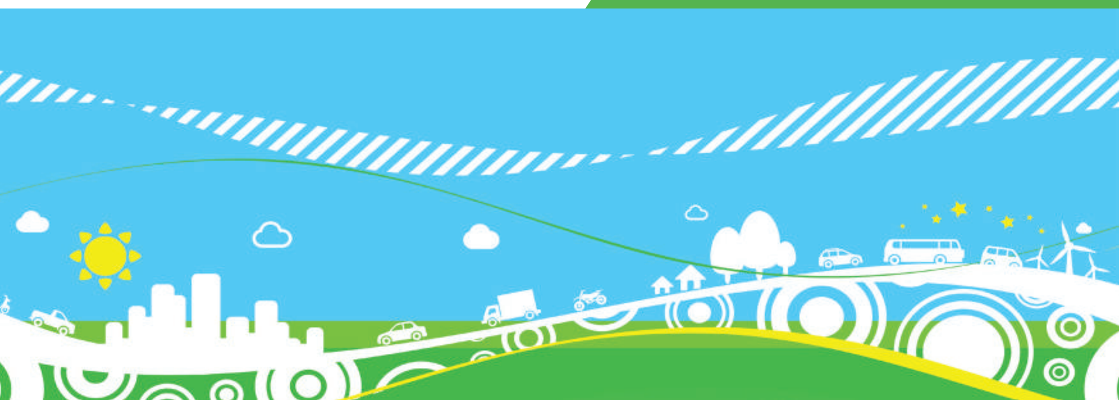
EGVI cPPP
Project Portfolio
Calls 2018 - 2020

EGVI
European Green Vehicles Initiative

Horizon 2020
European Union Funding
for Research & Innovation



Ed.: EGVIAfor2zero aisbl, Av. de Cortenbergh 66, 1000 Brussels

Foreword

The European Green Deal aims at transforming the EU into a modern, resource-efficient and competitive economy, and its success also depends on our ability to make the transport system as a whole sustainable. The EU calls for an "irreversible shift to zero-emission mobility" as identified in the "Sustainable and Smart Mobility Strategy". The proposed "Fit for 55 package" by the European Commission follows this ambition, with the commitment to cut GHG emissions by at least 55% by 2030.

Through the European Green Cars and Green Vehicles Initiative (EGVI) partnerships, the EU has funded almost 200 collaborative projects; this is a real European success story. The EGVI projects contribute to the transition towards a more sustainable road transport system in Europe.
For example, high-power charging solutions have been developed for electric buses for cleaner and more sustainable cities; range of electric vehicles (EV) has been extended while reducing their cost; new architectures for EVs are now in place. These are only a few of the challenges tackled by these projects, which shall further increase reliability, affordability, user comfort and safety of zero emission vehicles.

This new project portfolio showcases the activities of the excellent projects funded by the EGVI partnership from 2018 to 2020, covering many areas such as user-centric charging infrastructure, virtual development and production, innovative materials and sustainable urban mobility – that shall bring additional results for European citizens.
Collaborative research and innovation must drive and accelerate the transformative European Green Deal agenda by developing, testing and demonstrating innovative solutions, and ensuring that policy is coherent and evidence-based. Equally, we need these innovations to reach the market and our citizens – ensuring a strong impact for the environment, the economy and the society.

We congratulate EGVI and the project consortia on the impressive achievements that are detailed in this publication. Looking ahead, we shall continue to drive these technological improvements and breakthrough results for the benefit of all European citizens. The launch of the co-programmed European Partnership "Towards zero emission road transport" (2Zero) under Horizon Europe will build on the EGVI successes and provide even more opportunities to imagine, plan and develop our future zero-emission mobility solutions.

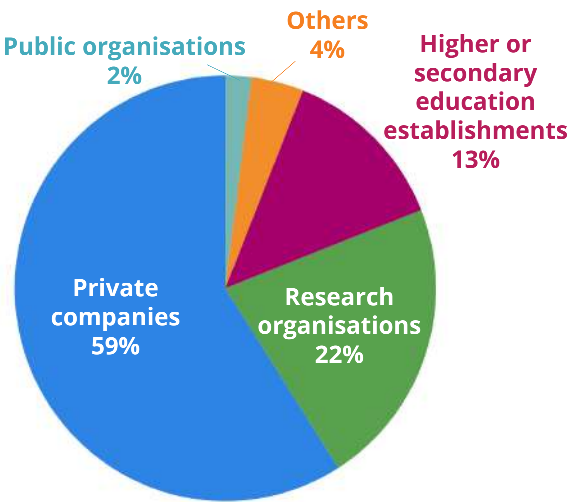
Rosalinde van der Vlies
Clean Planet Director
DG Research and Innovation
European Commission

Stephan Neugebauer
EGVIA Chairman

FACTS & FIGURES
FROM THE EUROPEAN GREEN VEHICLES INITIATIVE
2014 - 2020

85
projects funded

Who received funding?



1 440
participants

239 SMEs

33
topics published

M€ 628
Total EU Financial contribution

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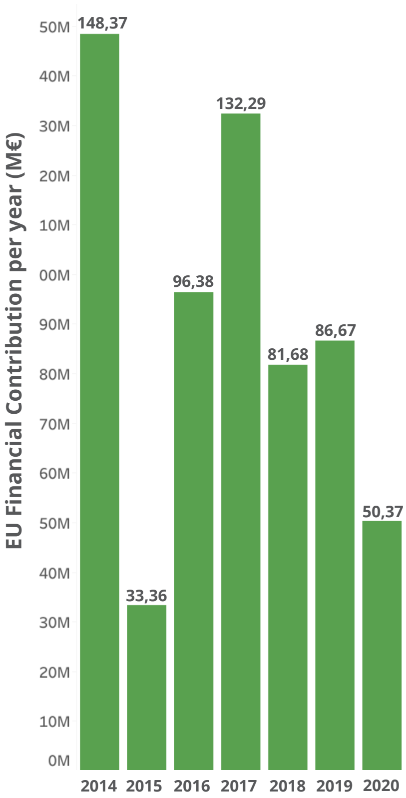
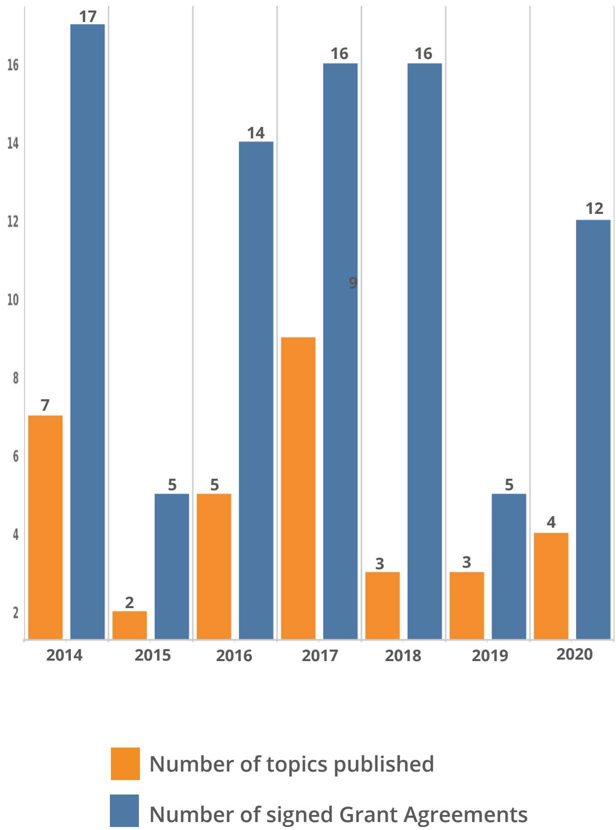
EU Financial Contribution per year in GV projects



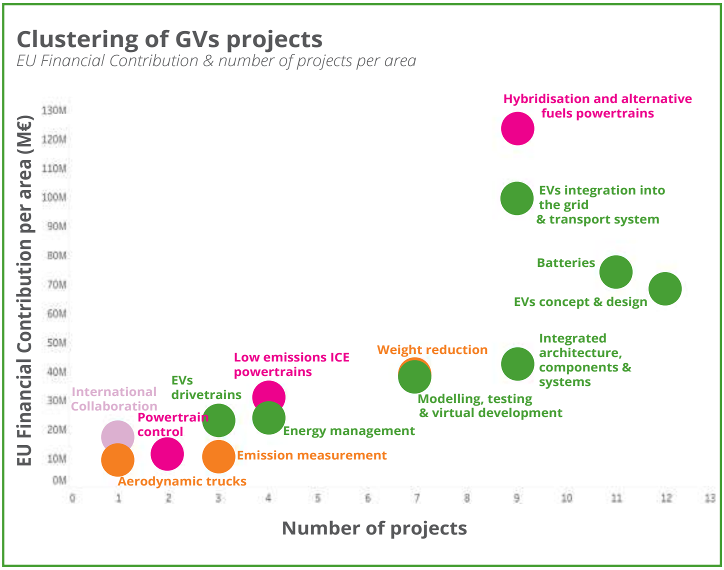
Number of published topics vs Number of signed Grant Agreements



Clustering of GVs projects

*EU Financial Contribution & number of projects per area**

** Plus one ERA NET and two CSA projects*



Transversal topics		Electrification and batteries		Alternative fuels, hybridisation and low emission powertrains		International collaboration	
11 projects	Total EU Financial Contribution M€ 60,34	55 projects	Total EU Financial Contribution M€ 373	15 projects	Total EU Financial Contribution M€ 166	1 project	Total EU Financial Contribution M€ 18

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EU Financial Contribution per country in Green Vehicles Projects

In H2020, legal entities from Associated Countries can participate under the same conditions as legal entities from the Member States

- Austria - M€ 50,40
- Belarus - M€ 0,38
- Belgium - M€ 38
- Croatia - M€ 0,58
- Czech Republic - M€ 3,51
- Cyprus - M€ 0,27
- Denmark - M€ 1,95
- Estonia - M€ 1,76
- Finland - M€ 9,37
- France - M€ 72,90
- Germany - M€ 145,33
- Greece - M€ 9,80
- Hungary - M€ 2,30
- Irland - M€ 0,12
- Israel - M€ 2,77
- Italy - M€ 89,80
- Luxembourg - M€ 2,45
- Netherlands - M€ 29,81
- Norway - M€ 0,54
- Poland - M€ 2,21
- Portugal - M€ 0,92
- Romania - M€ 1,24
- Slovakia - M€ 0,76
- Slovenia - M€ 6,55
- Spain - M€ 57,58
- Sweden - M€ 23,40
- Switzerland - M€ 3,81
- Turkey - M€ 8,30
- UK - M€ 30,86

Green Vehicles Projects

2018

GV-01-2018

Integrated, brand-independent architectures, components and systems for next generation electrified vehicles optimised for the infrastructure	SYS2WHEEL
	EVC1000
	TELL
	1000kmPLUS
	SELFIE
	CEVOLVER
	i-HeCoBatt
	ACHILES
	FITGEN

GV-02-2018

Virtual product development and production of all types of electrified vehicles and components	PANDA
	UPSCALE
	VISION-xEV
	XILforEV

LC-NMBP-30-2018

Materials for future highly performant electrified vehicle batteries	SPIDER
	Si-DRIVE
	LISA

2019

LC-GV-03-2019

User centric charging infrastructure	USER-CHI
	INCIT-EV
	eCharge4Drivers

LC-GV-04-2019

Low-emissions propulsion for long-distance trucks and coaches	LONGRUN

LC-GV-05-2019

InCo flagship on “Urban mobility and sustainable electrification in large urban areas in developing and emerging economies”	SOLUTIONSplus

Green Vehicles Project

2020

LC-GV-06-2020

Advanced light materials and their production processes for automotive applications	REVOLUTION
	ALMA
	Fatigue4Light
	LEVIS
	FLAMINGo

LC-GV-07-2020

Reducing the environmental impact of hybrid light duty vehicles	PHOENICE

LC-GV-08-2020

Next generation electrified vehicles for urban and suburban use	URBANIZED
	Multi-Moby
	DREEM
	LEONARDO
	REFLECTIVE

LC-GV-09-2020

Setting up a common European research and innovation strategy for the future of road transport	FUTURE-HORIZON

PROJECT NUMBER	824244		
PROJECT ACCRONYM	SYS2WHEEL		
PROJECT NAME	Integrated components, systems and architectures for efficient adaption and conversion of commercial vehicle platforms to 3rd generation battery electric vehicles for future CO2-free city logistics		
START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	6 531 672,5	**EU FINANCIAL CONTRIBUTION (M€)**	4 873 421,75
WEBSITE	https://sys2wheel.eu/		
COORDINATOR	Bernhard BRANDSTÄTTER bernhard.brandstaetter@v2c2.at		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The project SYS2WHEEL aims at developing sustainable city logistics and improving mobility, accessibility and quality of life of EU citizens. 12 international project partners are committed to achieve three main objectives:

1. Reducing cost in mass production by at least 20% through components becoming obsolete and through reduction of wiring costs.
2. Increasing powertrain efficiency by improved e-motor windings, advanced rare-earth magnets, reduced powertrain rotation parts, reduced losses, advanced control and weight reduction.
3. Increased affordability and user-friendliness by enhanced modularity and packaging. Space saving approaches in sys2wheel lead to more freedom for batteries, cargo and drivers.

