Risultati Italiani nelle call 21-22-23 Asset di innovazione industriale e priorità

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2ZERO: le aziende italiane

- In-kind contributions to the Actions funded by the Union, consisting of eligible costs in accordance with the Horizon Europe rules minus the Union contribution; In-kind contributions to Additional Activities that are in the scope of the Strategic Research and Innovation Agenda (SRIA) and addressed in the annual Additional Activities Plan, which is approved by the Partnership Board (-> reduced funding rate)

- In-kind Additional activities are those activities which contribute to achieving the objectives of the Co-programmed European Partnership, including R&I at higher Technology Readiness Level (TRL) and/or to ensure demonstration, market, regulatory and societal uptake, which are in the scope of the SRIA but are not covered by Union funding

Research members: POLIMI, POLITO, UNIBO
Associated members: ELMO

La SRIA della 2ZERO. Aree di R&D

- Vehicle technologies and vehicle propulsion solutions for BEV and FCEV
- Integration of BEV into the energy system and related charging infrastructure
- Innovative concepts, solutions and services for the zero-tailpipe emission mobility of people and goods
- LCA approaches and circular economy aspects for sustainable and innovative road mobility solutions

Vehicle technologies and vehicle propulsion solutions for BEV and FCEV (Power Electronics for vehicles)

- HiPE consortium covers the whole value chain to develop a new highly **energy-efficient, cost-effective, modular, compact and integrated wide bandgap (WBG) power electronics solutions for the next generation of battery electric vehicles (BEV)**, and to facilitate a significant market penetration of **WBG** in the automotive sector (**Marelli**) (2021)

- Focused on BEV architectures with **in-wheel powertrains**, **HighScape** will explore the feasibility of a family of highly efficient power electronics components and systems including integrated traction inverters, on-board chargers, DC/DC converters, and electric drives for auxiliaries and actuators (**POLITO**) (2021)

- SmartCorners will deliver **In-wheel motors** (**IWMs**) integrated in multi-functional and controllable modules consisting of the electric powertrain, friction brake and suspension/steering actuation. By combining several vehicle functionalities in a compact solution, the modules offer substantial opportunities to enhance the design and the operation of EVs. Using machine learning and AI, an adaptive multilayer control strategy will be implemented with historical and current data from the vehicle, its environment, and users, including relevant EV fleets. (**MARELLI**, **POLITO**) (2023)

SCAPE aims at: i) **proposing a standardisable, modular, and scalable approach, based on multilevel technology, for the design of the EV power conversion systems and take advantage from scale economy on one or few power ratings** ii) develop highly-compact and integrated building-block implementation. iii) propose intelligent modulation and control strategies, online diagnosis, and digital twin for predictive maintenance with machine learning. (**UNIMORE, Istituto Studi per integrazione sistemi**)

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Vehicle technologies and vehicle propulsion solutions for BEV and FCEV (HDC, LDV)

EMPOWER will deliver **two flexible, modular, and scalable zero-emission heavy-duty vehicles (ZE HDV) belonging to the VECTO vehicle group 9 (6×2 rigid trucks)**, with a gross vehicle weight equal or above 40 tons. One vehicle is powered by a Fuel Cell (**FC**) system and has a driving range of 750 km, while the other is powered by a **battery-electric powertrain**, and has a driving range of 400 km. Both vehicles will be delivered at TRL 8 by the end of the project (end of 2026) and are expected to approach the market by 2029 (**IVECO, GRUBER, BREMBO, IST INNOVAZ TECN BZ**) (**2022**)

MINDED will deliver **a battery electric IVECO eDaily minibus** with 20% improved range at 0°C against the 2023 baseline. This is achieved by introducing a highly efficient heating system based on infrared (IR) panels, controlled by a novel user-centric HMI, embedding an optimised thermal and energy management strategy (TEMS) for improved comfort and reduced energy consumption. These activities are complemented with the demonstration of a new HVAC unit based on a heat pump, capable of reducing the vehicle's cooling energy requirements by 15% against the baseline, while leveraging the efforts made on the HMI and TEMS. (**IVECO, LEADTECH)(2023)**

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Vehicle technologies and vehicle propulsion solutions for BEV and FCEV

