



Meeting of the Expert Group on policy development and
implementation of CO₂ from road vehicles

Report from the Working Group on the NEDC/WLTP correlation (CWG)

Brussels – 27 January 2015

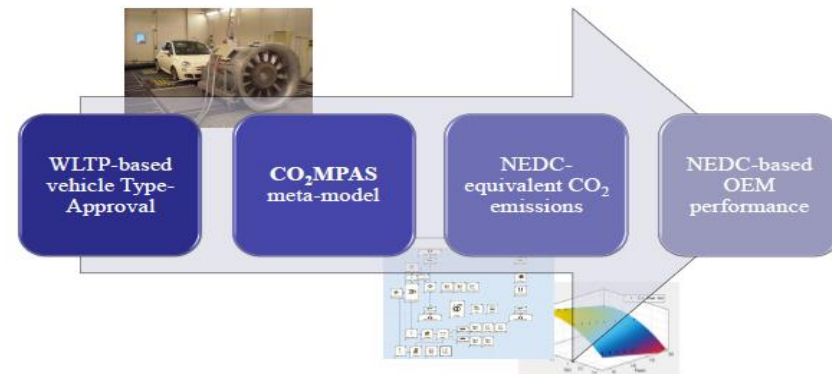
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JRC

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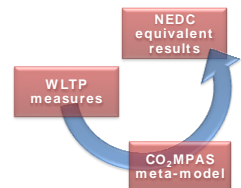
Back-translation

- At least for the transition period 2017-2019/2020, **WLTP-based CO₂ emissions (measured at type-approval) will be translated in the equivalent NEDC-based ones** and then used in the monitoring process in order to assess the compliance towards the CO₂ emission targets set by Regulations 443/2009 and 510/2011
- Two main elements are required:
 - **A model (COMPAS) able to translate WLTP-based CO₂ emissions into the corresponding NEDC ones (meta-model)**
 - **An operative approach to handle the process and the conditions for using COMPAS**



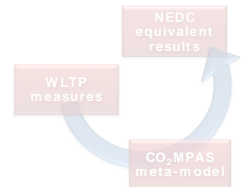
Main issues for the CWG

- The *COMPAS* model (WLTP/NEDC correlation function)
- The procedure for applying the *back-translation*

