

PEV low temp family concept

ACEA TF EV input for SG EV meeting on February 13th

Proposal PEV Low Temperature Family concept

ACEA TF EV proposal based on Interpolation family criteria with additional low temp family criteria

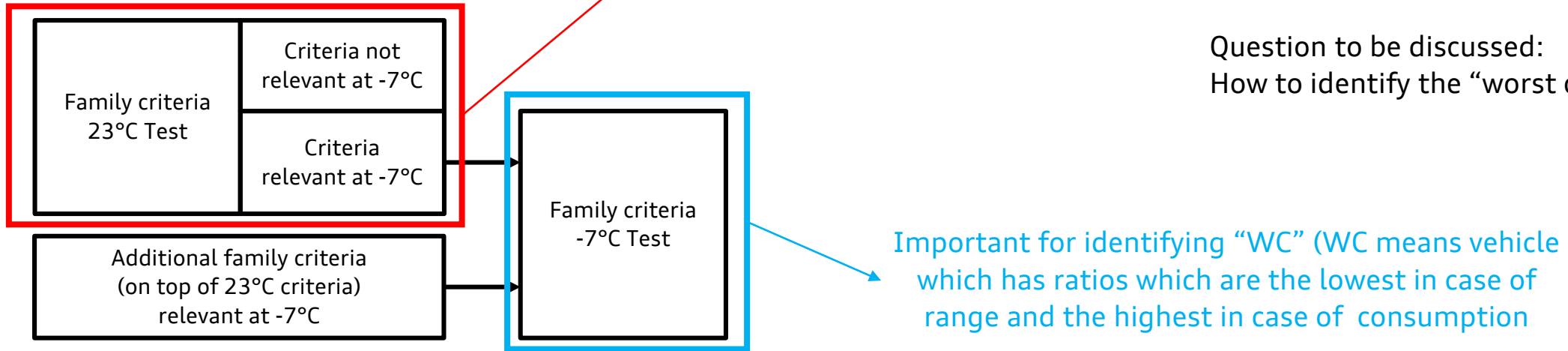
23°C Interpolation Family	Parameters	Relevant for -7°C	If relevant: worst case?
Type and number of electric machines	<ul style="list-style-type: none"> 1/2/4 etc. 		
Construction type of electric machines	<ul style="list-style-type: none"> asynchronous/ synchronous, etc. 		
Type of coolant (electric machine)	<ul style="list-style-type: none"> air, liquid 		
Type of traction REESS	<ul style="list-style-type: none"> Model, capacity, nominal voltage, nominal power, type of coolant (air, liquid)) 		
Transmission type	<ul style="list-style-type: none"> manual, automatic, CVT 		
Transmission model	<ul style="list-style-type: none"> Torque rating, number of gears, numbers of clutches, etc. 		
Number of powered axles			
Type of electric converter	<ul style="list-style-type: none"> between the electric machine and traction REESS between the traction REESS and low voltage power supply between the recharge-plug-in and traction REESS 		
n/v ratios	<ul style="list-style-type: none"> shall be considered fulfilled if, difference with respect to the transmission ratios of most commonly installed transmission type and model is within 8 % 		
Operation strategy of all components influencing the electric energy consumption within the powertrain			
Any other characteristics having a non-negligible influence on electric energy consumption and range under WLTP conditions			

-7°C Family additional criteria (TBC)	Parameters	Worst case?
Cabin	<ul style="list-style-type: none"> Cabin volume/weight (TBC) 	
Auxiliaries (Heating system)	<ul style="list-style-type: none"> Resistive / Heat pump/ Fuel heating etc. 	
Battery thermal management system	<ul style="list-style-type: none"> (TBC) 	
Preheating option	<ul style="list-style-type: none"> Battery preheating 	

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Family criteria:



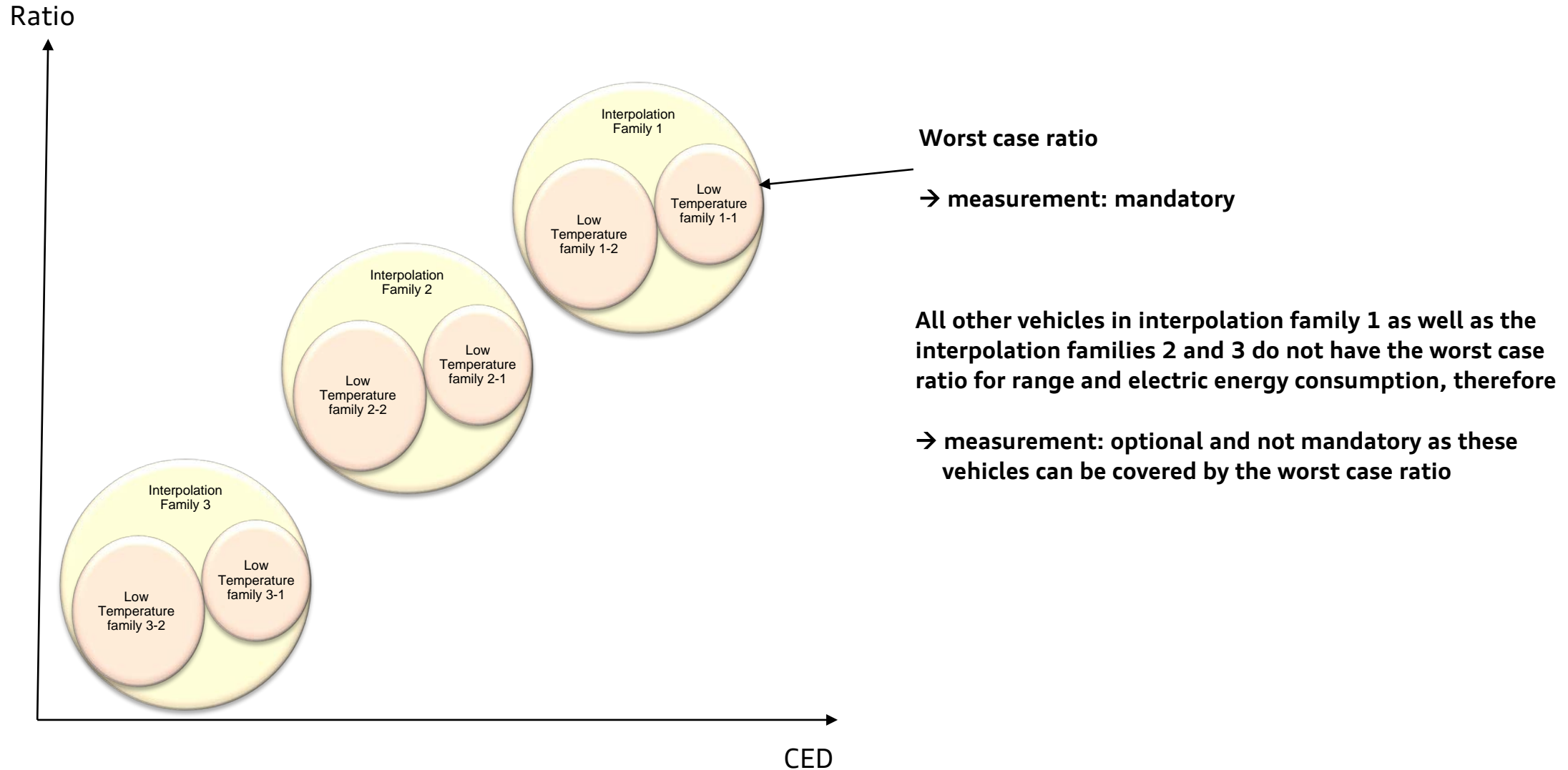
Question to be discussed:
How to identify the "worst case"?

Family concept (Worst-Case-Concept):

- The -7°C family criteria are defining the criteria how to identify the vehicle with the worst case ratio for range and electric energy consumption at -7°C
- Idea:
 - It is mandatory to measure this "worst-case" vehicle based on the -7°C family criteria and to apply the delta on fuel consumption, electric energy consumption and range on the other vehicles of the family (as applicable)
 - The manufacturer has the option to measure additional vehicles (e.g. depending on importance of the technology and available testing facilities)

