

WLTP-E-Lab Sub Group Progress report

WLTP-DTP-E-LabProc-034

Leader: Per Ohlund / Kazuki Kobayashi

Meeting (after 61th GRPE)

- 5th meeting:

Date: 27.1.2011

Location: Phone conference

Topics: GTR structure/Definition

- 6th meeting:

Date: 23-24.2.2011

Location: Brussels

Topics: GTR structure/Definition/CD&CS
test / Calculation

Meeting (after 61th GRPE)

- 7th meeting:

Date:1.4.2011

Location: Phone conference

Topics:CD&CS test /Calculation

Discussed based on ACEA proposal

- 8th meeting:

Date:12.4.2011

Location: Zurich

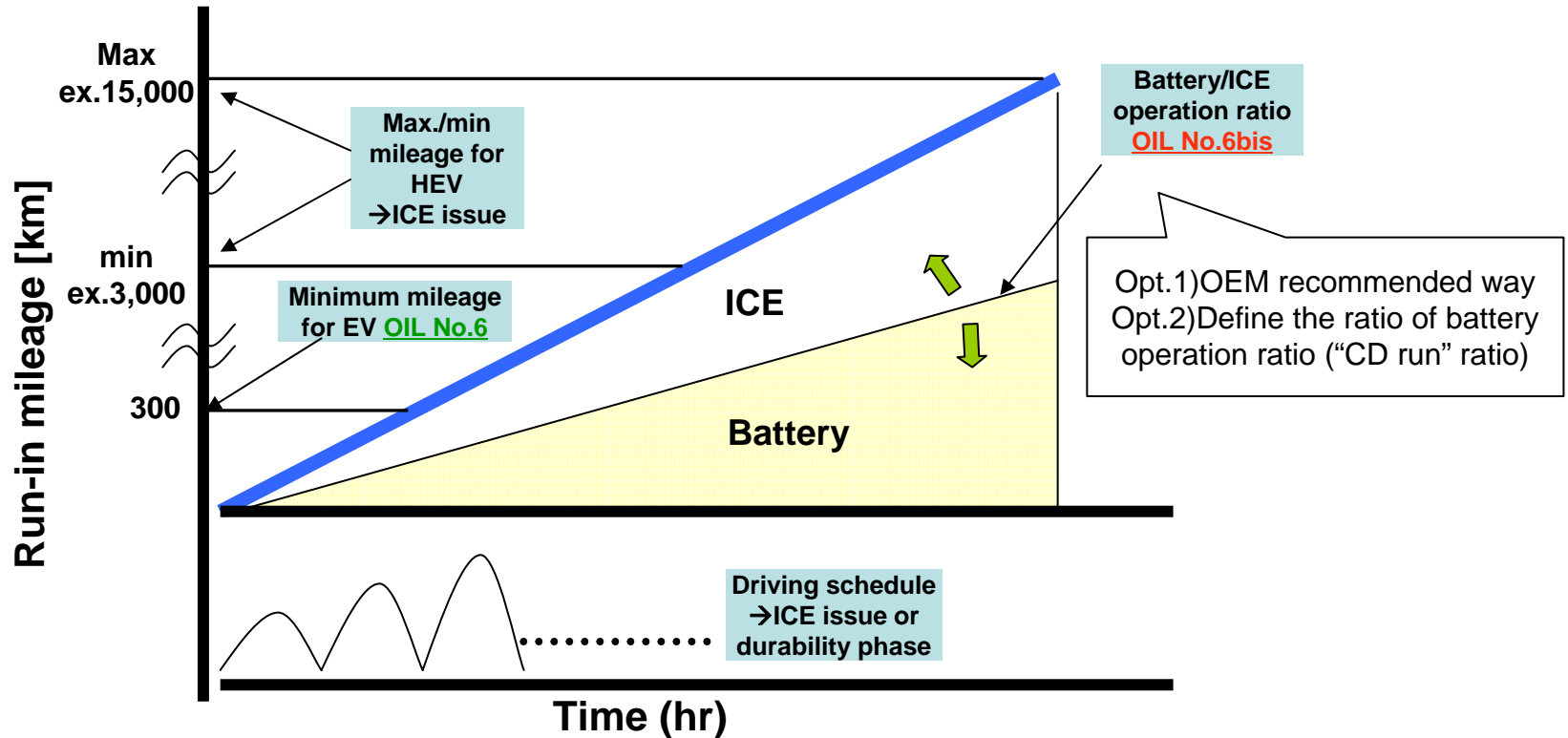
Topics: Open issues/Schedule

Meeting (after 61st GRPE)

- 9th meeting:
Date: 9.5.2011
Location: Phone conference
Topics: Open Issues
- 10th meeting:
Date: 1.6.2011
Location: Phone Conference
Topics: Open issues/gtr draft
- 11th meeting will be held on 5th of July at Sweden.

