

PROJECT

## EDAS

# Holistic Energy Management for third and fourth generation of EVs

**Funding:** European (7th RTD Framework Programme)

**Duration:** Oct 2013 - Sep 2016

**Status:** Complete

**Total project cost:** €15,311,138

**EU contribution:** €8,925,000



**Call for proposal:** FP7-2013-ICT-GC

[CORDIS RCN : 109692](#)

### Background & policy context:

Modern societies are eagerly looking for the integration of mobility and their urban living area to enable reliable and safe transportation, better efficiency and cost, comfort and low emissions for the environment. The trends are obvious, however, providing a hybrid/electrical car is only one part of the full picture. The "standard" customer is still very reluctant to buy a full electrical vehicle (FEV). The reasons are manifold but the most important is unpredictable mileage and limited autonomy. The prediction of the cruising range without any restrictions in terms of safety and comfort is a key point: essential is D-P-C (Drive safely, Park easily and Charge conveniently).

Today a nominal 100 km range might vary from 50 to 130 km in reality, depending on various conditions such as temperature and profile of the route. Increasing the capacity of the battery is no viable option because it results in a drastically increase in cost and weight of the car. Through eDAS we will limit the negative impact of high and low environment temperatures from -50% today to a maximum of -20% of the reachable range in electric vehicles, which corresponds to an improvement of 60% compared to state of the art. We will bring the infrastructure of the EV to the optimum operating temperature range for faster "fast charging", pre-conditioned passenger compartment and battery, also safety and convenience features, such as de-iced windows during winter time based on the available infrastructure without adding cost and weight based on new designs and architecture combining battery, e-motor, electronics, charger and energy management.

Addressing this challenge of the architecture of all subsystems of the complete EV requires a wide area of expertise, and in consequence leads to a large consortium. To develop and demonstrate the innovative hardware and software solutions, including new materials, adequate resources and budget are required.

### Objectives:

To develop and demonstrate the innovative hardware and software solutions, including new materials, adequate resources and budget are required. eDAS will deliver the following innovative demonstrators:

- Smart battery system with thermal management and peak temperature conditioning based on novel materials such as phase change materials (PCM)
- Novel e-motor with improved power density properties allowing reuse of thermal energy based on direct cooling of the coils
- Universal scalable and modular combined inverter / charger (power range 3-22 kW)
- Innovative accelerated inverter charger for faster "fast charging"
- Efficiency improvement in PHEV cars (e.g. pre-conditioning, exhaust gas energy recuperation)
- Wireless curb charging with thermal pre-conditioning (e.g. while parking) based on existing infrastructure in cities (power range 1-2 kW)
- Safe multi-core control architecture for the powertrain computer including energy resource scheduler and advanced management of electrical, mechanical and thermal energies
- Overall energy management including the before mentioned components and subsystems as well as the integration of 3D GPS data for energy optimal route selection

Standardization of the temperature levels of the different elements in the energy network will foster lower cost, higher efficient cooling solution and scalable systems and sub systems. The demonstrators will consider safety aspects and be evaluated with respect to robustness, by using fault injection methodologies.

eDAS will build an energy network within the FEV, making use of the available energy sources (electrical, thermal, mechanical), control them in an optimized way to feed energy back to the system and to minimize the impact of the external factors (temperature) by preconditioning of the car in order to achieve predictable and reliable mileage.

## Methodology:

eDAS will provide solutions for predictable mileage exploring novel concepts such as using the combination of different also non electrical energy sources and storages in the FEV as a network of energy elements.

eDAS will also directly influence the battery efficiency by preconditioning of the car itself. Thermal conditioning will set for example the temperature of the battery to the best operating range for faster and thermal peak or overload free "Fast Charging" also protecting the battery by actively controlling State of Charge and State of Health. These aspects together will definitely minimize the uncertainty in range. For getting energy "en route" eDAS will provide novel concepts of direct interaction of the FEV with the available infrastructure in urban environments (Smart Grid) and by using the available navigation systems to plan the optimal topology for the route.

Finally, we will consider OEM requirements e.g. VW stated that the additional complexity and concepts for thermal managements must not add more than max. 20 kg per 1000 kg in weight to the car (class E-UP and class GOLF) and the cost need to be very closely monitored.

## Parent Programmes:

[FP7-ICT - Information and Communication Technologies](#)

**Institute type:** Public institution

**Institute name:** European Commission

**Funding type:** Public (EU)

## Lead Organisation:

**Imarine Deniz Teknolojileri Ve Arastirmalari Sanayi Ve Ticaret Anonimsirketi**

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**Organisation Website:**

<http://www.infineon.com>

**EU Contribution:** €1,304,293

## Partner Organisations:

**Ideas & Motion Srl**

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Via Santa Margherita 8  
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**EU Contribution:** €474,889

**Valeo Systemes De Controle Moteur Sas**

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France

**EU Contribution:** €535,532

**Avl Software And Functions Gmbh**

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**EU Contribution:** €924,617

**Siemens Ag**

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<http://www.siemens.com>

**EU Contribution:** €863,075

**Technische Universitaet Dresden**

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**Organisation Website:**

<http://www.tu-dresden.de/>

**EU Contribution:** €466,560

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**EU Contribution:** €563,040

**Gemac - Gesellschaft Fur Mikroelektronikanwendung Chemnitz Mbh**

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**EU Contribution:** €527,904

**Kompetenzzentrum - Das Virtuelle Fahrzeug Forschungsgesellschaft M.b.h.**

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<http://www.v2c2.at>

**EU Contribution:** €175,104

**Lange Research Aircraft Gmbh**

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**EU Contribution:** €81,000

**Daimler Ag**

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**Organisation Website:**

<http://www.daimler.com>

**EU Contribution:** €475,200

**Qpunkt Gmbh**

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**EU Contribution:** €289,671

**Hutchinson Sa**

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**EU Contribution:** €389,328

**Frauenhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.v.**

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**EU Contribution:** €558,228

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**EU Contribution:** €345,984

### **Avl List Gmbh**

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**EU Contribution:** €634,579

### **Technische Universitaet Graz**

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**Organisation Website:**

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**EU Contribution:** €315,996

### **Technologies:**

Electric road vehicles  
Hardware and software solutions for EV network

**Development phase:** Research/Invention

Transport

**STRIA Roadmaps:** electrification

**Transport mode:** Road transport

**Transport sectors:** Passenger transport

**Transport policies:** Societal/Economic issues

**Geo-spatial type:** Other