

## EVE Informal Working Group Prioritization Discussion Points

Issue	Information re: Substantive impacts	Addressed by regulations?	Is another WP.29 group addressing this issue?
<b>1) Vehicle Energy Efficiency/Range</b>			
<b>a) Cabin Heating</b>	EVE-04-05e submitted by Dr. Tober: The total add. energy req. for climate control @ +10°C: 10 - 20 %, @ -10°C: 40 - 55%.  Elements to form recommendation in EV Reference Guide: - Pre-conditioning prior to vehicle usage would decrease effect on range though not necessarily total energy usage from the grid - Heated seats & steering wheel - Advanced technologies (Infra-red panels & heat pumps) - Accounting for these parameters in a test cycle to justify higher cost of advanced technologies	US/Can/S.Korea for public health pollutants; US/Can for label	Possible WLTP phase 2 (2014-2018)
<b>b) A/C</b>	EVE-04-05e submitted by Dr. Tober: The total add. energy req. for climate control @ +10°C: 10 - 20 %, @ -10°C: 40 - 55%.  Elements to form recommendation in EV Reference Guide: - Pre-conditioning prior to vehicle usage would decrease effect on range though not necessarily total energy usage from the grid - Advanced technologies: such as heat pumps and electrified compressors - Zeolite	US/Can/S.Korea for public health pollutants; US/Can for label	MACTP developing methods for internal combustion engine vehicles
<b>c) Potential battery temperature effect on capacity and efficiency</b>	Meyer, N et al (2012) "The Impact of Driving Cycle and Climate on Electrical Consumption and Range of Fully Electric Passenger Vehicles" reports a 15-20% loss of range for a variety of test cycles comparing 20 C and -20 C; and two tests indicate a relatively small difference in efficiency but it is not clear whether these are within the variation of the testing procedure  Elements to form recommendation in EV Reference Guide: -End-of-range is believed to occur sooner in cold temperatures, but it is uncertain what portion of the lost range is due to actual lost energy (i.e. reaching minimum SOC faster due to reduced discharge and regen efficiency) vs depressed voltage triggering an end-of-range condition at a higher SOC while energy still resides in the battery. The first case means an increase in energy consumption while the second does not (the unused energy will become accessible as the battery rests/warms, or will reduce the energy needed to recharge).? -Vehicle thermal management systems differ greatly	No (except India example)	Possible WLTP phase 2 (2014-2018)
<b>d) Potential battery state of charge effect on efficiency?</b>	Elements to form recommendation in EV Reference Guide: -Potential for energy loss with increased demand from the BMS (battery management system). There may be increased cooling demands as well as cell balancing demands in the case of Li-ion batteries.	No	No such efforts known
<b>e) Road gradient</b>	EVE-04-05e: A +2% Road Gradient results in 30%-50% higher energy consumption. The energy saving at -2% is nearly as high as the higher energy demand at +2%.  Elements to form recommendation in EV Reference Guide: - Regenerative braking efficiency	No	No such efforts known
<b>f) Energy equivalency conversion methods?</b>	Elements to form recommendation in EV Reference Guide: - Comparison on an energy or an energy-fuel basis - Future need to regulate energy efficiency (ie minimum kWh per km)		
<b>2) Battery performance/durability</b>			
<b>a) Battery durability effect on range</b>	Highly chemistry dependent, some research is available from Nissan: <a href="http://www.mynissanleaf.com/assets/An%20open%20letter%20to%20Nissan%20LEAF%20owners%20from%20Carla%20Ballo_FINAL.pdf">http://www.mynissanleaf.com/assets/An%20open%20letter%20to%20Nissan%20LEAF%20owners%20from%20Carla%20Ballo_FINAL.pdf</a>  Elements to form recommendation in EV Reference Guide: - Chemistry variations - Battery management system control of depth of charge and recharging rates - Thermal management systems	No	Possible WLTP Phase 2 (2014-2018)
<b>b) Potential battery durability effect on kWh/km</b>	Elements to form recommendation in EV Reference Guide: - Chemistry specific effects - Surface-film	No	
<b>c) Battery performance effect on emissions</b>	Elements to form recommendation in EV Reference Guide: - Reduced all electric range for PHEVs resulting in ICE starting sooner & running longer	Limited, such as US EPA hybrid (Inc. plug-ins)	
<b>d) Battery management system performance</b>	Elements to form recommendation in EV Reference Guide: - Cell-balancing - Thermal management draw - Other parasitic losses		
<b>Information Sharing Items (Outside of WP.29)</b>			
<b>3) Regulatory incentives</b>	Elements to form recommendation in EV Reference Guide: - HOV lane use - Manufacturer credits	Yes	no
<b>4) Regulatory Standards - Incorporating EVs into fuel economy standards</b>		Addressed in Japan's standard, US CAFÉ & Canadian LDV regulations	No
<b>5) EV charging</b>	Elements to form recommendation in EV Reference Guide: - Charge rate vs charger efficiency - Level 2 home charging stations are not made by the same manufacturer of the vehicle and efficiency could vary between manufacturers - Effects of various cell-balancing mechanisms	Generally industry standards; EU may legislate	No