To meet the ambitious targets of SYS2WHEEL, the project is divided into different types of activities, 2 horizontal and 2 vertical lines, each representing one work package.

RESULTS

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PROJECT NUMBER	824250		
PROJECT ACCRONYM	**EVC1000**		
PROJECT NAME	Electric Vehicle Components for 1000 km daily trips (EVC1000)		
START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	6 772 943,75	**EU FINANCIAL CONTRIBUTION (M€)**	5 149 428,51
WEBSITE	http://www.evc1000.eu		
COORDINATOR	Eric ARMENGAUD eric.armengaud@avl.com		

PROJECT PARTNERS

AVL Coordinator, Audi, DRIV, elaphe Propulsion Technologies, brembo, Technische Universität Ilmenau, Fraunhofer ENAS, i&m Ideas&Motion, JAC Italy Design Center JAC, University of Surrey

AIM OF THE PROJECT

The EVC1000 project brings together ten participants to provide innovative and mass-production optimised components enabling the efficient integration of powertrain and chassis systems, which will increase EV range and user acceptance. EVC1000 focuses on in-wheel drivetrain layouts, as well as a wheel-centric integrated propulsion system and EV manager.
More specifically, the above-mentioned points will be achieved through the design of:

- Energy-efficient, reliable, low-cost and scalable in-wheel electric motors;
- Centralized electric wheel drive family for electric axles with multiple motors and four-wheel-drive vehicles;
- Components and controllers for energy-efficient electrified chassis control (brake-by-wire, controllable suspension system, ECUs);
- Demonstration and assessment of the EVC1000 components and controllers on EV demonstrators during real-world operation.

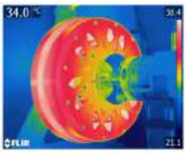
The new EVC1000 components will be showcased in two production-ready electric vehicle demonstrators of different market segments. This will include demonstration of long distance daily trips of up to 1000 km with no more than 90 minutes additional travel time due to charging, and without additional degradation of the components. The evaluation will also consider objective and subjective performance indicators for human factor analysis with a view to deliver enhanced customer experience.

RESULTS

The EVC1000 project has led to the development of brand-independent components and systems for integrated wheel-centric propulsion architecture:

- In-wheel motor delivering efficient and high torque direct drive, with minimal mass and volume footprint within the wheel integration space.
- Electric wheel dual inverter integrating Infineon's multi-core controllers of the TC277x family and the new WBG switches based on Silicon Carbide (SiC) technology.
- Electro-hydraulic suspension targeting to improve handling and energy consumption
- Brake-by-wire components, relying on redundant brake control units to process the requests and control the braking torque.

Preliminary results already foreseen an energy efficiency increase in the order of magnitude of 10%. During the last phase of the project, two vehicle demonstrators are being setup to confirm the preliminary results.


In-wheel motor


Electric wheel dual drive


Electro-hydraulic suspension


Brake-by-wire components

NOTES

PROJECT NUMBER	824254		
PROJECT ACCRONYM	**TELL**		
PROJECT NAME	Towards a fast-uptake of mEdium/Low-voltage eLectric power trains		
START DATE	01/12/2018	**END DATE**	30/11/2021
TOTAL BUDGET (M€)	5 674 771,25	**EU FINANCIAL CONTRIBUTION (M€)**	4 122 271,25
WEBSITE	https://horizon2020-tell.eu/		
COORDINATOR	Herbert PAIRITSCH Herbert.Pairitsch@infineon.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The TELL project addresses the optimisation and large-scale manufacturing of low and medium voltage electric powertrain solutions, with focus on high efficiency, compact packaging and low cost. Three main applications are targeted:

- Small-to-medium segment electric cars
- Hybrid electric cars with a low voltage add-on electric propulsion system
- The lightweight urban mobility sector, e.g., electric quadricycles

The TELL powertrains will be demonstrated on two electric vehicle platforms: i) a four-wheel-drive vehicle operated at a nominal voltage of 100 V; and ii) a two-wheel-drive vehicle operated at a nominal voltage of 48 V. Inverters will be based on the latest Si- and GaN MOSFET/HEMT semiconductor technologies.

RESULTS

Obtained results:

- TELL finalised a design routine to implement a novel approach in electric motors optimisation, promoting energy efficiency.
- TELL developed and is currently testing model-based control strategies to: i) efficiently distribute the tractive and regenerative braking torques between the front and rear axles of the vehicle; ii) guarantee traction capability both in straight line as well as in curves, and without affecting driving comfort.
- TELL has successfully performed the preliminary benchmarking tests on their four-wheel-drive vehicle prototype, establishing the necessary communication between the available sensors/actuators and the vehicle control system unit.
- With novel GaN HEMTs and Si MOSFETs based devices TELL demonstrated **inverters** specifically designed for urban driving cycles with peak **efficiencies up to 98,7%**.
- Novel high-efficiency synchronous reluctance motors assisted by permanent magnets

Expected results in the running tests:

- **Four- and two- wheel-drive architectures** *with improved acceleration and climbing performance, high energy recuperation, excellent fail-safe properties energy recuperation, excellent fail-safe properties*

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PROJECT NUMBER	824262		
PROJECT ACRONYM	**1000kmPLUS**		
PROJECT NAME	Scalable European Powertrain Technology Platform for Cost-Efficient Electric Vehicles to Connect Europe		
START DATE	01/01/2019	**END DATE**	30/06/2022
TOTAL BUDGET (M€)	6 892 382,5	**EU FINANCIAL CONTRIBUTION (M€)**	5 405 286,26
WEBSITE	https://1000kmplus.eu/		
COORDINATOR	Florian KALLEDER florian.kalleder@infineon.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The need for common, scalable and brand-independent technology platforms for the key elements of EV, like the inverter-motor-transmission/gearbox (powertrain) and the battery system, is evident. The project 1000kmPLUS will ensure the superiority of European automotive key technologies in terms of performance, scalability and costs for the 2nd and 3rd generation of EV. The EV powertrain and battery technologies must now start to mature, in order to fulfil existential human mobility needs in terms of affordability and usability: this is the key to enter the early mass market. It assumes ramp-up of series production and affordability by economies of scale.
1000kmPLUS will provide key arguments regarding the usability of the 2nd generation of EV to the Early Majority customers. Further, it will speed up the development and the ramp-up of series production of the 3rd EV generation.
To obtain breakthroughs in terms of energy efficiency, driving range, charging and costs, the 1000kmPLUS project develops a Scalable European Powertrain Technology Platform (SEPtop@SiC), which will define automotive powertrains for EV as commodities. It will use 1200 V SiC-MOSFETs to enable a 400 V/800 V cross-compatible inverter-motor-gearbox combo, scalable as a function of the required performance. Furthermore, ultra-fast charging up to 350 kW for everyday use will be demonstrated in an EV providing an initial driving range matching the requirements for modern electromobility. The 1000kmPLUS project will enable, demonstrate and set up European mass production capabilities of EV key components by Europe´s leading automotive companies. Further, it will build ECS value chains with focus on quality, safety, efficiency and costs. The 1000kmPLUS project will build up a Mercedes-Benz EQ vehicle to demonstrate the project achievements by performing 3 challenges, representing real use cases.

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RESULTS

New architectures, concepts and components to support the advent of the 3rd generation of electrified vehicles.

- A scalable and brand-independent shared automotive powertrain platform supporting a wide power range of 40 kW-120 kW at 400 V-800 V and including advanced motor control algorithms
- New modular power electronic modules for the inverter for cost reduction and scalability

Smart bus systems, electric motors, power electronics enabling smaller form factors, when integrated in batteries and motors and modular approaches, connectivity and systems for enabling automated driving functions.

- Common integration of inverter and motor to reach compactness and lower the costs during mass production
- Modular approach and scalability of the inverter and motor to reduce development /adaption and production costs of the most cost intensive parts in today’s EVs
- New modular power electronic modules for the inverter for cost reduction and scalability
- New routing and navigation algorithms to significantly enhance specifically the driving range of electric vehicles

Advances in electric batteries (elementary cells and pack assembly).

- Adaption of an existing electrochemistry to enable 350 kW ultra-fast charging
- Design of a modular 800 V battery pack able to be scaled down to 400 V and providing the thermomechanical structure (including thermal management for ultra-fast charging)

NOTES

PROJECT NUMBER	824290	
PROJECT ACCRONYM	SELFIE	
PROJECT NAME	SELF-sustained and Smart Battery Thermal Management SolutIon for Battery Electric Vehicles	

START DATE	01/12/2018	END DATE	31/05/2022
TOTAL BUDGET (M€)	5 842 546,25	EU FINANCIAL CONTRIBUTION (M€)	4 999 455,13
WEBSITE	https://eu-project-selfie.eu/		
COORDINATOR	Joeri VAN MIERLO Joeri.Van.Mierlo@vub.be		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The overall objective of SELFIE is to develop and demonstrate a novel self-sustained compact battery system, consisting of:

A smart modular battery pack, which has excellent internal thermal conductivity properties, a refrigerant cooling system and a PCM based thermal storage system (heat buffer) capable of absorbing excess heat due to fast charging, and which is thoroughly insulated from the outside

Specific objectives:

- Development of new/advanced components for battery packs that enable a step change in thermal management, energy efficiency and cost
- Integration, assembly and manufacturing and bench testing of the developed compact battery system
- Demonstration and validation of the battery system

RESULTS

The project is now in its 3rd year of research and despite challenges in light of Covid-19 pandemic, the Consortium made great efforts over the past months to keep the project on track.

Here are our main results:

The CAD design of the battery thermal management system has been concluded taking into account the weight and volume restrictions for the demonstrator vehicle. The manufacturing of the same is being processed. The topology of the refrigeration system was modified several times to eliminate the drawbacks in the initial design and find a promising solution. A Methodology for multi-concern assurance has been elaborated. The functional safety concept for the battery system elaborated in T5.1 is available. An experimental campaign was completed in order to have a complete characterisation of a baseline vehicle. A vehicle of the same segment, Nissan eNV200, was identified, instrumented and tested in a climatic chamber with rolling bench. The experimental setup of battery module at lab level was prepared and the testing is ongoing to evaluate the thermal performance.
With the concept design on components and system level coming to conclusion, SELFIE will move towards TRL7 demonstration in coming months, which includes battery pack assembly and thermal management system integration into demonstrator vehicle Fiat Doblo and testing of the same. The project would be able to demonstrate the fast charging at 4C continuous at 35 °C ambient without degrading the cells lifetime.

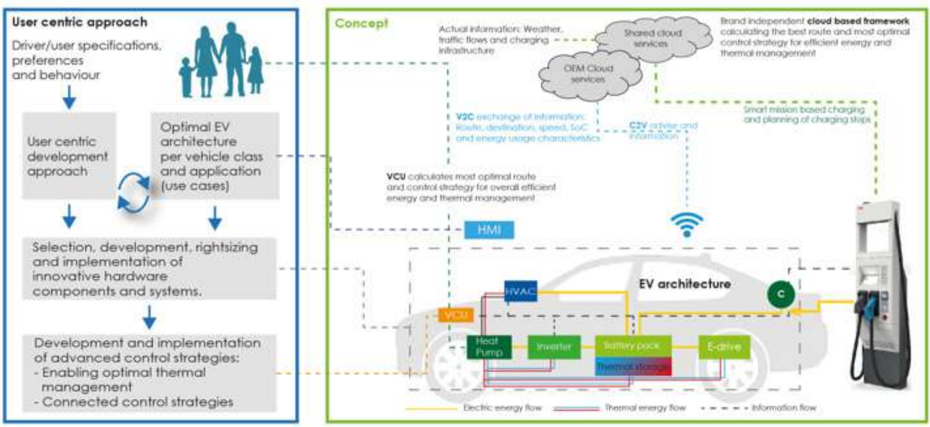
NOTES

PROJECT NUMBER	824295		
PROJECT ACCRONYM	**CEVOLVER**		
PROJECT NAME	Connected Electric Vehicle Optimized for Life, Value, Efficiency and Range		
START DATE	01/11/2018	**END DATE**	30/04/2022
TOTAL BUDGET (M€)	6 516 847,5	**EU FINANCIAL CONTRIBUTION (M€)**	4 999 700,26
WEBSITE	https://cevolver.eu/		
COORDINATOR	Christophe SCHERNUS schernus@fev.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT



RESULTS

The CEVOLVER project is a year in its life. Two main results are:

1. Within the CEVOLVER project an important role is played by advanced strategies that operate testing the prototype demonstrators using connectivity as a sources of real time information. The results of the discussions between the partners are available. In short we can say that the advanced features such as optimal thermal management, eco-routing with assured charging functionality, and eco-driving will rely on connectivity to improve, on one hand, the energy consumption (that will impact the vehicle range), and on the other hand, increase user confidence in electric vehicles. A Communication Control Unit (CCU) and a tablet will provide to the demonstration vehicle(s) the ability to connect to a cloud infrastructure or to Vehicle-to-X (V2X) systems. Another conclusion is that the cloud infrastructure is composed of the Original Equipment Manufacturer (OEM) cloud and a brand-independent (BI) cloud that is designed for the project. We can also state that the different connectivity architectures that can be employed by the demonstration vehicles are established.

