EGVI cPPP
Project Portfolio
Calls 2014 - 2017

EGVI
European Green
Vehicles Initiative

Horizon 2020
European Union Funding
for Research & Innovation

Ed: EGVIA, Av. de Cortenbergh 66, 1000 Brussels

Foreword

This **new edition of the Green Vehicle projects' portfolio** showcases the results and highlights the excellence of the projects funded by the **European Green Vehicles Initiative contractual Public-Private Partnership** (EGVI cPPP), under the European R&I Framework Programme.

Since the launch of the Green Cars in 2008, there has been significant progress in the development of alternative powertrains; some challenges we faced a decade ago have now been solved, many targets have even been outperformed as a result of outstanding research outcomes and new technologies developed by our greatest pride: the European R&I community.

However, there is still more to be done to achieve our common goal, a smart, clean, integrated and competitive road transport of the future.

For this purpose, we shall stay united, bringing together public and private actors, linking researchers with industry, and connecting ideas with opportunities.

Research and innovation have never played such a distinguishing role in our competitive world for creating jobs and growth, for protecting the environment and for improving our daily lives.

Individual project achievements contribute to the success of our effort by linking practical solutions delivered by the EU-funded R&I projects with policy targets. Nevertheless getting concrete results is not enough. Communicating our collaborative research results is critical to demonstrate the European added value, the impact, and more particularly, the benefits that new innovations bring to the environment, the economy and the society.

This is why it is so important to systematically and regularly harvest knowledge from relevant projects across the research and innovation programmes, to analyse their results, and thus shape the future policies.

This publication offers first insights from projects' objectives and results funded under the European Green Vehicle Private Partnership. **Join us in discovering these innovations making our road transport more efficient and greener!**

Clara de la Torre
Director Transport
DG Research and Innovation
European Commission

Stephan Neugebauer
EGVIA Chairman

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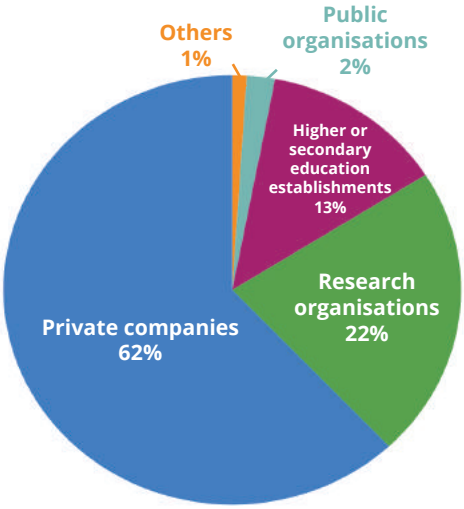
FACTS & FIGURES FROM THE EUROPEAN GREEN VEHICLES INITIATIVE FROM 2014 - 2017

52
projects funded

Who received funding?

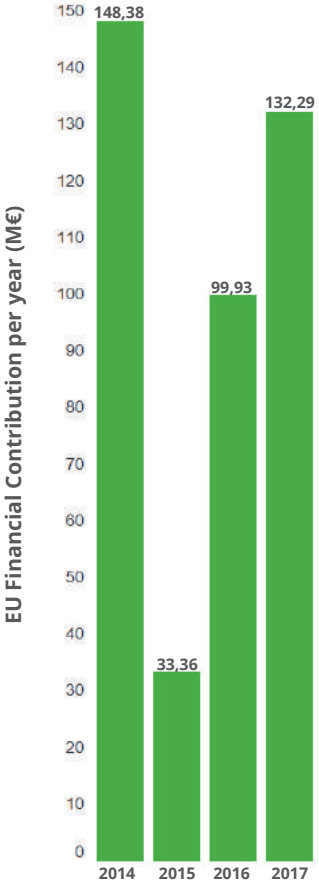


925
participants

154 SMEs

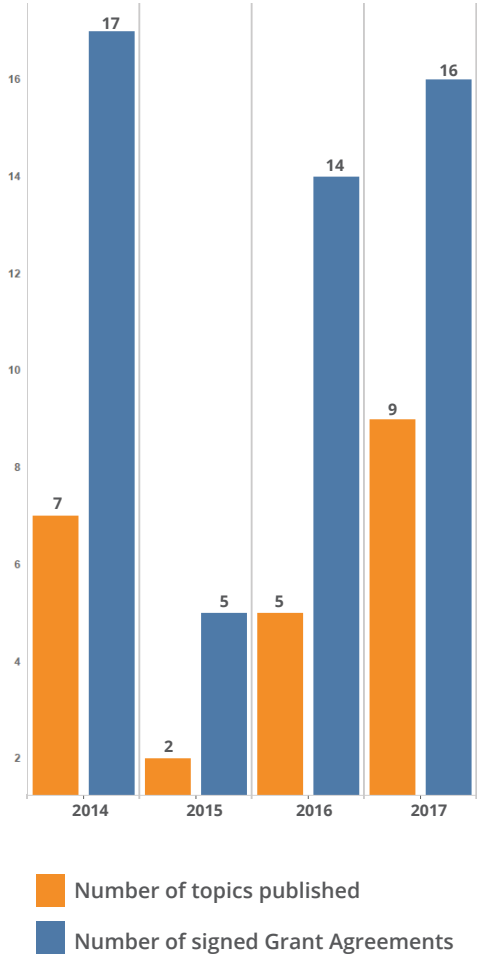
23
topics published

M€413,9
Total EU Financial contribution



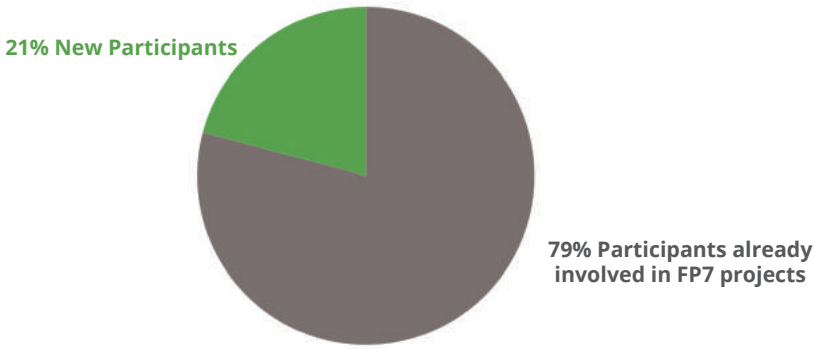
EU Financial Contribution per year in GV projects

Number of published topics vs Number of signed Grant Agreements



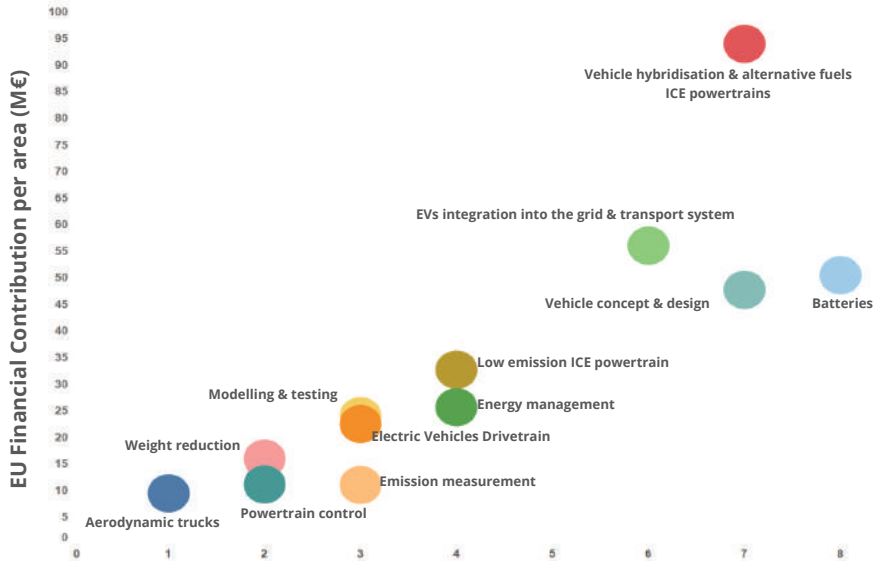
New participants to GV projects

(compared to framework programme - FP7)



Clustering of GVs projects

EU Financial Contribution & number of projects per area



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€ 37,3
- Belarus - M€ 0,55
- Belgium - M€ 22,7
- Croatia - M€ 0,78
- Czech Republic - M€ 1,9
- Denmark - M€ 2
- Finland - M€ 5,6
- France - M€ 51,1
- Germany - M€ 107,3
- Greece - M€ 6,7
- Hungary - M€ 1,3
- Israel - M€ 1,6
- Italy - M€ 61,9
- Luxembourg - M€ 2,1
- Netherlands - M€ 15,8
- Poland - M€ 1,8
- Portugal - M€ 0,26
- Romania - M€ 0,30
- Slovakia - M€ 0,77
- Slovenia - M€ 2,8
- Spain - M€ 32,7
- Sweden - M€ 19,6
- Switzerland - M€ 1,9
- Turkey - M€ 4
- United Kingdom - M€ 29,8

Green Vehicles Projects

2014

GV-1-2014

Next generation of comepetitive lithium ion batteries to meet customer expectations	SPICY
	FIVEVB
	e-CAIMAN

GV-2-2014

Optimised and systematic energy managemenet in electric vehicles	JOSPEL
	OSEM-EV
	OPTEMUS
	XERIC

GV-3-2014

Future natural gas powertrains and components for cars and vans	GasON

GV-4-2014

Hybrid light and heavy duty vehicles	ECOCHAMPS

GV-5-2014

Electric two-wheelers and new light vehicle concepts	ESPRIT
	WEEVIL
	RESOLVE
	Silver Stream
	EU-LIVE

GV-7-2014

Future natural gas powertrains and components for heavy duty vehicles	HDGAS

NMP-17-2014

Post-lithium ion batteries for electric automotive applications	HELIS
	ALISE

2015

GV-6-2015

Powertrain control for heavy-duty vehicles with optimised emissions	IMPERIUM
	optiTruc

GV-8-2015

Electric vehicles' enhanced performance and integration into the transport system and the grid	EVERLASTING
	NeMo
	ELECTRIFIC

2016

NMBP-08-2016

Affordable weight reduction of high-volume vehicles and components taking into account the entire life-cycle	LoCoMaTech
	ALLIANCE

GV-2-2016

	PaREGEn
	DiePeR

Technologies for low emission light duty powertrains	UPGRADE
	EAGLE
	DownToTen
	SUREAL-23
	PEMs4Nano
GV-3-2016	
System and cost optimised hybridisation of road vehicles	THOMSON
	ORCA
	ADVICE
GV-11-2016	
Stimulating European research and development for the implementation of future road transport technologies	FUTURE-RADAR
GV-12-2016	
ERA-NET Co-fund on electromobility	EMEurope

2017

GV-1-2017	
Optimisation of heavy duty vehicles for alternative fuels use	COLHD
GV-4-2017	
Next generation electric drivetrains for fully electric vehicles, focusing on high efficiency and low cost	ModulED
	DRIVEMODE
	ReFreeDrive
GV-5-2017	
Electric vehicle user-centric design for optimised energy efficiency	QUIET
	DOMUS
GV-6-2017	
Physical integration of hybrid and electric vehicle batteries at pack level aiming at increased energy density and efficiency	GHOST
	iModBatt
GV-7-2017	
Multi-level modelling and testing of electric vehicles and their components	OBELICS
	DEMOBASE
	Hifi-ELEMENTS
GV-8-2017	
Electrified heavy duty vehicles integration with fast charging infrastructure	ASSURED
GV-9-2017	
Aerodynamic and flexible trucks	AEROFLEX
GV-10-2017	
Demonstration (pilots) for integration of electrified L-category vehicles in the urban transport system	ELVITEN
	STEVE
GV-13-2017	
Production of next generation battery cells in Europe for transport applications	IMAGE

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PROJECT NUMBER	65573		
PROJECT ACCRONYM	**SPICY**		
PROJECT NAME	Silicon and polyanionic chemistries and architectures of Li-ion cell for high energy battery		
START DATE	01/05/2015	**END DATE**	31/07/2018
TOTAL BUDGET (M€)	7 250 428,75	**EU FINANCIAL CONTRIBUTION (M€)**	6 896 053,50
WEBSITE	http://www.spicy-project.eu/		
COORDINATOR	Willy PORCHER willy.porcher@cea.fr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

SPICY is a collaborative research project to the multidisciplinary development of a new generation of Li-ion batteries meeting the expectations of electrical vehicle end-users, including performances, safety, cost, recyclability and lifetime. For this purpose, SPICY is considering the development of new chemistry materials, cell architectures and packaging with the support of understanding and modelling activities. SPICY is addressing the whole value chain until the implementation of manufacturing.

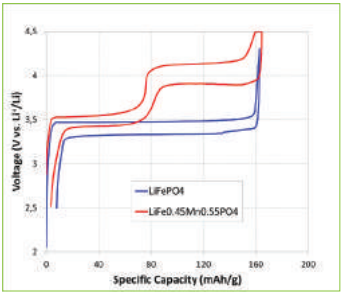
SPICY is **focusing on polyanionic phosphates for the cathode material**. LiFePO4 is well known as a safer and more durable cathode material. Unfortunately, its energy density is low even for PHEV application. One objective of SPICY is **to bind metals having a higher potential than Fe, allowing an increase of the material potential**. Regarding the anode material, SPICY is studying two chemistries. Graphite is used in current Li-ion cells and remains one of the major anode materials for the next generation of Li-ion cells. Silicon is investigated through new synthesis process methods providing nanoparticles and core-shell structures to improve particle stability. Active and passive components is harmonized for a higher energy density i.e: polyanionic phosphate /graphite up to 165 Wh/kg, and polyanionic/Si up to 190 Wh/kg.

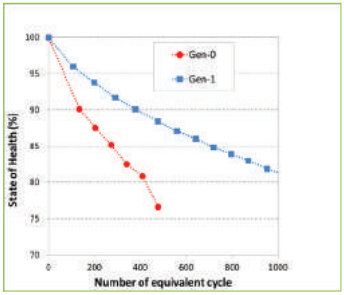
In addition, three cells architectures and packaging are investigated in PHEV design. The thermal behaviour of these cells is studied in ageing tests in order to model Li-ion cells.

Gen0: LFP/G 130Wh/kg	**Gen1: LFP/G** 140Wh/kg (PHEV)	**Gen2: LFMP/G** 165Wh/kg (PHEV)	**Gen3: LFMP/Si** 160Wh/kg (PHEV)

RESULTS

LiFe0.45Mn0.55PO4/C material has been developed with energy density increase of 18% compared to the reference LiFePO4 while keeping power capability. This material is highly suitable for Li-ion cell dedicated to PHEV application with strong power needs. In association with this active material, a high potential electrolyte has been developed with sulfolane or adiponitrile solvent. Current works are focusing on the evaluation of these materials in relevant cell for PHEV application. Evaluations of 17 Ah cells have shown that calendar ageing is not really dependent of the format contrary to life cycling tests where prismatic hard packaging cells show better results than cylindrical hard packaging cells.
Current works on post-mortem analysis should be able to point out why life cycling is lower at 5°C when using 0.3C compared to 2C in charge. Gen-1 optimized cells cycle life with aqueous process for the cathode and new graphite has doubled at 2C in charge and 45°C, with 1000 cycles for 80% capacity retention. Gen-1 soft packaging cell specifications are close to 140 Wh kg-1. Models for electrochemical and thermal behavior at the levels of particles, electrodes and cells are finally able to simulate the cell behavior under 3C rate of Gen-1 cells. Electrode loadings and porosities optimum were obtained based on modeling results. Energy density of the Gen-1 cells could be increased by 10 Wh kg-1, but the impact on life-cycling as thermal properties are lower must be validated. Gen-3 initial cells performance are of 160 Wh kg-1 in 2Ah cells and Gen-2 should be of the same level but in 22Ah cell.





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PROJECT NUMBER	653531		
PROJECT ACCRONYM	**FiveVB**		
PROJECT NAME	Five Volt Lithium Ion Batteries with Silicon Anodes produced for Next Generation Electric Vehicles		
START DATE	01/05/2015	**END DATE**	30/04/2018
TOTAL BUDGET (M€)	5 927 428,75	**EU FINANCIAL CONTRIBUTION (M€)**	5 673 272,50
WEBSITE	http://www.fivevb.eu/		
COORDINATOR	Thomas TRAUSSNIG thomas.traussnig@avl.com		

PROJECT PARTNERS

AVL (Coordinator), 3M, ARKEMA, BOSCH, umicore, virtual vehicle, VUB Vrije Universiteit Brussel, ZSW, BMW, European Commission

AIM OF THE PROJECT

The **FiveVB project** will develop a new cell technology based on innovative materials such as high capacity anodes, high voltage cathodes and stable, safe and environmentally friendly electrolytes. Since main European industry partners representing the value chain from materials supplier to car manufacturer are involved, this program will support and enable the development of a strong and competitive European battery industry.

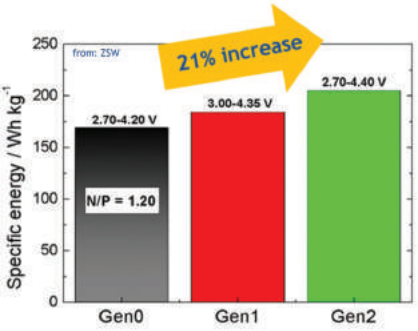
The multidisciplinary project team will also assure not only early **technology integration between materials, cells, batteries and application requirements**, but also **a subsequent industrialization of the developed technology**. With an integrated trans-disciplinary cell development approach an early feedback loop from battery and vehicle level to material suppliers and a feed-forward of relevant information to industrial scale cell production shall be realized. Through an iterative and holistic approach two generations of cell chemistries (anode, cathode, binder and electrolyte) will be evaluated and optimized to improve electrochemical performance of active materials and related new cell technology in terms of energy density, lifetime, safety and costs.

Among other objectives, in particular the lifetime and **aging aspects will be addressed in depth in FiveVB**, but also input for future European and International standardization will be provided. Thus, one major result of FiveVB is a hard case prismatic cell in PHEV1 format, developed according to automotive requirements and produced on a representative prototype facility.

RESULTS

	G0C	G1C	G2C
Rate capability	-	+	++
Low-Temperature performance	-	+	++
Cycling stability	++	+	-
Energy	-	+	++

from: ZSW



G0C - G1C - G2C small pouch cells: comparison specific energy density

- Prove of concept for new Li-ion chemistry & manufacturing (system concept → M36)
- Test methodologies available for next generation Li-ion cells (final results → M36)
- Standardization discussion on 'GV1-level' for testing (**together with *eCaiman* & *SPICY***)
- Durability as an issue => needs to be investigated from system level over cell level down to cell material level
- Specific challenge: 'Swelling» - Round table approach as highly beneficial - ongoing

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PROJECT NUMBER	653331		
PROJECT ACCRONYM	**eCAIMAN**		
PROJECT NAME	Electrolyte, Cathode and Anode Improvements for Market-near Next-generation Lithium Ion Batteries		
START DATE	01/05/2015	**END DATE**	30/04/2018
TOTAL BUDGET (M€)	6 126 698,75	**EU FINANCIAL CONTRIBUTION (M€)**	5 807 244,50
WEBSITE	http://www.ecaiman.eu		
COORDINATOR	Boschidar GANEV boschidar.ganev@ait.ac.at		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The objective of **eCAIMAN** is to bring European expertise together to develop an automotive Li-Ion battery cell that can be produced in Europe.

The consortium consists of several highly experienced industrial partners and research organizations. Together we will develop a more powerful battery by modifying and improving individual components and technologies to result in a significant overall improvement of the cell. Key innovations include a **5V high-voltage spinel, a high-capacity composite anode, and a stable high-voltage electrolyte**. Their cumulative effect should improve total cell capacity by at least 20%, aiming for an energy density of 270 Wh/kg and a cost of 200€/kWh on cell level.

The project will also investigate the integration in light, passenger, and heavy-duty vehicles.

