This Book represents several goals that EUCAR strives to achieve. Most importantly, the projects address issues that are at the top of the political agenda and that are important for Europe. The world around us is changing and therefore the role of innovation and research becomes vital in keeping Europe at the forefront of technological advancement. This can be seen through the projects with focus on issues such as automated driving, connected mobility and climate change.

All of our projects are the result of combining forces in order to devise strategies and find solutions. Furthermore, involving all relevant stakeholders is crucial to delivering the positive impacts upon which we all depend for our continued economic and social prosperity. Likewise, gathering the critical mass and momentum for faster implementation of R&D results is the approach needed to achieve clean, safe, efficient and sustainable transport to guarantee quality of life, growth and jobs.

This list of projects also indicates that the European dimension is of the utmost importance to the automotive industry. Horizon 2020 provides a stable ecosystem that allows for different actors to meet and collaborate. The framework programmes have helped us to bring solutions to society’s problems to market more rapidly than would have otherwise been possible. The fifteen European passenger car and commercial vehicle manufacturers within EUCAR are technology and business leaders and are crucial for the European economy. We hope that this book will illustrate our engagement at the EU level and our commitment to projects which benefit European society at large.

So get inspired - working together creates new ideas and makes projects better & stronger

Urban Wass
EUCAR CHAIRMAN 2017
SENIOR VICE PRESIDENT, RESEARCH & INNOVATION POLICY, VOLVO GROUP
THE EUCAR MISSION

To strengthen the competitiveness of the European automotive manufacturers through strategic collaborative research & innovation by:

- Driving strategy and assessment of collaborative automotive research & innovation
- Giving guidance and perspectives to help society achieve safer, cleaner, smarter and more efficient transport solutions
- Facilitating creation of high quality projects with industrial relevant results
- Establishing common work with the European Commission, Member States and other key stakeholders
- Collaboration with other associations and technology platforms to establish and communicate common positions
THE EUCAR STRATEGY FOR RESEARCH & INNOVATION

COMMERCIAL VEHICLES

SAFE & INTEGRATED MOBILITY

SUSTAINABLE PROPULSION

AFFORDABILITY & COMPETITIVENESS
Smart and safe vehicles for all purposes, integrated into a secure and intelligent transport system, progressing towards seamless mobility for all, maximum efficiency and ever-fewer accidents.

Collaborative automotive R&I towards propulsion systems which are clean and energy-efficient over the full life cycle, with cost-effective technologies while maintaining customer priorities.

New sustainable approach for developing and producing affordable and competitive vehicles in Europe.

An integrated approach for reliable, clean, safe and efficient freight transport and passenger mobility, through dedicated vehicle concepts and effective logistics.
SAFE & INTEGRATED MOBILITY

THE EUCAR STRATEGIC VISION

Smart and safe vehicles for all purposes, integrated into a secure and intelligent transport system, progressing towards seamless mobility for all, maximum efficiency and ever-fewer accidents.

SAFETY
Vehicles that protect their passengers, avoid accidents and dialogue safely with their drivers. Communications that enable cooperative safety for all road users. Safe application of increasing vehicle automation.

TRANSPORT / TRAVEL SYSTEM
An integrated system that provides comprehensive real-time actionable data, facilitates modal transitions and manages traffic for maximum mobility, efficiency and optimum use of infrastructure.

TRAFFIC EFFICIENCY
Substantially increased efficiency of passenger and goods traffic measured by time available for other purposes, consumption of individual vehicles and whole system efficiency.

VALUE ADDED CUSTOMER SERVICES
Highly valuable services, available to drivers and customers, that enhance the driving and mobility performance and experience, and provide additional business opportunities.

ICT & TELEMATICS
Vehicles that are integrated with the electronic information cloud, enabling a complete system approach for smart vehicles and intelligent transport.
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ADAPTIVE

Automated driving applications and technologies for intelligent vehicles

MOTIVATION AND OBJECTIVES
ADAPTIVE developed, tested and evaluated automated driving applications for passenger cars and trucks in daily traffic. Guidelines for the implementation of human-machine interaction were provided. To enhance the performance of automated systems the project improved the communication capabilities. It defined and validated new specific evaluation methodologies and examined existing legal conditions with regards to barriers to implementation.

EXPECTED IMPACT
• Society of Automotive Engineers (SAE) L3 and L4 functions ready for pilot testing
• Increased user acceptance by new guidelines for human-machine interaction
• Foundation for code of practice for automated driving laid

TECHNICAL APPROACH
• Derive functional and operational requirements
• Define technical specifications, considering cooperative technologies
• Integrate functionalities in demonstrator vehicles
• Provide guidelines on legal aspects
• Evaluate automated driving applications in realistic driving manoeuvres

ADAPTIVE DEMONSTRATOR

ACHIEVEMENTS
• Classification of automated systems from a legal perspective and examination of legal conditions
• Eight advanced demonstrator vehicles: seven passenger cars and one truck
• Evaluation methods and tools for and improved understanding of the impacts of automated driving on road safety, traffic and the environment. Improved human-machine interaction

BUDGET
€25 million

FUNDING
€14.3 million

START
January 2014

DURATION
42 months

CALL
FP7-ICT-2013-10

CONTRACT N°
610428

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PSA Peugeot Citroën, Renault Group,
Volvo Cars, Volvo Group.

Other: 18 partners from well-known academia and research centres, as well as highly successful industries.

www.adaptive-ip.eu
**ROBUSTSENSE**

Robust and reliable environment sensing and situation prediction

**MOTIVATION AND OBJECTIVES**

ROBUSTSENSE develops a robust and reliable sensor platform for automated and assisted driving capable of adapting to harsh conditions like snow, rain or sun-flare, and single sensor failures. Today’s systems decide in a binary manner on function availability. In case of a disturbance the system fails. ROBUSTSENSE will improve sensor technologies and advance methods for sensor signal processing and sensor data fusion. Based on an integrated system approach ROBUSTSENSE will add redundancy on sensor and processing level.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**

ROBUSTSENSE focuses on prototyping a system platform that will be capable of self-monitoring and information fusion. Each component should be able to continuously monitor its own performance and deliver this information to the other modules. Based on the current reliability of the sensors, the overall performance of the driving assistance system will be adapted and might – e.g. in case of bad weather – be reduced consequently to the safe range. Thus, ensuring continued system functioning – albeit with reduced performance.

**CONTINUOUS WORK OF THE ROBUSTSENSE SENSOR PLATFORM**

**ACHIEVEMENTS**

- Defined general system architecture, interfaces between components and to sensor fusion modules, validation criteria for sensors
- Enhanced sensors performance with new 1500 nm LIDAR (Laser Imaging Detection and Ranging) prototype
- Developed overall performance and reliability monitoring assessment module
- Showed a proof of concept of the ROBUSTSENSE platform focusing on key elements applied to different existing systems and functions

**BUDGET**

€10.5 million

**FUNDING**

€3.3 million

**START**

June 2015

**DURATION**

36 months

**CALL**

H2020-ECSEL-2014-1

**CONTRACT N°**

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www.robustsense.eu
DENSE

Adverse weather environmental sensing system

MOTIVATION AND OBJECTIVES

Reliable detection of vehicles' surroundings is necessary for higher automation levels of automated driving. Currently used sensors in the automotive domain show significant performance decreases under adverse weather conditions. DENSE overall objective is to design, develop, and validate an all-weather sensor suite for driver assistance and automated driving to enable operation especially in adverse weather like rain, snow, and fog.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH

The new sensor suite is based on a smart integration of three different technologies: Radio radar (MIMO Radar), gated short-wave infrared camera (SWIR) with pulsed laser illumination and short-wave infrared LiDAR (SWIR LiDAR). The sensor suite should consist of a combination of these sensors due to redundancy requirements. Neither one of the sensors alone manages variable visibility conditions especially under high safety requirements for autonomous driving. In addition, a mobile road state sensor will allow for the assessment of road surface conditions.

