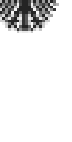




- 1. Explanation and Specification of the issue**
- 2. Application and Scope**
- 3. Definitions**
- 4. Overview on existing Regulations & Standards**
- 5. State of research**
- 6. Assessment of Harmonisation - development of a GTR**
- 7. References**



Explanation and Specification of the issue 1 (3)

- **Water steam (vapour) emissions**
→ **relevant for climate change (GHG)**
- **Water fluid emissions**
→ **partly vapourised later (see above)**
→ **relevant for traffic safety, because of wet streets and ice in winter**



Explanation and Specification of the issue 2 (3)

- **ICE (with H₂): water steam emissions
2,5 times higher compared to conventinel
engines**
 - **Conv. diesel engine: 2 – 11 % water steam**
 - **Conv. gasoline eng.: 9 % water (mass)**
- About 10 kg water/100km from H₂ ICE**



Explanation and Specification of the issue 3 (3)

- **Water emissions from a fuel cell ???**



2. Application and Scope

- **ICE and fuel cell**



3. Definitions

- **Water steam (vapour)**
- **Water fluid**
 - **temperature, ..**
 - **% (Vol.,mass)**



4. Overview on existing Regulations & Standards

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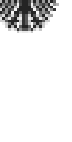
5. State of research

?



6. Assessment of Harmonisation – development of a GTR

- **Factor 2,5 is low**
- **No. of H2 vehicles is low for the next years**
→ for the time being no need for regulation



References

- **LBST**
→ Zittel, Altmann
**Molecular hydrogen and water vapour
emissions in a hydrogen energy economy,
11th Hydrogen Energy Conference 1996**
- **LBST**
→ www.hyweb.de/News/gazette.html,
23.06.2003



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