RESULTS

Actual results

- Working 5V baseline cell with LNMO cathode and graphite anode
  - Cobalt-free
  - Water-based processing for anode manufacturing
  - 90Wh/kg gravimetric energy density
- Module design (incl. mock-up 3D print) that incorporates requirements from three OEMs for flexible use in two-wheelers, cars and trucks
- BMS design for high-voltage cells, and with active cell balancing
- Recommendations on testing standardisation (https://www.batterystandards.info/)

Expected results (pending cell/module production)

- 100 5V cells, 72 of these to be integrated into modules; expect improved (>90Wh/kg) energy density vs. baseline cell
- Three demonstrator modules equipped with high-voltage BMS+active cell balancer
- Joint white paper on standardisation (together with *SPICY*, *FIVEVB*)

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PROJECT NUMBER	653851		
PROJECT ACCRONYM	**JOSPEL**		
PROJECT NAME	Low energy passenger comfort systems based on the Joule and Peltier effects		
START DATE	01/05/2015	**END DATE**	31/10/2018
TOTAL BUDGET (M€)	6 668 288	**EU FINANCIAL CONTRIBUTION (M€)**	6 668 288
WEBSITE	http://jospel-project.eu/		
COORDINATOR	Begoña GALINDO proyectos@aimplas.es		

PROJECT PARTNERS

AIMPLAS Instituto Tecnológico del Plástico – Coordinator
DOK-ING
AMV Design
durplastics
CIDETE El Arte de Refrigerar – Termoelectricidad
European Thermodynamics Limited – Intelligent Thermal Management
cleancarb
ARKEMA
Grupo Simoldes Plastic Division
Atos
INSERO
alkè – high performance utility vehicles
CTAG
Fraunhofer ISE

AIM OF THE PROJECT

The aim of the JOSPEL project is the development of **a novel energy efficient climate system for the optimization of interior temperature control management in electrical vehicles**.

EV motors and batteries do not create heat in the same way as internal combustion engines and do therefore require specific thermal management solutions. Current HVAC (heating, ventilation, and air conditioning) technologies reduce the EVs potential operating range with up to 25%.

The aim of JOSPEL project is the development of a novel energy efficient climate system for the optimization of interior temperature control management in electrical vehicles through an integrated approach that combines the application of the thermoelectric Joule and Peltier effect, the development of an efficient insulation of the vehicle interior, the energy recovery from heat zones, battery life increase duration enhancement as a side effect of thermal management, battery consumption reduction by Peltier cooling integration, innovative automated and eco-driving strategies and the electronic control of power flows.

Main objective is the reduction of at least 50% of energy used for passenger comfort (<1,250 W) and at least 30% for component cooling in extreme conditions with reference to electric vehicles currently on the market. As a final result of the project, it will be the building of a full monitorized "demo lab" with real users for the validation of the user cooler/heating feeling.

RESULTS

Last 7 and 8 November and coinciding with the 31st month of the project, the general assembly meeting of the JOSPEL project was held. The assembly of the different technologies developed in the two demonstrators was tackled.

The demonstrators are: electrical vehicles manufactured currently in the companies ALKE (Italy) and DOK-ING (Croatia). It is envisaged that the innovative system achieves a reduction of the energy used in electric vehicle air conditioning in at least 50 % with respect to existing equipment.

JOSPEL project has achieved the following **improvements in Energy reduction** at this stage:

- Heating system based on Joule Effect (30 %)
- Cooling system based on Peltier cells (25%)
- Battery consumption due to their optimal thermal management (12%)
- Thermal management of other EV components and eco-driving technologies (12%)
- Weight reduction and better insulation of the cabin (12%)

The first results measured for the moment are promising. A final event will be organised at CTAG facilities in Vigo on the 30th May 2018, in order to present the final results and the possibility to visit the final demonstrator with the developed technologies.

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PROJECT NUMBER	653514		
PROJECT ACCRONYM	**OSEM-EV**		
PROJECT NAME	Optimised and Systematic Energy Management in Electric Vehicles		
START DATE	01/06/2015	**END DATE**	31/05/2018
TOTAL BUDGET (M€)	8 002 536,25	**EU FINANCIAL CONTRIBUTION (M€)**	8 002 536,25
WEBSITE	http://www.osem-ev.eu/		
COORDINATOR	Reiner John Reiner.John@infineon.com		

PROJECT PARTNERS

Infineon (Coordinator), AVL, Fraunhofer IISB, HUTCHINSON, SAFT, Technische Universität Dresden, The University Of Sheffield., Valeo, DAIMLER, SIEMENS, IFEVS

AIM OF THE PROJECT

OSEM-EV will provide solutions for better autonomy and predictable range to address today´s car buyers concern about electro mobility.

Just increasing the battery capacity is not a viable option because the expectation is to have a familiar level of comfort and safe, eco and human oriented mobility at affordable costs. The highest priority is improved mileage and predictable range without adding further cost and weight. The negative impact of high and low ambient temperatures will be limited. Cars autonomy will be increased due to a reduction of at least 50% of energy used for passenger comfort and at least 30% for component cooling in extreme conditions compared to current FEVs. The consortium focuses on electro-thermal energy substitution, harvesting and smart energy usage for cooling and heating of the passenger compartment and in-car infrastructure..

OSEM-EV goes for novel electro-thermal architectures and control algorithms including thermal insulation, thermal storage, innovative heating and cooling approaches applied to the powertrain, battery life duration enhancement as a side effect of thermal management, electronic control of energy and power flows, energy efficiency of electrified accessories, energy substitution and harvesting functions.

The consortium will take a radical approach, which does not only rely on improving the efficiency of subsystems but also focuses on their interoperability. By creating an electro-thermal network, energy shall be reutilized, no matter if stored in mechanical, electrical or thermal form.

RESULTS

Within this project AVL List was responsible for the build-up of the electric vehicle demonstrator (Daimler), integrating the components delivered from the project partners (Fraunhofer IISB, Infineon, TUB, Hutchinson, TU Dresden). For this purpose, AVL first executed a comprehensive vehicle electrical-thermal-mechanical energy flow simulation, then together it built up the vehicle heat-pump system (together with Infineon and Brno University) to achieve optimal thermal-mechanical-electrical energy efficiency.

Following learnings were observed:

- Using the PCM as a heat source enables to reduce the compressor power and to shorten the duration for the cool down phase of the cabin (at 35°C ambient temperature) leading to a reduction of the entire energy consumption for one WLTC cycle by of 7%.
- Implementing a conventional PTC heater for the cabin heating at -10°C ambient temperature increases the energy consumption by 104% compared to the baseline simulation at 20°C with a deactivated HVAC system.
- With the usage of a heat pump as a heat source at an ambient temperature of -10°C the energy consumption is limited by an increase of 43% but the cabin target temperature is reached only at the end of the WLTC (after 25 minutes).
- Using a PCM with 25°C as heat source temperature for the warm-up leads to a minor reduction of the energy consumption but it allows reaching the cabin target temperature within 5 minutes.

Results:

Use Case	Energy consumption difference
Baseline @ 20°C ambient	0%
Cooling with ambient as heat sink @ 35°C ambient	+31%
Cooling with ambient and 15°C PCM @ 35°C ambient	+23%
Cooling with ambient and 25°C PCM @ 35°C ambient	+24%

Comparison of cooling case with baseline

Use Case	Energy consumption difference
Baseline without cabin heating	0%
Heating with PTC	104%
Heating with ambient as heat source	43%
Heating with 15°C PCM and ambient as heat source	43%
Heating with 25°C PCM and ambient as heat source	40%

Comparaison of heating case with baseline @ -10°C ambient

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PROJECT NUMBER	653288		
PROJECT ACCRONYM	**OPTEMUS**		
PROJECT NAME	Optimised Energy Management and Use		
START DATE	01/06/2015	**END DATE**	28/02/2019
TOTAL BUDGET (M€)	6 390 633,75	**EU FINANCIAL CONTRIBUTION (M€)**	6 390 633,75
WEBSITE	http://www.optemus.eu		
COORDINATOR	Alois STEINER alois.steiner@v2c2.at		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

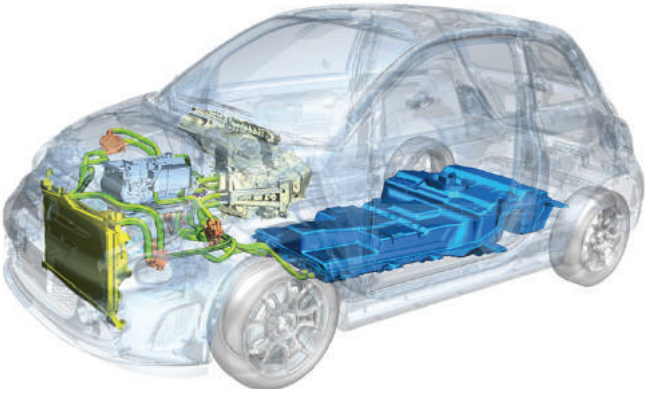
Optimised energy management and use (OPTEMUS) represents an opportunity for overcoming one of the biggest barriers towards large scale adoption of electric and plug-in hybrid cars: range limitation due to limited storage capacity of electric batteries.

The OPTEMUS project proposes to tackle this bottleneck by leveraging low energy consumption and energy harvesting through a holistic vehicle-occupant-centred approach, considering space, cost and complexity requirements. Specifically, OPTEMUS intends to develop a number of innovative core technologies (Integrated thermal management system comprising the compact refrigeration unit and the compact HVAC unit, battery housing and insulation as thermal and electric energy storage, thermal energy management control unit, regenerative shock absorbers) and complementary technologies (localised conditioning, comprising the smart seat with implemented TED and the smart cover panels, PV panels) combined with intelligent controls (eco-driving and eco-routing strategies, predictive cabin preconditioning strategy with min. energy consumption, electric management strategy).

The combined virtual and real-life prototyping and performance assessment in a state of the art, on-the-market Asegment electric vehicle (Fiat 500e) of this package of technologies will allow demonstrating a minimum of 32% of energy consumption reduction for component cooling and 60% for passenger comfort, as well as an additional 15% being available for traction, leading to an increase of the driving range in extreme weather conditions of at least 44 km (38%) in a hot ambient (+35ºC and 40% rH) and 63 km (70%) in a cold ambient (-10ºC and 90% rH).

RESULTS

- A decrease of the energy consumption of -73 % for passenger comfort of the A-class EV at -10 °C ambient temperature is expected
- A decrease of 15 to 23 % in traction energy is expected
- + 30 % driving range are expected at -10 °C ambient temperature



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PROJECT NUMBER	653605
PROJECT ACCRONYM	**XERIC**
PROJECT NAME	Innovative Climate-Control System to Extend Range of Electric Vehicles and Improve Comfort

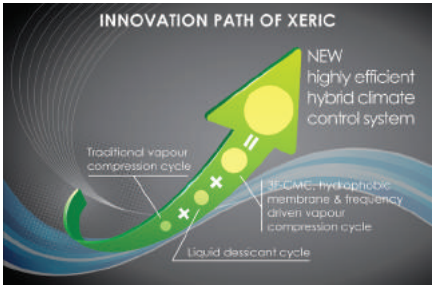
START DATE	01/06/2015	**END DATE**	31/05/2018
TOTAL BUDGET (M€)	4 621 280	**EU FINANCIAL CONTRIBUTION (M€)**	4 621 279,75
WEBSITE	http://xeric.eu - and follow us @XERICproject		
COORDINATOR	Nino GAETA sng@gvs.com		

PROJECT PARTNERS

GVS Coordinator
ITCASS
Fraunhofer ITWM
EMH European Membrane House
FRIGOMAR
UNIVERSITÄT DUISBURG ESSEN
vito
ain
3d Party
UNIVERSITÀ DEGLI STUDI DI GENOVA

AIM OF THE PROJECT

Because of the limited capacity of electric batteries and the substantial amount of energy necessary to run auxiliary equipment, the range capability of electric vehicles is today dramatically affected. For instance, climate control systems absorb in summer conditions 40-60% of the total available energy. **The objective of XERIC is to develop an energy friendly climate control system** capable to reduce drastically the energy used for passenger comfort (heating, cooling and dehumidifying), not only in summer or winter period in Europe but also in countries with more extreme climate conditions.



The core of the system is an **innovative highly compact and energy efficient 3-fluids combined membrane contactor (3F-CMC)** that simultaneously works with air, desiccant solution and refrigerant. The membrane is between the dessicant and the air, and acts as a contacting surface. Air enters the contactor, flows onto the membrane surface and is then de-humidified, at the level required for the specific application. The concept is covered by very original patents belonging to consortium members.

More specifically XERIC's climate control system will reduce more than 50% the energy for comfort, have a lifetime longer than 10 years and get an easy industrialization and customization at cost from 1,200 to 3,000 €.

RESULTS

XERIC prototype is real and functional

GVS with the support of TICASS, UNIGE, ITWM, FRIGOMAR, UDE and VITO, manufactured four working prototypes of 3F-CMC. FRIGOMAR assembled the full XERIC Climate Control System (CCS) to test it in a dedicated climatic chamber, which enable to test different indoor and outdoor conditions. The XERIC innovative CCS includes the following specific components developed in the frame of the project:

- Small-scale prototype of 3-fluids combined membrane contactor - (3F-CMC)
- Hydrophobic membranes (PTFE and PVDF)
- Innovative electronic system including a variable frequency drive compressor
- Tool to predict –through modelling– the performance of the novel CCS
- Tool to predict and prevent – through modelling – the frost formation on the evaporator
- Plasma treatment deposition of hydrophobic coatings on membranes
- U-shaped coated minitubes
- Evaluation of the environmental impact and economic feasibility of the CCS prototype as part of life cycle analysis and life cycle cost analysis assessments

From the lab to the market

Although the main application that has been identified is electric cars, XERIC CCS is valuable for other applications, such as busses, boats or buildings. The working prototype is ready to be modulated according to the market needs (i.e. capacity, size).

The consortium partners are now exploring industrial partnership opportunities and particularly with Original Equipment Manufacturers (OEM) to tailor the XERIC system.

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PROJECT NUMBER	652816
PROJECT ACCRONYM	**GasOn**
PROJECT NAME	Gas-Only Internal Combustion Engines

START DATE	01/05/ 2015	**END DATE**	31/10/2018
TOTAL BUDGET (M€)	23 391 977,5	**EU FINANCIAL CONTRIBUTION (M€)**	16 704 977,14
WEBSITE	http://www.gason.eu		
COORDINATOR	Massimo FERRERA massimo.ferrera@crf.it		

PROJECT PARTNERS

AIM OF THE PROJECT

Aim of GasOn project is focusing on the engine, in order to exploit the main environmental benefits of **CNG** and biomethane (Natural Gas from renewable sources) enabled by low carbon content and the high knocking resistance enabled by high octane number, the way has to go over gas-only powered engines through **the following steps**:

1. The implementation of **CNG direct injection (DI)** as first important step to much more efficient gas vehicles. The direct injection is a key step to CNG performance equivalent to gasoline, moving to a full integration of advanced technologies.
2. The development of a **new lean burn concept**, a new step to producing highly efficient gas-only engines. **Non-DI CNG** lean burn combustion process, based on a diesel engine, will fundamentally gain additional benefits related to the further development of DI CNG engines.
3. The development of advanced boosting system to optimise the engine combustion
4. The development of a sensor to detecting gas quality and composition, a helpful tool for all gas vehicles to improve efficiency. The measurement of the methane number and the caloric value allows adjusting the ignition timing to operate the engine close to the knock line and to optimise injection stragety and boost pressure.
5. The driving range of at least **600 km** achievable thanks to the development of advanced solution for the compressed gas storage system.

RESULTS

State of the Art / Guidelines / Scenarios / Challenges

1. Performed literature survey on SoA of methane as fuel in automotive application
2. Summarized technical approaches in R&D

Stoichiometric & high structural integrity small TC VVA DI engine

1. Completed development & prototyping of CNG Direct Injection system
2. Completed mixing process investigation via optical engine
3. Completed development of multi cylinder engine matching DI injection, boosting and VVA (design, simulation, prototyping)

Advanced boosting & variable compression ratio for downsized CNG engines

1. Completed development & build of dedicated CNG prototype engines
2. Combustion system design & steady state calibration of Non-VCR version finished
3. Non-VCR prototype vehicle designed & build. Vehicle ready for transient calibration

Lean Combustion concepts and on-board CNG quality sensor

1. Completed CFD simulation of prechamber design incl. validation with engine-tests
2. Basic research regarding pre-chamber combustion system on RCEM ongoing
3. Two engines with pre-chamber design built, efficiency 43+% demonstrated
4. Charge dilution (internal & external EGR) and exhaust gas temperature management /

Aftertreatment strategies & solutions for CNG DI engines

1. Completed fabrication of 4 multi cylinder engines, including final injection system
2. Completed aftertreatement development for diluted operation with EGR
3. Multi cylinder complete engine tuning at dyno optimizing performance and fuel economy started

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PROJECT NUMBER	653468		
PROJECT ACCRONYM	**ECOCHAMPS**		
PROJECT NAME	European COmpetitiveness in Commercial Hybrid and AutoMotive PowertrainS		
START DATE	01/05/ 2015	**END DATE**	30/04/2018
TOTAL BUDGET (M€)	28 585 128,75	**EU FINANCIAL CONTRIBUTION (M€)**	21 124 805,3
WEBSITE	http://www.ecochamps.eu		
COORDINATOR	Guus ARTS Guus.Arts@DAFTRUCKS.com		

PROJECT PARTNERS

AIM OF THE PROJECT

Even though hybrid passenger cars are already in production, their market penetration is still relatively low and limited to certain vehicle classes. To increase user interest in hybrid vehicles, the ECOCHAMPS project aims to extend their functionality while minimising their cost premium.

The overall objective of the ECOCHAMPS project is to **achieve efficient, compact, low weight, robust and cost effective hybrid powertrains for both passenger cars and commercial vehicles** (buses, medium duty and heavy duty trucks) **with increased functionality, improved performance, comfort, functional safety and emission levels below Euro 6 or VI**.

The targeted achievements of ECOCHAMPS are to:

- Improve powertrain efficiency by up to 20% during representative operation
- Reduce powertrain weight and volume by up to 20%
- Reduce hybrid vehicles costs, targeting a 10% maximum cost premium

These targets have been used to derive requirements for five demonstrator vehicles: two passenger cars, a medium duty truck, a city bus and a long haul truck. The achievements will be demonstrated at Technology Readiness Level 7, i.e. “system prototype demonstration in operational environment”.

In parallel, a Modular System and Standardization Framework (MSF), a pre-standard framework is developed. Whilst for light duty vehicles (hybrid passenger cars) there are existing standards for drivetrain components and electrically driven auxiliaries, no such similar standards exist for heavy duty vehicles. ECOCHAMPS aims to develop a pre-standard framework and MSF-conform drivetrain components and auxiliaries.

RESULTS

The five demonstrators have been built up, and all vehicles are now in the testing and evaluation phase. Considering the fact that ECOCHAMPS brings direct competitors together in one project, the information flow within the project is strictly defined and specified. Two golden engineers from independent organisations are appointed to oversee the vehicle evaluation, and processing of the data. This process is ongoing at the time of writing; the results will be presented at the TRA 2018.

At the start of ECOCHAMPS a proposal has been made for the modular system and standardization framework (MSF). The document describes the components that are considered for standardization, and the standardisation requirements that are proposed. Now, at the end of ECOCHAMPS, the components have been developed and implemented into the demonstrator vehicles. New insights, coming from the development process, will improve the standardisation proposals. Therefore, the properties and requirements are now being evaluated internally, to obtain the final MSF document and the expected impact from standardisation at the end of the project. The latest developments will be presented.

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PROJECT NUMBER	653395		
PROJECT ACCRONYM	**ESPRIT**		
PROJECT NAME	**E**asily di**S**tributed **P**ersonal **R**ap**I**d **T**ransit		
START DATE	01/05/2015	**END DATE**	31/10/2018
TOTAL BUDGET (M€)	7 996 591,25	**EU FINANCIAL CONTRIBUTION (M€)**	7 996 591,25
WEBSITE	http://www.esprit-transport-system.eu/		
COORDINATOR	Valéry CERVANTES valery.cervantes@cea.fr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Today, transportation both to/from city-centres and within peri-urban areas, is unsatisfactory in terms of congestion, environmental and societal aspects. To answer identified needs, the Easily diStributed Personal RapId Transit (ESPRIT) project aims to **develop a purpose-built, light weight L6 category electric vehicle that can be stacked together to gain space.**

Thanks to pioneering coupling systems, up to 8 ESPRIT vehicles can be nested together in a road train, 7 being towed for an efficient redistribution of fleets and a smartly-balanced and cost efficient transport system. Within the project, 2 user scenarios are foreseen: a one-way carsharing system within city centres and a last-kilometre personal mobility system to existing public transport infrastructures in peri-urban areas. These will be tested through 3 different geographical use cases (Glasgow, Lyon and L' L'Hospitalet de LLobregat near Barcelona).