DENSE SENSOR CONCEPT

ACHIEVEMENTS

DENSE finished the specifications and system architecture as well as first baseline tests. It is now focusing on the development of:
• Radar concept for operating in 77-81 GHz automotive frequency band
• Short Wave Infrared (SWIR) gated camera sensor and illumination
• SWIR LiDAR, as well as, road state sensor
• Signal enhancement and fusion algorithms based on convolutional neural networks
L3PILOT

Piloting automated driving on European roads

MOTIVATION AND OBJECTIVES
L3PILOT tests the viability of Automated Driving as a safe and efficient means of transportation. The project focuses on large-scale piloting of SAE Level 3 functions, with additional assessment of some Level 4 functions. The functionality of the systems used is exposed to variable conditions in 11 European countries, 100 vehicles and 1,000 test drivers. The tested functions cover a wide range from parking to overtaking, and urban intersection driving.

EXPECTED IMPACT
The stringent user-centric approach of L3PILOT will lead to the optimal design and handling of Automated Driving functions and will generate knowledge about the most effective way of implementing these systems. Furthermore, it will contribute to knowledge about L4 and L5 function developments, and potential pitfalls while driving automatically.

TECHNICAL APPROACH
- Create a standardised Europe-wide piloting environment for Automated Driving
- Define a common FESTA methodology and implement it on the test sites
- Coordinate pilot activities to acquire the required data
- Conduct Automated Driving tests in northern, central and south-western Europe, including cross-border activities
- Evaluate automated driving functions and connected automation
- Perform data analysis and provide recommendations for deployment

L3PILOT project approach

BUDGET
€68 million

FUNDING
€36 million

START
September 2017

DURATION
48 months

CALL
ART-02-2016

CONTRACT N°
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Ford of Europe, Jaguar Land Rover,
Opel Automobiles,
PSA Peugeot Citroën, Renault Group,
Toyota Motor Europe, Volvo Cars.

Other: 23 partners from well-known academia and research centres, as well as highly successful industries.

ACHIEVEMENTS
First project results are expected at a later stage.

www.L3Pilot.eu
MOTIVATION AND OBJECTIVES

ADAS&ME will develop Advanced Driver Assistance Systems (ADAS) that incorporate driver/rider state, situational/environmental context and adaptive interaction, to automatically transfer control between vehicle and driver/rider and thus ensure safer and more efficient road usage for all vehicle types (conventional and electric car, truck, bus, motorcycle).

EXPECTED IMPACT

- Resource efficient transport that respects the environment
- Better mobility, less congestion, more safety and security
- Forward looking activities for policy making
- Reduction of the automated driving systems’ development costs
- Enhanced robustness and performance of sensor and data analysis systems and optimized HMI and advice strategies
- Improved efficiency, safety and traffic flow through better use of the existing infrastructure capacity

TECHNICAL APPROACH

The holistic approach of ADAS&ME considers automated driving/riding along with information on driver/rider state, to develop optimized HMI and support strategies, where automated and partly automated driving/riding is seen as, both an influencing factor, and a tool to affect driver/rider state.

ADAS&ME ADDRESSES, AMONG OTHERS, DRIVER’S FATIGUE

Achievements

The most relevant result, so far, is the State-of-the-Art (SoA) and Benchmarking deliverable. This document reports the results from the literature review and benchmarking search carried out within task A1.1 “Benchmarking and SoA” for systems that are relevant to the project’s preliminary Use Cases (UCs) of ADAS&ME project.
ENABLE-S3

European initiative to enable validation for highly automated safe and secure systems

MOTIVATION AND OBJECTIVES

ENABLE-S3 aims at significantly raising the level of dependability of automated systems and keeping the effort and costs for testing at a reasonable level. This will be achieved by the provision of a comprehensive modular verification and validation framework. Methods and bricks will be developed to reduce the required test effort across six industrial domains (Automotive, Aerospace, Rail, Maritime, Health, Farming), fostering cross-domain reuse and knowledge exchange wherever possible and reasonable.

PROJECT PLAN, MILESTONES AND DELIVERABLES

ENABLE-S3 MODULAR VALIDATION FRAMEWORK (SEE BELOW)

ACHIEVEMENTS

The development of automated systems is satisfactorily understood in terms of technology. However, demonstrating reliability, safety, and robustness in all possible situations is still a key challenge. ENABLE-S3 has defined 12 use cases and derived requirements for the respective test systems. First technology bricks have been implemented in the first year and integrated in first prototypical demonstrators.
## MOTIVATION AND OBJECTIVES

Connected and automated driving (CAD) promises a variety of socio-economic benefits, starting from increased road safety towards increased productivity, improvements of social inclusion and energy savings. Connectivity will further expand the performance of vehicles towards highly automated vehicles. Therefore, the project will bring together the automotive, telecom and ICT industries in order to identifying pathways in a cross-sectorial roadmap for an accelerated proliferation of safe and connected automated driving in Europe.

## TECHNICAL APPROACH

Starting from a state-of-the-art analysis on the basis of previous and ongoing research projects as well as the investigation of user expectations and concerns, the roadmap will propose actions of technical and non-technical nature and indicate the time frame of implementation. The actions will result from the analysis of gaps, potential use cases, business models and international trends. Dedicated advice will be derived for policy makers at EU, member states and regional levels as well as for companies and the general public.

## VISION OF CONNECTED AND AUTOMATED DRIVING IN 2030

A broad overview on societal trends, regarding goals, expectations and hurdles, in CAD was established through expert workshops and in cooperation with the broad stakeholder network, which was the foundation of the vision for CAD in 2030. Furthermore, the state of the art of technical and legal enablers for CAD have been analysed and novel business models have been identified. These results serve as the basis for the development of a comprehensive roadmap for CAD in 2030 to advise policy makers and public authorities.
CARTRE
Coordination of automated road transport deployment for Europe

MOTIVATION AND OBJECTIVES
Accelerating the development and deployment of Automated Road Transport (ART) in Europe is the mission of the coordination and support action CARTRE. It facilitates the development of clearer and more consistent policies of EU Member States in collaboration with industry players to:
• Ensure that stakeholders are well informed of ART activities
• Actively support ART pilots and test across Europe
• Establish European leadership through public-private collaboration

EXPECTED IMPACT
CARTRE contributes to the EU policy goals in terms of road safety, reduced congestion, energy efficiency and air quality as well as ensuring the leading role of European industry in the global market to boost sustainable growth and create jobs. CARTRE is constituted to bring different stakeholders group closer and reach wider consensus and understanding across the groups.

TECHNICAL APPROACH
Stakeholders and potential data re-users are interviewed on requirements for data and evidence to be collected. New FOT (Field Operational Tests) are contacted and interviewed for their main evaluation plans and needs for methodology support. A data exchange platform is created. A common methodology for conducting the studies and for analysing the results and impacts is maintained and improved. The different possibilities for analysis and re-use of available data are demonstrated in case studies.

1ST CONFERENCE ON CONNECTED AND AUTOMATED DRIVING
In April 2017, CARTRE co-organised the First European Conference on Connected and Automated Driving, which drew 700 high-level participants to Brussels. Eleven thematic working groups have developed policy positions on their respective fields. CARTRE centrally contributed to the updated ERTRAC roadmap on research in Connected and Automated Driving and its website has become a go-to reference on the subject.

BUDGET
€3 million

FUNDING
€3 million

START
October 2016

DURATION
24 months

CALL
H2020-ART-06-2016

CONTRACT N°
724086

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Fiat Chrysler Automobiles,
Renault Group, Volvo Cars.

Other: 36 partners from well-known academia and research centres, as well as highly successful industries.

www.connectedautomateddriving.eu
**PROSPECT**

Proactive safety for pedestrians and cyclists

**MOTIVATION AND OBJECTIVES**

Traffic accidents involving pedestrians and cyclists are still a significant issue for global road safety. The Autonomous Emergency Braking (AEB) systems that avoid/mitigate Vulnerable Road Users (VRU) accidents are already on the market. The PROSPECT project aims to improve the effectiveness of active VRU safety systems compared to current ones by expanding the scope of addressed accident scenarios and improving the overall system performance (VRU sensing, situational analysis, etc.).

