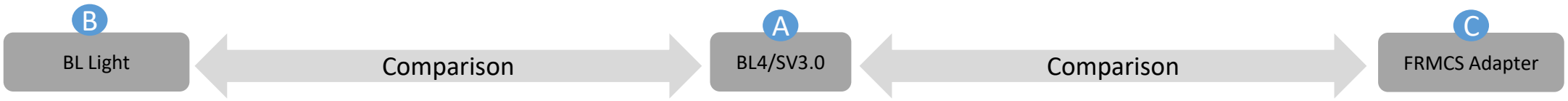
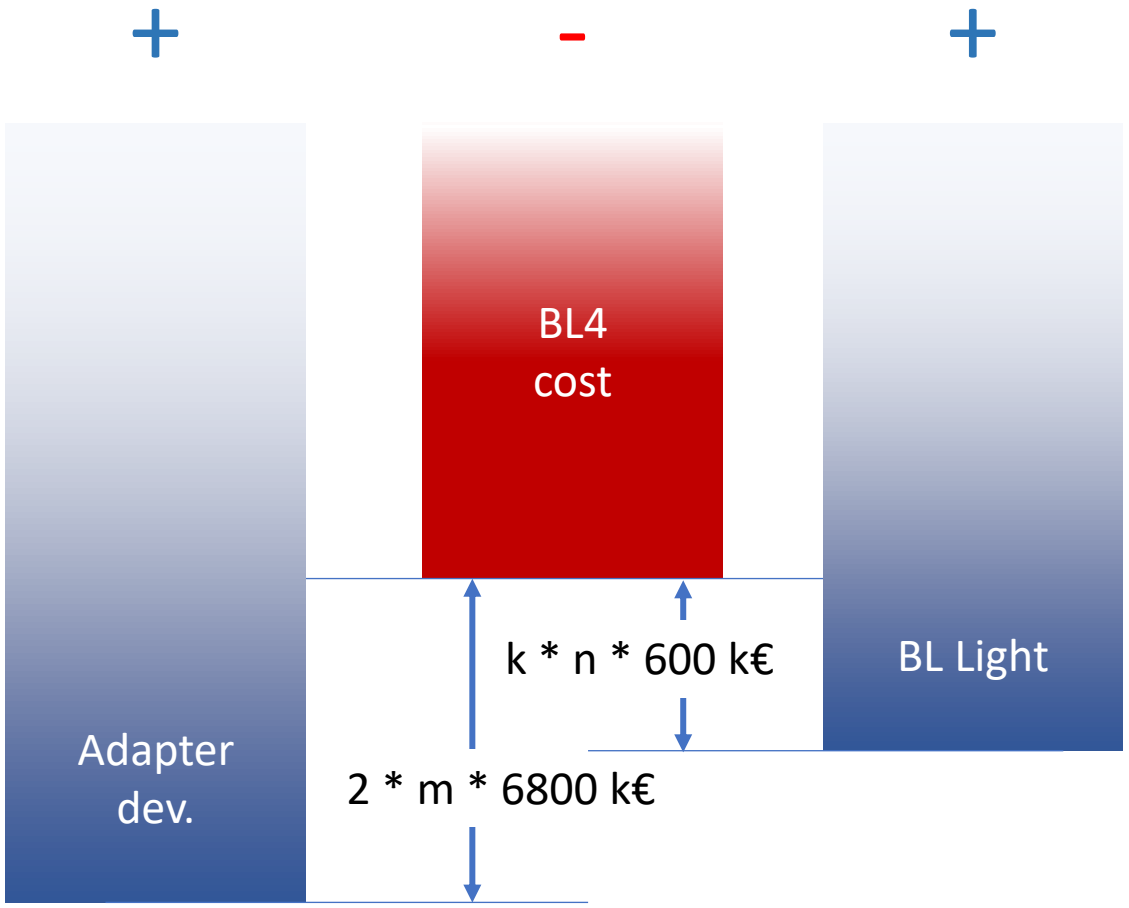
The delta cost estimation approach



Out of scope (identical costs)	– FRMCS HW – Non-recurrent cost: Engineering for installation/upgrade	
In scope (**delta** cost)	Non-recurring Development cost	Non-recurring Development cost
	Non-recurrent cost (per First in Class)	Non-recurrent cost (per First in Class)
	Recurring cost (per vehicle)	Recurring cost (per vehicle)

Non-recurring cost for development (once for European fleet)

