



Market Relevance for *openETCS*

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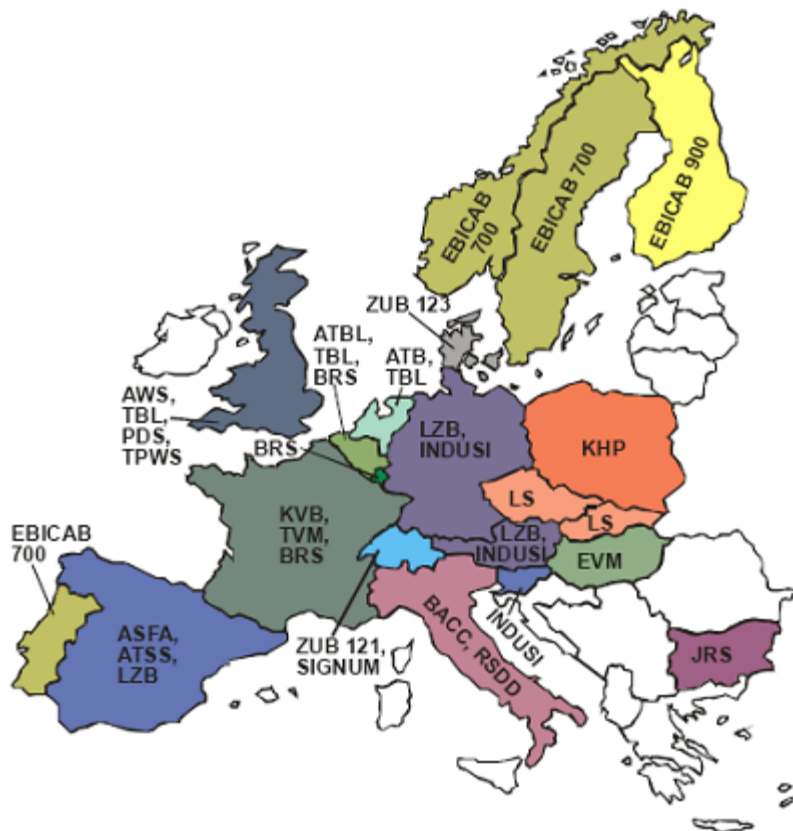
openETCS@ITEA2 Project

