

Hydrogen Research & Innovation Days

24-25 November 2025





Hydrogen for Mobility

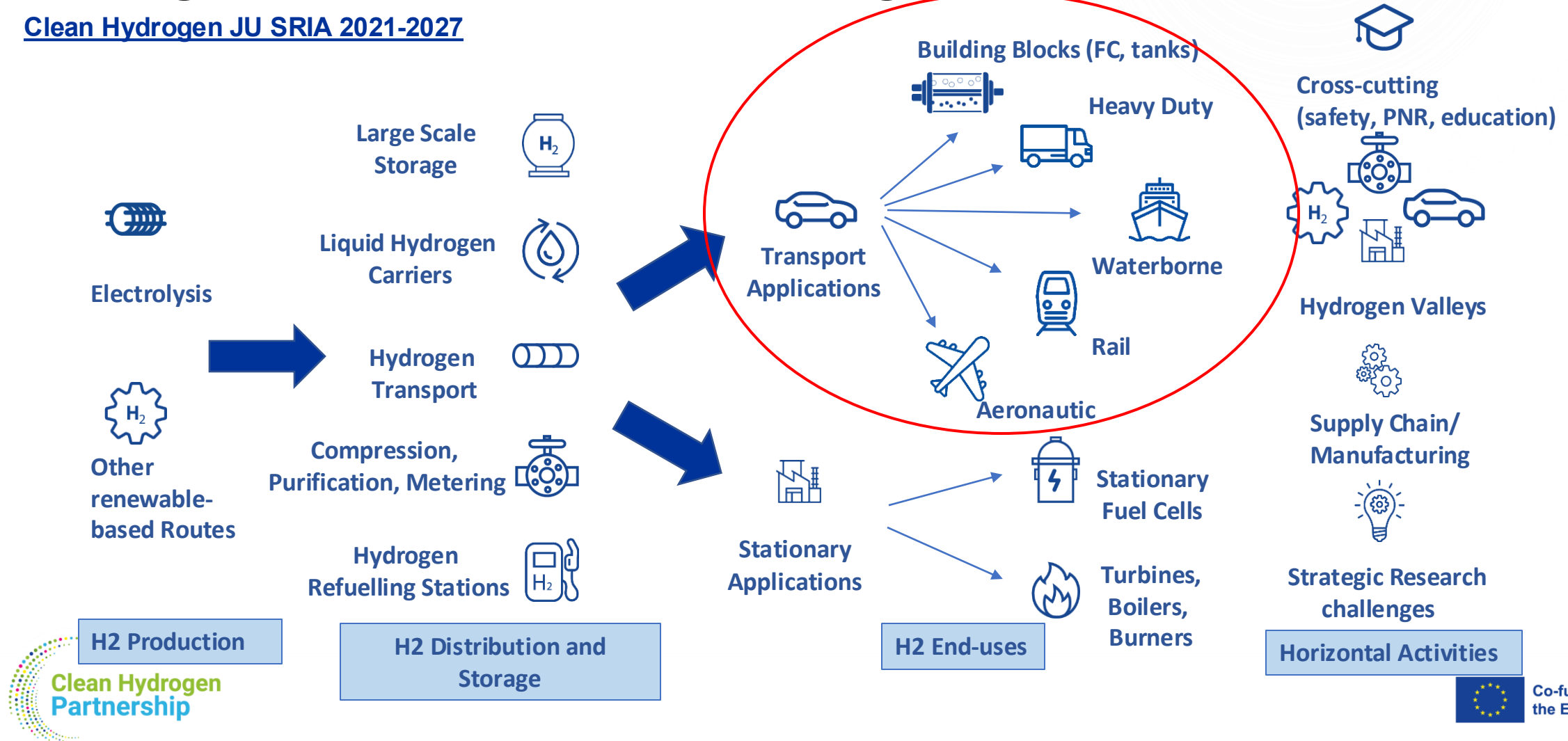
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Strategic Research & Innovation Agenda

Clean Hydrogen JU SRIA 2021-2027



From technology building blocks to applications

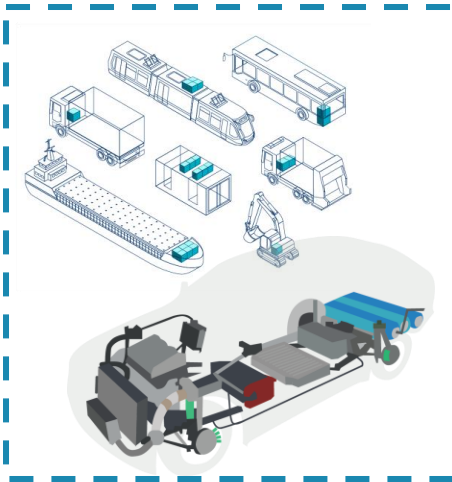


Continuous loop of innovation

Components



Prototypes



Applications



Demo feedback for new generation products

Lifetime ↑

Performances ↑

Costs ↓

Competitiveness ↑

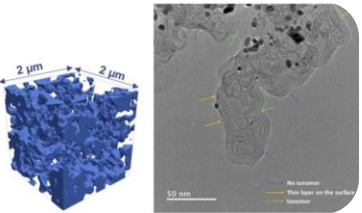
TRL

Five key dimensions of fuel cell research

Materials

- **Catalysts**, membranes, ionomers
- **Reduced PGM**
- Fundamentals of reactions

caMelot



Performance

- **Power density & efficiency**
- **Architectures & modelling**
- Water / heat management



