Submitted by the EVE informal working group

Informal document **GRPE-77-28**
77th GRPE, 6-8 June 2018
Agenda item 9

Electric Vehicles and the Environment (EVE IWG)

REPORT TO GRPE 77TH SESSION

Current Mandate

- Approved mandate targets approval of power determination GTR by AC.3 in November 2019 with flexibility to extend by up to 1 year based on results of validation testing
  - Currently optimistic to meet that deadline without extension
- Determination of electrified vehicle power
  - Developing GTR to determine system power of PHEV and multi-motor PEVs, primarily for use with WLTP (downscaling, classification)
- Electrified vehicle durability
  - Continuing research on EV battery performance and durability
  - Return to AC.3 with recommendation for next steps (if any), or conclusion of topic
- Method of stating energy consumption
  - Approach the *Group of Experts on Energy Efficiency (GEEE)* to request that they assume leadership of the work

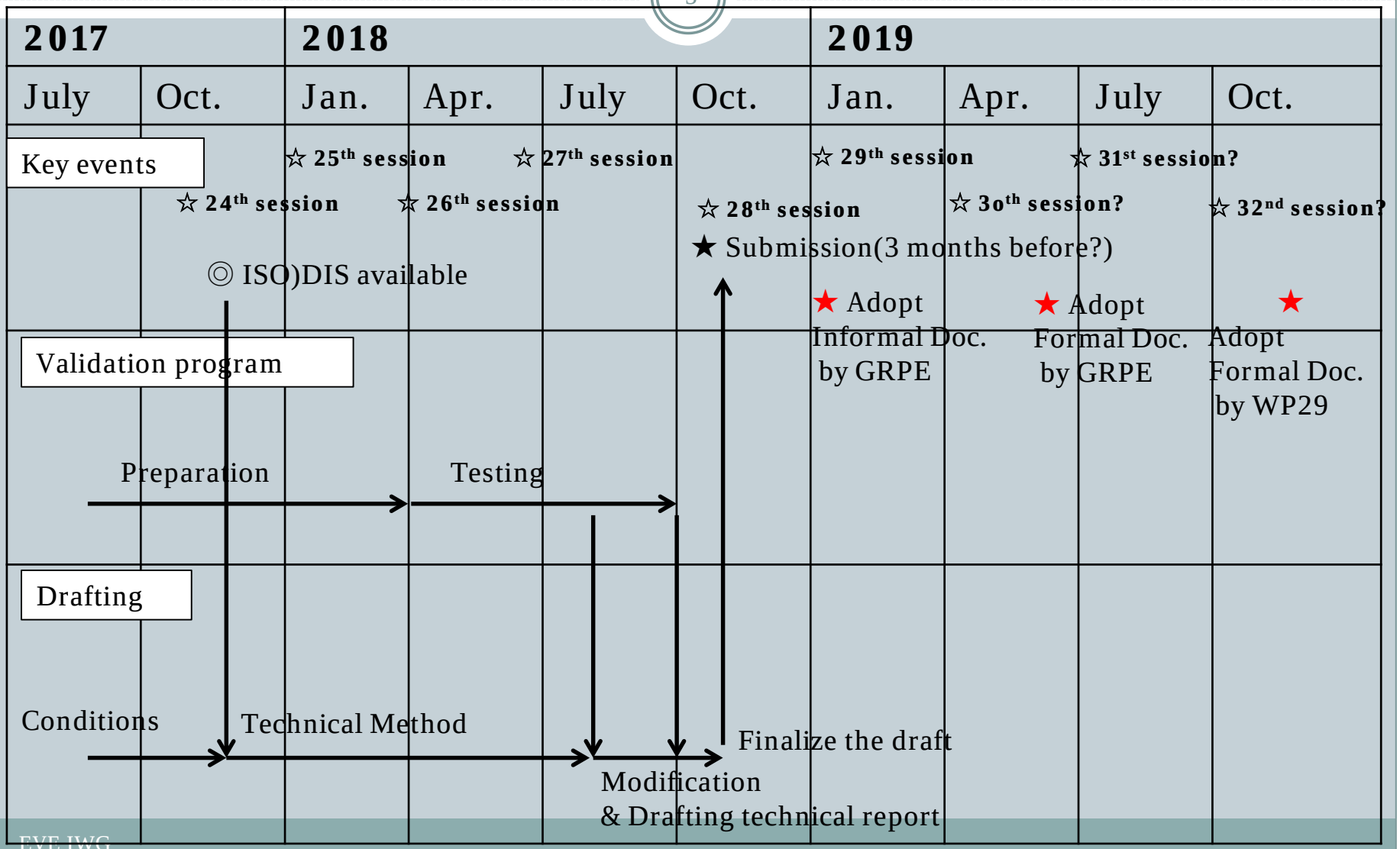
Proposal to Better Align Timeline of Deliverables