Proposal

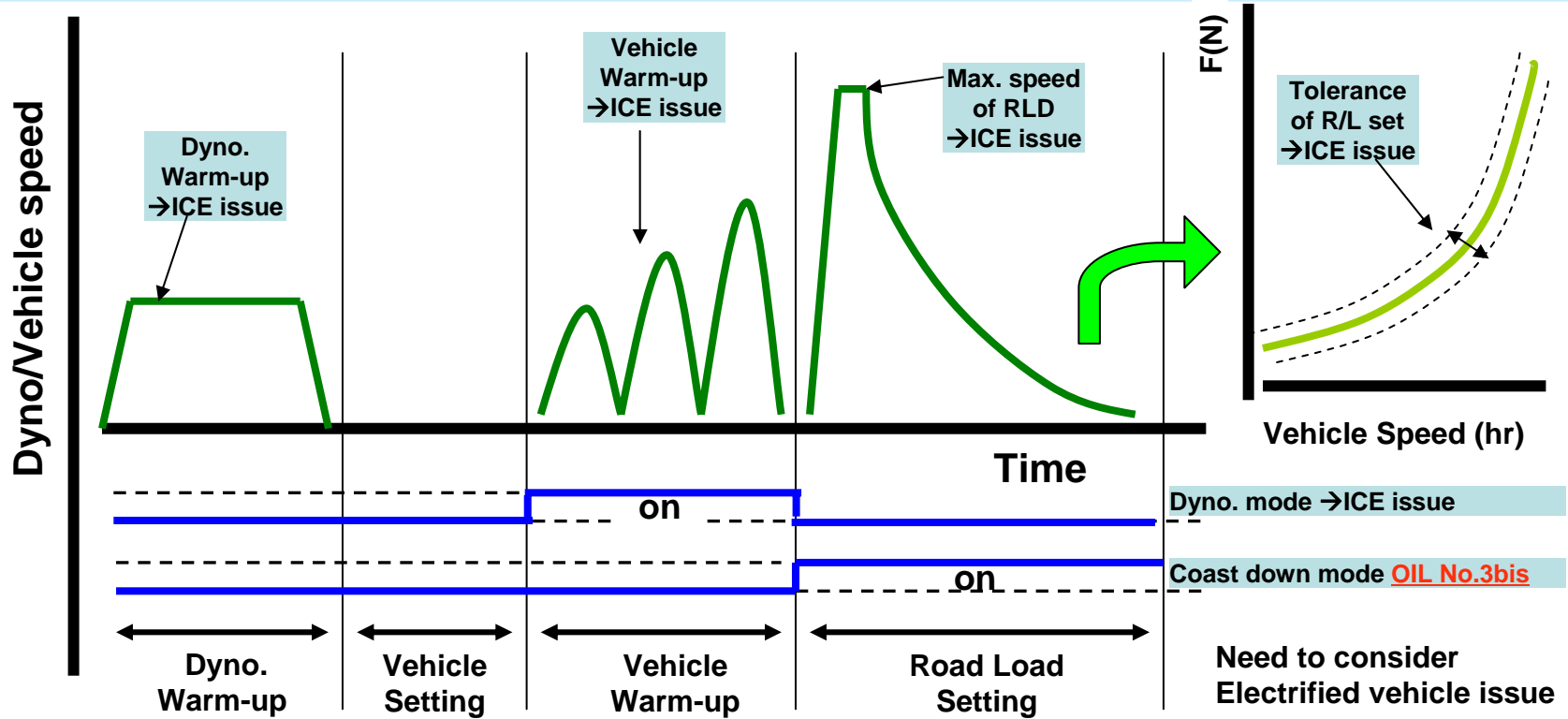
Step1: Vehicle Run-in



	Operation switch	Driving schedule	Run in mileage min.	Run in mileage Max.	Battery / ICE operation ratio
EV	n/a	Follow ICE / later	300km OIL No.6	n/a ?	n/a
OVC HEV	Without	Follow ICE	Follow ICE	Follow ICE	OIL. No.6 bis
	With (incl. pure EV)	Or			
	With (no pure EV)	Phase II (durability)			
NOVC HEV	Without	Follow ICE	Follow ICE	Follow ICE	n/a
	With (incl. pure EV)	Or			
	With (no pure EV)	Phase II (durability)			

Proposal

Step2: Road Load Setting



	Operation switch	Dyno. warm-up	Vehicle setting	Vehicle warm-up	Coast down mode	Road load setting criteria
EV	n/a	Follow ICE	Follow ICE	Follow ICE *	OIL. No.3bis	Follow ICE
OVC HEV	Without					
	With (incl. pure EV)					
NOV C HEV	With (no pure EV)					
	Without					
	With (incl. pure EV)					
	With (no pure EV)					

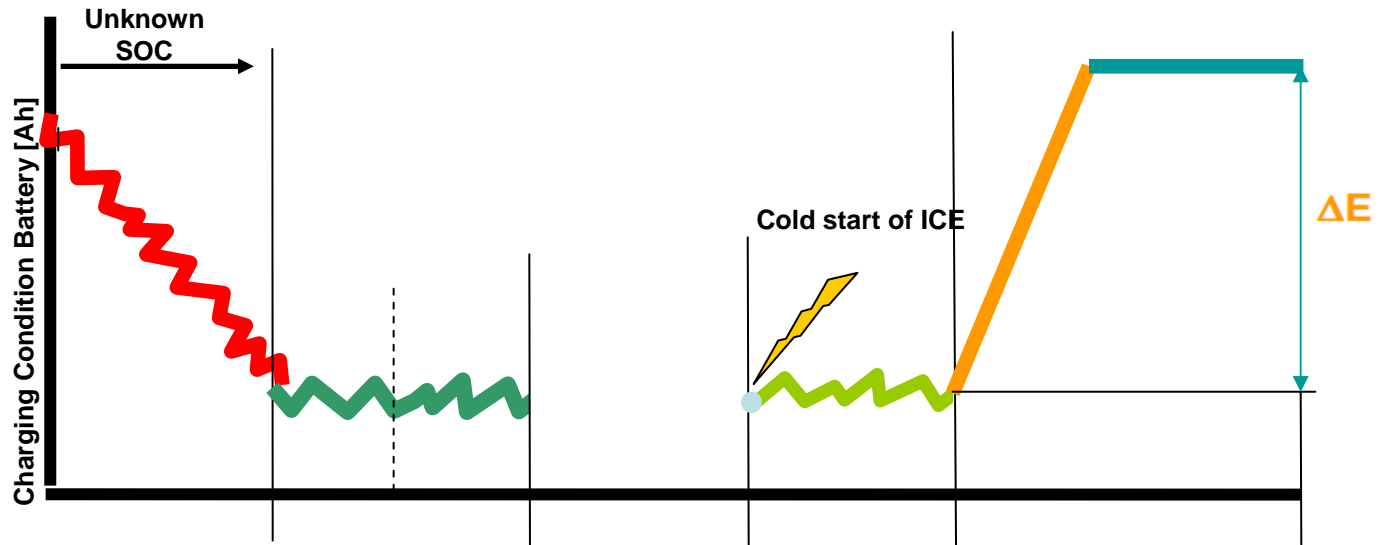
*) allow battery charging during vehicle warm-up to prevent empty battery