**EXPECTED IMPACT**

PROSPECT contributes not only to the generation of state-of-the-art knowledge but as well to technical innovations i.e. methodologies and tools for testing and next generation AEB systems. The results will enhance road safety, contributing to the ‘Vision Zero’ of no fatalities in road traffic. Test methodologies and tools shall be considered by Euro NCAP with an aim to support the EC goal of halving the road toll by 2020.

**TECHNICAL APPROACH**

PROSPECT comprises: better understanding of relevant VRU scenarios by means of statistical accident studies and naturalistic observations; improved VRU sensing by enlarged sensor coverage and situational analysis; advanced control strategies such as combined steering/braking; project demonstrators that integrate envisaged concepts; validation in realistic traffic scenarios, user acceptance tests and test methodologies that will be proposed to Euro NCAP for standardization.

**THE PROSPECT PROJECT MILESTONES**

**ACHIEVEMENTS**

The concepts for sensors and control systems will be shown in vehicle demonstrators, mobile driving simulator and tested using novel dummy specimen

- New sensor concepts and operation modes for AEB VRU systems
- New generation of AEB VRU systems fitted into passenger cars
- Test and assessment methods for Euro NCAP AEB VRU systems
- Test tools for AEB VRU development and testing
**SAFE & INTEGRATED MOBILITY**

**EUCAR PROJECT BOOK 2018**

**SENIORS**

Safety enhanced innovations for older road users

**MOTIVATION AND OBJECTIVES**

A reduction of 48% of all road fatalities was achieved in Europe in the past years. However, among all the road fatalities, the proportion of elderly is steadily increasing. In an ageing society, SENIORS aims to improve the safe mobility of the elderly (and overweight people). Thus, this project primarily investigates and assesses the injury reduction that can be achieved through innovative and suitable tools as well as passive vehicle safety systems targeting the protection of the elderly.

**EXPECTED IMPACT**

SENIORS provides test tools, procedures and assessments to increase the level of road safety in near- to mid-term especially for older car occupants, pedestrians and cyclists. These means will demand the still expected high potentials of passive vehicle safety systems lead also to the introduction of enhanced, adaptive restraint systems.

**TECHNICAL APPROACH**

SENIORS has four technical Work Packages (WP1 – WP4) which provide substantial knowledge throughout the project focusing on car occupants, pedestrians and cyclists. These WPs consider “Accidentology and behaviour of elderly in road traffic”, “Biomechanics”, “Test tool development” and the “Current protection and impact of new safety systems”. The transfer of knowledge and results is guaranteed through cooperation with regulatory, industry, consumer and insurance entities.

**RESULTS FROM THE SENIORS PROJECT**

**ACHIEVEMENTS**

- View on anthropometric particularities of the elderly and their injury mechanisms compared with younger persons
- Development and optimization of test tools, procedures and assessment methods in the area of passive vehicle safety regarding the needs of the elderly
- Identifying differences in the dynamics of different age groups in the pre-crash and crash phase
- Customised R-scripts package for the calculation of injury risk curves

**BUDGET**

€2.9 million

**FUNDING**

€2.9 million

**START**

June 2015

**DURATION**

36 months

**CALL**

H2020- MG-3.4-2014

**CONTRACT N°**

636136

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Other: Autoliv, BASt, Humanetics,
idiada, LMU Munich,
Transport Research Laboratory.

[www.seniors-project.eu](http://www.seniors-project.eu)
SUSTAINABLE PROPULSION

THE EUCAR STRATEGIC VISION

Collaborative automotive R&I towards propulsion systems which are clean and energy-efficient over the full life cycle, with cost-effective technologies while maintaining customer priorities.

ICE BASED POWERTRAIN
Highly efficient and affordable powertrains with an internal combustion engine as the major propulsion unit, based on most advanced components, system architecture and operation strategies.

XEV* BASED POWERTRAIN
Highly efficient and affordable electrified powertrains, based on most advanced components and system architecture.

FUELS & INFRASTRUCTURE
Advanced fuels, including electricity, produced sustainably and under efficient processes including required infrastructure.

VEHICLE THERMAL & ELECTRIC ENERGY MANAGEMENT
Efficient management of thermal and electric energy flows in the vehicle.

* xEV includes BEV, FCEV, REEV, PHEV
## MAPPING

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### MOTIVATION AND OBJECTIVES

The objective of ECAIMAN is to bring European expertise together to develop a battery cell that can be produced in Europe and meet the following demands:

- Energy density of Lithium-ion batteries (LIB) of ~270 Wh/kg
- Cost 200 €/kWh

The project will also investigate the integration in light, passenger, and heavy-duty vehicles and validate safety and reliability of the cells.

### EXPECTED IMPACT

- Stimulate European innovation and capacity in the production of high-energy automotive Li-Ion cells
- Support proliferation of battery (PH)EVs through low-cost cutting-edge battery technology
- Participate in EU standardization efforts, update test procedures for future high-voltage cells

### TECHNICAL APPROACH

The objectives will be achieved by:

- Industrialising a 5V high-voltage spinel cathode material
- Industrialising a high-capacity composite anode material
- Industrialising a stable high-voltage electrolyte
- Producing Technical Readiness Level 6 (TRL) large-scale automotive cells applying above materials and technology

### MAIN AREAS COVERED BY ECAIMAN

- Electrolyte, cathode and anode improvements for market-near next-generation lithium ion batteries

### ACHIEVEMENTS

- Working 5V full cell with water-processable anode and without the use of critical raw materials
- Flexible module design integrating the requirements of light, passenger and heavy-duty vehicles
- High-capacity tin-dioxide anode

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**www.ecaiman.eu**
GHOST

Integrated and physically optimised battery system for plug-in vehicles technologies

MOTIVATION AND OBJECTIVES

The GHOST project addresses all aspects for integrating hybrid and electric vehicle batteries at pack level aiming at increased energy density and efficiency. GHOST includes important contributions on the innovative Dual Battery System (DBS) architecture based on next generation of battery technologies (i.e. Li-S) and its impact in terms of reducing the cost and complexity of the E/E architecture while improving energy density, efficiency, safety, scalability and modularity.

EXPECTED IMPACT

Novel modular BS with up to 20% higher energy density through advanced light and functionalized housing material; innovative, modular, energy/cost efficient thermal management; BS energy density increase up to 30%; development of mass producible innovative and integrated design solutions to reduce at least by 30% the battery integration cost through smart design. Design for low cost disassembly and 2nd life use.

TECHNICAL APPROACH

The activity proposed will be conducted by a 13-strong consortium from to 7 EU member states providing the full range of competencies in the field of Battery Systems (BS) and their thermal management, integration and safety for automotive applications (including OEMs (Fiat Chrysler Automobiles, IVECO, Toyota Motor Europe), suppliers (CLEPA), research and innovation providers, and universities (EARPA) many of which are active in ERTRAC).

WORKPLAN FOR THE GHOST PROJECT

ACHIEVEMENTS

The aim is to achieve integrated Li-ion module for different energy-power requirements through appropriate series-parallel connection and different integrated thermal management solution. Validation will be performed with two full-scale Battery Systems with low-weight housing on a Fiat 500X P-HEV and an IVECO BEV with very high-power opportunity charge capability. Laboratory demonstration of longer term hybrid dual battery unit with higher energy post Lithium-Ion technology.

www.h2020-ghost.eu
HyFIVE

Hydrogen for innovative vehicles

**MOTIVATION AND OBJECTIVES**

HyFIVE is an ambitious European project with 15 partners who will deploy 185 fuel cell electric vehicles (FCEVs) from the five global automotive companies leading their commercialisation (BMW Group, Daimler, Honda, Hyundai Motor Europe and Toyota Motor Europe). Refuelling stations configured in viable networks have been developed in three distinct clusters by deploying 6 new stations linked with 12 existing stations.

**EXPECTED IMPACT**

The project’s scale and pan-European breadth allow it to tackle all of the final technical and social issues which could prevent the commercial roll-out of hydrogen vehicle and refuelling infrastructure across Europe. Research tasks will ensure these issues are analysed and that the learning is available for the hydrogen community across Europe.