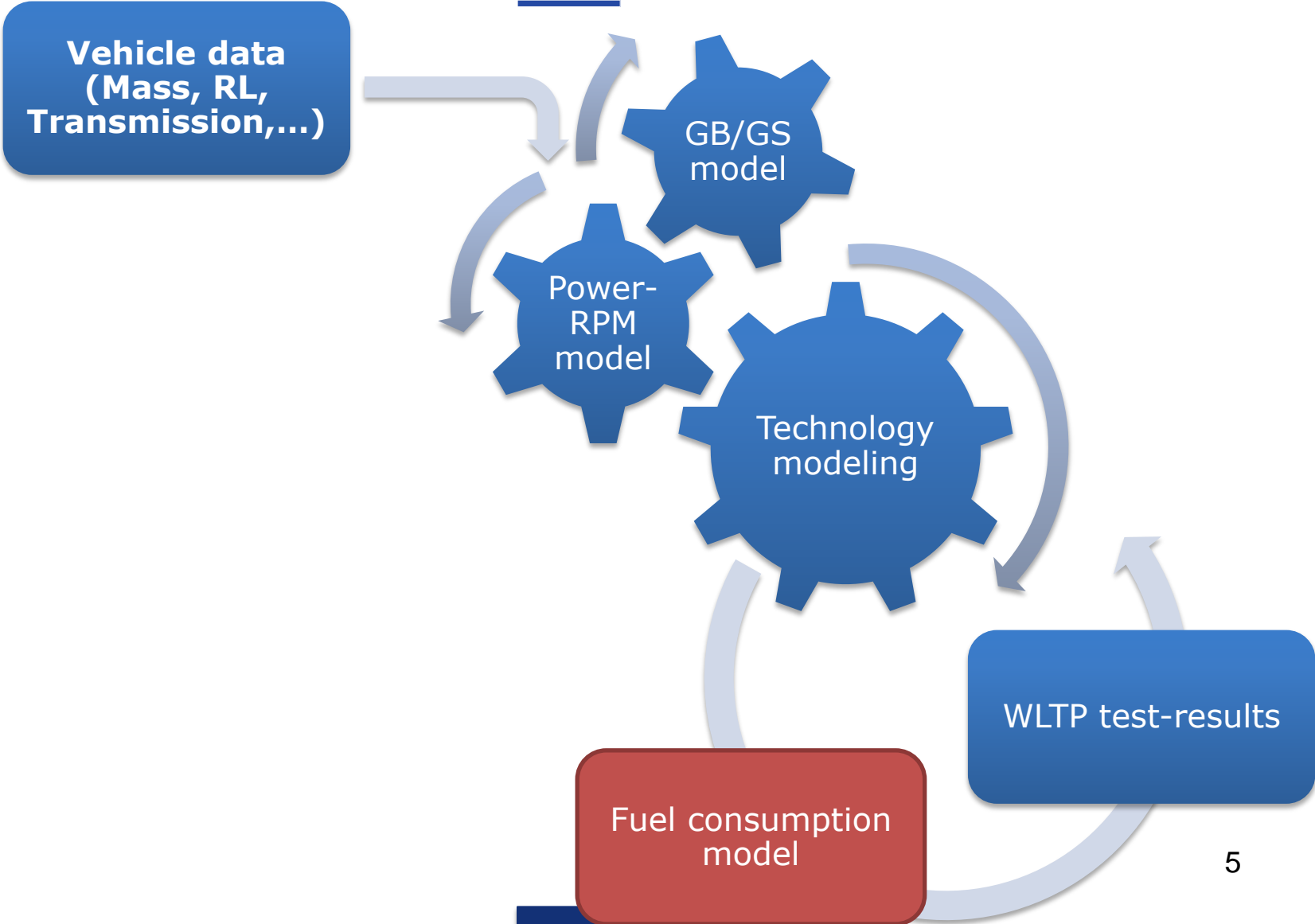


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