This innovative transport system concept will be demonstrated to TRL5 though state-of-the-art developments of diverse technological bricks (including vehicle and road train architecture, coupling and guiding systems, kinetic and dynamic behaviour management systems, efficient energy supply and rapid charge battery strategies). To prove the ESPRIT concept, the project will also work on modelling and simulation tools to predict, once ESPRIT vehicles are deployed, the economic, social and environmental benefits as well as key operating strategies.

This concept will incite citizens to use public transport and carsharing solutions rather than their private vehicles leading to seamless intermodal transport, decongestion, significant reduction of noise and air pollution. To reach all stakeholders, the ESPRIT project will not only rely on its technical expertise but also on the knowledge and network of its end user community represented by several partners as well as the Advisor Board which includes carsharing organisations, public authorities and transport operators.

RESULTS

Operation and Business Model estimation tool running in the Lyon city case.
ESPRIT Modal share ranking from 6 to 11% in combination with public transport

ESPRIT is currently running in a 3 vehicle roadtrain configuration

ESPRIT characteristics

- ⇨ 65 Km/h (alt 45)
- ⇨ Electric drivetrain
- ⇨ 3 seats (alt. 2)
- ⇨ 1 charging station per train
- ⇨ 50Kms Range
- ⇨ Charging time 30mins
- ⇨ 1m2 for goods/luggage/shopping

Control laws are designed to run a ISO 3888 (Elk test) at max redistribution speed.
4 technical prototypes running
First complete vehicle mock-up realized.
Two more complete vehicle (technical + body) expected end of February

Key milestones:

- Top level ESPRIT product description issued (Sept 2015)
- Final design review performed Preliminary demand forecast stabilised (July 2016)
- 3 complete vehicles ready for testing (June 2018)

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PROJECT NUMBER	653926		
PROJECT ACCRONYM	**WEEVIL**		
PROJECT NAME	Ultralight and Ultrasafe Efficient Electric VehIcLe		
START DATE	01/06/ 2015	**END DATE**	31/05/2019
TOTAL BUDGET (M€)	6 293 944	**EU FINANCIAL CONTRIBUTION (M€)**	6 293 944
WEBSITE	http://www.weevil-ev.eu/		
COORDINATOR	Imanol EGAÑA imanol.egana@tekniker.es		

PROJECT PARTNERS

IK4 TEKNIKER (Coordinator) · CECOMP · IAAD. · HEXAGON studio · MONDRAGON · PIMOT · FLASH BATTERY kartek · FAGOR AUTOMATION · iki COATINGS IRURENA GROUP

AIM OF THE PROJECT

CHALLENGE AND SCOPE GV-5-2014	WEEVIL CONTRIBUTION
New ultra-light vehicle concepts for personal mobility in urban areas, innovative vehicle architecture	A new 3-wheeler concept made out of an ultra-light composite structure. It includes an innovative width variation mechanism to allow vehicle transiting and parking in tight spaces.
Solution to congestion in cities with scarce parking space	WEEVIL vehicle has a reduced footprint due to its limited dimensions. The width variation mechanism allows for an additional size reduction when transiting at low speeds and/or parking. A joystick system enables the driver to park the vehicle from outside when there is not even space to open the door and get in or out.
Quiet, clean and energy efficient powertrains	A new motor with enhanced efficiency over the whole operating range. A new battery management system so that battery degradation is prevented, and battery cells can operate at maximum capacity and efficiency for an extended lifetime.
Integration and modularity of battery packs	A new open-protocol for battery pack interchangeability in order to allow the user to include the batteries from any range and/or manufacturer with limited or no effort.
Safety	A new composite made structure with higher energy absorption capabilities than the typical metal parts used in the crash structures of automobiles
Affordability, cost efficiency	The new motor is magnet-free, so that permanent magnet associated cost is totally avoided. The composite structure will be fabricated through a novel high productivity manufacturing process. The new open-protocol will allow the user to include batteries (highest cost in an EV) from any range and/or manufacturer with limited or no effort.

RESULTS

Vehicle prototype status:

- PINCER manufactured and tested.
- Battery packs: first manufactured and tested, second in manufacturing process.
- Motor: manufactured and test in process.
- Chassis: manufacturing in process.
- Body panels: manufacturing in process.
- Rest of the vehicle: manufacturing in process.

Vehicle characteristics:

Size	Variable width: 1 m in narrow position, 1.4 m in open position. Length: 2.5 m. Height: 1.5 m. Turning radius: 3.5 m. Parking option for very tight spaces from outside the vehicle with a joystick.
Safety	Crash structure with 3 times higher energy absorption than typical metal crash structures of automobiles.
Comfort	Full encapsulation. Comfortable for 2 people. Ergonomically studied. No tilting while turning.
Affordability	Magnet-free motor: switched-reluctance transversal-flux motor. Battery pack interchangeability (different chemistries, performances and prices): open protocol & easy to remove.
Efficiency	(To be tested) Balancing of the battery cells to reduce degradation and increase efficiency.

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PROJECT NUMBER	653511		
PROJECT ACCRONYM	**RESOLVE**		
PROJECT NAME	Range of Electric Solution for L category VEhicles		
START DATE	01/05/ 2015	**END DATE**	30/04/2018
TOTAL BUDGET (M€)	6 920 277	**EU FINANCIAL CONTRIBUTION (M€)**	6 844 027
WEBSITE	http://www.resolve-project.eu		
CONTACT	Marco PIEVE marco.pieve@piaggio.com		

PROJECT PARTNERS

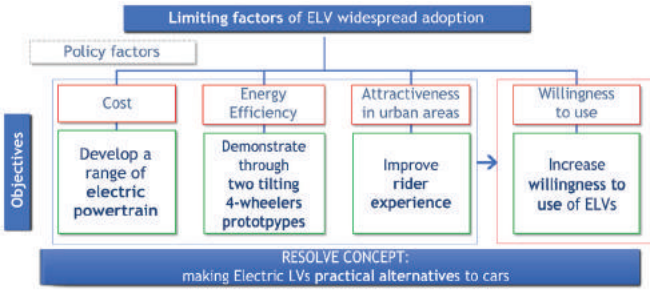
Coordinator

AIM OF THE PROJECT

Future scenarios for EU urban centres see a modal shift in personal mobility from cars to lighter, smaller, more specialised and environmentally friendly alternatives.

RESOLVE project is aimed to:

- Make electric L-vehicle practical, alternatives to cars for urban commuting
- Develp an integrated, scalable, modular range of fully electric drivetrains
- Showcase energy efficiency advances in 2 tilting four-wheelers demonstrators
- Improve the driver experience through ad-hoc HMI concept



RESULTS

Indicator	Project Reference	Current achievements
Overall vehicle energy efficiency improvement	Smart Range Management, regenerative braking	Simulations indicated values slightly higher considering ideal conditions. Realistic targets to be assessed after test are: 45 Wh/km (D1); 54 Wh/km (D2)
Vehicle weight reduction	Reduce vehicle weight by reducing weight of battery and optimal weight distribution	D1 about 275 kg, D2 about 350 kg - estimated weight from virtual mock-up and realized components
Demonstrator developed	Full electric vehicles	3 tilting (2 four-wheelers and 1 three wheeler)
Cost reduction through functional integration	Modularity and generic powertrain simulation model to enable scalability; Functional integration to reduce complexity	4kW drivetrain management module (DMM) is expected to cost € 500 for 2000 volume per year

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PROJECT NUMBER	653861		
PROJECT ACCRONYM	**SILVER STREAM**		
PROJECT NAME	Social innovation and light electric vehicle revolution on streets and ambient		
START DATE	01/06/2015	**END DATE**	31/05/2018
TOTAL BUDGET (M€)	4 573 567,50	**EU FINANCIAL CONTRIBUTION (M€)**	3 990 111,25
WEBSITE	https://silverstream.automotive.oth-aw.de/		
COORDINATOR	Reiner JOHN Reiner.John@infineon.com		

PROJECT PARTNERS

Infineon Coordinator
elaphe Propulsion Technologies
Fraunhofer Gesellschaft
i&m Ideas&Motion
JAC MOTORS
Maxwell TECHNOLOGIES
BRC GAS EQUIPMENT
FCSR Fondazione Centro San Raffaele
University of Surrey

AIM OF THE PROJECT

The **SilverStream project** addresses the challenges associated with sustainable and affordable personal mobility for the growing and ageing population in congested European cities. The project combines both ergonomic concepts conceived for elderly people and advanced automotive technologies that are quiet, clean, energy efficient and safe.

The particular objectives of SilverStream are:

1. specifications related to the needs of urban and ageing population;
2. enhanced vehicle manoeuvrability for urban context;
3. sustainable ergonomics, health monitoring and adaptive HMI for minimum-fatigue vehicle operation;
4. dual voltage 12/48 V power network for modular and scalable E/E architecture;
5. hybrid energy storage system for extended operating life and increased efficiency;
6. compact in-wheel drive units for light urban mobility solutions; and
7. maximizing project impact for enhanced European competitiveness.

The developed technologies will be driven by a team of expert in the field of medical and cognitive science domain through a top/down approach, and will be demonstrated with a vehicle prototype running in a realistic test environment.

In conclusion, **SilverStream will develop and demonstrate a radically new light and affordable vehicle concept (L-category).** In doing so, SilverStream provides one possible mobility solution to address the tough challenges faced by Europe in relation to the field of air quality, noise and environmental protection, traffic congestion, competiveness and jobs preservation, as outlined in the specific challenge of the work programme.

RESULTS

At the current stage, all the project goals have been accomplished. In particular a new L6e vehicle has been developed according to the specifications related to the needs of urban and ageing population highlighted during the requirement analysis perfomed in the first year of the project.

Technical components such as a dual voltage 12/48 V power network for modular and scalable E/E architecture has been developed as well as the hybrid energy storage system and the compact in-wheel drive units.
Enhanced vehicle manoeuvrability (i.e. for urban context) has been also provided thanks to the large steering angles at the front wheels combined with torque vectoring for reduced turning radius of <3m.
Specific vehicle components (HMI, Seat, Roto-Translating platform, rear e-Lift, cane) have been designed considering elderly needs and tested in Lab-environment (controlled conditions), during the first and the second year of the project, with target group: about 90 subjects over 65 y.o. have been involved in the various testing phases to validate the proposed technological solutions as well as to get valuable feedbacks for the system improvements. **Results obtained during the testing phase showed a high degree of users' acceptability** of the proposed technologies and, in addition, a good level of validity from also a clinical/medical perspective (i.e. studies for evaluating the benefit of the ingress-egress movement using the rototranslation system integrated into the vehicle showed a reduction of hip and knee range of motion with respect to the conventional movement).

Validation in realistic scenarios will be performed in the last three months of the project, by involving subjects belonging to the target group. Subjects will be asked to drive the vehicle and evaluate each of the development components, now integrated into a unique system, as well as the overall vehicle.

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PROJECT NUMBER	653203		
PROJECT ACCRONYM	**EU-LIVE**		
PROJECT NAME	Efficient Urban Light Vehicles		
START DATE	01/06/2015	**END DATE**	31/05/2018
TOTAL BUDGET (M€)	6 713 338,75	**EU FINANCIAL CONTRIBUTION (M€)**	6 713 338,75
WEBSITE	http://eu-live.eu/		
COORDINATOR	Werner ROM eu-live@v2c2.at		

PROJECT PARTNERS

virtual vehicle (Coordinator), PSA GROUPE, PEUGEOT SCOOTERS, Continental, SAMSUNG SAMSUNG SDI, Fraunhofer LBF, MONDRAGON UNIBERTSITATEA GOI ESKOLA POLITEKNIKOA FACULTY OF ENGINEERING, fka, spirit design thinking the future, IFP Energies nouvelles, brembo, elaphe

AIM OF THE PROJECT

EU-LIVE will provide a comprehensive European solution for the **next generation of electrified, cost- and energy-efficient light urban vehicles** to cope with the challenges of future personal urban mobility, based on both user needs and acceptance.

EU-LIVE will establish the **«EU-LIVE modular platform», a systematic approach for efficiently designing, developing and building a wide range of L-category vehicles from more close-to-the-market to radically new ones**. This comprises a set of modular electrified powertrain components and subsystems for PHEVs and BEVs, modular bodies (within the same L-vehicle class), and an integrated modular co-simulation platform to guarantee re-usability, flexibility and sharing of components as well as subsystems for L-category vehicles. EU-LIVE will provide innovative modular solutions regarding cost-efficient, energy-efficient, low-emission and low-noise powertrains and future-proof, flexible and scalable vehicle architectures.

Through its excellent partner consortium - including 2 OEMs and several key suppliers - EU-LIVE is able to credibly provide a clear route to market for a range of different L-category vehicles. By its modular approach and the efficient transfer of expertise from high-volume automotive to low-to-medium-volume light vehicle industry, EU-LIVE enables economies of scale, therefore overcoming a major barrier to affordable light urban vehicles.

RESULTS

Main result is a fully modular powertrain supporting both completely electric and plugin hybrid propulsion. Based on highly innovative components (in-wheel motors, highly efficient transmission and combustion engine ready to go beyond Euro 5, completely new E/E architecture...) it is applicable in a broad variety of different L-category vehicle concepts.
For the L3e, a conventional motorcycle has been fully electrified using the modular EU-LIVE powertrain.
The **fully featured L5e (suitable for both electric and plugin-hybrid powertrain) demonstrates an innovative set of features on a small footprint** (e.g. by using rotating doors and a tilting mechanism for superior handling).
By going up to 130km/h and with a range of up to 400km in PHEV mode, it serves the needs of users in both urban and suburban environments.
The (virtual) radically new ultra-light L6e, designed during a worldwide design contest, demonstrates the applicability of EU-LIVE solutions in different vehicle categories by utilizing the same powertrain components and development methods as the L3e & L5e.

L5e three-wheeler

L6e four-wheeler

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PROJECT NUMBER	653391		
PROJECT ACCRONYM	**HDGAS**		
PROJECT NAME	Heavy Duty Gas Engines integrated into Vehicles		
START DATE	01/05/ 2015	**END DATE**	30/04/2018
TOTAL BUDGET (M€)	27 801 977,81	**EU FINANCIAL CONTRIBUTION (M€)**	19 890 587,5
WEBSITE	http://www.hdgas.eu		
COORDINATOR	AVL List GmbH	**NAME:** Theodor SAMS **EMAIL:** theodor.sams@avl.com	

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The overall objective of HDGAS is to provide **breakthroughs in LNG vehicle fuel systems, natural gas and dual fuel engine technologies and aftertreatment systems**.
Specific objectives concern

- The Standardisation of LNG technology, and in particular to specify technical requirements and international/ European standards of LNG fueling interfaces and fueling process for heavy duty vehicles (trucks and buses) and to develop selected LNG fueling components and interfaces;
- To develop an advanced LNG fuel tank system which is in line with relevant present and yet to be defined technical specifications and standards for fueling interfaces and filling processes, comprising the Development of several compact LNG tank systems with a capacity between 300 and 700 liters;
- The Development of two cryogenic LNG pumps, both for in-situ tank usage;
- To develop and demonstrate new generations of exhaust aftertreatment systems and low emission technologies (TRL6) for dual fuel and gas engines allowing real driving emissions below Euro VI limits for heavy duty vehicles;
- To develop and demonstrate advanced ≥ 10% more fuel-efficient direct Positive Ignition natural gas engines and powertrains (TRL6) suited for heavy duty vehicles and integrate the engine and a new fuel system on a vehicle;
- To develop and demonstrate an advanced port injected dual fuel powertrains (TRL6) suited for heavy duty vehicles and integrate the engine and a new fuel system on a vehicle;
- To develop and demonstrate an advanced gas engine concept based on high pressure gas injection and pilot diesel ignition (TRL6) and integrate the engine and a new fuel system on a vehicle;
- To assess the achieved technical solutions by independent testing and to carry out an overall assessment of the proposed technology combinations and quantification of their environmental impacts along the entire Tank-to-wheel chain.

RESULTS

The results within the HDGAS project have been divided in 7 different categories:

1. Advanced LNG vehicle fuel system and standardizations of fueling process and interface: Two news items have been published as well, one on the definition of the system layout of an LNG tank, and another one on SAG delivering tank systems with pumps to the OEMs
2. Exhaust after treatment systems and emission control (including ageing aspects): News items throughout the project focused on the development of an aftertreatment strategy for NG fuelled vehicles, ATS design for natural gas engines, and accelerated aging testing on HDGAS dual fuel aftertreatment hardware
3. Low pressure positive ignition direct injection pure NG Engines and vehicle integration: Item on design of an advanced spark-ignition engine for LNG operation
4. Low pressure dual fuel port injected engine development and vehicle integration: Item on Diesel engine performance and Dual Fuel operation, performance evaluation Duel Fuel trucks available on the market, and MPI low pressure duel fuel functional operation with a new open engine management system
5. High pressure gas injection engine and vehicle integration
6. Independent testing and overall assessment
7. Dissemination, communication and preparative exploitation activities

You may access all available report and news items on the website:
http://www.hdgas.eu/results/

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PROJECT NUMBER	666221		
PROJECT ACCRONYM	**HELIS**		
PROJECT NAME	High energy lithium sulphur cells and batteries		
START DATE	01/06/2015	**END DATE**	31/05/2019
TOTAL BUDGET (M€)	7 974 352	**EU FINANCIAL CONTRIBUTION (M€)**	7 974 352
WEBSITE	http://www.helis-project.eu/		
COORDINATOR	Robert DOMINKO Robert.Dominko@ki.si		

PROJECT PARTNERS

Coordinator, SAFT, CNRS, Solvionic, Chalmers, Fraunhofer UMSICHT, Fraunhofer ISIT, Picosun, Westfälische Wilhelms-Universität Münster, Max-Planck-Gesellschaft, IREC Catalonia Institute for Energy Research, ACCUREC Recycling GmbH, Tel Aviv University, INERIS, PSA Peugeot Citroën

AIM OF THE PROJECT

The specific objectives are as follows:

- **To double the energy density and specific power** compared to current Li-ion batteries (at least 500 Wh/kg and 1,000 W/kg during normal operation conditions) while maintaining the low cost of Li-S cells (max. 150 €/kWh);
- **To obtain a durability according to automotive industry specifications** (at least 5 years and a 1000 cycle lifetime within the full discharge/full charge conditions);
- **To scale-up and engineer materials and components** developed in the EUROLIS project (FP7 project No. 314515);
- **To understand the ageing of Li-S cell prototypes** and to postulate a mechanism which will predict Li-S cells and battery packs ageing in different climate environments;
- **To fully assess Li-S cells** through several safety tests;
- **To protect European technology**;
- **To bring Li-S technology to technology readiness levels** (TRLs) ≥4.

RESULTS

Project is entering into the last part of its duration and so far we have prepared two sets of prototype cells with a D-size configuration. Cells with a nominal capacity above 3 Ah have been prepared and used for different tests. The projected energy density was not obtained in the first prototype set due to high amount of electrolyte required for cells operation. That was tackled in the second set of prototypes where a reduced amount of electrolyte is used. These cells are currently evaluated with different electrochemical, ageing and safety tests. Ageing test of the first set of prototypes showed relative fast chemical and electrochemical ageing. Safety tests (nail penetration and thermal runaway) suggest low hazards with a cell configuration used for prototype testing, although exposure of polysulphides to humid atmosphere leads to the formation of H2S. Basic algorithms for recycling are under development with a focus to recuperate lithium from the cells. Second set of prototype cells is based on electrolytes with lower solubility of polysulphides and that offers a possibility for improvement of electrochemical cycling and shell life.