**TECHNICAL APPROACH**

- Demonstrating that the vehicles meet and exceed the technical and environmental expectations for FCEVs
- Establishing best practice for supporting FCEVs e.g. new procedures for equipping maintenance facilities, training dealers, establishing a spare parts regime etc
- Using the project stations to discover solutions to outstanding tech issues facing HRSs e.g. electrolyser for generating renewable hydrogen

**ACHIEVEMENTS**

We have effected notable changes to policy across Europe, transforming the policy environments to commercialise the sector and prepare the market for high volumes of hydrogen vehicles and interoperability of stations. London has seen the co-integration of stations including a new relationship between ITM Power and Shell to expand the network; 700 bar refuelling for Italy; and tax exemption for low and zero emission vehicles has been extended in Denmark to 2019.
H2ME

Hydrogen mobility Europe

**MOTIVATION AND OBJECTIVES**

Significant progress in the hydrogen mobility sector have been achieved in recent years: with the market launch of Fuel Cell Electric Vehicles (FCEV) from major OEM and a basic network of hydrogen refuelling stations (HRS) operating. This demonstrates a transition from R&D to an early market introduction. However, efforts are still required to make the sector truly ready for a mass commercial market, requiring innovation and joint collaborative actions, at a pan-European scale.

**EXPECTED IMPACT**

The project will have the following expected impact:

- Demonstrate new vehicles across a range of platforms (Daimler, Honda, Hyundai, Toyota and Symbio)
- Develop attractive ownership case to allow increased sales volume and hence additional loading of HRSs
- demonstrate the role of electrolyzers as a beneficial contributor to the energy system by providing grid balancing services

**TECHNICAL APPROACH**

H2ME brings together actions in 10 European countries to deploy innovations in a 6-year collaboration. The project will perform a large-scale market test of a large fleet of FCEVs (1400) and associated refuelling infrastructure (49) operated in real-world customer applications across multiple European regions. In parallel, it will demonstrate that the hydrogen mobility sector can support the wider European energy system via electrolytic hydrogen production.

**H2ME PARTNERS AND DEMONSTRATION SITES**

**ACHIEVEMENTS**

Key progress during initial years of the project includes:

- Commissioning of 4 HRS and work under way for a further 45
- Over 100 FCEVs in operation and sales activities started in 10 countries
- Technical data sets for equipment in operation were delivered and analysed; HRS in operation have achieved 98.2% availability to date and H2ME project vehicles have now driven 625,300 km driven and consumed a total of 7,900 kg of hydrogen

**BUDGET**

€68 million

**FUNDING**

€32 million

**START**

June 2015

**DURATION**

11 months

**CALL**

H2020-JTI-FCH-2015-1

**CONTRACT N°**

700350

**COORDINATOR**

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**PARTNERS**

EUCAR members:
Audi (Volkswagen Group), BMW Group, Daimler, Hyundai Motor Europe, Toyota Motor Europe, Renault Group.

Other: 34 partners from well-known academia and research centres, as well as highly successful industries.

www.h2me.eu
Feasibility analysis and development of on-road charging solutions for future electric vehicles

**MOTIVATION AND OBJECTIVES**

FABRIC assesses the technological feasibility, economic viability and socio-environmental impact of dynamic charging of electric vehicles (EVs). The basic project objectives can be summarised as follows: Development and testing of advanced dynamic, wireless charging solutions; Specifications for sustainable integration with road and grid infrastructures; Long-term socioeconomic impact & feasibility studies for large-scale deployment of dynamic EV charging.

**EXPECTED IMPACT**

FABRIC is expected to have an impact on future Electromobility R&D by assessing the use of dynamic charging as a means to reduce the size and weight of EV batteries, thus making EVs more affordable to the general public. Wireless charging could also increase the users’ convenience allowing “dynamic” battery recharging on the go, making future EVs an even more attractive choice in relation to conventional vehicles.

**TECHNICAL APPROACH**

In order to assess the technological feasibility and long-term viability of dynamic wireless EV charging solutions and their large-scale deployment potential, novel wireless power transfer solutions were developed and adaptations of EVs, road and grid infrastructures were implemented and are being tested in three test sites in Italy, France and Sweden. Testing results will feed to thorough feasibility analyses and impact assessment of large-scale deployment in relation to users, society and the environment.

**FABRIC ON-ROAD CHARGING**

The main achievement of FABRIC in the past years is the design and construction of three different wireless charging prototypes for EVs. A >100m e-road has been constructed and was successfully tested for 20kW charging at speeds over 100km/h at the French test site with wide media coverage. The construction of the Italian test track, hosting two charging prototypes, is being finalized and tests will follow soon. Large-scale deployment feasibility studies are currently ongoing.
ECOCHAMPS

European competitiveness in commercial hybrid and automotive powertrains

MOTIVATION AND OBJECTIVES

To increase user interest in hybrid vehicles, the ECOCHAMPS project aims to extend their functionality while minimising their cost premium. The overall objective 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.

EXPECTED IMPACT

Achieving the key innovations at affordable cost will strengthen the technological leadership in powertrain and system optimization, will establish a leading position in hybrid technology and increase the competitiveness of European road vehicle manufacturers. Equally importantly, the technology will have a strong impact on the reduction of CO2 for road transport and improvements in air quality.

TECHNICAL APPROACH

ECOCHAMPS’ overall concept, approach and methodology of the work plan, is based on the following logical steps:
• Target setting
• Modularisation, standardisation and development of hybrid components leading to cost optimisation
• Design and build up the hybrid drivelines and vehicles
• Evaluate the demonstration vehicles, underlying hybrid powertrains, components and technologies
• Prepare the implementation and exploitation of the results and disseminate the findings

PROTOTYPES FOR ECOCHAMPS

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
• ECOCHAMPS will enable a leading European position in hybrid technology. All the vehicles to be developed should be ready for market introduction between 2020 and 2022 and (price-) competitive to the best in-class full hybrid vehicles on the market in 2013
NEMO

Hyper-network for electro-mobility

MOTIVATION AND OBJECTIVES

NEMO aims to make electromobility more attractive and facilitate its mass adoption, acting in a catalytic way across the entire energy management cycle of electromobility, including battery and smart grid recharging management. The project aims to facilitate increased service availability and the better planning and more secure electric grid operation, by making backend data and services accessible to the right actors and bringing down digital and physical barriers.

EXPECTED IMPACT

NEMO improves the attractiveness of EVs by: providing EV users with a single method of identification, authorization and payment; unifying charging infrastructures for all operators connected to its Hyper-Network; providing access to a market of seamless innovative services; establishing the means for integration of future smart-grid applications and services.

TECHNICAL APPROACH

NEMO develops a distributed environment with open architecture based on standardised interfaces, in which all electromobility actors, physical (i.e. Charge Points, Power Grid, EVs) or digital (i.e. Charge Point Operators, Distribution System Operators, Service Providers, EV owners, etc.), will connect and interact seamlessly, in order to exchange data and provide improved electromobility ICT services in a fully integrated and interoperable way via an open virtual Cloud Marketplace.

ELECTROMOBILITY ACTORS INTEGRATED INTO THE NEMO HYPER-NETWORK

ACHIEVEMENTS

NEMO has selected 64 relevant use cases, based on which it has proposed Common Information Models for relevant objects and data structures, including the vehicle, the charge session and smart charging, the market place, the user, grid loads and advice for vehicle preparation for drive-off. It has also proposed an Inter-Roaming protocol, based on existing widely-used ones and according to standardisation norms, to merge all relevant electromobility market actors.

BUDGET

€7.8 million

FUNDING

€7.8 million

START

October 2016

DURATION

36 months

CALL

H2020-GV-8-2015

CONTRACT N°

713794

COORDINATOR

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PARTNERS

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BMW Group,
Fiat Chrysler Automobiles,
Renault Group.

