BEMU/hydrogen initiative for railways
Workshop FCH JU in Brussels 17 May 2019

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Initiative on BEMU/hydrogen project for railways

- Motivation DB / SNCF (main promoters)
  - Fossil energy free operation on existing infrastructure (e.g. non or partially electrified)
  - Focus at first on regional traffic
  - With only new trains, it will take more than 30 years until all running diesel trains are substituted by new BEMUs / HMUs.
  - A large portion of the European Diesel fleet (appr. 4.000 Diesel trains) was identified to be suitable for a retrofit
  - Need for a component demonstrator for the use in battery trains, hybrid trains and hydrogen trains

- A separate working group was established, lead by DB / SNCF

- Participating Industry

ALSTOM BOMBARDIER CAF SIEMENS KNORR-BREMSE

The working group identified significant R&D-potential to be investigated

- Additional R&D-potential identified in the following clusters(in **bold**)

R&D-Cluster	Major Topics	Benefit / Effort
Use cases globally	• Market for storage systems • target costs / LCC-reduction • new services / increased availability • Migration strategy for rollout	to improve the knowledge of different solutions and use cases
Infrastructure *	• **Battery charging solutions for different applications** • Standardization of loading and refilling systems	to come to standardized and cost efficient solutions
Rolling Stock *	• **Battery technology for rail application** • weight and energy management • **technical roadmap on batteries and fuel cells**	to make the new technologies cheaper and more available
Operation	• Adoption of time table with recharging requirements • **Performance and system optimization** • safety aspects	to optimize the operational integration of the new technologies
Homologation	• Simplification and standardization of homologation • Scope enlargement to trains and infrastructure	to make the homologation of new technologies faster, cheaper and more flexible

* In coordination with EuroSpec-WG „Alternative traction“

The working group identified significant R&D-potential to be investigated

- Use cases globally
  - Reduction of System LCC expectations
  - Different new services offered by using battery / hydrogen trains
  - New “NEXT generation” battery / hydrogen trains or / and refurbishment of existing trains
  - Business models
  - Benchmarking with other transport modes
  - Adaption of rules for operation / train / infrastructure
- Infrastructure
  - Electricity: catenary and connector/plug; integration into national and European electric network
  - On-site hydrogen production from surplus power (wind or solar) incl. electrical grid stabilization
  - Hydrogen: filling stations integration into hydrogen "network"/supply
  - Ownership of loading facilities / investment / …
  - Standardization of loading and refilling systems/facilities
  - Safety (hydrogen filling)
  - Infrastructure/charging aspects

The working group identified significant R&D-potential to be investigated

- Operation
  - Driver training
  - Timetable optimisation
  - Performance (long distances/high speed/acceleration) vs. Costs (total and in comparison to todays DMU or…?)
  - Recharging time
  - Operation conditions (speed, disruptions, timetable, …)
  - Definition of "range" (under which condition)
  - Safety (passengers, battery hazard, rescue of train)
  - System optimisation (i.e. battery on board or on ground)
- Rolling Stock
  - Train system level (e.g. system architecture, weight management)
  - Battery technology (e.g. increased availability, standardized interfaces)
  - Fuel cell and hydrogen technology (e.g. improvement of hydrogen storage system)
- Homologation
  - Standardisation
  - Reduction of costs and duration
  - Safety (e.g. hydrogen filling)

Possible future collaboration between S2R / FCH – Open to railway stakeholders

- Motivation: Identification and exploitation of possible synergies and avoidance of double-funding by the EC

- Possibility to either make use of existing project results at FCH JU or to define topics for future collaboration involving
  - Technology providers
  - Railway stakeholders
  - Policy makers

- Results of the Roland Berger H2-study (presented today) may path the way for the future collaboration

Many thanks for your attention