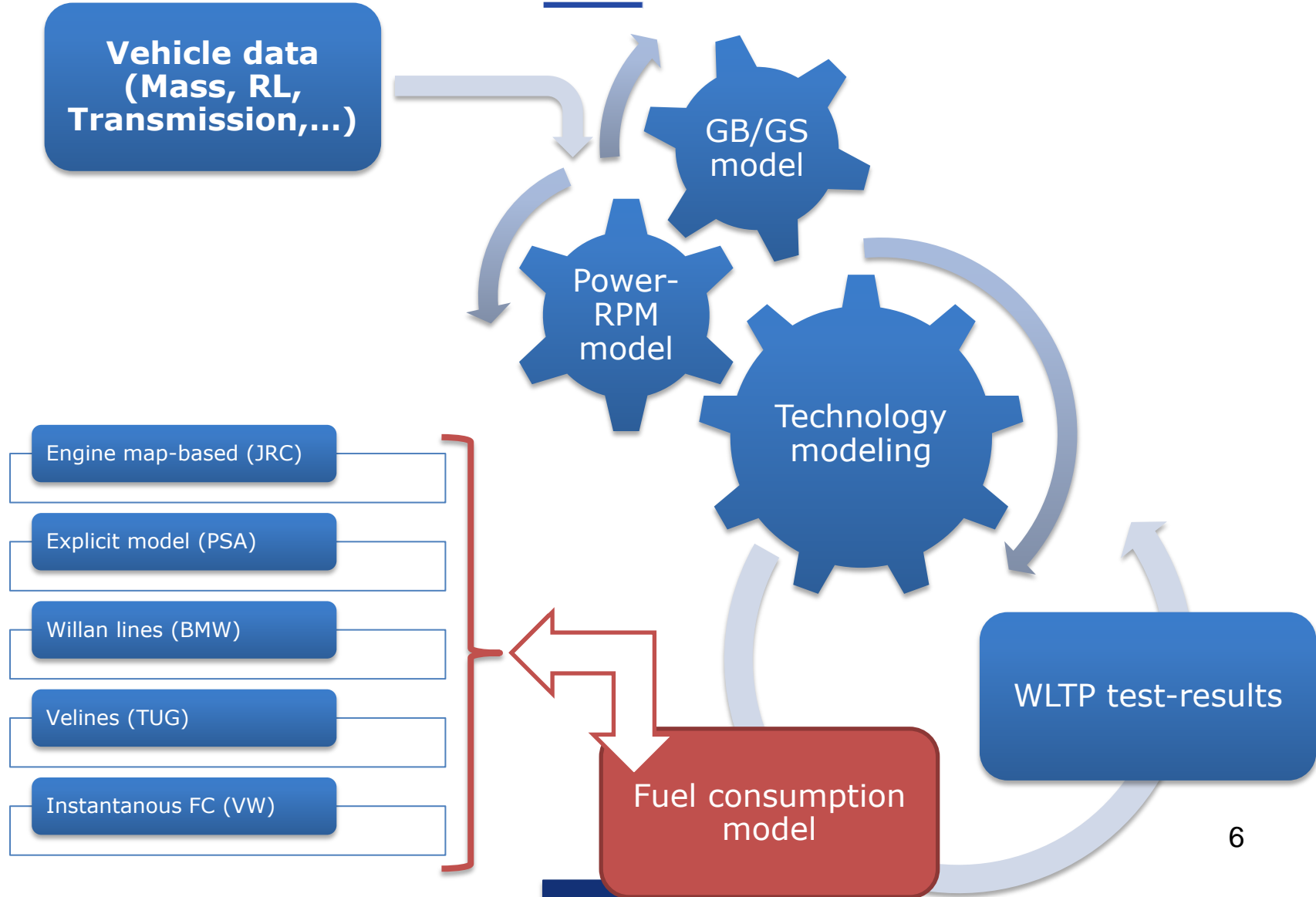
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