Other: ICCS, City of Barcelona,
Broadbit, ERTICO, FKA, GIREEVE,
Hubject, IBM, ICOOR, IDIADA, IREN,
SingularLogic, Tecnositaf, TomTom,
TUB, Verbund, MOSAIC FACTOR.

www.nemo-emobility.eu
ORCA

Optimised real-world cost-competitive modular hybrid architecture for heavy duty vehicles

MOTIVATION AND OBJECTIVES
The overall objectives of the ORCA project are to reduce the Total Cost of Ownership (TCO) to the same as diesel vehicle TCO level, targeting over 10% system cost premium reduction; to improve the hybrid powertrain efficiency up to 5% through optimized renewable energy sources (RES) selection & sizing and by improving the energy and Internal Combustion Engine (ICE) management; to reduce the fuel consumption by 40%; to downsize the ICE by at least 50%; to improve the electric range from 10km to 30km by adding the PHEV (Plug-in Hybrid Electric Vehicle) capabilities and optimising the RES capacity; and case study for Compressed Natural Gas (CNG) heavy-duty engines.

TECHNICAL APPROACH
ORCA will be conducted by an 11-member consortium from 7 different European Member States representing all requested competencies in the field of powertrain optimization for Heavy Duty vehicles. The consortium comprises OEM with IVECO, Fiat Chrysler Automobiles and Volvo Group, suppliers Valeo, Bosch, JOHNSON MATTHEY and JSR MICRO, leading RTD organizations and Universities with TNO, Fraunhofer, and VUB. The majority are also members of ERTRAC and EGVIA.

ORCA APPROACH TOWARDS SYSTEM OPTIMISATION

Achieving these key innovations at affordable cost will significantly strengthen the European technical and technological leadership in the value chain of heavy-duty vehicles, enabling a leading position in this crucial field of hybridised vehicles and increasing the competitiveness of European heavy-duty road vehicle manufacturers and suppliers. The optimised real-world cost-competitive modular hybrid architecture will be ready for its first market introduction between 2021 and 2022.
MOTIVATION AND OBJECTIVES

The project aims to develop cost-effective solutions, based on 48 V architectures, answering the need to reduce the environmental impact of the transportation sector through a clever combination of advanced engine technologies, electrification, and wider use of alternative/renewable fuels.

EXPECTED IMPACT

The project addresses very precise and consistent objectives to support a quick transition towards high efficient, cleaner, and affordable electrified powertrains focusing on the 48V architectures, intended as key elements to increase fuel economy and reduce environmental impact and to support a quick penetration on the market of hybrid powertrains.

TECHNICAL APPROACH

The project will provide an exhaustive evaluation of the hybrid concept through the development of two different 48V architectures, one integrating the e-machine on the front belt drive, the other between engine and transmission and on two different engine families: a mid-size 1.6 Diesel engine and a small downsized Spark Ignited CNG engine with Direct Injection system.

ARCHITECTURE FOR THE THOMSON PROJECT

ACHIEVEMENTS

During the first 12 months of the project, the following achievements have been reached:

- Boosting system specified
- Global vehicle models, to optimise energy utilisation and emission control, developed.
- Definition of the 48V mHEV configurations

BUDGET

€11.7 million

FUNDING

€9.1 million

START

October 2016

DURATION

36 months

CALL

H2020-GV-3-2016

CONTRACT N°

724037

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PARTNERS

EUCAR members: Fiat Chrysler Automobiles, Ford of Europe.

Other: BORG WARNER, Bosch, Continental, EMITEC, Faurecia, POLIMI, Ricardo, SCHAEFFLER, UNI Bath, TU Berlin.

www.thomson-project.eu
OBELICS

Optimization of scalable real-time models and functional testing for e-drive concepts

MOTIVATION AND OBJECTIVES
As the impact of global warming becomes increasingly clear, electric transportation is emerging as the only sustainable alternative to preserve the environment and guarantee future mobility needs. OBELICS addresses the urgent need for new tools to enable multi-level modelling and testing of electric vehicles (EV) and their components to deliver more efficient vehicle designs faster while supporting modularity to enable mass production and hence improved affordability.

EXPECTED IMPACT
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.

TECHNICAL APPROACH
OBELICS intends to implement systematic modelling and testing (and corresponding corrections) of the system right from the beginning. The approach of OBELICS is to Shift Left on the proverbial ‘V’ in order to reduce development and testing efforts by 40%. This can be achieved by creating a robust governance framework for the development, with integrated teams, where the quality and testing team becomes a part of the design and development.

ACHIEVEMENTS
First project results are expected at a later stage.

BUDGET
€9.1 million

FUNDING
€9.1 million

START
October 2017

DURATION
36 months

CALL
H2020-GV-07-2017

CONTRACT N°
769506

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SIE-SAS, UNR, Valeo, CEA,
Fraunhofer-LBF, FHJ, NIC, UL, UNIFI,
US, VIF, VUB.

www.obelics.eu
GASON

Gas-only internal combustion engines

**MOTIVATION AND OBJECTIVES**

To realize sustainable mobility in Europe, future vehicles for road transport should be significantly more efficient by 2020: GASON project aims to develop advanced CNG only, mono-fuel engines able to comply with post-2020 CO2 emission targets, claiming the 20% CO2 emission reduction compared to the current best in class Compressed Natural Gas (CNG) vehicle segment by segment, to fulfill the new homologation cycle and to guarantee a low fuel consumption even in real driving conditions.

**EXPECTED IMPACT**

New generation of CNG engines able to remove all gaps in comparison with conventional fuel engine/vehicle in terms of engine performance, fun to drive, driving range, trunk space and operating costs.

**TECHNICAL APPROACH**

GASON is based on 3 parallel technology ways leading full development of demonstrator vehicles, all based on the integration of the gaseous direct injection system developed in the project matched with advanced variable valve actuation or advanced boosting system with variable compression ratio or lean burn/charge dilution combustion. The project is focusing also on innovative combustion approaches (like pre-chamber), advanced aftertreatments and fuel quality sensors.

**CNG ENGINE DEVELOPED IN GASON**

- CNG engine prototype with direct injection, fully flexible variable valve actuation and high compression ratio
- CNG engine prototype with direct injection, twin stage turbocharger and variable compression ratio device
- CNG engine prototype with direct injection, charged diluted via EGR and advanced exhaust aftertreatment system
- CNG Lean burn prototype engine with pre-chamber system

**ACHIEVEMENTS**

- CNG engine prototype with direct injection, fully flexible variable valve actuation and high compression ratio
- CNG engine prototype with direct injection, twin stage turbocharger and variable compression ratio device
- CNG engine prototype with direct injection, charged diluted via EGR and advanced exhaust aftertreatment system
- CNG Lean burn prototype engine with pre-chamber system

**BUDGET**

€23.4 million

**FUNDING**

€16.7 million

**START**

May 2015

**DURATION**

42 months

**CALL**

H2020- GV-3--2014

**CONTRACT N°**

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Ford of Europe, Renault Group,
Volkswagen Group.

Other: AVL, CEA, Continental, CTU,
Delphi, Empa, ETH, FEV, IFPEN,
Ricardo, Pierburg, Schaeffler, POLITO,
Poznan Uv., UPVLC.

[www.gason.eu](http://www.gason.eu)
**HDGAS**

Heavy Duty gas engines integrated into vehicles

**MOTIVATION AND OBJECTIVES**

The overall objective of the HDGAS project is to develop, demonstrate and optimize advanced powertrain concepts for dual-fuel and for pure natural gas operation engines, perform integration thereof into heavy-duty vehicles and confirm achievement of Euro VI emissions standards, in-use compliance under real-world driving conditions and CO2 or greenhouse gas targets currently under definition.

**EXPECTED IMPACT**

HDGAS targets for step-changes in vehicle costs, vehicle performance and vehicle/engine availability. The achievement of these targets will facilitate the deployment of heavy-duty natural gas (NGVs) and dual fuel vehicles (DFVs) and will facilitate investments in infrastructure and the deployment of the Liquefied Natural Gas/Compressed Natural Gas (LNG/CNG) stations.

**TECHNICAL APPROACH**

To specify technical requirements of LNG fuelling interfaces. To develop selected LNG fueling components and interfaces. To develop an advanced LNG fuel tank system. To develop and demonstrate new generations of EAS. To develop and demonstrate three different engine concepts (SI, dual fuel and HPGI). To assess the achieved technical solutions by independent testing and to carry out an overall assessment.

