



FUEL CELLS  
AND HYDROGEN  
JOINT UNDERTAKING



## FCH 2 JU & S2R JU: Hydrogen Train Workshop, 15 May 2017, Hosted by HyER

The purpose of the workshop was to discuss together with industry about the future of hydrogen trains. State of art was presented and discussion about next steps was opened.

Matthew Baldwin, DG MOVE: “interesting to see how both sectors can interact”. For the European Commission it is important to know: how can they best help and what support is needed.

### WHY?

Hydrogen was frequently referred to as an “alternative to fossil fuel” and as a “complete solution”. Reducing emission is necessary to comply with energy policies and environmental needs.

Various regions in Europe are interested in hydrogen for trains (i.e. regional trains in Germany, Norway or Scotland are looking for alternatives) for several reasons:

- Where electrifications is not best solution because there is not enough traffic (i.e. Scotland), or complicated settings (logistic platform in Aragon region, Spain).
- According to a study conducted for non-electrified lines in Norway (mainly used for freight), hydrogen can be the cheapest option, followed closely by batteries. Overhead lines are by far the most expensive option, especially because traffic is low.
- Province of Groningen is looking for alternative fuels for trains because of climate policies and earthquakes due to gas extraction.

### SOLUTIONS

#### **Regional trains:**

Regional trains Coradia iLint is now fully integrated and being tested – certification phase (2017) and commercial services expected in 2020-2021.

For those hydrogen trains, a diesel train design is being used and fuel cells which were originally designed for buses are integrated in the train. Therefore, there is room for improvement if the elements were specifically designed for hydrogen trains. Additionally, those regional trains only need one refuelling station.

#### **Long distance - mainline, freight cases:**

A number of challenges were identified:

- Large amount of hydrogen will be needed, which requires space on the trains for its storage.

Redesign of locomotives is needed, which requires 4-5 years of work. Nevertheless, decarbonisation of railway has to happen and redesign will be necessary independently of the fuel alternative.



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- The industry is investing first on regional trains and shunting locomotives. Freight and mainline will follow if there is a business case (there will be “no client” for it, yet)
- An intermediate solution for mainline and freight could be “hybridise with suitable battery solution”. In the future, relaying on hydrogen - only systems should be possible, as research progresses since “energy densities are increasing” for hydrogen storage.
- Installing hydrogen fuel cells in trains is also good way to lobby for fuel cells (people will see it is working and will talk - publicity). Hence, need for more “demonstration” projects.
- Rail can effectively transport big quantities of hydrogen – different safety regulations than on road.
- A number of requirements for hydrogen to be used in freight were mentioned, such as compliance with safety and quality regulations.
- The lifetime of the locomotives must be considered too (30 years). This means that for fuel cells, the maintenance and services need to be provided over this life-frame.
- There is concern about refuelling infrastructure for larger trains (long time for refuelling). Hydrogen infrastructure companies argued that they are ready to cope with this requirement. Cost of hydrogen are stable, independent from price of fossil fuels.

#### **Hydrogen: infrastructure & service providers:**

Two cases were mentioned:

- Shunting loco project in Latvia (zero emission, low noise).
- Tram line in China (100 km) – refuelling every 3-4 trips.

The current refuelling stations for buses can manage bigger hydrogen demand in future.

Business case on equipment of sub-stations with fuel cells: DC traction power sub-stations could be equipped with fuel cells to boost the electric feeding in DC (1.5 or 3 kV) electrified network where the voltage is too low. This would increase the network capacity, while avoiding new sub-stations.

## **FUTURE**

What railway industry/operators need to make it viable?

- Demonstration projects – Need for pilots
- Shunting projects - Need for emission and noise reduction in cities
- Modularity - Need to facilitate hydrogen installation in various configurations
- Refuelling protocol – Need to improve it and it make faster
- Storage – Need to increase density of stored hydrogen
- Environment impact – Need for regulatory changes