

DAIMLERCHRYSLER

Certification of fuel cell busses around the world **Lessons learned**

Conference on European Fuel Cell Bus Demonstration Projects
May 10th/11th 2006 in Hamburg

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Truck Product Creation (4P)
Central Functions - MIA

Overview

- **Fuel Cell Busses around the world**
- **Change Management Process**
- **H₂ – Field Testing**
- **Codes and Standards**
- **Pending Items**
- **Conclusions**

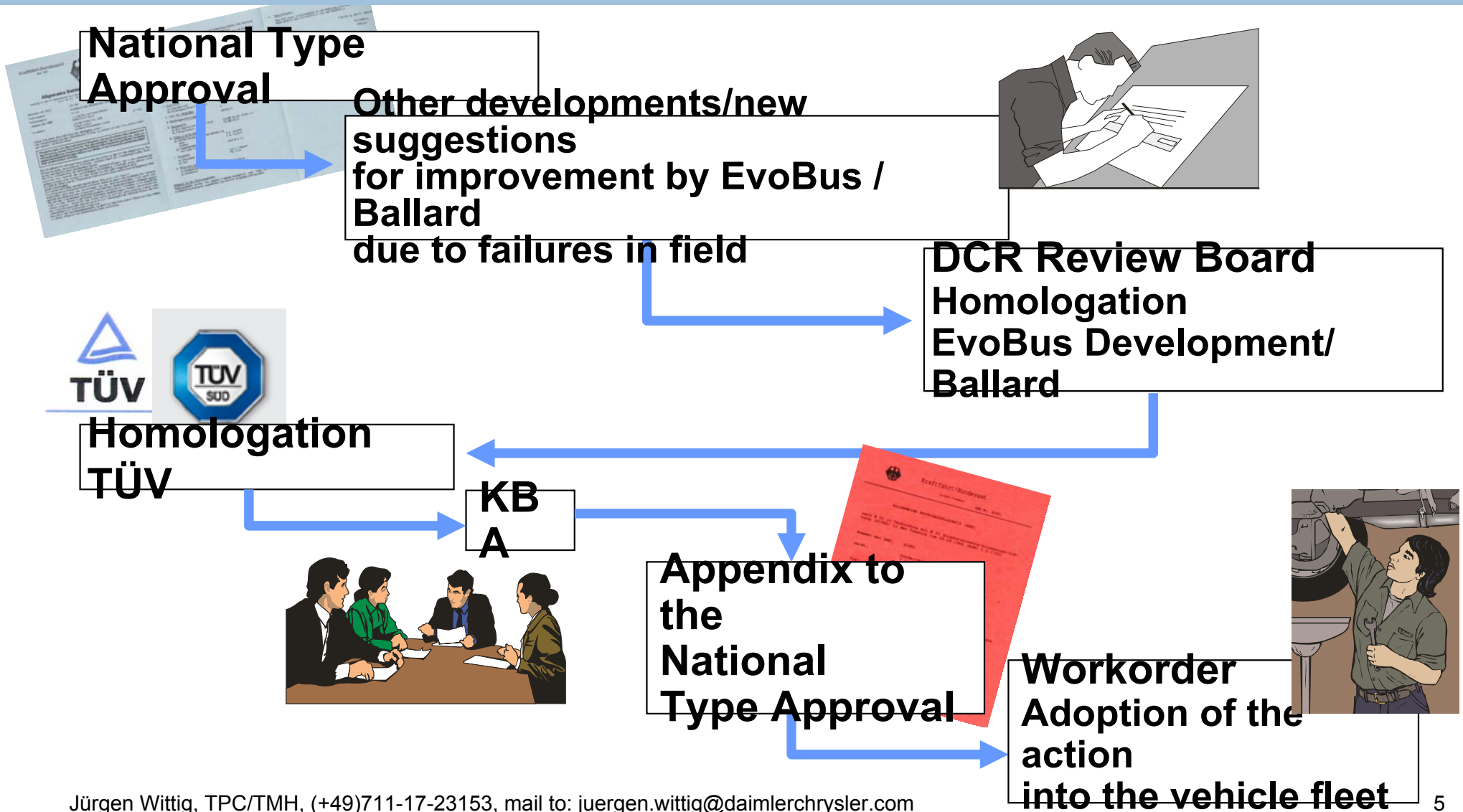
Fuel cell busses around the world – running in 2005