2. The CEVOLVER scene for a connected energy and thermal management has been set! The connected management functionalities make use of several connectivity features to optimise the route selection, driving behavior, charging stops and charging process. This is made possible due to the cloud-based data and the cloud computing capabilities to perform resource intensive calculations that cannot be otherwise implemented on a Vehicle Control Unit (VCU). An extra benefit of working on this topic is that it has allowed discussing the connectivity limitations and the solutions to support the CEVOLVER features to be developed. The first list of required signals has been formulated and will evolve during the project.

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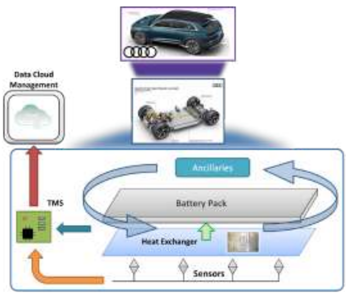
PROJECT NUMBER	824300		
PROJECT ACCRONYM	**i-HeCoBatt**		
PROJECT NAME	Intelligent Heating and Cooling solution for enhanced range EV Battery packs		
START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	4 192 705,42	**EU FINANCIAL CONTRIBUTION (M€)**	3 287 012,43
WEBSITE	https://ihecobatt.eu/		
COORDINATOR	Aitor MAKIBAR amakibar@cidetec.es		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The aim of i-HeCoBatt is to achieve a smart, cost bursting, industrial battery heat exchanger to minimize the impact on full electric vehicle range in extreme conditions. Smart, because new sensing functionalities will be embedded to the thermal system in order to monitor the behaviour of the whole BP thermal system. Cost bursting, because expensive components of current SoA products will be replaced by cost efficient components as well as the number of parts minimized. Industrial, because mass production means will be used to manufacture the heat exchanger.



The proposed solution will remove the currently used expensive and heavy gap filler between the heat exchanger and the battery pack (BP) and will replace the interface plate in contact with the BP with an advanced material product. This design enhances the efficiency of the heating and cooling system that will be supported by a heating actuator. Customized printed sensors will be embedded to the heat exchanger to monitor relevant parameters and will feed the battery management control unit as well as an external early diagnostic and safety system connected to the cloud. Different interfaces will be created to access these data according to user profiles: designers, testers, maintenance teams or driver. Finally, the industrialization of the patented innovative heat exchanger concept will contribute to the cost reduction of the heating and cooling system and the EV.

The consortium gathers know-how from a multidisciplinary group of research centres, SME and industrial partners, including an automotive OEM, with expertise in BP and thermal systems design, testing and manufacturing for automotive applications. Partners behind the intelligent heat exchanger concept are European TIERs that intend to position with an unbeatable environmental compliant product that will be introduced in OEMs value chain in a maximum period of 2 years after the closure of the project.

RESULTS

At the time of publication, the following results have been obtained:

- Experimental tests of the battery pack have been carried out to set a reference and to develop models.
- First version of the heat exchanger prototype is modeled, designed and built.
- Fist version of the diagnostic application is developed.

At the end of the project, the following overall results are expected:

- To increase the e-powertrain overall efficiency up to 5%, compared to a state of the art EV, through the implementation of a novel BP heating and cooling system.
- To prove a minimum of 20% cost reduction in mass production of the thermal system by the introduction of an innovative heat exchanger.
- To integrate new components and functionalities leading to higher user friendliness, reduction of range anxiety and temperature impact on degradation of the BP.
- To achieve automotive class quality.
- To demonstrate the developed solutions in several Audi BEV prototypes.

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PROJECT NUMBER	824311		
PROJECT ACCRONYM	**ACHILES**		
PROJECT NAME	Advanced Architectures Chassis/Traction concept for Future Electric vehicles		
START DATE	01/12/2018	**END DATE**	31/05/2022
TOTAL BUDGET (M€)	6 093 473,75	**EU FINANCIAL CONTRIBUTION (M€)**	4 895 704,26
WEBSITE	https://h2020-achiles.eu Twitter: @ACHILES_H2020 and @EVOLVECluster		
COORDINATOR	Omar HEGAZY (VUB) Omar.Hegazy@vub.be		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

ACHILES will develop enhanced parts and functionalities in a new E/E system architecture by developing and further integrating four innovative technological concepts:

1. A new torque vectoring algorithm will significantly improve vehicle dynamics.
2. A new wheel concept design will be equipped with full by-wire braking, including a new friction brake concept.
3. An out of phase control will allow to intentionally operate the electric motor inefficiently to dissipate the excess of braking energy in case of fully charged batteries.
4. A centralized computer platform will host the e-drive functionalities and reduce the number of ECUs and networks while fulfilling the safety & security requirements. It will also support centralized domain controller required to implement high automation and autonomy concepts, a key requirement for smart mobility.

ACHILES is a member of the E-VOLVE cluster.

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RESULTS

The full requirements and specifications for the ACHILES Battery Electric Vehicle (BEV) have been defined; focus was given to the powertrain and chassis with support of the brake system by the powertrain. Requirements are based on the Audi Q2 BEV, which will be used as a baseline and improved with targeted innovations in the project. The test procedures and test list have been defined to verify the requirements.

The overall architecture and the Centralized Computer Platform (CCP) interface have been optimized, including hardware design choices and improved software integration. Subsystems were finalized to allow higher reliability, safety, security and energy efficiency with proper signal interfaces. Modelling and control of the powertrain and battery system components, including aging tests for SoC and SoH software implementation were done. The innovative torque vectoring algorithm was also already developed as well as the safety concept for the vehicle. The virtual integration was completed for the vehicle for Model-in-the-Loop (MiL) and Hardware-in-the-Loop (HiL).

Finally, the design and prototyping of the new wheel concept and brake system, including out-of-phase control, together with the powertrain components (e-motors and power electronics) have been completed. The physical integration of the components into the vehicle is partially completed and the ACHILES vehicle is operational and is being tested at the component level. Preliminary testing on the baseline vehicle has been performed and will be used for the final assessment.

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PROJECT NUMBER	824335		
PROJECT ACCRONYM	**FITGEN**		
PROJECT NAME	Functionally Integrated E-axle Ready for Mass Market Third GENeration Electric Vehicles		
START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	5 841 242,5	**EU FINANCIAL CONTRIBUTION (M€)**	4 998 667
WEBSITE	http://www.fitgen-project.eu		
COORDINATOR	Michele DE GENNARO michele.degennaro@ait.ac.at		

PROJECT PARTNERS

AIT AUSTRIAN INSTITUTE OF TECHNOLOGY

Coordinator

BRUSA

GKN

tecnalia Inspiring Business

POLITECNICO DI TORINO

FCA FIAT CHRYSLER AUTOMOBILES

CRF

ST

VUB VRIJE UNIVERSITEIT BRUSSEL

AIM OF THE PROJECT

FITGEN aims at developing a functionally integrated e-axle ready for implementation in third generation electric vehicles. It is delivered at TRL and MRL 7 in all its components and demonstrated on an electric vehicle platform designed for the European market (A-segment reference platform). The e-axle is composed of a latest generation Buried-Permanent-Magnet Synchronous Machine, driven by a SiC-inverter and coupled with a high-speed transmission. It is complemented by a DC/DC-converter for high voltage operation of the motor in traction and for enabling superfast charging of the 40kWh battery plus an integrated AC/DC on-board charger. The e-axle also includes a breakthrough cooling system which combines the water motor/ inverter circuit with transmission oil. The FITGEN e-axle delivers significant advances over the 2018 State of the Art:

1. 40% increase of the power density of the e-motor;
2. 50% increase of the power density of the inverter, via adoption of SiC-components;
3. affordable super-fast charge capability enabled by the DC/DC-converter, integrated with single- or 3-phase AC/DC-charger;
4. increase of the electric driving range from 740 to 1,050km (including 75 minutes of charging time) in real-world freeway driving with the use of auxiliaries.

The FITGEN e-axle will enter the market in the year 2023, reaching a production volume target of 200,000 units/year by 2025 and of 700,000 units/year by 2030. It is designed to be brand-independent and to fit different segments and configurations of electric vehicles, including hybrids.

RESULTS

At present (October 2021, project month #34), the e-axle components (i.e. e-motor, inverter, DC/DC converter and transmission) are designed, prototyped and assembled, and are undergoing a testing campaign to characterize the performance KPIs before proceeding with e-axle integration on the demonstrator vehicle (i.e. FIAT 500-electric). Earliest results indicate that the motor is capable of 5.2 kW/kg at 23,000 rpm of maximum rotational speed (27,600 rpm of sustained overspeed), while the inverter is capable of 26 kW/litre, exceeding the initial targets of the project. A picture of the e-axle in reported in Figure 1.

Figure 1. FITGEN e-axle (April 2021).

NOTES

Horizon 2020
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PROJECT NUMBER	824256		
PROJECT ACCRONYM	**PANDA**		
PROJECT NAME	Powerfull Advanced N-Level Digitalization Architecture for models of electrified vehicles and their components		
START DATE	01/12/2018	**END DATE**	31/05/2022
TOTAL BUDGET (M€)	3 488 671,25	**EU FINANCIAL CONTRIBUTION (M€)**	3 488 671,25
WEBSITE	https://project-panda.eu/		
COORDINATOR	Alain BOUSCAYROL alain.bouscayrol@univ-lille.fr		

Powerful Advanced N-Level Digital Architecture for models of electrified vehicles and their components

PROJECT PARTNERS

Université de Lille
Coordinator

SIEMENS Ingenuity for life

VUB VRIJE UNIVERSITEIT BRUSSEL

Valeo

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

Typhoon HIL

UBFC UNIVERSITE BOURGOGNE FRANCHE-COMTE

UNIRESEARCH

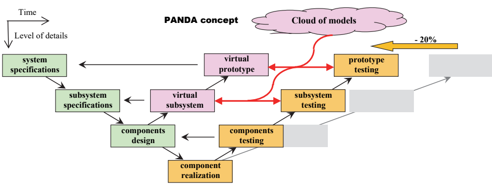
GROUPE RENAULT

BLUWAYS

TÜV SÜD

AIM OF THE PROJECT

The PANDA project aims to develop a unified organisation of digital models for seamless integration in virtual and real testing of electrified vehicles and their components. It will make development and test of new components and subsystems easier and will enable a reduction of time-to-market by 20%.
The V-model, currently used in industry to develop more efficient products, is rearranged in a W-model to highlight the trend in "virtual homologation".



A cloud of models and a dedicated innovative library will be developed. In addition, stand-alone and cloud computing will be realized first for virtual testing of 3 reference vehicles (a Battery Electric, a Fuel Cell and a Hybrid Vehicle), and second for real testing using "Hardware-In-the-Loop" (HiL) for electrical subsystem of the hybrid electric vehicle.
The main challenges are:

- Interconnection of any model involved in the W-model for seamless integration in the complete simulation of the studied electrified vehicles.
- Development of real-time models of the subsystems for real testing of the different parts of the system.
- Cloud-computing for virtual and real testing toward Industry 4.0

A disruptive simulation method will be developed thanks to the Energetic Macroscopic Representation (EMR) formalism.

RESULTS

After 35 months of work, the partners are close to finishing the experiments, and to showing that the computation time for simulating electric vehicles can be reduced by 15%.
In the first 18 months, Siemens has incorporated new libraries in Simcenter Amesim, their simulation platform for electrical systems. In addition to their previously existing physical (or structural) libraries, Siemens added new libraries based on the Energetic Macroscopic Representation (EMR) graphical formalism.
In the meantime, the project partners have developed models for these EMR libraries, based on experimental data from a prototype battery and from several e-motors. Using these models, they have simulated a battery electric vehicle (BEV), a fuel cell vehicle (FCV) and a plug-in hybrid (PHEV). Comparisons between experimental tests on the real vehicles and simulation leads to deviation of only 3% in terrms of energy consumption.
Work currently focuses on cloud-based HiL testing, and on calculating the improvement in simulation effort. Preliminary results show that the EMR-based simulation reduces the computation times by 15%.