EM-TECH will develop novel solutions to push the boundaries of electric machine technology for automotive traction, through: i) innovative direct and active **cooling** designs; ii) **virtual** sensing functionalities for the high-fidelity real- time estimation of the operating condition of the machine; iii) enhanced **machine control**, bringing reduced design and operating conservativeness enabled by ii); iv) electric **gearing** to provide enhanced operational flexibility and energy efficiency; v) **digital twin** based optimisation, embedding systematic consideration of Life Cycle Analysis and Life Cycle Costing aspects since the early design stages; and vi) adoption of **recycled** permanent magnets and circularity solutions. (**POLITO, IDEAS&MOTION**) (2022)

HEFT considers that an energy efficient rare-earth synchronous motor is the best option for next generation high-power primary axle traction EVs and proposes a set of **innovation challenges on electric synchronous motor** configuration **based on SiC inverters** (direct cooling of rotor and stator, advance insulation for high voltage, multibarrier rotor topology, wave windings) and advanced materials (advanced GBD magnets, epoxy for magnet fixation, composite for motor housing, insulation resin). These innovations will result in a high-efficient and low-cost solution that will be validated on 2 motor topologies, which compared to two main reference automotive IPM commercial motors in Europe (VW ID.3 and FIAT500) will lead to next impacts**: >800V, 20% reduction losses, >7 KW/kg and 42kW/l power density, 28% cheaper, 50-66% material savings, including 60% reduction of REE content and >80% REE recyclability rate.**
As this solution is still dependent on REE from China, HEFT will be aligned with the ERMA action plan towards a **circular economy market** of rare earth permanent magnets and suggests: one alternative magnet route (Ce based) and two REE recycled routes together with policies promotion towards the foundation of a European rare earths industry, capable of delivering 20% of EU demand by 2030 (**UNIBO**) (2022)

iBattMan will incorporate novel sensors and methodologies for monitoring the State-of-Health (SOH) of the cells during operation and in charging, together with cutting-edge technologies and tools for V2X and second-life applications, and use advanced physics- and data-based models implemented on-board and on-cloud for performance evaluation, diagnosis, health management and safety evaluation tools, to trigger actions to address safety and cyber-security concerns. **This will result in an innovative, modular and scalable BMS, for a wide range of vehicles, from small passenger cars to e-buses and electric trucks, with improved performance, connectivity, security and reliability to enhance battery performance and reduce total cost of ownership in EV applications and intelligent battery** use for grid support and in 2nd life applications, based on a holistic design of an interoperable architecture and supported by a suite of advanced sensors and edge- and cloud-computational resources.(**AVL Italia, Manifattura automobili Torino**)(2023)

Integration of BEV into the energy system and related charging infrastructure

FLOW boosts and demonstrates **multifaceted EV smart charging and V2X integration** into energy systems thanks to a range of comprehensive solutions providing answers to the needs of all actors involved. These solutions include highly replicable user-centric products, concepts, configurations and mechanisms to optimise operation. Cross-sector harmonisation and standardisation is delivered to facilitate activities of stakeholders and EV users. Demonstrators in 5 countries including IT (RSE, TERNA, ENEL, e-distribuzione, ARETI, ACEA, Enel-x)(2021)

Innovative concepts, solutions and services for the zero-tailpipe emission mobility of people and goods (Logistics)

ZEFES aims at executing of real-world demonstrations of long-haul BEVs and FCEVs across Europe to take zero-emission long-haul goods transport in Europe to the next level. **Pathway for long-haul BEVs and FCEVs to become more affordable and reliable, more energy efficient, with a longer range per single charge and reduced charging times able to meet the user's needs.** Technologies which can deliver promised benefits (easy handling, similar driving hours & charging/fueling, high speeds and ability to operate in complex transport supply chains). **Mapping of flexible and abundant charging/fueling points and novel charging concepts. Novel tools for fleet management to support the rising number of long-haul BEVs and FCEVs vehicles in the logistics supply chains**. (GRUBER Logistics) (2022)

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LCA approaches and circular economy aspects for sustainable and innovative road mobility solutions

TranSensus LCA aims to develop a baseline **for a EU-wide harmonised, commonly accepted and applied single life cycle assessment (LCA) approach for a zero-emission road transport system.** Such a European single LCA approach is seen as a key element in achieving the Green Deal targets, making Europe the first digitally enabled circular, climate-neutral and sustainable economy (**IVECO, FIAT, UNIFI**) (2023)

