

# Japan positions/comments on UBE/UBC Measurement for HDV

prepared by Japan

@EVE65

11<sup>th</sup> & 12<sup>th</sup> October 2023

# Japan Proposals on UBE/UBC measurement

UPDATED

1. Add new criteria under the Part A family definition
  - same measurement parameter
  - same measurement procedure  
(to avoid manipulating the Part A verification program)
2. Matrix of measurement procedure and parameter

Cases	Procedure		Parameter	Measurement device	
	main	alternative		Voltage	Ampere
with bidi charger function	cycle repetition + constant C-rate by bidi-charger <refer slide#4>	chassis dynamometer testing	discharge UBE	external or on-board sensor after demonstrating the equivalency with external device	external
			discharge UBC	NA (in case of difficulty to measure voltage)	
without bidi charger function**	test track* <del>on road driving</del> with multiple steady speed conditions (e.g. 60/80/100/120 km/h)<refer slide#5>	chassis dynamometer testing	discharge UBE	external or on-board sensor after demonstrating the equivalency with external device	external
			discharge UBC	NA (in case of difficulty to measure voltage)	

\* Our regional regulation does not allow on-road driving before registration.

\*\* Considering the difficulty of test track (on-road) measurement (i.e. ambient/road surface temperature, solar radiation, ,,)  
Japan is open for other practical test methods if the technical evidence of the equivalency was provided

Japan comments

Alternative methods for checking Battery Durability Monitor for HDV					
	HDV with no bidirectional charging				HDV with bidirectional charging
	Method 1a	Method 1b	Method 1c	Method 1d	Method 2
<b>Description</b>	Discharge by standard average speed with tolerances on test track  And charge	Discharge by driving on the road with average speed with higher tolerances  And charge	Discharge with on-board systems  And charge	Standard charging Discharging by any method (not measured)	Virtual Round Trip Efficiency (VRTE) test  Charging and discharging in a column
<b>Repeatable</b>	Yes	Partly, if tolerances are set	Potentially, but not characteristic	Yes	Yes
<b>C-rate</b>	Constant (different for categories)	Varying but limits could be set	Small and difficult to control	to be set also in this case	Constant
<b>RTE</b>	YES	YES	YES	NO	YES
<b>UBE</b>	Yes	Yes, but it depends on the driving	Yes	Not meaningful Not measured	Yes
<b>UBC</b>	Yes	Yes	Yes	Yes but issues with current leaking	Yes
<b>comment</b>	tolerances of the average speed to be discussed  Proposal from Japan on different constant speeds in the test	tolerances of the average speed to be discussed	not favourable method	discharge more favourable this method 1d not applicable	
<b>Feasibility</b>	voltage sensor, voltage measurement, under discussion				
<b>discharge vs charge</b>	UBE in discharge				
<b>UBE vs UBC</b>	discharge and charge RTE				

~~C-rate = Constant~~  
→ cycle repetition + constant C-rate  
<refer slide#4>

~~RTE test = YES~~  
→ Discharge test only  
(Japan provided the Bidi-charger test data. This condition is the discharge only.)

~~Method 1b~~  
→ Our regional regulation does not allow on-road driving before registration

<refer slide#5>

<refer slide#6>

## cycle repetition + constant C-rate by bidi-charger

EVE-64-YYe

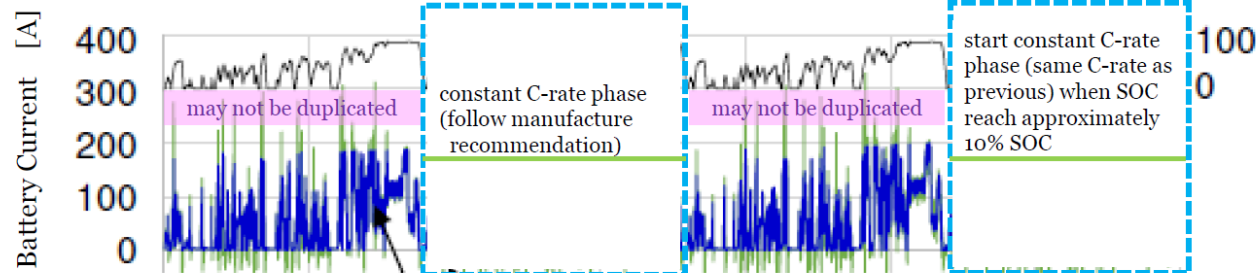
### Proposals on C-rate during HD UBE measurement

prepared by Japan  
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19<sup>th</sup> & 20<sup>th</sup> September 2023

**NEW  
PROPOSAL**

#### Cycle repetition under WHVC condition with constant C-rate phases (same scenario as LD)

1. preferably select maximum CED configuration @ WHVC within Part A family
2. reproduce C-rate profile representing the WHVC
3. apply the constant C-rate phase in the middle and in the end of discharge pattern to avoid the unstable SOC at the end of measurement
4. the constant C-rate : follow manufacture recommendation (considering the balance between battery load and test efficiency)