Expected results:

- Real testing of the e-subsystems of the P-HEV (June 2021)
- Cloud-based HiL tests (January 2022)
- Estimation to the time-to-market reduction

NOTES

PROJECT NUMBER	824306		
PROJECT ACCRONYM	**UPSCALE**		
PROJECT NAME	Upscaling Product development Simulation Capabilities exploiting Artificial inteLligence for Electrified vehicles		
START DATE	01/11/2018	**END DATE**	30/04/2022
TOTAL BUDGET (M€)	3 994 802,5	**EU FINANCIAL CONTRIBUTION (M€)**	3 994 802,5
WEBSITE	https://www.upscaleproject.eu/		
COORDINATOR	Monica PLA monica.pla@idiada.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

- Enhance the performance of existing CFD and FEM crash test tools and processes using machine learning, thus leveraging the potential of ML/MOR to make primary CAE systems faster and more flexible directly impacting the costs and performance of electric vehicles as they heavily rely on simulation for design.
- Implement AI for aerodynamic design, first the consortium will work on body parametrization and then will create and train an aerodynamics Reduced Order Models capable of computing aerodynamic values.
- Implement AI for crash simulation, which will reduce the simulation run time for a full electric vehicle crash by 30%, including battery packs. The consortium will focus on crash battery modelling by means of ROM.
- CAE process acceleration by means of subrogation of time-consuming solver functions by AI trained algorithms.
- Assessment of a new crash and aerothermal frameworks for full-scale BEV design

EXPECTED RESULTS

Main expected results:

- Battery Reduced Order Model (ROM) for crash simulation. The battery ROM for crash enables to reduce the computation time of the battery strains and stresses by 6 orders of magnitude and allows computing the probability of shortcut within cells.
- Battery 1D model for thermal simulation. The battery thermal 1D model is complementary to the aerodynamics ROM and allows to assess the cooling needs of EVs.
- Aerodynamics Reduced Order Model (ROM). The aerodynamics ROM computes the aerodynamic forces and the flowfield around vehicles in almost real time with an accuracy error below 2%.
- ML accelerated CFD solver for aerothermal simulations. Several improvements have been introduced in the CFD workflow to accelerate CFD simulations by 5 times.
- Physics informed turbulence model. The PIML algorithm allows computing corrected Reynolds stresses that approximates Direct Numerical Simulation CFD flowfields by means of machine learning predictions.

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PROJECT NUMBER	824314
PROJECT ACCRONYM	**VISION-xEV**
PROJECT NAME	Virtual Component and System Integration for Efficient Electrified Vehicle Development

START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	3 995 061,25	**EU FINANCIAL CONTRIBUTION (M€)**	3 995 061,25
WEBSITE	https://vision-xev.eu/		
CONTACT	Reinhard TATSCHL reinhard.tatschl@avl.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

VISION-xEV investigates beyond the state-of-the-art component development and system integration modelling and simulation to facilitate the use of digital product development for all kinds of future electrified powertrain systems and to reduce lab and road testing.

In complex multi-domain products, such as hybrid electric vehicles, developing the different components and sub-systems separately and then connecting them afterwards is not the optimum way to go forward. This is mainly due to the fact, that an extra overall calibration process is needed to harmonize the whole multi-domain system. Additionally, because of the involvement of engineers from different disciplines, issues related to communication and model/data exchange efficiency cannot be avoided. However, powerful computer hardware and related high-performance computing capabilities available today allow to efficiently perform complex computations as well as large series calculations covering thousands of parameter variations. This enables the efficient development and pre-optimization of physics-based virtual prototypes (digital twins) of hybrid electric vehicles on both component and system level. Adopting detailed digital twins of components and sub-systems and integrating them into complex powertrain and vehicle models enables massive frontloading of development activities and hence significantly reduces development time, cost and finally time to market. In this way, a huge percentage of traditional development efforts can be shifted from road, test rigs and laboratories to simulation and virtual testing.

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RESULTS

In **VISION-xEV** a versatile simulation framework for next generation electrified/hybrid vehicle virtual product development and optimization was elaborated targeting at:

- simulation accuracy gains of >30%,
- model parameterization effort lowering of >35%,
- model coupling effort reduction of >40%,
- multi-domain xEV model set-up and simulation effort cutting of >40%,

serving as an enabler for massive frontloading of activities to earlier phases in the product development process, leading to an overall xEV development efficiency gain of >25%.

The **VISION-xEV** project results comprise:

- Methods for the analysis of RDE measurements, for the evaluation of the impact of different parameters on the whole PHEV performances, and subsystems operation.
- Experimentally validated, scalable models of electrical energy storage/conversion systems, of advanced ICE, TC and EAS components and related parameterization.
- Simulation framework combining component and sub-system models based on different simulation platforms and originating from different academic and industry partners for:
    - supporting control and energy management development,
    - enabling robust matching of ICE and EAS with electrified powertrain systems,
    - facilitating holistic xEV vehicle thermal system layout, and
    - empowering xEV components and powertrain system architecture layout.
- Demonstration of the applicability of the component and system integration framework to realistic electrified/hybrid vehicle development and optimization use-cases and quantification of the potential development efficiency gain.
- Fast gas-path simulation solver and co-simulation methodology for flexible coupling of engine and aftertreatment component models (electrically heated catalysts and phase change material)
- Thermal management models and architecture for hybrid powertrains and vehicles

NOTES

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PROJECT NUMBER	824333
PROJECT ACCRONYM	**XILforEV**
PROJECT NAME	Connected and Shared X-in-the-loop Environment for Electric Vehicles Development

START DATE	01/01/2019	**END DATE**	31/12/2021
TOTAL BUDGET (M€)	3 575 078,75	**EU FINANCIAL CONTRIBUTION (M€)**	3 575 078,75
WEBSITE	https://xil.cloud		
COORDINATOR	Valentin IVANOV valentin.ivanov@tu-ilmenau.de		

PROJECT PARTNERS

Technische Universität Ilmenau — Coordinator

elaphe Propulsion Technologies

Audi — Vorsprung durch Technik

SIEMENS

TENNECO

ITAINNOVA

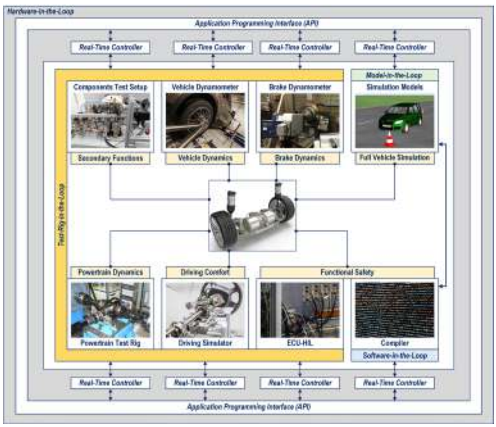
EFS

TU Delft

AIM OF THE PROJECT

The **XILforEV project** is proposing a unique approach to the validation and testing of electric vehicles (eEV) and electric vehicle systems with the goal to essentially improve their sustainable production.

To address this problem integrated development and efficient testing of EV, the project is creating for the first time a connected and shared x-in-the-loop experimental environment uniting test platforms and setups from different physical domains and situated in different geographical locations. within XILforEV environment, real-time running of test scenarios simultaneously in all locations allows exploring interdependencies between processes that can be hardly identified or even expected on the design development stage. In the long-term perspective, the plug-in concept of including various test platforms/devices and easy on-demand access to the test programmes for developers, engineers and researchers will bring a vast impact to the EV design community through connecting experimental environments around the world.



RESULTS

The XILforEV project is being established two principal frameworks of connected experimental setups: (i) Distributed local, when the setups are distributed within the narrow location, e.g. within the company site, university campus et al.; (ii) Distributed remote, when the setups are distributed remotely between different geographical locations. The application of both frameworks is being demonstrated in the project for several use cases, highly demanded by designing electric vehicles: development of brake blending and ride blending systems, integrated chassis control as well as fail-safe studies. With the proposed design methodology, the following benefits can be achieved (based on estimation of industrial participants of the consortium):

- The Digital Twin design approach in combination with the shared XILforEV strategy that reduces the development time between 15% and 25% for EV systems. Furthermore, the shared simulation and testing environment will improve the quality through more robust verification, validation and certification of safety-critical EV components;
- A radically new x-in-the-loop solution to end-users as automotive OEMs and suppliers, which will allow substantial accelerating of the development and testing ahead of the EV systems integration and faster modularity assessment, including reduction of R&D material and time costs by developing new electric motors and EV chassis systems;
- A novel service for connected complex test setups and hardware/virtual labs that can be used for specific engineering tasks, which are to be hardly investigated using traditional experimental procedures and real-world tests on full-scale demonstrators;
- An extension of available simulation cloud business models towards real-time domains for designing and validation of cross-domain physical systems.

NOTES

PROJECT NUMBER	814389
PROJECT ACCRONYM	SPIDER
PROJECT NAME	Safe and Prelithiated hIgh energy DEnsity batteries based on sulphur Rocksalt and silicon chemistries

START DATE	01/01/2019	**END DATE**	31/08/2022
TOTAL BUDGET (M€)	7 975 192,5	**EU FINANCIAL CONTRIBUTION (M€)**	7 975 192,5
WEBSITE	https://www.project-spider.eu/		
COORDINATOR	Cedric HAON cedric.haon@cea.fr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The SPIDER project proposes a multidisciplinary approach to develop safe and long lifetime, high energy density Li-ion cells. This approach is based on new high capacity materials (sulphur rocksalt cathodes and silicon carbon composites anodes), advanced electrolyte formulations, implementation of selected prelithiation process at cell level compatible with industrial requirements and complimented by in-depth characterization, safety, modelling and Life-cycle-analysis studies. SPIDER's advanced, low-cost (75 €/kWh by 2030) battery technology is predicted to bring energy density to ~ 450 Wh/kg by 2030 and power density to 800 W/kg. It operates at a lower, and thus safer, voltage, which enables the use of novel, intrinsically safe liquid electrolytes. Safety concerns will be further eliminated (or strongly reduced), and thermal runaway temperature increased to over 200°C. Moreover, thanks to the prelithiation, SPIDER overcomes one of the main Li-ion ageing mechanisms for silicon based anodes: notably, the loss of cyclable lithium, which should increase lifetime to 2000 cycles by 2022. In addition, SPIDER's classic cell manufacturing process with liquid electrolyte will be readily transferable to industry, unlike solid electrolyte designs, which still require the development of complex manufacturing processes. SPIDER batteries will be designed to be 60% recyclable by weight, and a dedicated recycling process will be developed and evaluated. Finally, the SPIDER project will contribute to help electric vehicles to rapidly gain market share and reduce CO2 emissions.

EXPECTED RESULTS

SPIDER technologies are implemented on 4 consecutive advanced Li-ion cell generations in which the presented concepts will be successively introduced to get better understanding of Li-ion battery cost, performance, recyclability and safety. Generation 0 cells will be delivered during the second quarter of 2020 and will provide a performance baseline for NMC811 / silicon – carbon composite materials combined with a reference electrolyte formulation. During the first year, a benchmark of the state-of-the-art materials has been done in small Li-ion pouch cells by comparing NMC622 vs NMC811 and graphite vs silicon – carbon composite. Regarding the energy density, by replacing NMC622 with NMC811 an increase in specific energy density of >10% can be achieved (with graphite) and the capacity retention is similar with 95% after 300 cycles. In addition, by replacing graphite with silicon composite an initial increase in specific energy density of ~14% can be achieved. In the future, the project aims at achieving the performances below:

Key Performance Indicator at cell level	baseline (NMC622/Graphite)	SPIDER technology 2022
Energy density (Wh/kg)	240	390
Power density (W/kg)	700	800
Durability (number of cycles)	500 - 1000	Up to 2000
Cost (€/KWh)	180	90
Safety (Thermal energy dissipation (kW/kg)	20	4
Recyclability (recycling efficiency in %)	55	60
Sustainability (dependence on Critical Raw Materials)	Cobalt, Nickel	Absence of Cobalt and Nickel

NOTES

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PROJECT NUMBER	814464		
PROJECT ACCRONYM	**Si-DRIVE**		
PROJECT NAME	Silicon Alloying Anodes for High Energy Density Batteries comprising Lithium Rich Cathodes and Safe Ionic Liquid based Electrolytes for Enhanced High VoltagE Performance.		
START DATE	01/01/2019	**END DATE**	31/01/2023
TOTAL BUDGET (M€)	7 999 492,5	**EU FINANCIAL CONTRIBUTION (M€)**	7 999 492,5
WEBSITE	http://sidrive2020.eu/		
COORDINATOR	Kevin RYAN kevin.m.ryan@ul.ie - sidrive@ul.ie		

