CTAG – AUTOMOTIVE TECHNOLOGY CENTRE OF GALICIA

PRIVATE AND INDEPENDENT DEVELOPMENT CENTRE FOCUSED ON THE AUTOMOTIVE & MOBILITY SECTOR

4 MAIN AREAS OF ACTIVITY

MATERIALS AND PROCESSES | TESTING | PASSIVE SAFETY | ELECTRONICS & ITS

+800
80% engineers

56M
Total investments

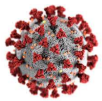
70%
International activity

49%
OEMs

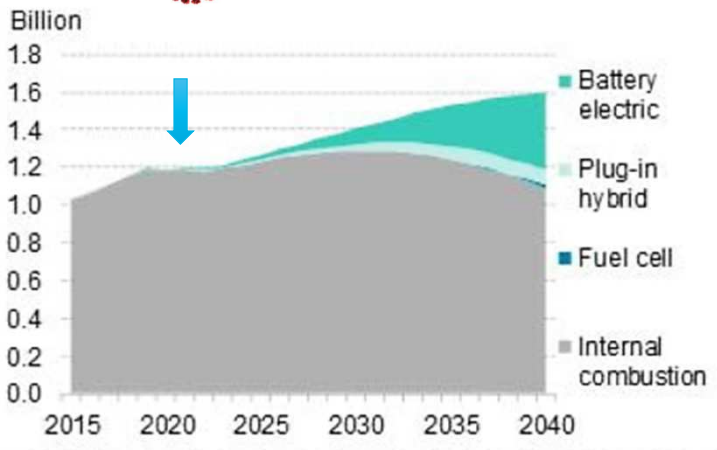
FCEV: an industrial approach to vehicle R&D

H2 is an energy vector

Applications in industry, transport, building and generation.



COVID-19

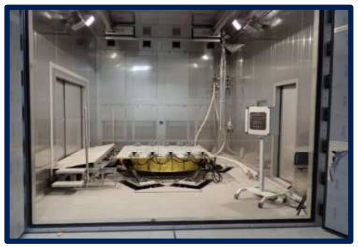


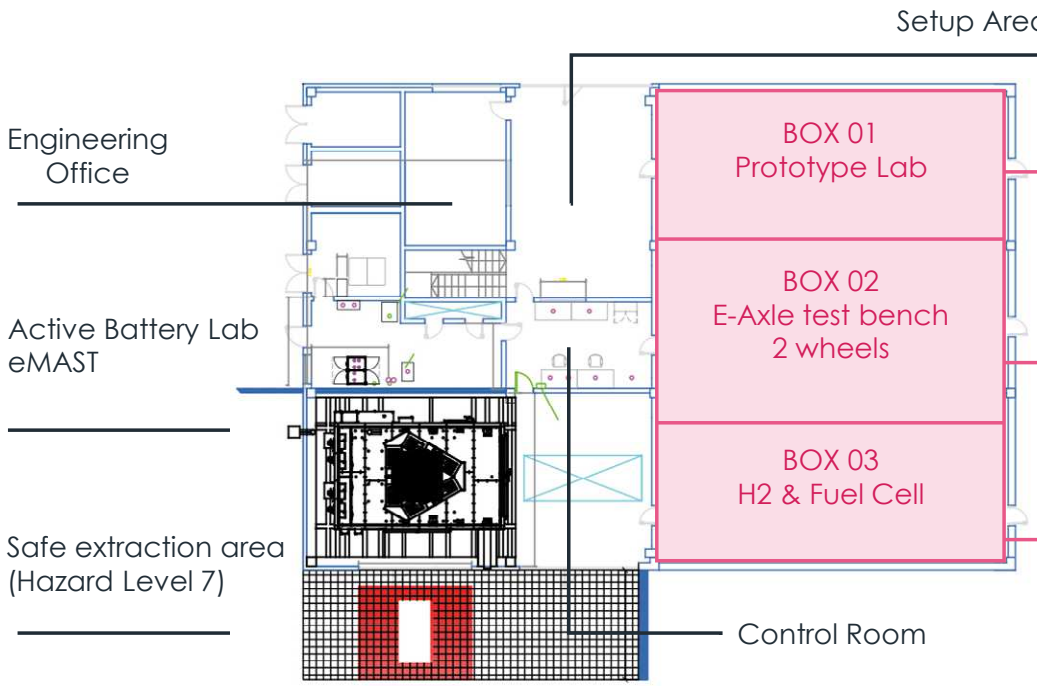
EV sales drop in 2020 for 1st time in the modern era