A continuation of work started in the ***Eurolis project*** (grant agreement No. 314515) is focused on scale-up of carbon host matrix for the cathode and patent application has been filled for this process. Additionally to that, we have successfully scaled up the process for preparation of ion-selective separators by applying thin ALD coating on top of commercially available separators used in Li-ion batteries. Work in the consortium is supported by modelling work package and suggestions from this WP are currently tested on the laboratory level and are planned to be implemented into the last set of prototype cells.

Besides one patent application, the consortium has published 6 open access paper and work has been presented at several international meetings.

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PROJECT NUMBER	666157		
PROJECT ACCRONYM	**ALISE**		
PROJECT NAME	Advanced lithium sulphur battery for xEV		
START DATE	01/06/ 2015	**END DATE**	31/05/2019
TOTAL BUDGET (M€)	6 899 233	**EU FINANCIAL CONTRIBUTION (M€)**	6 899 233
WEBSITE	http://www.aliseproject.com/		
COORDINATOR	Christophe AUCHER caucher@leitat.org		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

ALISE is a pan European collaboration focused on the development and commercial scale-up of new materials and on the understanding of the electrochemical processes involved in the **lithium sulphur technology**.

It aims to create impact by developing innovative battery technology capable of fulfilling the expected and characteristics from European Automotive Industry needs, European Materials Roadmap, Social factors from vehicle consumers and future competitiveness trends and European Companies positioning.

The project is focused to achieve **500 Wh/Kg stable LiS cell**. The project involves dedicated durability, testing and LCA activities that will make sure the safety and adequate cyclability of battery being developed and available at competitive cost. Initial materials research will be scaled up during the project so that pilot scale quantities of the new materials will be introduced into the novel cell designs thus giving the following advancements over the current state of the art.

The project approach will bring real breakthrough regarding new components, cell integration and architecture associated. New materials will be developed and optimized regarding anode, cathode, electrolyte and separator. Complete panels of specific tools and modelling associated will be developed from the unit cell to the batteries pack.

RESULTS

December 2017:

- Optimized cathode: >2.5 mAh/cm2, >1200 mAh/g
- Lithium sulphur light cell: >100 units, 300 Wh/kg, 230 Wh/L, 12.5 Ah
- Lithium sulphur PHEV module: 82 cells, 41s2p, 15.33Kg

Indicator	Units used	Project reference	Project objective	Current achievements	Target for module manufacturing (Feb 2018)	Target for Pouch cell (May 2019)
Nominal Capacity	Ah	0.2C or lower	12.5	12.5	14	16
Nominal Capacity	Ah	2C or higher	12.5	9	10	12.5
Gravimetric Energy	Wh/Kg	12.5 Ah Pouch Cell	400[a], 500[b]	300	>300	400
Volumetric Energy	Wh/L	12.5 Ah Pouch Cell	440[a], 550[b]	230	>250	440
Cycles	-	at 0.2C or lower, DOD 80 % BOL 80%	2000	100	300	800

[a] Pouch cell generation used for integration at module level, using metallic lithium as anode, [b] Pouch cell generation built using protected anode

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PROJECT NUMBER	713783		
PROJECT ACCRONYM	**IMPERIUM**		
PROJECT NAME	IMplementation of Powertrain control for Economic, low Real driving emIssions and fuel ConsUMption		
START DATE	01/09/2016	**END DATE**	31/08/2019
TOTAL BUDGET (M€)	9 945 610,68	**EU FINANCIAL CONTRIBUTION (M€)**	6 625 977,14
WEBSITE	http://www.imperium-project.eu		
COORDINATOR	Dr. Alois DANNINGER alois.danninger@avl.com		

PROJECT PARTNERS

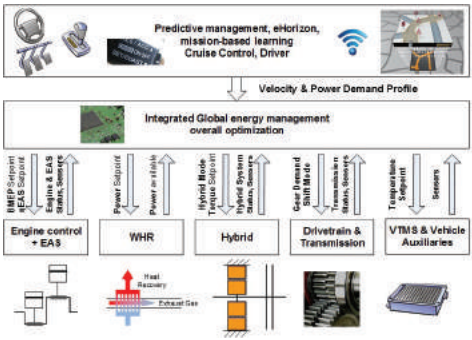
Coordinator

AIM OF THE PROJECT

Fuel economy is a key aspect to **reduce operating costs and improve efficiency of freight traffic**, thus increasing truck competitiveness. The main objective of the IMPERIUM project is to achieve fuel consumption reduction of up to 20% (diesel and urea) whilst keeping the vehicle within the legal limits for pollutant emissions. The IMPERIUM consortium consists of major European actors and is able to provide a 100% European value chain for the development of future powertrain control strategies for trucks.

The approach relies on the three following stages:

- Direct optimisation of the control of the main powertrain components (e.g., engine, transmission) to maximize their performances.
- Global powertrain energy manager to coordinate the different energy sources and optimize their use depending on the current driving situation.
- Provide a more comprehensive understanding of the mission (e.g., eHorizon, mission-based learning) to enable long- term optimization strategies.



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RESULTS

Fuel economy - whilst keeping the vehicle within the legal limits for pollutant emissions – is a key aspect to reduce operating costs and improve efficiency of freight traffic, thus increasing truck competitiveness.
The availability of accurate and long-term information of the mission, taking into account locally and temporally dynamic data, is a key aspect to improve fuel efficiency. It enables long term mission optimization by taking into account the vehicle (e.g., mass) and its environment (e.g., weather, road slope, traffic jams) in a comprehensive way.
Finally, the different energy sources, storages and converters (such as vehicle speed, altitude or combustion engine, e-drive module, waste-heat recovery, transmission) can be used in a more optimal area according to the given mission.

IMPERIUM's objectives, main innovations and targeted key results are:

- **Obj. 1:** Development of a methodology and simulation environment for assessing the performance of HD trucks in real-driving conditions
- **Obj. 2:** Development of Dynamic eHorizon system for Heavy Duty trucks
- **Obj. 3:** Three advanced fuel efficient Heavy-Duty Demonstrators
- **Obj. 4:** Analysis and validation of the project outcomes by means of in-vehicle measurements integrated into the proposed simulation environment

Currently the consortium members work on simulation, development and initial validation in office, test bed and vehicle.

Until the end of the project (August 2019), these concepts will be implemented and evaluated by means of detailed simulations, real prototypes, and supported by in-vehicle measurements.

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PROJECT NUMBER	713788		
PROJECT ACCRONYM	**optiTruck**		
PROJECT NAME	Optimal fuel consumption with Predictive PowerTrain Control and calibration for intelligent trucks		
START DATE	01/09/2016	**END DATE**	31/08/2019
TOTAL BUDGET (M€)	5 385 958,75	**EU FINANCIAL CONTRIBUTION (M€)**	4 540 988,88
WEBSITE	http://optitruck.eu/		
COORDINATOR	Jean-Charles PANDAZIS jc.pandazis@mail.ertico.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

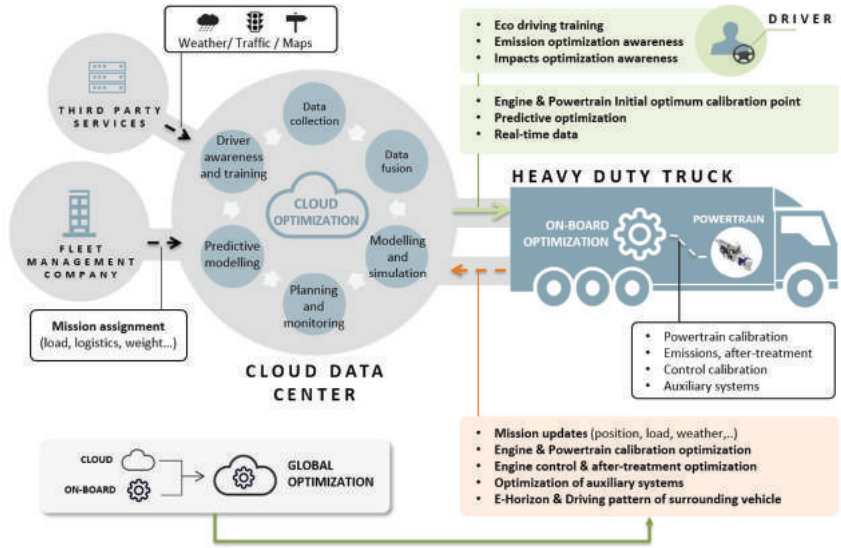
The goal of optiTruck is to bring together the most **advanced powertrain control and intelligent transport systems technologies** to achieve a 20% reduction in fuel consumption while achieving Euro VI emission standards for heavy duty road haulage (40t).
The project involves many disciplines, covering ten innovations, and requires a lot of interdisciplinary team work. Big Data analytics, cloud computing, data security, predictive algorithms, electronic systems, embedded software systems, engine and after-treatment systems modelling, vehicle modelling are just some of the disciplines that will be used in the project.
By integrating these technologies, innovations and disciplines we will develop a prototype to demonstrate a total of 21.6% of fuel reduction while meeting the EURO VI emission standards.

How will we do it?
The project will work towards the creation of a global optimiser which consists of a set of dynamic, intelligent control and prediction components designed for effective powertrain management, utilising environmental data related in particular to:

- journey,
- road topography,
- weather and road conditions

The optiTruck concept is based on the collective use of 10 Innovative Elements. On their own, these innovations have a fairly minimal impact but together they will help to reduce greenhouse gas emissions by more than 20%.

RESULTS



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PROJECT NUMBER	713771		
PROJECT ACCRONYM	**EVERLASTING**		
PROJECT NAME	Electric Vehicle Enhanced Range, Lifetime And Safety Through INGenious battery management		
START DATE	01/09/2016	**END DATE**	31/08/2020
TOTAL BUDGET (M€)	8 201 423,75	**EU FINANCIAL CONTRIBUTION (M€)**	8 201 423,75
WEBSITE	http://www.everlasting-project.eu		
COORDINATOR	Carlo MOL carlo.mol@vito.be		

PROJECT PARTNERS

vito Coordinator · cea · SIEMENS Ingenuity for life · Technical University of Munich · TUM · TÜV SÜD Battery Testing · ALGOLION · RWTH AACHEN UNIVERSITY · LION Smart · TU/e Technische Universiteit Eindhoven University of Technology · voltia · VDL Enabling Transport Solutions

AIM OF THE PROJECT

The EVERLASTING project is developing innovative technologies to **improve the reliability, lifetime and safety of Lithium-ion batteries based on more accurate, and standardized, battery monitoring and management systems**. This allows predicting the battery behaviour and safety in all circumstances and over its full lifetime and enables pro-active and effective management of the batteries, which leads to higher reliability and safety which enables preventing problems rather than mitigating them.
Moreover, by exploiting the interaction between the battery and the vehicle, more accurate range predictions can be made to reduce the range anxiety for the driver and allows the battery to be kept in a safe and optimal operational state to improve the lifetime of the battery (target +20%) and to use the battery to its full capacity in a safe way. This will lead to lower overall costs.

RESULTS

Available Results:

- Analysis of the state of the art on BMS.
- Definition of procedures for testing BMS functionalities.
- Requirements and architecture concept of a highly modular prototyping BMS hardware platform.

Expected Results:

- **September 2019:**
  - Model based virtual test benches (MiL, HiL) as tools to support development of BMS and battery pack design.
  - Thermal models and on-line predictive algorithms to determine safe operating windows for batteries.
- **January 2020:**
  - Modelling tools for passive and active battery cooling.
- **March 2020:**
  - On-Line self-learning battery SoC, SoH, SoF, SoS algorithms with minimum sensing.
  - Methodologies for driving range prediction and extension.
  - Load management algorithms for battery life time extension.
  - A generic, flexible and open BMS architecture, including BMS hardware platforms, software components, and their interfaces.
  - Multi-sensing safety system for diagnosing precursors to internal cell defects that enables the prevention of thermal runaway
- **September 2020:**
  - Demonstrator vehicles (electric delivery van and electric public transport bus)

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PROJECT NUMBER	713794
PROJECT ACCRONYM	NeMo
PROJECT NAME	Hyper-network for Electromobility

START DATE	1/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	7 836 827,04	**EU FINANCIAL CONTRIBUTION (M€)**	7 836 827,04
WEBSITE	http://nemo-emobility.eu/		
COORDINATOR	Dr. Angelos AMDITIS a.amditis@iccs.gr		

PROJECT PARTNERS

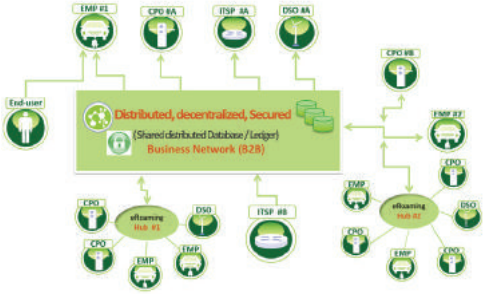
Coordinator

AIM OF THE PROJECT

NeMo will boost the market share of EVs by enabling **increased accessibility to electromobility and ICT services to all connected actors.** It will create tools and structures to enable a wide B2B interconnectivity, thus facilitating seamless service availability. Additionally, it will support a better planning and more secure electric grid operation, by making backend data and services accessible to the right actors.

This will be achieved by the following main outcomes:

- Hyper-Network for the interconnection of B2B actors which will enable the provision of seamless and interoperable electromobility services;
- Common Information Models for data exchange among the actors connected in the Hyper-Network;
- Pan European Inter-Roaming framework to enable the seamless inter-connection of service providers and charge point operators, already connected to existing eRoaming platforms;
- Open B2B Marketplace for electromobility;
- Horizontal smart services for use by service providers in the Hyper-Network;
- Self-certification mechanism, to ensure quality of service;
- New business scenarios and models.



NeMo Hyper-network for Electromobilty provides a decentralised and open environment for seamless service provision

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Topic GV-8-2015

RESULTS

NeMo is expected to:

- Improve attractiveness of electric vehicles (EVs) and enhance driver satisfaction: Drivers will be able to "charge anywhere & anytime" across Europe via a single identification, authorisation & payment method;
- Unify the ICT backends of eRoaming platforms, service providers and charge point operators connected to the Hyper-Network
- Enable the easy creation and delivery of innovative, interoperable electromobility services;
- Allow information exchange among all connected actors;
- Facilitate the offering of smart-grid applications and services, to support the EVs integration in the electricity grid.

The project is at its second year of runtime and the following have been achieved so far:

- Common Information Models have been proposed for objects and data structures relevant to the selected use cases.
- An Inter-Roaming protocol has been proposed, to allow interconnection of eRoaming platforms and their connected actors between them and with all other actors connected in the NeMo Hyper-Network.
- The service creation environment of the marketplace has been developed.
- Data translators from proprietary protocols to the Common Information Model and vice versa are available.

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PROJECT NUMBER	713864		
PROJECT ACCRONYM	**ELECTRIFIC**		
PROJECT NAME	Enabling seamless electromobility through smart vehicle-grid integration		
START DATE	01/09/2016	**END DATE**	31/08/2019
TOTAL BUDGET (M€)	6 152 118,75	**EU FINANCIAL CONTRIBUTION (M€)**	6 152 118
WEBSITE	https://electrific.eu/		
COORDINATOR	Maria PEREZ ORTEGA info@electrific.eu		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

ELECTRIFIC aims at **revolutionising how electric vehicles are integrated into power grid and users' life**.

The fundamental premise on which the project will work that significant improvements to electromoblity can be unlocked by increasing coordination of all the actors in the electromobility ecosystem.
To this end, the project will deliver novel techniques and ICT tools for enabling such coordination at all levels of the ecosystem.

At the **grid level,** the project will develop new smart charging stations capable of dynamically controlling charging rate, maximizing the use of renewables and making as grid-friendly as possible.
At **level of EV users**, the project will develop advanced driver assistance services that help and motivate the users plan travel and charging in a way that is convenient and yet respects potential constraints on charging capacity.
Finally, at the **EV fleet level**, the project will develop management tools that help to optimise fleet operations, maximising battery lifetime and minimising charging costs.

ELECTRIFIC comprises a balanced consortium of experienced research partners, energy providers and innovative electromobility SMEs. The results of the project will disseminated in the scientific community and rolled out to commercial use from e-bikes to e-buses, from private owners to government services and including cross-border mobility.

RESULTS

The **ELECTRIFIC travel planner (ADAS)** was developed, and released in its 1st stable version via Google Play.

- the ADAS UI, the graphical interface (Android mobile app)
- the ADAS AI, the smart routing engine.

SoC model, more accurate than the range calculation provided by the vehicle/battery manufacturer

Using the SoC model, the ELECTRIFIC Smart Scheduler in its 1st version: EV fleet scheduler. ELECTRIFIC is able to incentivize users to charge when more renewables are available. The incentives schema has been defined during this period and tested, and will be further developed during the next.

We demonstrated how a charging station can be reactive to possible grid issues.

CS can react in real-time to issues coming from the grid side once the charging process is being performed (ELECTRIFIC Smart Charger).

Through surveys and field trials (eco-button trial and ADAS trial) we analysed which kind on incentives schemas should be defined in order to foster users' behaviour towards a more sustainable mobility. In addition, user profiling variables have been identified

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PROJECT NUMBER	723517		
PROJECT ACCRONYM	**LoCoMaTech**		
PROJECT NAME	Low Cost Materials Processing Technologies for Mass Production of Lightweight Vehicles		
START DATE	01/09/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	7 997 725	**EU FINANCIAL CONTRIBUTION (M€)**	7 997 725
WEBSITE	http://www.locomatech.net/ProjectArea1/home		
COORDINATOR	Jianguo LIN jianguo.lin@imperial.ac.uk		

PROJECT PARTNERS

Imperial College London (Coordinator), AIN, DIAD GROUP, PAB, MARBEAU DesignConsultancy, Plasma Team, ANTER, AML, Impression Technologies, TBZ PARIV, esi get it right, APT Automation Presses Tooling, Constellium, voestalpine, CRF, University of Birmingham, University of Strathclyde Glasgow, MISKOLCI EGYETEM University of Miskolc, National Technical University of Athens

AIM OF THE PROJECT

The overall aim of LoCoMaTech is, in the first place, to enable the novel HFQ® process, (patented by ICL) in its latest most advanced form, which includes 10 recently patented refining technologies (TRL4), to be used for the manufacture of lightweight, high strength body and chassis structures and components for low-cost vehicles, by establishing a prototype, full scale pilot production line (TRL6), supported by a supply chain ranging from raw material to end of life.

This will be the first low-cost technology in the world enabling manufacture of high-strength lightweight complex-shaped aluminium parts and low environmental impact. The 1st generation of HFQ technology has already been commercially used in manufacturing 4 types of niche vehicles.

This project aims at bringing the materials and manufacturing cost significantly down, through introducing newly patented technological measures, by which the technology could be used for producing low-cost vehicles. The **low cost HFQ® technology** will be used first for mass production of aluminium car body and chassis structures (eventually for all vehicles), which will lead to substantial improvement in energy efficiency, performance and travel range of low-end vehicles.

RESULTS

The project will develop a novel **HFQ® aluminium processing technologies** for mass production of low cost HFQ® aluminium alloys using the advanced fast temperature control and stamping technologies, and novel HFQ® tooling technique and surface engineering methods for low-cost HFQ® forming.

The HFQ® manufactured components can contribute to the reduction of energy consumption per vehicle by 15%, and cost-effective savings from 8.5 to 2.1 €/kg-saved.

To support the actual mass production process, a novel multi-objectives optimisation virtual engineering system is established for vehicle component/structure design and forming process optimisation with improved design/manufacture efficiency.

Meanwhile, first in the world, a novel pilot production line equipped with advanced hardware and intelligent software is to be established to achieve customized mass production for low-cost manufacture of complex-shaped aluminium lightweight components.