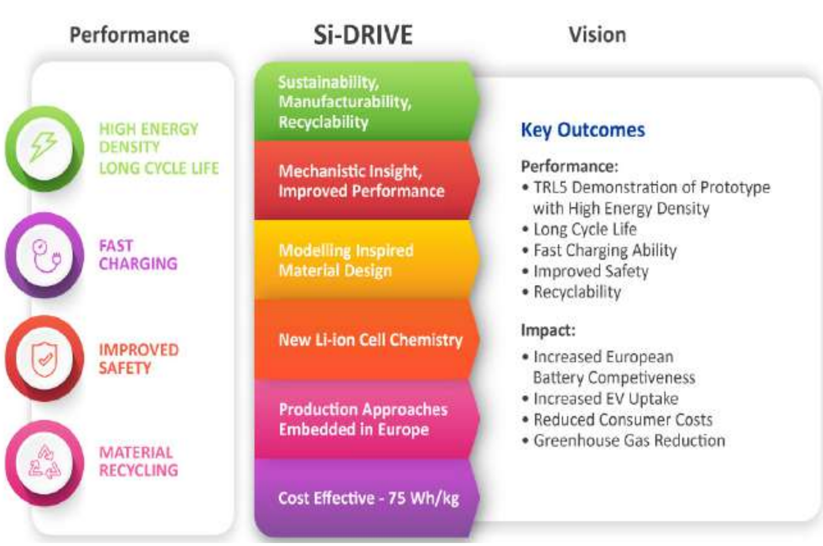
PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Si-DRIVE will develop the next generation of rechargeable Li-ion batteries, allowing for cost competitive mass market EVs by transformative materials and cell chemistry innovations, delivering enhanced safety with superior energy density, cycle life and fast charging capability using sustainable and recyclable components. The technology encompasses amorphous Si coated onto a conductive copper silicide network as the anode with polymer/ionic liquid electrolytes and Li-rich high voltage (Co-free) cathodes via processes that are scalable and demonstrably manufacturable within Europe. Comprehensive theoretical and experimental studies will probe and control interfacial processes that have heretofore limited Li-ion technologies to incremental gains, guiding materials design and eliminating capacity fade mechanisms. The Si-DRIVE technology will exceed the stringent demands of EV batteries where safety is paramount, by dramatically improving each component within the accepted Li-ion platform and achieving this in a market competitive process with whole of life considerations. The technology will also demonstrate suitability for 2nd life applications at reduced energy density beyond the primary EV lifetime, prior to cost effective materials recycling, consistent with a circular economy. The Si-DRIVE consortium boasts the required academic and industrial partner expertise to deliver this technology and spans material design and synthesis, electrochemical testing, prototype formation and production method validation, life cycle assessment and recycling process development.

EXPECTED RESULTS



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PROJECT NUMBER	814471		
PROJECT ACCRONYM	LISA		
PROJECT NAME	Lithium sulphur for SAfe road electrification		
START DATE	01/01/2019	**END DATE**	31/07/2022
TOTAL BUDGET (M€)	7 920 587,5	**EU FINANCIAL CONTRIBUTION (M€)**	7 920 587,5
WEBSITE	https://www.lisaproject.eu/		
COORDINATOR	Luis MIGUEL DOS SANTOS lmartins@leitat.org		

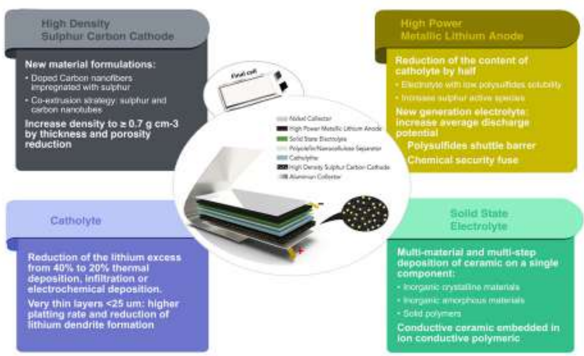
PROJECT PARTNERS

LEITAT Coordinator, ACCUREC Recycling GmbH, ARKEMA, CIC energiGUNE, Cranfield University, Fraunhofer IWS, OXIS Energy, Groupe Renault, VARTA, optimat, Pulsedeon, VDL, Technische Universität Dresden

AIM OF THE PROJECT

LISA is focused on optimising li-s components and cells through new and significantly improved materials and innovative processes. This project directly builds on the results of the ALISE project, in which more than hundred pouch cells have been produced, and the first 2 kWh PHEV lis battery module has been delivered. Nevertheless, there were key bottlenecks encountered during the project such as the safety, the volumetric energy density, the power rate and the cycle life.

LISA proposes the development of high energy and safe lis battery solving the problems of the cells developed in ALISE. The sustainability of the technology will be assessed from an environmental and economic perspective



EXPECTED RESULTS

The cell aims to be validated at 20Ah according to EUCAR industrial standards.

LISA will solve specific lithium sulphur bottlenecks such as the metallic lithium protection, the power rate, and the volumetric energy density.

A target has also been set for production cost, as it is the main selection criteria for EV batteries.
The outcome of the project in terms of new materials, components, cells, and manufacturability will be transferable to other lithium-anode based technologies such as Li-ion and solid-state lithium technologies.

LISA will have a large impact on existing and next-generation EV batteries, delivering technology with higher energy density beyond the theoretical capacities of chemistries using CRM – i.e. natural graphite and cobalt - or silicon-based chemistries inherently limited by their manufacturability.

The sustainability of the technology will be assessed from an environmental and economic perspective. Recycling safety, recycling cost and commercial product optimization should be all considered in order to implement a sustainability, and cost-efficient recycling process.

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PROJECT NUMBER	875187		
PROJECT ACCRONYM	**USER-CHI**		
PROJECT NAME	Innovative solutions for USER centric CHar-ging Infrastructure		
START DATE	01/02/2020	**END DATE**	31/01/2024
TOTAL BUDGET (M€)	17 486 866,25	**EU FINANCIAL CONTRIBUTION (M€)**	14 263 188,38
WEBSITE	https://www.userchi.eu/		
COORDINATOR	Antonio MARQUÉS amarques.etraid@grupoetra.com		

USER-CHI
CHARGING YOUR E-MOBILITY FUTURE

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

USER-CHI aims at unlocking the massive potential of electromobility in Europe. This will be achieved by (1) integrating different innovative charging technologies with a holistic perspective, (2) putting the users at the centre and empowering them, (3) exploiting the synergies between electromobility and green and smart grids, (4) integrating the technological tools, business models and regulatory measures to improve the experience of electric vehicle (EV) drivers while making it financially attractive for the relevant private and public actors to deploy large scale European user-centric charging infrastructure.

USER-CHI is an industry powered, city driven and user-centric project which will build and demonstrate its results in five urban areas all along the European territory: Barcelona (Spain), Rome (Italy), Berlin (Germany), Budapest (Hungary), and Turku (Finland). Since large scale replication and transferability of USER-CHI results is one of the cornerstones of the project, two replication cities have been included: Murcia (Spain) and Florence (Italy). These seven urban areas are urban nodes of the key Mediterranean and Scandinavian-Mediterranean TEN-T corridors, while their different sizes, complementary contexts and e-mobility maturity level offer a representative sample of e-mobility in Europe, facilitating the scalability and replicability of the demonstrated solutions.

The seven USER-CHI demo and replication sites will involve more than 27,000 EVs and 1,800 Electric Vehicle Supply Equipment (EVSEs).

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EXPECTED RESULTS

USER-CHI will develop integrated approaches, smart solutions and innovative technologies - referred to as ‘specific cases’ - that will be demonstrated in the five demonstration cities as of July 2022. Moreover, USER-CHI will develop eight products that will be designed and developed to support technical performance within the project, and the sustainability and market transferability after the project completion. Those are:

- CLICK – Charging Location and Holistic Planning Kit (July 2022);
- ‘Station of the Future’ Handbook;
- eMoBest – e-Mobility Replication and Best Practices Cluster (continuous);
- INFRA – Interoperability Framework (April 2021);
- INCAR – Interoperability, Charging and Parking Platform (January 2022);
- SMAC – Smart Charging Tool (March 2022);
- INSOC – Integrated Solar-DC Charging for Light Electric Vehicles (April 2022);
- INDUCAR – Inductive Charging for EVs (April 2022) .

USER-CHI expects to directly increase the number of EVs by 8,000, the number of EVSE by 400, users’ satisfaction levels by 70%, citizens’ acceptance level by 50% and reduce GHG emissions by 450,000 tons per year in the demonstration cities. In addition, indirect impacts of USER-CHI are estimated in 224,000 new EVs, 11,200 new EVSEs and a reduction of 12,600,000 tons CO2/year.

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PROJECT NUMBER	875683		
PROJECT ACCRONYM	INCIT-EV		
PROJECT NAME	Large demonstratIoN of user CentrIc urban and long-range charging solutions to boosT an engaging deployment of Electric Vehicles in Europe		
START DATE	01/01/2020	**END DATE**	31/12/2023
TOTAL BUDGET (M€)	18 630 765,24	**EU FINANCIAL CONTRIBUTION (M€)**	14 999 390,52
WEBSITE	https://www.incit-ev.eu/		
COORDINATOR	Xavier SERRIER xavier.serrier@renault.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

INCIT-EV aims to demonstrate an innovative set of charging infrastructures, technologies and its associated business models, ready to improve the EV users experience beyond early adopters, thus, fostering the EV market share in the EU. The project will seek the emergence of EV users' unconscious preferences relying on latest neuroscience techniques to adapt the technological developments to the users' subjective expectations. 5 demo environments at urban, peri-urban and extra-urban conditions will be ready for the deployment of 7 use cases, addressing:

1. Smart and bi-directional charging optimized at different aggregation levels
2. Dynamic wireless charging lane in an urban area
3. Dynamic wireless charging for long distance (e-road prototype for TEN-T corridors)
4. Charging Hub in a carpark facility
5. Superfast charging systems for EU corridors
6. Low power DC bidirectional charging infrastructure for EVs, including two-wheelers
7. Opportunity wireless charging for taxi queue lanes in airports & central stations

These use cases pursue innovations in the current charging solutions as well as their seamless integration into the existing transport, grid, ICT and civil infrastructures. For this purpose, the INCIT-EV Platform will be developed comprising a DSS and a set of APPs addressing the users and e-mobility stakeholders' needs.

EXPECTED RESULTS

INCIT-EV approach will target all type of EV end-users, deploying technological solutions to cover most of the needs of end users, including commuters [UC4, UC6], fleet operators such as Taxis/TNCs [UC2,UC7] long-range drivers [UC3, UC5], car sharing and mobility services users [UC1, UC4, UC6] and private parking users [UC1]. INCIT-EV will directly engage 3,475 private EV drivers along these use cases for the dissemination and testing of the charging solutions and the enhanced driving experience deployed in the project, as well as 10 local communities, 4 Taxis cooperatives/associations, 4 car sharing and 4 LEVs sharing companies with the goal to improve their perception about electromobility. To this end, INCIT-EV solutions will be designed to cover 80% of the user needs and requirements as gathered in the surveys. Furthermore, the areas involved in INCIT-EV gather an overall population over 20 M people, and over 10.3M registered private vehicles (of which 104,269 are EVs).

NOTES

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PROJECT NUMBER	875131
PROJECT ACCRONYM	eCharge4Drivers
PROJECT NAME	Electric Vehicle Charging Infrastructure for improved User Experience

START DATE	01/06/2020	**END DATE**	31/05/2024
TOTAL BUDGET (M€)	18.405.861,2	**EU FINANCIAL CONTRIBUTION (M€)**	14.424.526,39
WEBSITE	https://echarge4drivers.eu/		
COORDINATOR	Institute of Communication and Computer Systems (ICCS) info-isense@iccs.gr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The vision of eCharge4Drivers is to focus on the users and substantially improve the EV charging experience within cities and on long trips, making it better than refuelling an ICE vehicle. The objectives are:

- Develop and demonstrate user-friendly charging stations and smart charging solutions for passenger vehicles and LEVs
- Enable and demonstrate the interoperability of end-to-end communication (vehicle-to-charging station, charging station-to-back-end and back-end-to-user) by implementing the ISO 15118 Plug & Charge feature and Open Charge Point Protocol (OCPP) in its charging stations and the back-offices of all service providers in the consortium, additionally enabling the provision of enhanced information to the EV users, before, during and after a charging session
- Maximise benefits (i.e. reduce costs) for the users by designing and demonstrating innovative efficient charging stations and charging components, smart power management modules and smart charging strategies, that will additionally enable the more efficient integration of EVs in the electricity network
- Deploy and demonstrate innovative charging solutions for on-street residential charging for passenger vehicles, including a mobile charging service and charging points on lamp posts, and standardised battery swapping stations for LEVs
- Accelerate the deployment of charging infrastructure and other charging services in a sustainable and user-centric way.