**GAS REFUELLING ON A HEAVY DUTY VEHICLE**

- Prototype tank systems have been developed and are under procurement
- Draft standard for LNG refueling interface created at ISO
- Aftertreatment systems specified, designed and delivered to partners
- Single cylinder testing for SI and HPGI engine finalized
- Multi cylinder prototype engines delivered to partners for all three concepts

**ACHIEVEMENTS**

- Prototype tank systems have been developed and are under procurement
- Draft standard for LNG refueling interface created at ISO
- Aftertreatment systems specified, designed and delivered to partners
- Single cylinder testing for SI and HPGI engine finalized
- Multi cylinder prototype engines delivered to partners for all three concepts

**BUDGET**

€27 million

**FUNDING**

€19.9 million

**START**

May 2015

**DURATION**

36 months

**CALL**

H2020-GV-7-2014

**CONTRACT N°**

653391

**COORDINATOR**

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AVL List

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EUCAR members:
Daimler, IVECO, MAN Truck and Bus (Volkswagen Group), Volvo Group.

Other: AVL, BWR, Bosch, DINEX, FPT, IDIADA, POLIMI, RCD, SAG, TNO, TU Graz, UEF, UASE, UNR, ViF.
REWARD
Real world advanced technologies for diesel engines

MOTIVATION AND OBJECTIVES
It is the aim of the REWARD project to reduce the pollutant emissions of diesel powered class B, C, D and E passenger cars below the Euro VI emissions limits under Real Driving conditions (EU-VI RDE) and, additionally, to improve their fuel efficiency. REWARD develops and will demonstrate advanced 4-stroke diesel combustion concepts, exhaust gas after-treatment systems, control strategies and new approaches for friction & wear reduction. Furthermore, REWARD will develop an innovative 2-stroke Diesel engine architecture.

PROJECT PLAN, MILESTONES AND DELIVERABLES

TECHNICAL APPROACH
REWARD’s holistic approach addresses the 3 major energy conversion items for diesel engines:
• Smooth cylinder charging & gas exchange
• Efficient and complete combustion
• Consistent exhaust aftertreatment
New control strategies focus on an improved model-based control of the cylinder charge and on new concepts for the compensation of emission drifts.
Friction and wear reduction is accomplished by new coatings in combination with new lubricants.

EXPECTED IMPACT

ACHIEVEMENTS
The development of the test engines and the aftertreatment systems on test bed has been completed. Ongoing activities focus on the calibration of the engine and aftertreatment systems and their integration in the demonstrator vehicles.
**IMPERIUM**

Implementation of powertrain control for economic, low real driving emissions and fuel consumption

**MOTIVATION AND OBJECTIVES**

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 can provide a 100% European value chain for the development of future powertrain control strategies for trucks.

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

**TECHNICAL APPROACH**

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

**IMPERIUM - TECHNICAL APPROACH**

**ACHIEVEMENTS**

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

**BUDGET**

€9.9 million

**FUNDING**

€6.5 million

**START**

September 2016

**DURATION**

36 months

**CALL**

H2020-GV-6-2015

**CONTRACT N°**

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DAF Trucks, IVECO, Volvo Group.

Other: AVL, FPT, Honeywell, SPOL, Bosch, Continental, FEV, Ricardo, Chalmers, CTU Prague, RWTH, POLIMI, POLITO, TU Eindhoven.

www.imperium-project.eu
PAREGEN

Particle reduced, efficient gasoline engines

MOTIVATION AND OBJECTIVES

The overall objective of PAREGEN is to demonstrate at up to Technology Readiness Level (TRL) 7 a new generation of gasoline direct injection engine vehicles, achieving a 15% reduction in CO2 emissions and compliance with Euro VI Real Drive Emission (RDE) limits with the Particle Number (PN) measured to a 10 nm threshold, through 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.

EXPECTED IMPACT

The PAREGEN project aims to develop a new generation of non-hybrid gasoline engines targeted at improving the efficiency and emissions of these engines. The technology to be developed has the potential to deliver up to 15% fuel efficiency improvements in individual vehicles when compared to equivalent state of the art 2015 vehicles.

TECHNICAL APPROACH

The overall concept and technical approach comprises three major elements:

• Research for improved understanding
• Innovation and demonstration of new technologies combinations, where the developed know-how, software and control strategies are implemented in two novel optimised gasoline engine vehicles
• Independent assessment of their impact to track the progress towards reaching the targets

PAREGEN CHASSIS DYNAMOMETER TESTING

A first step has been taken in gaining more fundamental understanding of the in-cylinder processes and their effects on emissions by creating a stochastic reactor model for spark-ignition engine (SI-engine) combustion simulation.

For both demonstrator vehicles, a concept study has been performed to determine the possible efficiency gains for each component of the engine and aftertreatment, specifying the objectives for the subsequent design and development tasks.

BUDGET

€12.1 million

FUNDING

€10 million

START

October 2016

DURATION

36 months

CALL

H2020-GV-02-2016

CONTRACT N°

723954

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PARTNERS

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Daimler, Jaguar Land Rover.
Other: Ricardo, Bosch, FEV, Honeywell, Johnson Matthey, JRC, Uniresearch, IDIADA, Siemens, LOGE, ETH, UDE, RWTH, UFI Filters.

www.paregen.eu
**UPGRADE**

High efficient particulate free gasoline engines

**MOTIVATION AND OBJECTIVES**

The UPGRADE project aims to support the transition to a highly efficient, cleaner and affordable powertrain technology systems, based on spark-ignited GDI (Gasoline Direct Injection) approach suitable for future light duty applications. The project also includes a deep analysis of the phenomenon of nanoparticles formation and the study and development of a new Gasoline Particulate Filter (GPF) technologies.

**EXPECTED IMPACT**

- To lower the environmental and health impact of road traffic, by lowering emissions (nanoparticles down to 10 nm) especially in urban area and under real driving conditions
- The new engine platforms developed will allow a wider use of advanced biofuels and other alternative fuels like Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG)

**TECHNICAL APPROACH**

To increase the engine efficiency under real driving conditions, the following steps will be carried out

- Address stoichiometric combustion approach on a “small” size engine and lean-burn combustion approach on a “medium-size” one
- Study and develop the best combination of technologies including advanced Variable Valve Actuation/ Variable Valve Timing (VVA/VVT) capabilities, advanced boosting system, exhaust gas recirculation (EGR) and thermal management

**UPGRADE EMISSIONS AND CONSUMPTION BENEFITS**

**ACHIEVEMENTS**

During the first 12 months of the project, the following achievements have been reached:

- First stage soot model available/set up of a prototype measurement system particle size < 23 nm
- Identified the best advanced solution for e-boosting
- Low voltage Belt Starter Generator (BSG) system, with electric supercharger and active tensioner, is under development

**BUDGET**

€9.5 million

**FUNDING**

€9.5 million

**START**

October 2016

**DURATION**

36 months

**CALL**

H2020-GV-02-2016

**CONTRACT N°**

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Other: AVL, CHALMERS, IFPEN, JOHNSON MATTHEY, POLIMI, SCHAEFFLER, UNI Genova, UNI Thessaloniki, Valeo.

www.upgrade-project.eu
DIEPER

Diesel engines efficiency improvement with particulates and emission reduction

MOTIVATION AND OBJECTIVES

DIEPER is a logical and inevitable continuation of European R&D programmes on diesel engines for passenger cars. It does not only expand this sector to core areas of light commercial vehicles (LCV) but also contributes to the framework of sub 23 nm particles emissions with new technology for the reduction of sub 23 nm particles from diesel engines.

EXPECTED IMPACT

- Improved fuel economy compared to model year (MY) 2015 reference engines of the participating OEM (≥ 5%)
- Pollutant emissions that go to ≤ 50% of EU VI directive, including particle emissions down to 10 nm in size
- The particulate number (PN) target is to go below 20% of the EU VI limit. The counting of particles will be carried out with improved techniques developed in the European project DOWNTOTEN

TECHNICAL APPROACH

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), advanced charging, EGR, thermal management and exhaust gas treatment concepts. Two demonstration vehicles (2.0l Renault Espace and 3.0l IVECO Daily) will contain the selected technologies.