Proposal

Step 3 Charge Sustaining Mode

Performance of
Watt-hour meter,
Am-meter

OIL No.15,16,17

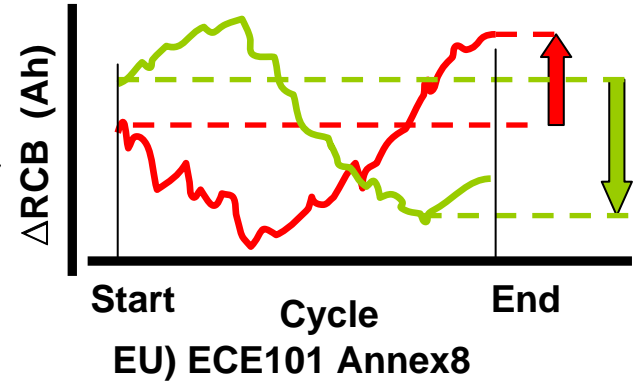
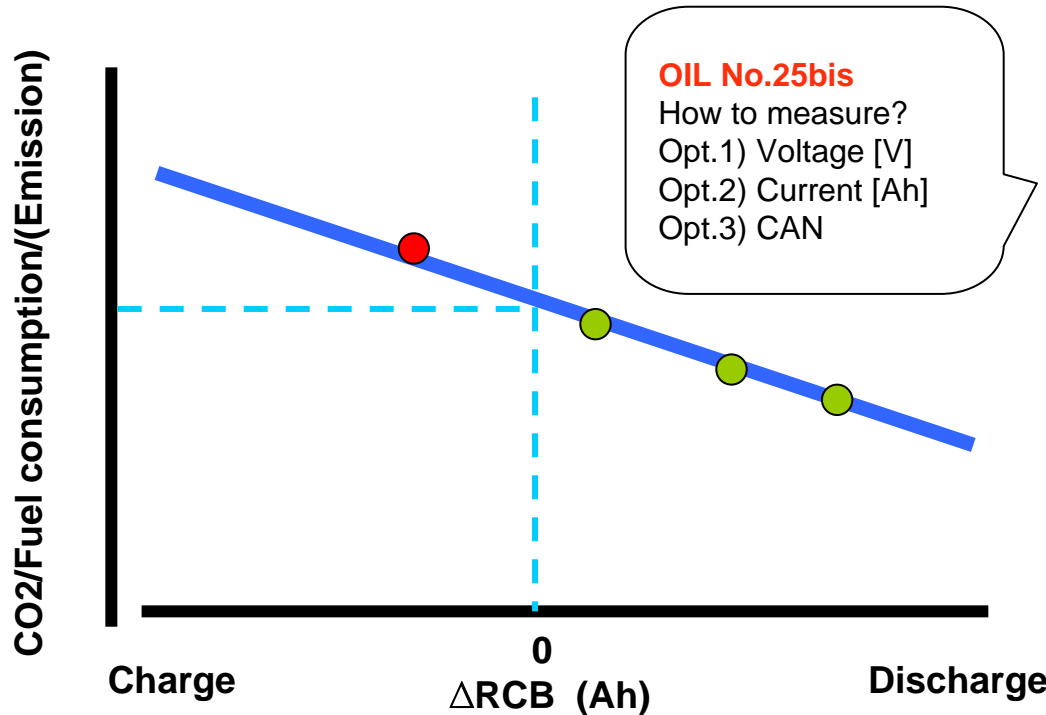


	operation switch	initial discharge	pre-conditioning	Soak time	Charge sustaining test	Charging OIL No.8 Charging method
EV	n/a	n/a	n/a	n/a	n/a	Consumption test OIL No.2
OVC HEV	without	OIL No.14 discharge condition	follow ICE	follow ICE	OIL No.26,27 RCB correction	Charging time: OIL No.9 Condition: OIL No.7 end of charge : OIL No.10,10bis
	With					
NOVC HEV	Without	n/a	follow ICE	follow ICE	Ex; correct emission?	n/a
	with					
	with					