Klaus-Rüdiger Hase

Paris, 03.07.2013

European Diversity

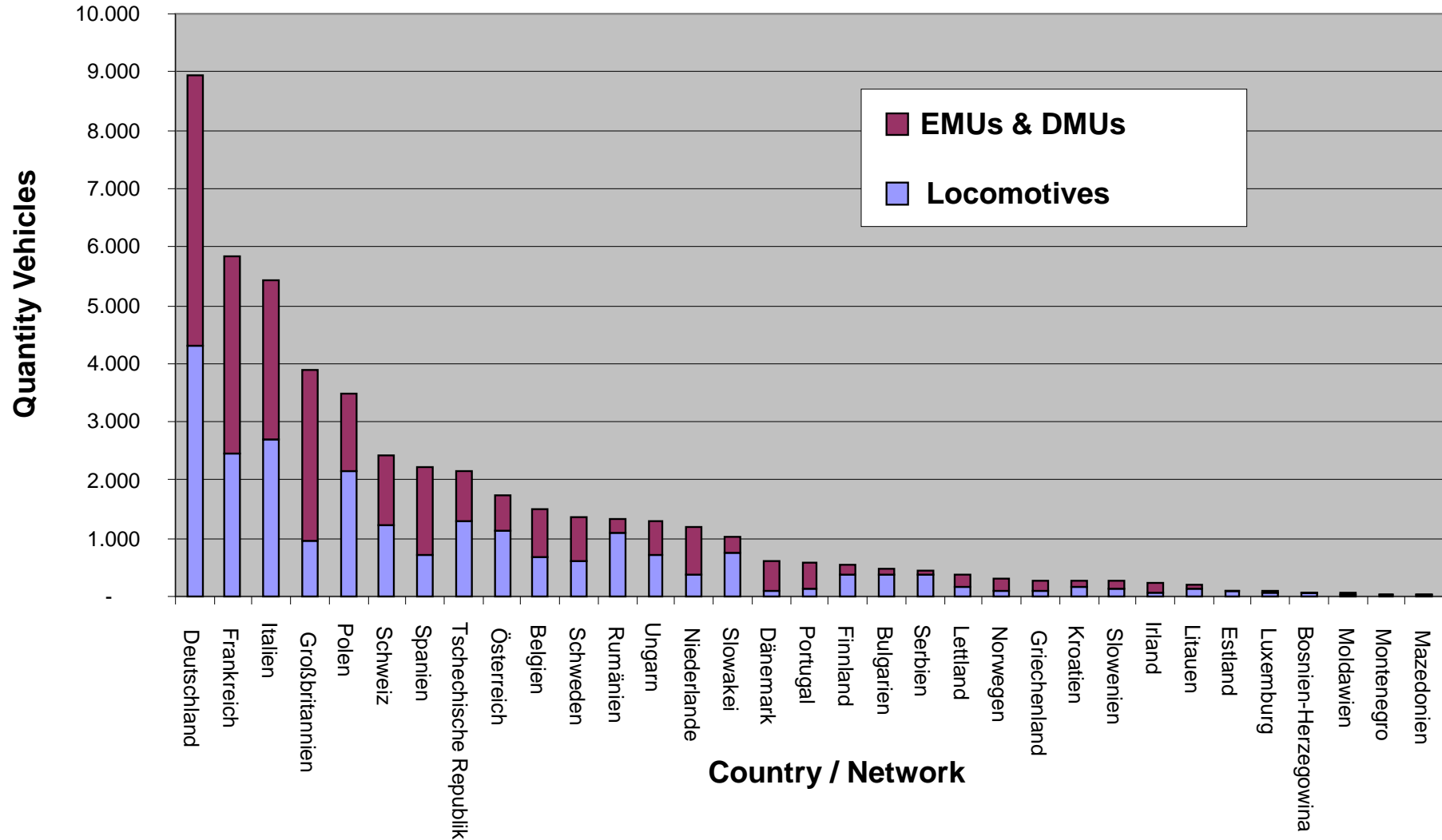
Today: Diversity



Future: Unity

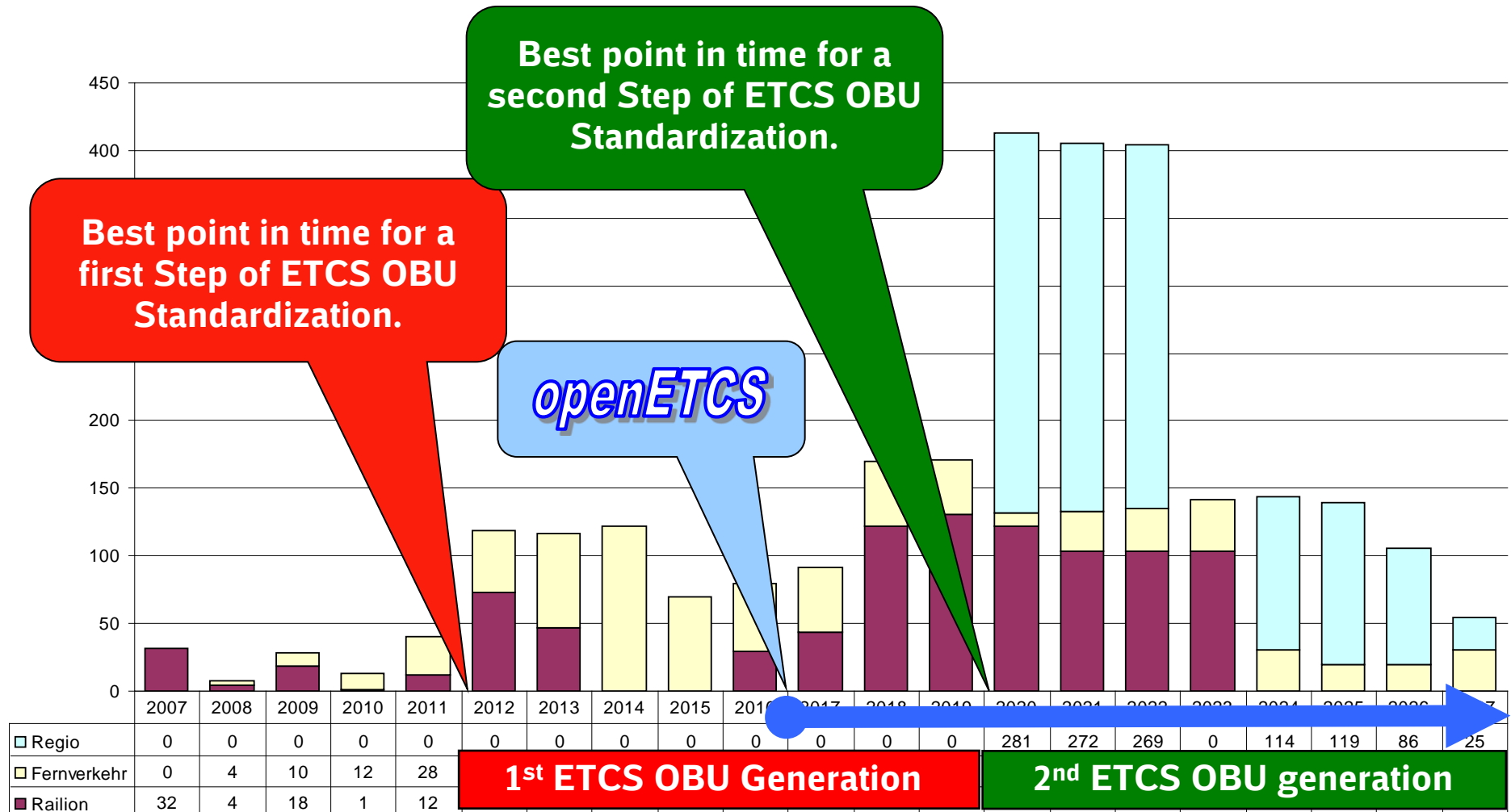


Total Number of Vehicles for ETCS in Europe: 48.986



Deutsche Bahn: Retrofit Schedule for ETCS

Two Step Approach with two OBU Generations



ETCS Retrofit Projects @ DB

- Class 101 (D)
- ICE 1 EMU (CH)
- ICE 3-M EMU (F, B, NL)
- Class 185 (CH)
- Class 189 (NL)
- ICE T / ICE 3 (D, A, CH)
Dec.'12



Experience from vehicle retrofit projects at DB before 2010: High engineering cost & very high per vehicle cost figures

Class	Units	ETCS-Vendor	Deployment	Engineering Cost	per Vehicle	Total Cost
101	5 Loc.	A	D (Pilot)	~ 800 T€	*) ≈ 400 T€	10,2 m €
185	10 Loc.	B	C	~ 400 T€	*) ≈ 400 T€	2) 4,8 m €
ICE1	38 PH	B	C	5,5 m €	350 T€	18,8 m €
Thalys4	PH	C	C	≈ 3,4 m €	**) 30 T€	4,6 m €
189	26 Loc.		NL	3,0 m €	30 T€	23,0 m €
ICE310	EMU	C	B	5 m €	**) ≈ 450 T€	11,0 m €
442	42 EMU	A	D	~ 5 m €	57 T€	28,0 m €

**83 Vehicles @
~ 430.000 € per Veh.
(plus Engineering Cost)**

*) Due to limited information, recurring and non-recurring engineering cost could not be differentiated.