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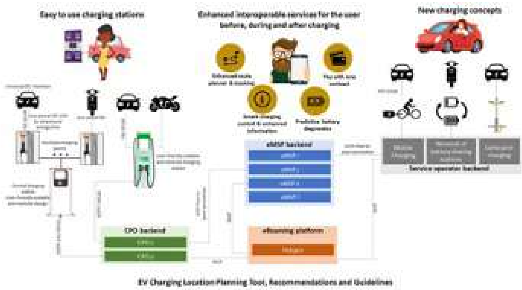
EXPECTED RESULTS



The work will start with wide surveys in 10 demonstration areas, to capture the a priori users' perceptions and expectations as regards the various charging options and their mobility and parking habits. Based on the survey findings and after matching with the perspective of authorities, operators and service providers, the project will develop and demonstrate in 10 areas, including metropolitan areas and TEN T corridors, easy-to-use, scalable and modular, high- and low-power charging stations, low-power DC charging stations and components with improved connection efficiency and standardised stations for LEVs. The project will demonstrate additional convenient charging options within cities, a mobile charging service, charge points at lamp posts and networks of battery swapping stations for LEVs. Using the knowledge generated, the project will propose an EV Charging Location Planning Tool to determine the optimum mix of charging options to cover the user needs, recommendations for legal and regulatory harmonization and guidelines for investors and authorities for the sustainability of charging infrastructure and services.
The project results will support the deployment of user-centric charging infrastructure and the market uptake of EVs.

NOTES

PROJECT NUMBER	874972		
PROJECT ACCRONYM	LONGRUN		
PROJECT NAME	Development of efficient and environmental friendly LONG distance powertrain for heavy dUty trucks aNd coaches		
START DATE	01/01/2020	**END DATE**	30/06/2023
TOTAL BUDGET (M€)	32 987 488,9	**EU FINANCIAL CONTRIBUTION (M€)**	24 986 680
WEBSITE	https://www.h2020-longrun.eu/		
COORDINATOR	Lukas VIRNICH virnich@fev.com		

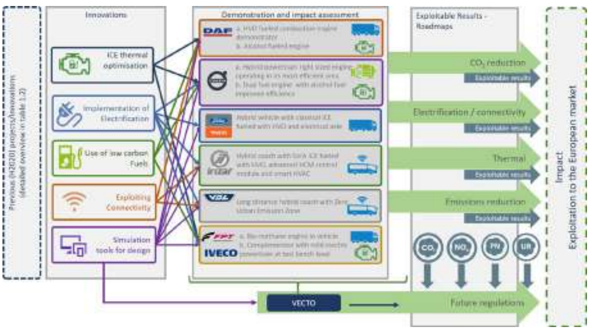
PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The overall objective of the project is to implement innovative solutions into demonstrator vehicles, powertrains and engines, and to demonstrate and assess them within specific use cases.

Objective 1: To achieve over 10% energy saving (tank to wheel (TtW)), excluding effects of plug-in hybrids) and correspondent CO2 reduction.
Objective 2: Realisation of robust ICE engine technology for use of future fuels (HVO, dual fuel mixtures), to achieve a major (>90%) CO2 reduction well to wheel through.
Objective 3: To achieve an internal combustion engine performance which reaches a 50% target in terms of peak thermal efficiency.
Objective 4: Aftertreatment systems integrated into hybrid powertrains with advanced engines.



Objective 5: To achieve a multiscale backward/forward simulation framework to support the design and development of efficient powertrains, including hybrids.
Objective 6: To demonstrate the optimal combination of technologies by validation on engine test rigs/ test track/ on road with the realisation of demonstrator engine, drivelines and vehicles with the key innovations implemented.

EXPECTED RESULTS

- LONGRUN will implement innovative solutions into demonstrator vehicles, powertrains and engines, and to demonstrate and assess them within specific use cases. LONGRUN will contribute to lower the impacts with 10% energy saving (TtW) and related CO2, 30% lower emission exhaust (NOx, CO and others), and 50% Peak Thermal Efficiency.

- A second achievement will be the multiscale simulation framework to support the design and development of efficient powertrains, including hybrids for both trucks and coaches. With the proposed initiatives a leading position in hybrid powertrain technology and Internal Combustion Engine operating on renewable fuels in Europe will be guaranteed. A single solution is not enough to achieve these targets.

- The LONGRUN project brings together leading OEMs of trucks and coaches and their suppliers and research partners to publish major roadmaps for technology and fuels in time for the revision of the CO2 emission standards for heavy duty vehicles in 2022 to support decision making with most recent and validated results and to make recommendations for future policies.

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PROJECT NUMBER	875041		
PROJECT ACCRONYM	**SOLUTIONSplus**		
PROJECT NAME	Integrating Urban Electric Mobility Solutions in the Context of the Paris Agreement the Sustainable Development Goals and the New Urban Agenda		
START DATE	01/01/2020	**END DATE**	31/12/2023
TOTAL BUDGET (M€)	20 305 278,75	**EU FINANCIAL CONTRIBUTION (M€)**	17 996 079,75
WEBSITE	http://www.solutionsplus.eu		
COORDINATOR	Oliver LAH Oliver.lah@uemi.net		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

SOLUTIONSplus is an international flagship project to support the global transition to sustainable mobility. In the context of the EU-funded SOLUTIONSplus project 45 partners and over 100 associated partners work together on transformative change towards sustainable urban mobility through innovative and integrated electric mobility solutions. The team of local authorities, knowledge and finance partners, industry, networks and international organizations will help boosting the availability of public and shared electric vehicles, foster the efficiency of operations and support the integration of different types of e-mobility in urban areas that meet the needs users and local conditions in Europe, Asia, Africa and Latin America. The project will implement e-mobility solutions for the first and last mile (electric two and three-wheelers), electric buses and minibuses, innovative charging solutions and multimodal journey planners in the partner cities. The project brings together some of the leading networks, industry actors, knowledge and implementation organisations and highly motivated cities to test innovative e-mobility solutions that can help addressing these challenges. The consortium will develop, test and replicate innovative, intermodal e-mobility solutions to address the increased demand for personal and freight transport and the related challenges. The focus for the project will be on shaping energy use, providing access for all, creating business opportunities and developing concepts that can make a direct contribution to a low-carbon development through e-mobility. The emphasis on shared and public transport fleets of the project will also help address, among other things, urban congestion, access to jobs and services, and influence land use. A core element of the implementation concepts to be developed will be an integrated and balanced approach that addresses social, economic and environmental issues.

EXPECTED RESULTS

The project will work on the adaptation and integration of different solutions three key areas of urban mobility:

- **Vehicles:** The demonstration actions support the introduction and integration of electric buses, mini-buses, taxis, 2- and 3-wheelers in partner cities. The key focus for the international cooperation aspects will be on the collaboration between European industries and local companies, with a particular focus on last-mile connectivity. but also testing the viability of e-logistics options.
- **Operation:** The demonstration actions will also focus on e-mobility operations, including conventional and wireless, innovative charging solutions for different types of vehicles. The key focus for the international cooperation aspects will be on the provision and adaptation of innovative European charging solutions for different use-cases in the partner cities.
- **Integration:** The demonstration actions will foster intermodal route planning, eco-routing, ticketing, trip planning, navigation, demand-responsive service and dispatching and will provide a white-label app for the adaptation to the local contexts.

The project encompasses city level demonstrations to test different types of innovative and integrated e-mobility solutions, complemented by a comprehensive toolbox, capacity development and replication activities. Demonstration actions will be launched in Hanoi (Vietnam), Pasig (Philippines), Lalitpur/Kathmandu (Nepal), Nanjing (China), Kigali (Rwanda), Dar es Salaam (Tanzania), Quito (Ecuador), Montevideo (Uruguay), Madrid (Spain) and Hamburg (Germany) and replicated in 20 additional cities.

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PROJECT NUMBER	101006631		
PROJECT ACCRONYM	**REVOLUTION**		
PROJECT NAME	Supporting the Electric Vehicle REVOLUTION through maximising EV Range and End-of-Life Vehicle Recovery through optimisation of recycled plastics and advanced light materials		
START DATE	1/01/2021	**END DATE**	31/12/2023
TOTAL BUDGET (M€)	5 927 475	**EU FINANCIAL CONTRIBUTION (M€)**	4 997 912,63
WEBSITE	https://revolution-project.eu		
COORDINATOR	Emre ELMAS emre.elmas@farplas.com		

PROJECT PARTNERS

farplas
Coordinator

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AIM OF THE PROJECT

The aim of the REVOLUTION project is to innovate new solutions for lightweight vehicle components with circular economy principles and Artificial Intelligence.

The project focuses on developing lightweight car components for enhancing the development of Electric Vehicles (EVs) and increasing the circularity in the automotive industry by facilitating the recycling of polymeric materials of the car components and the use of recycled polymers in the conformation of those car components.

The **REVOLUTION project** proposes a disruptive innovation that will bring open-loop recycling to the forefront of automotive injection moulding. The project will use Artificial Intelligence to optimise the input of recycled materials and the injection moulding process to deliver high-quality parts. Besides contributing to the adoption of circular economy principles in the automotive industry, **REVOLUTION** will work with specific materials that can be seen as lightweight alternatives to glass and mineral-filled polymers. In some cases, even to metal. The project will focus on achieving lightweight design by maximising recycled material and introducing materials that can offer ease of recyclability.

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EXPECTED RESULTS

The Revolution Project aims to reduce the weight of the components between 10% and 40% compared to the current alternatives and to demonstrate that at least 80% of the components of the selected use cases can be recovered for recycling and/or reuse.

The REVOLUTION project will present significant innovations within four use cases, which include both effective solutions for reuse and recycling of all materials and components and to get affordable and sustainable weight reductions on those car components. The REVOLUTION project will demonstrate its approaches on four car components:

- **Rear back seat panel**: This component is currently made of a formed steel sheet that is welded to a metallic frame. REVOLUTION will build on CRF's previous efforts to convert this component to a SRPO, with a weight saving of ~55%.
- **B-Pillar Cover**: During the REVOLUTION project, the manufacturing of a 2k dual-part will be transformed into a mono-material injection moulded component using post-industrially recycled PMMA.
- **Crash Box:** Nowadays, most crash boxes are commercially produced using steel. The rear crash box demonstrated in REVOLUTION will be a 100% polymer solution.
- **Lower Rear Bumper**: is a coloured aesthetical part. REVOLUTION will address the difficult post-consumer recycled materials challenge of attaining both appropriate colour and gloss and mechanical and physical properties. REVOLUTION project will optimise the use of PCR PP, aiming to achieve a 20% weight reduction.

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PROJECT NUMBER	101006675		
PROJECT ACCRONYM	**ALMA**		
PROJECT NAME	Advanced Light MAterials and processes for the eco-design of electric vehicles		
START DATE	1/02/2021	**END DATE**	31/01/2024
TOTAL BUDGET (M€)	5 197 595	**EU FINANCIAL CONTRIBUTION (M€)**	4 335 786,38
WEBSITE	https://almaproject.eu/		
COORDINATOR	Raquel LEDO BAÑOBRE raquel.ledo@ctag.com		

Alma
ADVANCED LIGHT MATERIALS

PROJECT PARTNERS

CTAG Centro Tecnológico de Automoción de Galicia
Coordinator

Ford · ArcelorMittal · BATZ · RESCOLL Société de Recherche · Fraunhofer ITWM · TNO innovation for life · ISWA International Solid Waste Association

AIM OF THE PROJECT

In the need to improve the efficiency and driving range of electric vehicles, one strategy is the weight reduction. There are already available solutions based on advanced light materials with promising structural properties but they still need further development to reach the market. Furthermore, increasing environmental awareness and forthcoming stricter regulations demands the adoption of circular economy principles across the entire vehicle life-cycle. To respond to this challenge, **ALMA** will develop a novel BEV structure for a passenger car with 45% weight reduction compared to current baseline (15% additional reduction if compared to prior-art solutions) at affordable costs (below 3€/Kg-saved of additional cost), thus enabling up to 2.2 KWh/100Km efficiency increase and 11% LCA improvement.

For this purpose, **ALMA** will develop a multi-material modular platform made of a combination of Advanced High Strength Steels, advanced-SMC and steel-hybrid materials, characterized with multiscale model-based tools. **ALMA** will adopt circular economy principles from early stages through the application of eco-design strategies to create a novel BEV platform "made to be recycled", using a structural reversible bonding technology to enable the separation of components for repair and reuse. A ground-breaking health monitoring system based on acoustic emissions will be integrated in the structure to detect and locate damage while in-service. At last, efficient recycling and material recovery options will be analysed to complete the circular loop.

EXPECTED RESULTS

As a result of the activities planned in **ALMA**, a novel multi-material body structure (body-in-white, chassis and closures) will be designed for a passenger battery-electric vehicle (BEV), showing a 45% lighter modular platform complying with technical performances and made to be recycled. The novel EV structure will be composed by a mix of finetuned advanced materials such as the 3rd generation of Advanced High Strength Steels (AHSS), steel-plastic thin laminates, duplex steel with aluminium content and advanced SMC composites. A novel reversible adhesive bonding technology triggered by heat will be developed and adapted to the automotive standards, enabling efficient separation of structural dissimilar joints at the end-of-life. A novel multiscale model-based characterization methodology will be developed as well, compatible with existing software and reducing up to 50% less the need for physical testing.