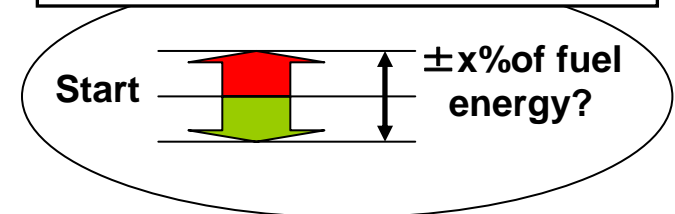
Validation test

Proposal

Appendix: RCB Compensation



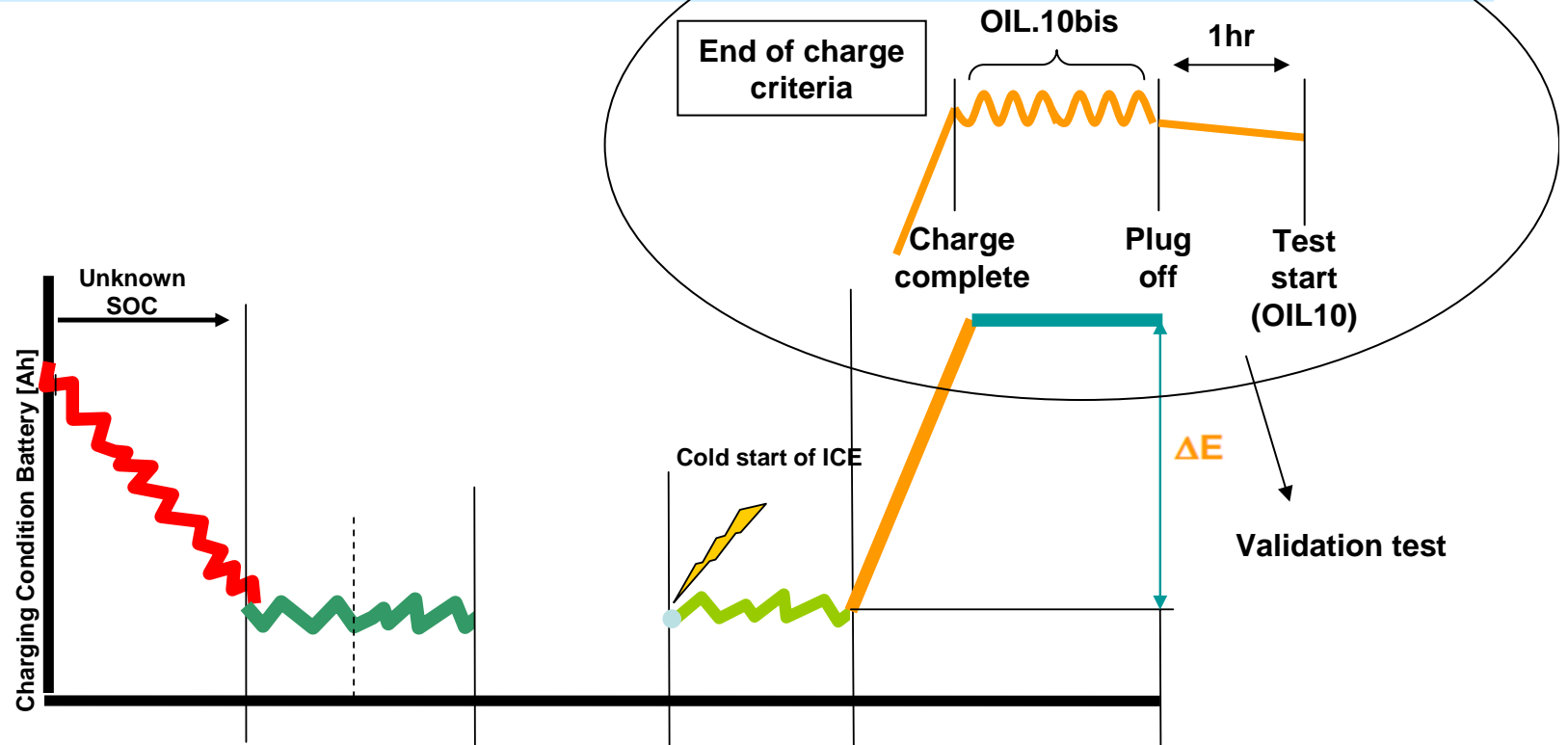
OIL No.27 RCB correction criteria



	Operation switch	Range test	Pollutants (including AP/PN/PM)		CO2/Fuel Consumption		
			CD test	CS test	CD test	CS test	
EV	Without	n/a	n/a	n/a	n/a	n/a	
OVC HEV	With (incl. pure EV)		RCB Correction for Emission?	n/a	OIL26/26bis/27	n/a	Applicable OIL No.27
	With (no pure EV)						
	Without						
NOVC HEV	With (incl. pure EV)		n/a	n/a	OIL26/26bis/27	n/a	Applicable OIL No.27
	With (no pure EV)						
	Without						