- As will be described in following slides, EVE IWG is proposing to slightly modify deliverables so that all work of EVE IWG can be formally considered by GRPE and WP.29 as a single, coherent package

Timelines for **Power Determination**

- Quote below from mandate
  - *(ii) June 2018: Draft gtr available, guidance on any open issues by GRPE;*
  - *(iii) June 2018-January 2019: Final drafting work on gtr text;*
  - *(iv) January 2019:*
    - *a. Endorsement of the draft gtr based on an informal document by GRPE;*
    - *b. Transmission of the draft gtr as an official document twelve weeks before the June 2019 session of GRPE.*
  - *(v) June 2019: Recommendation of the draft gtr by GRPE;*
  - *(vi) November 2019: Establishment of the gtr by AC.3 in the Global Registry.*

Planned Schedule for **Determination of Electrified Vehicle Power**



Timelines for **Battery Performance and Durability**

- Quote below from mandate
  - *(ii) November 2016 - June 2018:*
    - *a. EVE continues research on battery performance*
    - *EVE develops a detailed workplan and drafts request for relevant activities (including gtr development);*
    - *b. EVE continues consultation with the WLTP, including the WLTP-E-Lab sub-group and WLTP co-sponsors (Japan and the European Commission) as well as the EPPR IWG.*
  - *(iii) June 2018:*
    - *a. EVE IWG presents a first draft on the status of research work and proposal(s) for subsequent work (if appropriate) to GRPE;*
    - *b. EVE IWG presents informal documents on the status of research work and proposal(s) for subsequent work (if appropriate) for review by AC.3.*
  - *iv) November 2018: Approval of the authorization to develop a gtr by AC.3, if appropriate;*

Timelines for **Method of Stating Energy Consumption**

- Quote below from mandate
  - *(i) November 2016:*
    - *Approval to approach the Group of Experts on Energy Efficiency (GEEE), and possibly UNECE Executive Secretary about continuing work on the method of stating energy consumption;*
  - *(ii) November 2016 - June 2018:*
    - *EVE supports work of GEEE or another group on method of stating energy consumption as needed;*
  - *(iii) June 2018:*
    - *a. Report status of work on method of stating energy consumption to GRPE;*
    - *b. Report status of work on method of stating energy consumption to AC.3.*

Summary of June 2018 Deliverables in Mandate

- Early draft of System Power Determination GTR
  - Validation testing is started but not complete
  - Plan on slide 5 envisions final draft in January 2019 GRPE
- A first draft on status of Battery Durability research work and proposals for subsequent work if appropriate (including GTR development recommendation)
  - Modelling & testing work not complete, but progressing well
  - Not close to consensus on whether a durability GTR is appropriate
- Report on status of work on method of stating energy consumption
  - Not started, but can be prepared with minimal effort

Schedule Changes for Consideration

- Propose to submit first draft of all 3 deliverables together, ideally at January 2019 GRPE
  - Aligns better with current work progress
  - Gives more time to reach consensus on battery durability
  - Will allow all deliverables to be considered simultaneously by GRPE and WP.29 as a single, coherent package
- EVE IWG agreed on this path forward at Tokyo meeting in March 2018

Consideration by GRPE

- Consideration by GRPE of EVE IWG proposal to submit all deliverables as one coherent package
  - This was the intention of the EVE IWG when the current mandate document was developed, but is not what is reflected in the actual wording of the document, as previously described
- Discussion and Questions?