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PROJECT NUMBER	723893
PROJECT ACCRONYM	**ALLIANCE**
PROJECT NAME	**A**ffordable **L**ightweight **A**utomobiles Allia**NCE**

START DATE	01/10/2016	**END DATE**	30/10/2019
TOTAL BUDGET (M€)	9 019 278,75	**EU FINANCIAL CONTRIBUTION (M€)**	7 981 772,5
WEBSITE	http://lightweight-alliance.eu		
COORDINATOR	Sama MBANG sama.mbang@daimler.com		

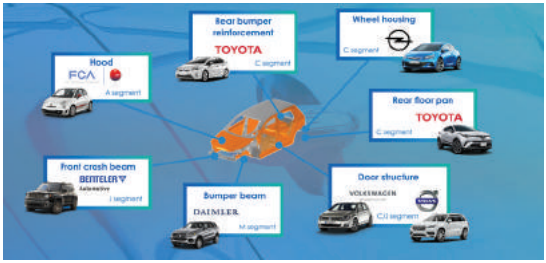
PROJECT PARTNERS

DAIMLER Coordinator, VOLVO, OPEL, TOYOTA, VOLKSWAGEN, CRF, thyssenkrupp, ADITYA BIRLA NOVELIS, BATZ, BENTELER makes it happen, swerea swedish research, inspire, Fraunhofer, ika RWTH AACHEN UNIVERSITY, KIT Karlsruher Institut für Technologie, UNIVERSITÀ DEGLI STUDI FIRENZE DIEF, BAX & COMPANY, RICARDO

AIM OF THE PROJECT

ALLIANCE brings together partners from the lightweighting value chain, aiming at **developing innovative materials, their respective manufacturing technologies, as well as a multi-parameter design optimisation methodology to achieve significant weight reduction in high volume automotive components**. The project consortium uses a holistic framework that will ensure their market viability. In addition, the consortium aims to tap into the innovation potential of Europe by mobilising the entire ecosystem of innovators in the field through a pan-European innovation challenge. Aiming to validate feasibility and accelerate adoption, the developed technologies will be validated in 8 demonstrator modules of existing or soon-to-be-released vehicles.

ALLIANCE aims to achieve a weight reduction of 21%-33% on the selected modules, which will enable consumption of road vehicles by 10%, decreasing life-cycle environmental impact (GWP) by 6%, and ensuring that the developed technologies reach widespread adoption by keeping the cost of lightweighting <3€/kg saved. Furthermore, ALLIANCE aims to strengthen the competitiveness and growth of European players in the lightweighting field.



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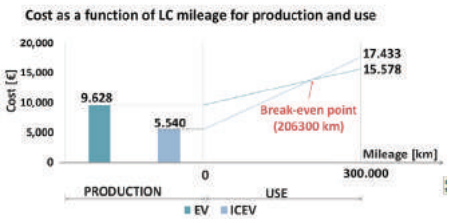
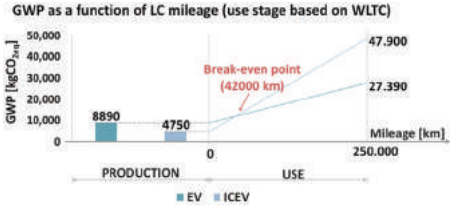
RESULTS

One of the main project results so far has been the life-cycle environmental and cost analysis of the benchmark modules which will be used to evaluate the demonstrators that will be developed during the project.

The visuals below show the preliminary break-even analysis for an EV and ICE powered vehicle, for both cost and Global Warming Potential (GWP).





The design of the demonstrator modules will be finalised in April 2018. All demonstrators are expected to be fabricated by March 2019. Finally, the life-cycle environmental and cost assessment will be completed in September 2019.

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PROJECT NUMBER	723954		
PROJECT ACCRONYM	**PaREGEn**		
PROJECT NAME	Particle Reduced, Efficient Gasoline Engines		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	12 060 598,75	**EU FINANCIAL CONTRIBUTION (M€)**	9 952 012,50
WEBSITE	http://www.paregen.eu		
COORDINATOR	Simon EDWARDS Simon.Edwards@Ricardo.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The overall objective of PaREGEn is to demonstrate (at up to TRL 7) a **new generation of gasoline direct injection engined vehicles**, which achieve a 15% reduction in CO2 emissions and compliance with future emissions limits (Euro 6 RDE) together with the low numbers of emitted particles (PN measured to a 10nm threshold), through the optimal combination of advanced engine and robust aftertreatment technologies. Modelling and simulation software will be verified and used to improve the design and the capability of the engines.

The project is organized with:

- An element of research for improved understanding to acquire in-depth knowledge of the relationships between combustion process, engine design aspects, engine operation, emissions (including CO2) and particle control over the engine operation map; and to include this understanding in new models, simulation tools and control strategies for future application in engine development and calibration processes;
- An element of innovation and demonstration of the new technology combinations, where the developed know-how, software and control strategies are integrated and implemented in two novel optimised gasoline engines together with new engine components; both engines using high compression ratio, the Miller Cycle and highly diluted combustion, but different in dilution methods: water injection with stoichiometric or dry with lean (homogeneous or stratified) combustion;
- An independent assessment of the progress of the project in reaching the targets and to assess the impact of the project in terms of the technological goals in these applications and in terms of societal goals: CO2 reduction (potential).

RESULTS

The project has been running for eighteen months, it is on-track and the first results have been achieved:

- A software model with various new feature has been developed and is being validated through laboratory testing. This model can be used to support the design process of low emission gasoline engines;
- To control the engine emissions, new catalytic aftertreatment arrangements are being investigated. Several new Gasoline Particle Filter specifications have been tested, many of which provide a significant reduction back-pressure over a reference formulation: this presents opportunities for improved engine fuel efficiency together with particle emissions control;
- For both demonstrator engines, the concept phases have been completed. A bundle of integrated technical measures is proposed for each engine to reach the project's ambitious targets. The technologies being considered include improved fuel injection, air handling and ignition systems, running at higher compression ratios via the controlled application of the Miller Cycle, and different forms highly diluted combustion;
- The targets that the two demonstrator engines and vehicles will have to fulfil have been set based upon baseline vehicle measurements on the chassis dynamometer and on- road over a variety of different driving cycles;
- Two technical papers related to the project have already been written and submitted. One of these papers will be presented at the TRA 2018.

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PROJECT NUMBER	723976		
PROJECT ACCRONYM	**DiePeR**		
PROJECT NAME	Diesel efficiency improvement with Particulates and emission Reduction		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	8 645 405	**EU FINANCIAL CONTRIBUTION (M€)**	7 211 029,75
WEBSITE	http://www.dieper-project.eu/		
COORDINATOR	Herwig OFNER herwig.ofner@avl.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Dieper develops advanced diesel engine technologies for passenger cars and Light Commercial Vehicles (LCV). These focus on fuel-efficient engine combustion with options such as Variable Compression Ratio (VCR), reduction of heat losses by thermo-swing wall heat insulation of the combustion chamber and associated thermal management strategies, advanced charging and EGR strategies.

The new technologies are implemented in two demonstration vehicles. Independent testing shall prove an > 5% improved fuel economy compared to MY 2015 reference engines and pollutant emissions that go to ≤ 50 % of EU 6d. The emitted particles (number) target is to go below 20% of the EU6d limit including particle emissions down to 10 nm in size. The counting of particles will be carried out with improved techniques developed in the European project ***DownToTen*** which currently is active.

The project also addresses design features, control and basic research such as modelling of particles formation and the deterioration of engine components (fuel injection system, exhaust aftertreatment system) and its effect on emissions, in order to assess the robustness of the vehicles over useful lifetime.

RESULTS

Two demonstration vehicles (2,0l Renault Espace and 3,0l Iveco Daily) will contain the following technologies. Independent testing shall confirm the achieved performance and emissions characteristics:

- **Reduction of heat losses** by advanced wall heat insulation of the combustion chamber (thermo-swing) and ports and a reduction of the charge motion (swirl)
- **Optimum utilization** of the increased exhaust energy for temperature management of EAS and evaluation of optimum concepts for heat recovery
- **Adapted** boosting, fuel injection, high pressure & low pressure EGR, charge cooling, control functions
- **Improvement of diesel particulate filters**: Sub 23nm particle source analysis, benchmarking of conventional filters, improvement of filtration efficiency including nanoparticles >10 nm at low pressure drop (< 100 mbar)

Projected by simulation:

- Fuel economy improvement by applying a combustion system with VCR
- Robustness of new technologies over useful lifetime

Status of results (project month 18). No quantitative results available yet:

- New engine and aftertreatment systems have been specified
- Vehicle baseline characteristics have been measured
- Modelling work is ongoing

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PROJECT NUMBER	724036		
PROJECT ACCRONYM	**UPGRADE**		
PROJECT NAME	High efficient Particulate free Gasoline Engines		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	9 563 222,50	**EU FINANCIAL CONTRIBUTION (M€)**	9 563 222,50
WEBSITE	http://www.upgrade-project.eu		
COORDINATOR	Stefania ZANDIRI stefania.zandiri@crf.it		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Looking to the evolution of the road transportation sector, the UPGRADE project addresses the challenging objectives to answer the needs in reducing simultaneously CO2 emissions and, more generally, noxious compounds, including nanoparticles emissions, under Real Driving conditions: the **UPGRADE project** will see the development of next generation Spark Ignited gasoline engines, optimizing the Direct Injection process with regard to fuel consumption, the nanoparticles formation process and the after-treatment system control.

The project will consider the best combination of new engine technologies addressing in parallel two different combustion approaches: stoichiometric on a new 3-cyl 1.0 l engine and lean burn on a 4-cyl 2.0 l engine and, consequently, also the after-treatment system development will consider both the combustion approaches providing a complete overview and assessment of both technologies.

Two full demonstrator vehicles, equipped with the related technologies developed in the project, will be provided to demonstrate the achievement of the target of 15% improvement on CO2 emissions based on the WLTP cycle and the compliancy with the Euro 6 RDE standard.

The project will provide several **key new knowledge and innovative technologies** that will support the development of future high efficient and clean Spark Ignited GDI engines for post 2020 market introduction. The two final demonstrator vehicles will represent the best combination of technologies, with a maturity level by TRL 7, ready to be finalized and validated for a quick market introduction, integrating an advanced after-treatment system covering also **particles filtration down to 10 nm diameter**.

RESULTS

The main scientific and technological objective of the project are the following:

1. Development of two advanced high efficient and clean engine platforms one representative of the "small" size target (around 1.0 litre displacement) and the second of the "medium" size target (around 2.0 litre displacement).
2. Study and development of new simulation models to predict nanoparticles and pollutant formation inside the combustion chamber, taking into account the different combustion approaches as well as the different charge dilution systems (exhaust gases or fresh air).
3. Analysis and development of the **after-treatment technologies**, focusing on new **GPF technologies targeting PN filtration down to 10 nm diameter (from TRL 4 to TRL 6)**; this in relationship with both 3-way catalyst for stoichiometric approach and lean burn aftertreatment systems. Provide demonstration of the overall targets through the realization of **two full demonstrator vehicles** that will be fully calibrated and **assessed by independent testing**.

Obtained results:

1. Powertrain and vehicles specification defined.
2. Engine simulation model developed, including the determination of soot size emissions.
3. Evaluation of new valve train technologies on a small size "mule" engine
4. After treatment system architecture defined, also for lean combustion ("medium" size)
5. Development of advanced and high efficient boosting system

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Horizon 2020
European Union Funding
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EGVI
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PROJECT NUMBER	724084		
PROJECT ACCRONYM	**EAGLE**		
PROJECT NAME	Efficient Additivated Gasoline Lean Engine		
START DATE	01/10/2016	**END DATE**	31/03/2020
TOTAL BUDGET (M€)	5 993 062, 74	**EU FINANCIAL CONTRIBUTION (M€)**	5 993 062, 74
WEBSITE	https://www.h2020-eagle.eu/		
COORDINATOR	Jean-Marc ZACCARDI j-marc.zaccardi@ifpen.fr		

PROJECT PARTNERS

IFP Energies nouvelles (Coordinator) · FEV · Università degli Studi di Napoli Federico II · Renault · Universitat Politècnica de València · vka Institute for Combustion Engines · RWTH Aachen University · Saint-Gobain · Continental

AIM OF THE PROJECT

The **EAGLE project** (*Efficient Additivated Gasoline Lean Engine)* aims at improving the energy efficiency of European road transport vehicles by developing a highly efficient gasoline engine adapted for future electrified powertrains.

The maximal efficiency of gasoline engines is usually lower than 40% because of various energy losses. By combining new advanced technologies, the EAGLE project is designing an innovative engine concept to reach a peak efficiency of 50%. This new concept will thus support the European automobile industry to reach the forthcoming CO2 emissions target of 50g CO2/km while complying with standards in terms of particulates and NOx emissions.

The engine efficiency will be significantly increased by the use of advanced insulating coating materials and ultra-lean mixtures (with a high excess air). However, the flame propagation being unstable in lean mixtures, the combustion process will be supported by a high cylinder charge motion, an advanced in-volume pre-chamber ignition system and the use of hydrogen.

RESULTS

According to various studies, the market share of gasoline HEV and PHEV in Europe in 2030 should be greater than 35%. In this context, a multi-mode hybrid architecture is considered in the EAGLE project in order to improve the efficiency in real driving conditions and to take into account broad customer requirements worldwide. Some first vehicle simulations have been performed to evaluate the benefits of this multi-mode hybrid powertrain and to estimate the main vehicle parameters affecting CO2 emissions considering the highly efficient internal combustion engine (ICE) that will be developed in the EAGLE project. Different scenarios were analysed depending on the driving cycles, the vehicle architecture (S/S, HEV, PHEV), and the maximal brake thermal efficiency of the ICE. First results show that PHEV architectures should be able to reach CO2 emissions of 50 g/km considering a C-class vehicle.

Several technologies are currently being developed to significantly increase the efficiency of the ICE. The impact of H2 as a combustion enhancer has been demonstrated and peak indicated efficiencies close to 47% have been achieved with ultra-lean mixtures (= 2). A pre-chamber ignition system has also been designed and numerically optimized to support the combustion process in those conditions. Additionally, smart insulation coatings are also being developed to reduce the heat loss.

These advanced technologies will be integrated and simultaneously evaluated on a single cylinder engine in 2018 with a specific control strategy. Besides, investigations are ongoing to optimise a NOx storage catalyst for ultra-lean SI engines. The performance of various materials are currently being quantified in terms of light-off, NOx and oxygen storage capabilities. **A full size LNT will be provided for the final evaluation of the EAGLE multicylinder engine in 2019-2020.**

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PROJECT NUMBER	724085		
PROJECT ACCRONYM	**DTT**		
PROJECT NAME	DownToTen. Measuring automotive exhaust particles down to 10 nano-metres		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	4 135 133,75	**EU FINANCIAL CONTRIBUTION (M€)**	4 135 133,75
WEBSITE	http://www.downtoten.com		
COORDINATOR	Zissis SAMARAS zisis@auth.gr		

PROJECT PARTNERS

Coordinator

in collaboration with international partners

AIM OF THE PROJECT

DTT aims at providing **scientific and technical contribution on total emissions control over real world operation**. DTT is developing a reliable and robust methodology that will enhance the regulatory approach in the assessment of particle number emissions in the sub 23nm region (down to at least 10nm). The size of approximately 10nm is selected to ensure that sub 23nm particles are regulated while avoiding measurement artefacts that may arise in the <10nm range. Focus is on PN emissions of the new generations of internal combustion engines with direct injection – primarily gasoline but also diesel.

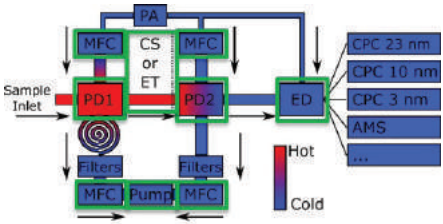
The specific objectives of the project are:

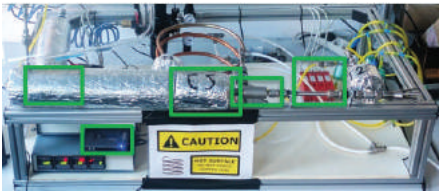
1. the unveiling and demonstrating the transformative effects of particle sampling from tailpipe exit to the detector inlet, and attempting to quantify these effects with respect to RDE and CVS measurements, in full consideration of the implications of these differences when generating a compliance factor to relate lab-based measurements to on-road PN levels; the objective is a PN-Portable Emission Measurement System demonstrator with high efficiency in determining PN emissions of current and future engine technologies in the real world,
2. to complement the in-cylinder particle formation as well as particle filtration research being undertaken in linked technology development projects (i.e., *uPGrAdE*).

To effectively address the above we have put together an unrivalled partnership of the main scientific, technical and logistical contributors to the Particle Measurement Programme – PMP and 5FP PARTICULATES programmes.

RESULTS

A prototype dilution system was developed. The **DownToTen (DTT) system** consists of one (hot or cold) porous tube dilutor, one catalytic stripper (exchangeable), one cold porous dilutor and an additional dilution (if required). The DTT dilution system was found to be a good vehicle to base the further activities of the project.





Synthetic exhaust bench tests demonstrated that the system is characterized by low non-volatile particle losses (with the exception of the catalytic stripper) and that the hot system appears to be artefact free at 10 nm against sulfuric acid – water nucleation.

Standardised penetration tests performed confirmed the low losses of the DTT system

Evaluation of the prototype system with dedicated experiments on chassis dynamometer using real exhaust showed that the penetration efficiency of the DTT system is close to the PMP system.

Computational fluid dynamics simulations (CFD) provide detailed insights on the air flow through the porous medium, and the mixing of the dilution air and the sample flow.

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PROJECT NUMBER	724136		
PROJECT ACCRONYM	**SUREAL-23**		
PROJECT NAME	Understanding and measuring SUb-23 nm particle emissions from direct injectionen-gines including REAL driving condi-tions		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	3 706 212,50	**EU FINANCIAL CONTRIBUTION (M€)**	3 428 712,50
WEBSITE	http://sureal-23.cperi.certh.gr/		
COORDINATOR	Eleni PAPAIOANNOU helen@cperi.certh.gr		

PROJECT PARTNERS

Coordinator

in collaboration with international partners

AIM OF THE PROJECT

Focus
The SUREAL-23 project focuses on the **particles**, **smaller than the current regulation cut-off limit of 23 nm**, emitted from Light Duty engines (**Diesel and gasoline**).

Objectives
- **Complement and extend** existing instrumentation for particles below 23 nm.
- **Characterize** in detail the nature of the particulate emissions below 23 nm.
- **Support future emissions** compliance through technical developments in RDE.

Innovation
- **Size and composition** analysis methods suitable for transient engine emissions.
- **Novel instrumentation** for measuring aerosol particles below 23 nm, providing backward compatibility with established PN measurement technology.
- Enhancement of instrument specifications to allow operation with less demanding sample conditioning requirements.
- Integration of the most suitable components of the extended sub-23 nm measurement toolset into **PEMS** and verification in real driving conditions.

RESULTS

Project results as of February 2018:

1. Realization of a Differential Mobility Analyzer (DMA) with **very high accuracy and resolution for particle sizes >5 nm and with minimal particle sampling and treatment requirements**; the DMA can operate at temperatures **up to 200 °C**; Particle concentration is based on electrometer signal and not optical measurements.
2. Development of a compact and straightforward electrical aerosol detector based on diffusion charging with **particle counting efficient (D50) down to 10 nm**, suitable for **PEMS** and able to operate with minimal particle sampling and treatment requirements (Temperature of sample up to 180 °C).
3. Development of an **advanced compact dilution system** able to operate efficiently under **transient conditions with variable dilution ratio** also incorporating a **Catalytic Stripper** to minimise particle losses and artefacts (99.9 % hydrocarbon oxidation efficiency, 100% sulphur trapping efficiency, >80% particle penetration for particles > 10 nm).
4. Significant progress in the development of **composition-specific particle analysers** with the incorporation of multi-wavelength photoacoustic aerosol spectroscopy and high-power super-continuum lasers.
5. Development of a robust methodology for **analysing sub-23 nm exhaust particles** via in-situ and ex-situ instrumentation and application in diverse exhaust environments such as GDI and PFI exhausts, the effect of biofuels, fuel additives, particular engine operating conditions, etc.