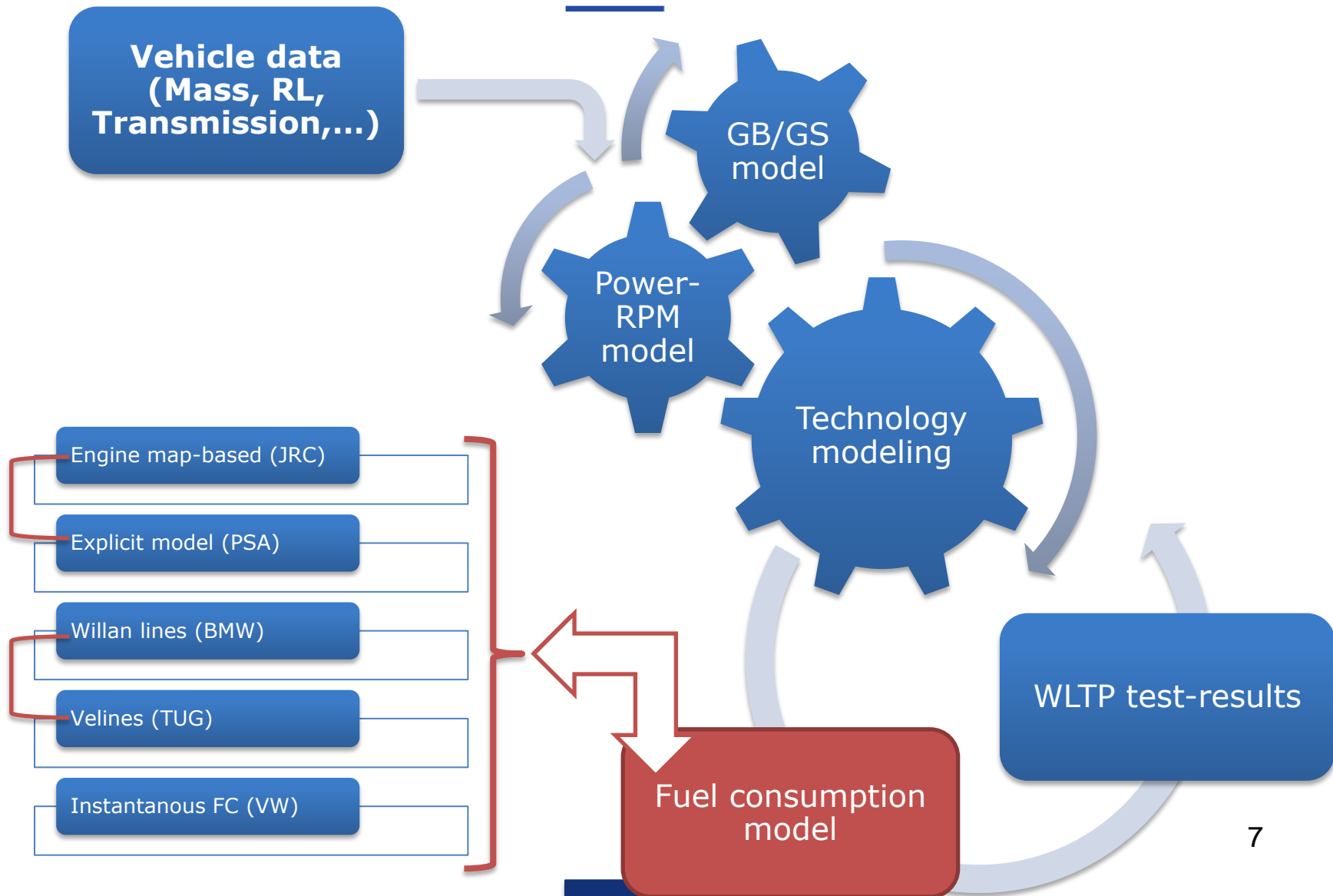
COMPAS simulation environment (JRC)