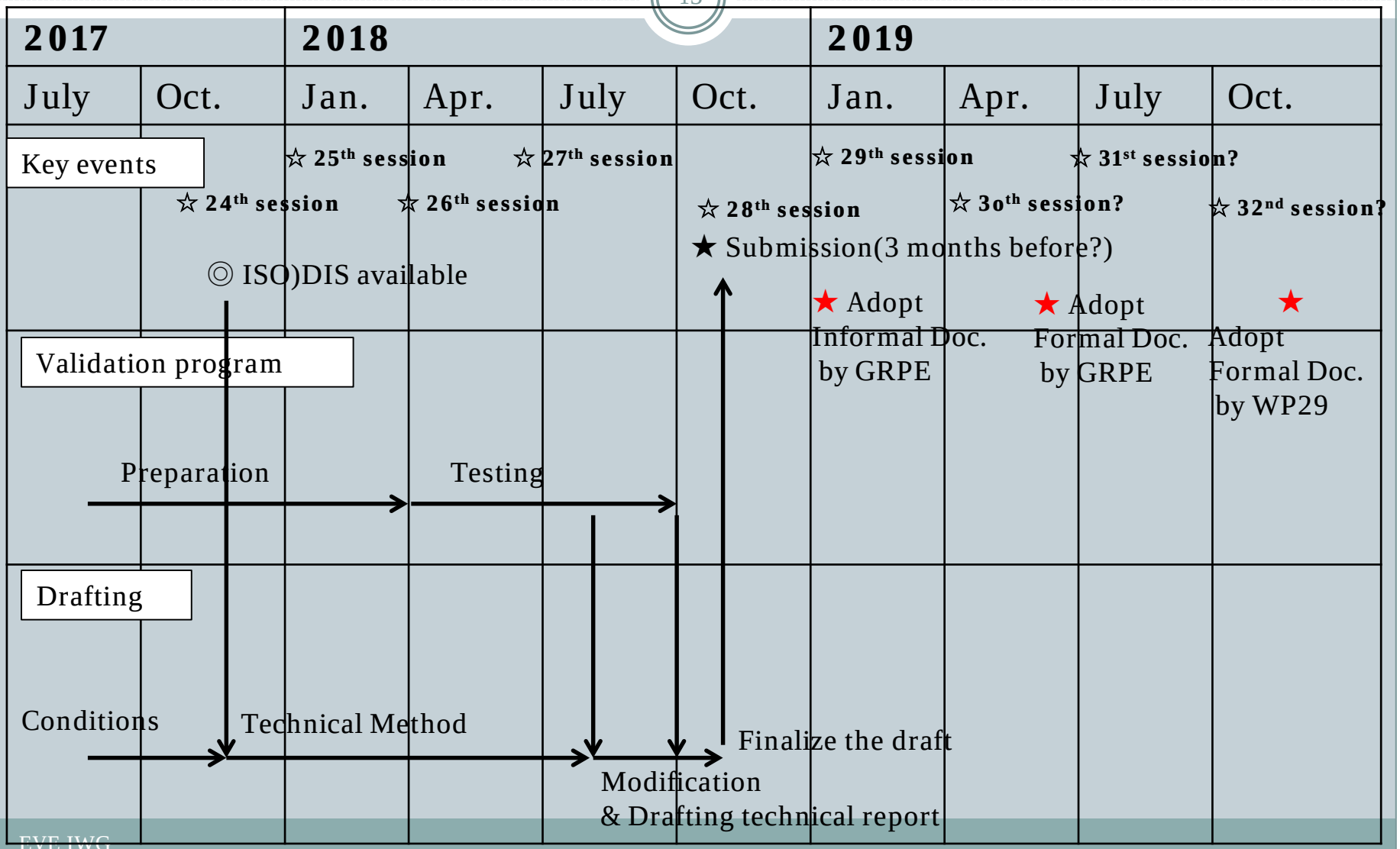
Next Steps for Determination of Electrified Vehicle Power

- Initial plan for GTR development included:
  - Reference Method, validated by vehicle testing
  - Candidate Method, which would allow certification based on component data
    - Candidate Method would only be developed if testing and analysis showed good correlation to the Reference Method
- Current work is focused on development of the Reference Method
  - Candidate Method has not shown good prospect for being developed at this stage
- EVE has continued close collaboration with WLTP, to ensure procedure and timelines meet WLTP needs

Next Steps for Determination of Electrified Vehicle Power

- Initial draft posted on shared site of Drafting Group on 23 May 2018
  - Many open issues identified, including validation needs
- Validation testing program beginning
  - JRC-OICA – cooperation for testing in mid-June in Ispra
  - Canada – vehicles procured and accumulated and testing is being scheduled for summer 2018
  - U.S.A. – vehicles procured and accumulated and testing is being scheduled for summer 2018
  - Korea – first tests to be completed in mid-June, followed by results analysis and further tests

Planned Schedule for Determination of Electrified Vehicle Power



GRPE Feedback on Determination of Electrified Vehicle Power

- EVE IWG and GRPE Chair noted at GRPE-76 in January 2018 that there would be a discussion and recommendation from GRPE in June 2018 on whether a GTR for EV power determination should be developed as a standalone GTR, or as an Appendix to GTR No.15
- 3 options:
  - Standalone GTR for hybrid system power determination
  - GTR as an annex to GTR No. 15 (WLTP)
  - New “Part B” to UN Regulation No. 85 (Power determination for conventional vehicle)

Annex to GTR No. 15

Pros	Cons
Most clearly meets current demand for hybrid vehicle power determination procedure (WLTP needs)	Least accessible format for future use by contracting parties for other purposes
Least effort for EVE IWG and Drafting Group to develop	Brings topic of power into a GTR that is intended to focus on emissions – does this set precedence for other procedures to be included in GTR No. 15 (i.e. tire rolling resistance)?
Most clearly aligns with current mandate of EVE IWG	