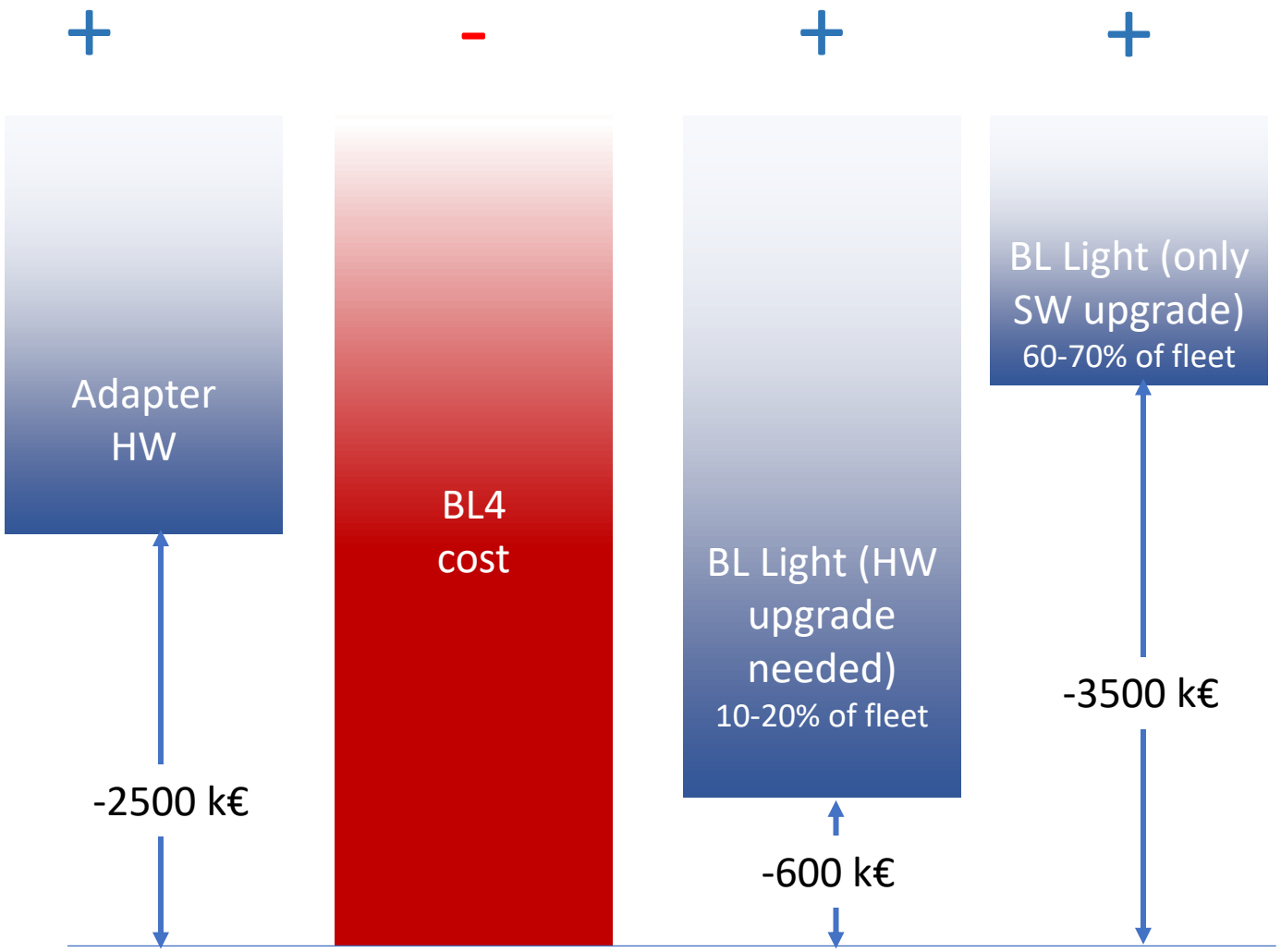
- Specifications have to be developed
- (2 types * m suppliers) adapter solutions to be developed
- Update certificates (for all concerned product baselines)



- Necessary specs are available
- Adaption of the Euroradio components (NVC-non vital computer) – interface changes
- Development of this solution in n different existing product baselines by k suppliers
- Update certificates (for all concerned product baselines)

Non-recurring cost (delta cost, once per FiC)

- Engineering for installation/upgrade, certification & authorization
- integration effort for each combination of Adapter and ETCS OBS variant (in former estimations, the number combinations were not considered