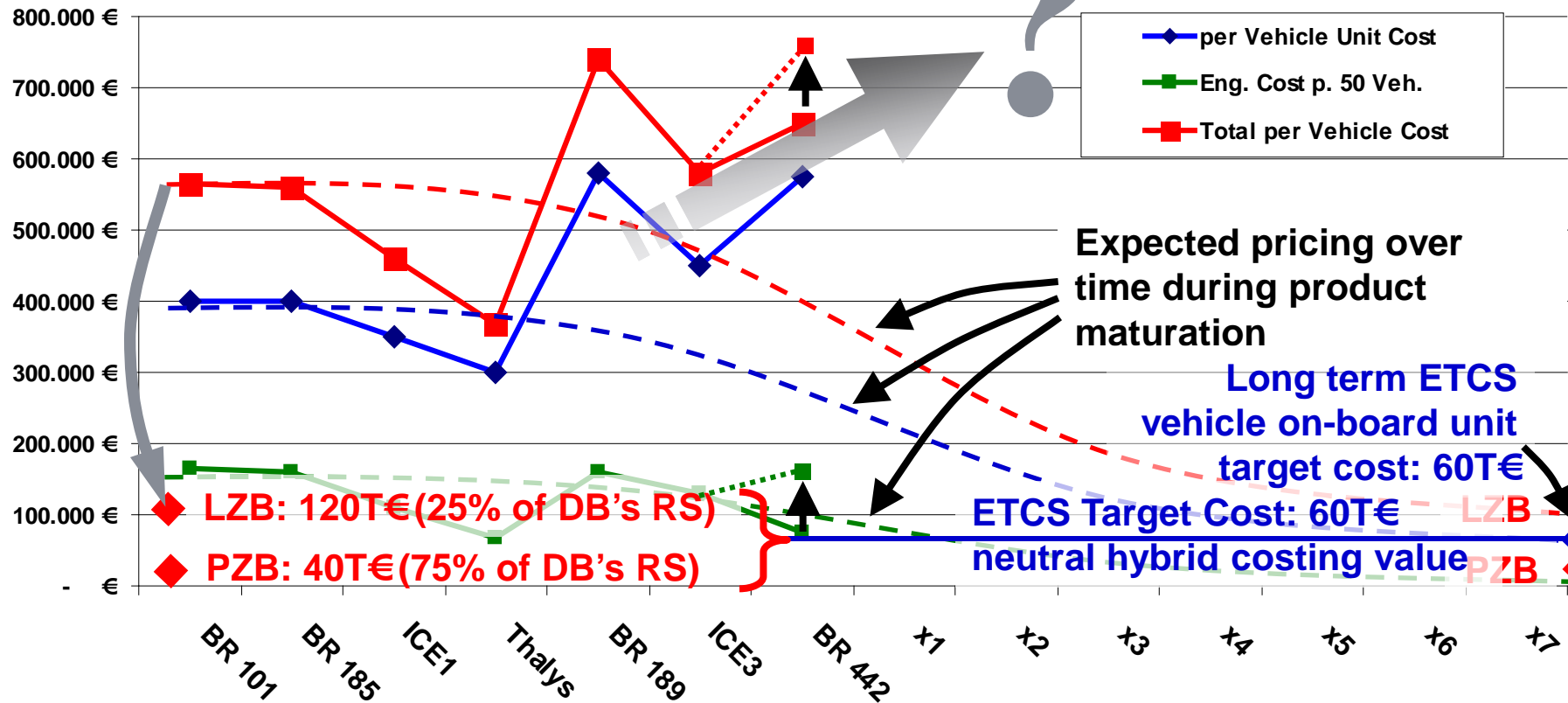
**) Estimated cost figures based on analogy from other projects, engineering cost most likely divided with other proj..

2) Swiss state-subsidies included, otherwise total cost was not disclosed, estimated value of 12 m €.

3) A non-integrated approach was contracted with option for integration (quote for integr. was: 32 m€).

ETCS onboard costing/time diagram reveals almost no maturation: *Product was still in it's infancy stage!*

WRONG WAY !!!



Why need for action?

Initial Situation:

PZB/LZB-System:

60 T€ average Cost per OBU

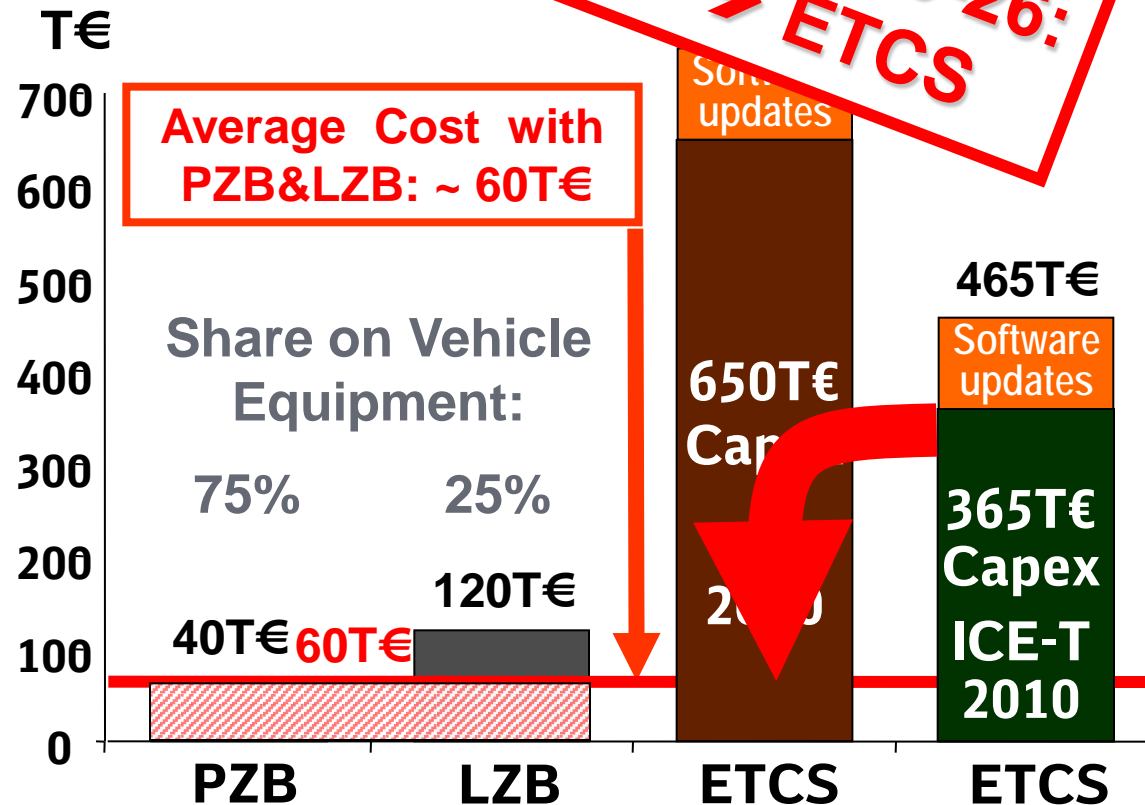
ETCS-System Capex:

Before 2010: 650 T€

In 2010 (ICE-T): 365 T€

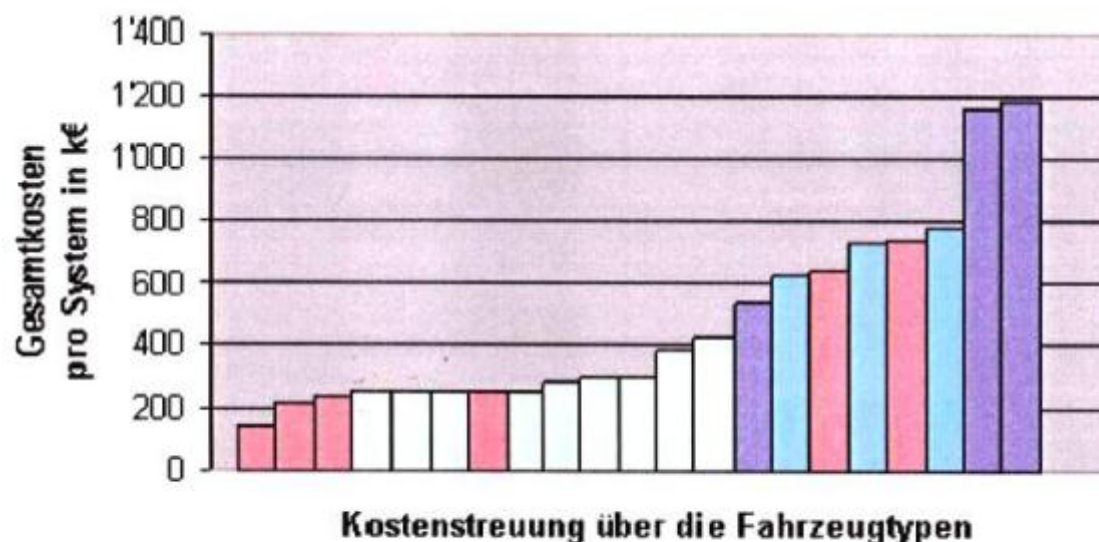
Identified Cost Driver:

- **One time cost**
(Engineering, Authorization, Proj.-Management,...)
- **+ 100 T€ for Software Updates per OBU over 15 years**



Investitionskosten für ETCS-Bordgeräte im Vergleich mit PZB/LZB bezogen auf typische Projektgrößen von 50 Anlagen (Referenzgröße), zuzüglich erwartete Software-Update-Kosten bei ETCS f. 15 Jahre, SW-Kosten bei PZB/LZB nicht transparent.