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PROJECT NUMBER	724145		
PROJECT ACCRONYM	**PEMs4Nano**		
PROJECT NAME	Portable Nano-Particle Emission Measurement System		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	3 752 475	**EU FINANCIAL CONTRIBUTION (M€)**	3 571 925
WEBSITE	http://www.pems4nano.eu		
COORDINATOR	Marcus RIEKER marcus.rieker@horiba.com		

PROJECT PARTNERS

HORIBA Automotive Test Systems (Coordinator) · BOSCH · CMCL Innovations · TSI Understanding Accelerated · University of Cambridge · Université de Lille 1 Sciences et Technologies · Applus IDIADA · HORIBA Scientific · UNIRESEARCH

AIM OF THE PROJECT

PEMs4Nano is developing technology to measure ultrafine particles in vehicle exhaust under real driving conditions, supporting the implementation of future EU emissions standards.

The cutting-edge technologies being developed in the PEMs4Nano project will enable the measurement of particles as small as 10 nanometres, far smaller than what the current exhaust testing systems are capable of.

The PEMs4Nano project addresses these challenges and aims to develop measurement procedures that are robust and reliable for both the development of lower emission engine technologies, as well as for serving as a solid basis for new regulations. The project will support the understanding, measurement and regulation of particle emissions below 23 nm (with the threshold of 10 nm).

Two CPC based measurement systems and the corresponding measurement procedures will be developed for use in the laboratory and for testing in real driving conditions. PEMs4Nano proposes a unique two-path approach based on advanced measurements systems and physico-chemical model guided application that connects vehicle tailpipe measurements with the origin and the evolution of the particles.

RESULTS

The existing PEMs4Nano technology is being developed to be able to reliably measure particle size distributions in the size range between 10 and 23 nm.

There have been several measurement campaigns at a single cylinder research engine for data collection and particle sampling under various engine conditions. Advanced measurement methods have been applied for a detailed characterization of particles such as atomic force microscopy (AFM), mass spectrometry (MS), infrared spectroscopy (IR) and secondary ion mass spectroscopy (SIMS). This information is necessary for an optimal design of the actual particle measurement systems for both, the laboratory and the mobile system for tests under real driving conditions that will be performed later in the project.

In parallel the model guided application (MGA) workflow that combines the physico-chemical simulation with statistical algorithms has been developed and validated against the gas phase emissions, particle concentrations and particle size distribution (10-100 nm) measurements from the single cylinder research engine. In the next step the MGA workflow is being applied to validate particle formation and evolution through to the tailpipe in multi-cylinder engine context.

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PROJECT NUMBER	724037		
PROJECT ACCRONYM	**THOMSON**		
PROJECT NAME	Mild Hybrid cOst effective solutions for a fast Market penetratiON		
START DATE	01/10/2016	**END DATE**	30/09/2019
TOTAL BUDGET (M€)	11 694 311,19	**EU FINANCIAL CONTRIBUTION (M€)**	9 123 957,51
WEBSITE	http://www.thomson-project.eu		
COORDINATOR	Stefania ZANDIRI stefania.zandiri@crf.it		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The THOMSON project will demonstrate the sustainability of **cost efficient 48V systems to increase vehicle fuel economy and to reduce pollutant emissions**, supporting a faster penetration of electrified powertrains on the market.

The twin approach (through Diesel and CNG applications) proposed in the project will demonstrate the potential of the mild hybrid approach as enabler of some useful complementary functionalities (e.g. e-boosting, e-heated catalyst) thanks to the system energy recovery capabilities.

The aim is not only to enhance the overall performance in terms of GHG emission and pollutant reduction, but also to improve functionalities of 48 Volt systems with respect to short e-drive assisted modes for a better driving experience also for the end user.

The major challenge for hybrid vehicle is the cost of its technology in relation to the benefit for end users and the variety of configurations that are possible: this project is focused on the development of advanced solutions able to reduce both the cost and complexity of pure hybrid, plug-in hybrid and range extended electric vehicles, and their effective mechanical, thermal and electrical integration into the vehicle.

RESULTS

Advanced cost effective boosting system: e-booster and new turbocharger design complete **Emission, energy and thermal management:** integrated co-simulation models have been built for the two demonstrator vehicles and have been run over the WLTC cycle with a prototype control strategy;
A prototype Thermal Management Module (TMM) has been made and will be bench-tested shortly.

Diesel cost effective hybridization technologies: The prototype vehicle has been equipped with all the new components (48V BOSCH BSG and 48V BorgWarner e-Booster, new BorgWarner turbocharger, WCAC, LP EGR); BOSCH and CRF have defined SW control functionalities in order to manage all the new components like 48V BSG, 48V e-Booster, 48V electric Heated Catalyst and the entire powertrain system; Politecnico di Milano has performed 1D and 3D simulations on the electrically heated catalyst effect on the aftertreatment showing advantages in NOx conversion efficiencies due to a higher temperatures on the inlet of the SCR system.

1.0 TC CNG Engine: identified the right concept and the corresponding powertrain system of a GTDi CNG – 48V mHEV powertrain with a dedicated air-charging system, electrified auxiliaries, optimised belt-drive systems, integration of a clutch-system for the manual transmission on the prospective 48VmHEV powertrain architecture and integration of an advanced and affordable thermal management system.

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PROJECT NUMBER	724087		
PROJECT ACCRONYM	**ORCA**		
PROJECT NAME	Optimised Real-world Cost-Competitive Modular Hybrid Architecture for Heavy Duty Vehicles		
START DATE	01/10/2016	**END DATE**	1/10/2020
TOTAL BUDGET (M€)	10 107 958,75	**EU FINANCIAL CONTRIBUTION (M€)**	8 310 755,13
WEBSITE	https://h2020-orca.eu/		
COORDINATOR	Rene CORBEIJ Rene.Corbeij@tno.nl		

PROJECT PARTNERS

TNO Coordinator, VOLVO, IVECO, VUB VRIJE UNIVERSITEIT BRUSSEL, Valeo, JM Johnson Matthey Inspiring science, enhancing life, JSR Micro JSR MATERIALS INNOVATION, BOSCH, CRF, ALTRA, Fraunhofer LBF

AIM OF THE PROJECT

The **ORCA Project** proposal addresses topic GV-03-2016, "System and cost optimised hybridisation of road vehicles" of the Green Vehicle work programme. The work proposed will, in a single coordinated project, address all the aspects of the domain 2 "For pure and plug-in hybrids, power-train system integration and optimisation through the re-use of waste heat, advanced control, downsizing of ICEs, innovative transmissions and the integration of electronic components" regarding Heavy Duty Vehicles.
The activities are conducted by an 11-member consortium from 7 different European Members States representing all requested competencies in the field of powertrain optimization for Heavy Duty vehicles. The consortium comprises OEMs, suppliers, leading Engineering and Technology Companies/organizations and Universities. The majority of the consortium are also active members of ERTRAC and EGVIA.

The overall objectives of the ORCA project are:

- Reduce the TCO to the same as diesel vehicle TCO level, targeting over 10% system cost premium reduction compared to actual IVECO hybrid bus and VOLVO conventional truck with the same performances, same functionalities and operative cost, and also targeting up to 10% rechargeable energy storage (RES) lifetime/energy throughput improvement.
- Improve the hybrid powertrain efficiency up to 5% compared to actual IVECO hybrid bus and conventional truck through optimized RES selection & sizing and by improving the energy and ICE management.
- Reduce the fuel consumption by 40% compared to an equivalent conventional HD vehicle (bus & truck).
- Downsize the ICE by at least 50% compared to actual IVECO hybrid bus and VOLVO conventional truck.
- Improve the electric range from 10km to 30km by adding the PHEV capabilities and optimising the RES capacity.

RESULTS

The requirements for the two ORCA use cases were specified by Bosch in close collaboration with the OEMs (*Volvo & Iveco*) and other partners.
The vehicle components' models are being developed. **The modelling methodology together with the components inputs/outputs has been specified and a list of parameters needed has been created and sent to OEMs.** The design of some components such as power converters and Waste Heat recovery system is ongoing. Besides, activities related to energy management strategy have started. Discussions on a common simulation platform are ongoing.
A multimodal hybrid architecture for the bus application is being investigated, defined and designed.
Main driver for architecture selection is flexibility so to guarantee optimal hybrid mode in terms of efficiency as well as TCO.
The realization of an electrical axle, that will be mounted on the Volvo demonstrator, has been investigated. A market analysis has been done with respect to hardware constraints, performance requirements and cost constraints. A parallel activity studies cost optimal sizing for a hybrid truck with an electrical axle. This is a complex problem and at this stage of the project the focus lies on methodology development.
A first project newsletter was sent out on March 31st, 2017 to a database of 2559 recipients with an expressed interest in electromobility.
Although recently started, the Annual Exploitation plan has been initially released and will set out the individual interests of the involved parties as well as defining the process for exploitation as results are generated during the project ahead.

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PROJECT NUMBER	724095		
PROJECT ACCRONYM	**ADVICE**		
PROJECT NAME	Advancing user acceptance of general purpose hybridized vehicles by improved cost and efficiency		
START DATE	01/04/2017	**END DATE**	31/03/2020
TOTAL BUDGET (M€)	12 694 011,25	**EU FINANCIAL CONTRIBUTION (M€)**	9 990 500,88
WEBSITE	http://www.iesta.at/advice/		
COORDINATOR	Lars-Olof CARLSSON olof.carlsson@volvocars.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

ADVICE aims at increasing the numbers of HEVs and P-HEVs up to 10 % of all vehicles registered in the mid-term range. This will be achieved by focusing on a market segment called "premium class", which covers medium class over upper medium class up to luxury vehicles and to SUVs. This segment is facing severe problems in reaching the more and more severe European CO2 targets, when running on fossil fuel only, not the least due to the considerable vehicle weight.

In ADVICE three physical demonstrator vehicles are built, ranging from mild-hybrid to full plug-in hybrid and – concerning fuel type – from gasoline to diesel-driven. In addition, it will be shown that the whole range in between these demonstrator vehicles can be well covered by means of validated simulation, yielding a complete coverage of the whole "premium class" segment.

Besides fulfilling the energy efficiency and emission requirements of the call and limiting premium cost to 5 % with respect to the best in-class non-hybrid diesel (and 15 % premium for a P-HEV), particular attention is devoted to optimum drivability and drive performance, which are essential when purchasing a "premium class" vehicle and thus crucial to achieve the market penetration aimed at.

RESULTS

Expected results from the project

- Cost premium of 5 % for mild and full hybrid and 15 % for P-HEV compared to best in class non-hybrid diesel vehicles available on the market 1.
- Reduction of fuel consumption on WLTP cycle by 20 % and 25 % increase in electric driving range for P-HEV, respectively.
- Demonstrating the vehicles' noxious emissions RDE compliance with a 1.5 compliance factor.
- Improvement of vehicle performance according to proper performance index 2 and the objective assessment of driveability.
- **First results based on simulation for efficiency potentials will be summer 2018**

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PROJECT NUMBER	723970		
PROJECT ACCRONYM	**FUTURE-RADAR**		
PROJECT NAME	Future Research, Advanced Development and Implementation Activities for Road Transport		
START DATE	01/01/2017	**END DATE**	31/12/2020
TOTAL BUDGET (M€)	3 499 376,25	**EU FINANCIAL CONTRIBUTION (M€)**	3 499 376,25
WEBSITE	https://egvi.eu/support-actions/future-radar		
COORDINATOR	Alexander HOLLEIS alexander.holleis@avl.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

FUTURE-RADAR supports the European Technology Platform ERTRAC and the European Green Vehicle Initiative Association to create and implement the needed research and innovation strategies for a sustainable and competitive European road transport system.

Moreover, FUTURE-RADAR facilitates the exchange between cities in Europa, Asia and Latin America on urban electric mobility solutions.

FUTURE-RADAR aims at achieving ERTRAC's holistic approach for a 50% more efficient road transport system until 2050. The dissemination of deliverables to the relevant stakeholders will strengthen the European Research Area for transport research and consequently support the development of innovations for a globally competitive European transport industry

Linking representatives of all stakeholder groups, the activities include project monitoring, strategic research agendas, international assessments and recommendations for innovation deployment as well as twinning of international projects and comprehensive dissemination and awareness activities.

RESULTS

Excellent results were already achieved.

Selected highlights:

- ERTRAC and EGVI roadmaps about electrification, automated driving, urban mobility
- Workshop about CO2 reduction from Heavy Duty Vehicles
- Support of SOLUTIONS/UEMI change-maker-call for international urban transport collaborations
- **Vision for road transport research by 2030**, covering the following items:
  - Ensure mobility in urban areas
  - Environmental sustainability: energy and resource efficiency, decarbonisation and air quality
  - Ensure an efficient and resilient road transport system
  - Connectivity and Automation – an enabler for improved mobility
  - Provide perfect protection: safety and security
  - Europe as world leader in innovation, production and services
- **ERTRAC Strategic Research Agenda 2030**

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PROJECT NUMBER	723977		
PROJECT ACCRONYM	**EMEurope**		
PROJECT NAME	ERA-NET Cofund Electric Mobility Europe		
START DATE	01/10/2016	**END DATE**	30/09/2021
TOTAL BUDGET (M€)	29 531 245	**EU FINANCIAL CONTRIBUTION (M€)**	9 745 306,76
WEBSITE	https://www.electricmobilityeurope.eu		
COORDINATOR	callsecretariat@electricmobilityeurope.eu		

PROJECT PARTNERS

TÜVRheinland® Genau. Richtig. Coordinator; bmvit; FFG; InnovationsFonden; Tekes; Bundesministerium für Verkehr und digitale Infrastruktur; TÜBITAK; FINPIEMONTE; Netherlands Organisation for Scientific Research; ACCIÓ; CDTI; Energimyndigheten

AIM OF THE PROJECT

Nineteen European national and regional government-related organisations set up the **ERA-NET Cofund Electric Mobility Europe (EMEurope) to further advance electric mobility in Europe**. This initiative is designed to take transnational emobility research and policy exchange towards deployable solutions.
In order to achieve these goals EMEurope is employing a dual strategy through:

A. Co-funded call for proposals
EMEurope will fund innovation projects focussing on the application and implementation of emobility with the objective of advancing the mainstreaming of the electrification of mobility in European urban and suburban areas. Projects shall address the following key areas of e-mobility:

- System integration (transport, (sub)urban areas)
- Urban freight and city logistics
- Smart mobility concepts and ICT applications
- Public transport
- Consumer behaviour and societal trends

B. Cooperation on policy level
EMEurope will establish a strategic pillar for governmental administrations at the ministerial level, providing a platform for cooperation and exchange of information and experiences between the involved countries. In cooperation with EGVIA, a close exchange of ideas and information will also be pursued between the governmental organisations and stakeholders from industry, academia and municipalities.
EMEurope will support the integration of new technologies into the existing transport system – particularly in urban and suburban areas – and by facilitating a stronger alignment of strategy and policy among the relevant stakeholders at the national, regional and local levels.

RESULTS

The EMEurope Call 2016 was launched in November 2016 and followed by a two-step submission and evaluation procedure, starting with the submission of light proposals.

A total of 33 light proposals were submitted and assessed by national experts either from or delegated by the EMEurope national and regional funding organisations. From those, 22 consortia were invited to submit a full proposal to be evaluated by an independet peer review of international experts.

Fourteen projects were selected for funding, covering all Key Areas addressed in the Call 2016 and finally thirteen projects will be funded. The funded projects will have a duration period between 24 and 30 months, starting in the beginning of 2018.

System integration (transport, (sub)urban areas):	eVolution2G-V2G
Urban freight and city logistics:	EUFAL
Smart mobility concepts and ICT applications:	OSCD, EMWF, eMaaS, ELECTRIC TRAVELLING
Public transport:	Trolley 2.0, CYB, COSTART e-Bus, PLATON, E-TRACT
Consumer behaviour and societal trends:	evRoaming4EU, PRO-EME

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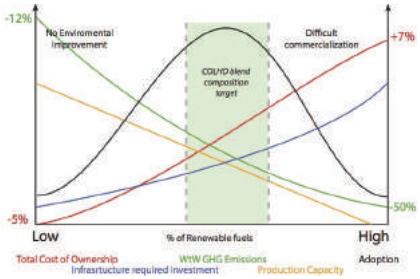
PROJECT NUMBER	769974		
PROJECT ACCRONYM	**COLHD**		
PROJECT NAME	**C**ommercial vehicles using **O**ptimised **L**iquid biofuels and **H**VO **D**rivetrains Collaborative Project		
START DATE	1/11/2017	**END DATE**	31/10/2020
TOTAL BUDGET (M€)	12 430 313.50	**EU FINANCIAL CONTRIBUTION (M€)**	8 984 735.20
WEBSITE	http://colhdproject.eu/		
COORDINATOR	Margarida LOZANO margarida.lozano@idiada.com		

PROJECT PARTNERS

Applus IDIADA Coordinator, MAN, BOSCH, SAG, REPSOL, HAM, University of Eastern Finland, VUB Vrije Universiteit Brussel, enagas, Universitat Politècnica de València, BAX & COMPANY, FordonsGas an Air Liquide company, automotive engineering iav, SIEMENS Ingenuity for life, UPC Universitat Politècnica de Catalunya BarcelonaTech, MONFORT Transportes

AIM OF THE PROJECT

The aim of the **COLHD project** is to commonly address the need to prove feasible and environmental-friendly cases of alternative fuels to fossil diesel for road transport, acknowledging the importance of reducing GHG emissions (beyond EURO 6) with affordable developments.
COLHD will follow a **3-tiered approach**, working on technology, infrastructure and removal of additional barriers. The project will optimize and further develop 3 DDF powertrains running on biogas (LBM or LBP) and 2nd generation biofuels (HVO), evaluating the several benefits under testing in the LNG Blue Corridors infrastructure. Therefore, COLHD will allow proving oil substitution on the short and medium term, addressing different markets and ranges.
Aiming at finally establish a EU market for AF HDVs, COLHD will co-develop cross-wise activities involving all key target audiences: raising awareness of general public, organising workshops with fleet operators and constantly assessing the EC on required policy directives.



Relation between % of renewable fuel substitution and TCO, infrastructure, GHG, and ultimately adoption in the case of a truck featuring COLHD's NGDI powertrain. (Curves are entirely indicative)

EXPECTED RESULTS

Optimised blends for optimal engine efficiency & emissions (LBM/ LNG and HVO)

- One or more blends of at least 30% HVO in Fossil Diesel, which can be used into COLHD Powertrain 1 and Powertrain 2
- One or more blends of at least 30% LBP in LPG and one or more blends of at least 30% HVO in Fossil Diesel, which can be used into COLHD Powertrain 3

3 DDF powertrains running on biogas (LBM or LBP) and 2nd generation biofuels (HVO)

1. HVO-LBM DDF LP (Powertrain 1) – TRL6 to TRL8
2. HVO-LBM NGDI (Powertrain 2) – TRL5 to TRL8
3. HVO-LBP DDF HP (Powertrain 3) – TRL5 to TRL8

Removing barriers

1. LCC and TCO analysis
2. Engage with at least 50 relevant Stakeholders
3. Recommendations for standards and new EC policy on AFVs

Main Expected Impacts:

- Substituting more than 750 million litres of fossil diesel by alternative fuels between 2025 and 2030
- Reducing more than 1,6 million tons CO2eq
- Market share of some 0.5% in 2025 of the total HDV fleet (expected at some 600,000 vehicles according to projections by F&S)

NOTES

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PROJECT NUMBER	769953
PROJECT ACCRONYM	**ModulED**
PROJECT NAME	Modular Electric Drivetrain

START DATE	01/10/2017	**END DATE**	01/10/2020
TOTAL BUDGET (M€)	7 022 867,50	**EU FINANCIAL CONTRIBUTION (M€)**	7 022 867,50
WEBSITE	http://www.moduled-project.eu		
COORDINATOR	BERNARD STREE bernard.stree@cea.fr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Project ModulED aims at developing a **market-driven new integrated electric propulsion system with new e-machine design, advanced motor electronics and improved transmission system**.

The powertrain itself will be modular to address multiple configurations for electric and hybrid vehicles.

The project targets:

- Powertrain related losses reduced by 50%,
- Power density increased by 5% with energy recuperation and mass reduction,
- and also the development cycle of next generation electrical powertrain modules shortened by 25%.

ModulED is based on Permanent Magnet Synchronous Motor (PMSM) and will develop new electrical machine using ferrites-based buried permanent magnets resulting in a lower content of rare earth material.

