

21st Meeting of the Electric Vehicles and the Environment Informal Working Group (EVE IWG)

Outline

- 2015-16 mandate and progress
- Communication with WLTP
- Battery performance and durability
- Determining the powertrain performance
- Method of stating energy consumption
- Battery recycling/recyclability
- Schedule & locations of past & upcoming meetings
- Next Steps

2015-16 Mandate

- A two-part mandate was approved by WP.29 in November 2014
 - Part A: 2015-2016
 - Part B: potentially 2017 and beyond
- Four work topics in Part A
 - Battery performance and durability
 - Determining the powertrain performance
 - Method of stating energy consumption
 - Battery recycling/recyclability

2015-16 Progress and Results

- 8 meetings (Geneva, Canada, China and teleconference)
- Formal document for WP.29
- Expanded knowledge base about factors affecting EV performance and durability
- Status report describing work completed during the mandate
- Excel model and supporting Word document for method of stating energy consumption
- Part B of mandate approved by AC.3 in November 2016

Battery Recycling/Recyclability

- 2015-16 details
 - Leadership: Secretary
 - Key Outcomes: Highlight reasons why battery recycling may not be an appropriate topic for WP.29 in general and the EVE specifically
- Proposed 2017-18 (or 19) details
 - Leadership: none
 - Key Outcomes: item is removed from the EVE mandate