Fuel cell busses around the world – extention for 2006/2007

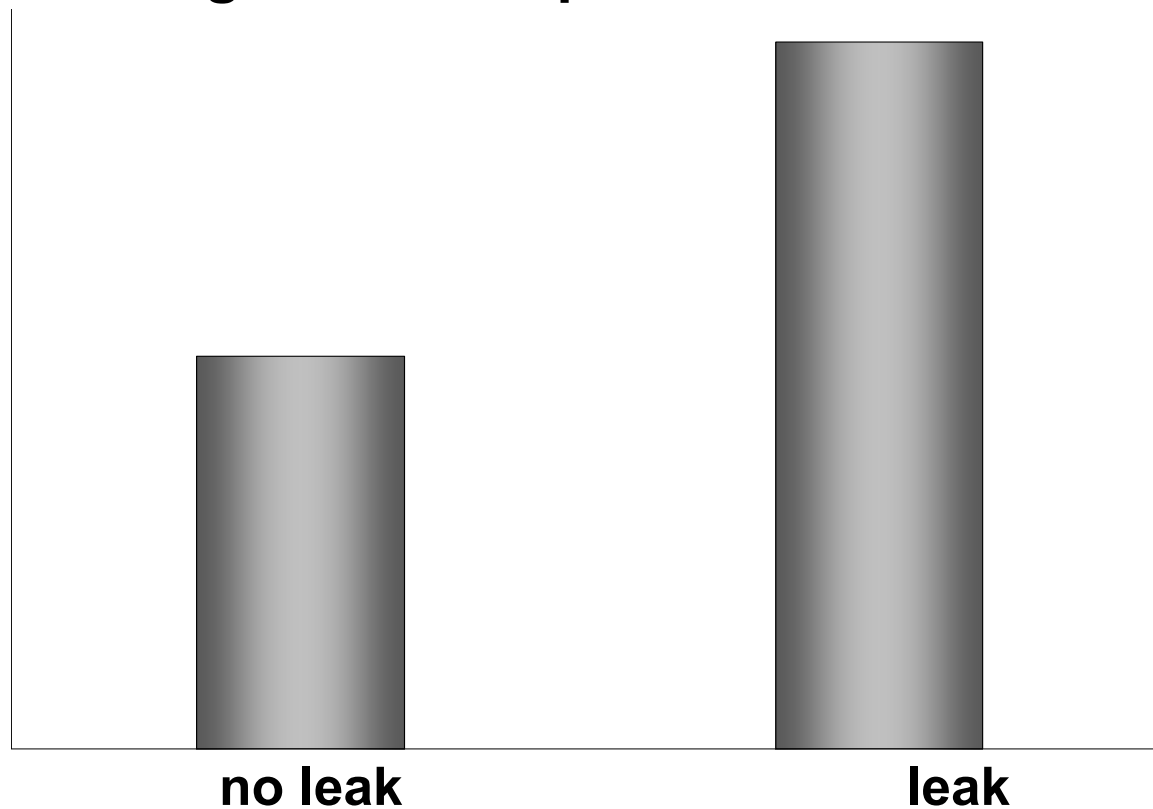


Change Management Process for technical modifications



H₂ field testing after 2 years

27 busses in field testing (busses in Australia and China still not extended), during the inspections of the H₂-system leak rates were higher than expected



- Hamburg   
- ~~Hamburg~~   
- ~~Luxemburg~~   
- ~~London~~   
- ~~Reykjavik~~   
- ~~Amsterdam~~   
- ~~Barcelona~~   
- ~~Madrid~~   
- 27**
- ~~Australien~~   
- ~~China~~   
- ~~Nebus Nabern~~   
- ~~Museum~~   
- 10**

H₂ testing – consequences

- Higher frequency of inspection
→ inspection every 3 months
- For future vehicles e.g. new prototype of Fuel Cell Bus:
we will use new and other designs/materials for
highly defective components e.g. for fittings
→ improving leakage problems to