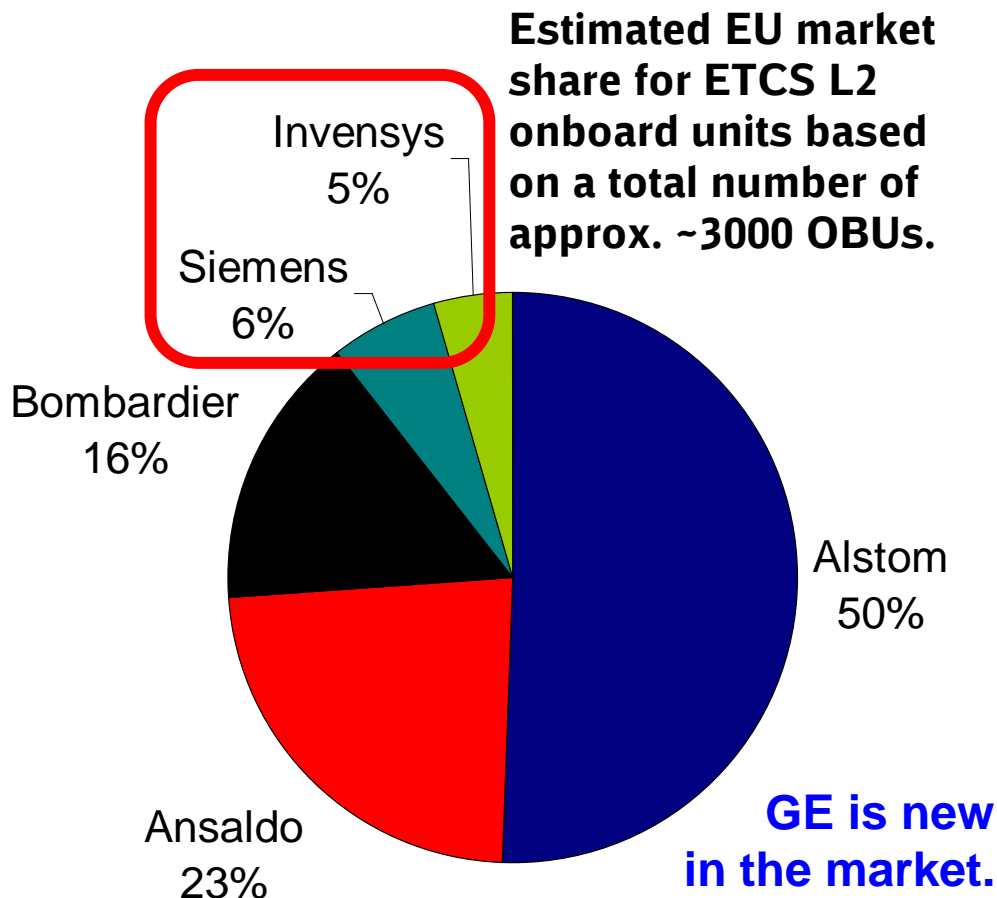
Overview of Costs – Vehicles in CH



Year ordered	Number of units ordered	Average total cost per vehicle in k€
2001	517	253
2004	47	662
2005	65	737
2006	15	1027

- The difference between lowest and highest total cost per unit is very large.
- Reasons for this include market values, volume of contracts and rather monopolistic position of suppliers.
- With low volume orders, the one –off costs of system development, vehicle engineering, system integration, certification and approvals, as well as operator investments are a stark proportion of overall cost.

Market Analysis of ETCS OBU EU Market Share indicates a Risk for Intermodal Competitiveness for the EU Railway Undertakings



Railway Undertakings need a fair and competitive ETCS OBU market:

- At least 3 independent and stable product lines are needed
 - There is a need for an independent and neutral reference EVC system
 - Long term market presence requires >20% market share to recover R&D + maintenance costs
 - Smaller product lines can only survive by sharing their ongoing R&D and maintenance costs
- ➡ **Market requires an Open Source Software based product line for independent reference OBU EVCs and R&D cost sharing.**