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Vehicle data
(Mass, RL,
Transmission,...)

GB/GS
model

Power-
RPM
model

Technology
modeling

Engine map-based (JRC)

Explicit model (PSA)

Willan lines (BMW)

Velines (TUG)

Instantaneous FC (VW)

Fuel consumption
model

WLTP test-results



COMPAS simulation environment (JRC)



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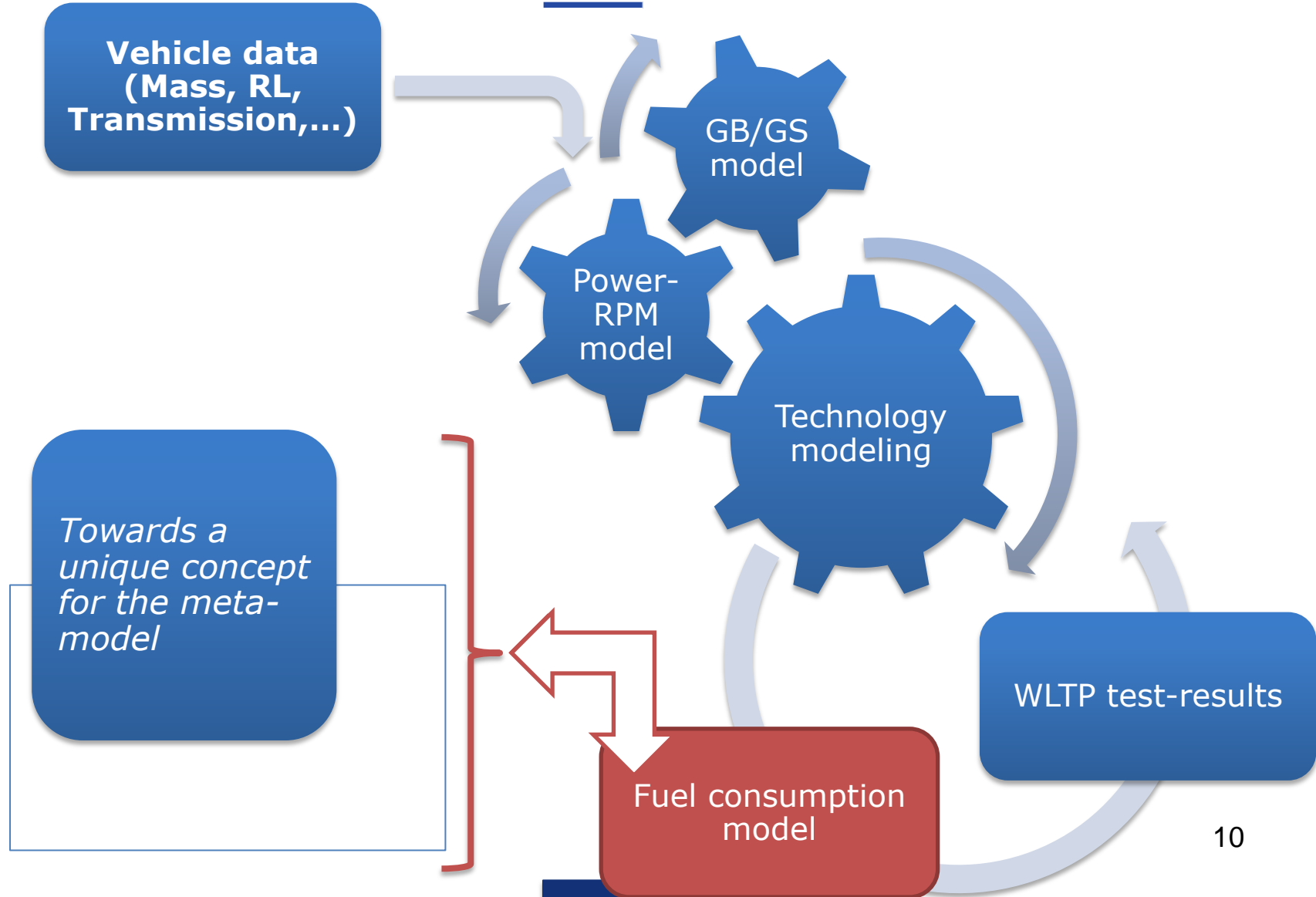
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WLTP test-results

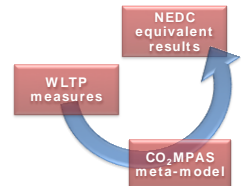


COMPAS simulation environment (JRC)



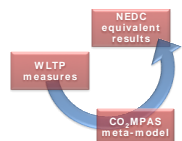
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TA WLTP CO₂ determination

- Given a vehicle family, the test for the determination of the CO₂ is carried out on the **vehicle H** (representing the worst-case conditions for CO₂ emissions) and, upon request of the OEM, also on the **vehicle L** (the best-case conditions)
- The results from the two tests allow the definition of an *interpolation line* (and the related formula) from which **the value of each vehicle put on the market can be determined** on the basis of its actual configuration between the L and H
- At TA, the impact of the different options in affecting the RLs is also certified so that, on the basis of the different options applied to a vehicle, its CO₂ value can be easily determined at the COC