FINE PARTICLES PM2.5 FOR TWO DIEPER VEHICLES

www.dieper-project.eu

ACHIEVEMENTS

In the first year of the project the baselines for the demonstrator vehicles have been determined and the final testing procedures have been defined. The development engines have been specified and procurement has started. Design features, control and basic research (modelling of particles formation and the deterioration of engine components) have started.
**JEC WTW Analysis**

Well-to-Wheels (WTW) analysis of future automotive fuels and powertrains in the European context

**MOTIVATION AND OBJECTIVES**

EUCAR, CONCAWE and JRC continue to perform joint evaluations of the WTW energy use and greenhouse gas (GHG) emissions for a wide range of existing and future fuel and powertrain options. The objectives of the study are:

- Establish a consensual WTW total / fossil energy demand and GHG emission assessment of automotive energy carriers and powertrains relevant to Europe
- Consider the viability of each fuel pathway
- Attempt to have the approach and results accepted as a reference by all relevant stakeholders

**PROJECT PLAN, MILESTONES AND DELIVERABLES**

The program has successfully completed several phases:

- 2012–2015: Version 4, projection towards 2020+ & full integration of EVs
- 2016–2018: Preparations for Version 5 on-going

**TECHNICAL APPROACH**

Well to Tank (WTT) evaluates the energy expended and the associated GHG emitted to deliver the final fuel to a vehicle. The Tank to Wheel (TTW) evaluation does the same for the fuel application in the vehicle. Hence the WTW integration enables an assessment of the combined fuel and vehicle pathways. The WTW study considers changes generated by fuel and/or powertrain substitution. This is particularly important for fuels where careful consideration of co-products is essential to a good understanding.

**ACHIEVEMENTS**

Results of this work are used by the European Commission (EU Renewable Energy Directive default value methodology; EU Fuel Quality Directive calculation of Fossil Fuel Comparator) and provides input to new initiatives, like the Clean Power for Transport program. Furthermore, it is considered by technology platforms like the European biofuels technology platform as well as ERTRAC and recognized by EU member states.
Photofuel
Biocatalytic solar fuels for sustainable mobility in Europe

**MOTIVATION AND OBJECTIVES**
The motivation is to develop high quality, low impact transportation fuels by enabling phototrophic algae or cyanobacterial microorganisms to produce alkanes and alcohols, which are excreted to the culture broth for direct separation without cell harvesting. Objectives are:
- Advanced biocatalysts for the direct production of solar fuels
- Upscaling of cultivation volume and raw fuel production
- Analysis of risks, economic efficiency and environmental impacts

**EXPECTED IMPACT**
Long term impacts by advancement of solar fuel technology are:
- Highly sustainable production of drop-in fuels on arid or marginal land
- Economic and environmentally sustainable large-scale systems for conversion of solar radiation to fuels or chemical energy
- Support rural communities and substitute fossil energy imports

**TECHNICAL APPROACH**
The project addresses the complete value chain:
- Development of biocatalysts for production of butanol, undecane and bisabolene
- Upscaling to 5m³ outdoor production (pilot scale)
- Fuel blending for engine and vehicle tests (passenger + heavy duty)
- Analysis of risks, economic efficiency and environmental impact of the complete production pathway

**BIOCATALYTIC CONVERSION ROUTE FROM SUNLIGHT, CO₂ AND WATER TO SOLAR FUELS**

**ACHIEVEMENTS**
The project is on track and important milestones were achieved:
- The butanol biocatalyst surpassed the target of 34 mg/L/day
- Production of free fatty acids for alkane are on similar order
- Production upscaling has reached 120L
- Fuel blending matrix and design of LCA-assessment are agreed
AFFORDABILITY & COMPETITIVENESS

THE EU CAR STRATEGIC VISION

New sustainable approach for developing and producing affordable and competitive vehicles in Europe.

APPLICATION OF SUITABLE MATERIALS FOR FUTURE VEHICLES
Materials suitable for enhanced affordable and competitive design and manufacturing of functionally optimised and lightweight vehicles.

VIRTUAL ENGINEERING PRODUCT PROCESS INTEGRATED APPROACH
Innovative engineering solutions to guarantee and ensure the European automotive competitiveness for future vehicle generations.

SUSTAINABLE AND FLEXIBLE MANUFACTURING
Efficient and effective manufacturing systems capable of producing affordable and competitive vehicles in Europe.
MAPPING

MATERIALS, MANUFACTURING AND VIRTUAL ENGINEERING

ALLIANCE

Affordable lightweight automobiles

DOMUS

Optimisation for electric vehicles
ALLIANCE
Affordable lightweight automobiles alliance

MOTIVATION AND OBJECTIVES
Six European carmakers, four suppliers and eight knowledge partners have joined forces to commonly deal with the high cost of innovations in vehicle lightweighting. The main objectives are to enable reduction of energy consumption by 10% and Global Warming Potential (GWP) by 6%, compared to a conventional vehicle by reducing vehicle weight by 21-33% whilst costing no more than €3 per kilogram reduced.

EXPECTED IMPACT
ALLIANCE aims to achieve a reduction of the automotive sector’s environmental impact by decreasing the energy consumption of road vehicles by 10%, decreasing life-cycle environmental impact (in terms of GWP) by 6%, and ensuring that the developed technologies reach widespread adoption by keeping the cost of lightweighting <3€/kg saved. Furthermore, ALLIANCE will strengthen the competitiveness and growth of European players in the lightweighting field.

TECHNICAL APPROACH
ALLIANCE brings together partners from the lightweighting value chain, aiming at developing innovative materials and their respective manufacturing technologies using a holistic framework that will ensure their market viability. 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. The developed technologies will be validated in 8 demonstrator modules.

OVERVIEW OF ALLIANCE TECHNOLOGICAL DEMONSTRATORS

ACHIEVEMENTS
ALLIANCE will develop lightweight materials and their respective manufacturing technologies for high volume production, as well as a life-cycle understanding of their related costs and environmental impact. Beyond the technical achievements, ALLIANCE aims at becoming a central hub for innovation in lightweight design in Europe by establishing an open inclusive framework towards external centres and clusters in the field of lightweighting.

BUDGET
€8.6 million

FUNDING
€8 million

START
October 2016

DURATION
36 months

CALL
H2020-NMBP-GV-08-2016

CONTRACT N°
723893

COORDINATOR
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PARTNERS
EUCAR members:
Daimler, Fiat Chrysler Automobiles,
Opel Automobiles,
Toyota Motor Europe,
Volkswagen Group, Volvo Cars.

Other: TKS, NOVELIS, BATZ,
BENTELER, SWEREA, Inspire,
Fraunhofer, IKA, KIT, UNIFI,
Bax & Company, Ricardo.

www.lightweight-alliance.eu
DOMUS
Design and optimisation for efficient EV based on a user-centric approach

MOTIVATION AND OBJECTIVES
The goal of DOMUS is to define a user-centric approach for the design of the new-generation electric vehicles (EV), whose solutions can achieve, altogether, a significant reduction of the energy dedicated providing optimal comfort and safety cabin conditions. DOMUS comprises not only multi-domain innovative solutions at component and system levels, but also special attention is paid to holistic regulation strategies.

EXPECTED IMPACT
DOMUS is aimed at achieving an increase of the driving range of 25% whilst improving user acceptance and comfort perception in a wide spectrum of use cases and ambient conditions. Solutions integrated in the DOMUS project are investigated pursuing short-to-medium-term mass-production.

TECHNICAL APPROACH
A virtual user-centric assessment method and a holistic comfort model to predict the impact of the solutions to be adopted in the advanced cabin design phase. Thermal insulation, low thermal inertia and active cabin components will be developed and integrated under a holistic cabin energy management model. Optimal solutions will be implemented in a demonstrator vehicle and validated virtually and physically.

STRUCTURE FOR THE DOMUS PROJECT

BUDGET
€8.9 million

FUNDING
€8.9 million

START
November 2017

DURATION
36 months

CALL
H2020-GV-5-2017

CONTRACT N°
769902

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PARTNERS
EUCAR members:
Fiat Chrysler Automobiles,
Toyota Motor Europe, Volvo Cars.
Other: IDIADA, AGC, Denso TS,
Faurecia, Hutchinson, IEE, LIST,
Coventry, Fraunhofer, IKA, Tecnalia,
ViF, Uniresearch.