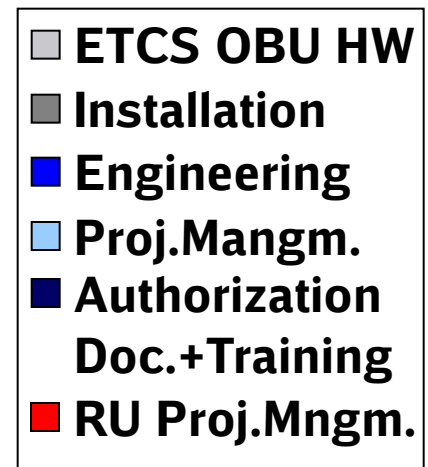
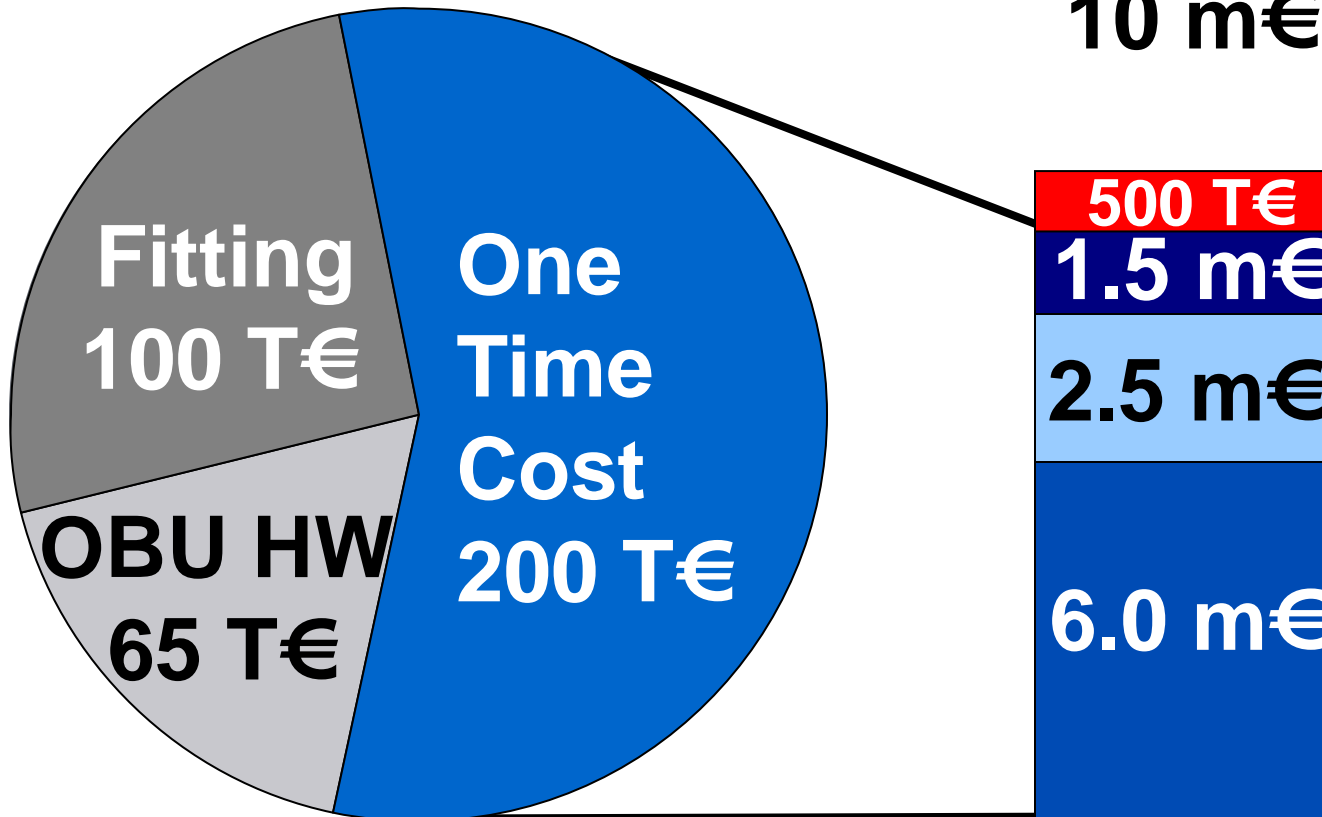
References: CER, UIC, UNISIG firms' press releases, various internet sources (February 2010)

Capex Allocation (ICE-T Average)

