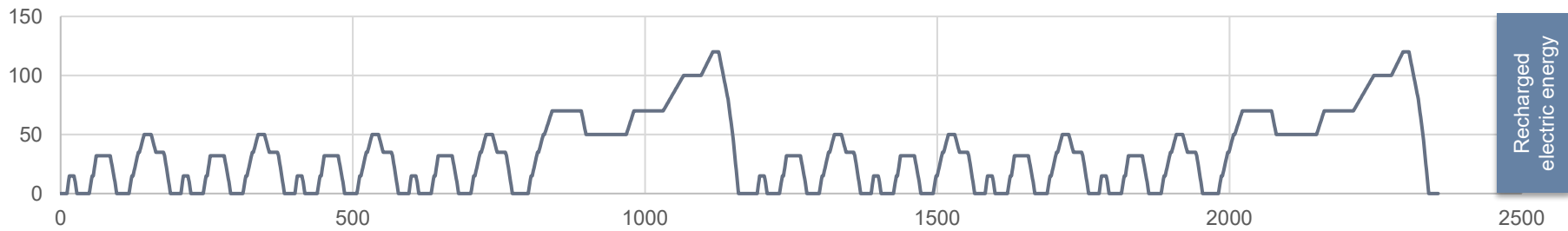
METHOD OF MEASURING THE ELECTRIC RANGE OF VEHICLES POWERED BY **AN ELECTRIC POWER TRAIN ONLY OR BY** A HYBRID ELECTRIC POWER TRAIN AND THE OVC RANGE OF VEHICLES POWERED BY A HYBRID ELECTRIC POWERTRAIN

NEDC approach to determine range and consumption for PEVs

COP procedure for electric consumption verification

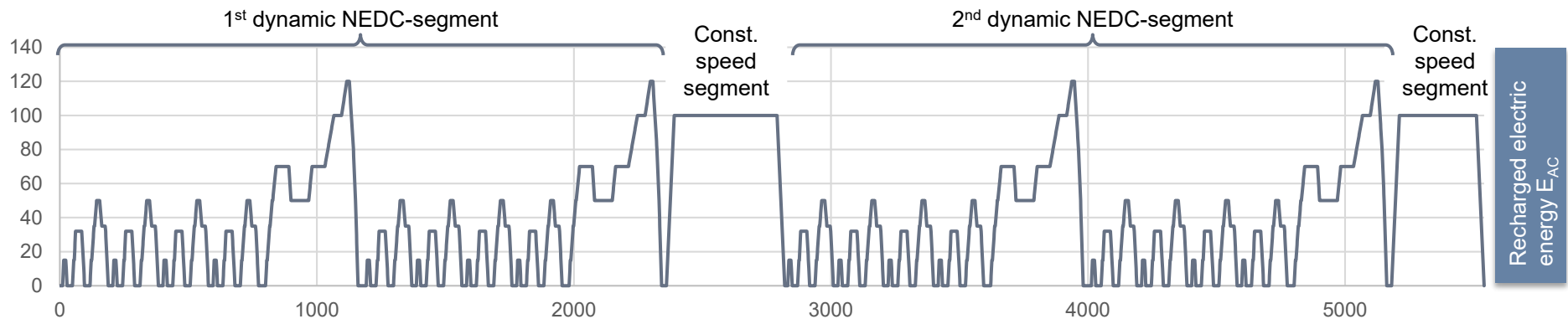
Determine the electric energy consumption based on the recharged electric energy and the driven distance of driven NEDCs

→ Same procedure as in homologation



Determine the electric energy consumption based on the Shortened Test Procedures

→ Same procedure as in homologation



UBE

Energy Consumption $EC_{DC,NEDC}$

Energy Consumption $EC_{DC,NEDC}$

NEDC approach to determine range and consumption for PEVs

New: Adding alternative COP procedure for electric consumption verification

Independent if the consecutive cycle procedure or the shortened test procedure has been used for determining electric consumption and electric range during type approval, the following alternative can be used for conformity of production verification of the electric energy consumption:

9.4.3.5. Electric energy consumption for vehicles powered by an electric power train only

The following value shall be declared and used for verifying the conformity of production with respect to the electric consumption:

$$EC_{DC,COP} = EC_{DC,first\ two\ NEDC} \times AF_{EC}$$

where:

$EC_{DC,COP}$ is the value for electric energy consumption that has to be confirmed during the conformity of production test procedure within the first two NEDC test cycles, in Wh/km;

$EC_{DC,first\ two\ NEDC}$ is the electric energy consumption of the first two NEDC test cycles calculated according to paragraph 5.2.5.1. to Annex 7 for type approval purposes, in Wh/km;

AF_{EC} is the adjustment factor that adjusts the electric energy consumption that has to be confirmed in COP based on the difference between calculated and declared electric energy consumption for type approval purposes.