ACHIEVEMENTS
In current-generation EVs, the energy dedicated to cabin comfort and safety systems accounts for a significant share of the total available battery capacity, introducing therefore great variability of available driving range depending on use cases and ambient conditions. DOMUS will minimize this effect by defining a user-centric cabin and energy management system able to optimally react to occupants and ambient changing conditions.
COMMERCIAL VEHICLES

THE EU-CAR STRATEGIC VISION

An integrated approach for reliable, clean, safe and efficient freight transport and passenger mobility, through dedicated vehicle concepts and effective logistics.

CONNECTED COMMERCIAL VEHICLE
Commercial vehicles that are connected to the infrastructure, operators and drivers, supporting an efficient and resilient transport system and effective logistics.

SAFE COMMERCIAL VEHICLE
Commercial vehicles that protect all road users and avoid and mitigate accidents through advanced vehicle technology, cooperative systems and increasing levels of automation.

EFFICIENT COMMERCIAL VEHICLE
Commercial vehicles with optimum efficiency and performance, making use of advanced propulsion and energy systems and dedicated vehicle configurations.
MAPPING

COMMERCIAL VEHICLES

TRANSFORMERS

Configurable and adaptable trucks and trailers

EBSF2

Bus system of the future

ASSURED

Electrified vehicles

CV RELATED PROJECTS

ADAPTIVE

Automated driving applications

FABRIC

Solutions for future electric vehicles

ECOCHAMPS

Competitiveness

HDGAS

Heavy duty gas engines

ORCA

Optimised real-world

IMPERIUM

Implementation of powertrain

MAPPING OF CROSS-CUTTING SUPPORT ACTIONS

FUTURE-RADAR

Support action for ERTRAC & EDVI

TRANSFORMERS

Configurable and adaptable trucks and trailers for optimal transport efficiency

MOTIVATION AND OBJECTIVES
By combining reduced energy consumption with load optimisation for long haul transport, TRANSFORMERS targeted a 25% energy consumption reduction per tonne.km of goods transported through:
- A semi-trailer mounted “Hybrid-on-Demand” electric driveline
- Mission-based, transformable vehicle aerodynamics
- An internal trailer design providing optimised load capacity
- Adaptability to enable optimisation for each transport mission

EXPECTED IMPACT
- From end user requirements a range of innovative solutions have been developed and evaluated to increase the efficiency of long haul goods transport
- The innovations increase transport efficiency by increasing load efficiency within current regulations and reducing fuel consumption
- Mission based configuration optimisation is enabled

TECHNICAL APPROACH
- One trailer optimises load capacity, along with a novel multi-segment moveable roof to optimise aerodynamics
- An electric drive line is integrated in a second trailer including intelligent energy control to offer a modular, mission selectable approach to hybridisation. Aerodynamic optimisation includes an innovative single segment moveable roof

FINAL DEMONSTRATORS FOR TRANSFORMERS

ACHIEVEMENTS
- The two innovative TRANSFORMERS semi-trailer combinations have reduced energy use/tonne.km of goods transported by 25%
- The first distributed, trailer mounted “Hybrid on demand” driveline supporting a conventional tractor driveline has been tested on road
- Enhanced aerodynamics including mission adaptable, lowerable roofs
- Internal load capacity increased within EU regulations

www.transformers-project.eu
**EBSF_2**

**European bus system of the future 2**

**MOTIVATION AND OBJECTIVES**
The European Bus Systems of the Future 2 capitalizes on the results of the previous EBSF project and aims to test and validate innovative technological solutions for urban and suburban bus systems through demonstrations in real service. The ultimate goal is to improve the efficiency of operations, mainly in terms of costs and energy consumption, while raising the image of the bus for the users.

**EXPECTED IMPACT**
The joint work of bus manufacturers, operators, authorities and research entities will complete the development and test of high quality products for the next bus generation, strengthening the leading role of European bus industry and paving the way for the possible development of standard concepts.

**TECHNICAL APPROACH**
Solutions dealing with 6 research areas will be tested on-board vehicles operating in several European cities, these areas are: Energy Strategy and Auxiliaries; Green Driver Assistance Systems; IT Standards introduction in existing fleet; Vehicle Design (Capacity, Accessibility, Modularity); Intelligent Garage and Predictive Maintenance; and Interface between Bus and Urban infrastructure.

**DEMONSTRATORS FOR THE PROJECT**

**ACHIEVEMENTS**
The demonstrators have finalised the plans for implementation of the 31 technological innovations under test within the project. Each measure is assessed using a classic before-vs-during implementation comparison, with a wide set of Key Performance Indicators assessing performance variations in each individual case study and cross-case. Tests are on-going, according to the local time scheduling.

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**BUDGET**
€12.4 million

**FUNDING**
€10 million

**START**
May 2015

**DURATION**
36 months

**CALL**
H2020-MG-3.2-2014

**CONTRACT N°**
636300

**COORDINATOR**
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**PARTNERS**
EUCAR members: Daimler, IVECO, Volvo Group.
Other: 38 partners from well-known academia and research centres, as well as highly successful industries.

www.ebsf2.eu
ASSURED

Fast and smart charging solutions for full size urban heavy-duty applications

MOTIVATION AND OBJECTIVES
The ASSURED Project proposal addresses urban commercial vehicles integration with fast charging infrastructure. The overall objectives of ASSURED are:

• Improving the total cost of ownership (TCO) through better understanding of the impact of fast charging profiles on battery lifetime, sizing, safety, grid reliability and energy-efficiency of the charger-vehicle combination
• Development of next generation modular high-power charging solutions for electrified HD and MD vehicles
• Development of innovative charging management strategies to improve the TCO, the environmental impact, operational cost and the impact on the grid stability from the fleet upscaling point of view

EXPECTED IMPACT
The project is expected to have the following impacts:

• ASSURED will impact on transit buses, especially those operating on electric powertrains, helping cities meet stringent emissions norms without compromising on people-per-hour-per-direction goals
• ASSURED strengthen electric transport bus technology, consolidating a lifetime cost saving over conventional bus (diesel bus) of about €180,000
• The ASSURED project will have Economic, Environmental and Societal impacts

TECHNICAL APPROACH
ASSURED technical approach will be focused on the following steps:

• Analysing, developing, demonstrating
• An overview of the results and their exploitation and dissemination
• The conclusions on the Project
• The socio-economic impact of the Project

ACHIEVEMENTS
First project results are expected at a later stage.
**FUTURE-RADAR**

Future research, advanced development and implementation activities for road transport – the support action for ERTRAC and EGVI

**MOTIVATION AND OBJECTIVES**

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

**EXPECTED IMPACT**

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.

**TECHNICAL APPROACH**

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.

**KEY TOPICS OF THE VISION 2050**

- Mobility in urban areas
- Safety, security and resilience
- Digitalisation as enabler for improved mobility
- An efficient and resilient road transport system
- Sustainability: Energy efficiency, decarbonisation and air quality

**ACHIEVEMENTS**

- ERTRAC and EGVI roadmaps about electrification, automated driving, urban mobility
- Workshop about CO2 reduction from heavy duty vehicles
- Support of SOLUTIONS/Urban Electric Mobility Initiative (SOLUTIONS/UEMI) change-maker-call for international urban transport collaborations

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**BUDGET**

€3.5 million

**FUNDING**

€3.5 million

**START**

January 2017

**DURATION**

48 months

**CALL**

H2020 GV-11-2016

**CONTRACT N°**

723970

**COORDINATOR**

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AVL List

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**PARTNERS**

EUCAR members:

BMW Group,
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Volkswagen Group, Volvo Group.

Other: AUTH, Bosch, CAIF, CVUT,
CONCAWE, ERTICO, FEHRL, Piaggio,
POLIS, Ricardo, WI, RUPPRECHT,
UN-Habitat, RWTH Aachen,
UITP, Valeo, VDI/VDE-IT, VUB.

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www(ertrac.org

www.egvi.eu