effects



**fuel
consumption**

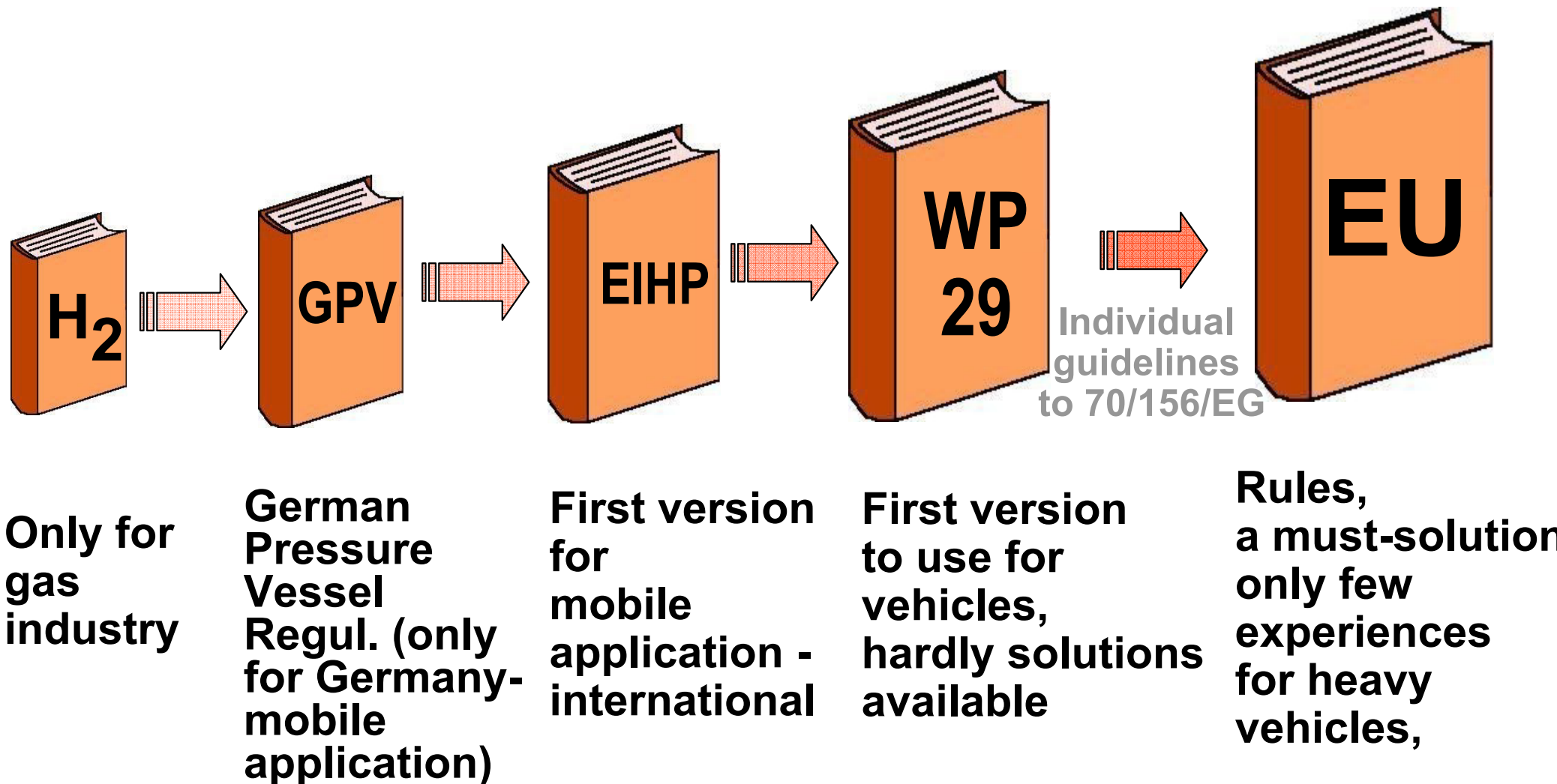


**safety
(decrease
of explosive
environment)**

Regulations - H₂ : Present Situation:

- Individual national requirements and standards are not applicable for approval of vehicles running on hydrogen
- Until now international regulations are still under preparation.
- An EU commission task force makes intensive efforts to create new regulations for H₂ storage systems
- To develop legal requirements for H₂ are essential in order to ensure basic safety and to avoid homologation problems in different countries.