In addition, an integrated Health Monitoring and Inspection (HMI) system will be installed in the structure to detect and determine damage during operation and thus enable future repair and reuse. In the case damage were irreversible, effective recycling and material recovery options will be lined up to close the loop (based on thermo-mechanical conversion) and long-term scenario (based on chemical recycling). These approaches will be closely assessed and guided thanks to an updated LCA and LCC methodology, as the key strategy to embrace circularity and cost-efficiency, and demonstrated at full-scale (TRL8).

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PROJECT NUMBER	101006844		
PROJECT ACCRONYM	**Fatigue4Light**		
PROJECT NAME	Fatigue modelling and fast testing methodologies to optimise part design and to boost lightweight materials deployment in chassis parts		
START DATE	01/02/2021	**END DATE**	31/01/2024
TOTAL BUDGET (M€)	5 500 000	**EU FINANCIAL CONTRIBUTION (M€)**	4 900 000
WEBSITE	https://fatigue4light.eu/		
COORDINATOR	Lucia GRATIELA BARBU lgratiela@cimne.upc.edu		

PROJECT PARTNERS

CIMNE Coordinator, ArcelorMittal, FCA CRF, Composite Service Europe AB, eurecat, MW, Gestamp, Luleå University of Technology, Politecnico di Torino, Profilglass, RISE, UNE Normalización Española, UPC CIEFMA

AIM OF THE PROJECT

Fatigue4Light aims to develop lightweight solutions adapted to the chassis parts of Electric Vehicles to enhance weight reduction compared to current solutions and increase vehicles' safety due to reduced sprung mass.

Solutions will be based on the introduction of especially developed materials solutions with high fatigue performance, the development of new computer modelling with high fatigue prediction accuracy and new experimental methodologies that reduce the testing time for new materials.

Affordability including critical raw materials for EU assessment, and sustainability of the proposed solutions, will be enhanced based on the application of an eco-design approach supported by the application of LCA and LCC studies.

Fatigue4Light is one of the first projects tackling weight reduction in automotive chassis parts, which is a necessary step to further progress in electric vehicle lightweighting, as reduction of vehicle weight impacts positively in CO_2 emissions, electric vehicle autonomy, driveability and security.

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EXPECTED RESULTS

Materials development for chassis parts

1 Fatigue4Light lightweight target is a **reduction of chassis' weight compared with the reference material**. Such a challenge will be addressed through the development of **material solutions based on steels, Al alloys and multi-material hybrid composites with optimal fatigue performance.**
Expected: May 2022

Development of tools for lightweighting

2 **New virtual and advanced experimental tools** to give additional weight savings and reduce the time for part development and manufacturing.
Expected: Jan 2023

Validation of developed solutions at lab and industrial scale

3 Six demonstrators for chassis' parts will be used for **validating the modelling approach and the lightweight efficiency of the Fatigue4Light materials solutions.**
Expected: May 2023

Computer and simulation methods

4 **New tests and computer simulation methods** to better estimate the fatigue life of chassis components and to select the optimal materials for lighter vehicle chassis.
Expected: Jan 2024

The goal is to reduce component weight between 20 and 30% depending on the material solution proposed while ensuring a good fatigue performance.
New fatigue modelling strategies and fast testing methodologies will also result from the project.

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PROJECT NUMBER	101006888		
PROJECT ACCRONYM	**LEVIS**		
PROJECT NAME	Advanced Light materials for sustainable Electrical Vehicles by Integration of ecodesign and circular economy Strategies		
START DATE	01/02/2021	**END DATE**	31/01/2024
TOTAL BUDGET (M€)	5 570 578,75	**EU FINANCIAL CONTRIBUTION (M€)**	4 990 113,63
WEBSITE	https://www.greenvehicles-levis.eu		
COORDINATOR	Dr. José Ramón VALDÉS jrvaldes@itainnova.es		

LEVIS
LIGHT MATERIALS FOR ELECTRIC VEHICLES

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The aim of **LEVIS** is to develop, verify and demonstrate lightweight structural parts in electric vehicles by adopting an eco- and circular design concept from the design phase to the end-of-life stage. **LEVIS** envisages the use of multi-material solutions based on fibre reinforced thermoplastic composites integrated with metal, which will be produced using cost-effective and scalable manufacturing technologies.
The combination of these developments will allow obtaining lightweight, cost-effective and eco-friendly components without compromising their mechanical performance, structural integrity and reliability, even improving their service life.
Special attention will be paid on using recyclable materials and designing the components in a way that after the components' end-of-life nothing will become waste and every part can be recycled or reused for the same or other applications. Thus, only recyclable resins and bio-resourced and recycled carbon fibres will be used for building the target components. Moreover, the components' service-life will be maximised, and all structural parts will be designed to enable a simple and effective dismantling and reuse of the components.
The **LEVIS** consortium envisages demonstrating the technical and economic feasibility of producing these components in three real-case demonstrators at a large scale: a suspension control arm, a battery holding set and a cross car beam. The consortium's goal is to introduce these innovative electric vehicle components into the market by the end of the project.

EXPECTED RESULTS

Until the end of the LEVIS project, the following results are expected:

- A significant target weight reduction for each of the demonstrators.
- At least two of the demonstrators will incorporate sensor technologies for service-life monitoring of developed components.
- Validation of cost effectiveness of manufacturing processes based on the application of novel one-shot production approaches.
- Proving the feasibility of using low-cost bio-based continuous carbon fibres for the development of carbon fibre reinforced polymers in EV demonstrators.
- Improvement of components design, based on enhanced structural integrity and service life prediction capabilities.
- Development of guidelines for the application of eco-design principles for the three demonstrators
- Definition of a suitable end-of-life approach for each of the demonstrators.
- Demonstration of the positive environmental impact of LEVIS proposed solutions in a Life Cycle Assessment (LCA) report.
- Demonstration of the techno-economic feasibility of the demonstrators in a Life Cycle Cost (LCC) report.
- Demonstration of the impact of replication of the LEVIS solutions to other EV components to achieve further weight reductions.

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PROJECT NUMBER	101007011		
PROJECT ACCRONYM	**FLAMINGo**		
PROJECT NAME	Fabrication of Lightweight Aluminium Metal matrix composites and validation In Green vehicles		
START DATE	01/02/2021	**END DATE**	31/01/2025
TOTAL BUDGET (M€)	5 276 597,03	**EU FINANCIAL CONTRIBUTION (M€)**	4 445 411,25
WEBSITE	https://www.flamingo-project.eu		
COORDINATOR	Paolo MATEAZZI - research@mbn.it Alvise BIANCHIN - coordinator@flamingo-project.eu		

PROJECT PARTNERS

MBN nanomaterialia — Coordinator; alkè Electric Vehicles; AXIA INNOVATION; Constellium; EWF; GROUP KAMPAKAS; OGI; exelisis; Factor Ideas for change; iSQ

AIM OF THE PROJECT

FLAMINGo will propose an industrial manufacturing route for the efficient production of high-performance lightweight Aluminium composite materials thanks to a novel metallurgical and forming approaches for making automotive parts. The aim of the project is to decrease by at least 10% the mass of electric vehicles by substituting from AHSS steels with lighter but stronger Aluminium Metal Matrix nano-Composites (Al-MMnCs) for the manufacturing of structural parts of EV (chassis and frame components); the mechanical properties of Al alloys will be enhanced by embedding ceramic nano-particles (e.g. SiC, Al_2O_3) within the metal matrix.
To achieve its objectives, different formulation of Al-MMnCs will be developed specifically for cast and extruded parts. Moreover, the material development activities consider its recyclability since the design stage, exploiting the routes already well established for Al-based material. This, along with the validation at pilot scale of all the manufacturing steps, will support an effective introduction of these new materials in the market.

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EXPECTED RESULTS

In the first 6 month of **FLAMINGo** project, all partners have put efforts in detailing the materials, the manufacturing methods and the design optimization methodologies of automotive lightweight components, considering their whole life cycle.

The information gathered by the partners are of pivotal importance since they allow to start the activities related to production of Al-MMnC powder, topology optimization and re-design of selected test cases, considering the casting and extrusion process set-up. The production of five Al-Metal Matrix nano-Composites powders has started, with different alloy compositions, nanoparticles concentrations and types; these powders will be used in casting and extrusion lines to obtain strengthened premium aluminium alloys, as well as known common ones (e.g. A356, AA6082). Two initial powder formulations, with nano-Al_2O_3, have been shipped (end of September 2021) while other are following by mid-October 2021; both casting and extrusion lines are ready to test them and provide feedbacks. Three iterations are planned to improve the mechanical properties of the new Al-MMnC, their processability and costing.

In parallel, the topology optimization has started utilising FEM analysis on a steering knuckle and structural frames, extrapolated from ALKÈ ATX electric vehicle, which has been selected for the final installation and testing of the demonstrators.

Expected results:

- Preliminary mechanical properties outcomes on Al-MMnCs cast billets => December 2021.
- Complete characterization of bulk Al-MMnCs cast and extruded test piece => April 2022.
- Cost breakdown of Al-MMnC powders => February 2022.

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PROJECT NUMBER	101006841
PROJECT ACCRONYM	PHOENICE
PROJECT NAME	PHev towards zerO EmissioNs & ultimate ICE efficiency

START DATE	01/01/2021	**END DATE**	30/06/2024
TOTAL BUDGET (M€)	5 939 722,50	**EU FINANCIAL CONTRIBUTION (M€)**	4 997 323,88€
WEBSITE	ot available at the time of publication		
COORDINATOR	Toni TAHTOUH toni.tahtouh@ifpen.fr		

PROJECT PARTNERS

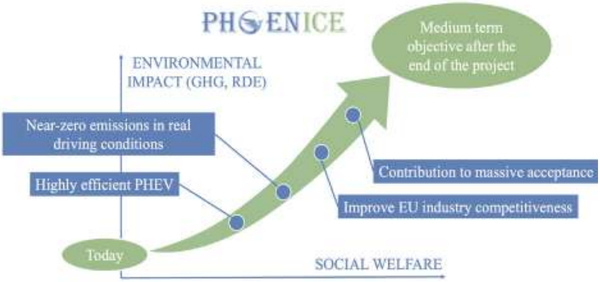
Coordinator

AIM OF THE PROJECT

The PHOENICE project will develop a C SUV-class plug-in hybrid (P1/P4) vehicle demonstrator whose fuel consumption and pollutant emissions will be jointly minimized for real world driving conditions. This development will require the optimisation of a highly efficient gasoline engine, relying on a dual dilution combustion approach with excess air and EGR, synergizing an innovative in-cylinder charge motion with high pressure injection, novel ignition technologies, and an electrified turbocharger particularly relevant for hybrid architectures. The potential of alternative fuels produced by P2X processes will also be considered. To achieve the targeted near-zero emissions in transient conditions specific to PHEV in real driving conditions, the demonstrator vehicle will be equipped with a complete and dedicated after-treatment system.

The vehicle overall efficiency will be increased with an exhaust waste heat recovery system for generating an additional electric power contribution for cabin heating or cooling, or for reducing the switch-on time of the internal combustion engine in cold conditions, thereby limiting the engine-out pollutant emissions such as particles.

Technologies developed in PHOENICE will achieve a TRL 7 paying a specific attention to cost, industrialization, and to the use opportunity for various vehicle classes so as to maximize the economic and environmental impacts. This project will support the European automobile industry in the medium term and speed up the transition towards a more environmentally friendly mobility in terms of air quality and GHG emissions.



EXPECTED RESULTS

Definition	Expected results at the end of the project
Fossil CO2 and greenhouse gas relevant emissions	Reducing the impact of exhaust gases on global climate heating compared to vehicle baseline
"Conventional" regulated tailpipe emissions species	Reduction of tailpipe emissions that are already covered in EU6d regulation compared to target
"Novel" tailpipe emissions species	Reduction of novel pollutant classes towards set target
Combustion system definition	Improving the engine thermal efficiency and lowering the engine-out pollutant emissions
Selection of relevant engine technologies	Controlling the engine complexity and reliability, and achieving the targeted TRL
Selection of WHR technologies	Controlling the WHR efficiency and reliability, and achieving the targeted TRL
Engine and after-treatment control	Defining and implementing all the required control functionalities
Warm steady-state calibration	Demonstrating a better efficiency than the baseline engine and assessing the engine-out emissions in a relevant operating area for the targeted hybrid vehicle in real driving conditions
Efficiency of virtual calibration	Reduction of number of demonstrator vehicles and increase share of virtual tests compared to conventional work flows
Participation to conferences	Presenting the PHOENICE project in 10 international conferences
Publications	Five scientific publications
Website and presence on social media	Reaching 100 000 cumulative visits

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PROJECT NUMBER	**101006943**		
PROJECT ACCRONYM	**URBANIZED**		
PROJECT NAME	Modular and flexible solutions for urban-sized zero-emissions last-mile delivery & services vehicles		
START DATE	01/02/2021	**END DATE**	31/12/2023
TOTAL BUDGET (M€)	6 400 000,00	**EU FINANCIAL CONTRIBUTION (M€)**	5 100 000,00
WEBSITE	https://urbanized.eu/		
COORDINATOR	Salvador RUIZ Salvador.Ruiz@idiada.com		

PROJECT PARTNERS

Applus+ IDIADA
Coordinator

VUB Vrije Universiteit Brussel

TNO

vitesco technologies

alkè high performance utility vehicles

Hellenic Institute of Transport CERTH / HIT

BAX & COMPANY

bpost

CLEPA European Association of Automotive Suppliers

AIM OF THE PROJECT

URBANIZED aims for future proof urban-readiness by solving the trade-offs between "one size fits all" and "design for purpose" approaches to sustainable last-mile delivery in the design of modular all-electric LCVs. We develop and demonstrate the next generation of modular vehicle architectures for urban-sized commercial e-vehicles, satisfying design principles of optimisation and right-sizing vehicles for their mission.

