eucar
EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

SUSTAINABLE MOBILITY

EUCAR RESEARCH RECOMMENDATIONS

- Charging solutions for a seamless and positive user experience
- Battery technologies and battery management systems
- New technologies and materials for Fuel Cell systems
- Substitute energy intensive and critical materials for FCEV
- Component integration at vehicle level
- Reduction of CO2 footprint of powertrains
- Environmental impact assessment of road transport
- Circularity in the automotive industry
- Availability of polymers in a carbon-neutral future

⇒ Charging solutions for a seamless and positive user experience

The future zero emissions vehicle solutions are already rapidly increasing. However, large-scale adoption of sustainable mobility solutions depends on user experience and meeting customers' expectations. For a smooth and effortless user experience, regarding availability, affordability and convenience of charging we innovate and harmonise charging solutions to better integrate vehicles into the grid, enabling quick and smart bi-directional charging.

⇒ **We innovate charging solutions for a seamless and positive user experience.**

- Defining interfaces, communication strategies and convenience charging.
- Defining and implementing smart charging and optimised V2G integration.
- Assessing and defining the specific needs for charging systems and modes for all vehicles (including Commercial Vehicles).
- Developing systems and technologies for vehicles, infrastructure, connectors/plug to further reduce charging time (power levels, charging power, charging rate, C-rate, etc), considering standardisation and harmonisation.

⇒ Battery technologies and battery management systems

Large-scale adoption of sustainable mobility solutions depends on user experience and meeting customers' expectations. We advance battery electric vehicle performance regarding range, durability and affordability and address sustainability by innovating battery technologies and management systems with present and future cell chemistries.

⇒ **We improve battery technologies and battery management systems.**

- Analysing of customer expectations and real-world user behaviour for battery development.
- Exploring different technologies (e.g. Li-Ion, L(M)FP, Na-Ion, solid-state) increasing overall performance of BEV while considering industrial feasibility (large scale production).
- Assessing (integrate in battery development) the circular economy approach (design for sustainability), including recycling and second use.
- Improving battery safety and providing guidelines for first responders and management at the End-of Life: access, handling and transport of batteries.
- Innovating to replace hazardous materials and to substitute critical materials.

⇒ New technologies and materials for Fuel Cell systems

FCEVs have to meet targets regarding sustainability, user experience and customers' expectations. We therefore develop FCEV technologies and solutions for increasing sustainability, affordability, reliability and safety of fuel cell systems and hydrogen storage.

⇒ **We innovate and develop new technologies and materials for Fuel Cell systems.**

- Developing methodologies and simulation models to accurately predict ageing of Fuel Cell systems under real life operations, and to define maintenance actions that extend the life of such components.
- Addressing the influence of operations, degradation and refuelling in all use cases: passenger cars, vans, busses and trucks.
- We innovate in technologies and sustainable materials to increase affordability and power density of Fuel Cell systems.

⇒ Substitute energy intensive and critical materials for FCEV

Resource efficiency will become equally important for sustainability, as demand for green technologies rapidly increase. To increase sustainability and affordability of hydrogen-powered vehicles, while lowering energy demand.

⇒ **We innovate to substitute energy intensive and critical materials for hydrogen-powered vehicles.**

- Reducing carbon intensity in CFRP in the hydrogen tank while in parallel exploring alternative ways of storing hydrogen in vehicles.
- Address recycling and second life for CFRP components to decrease the overall environmental impact of these components.
- Increasing the recycling content used and improving efficiency of recycling process of the critical minerals (Au and Pt for Fuel Cells) by developing new systems for dismantling, refurbishing and recycling at the end of life.

⇒ Component integration at vehicle level

Large-scale adoption of sustainable zero-emission mobility solutions depends on user experience and meeting customers' expectations. We develop mobility solutions for an enhanced quality of life, with energy and resource-efficient technologies that are carbon-neutral over the entire life cycle. The LCA considers each part of a vehicle, however, the performance and sustainability depend on the full vehicle integration.

⇒ **We improve the component integration at the vehicle level to provide even more energy-efficient and sustainable solutions.**

- Exploring the synergies of electric motors and other electronic components (e.g., usage of the e-motor stator and the inverter power switches, as elements to achieve high power charger on board).
- Innovating in power electronics for charging, fast charging and ultra-fast charging; including the overall control strategies at vehicle level and considering smart charging.
- Demonstrating in real life the component innovations by integration at vehicle level.

⇒ Reduction of CO2 footprint of powertrains

Although, due to the limited availability of renewable energy sources, energy efficiency is key for reaching climate neutrality, resource efficiency will become equally important for sustainability, as demand for green tech will rapidly increase and supply will lag behind.

⇒ **We address the reduction of CO2 footprint of powertrains and their components.**

- Assessing the carbon footprint of zero-emission vehicle components (with focus on the powertrain).
- Developing efficient powertrain configurations to minimise the CO2 footprint of their components (e.g., 2 central e-motor vs 2 in-wheel e-motors).
- Developing new advanced materials to replace critical raw minerals in powertrain components (e.g. Ni, Co, Li, Cu, Mg, rare-earth) ensuring a decrease in overall CO2 footprint while maintaining affordability.

⇒ Environmental impact assessment of road transport

Improving the further potential to achieve global reductions in the environmental impact of road transport by addressing the whole life cycle of the vehicles. Moving from product to system perspective.

⇒ **We assess the environmental impact of road transport and its energy carriers.**

- Defining the boundary conditions and allocations to achieve a future common LCA methodology (First step covered by TranSensus LCA).
- Focusing on LCA for propulsion systems as a first step, extending it to the whole vehicle, and accounting for scarcity of resources (critical raw materials).
- Understanding the pathways and real carbon footprint of energy carriers' production (with special attention to H2).

⇒ Circularity in the automotive industry

Sustainable mobility requires processes that contribute to a circular economy while reducing the environmental footprint along the value chain to the greatest possible extent.

⇒ **We increase circularity in the automotive industry.**

- Developing new sustainable technologies and processes for the efficient use and increased secondary material use.
- Addressing, defining and developing easier repairability and upgradability of the vehicles, components and systems to ensure a longer and sustainable lifetime while enabling for mobility for all.
- Defining and establishing recycling loops to allow an efficient use of resources across markets and regions (e.g. Rare-earth, Al, Polymers, Li, Ni, Mn, Co). We address fragmentation of the dismantling and recycling industry in Europe and globally.
- Digital Tools such as digital twins of batteries and vehicles will play a crucial role to optimize the circularity of the automotive industry.

⇒ Availability of polymers in a carbon-neutral future

A carbon neutral Europe requires all industries to become fossil-free. Automotive industry needs to move away from non-renewable fossil raw materials to reach the EU's climate targets as set out in the Green Deal.

⇒ **We assess the requirements, and support the industrial development, to ensure availability of polymers for the automotive industry in a carbon-neutral future.**

- Defining the roadmap to transform the automotive polymer industry from fossil based to carbon-neutral (e.g bio-based while using renewable energy sources, e-polymers).
- Establishing the necessary R&I actions to make polymers carbon-neutral and affordable (in quantities and qualities suitable for automotive industry).
- Addressing critical raw material and sourcing supporting the development of an EU strategy.
- Innovating to replace hazardous polymers replacement (e.g. PFAS).
- Exploring:
  - Sources for the biomass needed, that do not compete with food sources.
  - Necessary green energy sources for the bio-based industries involved.
  - Market framework conditions.