Test procedure for **Vehicle Family Approval** using WLTP

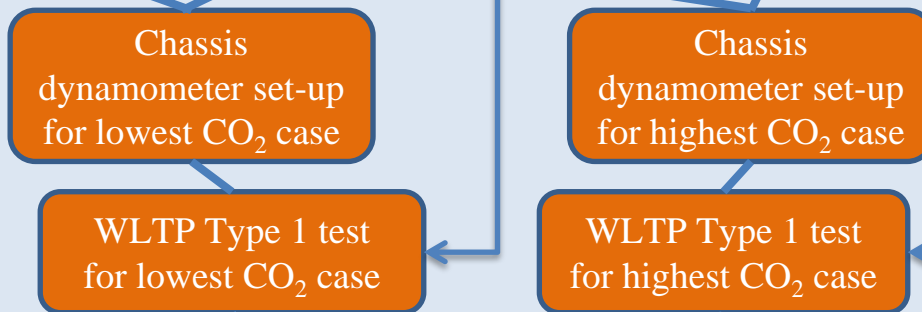
OEM data



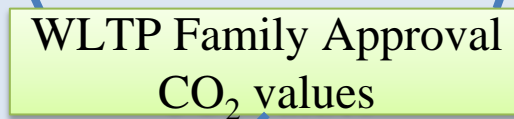
Pre-test calculations



Testing



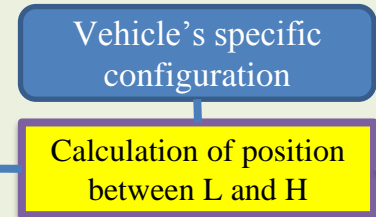
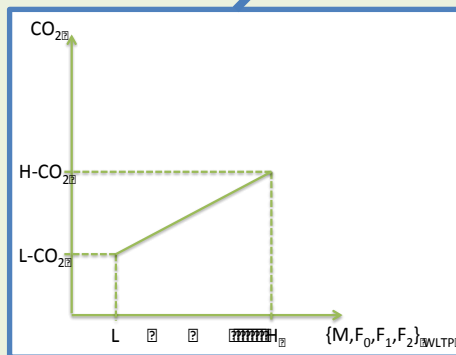
Key output



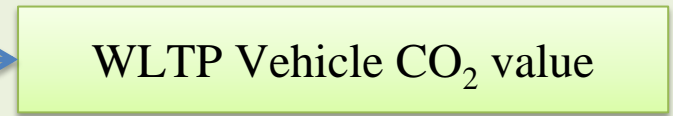
CO₂ values for **individual vehicle CoC**

OEM Provided data

Calculations

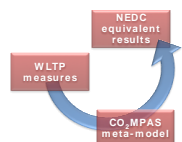


Application of Vehicle Family WLTP CO₂ values



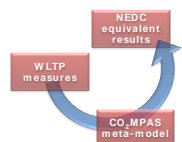
NEDC CO₂ values

- On the basis of the composition of the WLTP CO₂ family, an ***OEM will also define the NEDC grouping***
- Depending on the composition of the WLTP CO₂ family it may correspond to *one or more NEDC type, variant, version approvals*



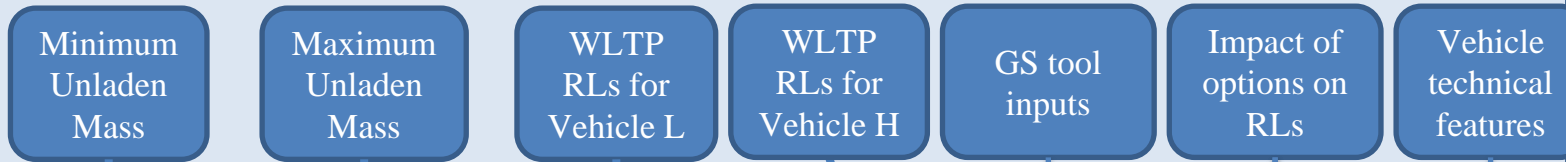
Proposed approach

- WLTP vehicle H represent the worst-case scenario (TMH, worst-case tires, worst aerodynamic configuration) for the different body shapes
- WLTP vehicle L represent the best-case scenario (TML, best-case tires, best aerodynamic configuration)
- **Each body-shape will lead to a different NEDC vehicle**
- An approach like that adopted for WLTP can be considered: ***the back-translation is only applied to best- and worst-case vehicles*** and then an interpolation equation (depending on mass and RLs) can be used to any NEDC vehicle laying in between