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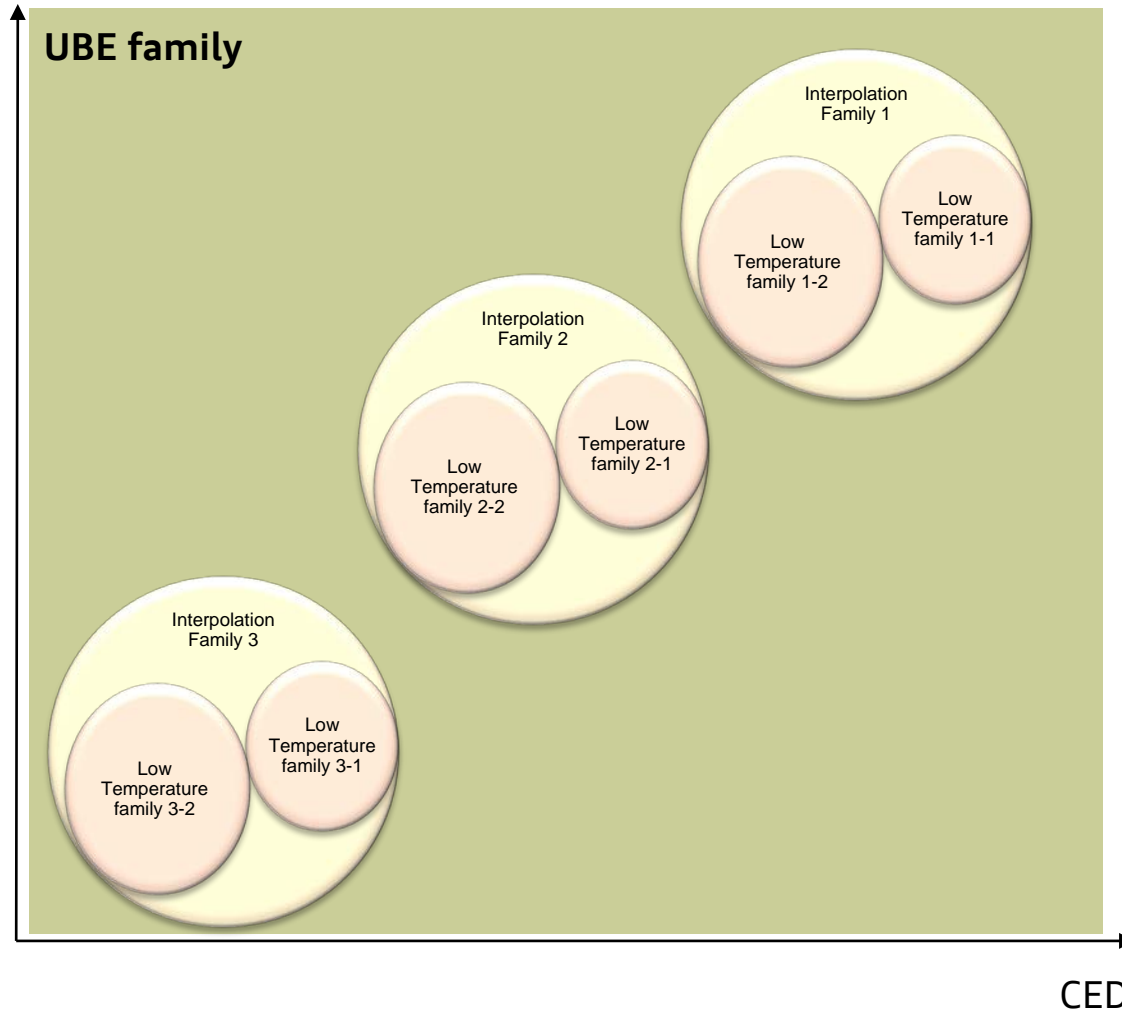
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Proposal PEV Low Temperature Family concept

UBE family as a potential solution for the future

Ratio



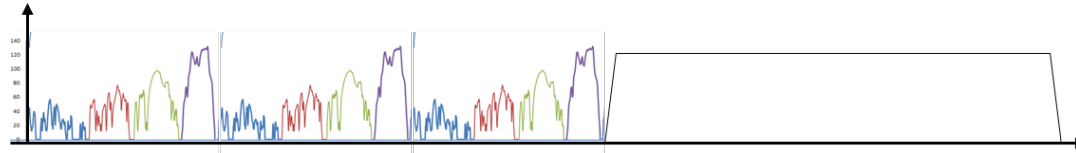
UBE family (TBC)	Parameters	Worst case
Preheating or not	▪ With or without	▪ Without
Capacity of battery		▪ Same or less?
Battery chemistry and type	▪ same	

If a new vehicle need to be tested and this vehicle fulfills the criteria of the UBE city family, this vehicle would only need to perform a short test to derive the electric energy consumption as UBE will be a carry over from the vehicle which had been tested in the complete procedure.

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UBE family as a potential solution for the future

UBE Family: Determination of UBE coefficient at -7°C



- Test vehicle: worst-case vehicle in the family
- Used only to define the UBE correction factor

UBE ratio: $UBE_{23^{\circ}\text{C}}/UBE_{-7^{\circ}\text{C}}$

Example:

Kangoo ZE: 0.93

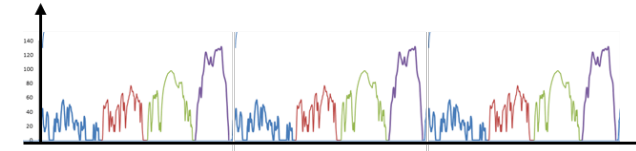
GM Bolt with preheating :0.97

GM Bolt w/o preheating :0.94

Nissan Leaf:

Tesla Model 3:

Determination Range, Energy consumption at -7°C



- Test vehicle: vehicle high (or vehicle low)
- Used to get 'Range ratio', 'energy ratio'
- Used for each interpolation family, extension of family, equivalency etc.

- Measure energy consumption
- Calculate Range from UBE ratio
- 50-70% test burden reduction