EXPECTED RESULTS

Several outcomes are expected:

- Modular design of powertrain components for hybrid and electrical vehicle, including e-motor, inverter, transmission and powertrain cooling systems
- The inverter integrates new high bandwidth GaN transistors
- The electric motor uses ferrite based permanent magnets to lower the content of rare earth metals
- A high level regenerative braking system
- Vehicle simulation solution and services supporting high speed modular electric powertrain

NOTES

Horizon 2020
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PROJECT NUMBER	769989		
PROJECT ACCRONYM	**DRIVEMODE**		
PROJECT NAME	Integrated Modular Distributed Drivetrain for Electric/Hybrid Vehicles		
START DATE	01/11/2017	**END DATE**	31/10/2020
TOTAL BUDGET (M€)	9 519 067,50	**EU FINANCIAL CONTRIBUTION (M€)**	9 519 067,50
WEBSITE	http://drivemode-h2020.eu/		
COORDINATOR	Pihlatie MIKKO Mikko.Pihlatie@vtt.fi		

DRIVEMODE
Integrated Modular Distributed Drivetrain for Electric & Hybrid Vehicles

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Within this project a **new compact and efficient high speed 30-50 kW electrical machine** will be integrated with an efficient fully SiC drive and a gearbox within a powertrain traction module. The electrical machine will have a dry rotor direct liquid cooling system integrated with the cooling system for the SiC drive. This traction module can be mechanically coupled with an axle of a low performance electric/hybrid vehicle, or several units could be coupled directly with the wheels for a high performance vehicle or a light-duty vehicle or a bus.

Economic feasibility of mass-manufacturing of different electric machine topologies will be studied to choose the best trade-off between performance, manufacturing cost, and efficiency in the selected performance range.

Feasibility of direct drive, single stage, and two-stage switchable high speed gearboxes will be studied as well. The resultant powertrain traction module will be an optimal trade-off between efficiency, manufacturability, and cost, utilizing newest technologies in electrical machines, power electronics, and high speed gearboxes.

We will demonstrate the scalability of the solution by embedding several powertrain modules on board a test vehicle.

EXPECTED RESULTS

DRIVEMODE modules will aim to satisfy demand side of different market segments (light cars, high performance vehicles, middle-sized and heavy-duty vehicles).

DRIVEMODE innovative approach supports economy of scale in manufacturing electric and hybrid vehicles.

DRIVEMODE distributed drive will enable stability control, improved steering and braking.

DRIVEMODE will integrate **high-speed SiC inverter and motor gearbox** within one compact drivetrain module and test it.

DRIVEMODE **aims at an incremental reduction in total motor and power electronics system costs** through optimised design for manufacture.

DRIVEMODE will **increase by 50% the maximum operating speed**, leading to a 30% increase in specific torque and power electric motors, whilst halving motor losses.

DRIVEMODE will target a **50% increase in the power density of motor power electronics**, reducing losses by 50%.

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PROJECT NUMBER	770143
PROJECT ACCRONYM	**ReFreeDrive**
PROJECT NAME	Rare Earth Free e-Drives featuring low cost manufacturing

START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	5 999 131,25	**EU FINANCIAL CONTRIBUTION (M€)**	5 999 131,25
WEBSITE	http://www.refreedrive.eu		
COORDINATOR	FUNDACION CIDAUT blaara@cidaut.es		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

The project is focused on **avoiding the use of rare earth magnets** through the development of a next generation of electric drivetrains, ensuring the industrial feasibility for mass production while focusing on the low cost of the manufacturing technologies.

This project will **study and develop simultaneously two solutions for the power traction system of electrical vehicles**. Both solutions are brushless AC electrical machines: induction machine with fabricated and copper diecast rotor and synchronous reluctance machine. Through their configurations these machines will be rare-earth magnet free and share common features that can be exploited during the design and manufacturing processes.

The **design of the motors will take as a premise the reduction of use of materials**, as more than half of the final price is formed by raw materials cost. Also, a minimization of manufacturing costs will be ensured. ReFreeDrive motor topologies have good room for cost reduction by off-setting permanent magnet use. However, it is not feasible to change the commodity prices for copper and steel. Therefore, one of the key avenues for cost reduction is the reduction of size through different techniques. An optimized use of copper on the project provides technical design with a higher efficiency due to lower losses regards other alternatives, and more efficient heat management.

Beyond the motor design, ReFreeDrive also consider an integrated design of the power train that allows the optimization of the electric connections, the cooling systems and the housing.

EXPECTED RESULTS

ReFreeDrive will design and develop two motor technologies with two different alternatives: IM with copper die cast rotor, IM with copper fabricated rotor, Pure SynRel, and PMa SynRel.

For each of these cases, two peak powers will be considered, delivering a total of 8 electrical machines:

- Integrated Induction Machine design with fabricated copper rotor and with die cast copper rotor
- Integrated Synchronous Reluctance Machine design, Permanent magnet assisted and pure synchronous reluctance
- Cooling system design for low cost high efficiency motors

These motors will be used for the design of integrated e-Drives, including power electronics that will be design for each power, operating for both different technologies.

- Design of advanced control algorithms for ReFreeDrive motors
- Design of advanced medium/high density electric drives integrated with the electric motor

Finally an in vehicle demonstration will be carried out for one of the power use cases.

NOTES

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PROJECT NUMBER	769826		
PROJECT ACCRONYM	**QUIET**		
PROJECT NAME	**QU**alifying and **I**mplementing a user-centric designed and **E**fficien**T** electric vehicle		
START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	6 998 955	**EU FINANCIAL CONTRIBUTION (M€)**	6 998 955
WEBSITE	http://www.quiet-project.eu		
COORDINATOR	Dr. Dragan SIMIC Dragan.simic@ait.ac.at		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

QUIET aims at developing an improved and energy efficient electric vehicle with increased driving range under real-world driving conditions. This is achieved by exploiting the synergies of a technology portfolio in the areas of:

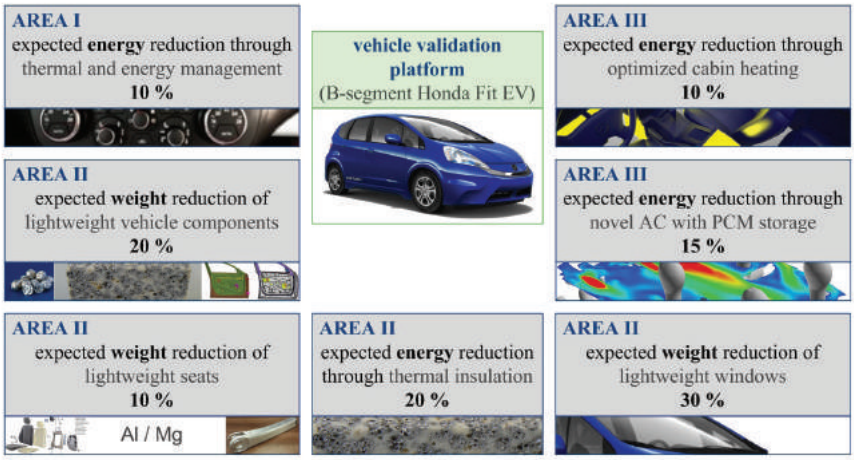
- user centric design with enhanced passenger comfort and safety
- lightweight materials with enhanced thermal insulation properties
- and optimised vehicle energy management

The developed technologies will be integrated and qualified in a Honda B-segment electric vehicle validator. Among these, a novel refrigerant for cooling, combined with an energy-saving heat pump operation for heating, advanced thermal storages based on phase change materials, powerfilms for infrared radiative heating, and materials for enhanced thermal insulation of the cabin will be investigated. Further focus is put on lightweight glazing for windows, as well as light metals like aluminium or magnesium for seat components. Optimized energy management strategies, will further enhance the thermal performance of the vehicle.

The objective of QUIET is to **reduce the energy needed for cooling and heating the cabin of an electric vehicle under different driving conditions**, by at least 30 % compared to the Honda baseline 2017. Additionally, a weight reduction of about 20 % of vehicle components (e.g. doors, windshields, seats, heating and air conditioning) is also addressed. These efforts will finally lead to at least 25 % driving range increase under both hot (+40 °C) and cold (-10 °C) weather conditions.

EXPECTED RESULTS

QUIET will provide a series of breakthrough technologies that enable **lowering the energy consumption for heating and cooling while reducing the weight of the entire electric vehicle validation platform**, resulting in an electric driving range increased by 25 %.



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PROJECT NUMBER	769902		
PROJECT ACCRONYM	**DOMUS**		
PROJECT NAME	**D**esign and **O**pti**M**isation for efficient EVs based on a **US**er-centric approach		
START DATE	01/11/2017	**END DATE**	01/05/2021
TOTAL BUDGET (M€)	8 958 010	**EU FINANCIAL CONTRIBUTION (M€)**	8 958 010
WEBSITE	https://www.domus-project.eu/		
COORDINATOR	Xavier CORT xcort@idiada.com		

PROJECT PARTNERS

AIM OF THE PROJECT

In a nutshell, the overall objective of the DOMUS project is to **reduce the overall energy consumption of future EVs** in order to increase the 25% the electric range for different ambient conditions. This will be achieved by understanding in depth the comfort perception of EV users before developing reliable methodologies for designing and assessing the full vehicle context from a user-centric perspective, investigating radically new cabin designs and delivering innovative components, systems and control strategies to meet customer expectations.

The specific technical objectives, main innovations and targeted key results are:

OBJECTIVE 1: Acquiring a thorough understanding of all factors influencing comfort perception and capturing the capability to improve EV energy efficiency while maintaining optimal user experience.

OBJECTIVE 2: Development of radical new cabin and EV designs and the methodology for virtual assessment of EV (cabin) designs that includes comfort perception, efficiency, well-being and safety.

OBJECTIVE 3: Development of new cabin components, systems and control strategies for energy efficient, safe and comfortable future EVs up to TRL 5/6 (for some potentially up to TRL 7)

OBJECTIVE 4: Implementation and validation of the developed models, cabin/EV designs and instrumental innovation of cabin components, systems and controls and assessment methodology

OBJECTIVE 5: Assess the impact and applicability of the solutions developed across different types of EVs.

EXPECTED RESULTS

DOMUS will develop, integrate and demonstrate new components, systems and control strategies for EVs that are energy efficient, comfortable, safe, configurable and cost effective.

The DOMUS project will achieve an **increase of 25% of the electric drive range of EVs** compared to their 2016 reference models to the gained understanding on how to use energy in cabin components in an optimised balance between comfort perception and energy consumption.

Development and integration methodologies, at physical and SW levels for various innovative components will be derived for further application in the new generation of electric vehicles.

DOMUS will generate know-how about user's perception of comfort and corresponding cabin requirements for future mass-market oriented efficient EVs.

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PROJECT NUMBER	770019		
PROJECT ACCRONYM	**GHOST**		
PROJECT NAME	InteGrated and PHysically Optimised Battery System for Plug-in Vehicles Technologies		
START DATE	01/10/2017	**END DATE**	31/03/2021
TOTAL BUDGET (M€)	8 870 204	**EU FINANCIAL CONTRIBUTION (M€)**	7 151 165,30
WEBSITE	http://h2020-ghost.eu/		
COORDINATOR	David STORER david.storer@crf.it		

PROJECT PARTNERS

CRF Coordinator, IVECO, TOYOTA, VUB Vrije Universiteit Brussel, JM Johnson Matthey, Infineon, umicore, ENGIE Laborelec, IK4 IKERLAN, EVE System, Fraunhofer IISB, Fraunhofer LBF, AVL, Valeo

AIM OF THE PROJECT

The aim of the GHOST project, which addresses the H2020 GV-06-2017 topic, is to contribute to **enhancing the performance Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (P-HEVs) in terms of range, battery lifetime, functional safety and reliability**. This will be achieved through a complete optimization of the electric, mechanical and thermal architecture of the on-board energy storage system. In particular, a modular, compact, integrated and standardized Battery System (BS) based on innovative thermal management solutions and new functionalized materials will be developed to enable improvement of system functionality, energy efficiency, scalability and Total Cost of Ownership.

The project also aims to provide important contributions regarding the **innovative Dual Battery System architecture based on next generation battery technologies** and its impact in terms of reducing the cost and complexity of the E/E architecture, while introducing improvements in terms of the energy density, efficiency, safety, scalability, and modularity.

Since the technologies developed in the project should have a significant impact on the performance of electrically chargeable vehicles (BEVs and P-HEVs), achieving these key innovations at affordable cost should strengthen the European technical and technological leadership in the **field of Battery Systems which is crucial for electrified vehicles**, and thus increase the competitiveness of European road vehicle manufacturers.

EXPECTED RESULTS

Considering both existing Li-ion and the future post-lithium-ion battery technologies, the main expected results are:

- Design of a novel and modular battery system with higher energy density (in weight) up to 20% based on the state-of-the-art of lithium-ion battery cell technologies through:
  - Implementation of advanced light and functionalized battery system housing;
  - Innovative, modular, energy and cost efficient thermal management architectures & strategies;
  - Optimal selection of the battery cell technology for different applications and use-cases that will be demonstrated in the project;

- Increase of the energy density of the battery system up to 30% based on novel Dual Battery System concept based on emerging lithium-sulphur technology and high power lithium-ion battery;

- Development of mass producible innovative and integrated design solutions to reduce the battery integration cost at least by 30% through smart design: starting from cell up to recycling, testing and modelling approaches;

- Definition of new test methodologies and procedures to evaluate reliability, safety and lifetime of different Battery Systems;

The technologies developed in the project are expected to be ready for first market introduction starting 2023.

NOTES

Horizon 2020
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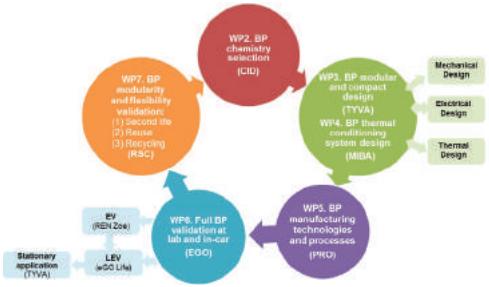
PROJECT NUMBER	770054		
PROJECT ACCRONYM	**iModBatt**		
PROJECT NAME	Industrial Modular Battery pack concept addressing high energy density, environmental friendliness, flexibility and cost efficiency for automotive applications		
START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	6 309 174,99	**EU FINANCIAL CONTRIBUTION (M€)**	5 180 794,01
WEBSITE	http://cidetec.es/imodbatt/en/		
COORDINATOR	Iosu CENDOYA iosucendoya@cidetec.es		

PROJECT PARTNERS

cidetec energy storage Coordinator · RESCOLL · TYVA énergie+ · Miba · HEXAGON studio · ISEA · RWTH AACHEN UNIVERSITY · Freemens · AIT · Cleancarb · e.GO · ACCUREC · PA PROAUTOMATION · CEA tech liten · RENAULT

AIM OF THE PROJECT

The **iModBatt Consortium** includes industrial partners of every step of the battery pack value chain, including automotive OEMs, battery parts manufacturers as well as leading European research centres with ample experience in the field of batteries.



The aim of iModBatt is to design and manufacture, with the minimum environmental impact, a high energy density modular Battery Pack, which is flexible enough to be used in automotive and small stationary applications. This battery pack will be suitable for industrial automated assembly with an easy disassembly design, to make possible the shift from primary applications to secondary ones, and to facilitate the battery pack recyclability or parts replacement if necessary.
One of the main targets of iModbatt is to increase the BP energy density by minimizing its weight. Alternative mechanical attachments between modules are proposed and conductive layers used to minimize wiring. Thermoplastic material is added to lower the weight of the cooling system and a main light cooling system independent from the vehicle is developed.

The **second important target focuses on automated BP industrial manufacturing** by an assembly unit designed within the project.
BP design is led by European industry and ruled by **eco design** recommendations and **smart recyclability** based on cell status check is implemented.
Final validation is accomplished at laboratory, in a Renault Zoe EV and an e.Go Life LEV. Additionally to this main goal the **second use and reuse** scenarios are validated in a stationary energy storage application.

EXPECTED RESULTS

- **Increase in battery pack energy density**, based on an already existing breakthrough modular battery concept around 20% compared to the current Renault Zoe EV Battery Pack. Expected by September 2020.
- **Reduction of the battery pack integration cost** by the introduction of an automated smart manufacturing unit and optimization of recyclability during manufacturing. This reduction is > 20 % if compared to current massively used semi-manual methods. Expected by September 2020.
- **Enhance the value of European SMEs and large industries** by their leadership in the project activities. Expected by September 2020.
- **Contribute to climate action** by ruling the whole battery pack design and battery pack manufacturing definition by eco-design recommendations and defining a smart recycling methodology. Expected by September 2020.
- **Create the battery pack design and manufacturing conditions** so that a second life and/or reuse of battery packs is feasible. Expected by September 2020.

NOTES

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PROJECT NUMBER	769506		
PROJECT ACCRONYM	**OBELICS**		
PROJECT NAME	**O**ptimization of scala**B**le r**E**altime mo-de**L**s and functIonal testing for e-drive **C**oncept**S**		
START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	9 077 497,50	**EU FINANCIAL CONTRIBUTION (M€)**	9 077 497,50
WEBSITE	https://obelics.eu/		
COORDINATOR	DI Horst PFLUEGL horst.pfluegl@avl.com		

PROJECT PARTNERS

AVL Coordinator, CRF, FORD OTOSAN, RENAULT TRUCKS, BOSCH, SIEMENS Ingenuity for life, UNRESEARCH, Valeo, liten, Fraunhofer LBF, FH JOANNEUM University of Applied Sciences, TU, Università degli Studi Firenze, UNIVERSITY OF SURREY, virtual vehicle, VUB, MOBILITY, LOGISTICS & AUTOMOTIVE TECHNOLOGY RESEARCH CENTRE

AIM OF THE PROJECT

Wide global deployment of EVs is necessary to reduce transport related emissions, as transport is responsible for around a quarter of EU greenhouse gas (GHG) emissions, and more than two thirds of transport-related GHG emissions are from road transport.

OBELICS addresses the urgent need for **new tools to enable multi-level modelling and testing of EVs and their components** in order to deliver more efficient vehicle designs faster while supporting modularity to enable mass production and hence improved affordability.

The overall objective of OBELICS is to develop a systematic and comprehensive framework for the design, development and testing of advanced e-powertrains and EVs line-ups, to reduce development efforts by 40% while improving efficiency of the e-drivetrain by 20% and increase safety by a factor of 10 using OBELICS advanced heterogeneous model-based testing methods and tools; as well as scalable and easy to parameterize real-time models.

OBELICS will provide a significant **"toolchain"** that allows for a reduction of development efforts and costs of electric vehicles while increasing the efficiency and reliability. As such, OBELICS will play its part in contributing to affordable EV´s.

EXPECTED RESULTS

Following results are expected from OBELICS:

- **Development of novel methodologies** for specifying and analyzing requirements with new models and testing methods;
- **Development of realistic use cases** (four engineering domains) **and metrics** for guiding development of new methods and tools for testing and modelling of electric/hybrid vehicles and components with a particular focus on battery, electric machine and inverter components;
- **A complete simulation environment**: tools (commercial or internal) that satisfy the modelling requirements and standards to share models and perform co-simulation, with requirements and boundaries for multi-physic modelling/scalable real-time models for batteries, inverters and e-motors (to be completed by the end of 2019);
- **The foreseen advances are to develop new sets of generic methods, models and simulation tools** (Generic interoperable simulation framework) efficiently supporting comprehensive EV design processes combining innovative powertrain architectures with relevantly impacting auxiliaries, for a range of vehicle configurations (by the end of 2019);
- **Advanced methodologies and strategies** for assessing functional safety, reliability and safety;
- **Analysis of second life battery market, performances/aging and applications** (by mid 2020).

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Horizon 2020
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PROJECT NUMBER	769900		
PROJECT ACCRONYM	**DEMOBASE**		
PROJECT NAME	Design and Modelling for improved Battery Safety and Efficiency		
START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	7 451 520	**EU FINANCIAL CONTRIBUTION (M€)**	7 451 520
WEBSITE	https://www.demobase-project.eu/		
COORDINATOR	Philippe DESPREZ philippe.desprez@saftbatteries.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

DEMOBASE main objectives are to cut down development and testing efforts for e-drivetrains at least by a factor 2 and to **improve their efficiency** by 20%. Safety will be fully managed and new concepts developed for fleet applications.
DEMOBASE is composed of 11 leading European partners with activities ranging from cells to vehicle to recycling.