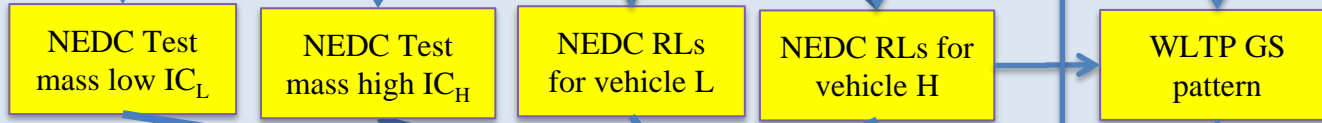


Calculation of the NEDC-equivalent CO₂ values

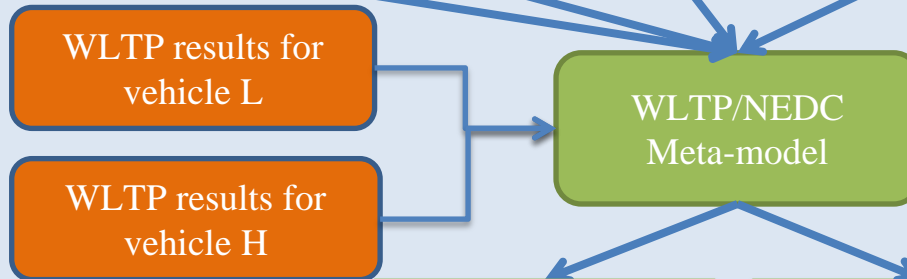
OEM Provided data



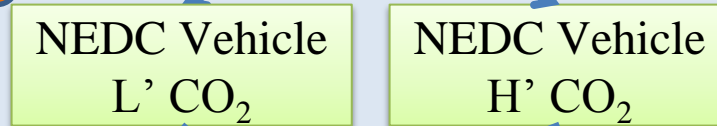
Pre-test calculations



Meta-model application



Key output

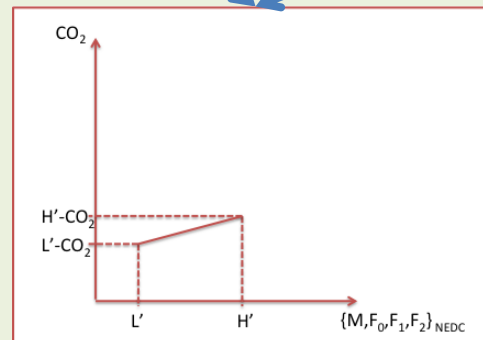


CO₂ values for individual vehicle CoC

OEM Provided data

Calculations

Application of Vehicle Family WLTP CO₂ values



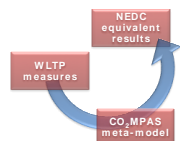
Vehicle's specific configuration

Calculation of position between L and H

NEDC vehicle CO₂ value

Back-translation @ TA

- **All the information required to run the meta-model are already available for the WLTP TA**
- The TA authority could easily run the meta-model to identify the CO₂ emissions corresponding to 1 or 2 NEDC equivalent vehicle(s)
- If needed, using the same rationale introduced for the WLTP, NEDC CO₂ emissions per each vehicle in the family might be calculated from the interpolation of the values obtained for L' and H' vehicles
- This would allow a ***limited and simple application of the meta-model*** with a consequent limited impact of the back-translation to the normal type-approval procedure



Conclusions

- The back-translation approach requires: i) **a model to correlate WLTP and NEDC CO₂ emissions**, and ii) **a clear procedure to identify the NEDC-equivalent vehicles** in the WLTP group proposed for TA
- The ***COMPAS meta-model (JRC) will be used for the translation – the fuel consumption model will be a merger of several different proposals.***
- **The procedure** for identifying the NEDC-equivalent vehicles **will be based on the group defined for the WLTP TA**. Details for a right selection and for the definition of the correct inputs are under discussion