Codes and Standards – History of H₂ - Regulations

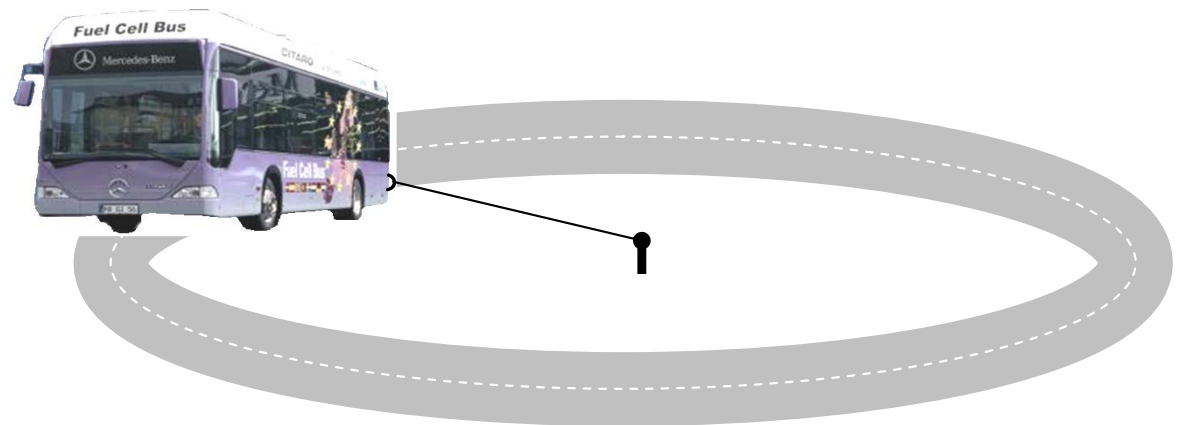


Codes and Standards – electrics/electronics

No regulation for high voltage in vehicles
→ **consequences for new generations of vehicles:**

examination of the subject: **high voltage** ($>24\text{ V}$)

- ⚡ no problems up to 60V,
dangerous for humans are voltages higher than 60V,
- ⚡ only regulations for stationary applications,
- ⚡ basic for safety
is **grounding**



Codes and Standards - electrics/electronics

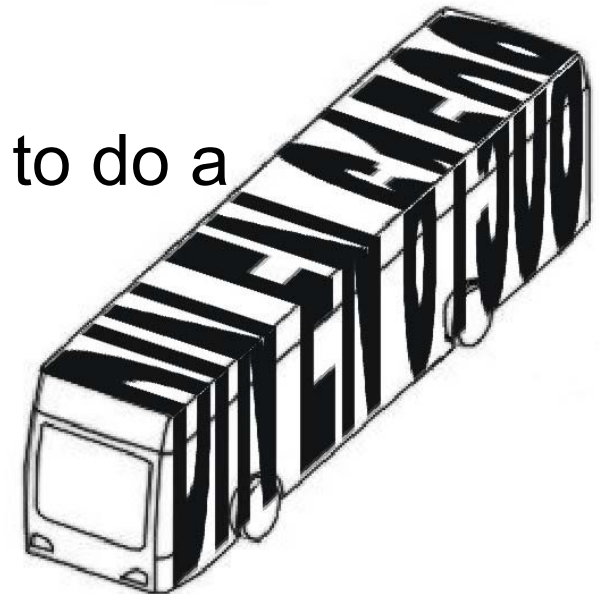
Next steps

- Develop special requirements for high voltage, electrical shock
 - adjust by EU → extension of ECE R 100
- Proposal by DC
 - VDA
 - german government
 - ECE WP 29
 - extension of ECE R 100

Codes and Standards - software

- Safety relevant software application in vehicle has an increasing contents and higher importance, in case of fuel cell vehicles compared to standard vehicle propulsion systems
- DIN EN 61508: describes the process of software development
- For vehicle application is it necessary to do a tailoring of DIN EN 61508 to use it for vehicles

DIN EN 61508



Pending items – rescue service

Automotive industry and rescue services have to treat following matters:

- ⚡ Identification of the vehicles
- ⚡ Knowledge high voltage after crash
- ⚡ Rescue of persons

→ Merge and harmonize the individual instructions of all vehicle



Pending items – Periodical Technical Inspection

- How to apply the 96/96/EG ?
(Periodical Technical Inspection)
 - For H₂, high voltage, software exist:
 - no generally agreed rules
 - no generally agreed test methods
- Extend the 96/96/EG to testing requirements for H₂, high voltage, software

Pending items – training for service staff

- Maintenance and repair staff needs special certification for working on
 - H₂- system
 - high voltage systems
 - working in explosive environment
- national legal requirements regarding for maintenance and repair staff in individual countries are very different
 - harmonization of the national requirements are necessary

Conclusion / Summary

- **CUTE Project was a „starting point“ to establish procedures for homologation and new codes and standards**
- **Creation of regulations is difficult, because technologies are still not ready developed**
- **We need future Fuel Cell Projects to check the draft regulations for :**
 - **Electronics**
 - **Software**
 - **Periodical Technical Inspection**
 - **Rescue Service**



**to ensure the base for the marketability
in the future !**

Thanks you for your attention