Objectives at **battery level** will be achieved by massive digitalization, substituting the today sequential cell development then battery system development by a parallelization of these activities.
Objectives at **vehicle level** will be achieved with a novel approach to design light-weight chassis. It will be demonstrated on an urban vehicle.

DEMOBASE is an original closed-loop project. In a first loop of the EV development, building blocks and their integration processes will be assessed using Key Performance Indicators. Then the most efficient bricks and processes will demonstrate their added value in a second step in 6 months run starting from new high performances cells to operational EV.

EXPECTED RESULTS

DEMOBASE Urban EVs can install a 30kWh battery pack and run above 300 km per charge. After 7,000 charges at 50% DoD each, the vehicle would have run 1 million km with the battery pack still retaining over 90% of its original capacity.
Today fail-safe concept stops battery operation when one cell is outside safe conditions. While, DEMOBASE battery system using fail operational concept will maintain the battery and the vehicle operational.
DEMOBASE addresses the development time and the investment to make a new chassis accelerating the take up of electro-mobility.

The targeted vehicle is a M1 class one, from I-FEVS.

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PROJECT NUMBER	769935		
PROJECT ACCRONYM	**HIFI-ELEMENTS**		
PROJECT NAME	High Fidelity Electric Modelling and Testing		
START DATE	01/10/2017	**END DATE**	30/09/2020
TOTAL BUDGET (M€)	7 532 318,75	**EU FINANCIAL CONTRIBUTION (M€)**	7 532 318,75
WEBSITE	http://www.hifi-elements.eu/		
COORDINATOR	Dr. Thorsten SCHNORBUS Schnorbus@fev.com		

PROJECT PARTNERS

FEV Coordinator, RWTH Aachen University, Ricardo, tecnalia Inspiring Business, cidetec energy storage, IVECO, DENSO Crafting the Core, Jeep, Tofaş Türk Otomobil Fabrikası A.Ş., Applus IDIADA, TNO innovation for life, Mondragon Unibertsitatea Faculty of Engineering, dSPACE, VUB Vrije Universiteit Brussel, MAGNA, Ford

AIM OF THE PROJECT

HIFI-ELEMENTS will develop, validate and publish a recommendation for standardisation of model interfaces for common e-drive components, and will implement compliant versions of existing models.

The project will implement a seamless workflow linking extended versions of existing tools—a model/data management tool and a co-simulation tool for MiL and HiL environments—augmented with effort-saving automated methods for model parameterisation and test case generation.

Validation of standardised models and workflow will be done in four industry relevant use cases depicting common scenarios in e-drivetrain and EV development.

On project conclusion, the interface recommendations and workflow methods will be disseminated in order to gain widespread EV-industry adoption.

EXPECTED RESULTS

- We will publish a **recommendation for a standard functional model interface specification** for a number of E-drive components including: E-machine, inverter, DC/DC-converter, and battery (at cell, module and pack level). The proposed interface specification will be independent of the application used for the implementation of the model in order to promote model inter-operability and scalability.
- We will publish a **recommendation for a standard set of model metadata** — independent of the specific implementation of the model — that allows (third-party) users to evaluate the suitability of a model to perform certain tasks in the EV development cycle.
- **We will demonstrate** — for a number of tasks in concept-to-validation development and/or testing scenarios — that the use of our implemented workflow can reduce the total effort (in person-hours) required to perform the task by at least 50% when compared to the current, fragmented workflow.
- We will **demonstrate that by front-loading system-level testing (both virtual and hybrid) we will be able to achieve a 20% decrease in vehicle energy consumption** (compared to a baseline series driveline from model year 2016/17) due to early system optimisation (as opposed to stand-alone component optimisation) and mission/route-specific control optimisation.
- We will **demonstrate a 3- to 10-fold increase in test coverage for the same total testing effort using the SYNECT/Morphee workflow** (allowing automatic execution of test cases) in combination with automatic test case generation, prioritisation and selection, when compared to the current SotA workflow (which is the "manual", ad-hoc generation and execution of test cases).

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PROJECT NUMBER	769850
PROJECT ACCRONYM	**ASSURED**
PROJECT NAME	fa**S**t and **S**mart charging solutions for full size **U**rban h**E**avy **D**uty applications

START DATE	01/10/2017	**END DATE**	30/09/2021
TOTAL BUDGET (M€)	23 648 132,51	**EU FINANCIAL CONTRIBUTION (M€)**	18 657 433,06
WEBSITE	https://assured-project.eu/		
COORDINATOR	Prof. Noshin OMAR Noshin.Omar@vub.be		

PROJECT PARTNERS

VUB Vrije Universiteit Brussel – Coordinator; UITP; Iveco Bus; Volvo; MAN; Solaris; vectia; CAF; VDL Bus & Coach; Irizar; Jeep; Tofaş Türk Otomobil Fabrikası A.Ş.; Siemens; Alstom; ABB; heliox; Schunk; Jema; Fraunhofer LBF; FEV; AVL; AIT; virtual vehicle; ENGIE Laborelec; IK4 IKERLAN; TNO; VTT; POLIS; RINA Consulting; Iberdrola Distribución Eléctrica; ENEXIS; ETH Zürich ICCS; Rupprecht Consult; Applus+ IDIADA; SCHOLT Energy Services; iav; Politecnico di Torino; PKM Jaworzno; TMB; Stadtwerke Osnabrück

AIM OF THE PROJECT

The project will develop **innovative heavy, medium and light-duty vehicle solutions with interoperable charging infrastructure concepts**, enhancing performances, comfort and safety while reducing the TCO and contributing to a competitive and sustainable mobility

- **Development of**
  - next generation modular high-power charging solutions (*up to 600kW*)
  - interoperable and scalable high-power charging solutions
  - innovative charging management strategies
  - standardised conformance and interoperability test protocol
  - efficient wireless charging solutions
- **Demonstration of**
  - efficient wireless charging solutions (*up to 100kW*)
  - ASSURED solutions (6 public buses at TRL 7) in EU cities
- **Evaluation and improvement of the cost**, energy efficiency, impact of grid
- **Support to the standardisation bodies** (i.e. *CEN-CENELEC, ISO, IEC*)

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Topic GV-8-2017

EXPECTED RESULTS

Expected technological impact:

- Interoperability solutions for super-fast charging
- Charging energy management strategies: eco-driving, eco-charging, eco-comfort
- Improved grid stabilisation
- Contribution in standardisation for super-fast charging
- Energy efficient power train
- Improved quality during fleet charging
- Better understanding of battery: lifetime, sizing, safety and grid stability

Expected Operational Impact:

- High charging power that reduces charging time, enhancing fleet operation
- Interoperability between vehicles and charging systems of different brands
- Recommendation roadmap for interoperable fast-charging solutions
- Smart charging at the depot, enabling the efficient charging of large fleets (+100)
- Grid stabilisation through ASSURED smart solutions
- Total Cost Ownership improvement

Expected outcomes:

- Strengthening the European technical and technological leadership in the value chain of electrified urban heavy duty, medium and light-duty vehicles
- Further developing strong collaboration and interaction with Public Transport Organisations/Public Transport Authorities

NOTES

Horizon 2020
European Union Funding
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PROJECT NUMBER	769658
PROJECT ACCRONYM	**AEROFLEX**
PROJECT NAME	Aerodynamic and Flexible Trucks for Next Generation of Long Distance Road Transport

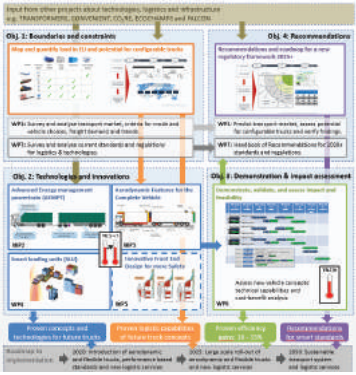
AEROFLEX

START DATE	01/10/2017	**END DATE**	31/03/2021
TOTAL BUDGET (M€)	11 818 561,25	**EU FINANCIAL CONTRIBUTION (M€)**	9 534 778,64
WEBSITE	https://aeroflex-project.eu/		
COORDINATOR	Ben KRAAIJENHAGEN Ben.Kraaijenhagen@man.eu		

PROJECT PARTNERS

MAN Coordinator, DAF A PACCAR COMPANY, IVECO, SCANIA, VOLVO, CRF, UNIRESEARCH, SCHMITZ CARGOBULL The Trailer Company, ECK, TIRSANSOLUTIONS, CREO DYNAMICS, MICHELIN A BETTER WAY FORWARD, WABCO, CHALMERS UNIVERSITY OF TECHNOLOGY, DLR, Fraunhofer IVI, HAN, Applus IDIADA, nlr, TRANSPORT & MOBILITY LEUVEN, TNO innovation for life, MHH Medizinische Hochschule Hannover, UIRR INTERNATIONAL UNION FOR ROAD-RAIL COMBINED TRANSPORT

AIM OF THE PROJECT



AEROFLEX SUPPORTS VEHICLE MANUFACTURERS TO MEET THE COMING CHALLENGES AND INCREASE EFFICIENCY FOR ROAD FREIGHT TRANSPORT.

The aim of AEROFLEX is to **develop and demonstrate new technologies, concepts and architectures for complete vehicles meeting future logistics and co-modality needs** to be met for the different segments and markets.
The optimal matching of novel vehicle concepts and infrastructures require the definition of smart performance-based standards for future trucks, load carriers and road infrastructures.

Objectives:

1. Characterise the European freight transport market (map, quantify and predict), the drivers, the constraints, the trends, and the mode and vehicle choice criteria.
2. Develop new concepts and technologies for trucks with reduced drag, which are safer, comfortable, configurable and cost effective and ensure satisfaction of customer needs under varying transport tasks and conditions.
3. Demonstration and impact assessment of potential truck aerodynamics and energy management improvements.
4. Drafting of coherent recommendations for revising standards and legislative frameworks in order to allow the new aerodynamic and flexible vehicle concepts on the road

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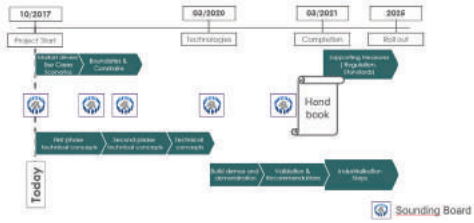
Topic GV-9-2017

EXPECTED RESULTS

The AEROFLEX project will develop the knowledge, concepts and technology to improve the efficiency of long-range freight vehicles by 18-33% while drawing up recommendations for implementing the results within European regulations and in the transport & logistic industry.

The overall efficiency target is broken down as follows:

- 4–5% energy saving by separate platforms;
- 4–6% energy saving by using loading space more effectively;
- 5–12% energy efficiency improvement from the integration of more flexible, advanced powertrains;



- 5–10% reduction in energy consumption through improved truck aerodynamics;
- Standardised interfaces and the resulting sharing of components leading to higher economies of scale;
- Front end in crashes end designs to ensure survivability in crashes up to 50 km/h for occupants and vulnerable road users.

NOTES

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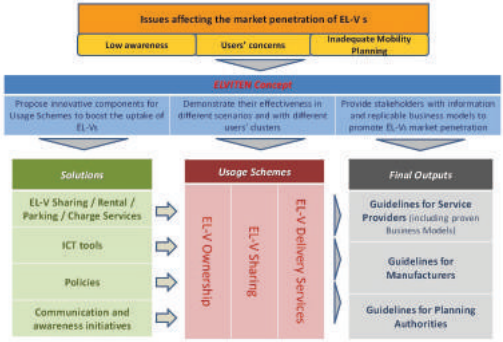
PROJECT NUMBER	769926		
PROJECT ACCRONYM	**ELVITEN**		
PROJECT NAME	Electrified L-category vehicles integrated into transport and electricity networks		
START DATE	01/11/2017	**END DATE**	31/10/2020
TOTAL BUDGET (M€)	9 544 750	**EU FINANCIAL CONTRIBUTION (M€)**	7 840 648,75
WEBSITE	http://www.elviten-project.eu/		
COORDINATOR	Angelos AMDITIS a.amditis@iccs.gr		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

ELVITEN aims to **boost the usage of all categories of EL-Vs** (bicycles, scooters, tricycles and quadricycles) **in urban environment** and ultimately to achieve a mind-shift among users by providing them with a better EL-V experience. This will be achieved by designing and offering replicable usage schemes, consisting of support services, ICT tools and policies.



The project has three principal objectives: First, it seeks to make users more familiar and facilitate them to use EL-Vs instead of ICE vehicles for their private transport and for light urban deliveries.

Second, it attempts to collect rich information sets made of real usage data, traces from dedicated ICT tools, and users' opinions after real trips.

Third, it will generate detailed guidelines and business models for service providers, Planning Authorities and manufacturers in order to make EL-Vs more attractive and more integrated in the transport and electricity networks.

EXPECTED RESULTS

ELVITEN aims to familiarise users and stakeholders with light electric vehicles via its long demonstrations in 6 Cities.

The project will set up support services for sharing or booking a light electric vehicle and for booking and paying a parking place or a charging station. It will also deploy ICT tools to facilitate and motivate the usage of light electric vehicles, including a **Motivator app and a Smart card** to collect award points for usage. A **big data bank** with logged trip and usage data and users' perceptions and experiences will be created. The analysis of this data will depict the users' needs and expectations and will lead to the creation of **guidelines for vehicle manufacturers**, so that the vehicles are in accordance to the users expectations, and to **guidelines for Planning Authorities**, as regards the most appropriate policies to support EL-Vs deployment in each City. The project will also propose sustainable business models for service providers.

All this work will speed up the penetration of EL-Vs in the market and this is expected to decongest and de-carbonise urban mobility, thus improving the quality of life in urban environments.

NOTES

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PROJECT NUMBER	769944		
PROJECT ACCRONYM	**STEVE**		
PROJECT NAME	**S**mart-**T**aylored L-category**E**lectric **V**ehicle-demonstration in h**E**therogeneousurban use-cases		
START DATE	01/11/2017	**END DATE**	31/10/2020
TOTAL BUDGET (M€)	9 517 870,18	**EU FINANCIAL CONTRIBUTION (M€)**	7 429 674,76
WEBSITE	http://www.steve-project.eu/		
COORDINATOR	Marco OTTELLA marco.ottella@infineon.com		

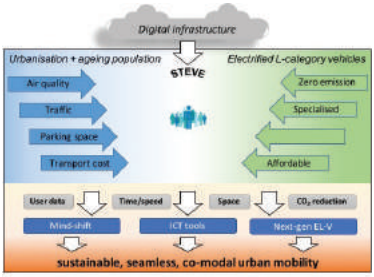
PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

Movement is at the heart of any city. Congestion and Air Polution are recurring problems of urban living which could be radically changed by a significant market penetration of EL-Vs (electrified L-category vehicles).

STEVE is developed as a stepping stone towards a vision of future mobility that provides sustainable, seamless, automated and personalised travel on demand. With a multidisciplinary team from cities, industry, small and medium enterprise and academia from 7 EU countries, supporting the idea of electromobility as a service (MaaS), STEVE will maximise the impact of urban demonstrations (Torino, Venaria, Calvià, Villach), generate data and support the necessary mind shift for a successful integration of next generation EL-Vs in the urban transport system. A gamification approach is chosen to facilitate EL-V usage, navigation systems and driver assistance systems will enhance energy-efficient usage (speed, route). STEVE proposes a human-centric vision for EL-V-based mobility, using low-cost, aesthetically attractive and connected quadricycles, for the demonstration of urban MaaS.



1: Detailed market analysis on EL-Vs and related services
2: Implementation of new energy-efficiency and customer-oriented services
3: Demonstration of the wide range of EL-V typologies and services
4: Analysis of the operation of EL-Vs in real scenarios and policy recommendations

EXPECTED RESULTS

O 1:Detailed market analysis on EL-Vs and related services

- White paper reporting on the survey and market analysis results, and proposing the main features to be implemented in the future generations of EL-Vs and EL-V services
- Survey and white paper summarising users' feedback with respect to the testing results of the STEVE use cases, state-of-the-art EL-Vs and services

O 2: Implementation of new energy-efficiency and customer-oriented services for EL-Vs, gamification approach resulting in a reduction of average energy consumption

- 5% through Human-Machine Interfaces (HMIs) suggesting the most energy-efficient path to the driver
- 15% in real-world operating conditions, through HMIs suggesting the energy-efficient velocity profile for the path selected by the user, and adaptable drivability maps

O 3: Demonstration of the wide range of EL-V typologies and services

- Fleet of 2-wheel EL-Vs and quadricyles deployed in four European cities, systematic testing of STEVE services, demonstration of EL-V focused traffic policy measures
- Deployment of next-generation, high-technology and low-cost electric quadricycles (20% cost reduction for the customer)

O4: Analysis of the operation of EL-Vs in real scenarios & policy recommendations

- 25% of measured travel time reduction (including parking) through the EL-V adoption
- Analysis of the EL-V mission profiles and energy efficiency performance
- White paper with lessons learned, recommended policies, procedures, services and EL-V design guidelines

NOTES

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PROJECT NUMBER	769929		
PROJECT ACCRONYM	**IMAGE**		
PROJECT NAME	Innovative Manufacturing Routes for Next Generation Batteries in Europe		
START DATE	01/11/2017	**END DATE**	30/04/2021
TOTAL BUDGET (M€)	4 948 026,25	**EU FINANCIAL CONTRIBUTION (M€)**	4 948 026,25
WEBSITE	https://www.h2020-image.com/		
COORDINATOR	Wolfram KOHS wolfram.kohs@avl.com		

PROJECT PARTNERS

Coordinator

AIM OF THE PROJECT

With **"IMAGE"** a **major leap towards an all-solid-state lithium battery technology** is done. The project focuses on **new materials with the major goal to build scalable industrial cells with a higher energy density, longer lifetime as well as improved safety** and thus to achieve an advanced cell technology.

IMAGE addresses the following subjects of technology to be included in battery cells applied for both mobile and stationary applications:

- Utilization of thin lithium metal foils as anode material
- Investigation of non-liquid electrolytes
- Validation of organic-solvent free manufacturing process for the cathode
- Investigation of possibilities to integrate the electrolyte into the cathode
- Utilization of novel, and more environmentally friendly electrolyte components
- Characterization of the new interfaces related to the lithium metal anode

In the course of the project, relevant processing know-how will be applied and developed in order to gain advanced manufacturing knowledge for a future high-level battery technology.

EXPECTED RESULTS

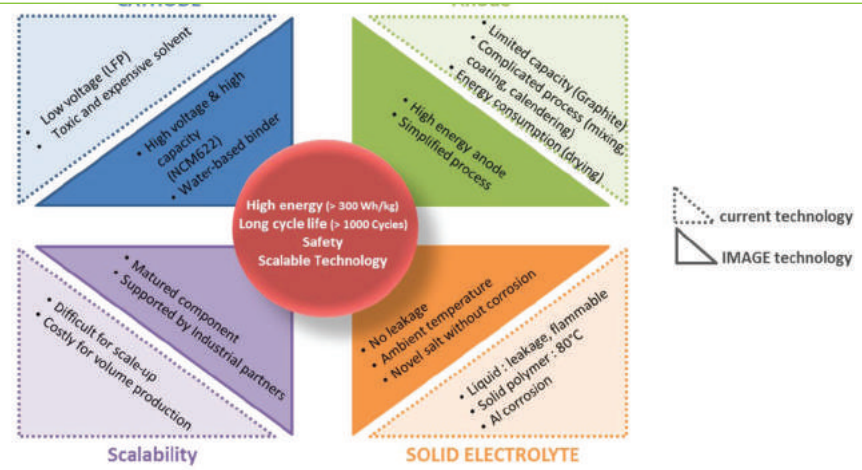

Figure 1: Ambition of IMAG

- Material characterisation reports for the electrodes and separator ➔ M20
- Mono- and multilayer cells built ➔ M20 & M33
- Analysis of selected manufacturing processes with perspective of mass production ➔ M36
- Report of ceramic and composite electrolyte battery results ➔ M40

NOTES

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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