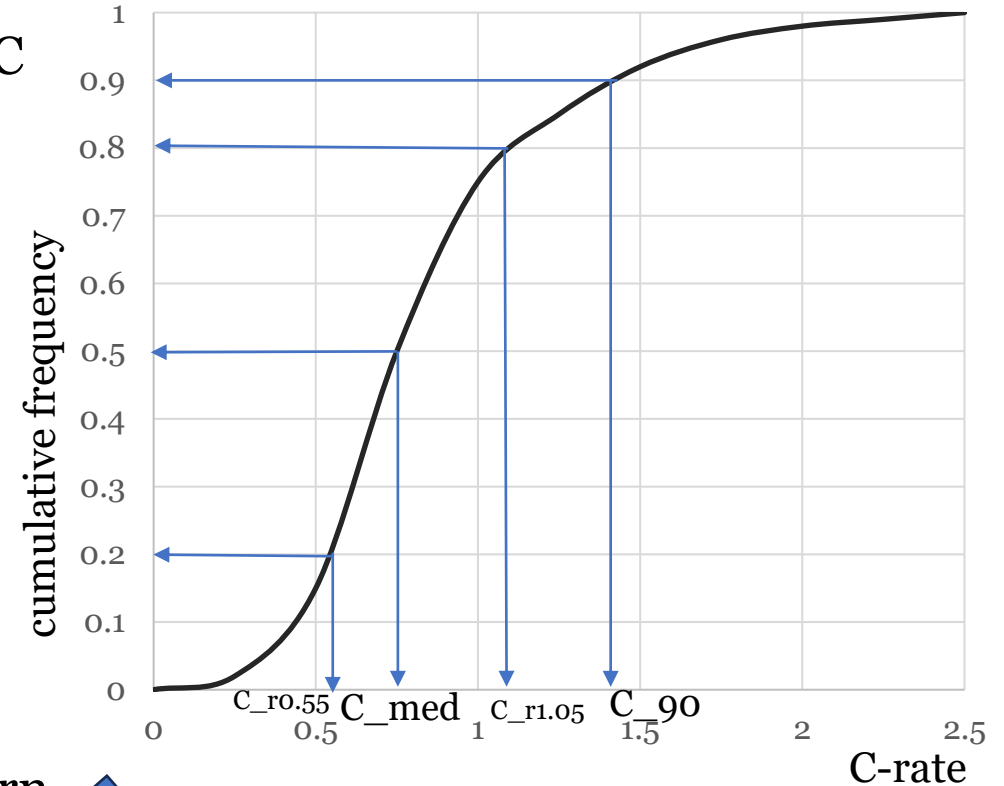
CED\* : Cycle Energy Demand

without  
bidi-charger

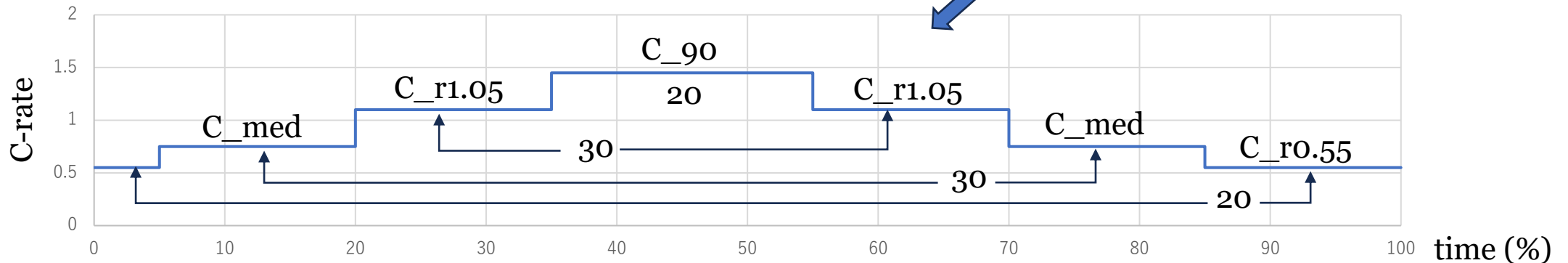
## multiple C-rates with proportional duration under WHVC condition

1. preferably select maximum CED\* configuration @ WHVC within Part B family
2. system power (P) needs to be defined for WHVC
3. automatically obtain the cumulative frequency against C-rate (see right figure)
4. C\_90 and C\_med shall be selected
5. additional C-rates may be selected (no limitation)
6. higher C-rate covers lower C-rate duration
7. OK to split each C-rate duration

CED\* : Cycle Energy Demand



sample : discharge pattern



1. To decide if UBE or UBC shall be measured: **UBE more favourable by CP**
2. To decide if applying discharge or charge measurements: **discharge more favourable by CP**
3. Current measured, Voltage measured, on-board data with equivalence of results, accuracy ... Availability of inspection point

### Next Action

- Propose concrete contents (i.e. current/voltage measurement technique, discharge pattern, C-rate range and others) to be incorporated into the GTR.

(ex) Test Procedure (Type Approval Test and In-service Test)

- ✓ Test procedure of both tests is to set the same C-rate of the Charge / Discharge Test.
- ✓ The CAN data of the current and voltage can be used during the in-service testing only when the accuracy of CAN data is confirmed during the Type Approval Test.

Charge/Discharge test

**Type Approval Test**

constant output power discharge  
(ex) C-rate = 0.3

• Measuring device  
→ Check : CAN data

➔

**In-service Test**

constant output power discharge  
(ex) C-rate = 0.3

or • Measuring device  
→ • CAN data

The same C-rate at the Type Approval Test

Accuracy → OK

Recommendations on HD UBE Measurement prepared by JAPAN

63rd EVE IWG  
18<sup>th</sup> -19<sup>th</sup> July, 2023

at EVE-63

Considering the safety issue and practical measurement technique, the vehicle on-board REESS voltage data may be used only when the accuracy of these data shall be demonstrated to the responsible authority.  
< UNR154 Annex B8/Appendix 3 3.3. >

If not the case, UBC parameter is one of solutions