Durability

- 20,000–30,000 h **lifetime** targets
- **Degradation** mitigation & ASTs
- Monitoring and **prediction**



Manufacturing

- Scale-up & **automation**
- **Cost and circularity**
- From lab to fab



H2UpScale

Validation

- **Deployment** in trucks, ships, etc.
- **Standardised** stacks / modules
- Real-world **testing & demos**



Challenges

- Durability under HD cycles
- Material limits vs. power density
- Costs and time for manufacturing
- Standardisation gaps

Non-road vehicles

- Agriculture, port and construction
- FC development, integration and demonstration
- Demanding conditions



Garbage trucks

11 refuse trucks
5 EU cities

87% 
Availability

49% 
Efficiency
(incl. Aux.)

REVIVE 



90.000 
km driven

7.400 
kgH₂ used

12.000 
hours of operation

Urban buses

Results from concluded projects:

- 2/3rd of all FC buses in EU (~252 FCB)
- Range >350km, Efficiency ~6kgH₂/100km
- Total reliability >600.000 FC hours

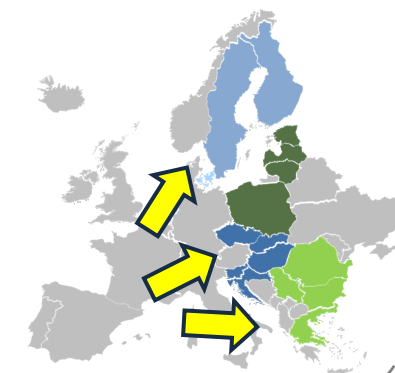


Post JIVE(s) activities:

- Most sites will continue
- Positive business cases achieved for large fleets

Roadshows: unlocking demand in new regions

- 15 Countries, 50 cities covered
- Follow up by multiple bus orders
- Wide media coverage and public proximity



Hydrogen trucks in daily commercial operations



Featuring

- 16 trucks
- 4 high capacity HRS
- 11 industrial end users

Achievements

- >140.000 km driven
- <20 min refueling time
- Range up to **800 km**
- Payload 25 t
- Availability **90,5%**
- Fuel consumption **<7,5kgH₂/100km**

Deployment



IVECO



IVECO



IVECO



Next steps

From



To



- **150 HD long haul trucks**
- Range: over 600 km
- Deployment: 8 MS, 5 TEN-T corridors



H MARINE

Multi-MW PEMFC stacks and systems

Hydrogen ports ecosystems

Tanks for hydrogen « bulk » and on-board storage

Heavy machinery for container handling

Liquid hydrogen bunkering

Heat and on-shore power for ferry terminals

Demonstration of short sea and fluvial vessels

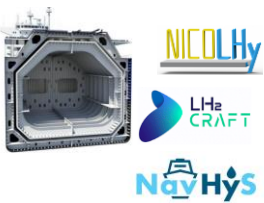
Regulations, codes and standards

Challenges

- H₂ price (TCO)
- SOFC supply chains



EUROPEAN PARTNERSHIP



Retrofitted train



Key achievements

- **1.2MW FC** pack retrofitted, **800km** autonomy
- Achieved **10.000km** of railways tests
- **Gap analysis** for normative framework

Cost Competitiveness analysis

- TCO remains lower for diesel solutions
- Costs improvements possible for H2 trains:
 - **H2 costs**
 - **FC and components costs**
 - **Train CAPEX**

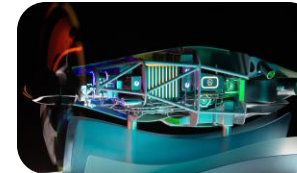
Research for aviation: FC and LH2 tanks

- FC from **stack** to **full system (MW)** and cooling system for aviation
- Next-gen **high temperature FC**

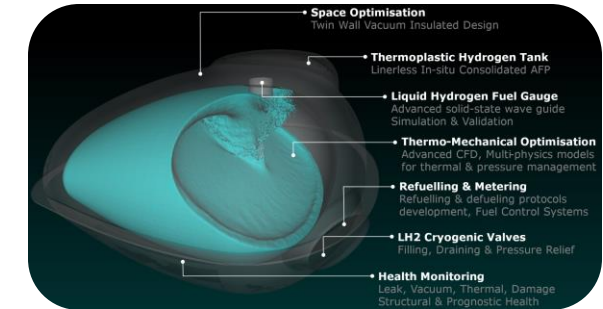


NIM PHEA

BRAVA



- Composite lightweight conformal **LH₂ Tank**



COCOLH₂T



Technology
maturation



Ground and
flight tests

Future outlook

- **ReFuel-EU: 1.2%** share of synthetic fuel in 2030
- Shift by **5-10 years (Airbus)** for ecosystem development



Conclusions

Hydrogen mobility is real and delivering

Buses, trucks, non-road vehicles and vessels demonstrate **high reliability, long range** and growing commercial uptake

Next markets are scaling up

Long-haul trucks, port ecosystems, MW-scale maritime systems, and first rail retrofits show **pathways to deployment**

Technology gaps remain but are narrowing

Durability, high-power FCs, LH₂ storage, and **manufacturing** scale-up are the main focused challenges

Investment and policy alignment are essential

Cost **competitiveness**, **infrastructure** build-out and **regulatory** frameworks will determine the pace of market adoption



Thank you for your attention!