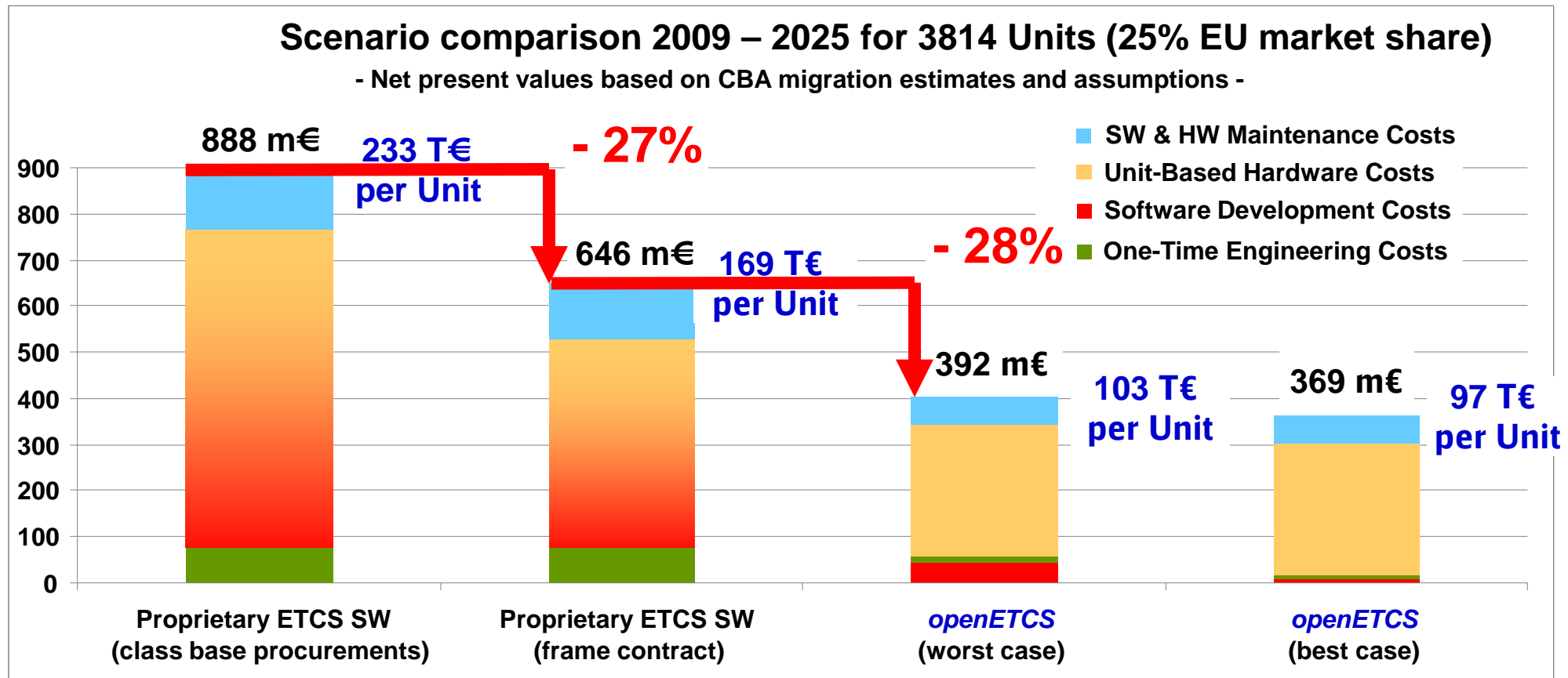
per 50 Units

One Time Cost

10 m€ + 0.5 m€



Significant LCC savings by launching openETCS combined with a Frame procurement contract rather than per class procurements



Methodology: Net present value for equipment with proprietary ETCS SW vs. *openETCS*, for 3.814 units (2.873 vehicles) assuming a 25% market share of total 11.492 vehicles to be equipped in 60% of EU's railway undertakings, differential costs are evaluated only, no full costs been considered (without STMs, e.g. for PZB/LZB).

FLOSS Experience @ Deutsche Bahn AG (2010):

1

We are using 178 OSS applications – including mission critical ones - for more than 10 years.

2

We never had a SLA breach caused by Open Source Software.

3

Cash reserve for critical situations to buy 3rd level support, was actually never needed.

- **Reduced cost on R&D for software and homologation**
 - *Manufacturer can cooperate by using the same software package*
 - *Improved competitiveness at world market level*
- **Pooling resources → faster time to market for new features**
- **New business opportunities: Long term Maintenance Support**
 - *Only possible with OSS license, independent from existence of organizations*
- **Reduced Risk**
 - *Faster feed-back from field experience and from cooperating partners*
 - *Minimize number of faults: Open source software → higher SW quality*
- **Improved competitiveness by attracting resources**
 - *OSS → academic research → creating educated engineering graduates*

Learning from **AUTOSAR**: *)
“**Cooperate on standards, compete on implementation**”

That was it ...

**Thank you very much
for your attention.**

