HYDROGEN TRAIN PROJECT

Arising post-carbon solutions
DECARBONISATION CHALLENGES FOR FRENCH RAILWAY TRANSPORTATION
FRENCH RAILWAY PERFORMANCES

A CO2 EFFICIENT TRANSPORTATION SOLUTION

passanger.km or tonne.km

- Railway: 11%
- Others: 89%

CO2\textsubscript{e} emissions

- Railway: 91.9%
- Ship: 3.8%
- F-gaz: 2.9%
- Airplane: 1.0%
- Road: 0.4%
FOSSIL FUEL TRACTION

REGIONAL TRAFFIC USING DIESEL WITH TERRITORIAL DEVELOPMENT STAKES

Regional traffic - train.km

- Electric: 60%
- Diesel: 40%

50%

15 000 km

- Non-electrified lines
SNCF ANNOUNCEMENT :
END OF FOSSIL FUELS TRAINS
BY 2035

Raison d’être
the freedom of effortless
mobility and a greener planet
BIMODES TRAIN IN FRANCE

450 BIMODES MULTIPLE UNITS SINCE 2004: 20% OF REGIONAL TRAFFIC
AGC by BOMBARDIER & Régiolis by ALSTOM

☑ NO DIESEL OPERATING UNDER CATENARIES
HYBRID TRAIN IN FRANCE

1st THREE MODES REGIONAL HYBRID TRAIN
TESTS ON COMMERCIAL SERVICE: 2021
FLEET DEPLOYMENT: 2022

Biofuel B100
> -60% CO₂
Quick win

hybride

Electric mode  Battery mode  Diesel mode
BATTERY TRAIN PROJECT

FEW TECHNICAL CHALLENGES: batteries and charging points
IMPORTANT OPERATIONAL CHALLENGES
AND SYSTEM TRAIN + INFRA OPTIMISATION: limited autonomy
HYDROGEN TRAIN  PROJECT

1st BI-MODES REGIONAL H2 TRAIN
IMPORTANT TECHNICAL AND SYSTEM CHALLENGES: Green H2 ecosystem
FEW OPERATIONAL CHALLENGES: large autonomy
CHALLENGES FOR RAILWAY

New railway operations

Post-carbon solutions

New rolling stocks

New railway infrastructures
CHALLENGES FOR REGIONS

Mobility as a service

New operations

Post-carbon solutions

New vehicles

New infrastructures

Smart grids

H2 stations

Local production of energy
HYDROGEN TRAIN PROJECT
ENGAGEMENT TOWARD H2 TRAIN

2018
- France goal: 1st train by 2022
- SNCF ambition to end diesel operations by 2035

2022 – 2028
- Demonstration: SNCF support the regions with a first mini fleet
- Feedback on daily operational conditions and on economical and environmental performances
- New regulations

2035
- Potential deployment for relevant operations for H2 train
H2 train specification

Selection of relevant railway operations to deploy a mini fleet

Evaluation of local conditions for H2 train deployment: refueling, maintenance,…

8 interested regions
H2 TRAIN CHOICE

A large capacity and bimode train: to increase the market size and maintain the operations flexibility
   Ability to operate a 4 coaches regional train with 230 seats on the whole railway network with the most efficient energy

An existing train: to allow retrofit of a recent bimode fleet
   The demonstrator project proposes the development of an H2 train on an existing platform
PERFORMANCES

- Maximum speed: 160 km/h
- Autonomy: 400 to 500 km
- Power: 700 to 900 kW
- H₂: 200 kg at 350 bars
REMAINING CHALLENGES

A limited range with available volumes

Regulation & safety issues of catenary with H2 in confined spaces

New partnership model for the refueling infrastructures considering possible synergies with other usages