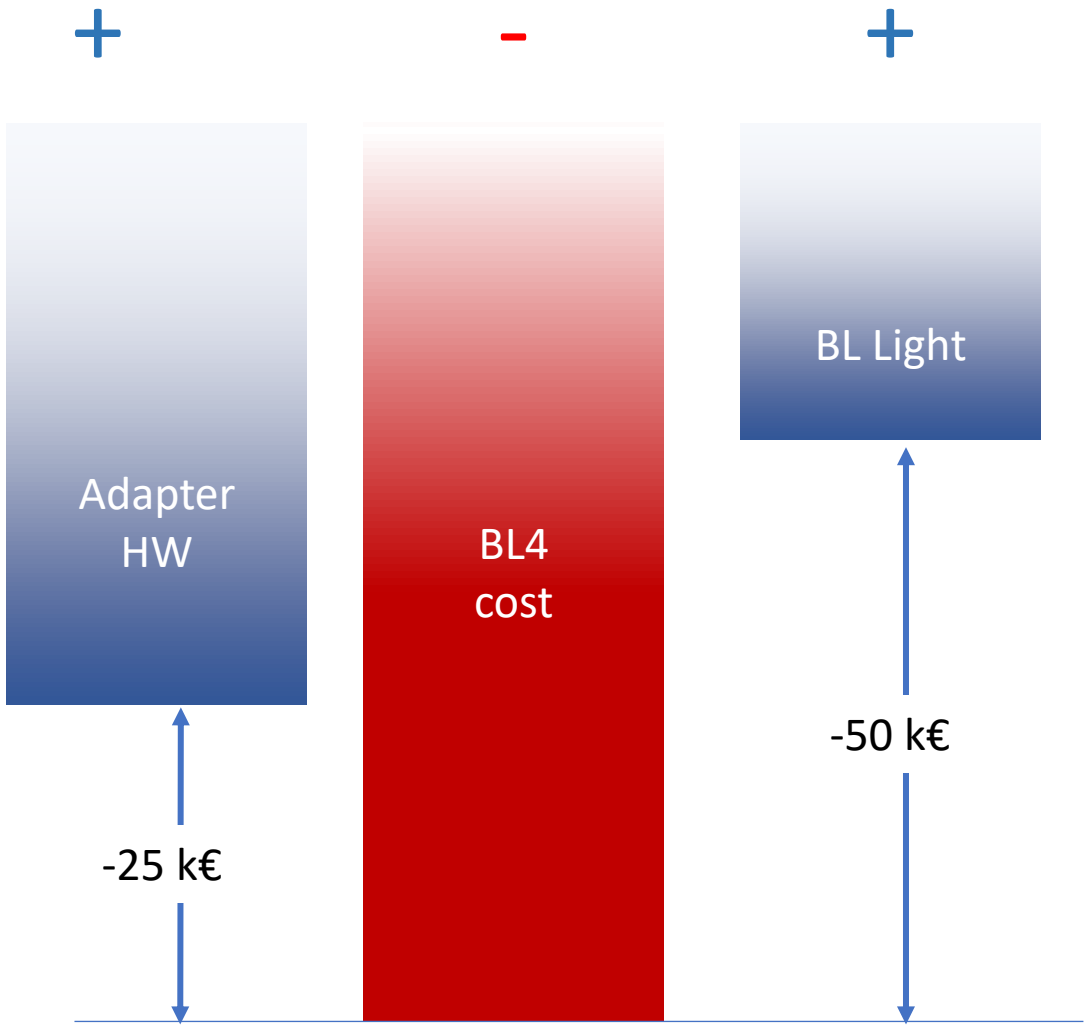


- No consideration of new NTR's
- Engineering for the concerned product baseline (paperwork)
- EG certificate (assembly) and homologation (one stop shop)

Distribution of fleet refers to slide 5, column D

Recurring cost (delta cost, once per vehicle)

- Adapter HW
- Installation, commissioning
- Update documents for the concerned vehicle
- Further cost savings possible if reauthorization of the vehicle is not needed



- Perform SW update only
- Commissioning
- Update documents for the concerned vehicle
- Further cost savings possible if reauthorization of the vehicle is not needed

Back Up, as shown on 26th of April

Most of vehicle volume is from hardware perspective suitable for BL Light

Scenarios	All solutions	Reference, BL Light and Adapter A	Reference, BL Light and Adapter D	Reference and BL Light	Reference and Adapters	Reference and Adapter A	Reference and Adapter D
	A	B	C	D	E	F	G
SV 3.y reference[1]	10-20%	10-20%	10-20%	10-20%	10-20%	10-20%	10-20%
SV3.y reference with HW Upgrade	0%	0%	0-10%	0-10%	40-50%	60-70%	60-70%
BL Light SW Upgrade[2]	60-70%	60-70%	60-70%	60-70%	0%	0%	0%
BL Light HW Upgrade[2]	0-10%	10-20%	0-10%	10-20%	0%	0%	0%
Adapter D (SV2.1)[3]	0-10%	0%	0-10%	0%	20-30%	0%	20-30%
Adapter A (SV2.0)[3]	0-10%	0-10%	0%	0%	20-30%	20-30%	0%
	100%	100%	100%	100%	100%	100%	100%

- **Scenario A**: In a quantitative analysis approach the fleets are distributed based on their hardware suitability to the six potential solutions: SV3.y reference, SV3.y reference with a Hardware Upgrade, BL Light with a Software Upgrade, Baseline Light with a required hardware upgrade of the non-safety part, Adapter D for the remaining SV2.1 vehicles and Adapter A for the remaining SV2.0 vehicles

- **Scenario B-G:** Using scenario A as a starting point the fleets are then distributed, based on expert judgement, in the most likely way to each potential solution based on their hardware suitability and also on their given lifetime (e.g. the adapter solutions are considered a more attractive solutions for vehicles with a remaining lifetime <15 years then the SV3.y reference solution)

- The green fields highlight the best cases for each solution whereas the red fields highlight the worst case

[1] Vehicles suitable for SV3.0, BL Light and Adapter | [2] Vehicles suitable for BL Light and Adapter | [3] Vehicles suitable from hardware perspective only for the Adapter