Proposal

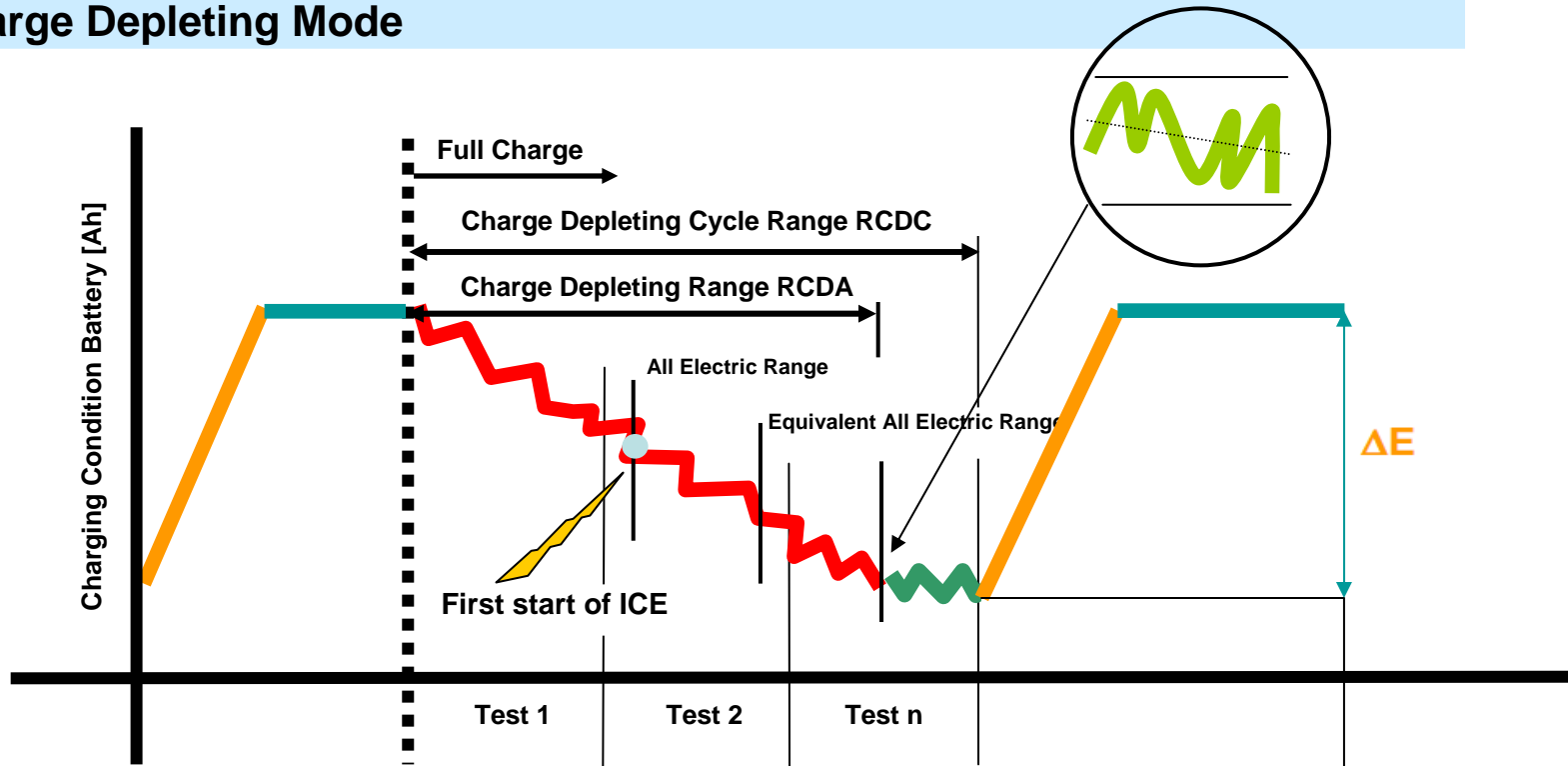
Step 3 Charge Sustaining Mode (bis)



	operation switch	initial discharge	pre-conditioning	Soak time	Charge sustaining test	Charging
EV	n/a	n/a	n/a	n/a	n/a	
OVC HEV	without	OIL No.14 discharge condition	follow ICE	follow ICE	OIL No.26,27 RCB correction	Charging time: OIL No.9 Condition: OIL No.7 end of charge :OIL No.10,10bis
	With					
NOVC HEV	Without	n/a	follow ICE	follow ICE	Ex; correct emission?	n/a
	with					
	with					

Proposal

Step4 Charge Depleting Mode



	operation switch	charging after CS test	Charge depleting test/EV range test OILNo.11 Interruption Condition	Charging
EV	n/a	n/a	Test termination Condition OIL No.12 Stop Condition OILNo.13	Same as Step3
OVC HEV	without	refer to step3	break off criteria: OIL No.25& 25bis Deceleration condition; OIL No.13bis EAER determination OIL No.21	Same as Step3
	with			
	with			
NOVC HEV	without	n/a	n/a	n/a
	with			
	with			

Proposal

Step5: Calculation

Detailed calculation formula is developed after completion of WLTC.

Pollutants :

CO2/Fuel Consumption :

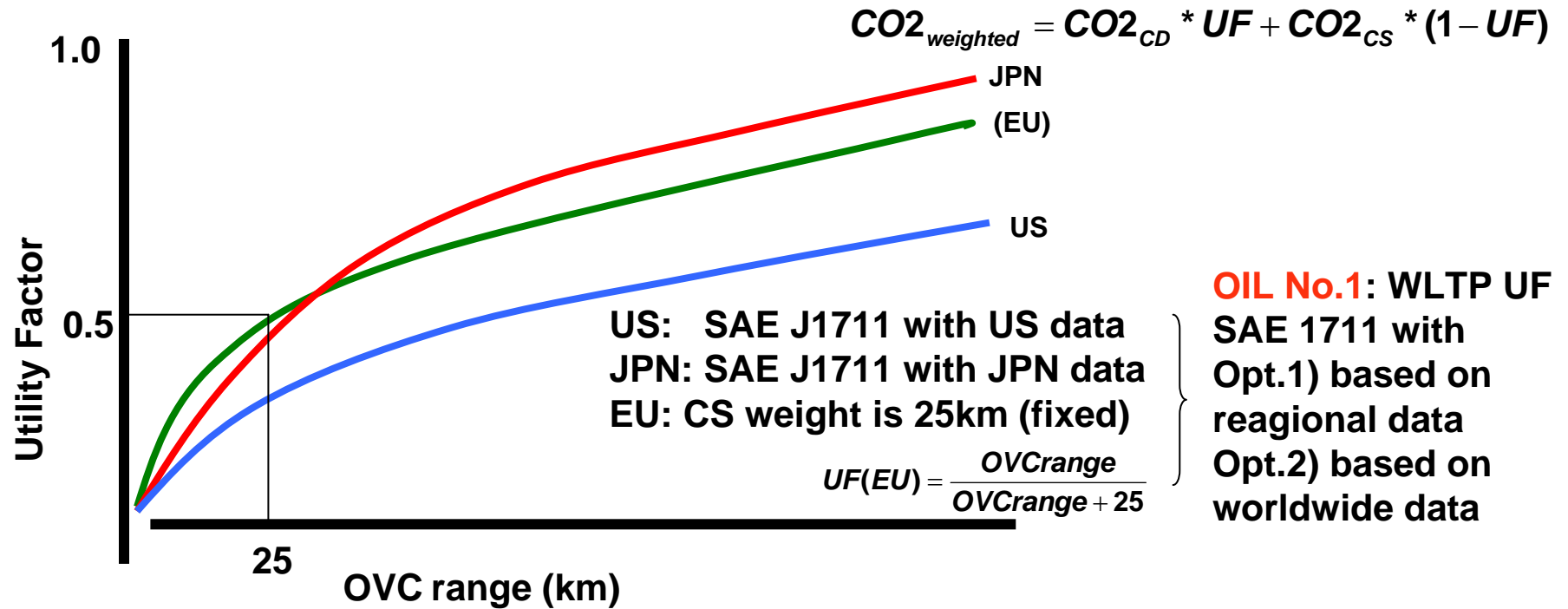
Range :