New Standalone GTR

Pros	Cons
Similar to structure of current power determination for conventional vehicles	Some preference for this option, but no clear demand from contracting parties for this structure
Makes test procedure more accessible for other uses in the future if desired by contracting parties, such as customer information purposes, registration requirements or taxation systems	More work to develop than annex to GTR No. 15
Logical structure that keeps consideration of power and emissions in separate Regulations	Slight deviation from mandate of EVE IWG, GRPE Secretariat would seek concurrence from WP.29

New Part for UN Reg No. 85

Pros	Cons
Keeps power determination for conventional powertrains and hybrid powertrains in the same regulation	No clear demand from contracting parties for this structure
Makes test procedure more accessible for other uses in the future if desired by contracting parties	More work to develop than annex to GTR No. 15
Logical structure that keeps consideration of power and emissions in separate Regulations	Slight deviation from mandate of EVE IWG, GRPE Secretariat would seek concurrence from WP.29
	UN Reg No. 85 is under 1958 Agreement rather than 1998 Agreement

Preferences Expressed

Preference	Country/Organization	Preference Strength
Annex to GTR No. 15	Japan*	Medium
	OICA	Strong
Standalone GTR	Canada	Weak
	U.S.A.	Weak
Part of UN Reg No. 85	none	
No firm preference yet	China	
	European Commission	

- *Japan views Annex to GTR No. 15 as path forward dictated by current mandate

Consideration by GRPE

- Consideration by GRPE for decision on which of the following structures is most suitable for the GTR on power determination for electrified vehicles
  - Annex to GTR No. 15
  - Standalone GTR for electrified vehicle power
  - New “Part B” of UN Reg No. 85

Next Steps For Electrified Vehicle Durability

- Recent work included development of a parametrized simulation model (JRC lead) validated by on-road testing (Canada lead)
  - Parameters include cell chemistry, battery architecture, battery reserve capacity, driving activity, vehicle architecture, charging power, charging frequency
- EVE IWG continues to cooperate with WLTP IWG to consider vehicle level durability requirements
- Final recommendation to AC.3 (likely in 2019) may include a recommendation to seek authorization for relevant additional activities such as GTR development, or may recommend concluding the topic

Next Steps For Electrified Vehicle Durability

- Contracting parties to provide views on the urgency of creating a durability procedure for electrified vehicles
- Japan and European Commission have previously made strong statements in support of a GTR for some durability aspects (air pollutants in particular)
- EVE has identified potential GTR solutions, however, considerable work still needs to be done

Next Steps For Electrified Vehicle Durability

- In addition, consensus had not yet been reached on overall durability requirements
  - Sample questions:
    - Should conventional and electrified vehicles have same durability thresholds (calendar age or km life)?
    - Are minimum requirements needed for maintenance of all-electric range?
  - Sample view from Japan:
    - EVE could consider the possibility of using of deterioration factors for pollutant emissions from OVC-HEVs and NOVC-HEVs in line with ICE vehicles. In this case, the clear evidences which degraded batteries will not affect the function of treatment systems for emissions shall be required.

Next Steps for Method of Stating Energy Consumption

- At conclusion of previous mandate, EVE noted that further improvement of EVE's models to assess energy consumption of electrified vehicles would require the work of experts in electricity generation and distribution
- On 01-Nov-2017, EVE Secretariat presented via WebEx to the *Group of Experts on Energy Efficiency (GEEE)* to request that they assume leadership of the topic, with the support of the EVE IWG as needed
  - Romain Hubert attended in person, as GRPE was between Secretariats
  - Presentation is posted at EVE-25-04e https://wiki.unece.org/display/trans/EVE+25th+Session
- GEEE was receptive to the idea, and endorsed a proposal for the Group of Experts on Cleaner Electricity Production (CEP) to consider this work, with support of EVE IWG
  - No formal cooperation mechanism has yet been established

Overall EVE Next Steps

- Continue drafting of GTR for power determination
- Continue validation testing of GTR for power determination
- Improve and expand vehicle durability simulation and testing to validate the modeling
- Prepare recommendation on next steps for in-vehicle battery durability (for eventual consideration by WP.29)
- Establish cooperation mechanism with GEEE and/or CEP experts to support work on a method of stating energy consumption

EVE Meetings

- Regular meetings concurrent with GRPE each January and June
- 10-11 April 2017 – Ann Arbor, USA
- 24-25 October 2017 – Vienna, Austria
- 27-28 March 2018 – Tokyo, Japan
- 16-18 October 2018 – Ottawa, Canada
  https://wiki.unece.org/display/trans/EVE+28th+Session
- Spring 2019 – City TBD, Sweden (if needed)
- Fall 2019 – TBD (if needed)