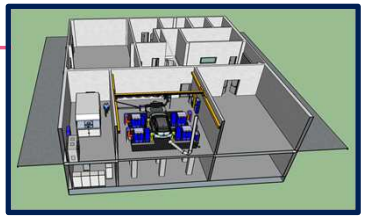
Fig. source: modified from BNEF, 2020

- Compared to BEV only a few car OEMs offer currently FCEV.
- Toyota, Hyundai Group and Honda with strong FCEV strategy.
- Stellantis has presented in 2021 plans for an FCEV commercial car.
- Tesla and German OEM´s with strong position for BEV strategy.
- Some startups active, uncertainty with Chinese players position.
- Focus of adoption shifting to commercial and industrial vehicles, especially heavy and long haul.

FCEV: an industrial approach to vehicle R&D







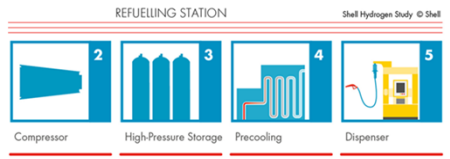
FCEV: an industrial approach to vehicle R&D

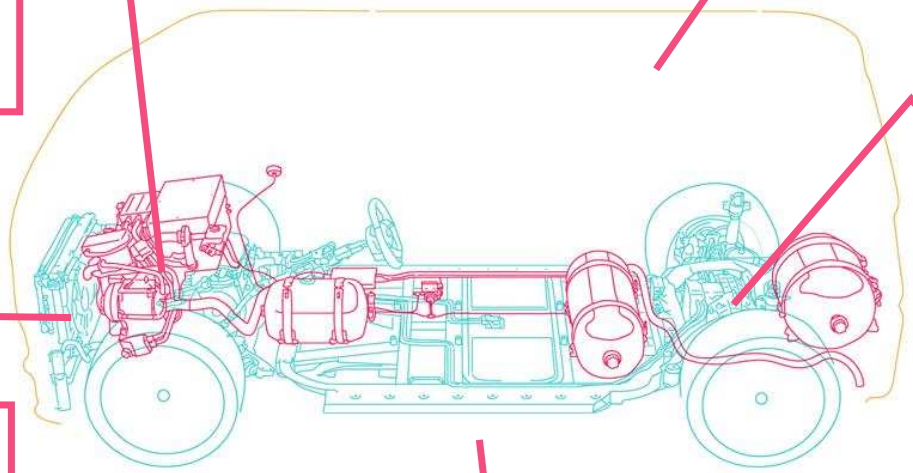
H2:Energy storage + Fuel Cell stack:

Hybridization strategies

- BEV, FCEV, PHEV and PHFCEV.

H2 Hydrolyser





Powertrain + power electronics

Thermal management

Safety

- Risk assessment and design of safe facilities

FCEV: an industrial approach to vehicle R&D

- **FCEVs show big advantages in usability but still require significant technical development in order to reduce the FC cost and improve the efficiency.**
- Regulation will play a major role in order to increase penetration of this technology in the market, as well as the improvement in the number of recharge stations.
- Usability is better than BEV (charging time, weight, performance in cold temperatures, scale in power mileage).

USE OF NON-CRITICALS MATERIALS

CIRCULAR ECONOMY

RECICLABILITY

EFFICIENCY

SAFETY

INFRAESTRUCTURES