Our approach pursues innovation at 3 levels: vehicle systems level, vehicle level, and fleet level. In vehicle systems, we aim to reduce production costs by solving trade-offs between standardisation and customisation. At the vehicle level, we aim to increase uptake of zero-emission LCVs by offering superior solutions to those in use today. In our fleets, we aim to use modularity to build a mixed fleet that is both "one size fits all" and "designed for purpose".

To make the LCV we are designing a success, we have several key objectives including:

- 10% energy efficiency increase in our systems
- Up to 25% lower cost systems with high safety standards
- Reduce energy consumption on a fleet level by 12,8%
- Increase fleet efficiency by up to 81%

EXPECTED RESULTS

The core results are still to come:
The main outcome of this project will be three URBANIZED prototypes (modular all-electric LCV):

- Two vehicles will be used for crash testing with the objective to achieve 4 stars EuNCAP.
- One demo vehicle will be used to prove the key project KPIs and to be operated by Belgium Post, with different modular cargo bodies.

Additionally, other relevant outcomes will be a new electric machine (M28), energy management system including different driving functions (M14), and a fleet management platform to support decision making of the operators (M36).

Results already performed:
During the first 6 months the project has defined: the vehicle mission profiles, the list of vehicle requirements and the design specifications (M6).

The First workshop was successfully held: Creating the conditions for flexible, zero-emission, 100% electric city logistics Mission definition (M7).

Dissemination is already underway with the project's dissemination strategy, brand identity, website, and social media channels finalised and published (M3).

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PROJECT NUMBER	101006953		
PROJECT ACCRONYM	**Multi-Moby**		
PROJECT NAME	Safe, secure, high performing multi-passenger and multi-commercial-use affordable electric vehicles		
START DATE	01/12/2020	**END DATE**	31/11/2023
TOTAL BUDGET (M€)	7 774 025	**EU FINANCIAL CONTRIBUTION (M€)**	5 731 092,50
WEBSITE	https://www.multi-moby.eu/		
COORDINATOR	Barbara EICHINGER Barbara.eichinger@infineon.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The Multi-Moby project addresses the development of technology for safe, efficient and affordable urban electric vehicles, through the implementation of a fleet of multi-passenger and multi-purpose commercial vans including:

- Best-in-class safety for occupants and Vulnerable Road Users (VRUs) protection as required by the M1/N1 regulations
- Driving automation capabilities by adopting the most extensively tested sensing and computing platforms, with the addition of low-cost scanning and night vision functionalities
- High efficiency 48V and 100V powertrains adopting the most advanced power semiconductor technologies, including Si, SiC and GaN
- Robust battery packs based on hybrid cells with specific energy close to 200 Wh/kg at pack level
- On-board charger integrating a DCxxV-DC12V converter optimised for the two voltages of interest
- Advanced Electric Electronic (EE) architecture with secure procedures for remote updates and upgrades of the firmware and predictive maintenance, by applying advanced artificial intelligence (AI) methodologies
- Application of low-cost, flexible, agile and lean manufacturing through a low-investment micro factory concept
- Competitive price positioning with respect to existing and forthcoming fully electric urban passenger and commercial vehicles.

Fig. 1 : Passenger vehicle and multipurpose van to be developed in Multi-Moby

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RESULTS

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PROJECT NUMBER	101007085		
PROJECT ACCRONYM	DREEM		
PROJECT NAME	Designing useR centric E-kickscooters & business models for Enhancing interModality		
START DATE	01/02/2021	END DATE	31/02/23
TOTAL BUDGET (M€)	2 617 468.75	EU FINANCIAL CONTRIBUTION (M€)	1 925 415.63
WEBSITE	https://dreemscooter.eu/e-kickscooter		
COORDINATOR	Pier Luigi PICCININI pierluigi.piccinini@punchtorino.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The use of different and optimally combined transport modes in a seamless way is one of the key challenges to achieve greater sustainability in smart cities transport systems. Each mode of transport has its own advantages and satisfies different mobility purposes and needs. The core of new electrified micro-vehicle concept is to combine design and user needs for an easier usage within traditional transportation modes (e.g., public transport) in both urban and suburban areas.

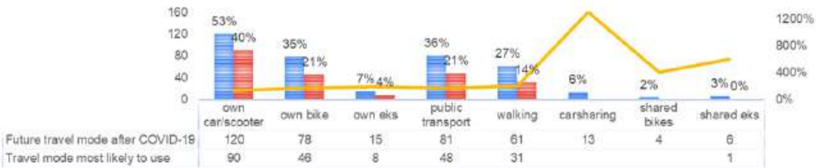
The project aims at finalizing and testing a safer and modular electric kick scooter (e-ks) for personal urban and suburban mobility. It presents 2 main innovation levels: on the vehicle side with the development of new features in term of modularity, foldability and improved safety; on the systemic side, the consortium will study and present (a) new business model(s) for a win-win situation for all stakeholders. The Consortium relies on the extensive experience of Consortium partners, on key learnings of on-going projects and on the inputs from an Advisory Group within the project that will involve representatives from mobility managers, local and city administrators and standardization and certification bodies.

Once users' needs have been identified and analysed, DREEM aims to test a 3-wheel electric kick scooter in 3 different pilot cases. Dissemination of key mobility patterns and best practices will be part of the project. While starting with vehicle design and vehicle architecture, the proposal will also explore the feasibility of innovative business models and circular economy.

EXPECTED RESULTS

The project is not as far to share a complete list of results.

In the first months of the project, engagement activities have been focused on a survey launched in the three pilots with response rates between 15-30%. The survey has allowed to define the socio-demographic profiles of the users, characterise their regular journey and get information on their mobility experience and perceptions. An example of the results show respondents considering new forms of mobility after COVID, with 47% of respondents modifying or adding new travel modes, important increases in shared and active modes.



The survey will allow to define user profiles in the three different pilots, that will be recruited early 2022 to test the e-kickscooters between March and June 2022

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PROJECT NUMBER	101006687		
PROJECT ACCRONYM	**LEONARDO**		
PROJECT NAME	Microvehicle for stand-alone and shared mobility.		
START DATE	01/03/2021	**END DATE**	28/02/2024
TOTAL BUDGET (M€)	2 189 091,25	**EU FINANCIAL CONTRIBUTION (M€)**	1 923 655,75
WEBSITE	https://leonardoproject.eu/		
COORDINATOR	Dario VANGI dario.vangi@unifi.it		

PROJECT PARTNERS

Università degli Studi Firenze — Coordinator

Beta motorcycles

Eilat Municipality

VUFO GmbH

Prosumerlab

SPQR

Tekniker — Member of Basque Research & Technology Alliance

UNeed.IT — Matching your interests

Military University of Technology

AIM OF THE PROJECT

The main objective of the **LEONARDO** project is to develop, test and explore the potential of an electric micro vehicle based on the smart fusion of the concepts of the monowheel and scooter. The vehicle, starting from prototypes and preliminary tests, will be developed and perfected up to a TRL 8-9. **LEONARDO** solution will break the barriers for extended micro vehicle adoption in urban areas. The **LEONARDO** vehicle will be quiet, clean, energy efficient and safe, as well as attractive to the public so that the barriers for adopting it are minimized. A new drive-train with improved energy efficiency will be incorporated, as well as new solutions on system integration such as modular battery packs.

The aim is to obtain a vehicle with the following characteristics:

- to be light and compact, to be transported on public and private vehicles, in order to fully exploit the intermodality;
- to be comfortable and safe even on rough roads;
- to be recharged at home or office, without the need for parking;
- to be interfaceable with a battery sharing system;
- to have a range of use of 20 km, which can be extended with the battery sharing service.

The vehicle will be tested in stand-alone and battery sharing mode in three European cities and in one non European city in order to collect information, comments and judgments about the vehicle and its method of use, to direct and finalize the development of the final prototypes.

EXPECTED RESULTS

By the time of the publication, the consortium achieved a definition of the aesthetic design and the realization and testing of some very first prototypes of the components (engine, platform).

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PROJECT NUMBER	101006747		
PROJECT ACCRONYM	**REFLECTIVE**		
PROJECT NAME	RECONFIGURABLE LIGHT ELECTRIC VEHICLE		
START DATE	01/02/2021	**END DATE**	31/01/2024
TOTAL BUDGET (M€)	7 576 812,50	**EU FINANCIAL CONTRIBUTION (M€)**	5 981 056,25
WEBSITE	https://www.reflective-h2020.eu/		
COORDINATOR	Jenni PIPPURI-MÄKELÄINEN jenni.pippuri-makelainen@vtt.fi		

PROJECT PARTNERS

VTT Coordinator, Applus IDIADA, auvetech, AVL, CYRIC, THIEN eDrives, Università Cusano, S.C.I.R.E., sensible4, University of Ljubljana

AIM OF THE PROJECT

Transport related emissions and urbanisation are creating an unparalleled demand for less polluting and efficient means of moving. Tackling the challenge is imperative and it calls for comprehensive understanding of the landscape, its every aspect and innovative mindset.
It is a well-known fact that electric vehicles are a big part of the solution (combined with renewable energy production). We aim at developing and demonstrating an innovative, modular vehicle concept that is just perfect for the urban needs: zero emission, compact, safe, and rightsized for the mission. Furthermore, we aim at intensifying the utilisation of the vehicles through versatile designing to promote, e.g. multipurpose usage and shared concepts. The key technical innovations of our **RECONFIGURABLE LIGHT ELECTRIC VEHICLE, REFLECTIVE**, vehicle are:

1. modular, scalable, electric powertrain and reconfigurable interiors fit from L7 quadricycles to M1/A vehicles;
2. supreme structural and active safety proven in Euro NCAP crash test and real life experiments of our L7 demonstrator vehicles;
3. added usability and comfortability through adaptable charging solution combining conductive and wireless charging and limited automated features.

To conclude, we aim at introducing a L7 demonstration vehicle that meets the highest quality and safety standards with an affordable price making it an irresistible choice for any urban environment and use case. No such solution exists at the market and our primary aim is to bridge this gap.

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EXPECTED RESULTS

The expected outcomes include

- modular electric powertrain with up to 10% higher energy efficiency than that of present commercial counterparts
- highly safe heavy quadricycle demonstrator vehicle achieving 4 (or 5) stars at Euro NCAP evaluation
- up to 50% increased vehicle utilisation rate thanks to reconfigurable interiors for transportation of passengers and goods
- enhanced usability via automated driving and user-friendly charging features
- wide promotion of the results to guarantee the commercial success of the developed light electric vehicle technologies

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PROJECT NUMBER	101006598		
PROJECT ACCRONYM	**FUTURE-HORIZON**		
PROJECT NAME	Future on-/off-road transport and mobility research, cross-border cooperation strategies, realization actions and procurement processes.		
START DATE	01/02/2021	**END DATE**	31/01/2023
TOTAL BUDGET (M€)	998 595	**EU FINANCIAL CONTRIBUTION (M€)**	998 595
WEBSITE	https://www.ertrac.org/index.php?page=future-horizon		
COORDINATOR	Verena WAGENHOFER verena.wagenhofer@avl.com		

PROJECT PARTNERS

AIM OF THE PROJECT

The Coordination and Support Action FUTURE-HORIZON will support ERTRAC, related Horizon Europe partnerships and the European Commission in identifying future research needs for upcoming R&I programmes, to facilitate a sustainable and efficient road transport system in Europe, while also extensively fostering international cooperation.

The project was preceded by FOSTER-ROAD (2013-2016) and FUTURE-RADAR (2017-2020).

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EXPECTED RESULTS

FUTURE-HORIZON will:

- Provide high-quality input for ERTRAC research roadmaps, strategic research agendas and other implementation documents.
- Assess RTR strategies in Europe, other established markets and emerging markets.
- Support capacity-building for local and national policy makers and practitioners, to generate and implement innovative sustainable mobility solutions.
- Utilize the expertise of a well-developed stakeholder network, incorporating also external advice in project outputs.
- Develop an ERTRAC dissemination strategy and communicate key ERTRAC activities and publications.

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Disclaimer : All the information provided in this booklet has been submitted on a volontary basis by the projects' coordinators, reflecting their progress at the date of publication

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