Electric Energy consumption

	Operation switch	Pollutants	Fuel Consumption	Electric Energy	Range					RCB(DC)	Chaege Duration	others	
					AER	EAER	Rcda	Rcdc	AERcity				
EV	n/a	n/a	n/a	applicable	applicable	n/a					Applicable		
OVC HEV	Without	applicable	applicable	Applicable	Applicable								
	With												
	With												
NOVC HEV	Without	applicable	applicable	n/a									
	With												
	With												

Proposal

Appendix: Utility Factor



	Operation switch	Utility Factor
EV	Without	n/a
OVC HEV	With (incl. pure EV)	OIL. No.1 SAE method is acceptable. But to get the traffic data of all country is too difficult. Political issue what should be discussed in DTP meeting.
	With (no pure EV)	
	Without	
NOVC HEV	With (incl. pure EV)	n/a
	With (no pure EV)	
	Without	

Open issue list1

Open issues	23
Political issue	1
Agreed or Closed	15
Validation test	3
Total	42

	tech/polit /overlap	A/P/OI	Item	Issue	Action	Vehicle	Date of discussion
1	political	OI	Utility factor	The us and jp regulation has methods which include statistical analysis. (EU:25km)	These methods will be considered. SAE method is acceptable. But to get the traffic data of all country is too difficult.	PHEV	1.6.2011->DTP
2	tec	A	Energy consumption test condition	"Battery temperature requirements" : What does it mean ? ---> "T°C of the test" ? need to precise this wording	Follow recommendation from ICE group regarding ambient temperature, in phase 1 only normal ambient temperature and in phase 2 consider cold ambient temperature.	EV	agreed
3	tec/Overlap	OI	Road load	* Issue for vehicle with no mechanical neutral gear * consider the charging/recharging electrical energy during deceleration : to guaranty the same behavior on the "road" and on the chassis dyno	Follow recommendations from ICE group except in cases where there are differences for example no mechanical neutral gear. Agreed to consider minimum requirement. This will make flexibility for future technical development and prevent judgment variation by contracting parties	ALL	9.5.2011->5.7.2011
3 bis	tec/Overlap	OI	Road load	Coast Down Mode : there is a need for a coast down mode and where there are special requirement for electrified vehicles this will be addressed by the Elab subgroup.	To be discussed (see T&E proposal) : ICE proposal ok with a few corrections from E-lab	ALL	9.5.2011->5.7.2011
4	tec/Overlap	OI	Weighting factor	The vehicles which have difficulty to follow the prescribed cycle. (like as electrified vehicles for only urban)	follow development in the DHC group. Vehicles that will have problem following the driving cycle will be considered by the DHC group.	ALL	after DHC completed
5	tec	A	Emission worst test :	to merge row 5 and row 29 General opinion to avoid to large number of tests. Only Japanese regulation has worst emission test for CD mode.	out of GTR scope Japanese worst emission test is out of gtr scope.. Same with No29	PHEV	agreed
6	tec	A	Run in mileage	Run in mileage for test	300km or more (Evs) and for PHEVs ? EV:300km or more, PHEV->Follow ICE	Evs and PHEVs	1.6.2011->agreed

