Proposal for a new UN GTR on Determination of Electrified Vehicle Power (DEVP)

IWG on EVE
81st GRPE Virtual Meeting
9-11 June 2020
History

• Second mandate of the EVE IWG was approved in November 2014
• WLTP had stated a need for an improved procedure to determine system power for classification and downscaling of light-duty hybrid vehicles
  • Hybrid electric vehicles
  • Pure electric vehicles with more than one motor
• Part B of the mandate directed EVE to develop an Annex to GTR No. 15
• EVE consulted with organizations doing similar work (SAE, ISO, KATRI)
  • ISO 20762 was selected as basis for the procedure
  • Initial draft was developed in 2017-2018 based closely on ISO 20762
• Later, contracting parties stated a preference for a standalone GTR
• In March 2019 AC.3 approved the decision to develop a standalone GTR
Validation

• JARI validation tests
  • Commissioned by JAMA in 2016, in support of ISO 20762 development
  • JARI tested several HEVs with good results
  • JARI test report and technical expertise was provided to EVE IWG

• Phase 1
  • EVE conducted testing in 2018 using a draft based closely on ISO 20762
  • Participants: JRC, Environment Canada, KATRI, US EPA
  • Phase 1 revealed some differences in results of TP1 and TP2, and suggested other ways the procedure could be improved for use as a GTR

• EVE proposed Phase 2 validation, and one year schedule extension
  • Procedure was revised and evaluated for improved reliability of results
  • Participants: JRC, Environment Canada
Validation

• Validation program led to restructuring of procedure and provided key results
  • Further demonstrated that the method of eliciting maximum power is reliable
  • Determined relative applicability of TP1 and TP2 to diverse powertrain types
  • Strong theoretical basis for equivalence of TP1 and TP2 is now embodied in the procedure
  • Where equivalence cannot be fulfilled, TP1 or TP2 alone is now specified
  • If both are applicable, then if measurements are accurate, TP1 and TP2 should be very similar

• Any validation program has limitations
  • A fully authentic type approval situation is very difficult to duplicate
    • Dependencies on level of manufacturer involvement, support and consultation
    • Dependencies on ready availability of specific input data needed by the procedure
  • Not every current and future variation in architecture or calibration can be tested

• A strong case for validity may be based on good engineering judgment informed by the testing experience and its results

• We are confident in its technical basis, and will likely learn more from its use in practice
Status

• Proposed DEVP GTR is **Working Document GRPE/2020/12**
• Amended by informal document **GRPE-81-27e_track**
  • Section I is Statement of Technical Rationale and Justification
    • It is intended that this will serve as the “Technical Report”
      • Detailed background on the technical development of the current procedure
      • Review of validation program
      • In-depth validation test reports have previously been shared via EVE website
    • For an outline of the most significant changes from ISO 20762, see Section E.1
  • Section II is the test procedure itself
  • Annex 1 and 2 concern identification of reference points and test speed
  • Annex 3 reserved for future text on determination of method equivalency
Amendments

• Most amendments accept bracketed text in working document
  • Marked via Track Changes and comments in GRPE-81-27e_track
  • List of amendments: see informal document GRPE-81-27e_list

• New amendments concern:
  • Minor edits (added abbreviation; clarified unit ‘kph’; typos)
  • Correction of wording relating to 10-second measurement window
  • Clarification that UNR 85 is equivalent to ISO 1585 for purpose of GTR
  • Addition of RESERVED Annex 3 for determination of method equivalency
    • Placeholder for future work on candidate method or equivalent
Possible future work

• Candidate method
  • A candidate method (based on component tests rather than chassis test) could reduce test burden
  • Annex 3 is reserved for future text on method equivalency or candidate method

• WLTP expects to specify the DEVP GTR for determining a power value for classification and downscaling of hybrid vehicles
  • EVE IWG anticipates working with WLTP for this purpose
Acknowledgements

• Thank you to the drafting team, and to the many technical experts and staff who supported this effort by participating in the EVE IWG

• Thank you also to the laboratories who performed validation testing and provided other critical resources:
  • Japan Automobile Research Institute (JARI)
  • Joint Research Centre (JRC) VeLA 8, Ispra, Italy
  • Korea Automobile Testing and Research Institute (KATRI)
  • Environment and Climate Change Canada (ECCC) River Road Facility, Ottawa
  • U.S. EPA National Vehicle and Fuel Emissions Laboratory, Ann Arbor, USA