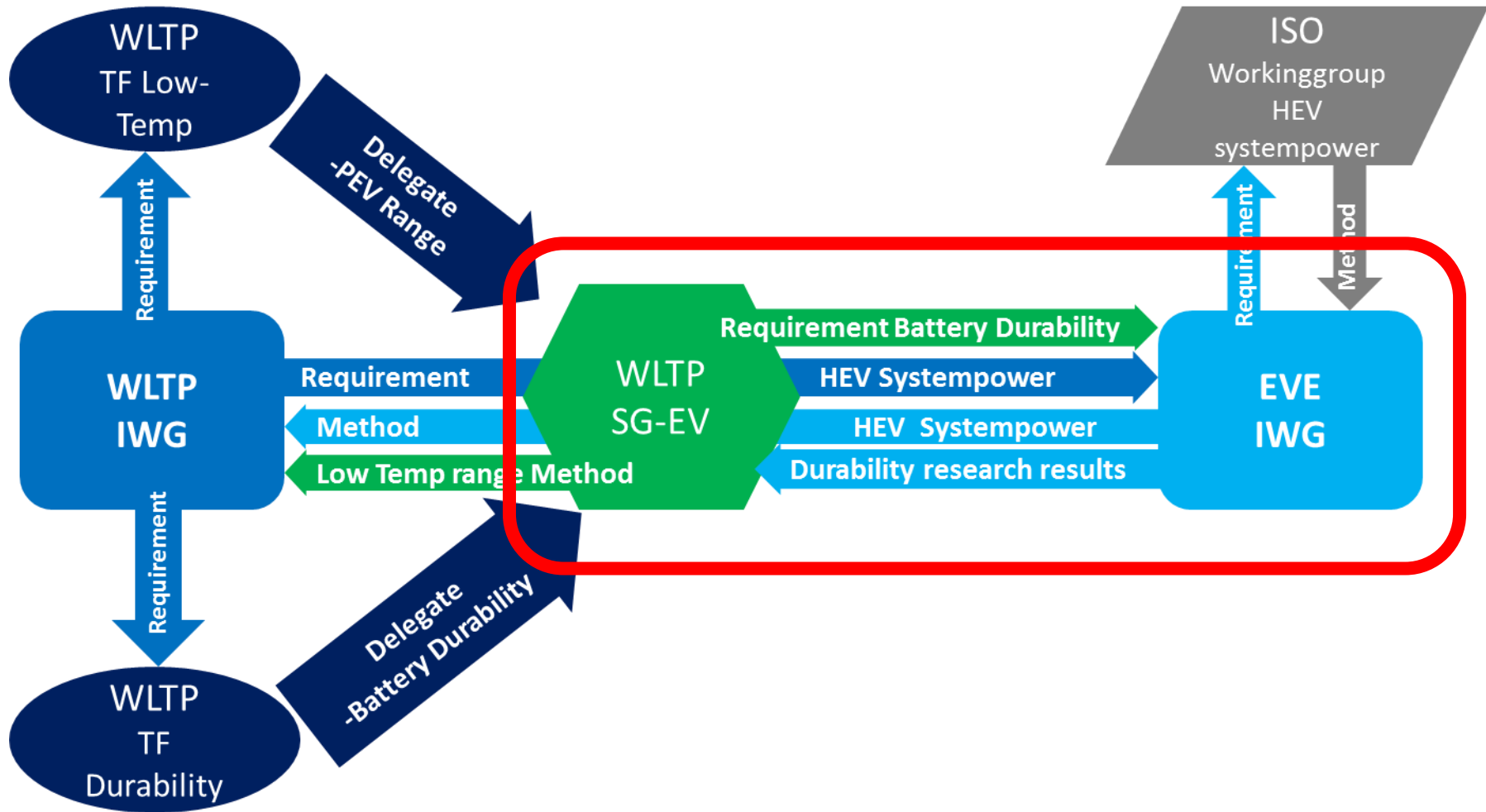
Battery Performance and Durability

- 2015-16 details
 - Leadership: Canada and United States
 - Key Outcomes: Expanded knowledge base of factors which impact battery durability
- Proposed 2017-18 (or 19) details
 - Leadership: Canada and United States
 - Key Outcomes: Further expanded knowledge base with the goal of a plan/recommendation for development of an EV durability GTR or a determination that the EVE IWG will not be capable of developing a procedure in 2018 or 2019

Battery Performance and Durability

- Key considerations
 - Coordination with WLTP IWG and prescribed durability criteria (age, km, temperature range, etc.)
 - Variety of battery chemistries
 - Variety of xEV architectures
 - Variety of battery management systems (i.e. SOC and temperature controls)
 - Influence on future battery designs (i.e. possible future batteries which are regularly replaced like tyres)
 - Degradation in both battery power and capacity are possible

Communication with WLTP



Battery Performance and Durability

- Ongoing work
 - ▣ Impact of level 2 vs level 3 charging (Canada)
 - ▣ Low temperature durability testing (Canada)
 - ▣ Testing capacitor based regenerative braking (Canada)
- Existing needs
 - ▣ Interested in non-confidential information from manufacturers about methodologies they are using to determine EV battery durability
 - ▣ Interested in ideas from EVE group members on key research areas or on-going projects of interest at the national level

Method of Stating Energy Consumption

- 2015-16 details
 - Leadership: China
 - Key Outcomes:
 - Excel model & supporting Word document for method of stating energy consumption
 - Identified need for additional experts in electricity generation and distribution
- Proposed 2017-18 (or 19) details
 - Leadership: China?
 - Key Outcomes: Transferring leadership to another UNECE group such as the *Group of Experts on Energy Efficiency (GEEE)*, and supporting that group moving forward

Method of Stating Energy Consumption

- Key considerations
 - Approaching GEEE about taking on a leadership role for this project
 - Approaching UNECE Executive Secretary if GEEE is unable to continue work on this topic
 - Ratio between EV and conventional power for plug-in hybrid vehicles
 - Global variation in infrastructure for the generation and distribution of electrical power

Method of Stating Energy Consumption

- Existing needs
 - Confirm subgroup leadership
 - Develop plan to approach GEEE
 - Develop backup plan to approach UNECE Executive Secretary