Open issue list2

	tech/polit /overlap	A/P/OI	Item	Issue	Action	Vehicle	Date of discussion
6 bis	tec	New OI	Run in	Battery / ICE operation ratio during vehicle run in for OVC type HEV. Consider the necessity to define the "battery operation ratio" during "run in mileage"	To be discussed PHEV and HV :Follow ICE	PHEV	1.6.2011-> 5.7.2011
7	tec	A	Charging condition	to not regulate the possibility to soak outdoor. (proposed by Jp) ; Remark : actually maybe still an OI for PHEV (electric range impact) as well. Please to explain which country(ies) has (have) a problem to perform the charge of the battery inside ?	It could be a safety issue for by some contracting parties if we do not allow charging outdoor. Leader changed the status " agreed". Because we are not sure which country has such a problem.	PHEV/EV	1.6.2011-> agreed
8	tec	A	Charging method	charging method	manufacture's recommended	PHEV/EV	agreed
9	tec	A- P	Charging time	time: Stop with full charged. 4.5. The Lab-process group has decided to have 2 alternatives for the soak time: Alt 1: This conditioning shall be carried out for at least six hours and continue until the engine oil temperature and coolant, if any, are within ± 2 K of the set point temperature of the room. At the request of the manufacturer, forced cooling down could be used with open bonnet, appropriate use of cooling fan. Alt.2: This conditioning shall be carried out at least 12 hours and maximum 36 hours, with closed bonnet in soak area environment without using a fan. So, before the test CD test for EV and OVC HEV, we propose to keep the choose between both options during the soak time with specific provision for the charge of the battery	Upper limit for charging time is 36 hr. To be discussed ICE proposal should be confirmed during validation test	PHEV/EV	1.6.2011 -> Validation test
10	tec	O+P	criteria for end of charging	which is the criteria "plug-off" : indication of charging completed from the vehicle and starting within 1 hour from plug off test procedure shall be applied (ACEA proposal)	Still an open issue. —See ACEA proposal To be confirmed during validation test for considering RCB fluctuation from charging completed to plug off.	EV/PHEV	1.6.2011 -> Validation test
10 bis		New OI	criteria for end of charging	see § End of charge criteria : to find a consensus on the "same conditions" before and after the test.	All Charging length : losses issue to deal with as far s energy consumption calculation is concerned. Do we have to take into account such losses in the procedure ? The purpose of such a discussion is to avoid double counting to be confirmed during validation test	EV/PHEV	9.5.2011 -> Validation test
11	tec	P and OI	Interruption condition	Less than 3 minutes interruption is possible for every one cycle. During interruption, main power may be OFF.	still an open issue. Needs the driving cycle from DHC.	EV/PHEV	1.6.2011-> 5.7.2011
12	tec	OI	test termination condition	Test termination condition for range measurement	ACEA will make a proposal : Need to know the driving cycle in order to close the open issue.	EV/PHEV	9.5.2011-> 5.7.2011

Open issue list3

	tech/polit /overlap	A/P/OI	Item	Issue	Action	Vehicle	Date of discussion
13	tec	A	Stop condition	Proposed stop condition :Accel Off ,and press braking pedal when 5 km/h or lower to stop.	agreement	EV	agreed
13 bis	tec/overlap	OI	deceleration condition	ACEA proposal: to enable OEMs to fully take advantage of regenerative braking potentials, it should be allowed to disengage the clutch at deceleration periods. There may also be conventional ICE vehicle concepts with very long axle ratios where such an disengagement of the	To be discussed-(not yet mature. To be reconsidered when the new cycle is known)	ALL	9.5.2011
14	tec	A	Initial Discharge condition	Initial Discharge condition before test: Discharge until manufacture's recommended level	agreement on the proposal and a wish that this should be optional and not a requirement. And also to add temperature condition for the discharge driving (?? To check this requirement ---> A priori, the T°C should be the same as the one for the test ...)	EV	1.6.2011->agreed
15	tec	OI	Watt-hour meter measurement accuracy	US and JP: +/-2% EU: +/-0.2%	To be discussed	EV/PHEV	9.5.2011->5.7.2011
16	tec	OI	Accuracy of ammeter	JP: +/-1% F.S. EU: +/- 0.5%	Japan proposed +/-0.5%	EV/PHEV	9.5.2011->5.7.2011
17	tec	OI	LOD of ammeter	JP:0.0001Ah (<=50A) 0.001Ah(>50A) EU: No regulation	Japan proposed minimum measurable integration amount which regulated Jpn regulation.	EV/PHEV	9.5.2011->5.7.2011
18	tec	A	RCB(SOC)	Definition;Rename " SOC" to "RCB". RESS (Rechargeable energy storage system) ECB (RESS Charge Balance)	To be discussed	ALL	agreed
19	tec	A	RCB(SOC)	For CS mode, it could be necessary to compensate the CO2/fuel consumption based on SOC balance RCB to obtain correct value. (for CD mode, no need to compensate).	Need results about the driving cycle from the DHC group to continue the discussion. Same with No26	PHEV	agreed

Open issue list4

	tech/polit/overlap	A/P/OI	Item	Issue	Action	Vehicle	Date of discussion
20	tec	OI	CD test	calculation method for CD test (fuel consumption)	To be discussed	PHEV	5.7.2011
21	tec	OI	EAER determination : CO2 compensation for range test	Separation point of CD mode and CS mode in one cycle is agreed but the method on how is still an open issue.	To be discussed	PHEV	5.7.2011
22	tec	P	Electric range : Shorten the test procedure	Current requirement (full charge to empty) is basic procedure. As an option, need to adapt the shorten procedure to reduce testing burden (i. e. SAE	To be discussed	EV/PHEV	5.7.2011
24	Overlap with ICE	A	Ambient Air Correction	Open issue from ICE group. Intake air emission should be subtracted from tail emission.	To be considered. Follow ICE group.	ALL	follow ICE->agreed
25	Tec	OI	For detection of CS condition : RCB break off criteria	<p>1) <u>ACEA and JAMA agree on the principle to perform n+1 test sequence to confirm the end of CD test and define the transient cycle as the test n.</u> If the battery energy used during each test sequence is less than a certain value [to be defined in % of fuel consumption], so the cycle before (test n) is the transient one. <u>As an option</u>, the fuel consumption value of the test sequence x could be compared to the fuel consumption measured at CS test.</p> <p>2) <u>Definition of the break off criteria :</u> ACEA proposal : absolute NEC* as a % of cycle energy demand or % of total energy used (to be discussed) * NEC = Net Energy Change = RCB x nominal voltage of RESS (Proposal to be checked : the test is considered to b</p>	<p>Actions : 1) method to be developed to determine the cycle energy demand and then to define the value ; 2) to check Renault's proposal (26/05/2011) and to reformulate it if any. (The [values] are given as an indication but have to be well defined)</p>	PHEV	9.5.2011->5.7.2011
25 bis	New tec	OI	For detection of CS condition : RCB break off criteria	<p>> new O.I. to be discussed with EC / JRC, other experts to find an acceptable way to measure in safety conditions or to pick-up the voltage information from the can ?</p> <p>If the absolute NEC is not measurable for safety reason and the CAN solution not accepted, we will have to finde an alternative proposal</p>	To be discussed	PHEV	9.5.2011->5.7.2011
26	tec	A	RCB correction	<p>Japan-proposal:All emissions should be corrected.</p> <p>ACEA proposal:FC/CO2 should be corrected.</p>	<p>All emission should be corrected,excluding no relation with emission value.</p> <p>Need to consider AP constituents including PN/PM.</p>	PHEV	deleted
26	New tec	A	RCB correction	JAMA and ACEA agree to only correct CO2 and fuel consumption. No relevance for pollutant emissions because no relationship between RCB and pollutant emisissions	<p>Tests related to CO2 correction factor elaboration are used to show that pollutant emissions comply with the limit values and no relationship with RCB. So, it means that specific tests should not be required for certification test. The non relationship between RCB and pollutants emission can be showed with manufacturers internal data associated to the</p>	NOVC HEV and PHEV in CS test	5.7.2011