ZEvRA's main objective is to improve the **circularity of light-duty EVs** throughout their entire value chain, from materials supply and manufacturing to end-of-life (EoL) processes, which aligns with the European Union's goal of achieving zero CO2e emissions by 2035, particularly in the EV value chain. To do so, ZEvRA will develop a Design for Circularity (DfC) methodology and a holistic circularity assessment aimed at improving the production of electric vehicles (EVs) based on the 9Rs. This methodology will be validated by developing zero emission solutions for the most important automotive materials, covering > 84% material mix: steel, three versions of aluminium (wrought, casting, and foam), thermoplastics composites (long and continuous fibre-reinforced), unfiled/short fibre plastics, glass, tyres and Rare Earth Elements (REE). (**POLIMI, UNIBO, FIAT, RAFFMETAL**) (2023)

Leveraging innovative design and engineering techniques**, ZEV-UP** vehicles will be tailored to meet **the specific needs of users** in both developed and emerging markets, ensuring high levels of user acceptance and market uptake. **By optimizing vehicle components for reduced material usage and enhanced structural properties, the project will achieve lighter vehicles with increased autonomy and minimized environmental impact.** ZEV-UP will also **develop digital-twin models to improve vehicle development efficiency and reduce validation costs**, as well as designing charging capabilities compatible with a variety of regional power systems. **Novel business and usage models, such as Battery as a Service**, will be explored to maximize the benefits and impact of the L7e BEV platform. (**CONS INTERUNIV PER l'ottimizzaz e la ric operativa**) (2023)

LCA approaches and circular economy aspects for sustainable and innovative road mobility solutions (LPT)

The **eBRT2030** project will create a New Generation of advanced full electric, urban and peri-urban European **Bus Rapid Transit** (BRT) enhanced with novel automation and connectivity functionalities, to support sustainable urban transport by reducing cost/km/passenger, TCO, GHG and pollutant emissions and traffic congestion. The eBRT2030 project is developed through 3 main lines:
1) Technology-focused key innovative solutions for BRT, both at system and subsystem level, at level of vehicle, infrastructure, operation, and IoT connectivity 2) 7 demos of BRT system innovative solutions in real-operation, both city-&operator-led and BRT system-focused, or focused on specific technology innovation at subsystem level that are ready for BRT operations, in EU and outside EU (in Latin America and East-Africa), and fully integrated in the whole urban mobility scenario 3) definition a new EU concept of Bus Rapid Transit for year 2030, benefitting of evaluation, multiplication and replication of the real-operation test of innovations, that improve the performance of the whole EU urban bus system (**RINA, ENEL-X, START ROMAGNA (TPL in Romagna), UNIBO**) (**2022**)

Asset di innovazione industriale che caratterizzano il sistema nazionale

- Sembrano pronte al nuovo mercato della mobilità elettrica le aziende manifatturiere della filiera che operano nel settore dell'elettronica di potenza (con particolare riferimento alle tecnologie per i motori a Integrated Wheel Systems e quelle che utilizzano dispositivi WBG)
- Tecnologie innovative per l'elettronica di potenza basata su semiconduttori a banda larga (WBG) (Partnership POLITO-PEIC e MARELLI su progettazione e prototipazione di inverter multilivello a elevata potenza per la trazione elettrica, basato su tecnologia GaN).
- Sviluppo di Digital Twin per l'automotive
- Analisi del ciclo di vita per la mobilità elettrica. Riduzione dell'impiego di materie prime critiche e riciclo
- Soluzioni digitali avanzate ed interoperabili per la logistica (piattaforme di gestione della logistica) (GRUBER)

Priorità del sistema italia, indirizzo strategico della ricerca e punti di forza

- **Sviluppo di infrastrutture di ricarica intelligente per BEV e FCEV in aree urbane in modo compatibile con la densità abitativa delle città italiane;**
- **Sviluppo di topologie di rete innovative dedicate ai sistemi di alimentazione delle infrastrutture di ricarica che possano integrare la produzione di energia da FER;**
- **Sviluppo di soluzioni interoperabili per il controllo delle risorse energetiche legate alla mobilità elettrica (V2G e V2X)**
- Economia circolare nel settore e-automotive. Riciclo e riuso di materie prime critiche (REE, Litio, etc…) e creazione di catene di approvvigionamento nazionali.

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