Determining the Powertrain Performance

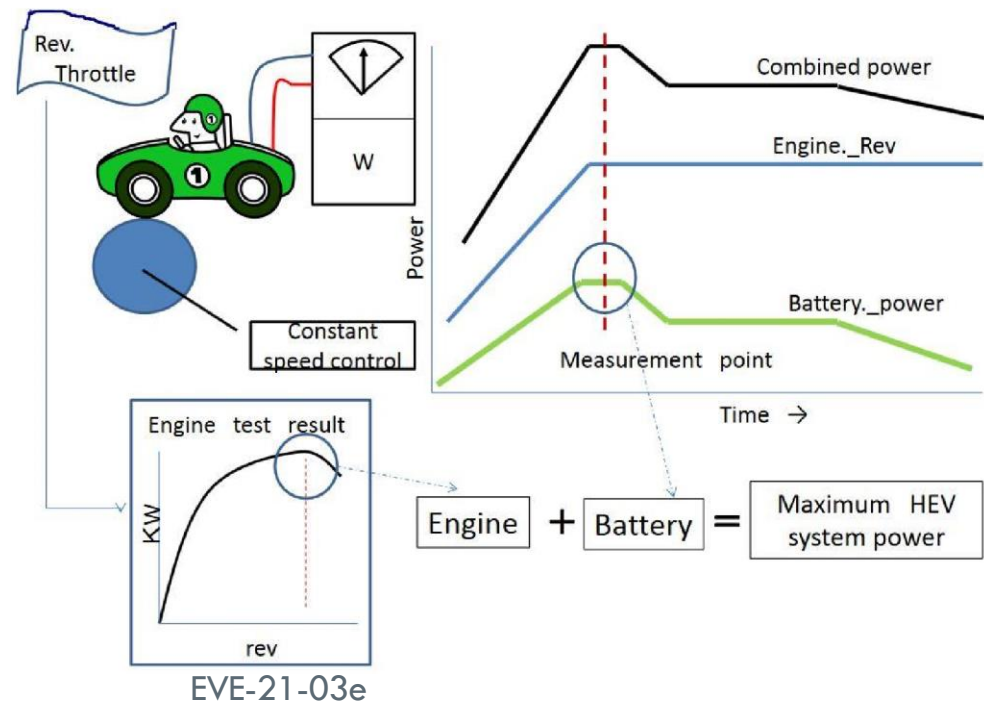
- 2015-16 details
 - Leadership: Germany & Korea
 - Key Outcomes: Draft plan and timeline to develop GTR on determining xEV powertrain performance
- Proposed 2017-18 (or 19) details
 - Leadership: ???
 - Key Outcomes: GTR for determining powertrain performance of xEV in 2018 (or 19)

Determining the Powertrain Performance

□ Key considerations

- Coordination with WLTP IWG
- Comparability to power rating of ICE vehicles
- Two possible methods

- Reference method
 - chassis dyno
- Candidate method
 - component testing and calculation



Workplan for Determining the Powertrain Performance

- I. Consideration of the concepts:
 - Reference Method – Chassis dyno testing and calculation
 - Candidate Method – Component testing and calculation
- II. Consideration of the open points
 - Load Collectives and Maximum Power
 - Reference Method => Chassis Dyno Testing with completed vehicle and calculation to determine System Power
 - Candidate Method => Component Testing and calculation to determine System Power
 - Customer Information and other information with added value

Workplan for Determining the Powertrain Performance

- III. Determination of work plan with task list and including allocation of work load
- IV. Proof of concepts: Studies with different types of HEVs including. series HEV, REX and PEVs
- V. Test, refine / improve and validation of the method(s)
- VI. Drafting of the gtr
- VII. Proposal for a draft amendment to GTR No. 15
- VIII. Approval at GRPE, voting at WP.29 AC.3

Battery Performance and Durability

- Ongoing work
 - Coordination with WLTP SG-EV
- Existing needs
 - Confirm subgroup leadership
 - Continue coordination with WLTP SG-EV
 - Develop and draft GTR, based on plan approved in Formal Document
 - Find laboratories willing to conduct validation testing necessary to confirm validity of Candidate and Reference Methods

Past Meetings

Meeting	Date	Location
EVE-13	12 January 2015	Geneva, Switzerland
EVE-14	20 April 2015	Teleconference
EVE-15	08 June 2015	Geneva, Switzerland
EVE-16	19-20 October 2015	Ottawa, Canada
EVE-17	11 January 2016	Geneva, Switzerland
EVE-18	11-12 April 2016	Shanghai, China
EVE-19	08 June 2016	Geneva, Switzerland
EVE-20	26 July 2016	Teleconference

Upcoming Meetings

Meeting	Date	Location
EVE-21	11 January 2017	Geneva, Switzerland
EVE-22	Spring 2017	United States
EVE-23	June 2017	Geneva, Switzerland
EVE-24	Fall 2017	TBD?
EVE-25	January 2018	Geneva, Switzerland
EVE-26	Spring 2018	TBD?
EVE-27	June 2018	Geneva, Switzerland
EVE-28	Summer/Fall 2018	TBD?
EVE-29 (if needed)	January 2019	Geneva, Switzerland
EVE-30 (if needed)	Spring 2019	TBD?
EVE-31 (if needed)	June 2019	Geneva, Switzerland
EVE-32 (if needed)	Summer/Fall 2019	TBD?

Next Steps

- Invitation to EVE-22 in the United States is likely to come soon
 - Possible locations include Michigan and California
- Identify and confirm subgroup leads
- Identify host countries/organizations for upcoming meetings
- Conduct workplans of three subgroups