Open issue list5

	tech/polit /overlap	A/P/OI	Item	Issue	Action	Vehicle	Date of discussion
26 bis	New tec	OI	RCB correction	Need for a clarification regarding statement from ACEA and JAMA. Both agrees that there is no need for pollutants emission correction unless there is evidence for a correction. Remark from ACEA there is the Matador study that could give clarity for the need of a correction. Japan is of the opinion that since there is correction for CO2 there is no extra burden for the manufacturer and that correction for critical emissions could be applied. Comment from Japan, additional pollutants will be regulated in the WLTP process. The Japanese government will require to show to influence of different RCB.	Need of pollutants emisison correction if evidence to be discussed for final clear position. Especially, if there is relationship between RCB and pollutants emissions but in any cases the pollutants emission comply with the limit value : should we need to correct as well ? (Zurich)	NOVC HEV and PHEV in CS test	5.7.2011
27	tec	OI	RCB correction criteria (window definition) CO2-related	ACEA proposed the tolerance a window (% of fuel energy) in which there is no RCB correction. Japan does not agree. But JAMA coul agree with ACEA as per a reasonable window definition	ACEA will make a proposal until 18th March : RCB window without correction needed; in case of exceeding the 1% (of fuelenergy used) a correction calculation is required.	NOV HEV and PHEV in CS test	5.7.2011
28	tec	A	CS test achievement : E1/Eo criteria	Only Japanese regulation: If necessary, to confirm E1/E0<+-10%	Japan will confirm the necessity and reason. ->Japan agreed to delete this criteria.	PHEV	agreed
30	tec	OI	energy efficiency Calculation of electric consumption of CD range	Japan proposal: to be calculated by EAER ACEA proposal: to be calculated by RCDA (or Rcdc : to be checked)	ACEA/JAPAN will provide the concrete calculation sample, then discuss its advantage/disadvantage	PHEV	5.7.2011
31	tec	OI	AER City	There is an interest for EV and OVC HEV with low power engine and even with full capable engine to consider such an electric range like AER city (which means low speed part(s) of the WLTC). As far as NOVC HEV are concerned, we have to consider the interest to get this pure electric driving information with the EU Commission as well.	To discuss with all together and especially along with the european Commission.	EV/OVC HEV	5.7.2011
32	tec	P	performance info.	additional performance item(s) may be necessary for customer information, e.g. B charge time	EC ask JRC? for study	EV/PHEV	September
33	tec/overlap	OI	gear box/multi modes	See ICE group proposal according to the presence or not of a default mode : number of tests to perform for pollutants emissions and CO2/fuel consumption ..	To check if it is transposable to electrified vehicles ? To be discussed	All	1.6.2011->5.7.2011
34	tec	A	CD test : pollutants emissions compliance	Discussion about requirement on emissions during CD test. The Japanese legislation require emissions compliance during CD test and the manufacturer is to provide documentation that for different initial SOC there is also compliance with emission standards. ACEA is of the opinion that the GTR requires emissions compliance during all conditions and therefore additional test is not required.	Final decision of the group confirmed on 31/03/2011 : agreement to remove such requirement (additional tests) from the GTR and to let it only at the regional request that is to say at the Japanese government request if needed.	PHEV	agreed
38	tec overlap with ICE	OI	12 voltage battery	See ICE proposal and give the E-lab position		HEV/PHEV	?
38	tec overlap with ICE	OI	scope of E-lab	Does the group to handle hybrids vehicles as well or hybrids vehicules are part of ICE group ?	DTP_E-lab group has to discuss with ICE group		GRPE

These open Issues will be discussed according to E-Lab group schedule.

SAE Utility Factor

The UF indicates the limited utility of a particular initial operating mode-for PHEVs, the CD mode. An operating mode with a very long range, for example, will have a very high utility and, thus, a UF that approaches 1.0. The UF result is for a distance R_{CD} based upon a set in-use data collected of daily miles traveled per day of a large sample group. The UF is defined by using the assumptions that (1)the vehicle starts the day from a routinely achieved, fully charged state and (2)the vehicle is charged to said state before everyday of personal travel. The UF weighting for given R_{CD} is applied to the CD results, and the term (1-UF) is applied the CS mode results.