ELVA

Advanced Electric Vehicle Architectures

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

**Duration:** Dec 2010 - May 2013

**Status:** Complete with results

**Total project cost:** €4,823,714

**EU contribution:** €2,899,398

**Call for proposal:** FP7-SST-2010-RTD-1

**CORDIS RCN:** 97179

**Background & policy context:**

Increasing energy costs and stringent CO2 emission targets drive the growing market opportunity (and societal need) for fully electric vehicles. The ELVA project focuses on electric cars for city passengers and urban delivery where traffic volume is high and the impact on the local environment is most significant. Knowledge transfer to other vehicle types will be facilitated by a novel design approach to be developed by ELVA.

**Objectives:**

The change in propulsion technology from internal combustion engines to electric power trains will lead to the integration of new components and systems, while others undergo changes or become obsolete. This opens up new freedom in design and clears the way for new vehicle concepts. Exploiting new freedoms in design for fully electric urban vehicles is the aim of the project.

The ELVA project will deliver results that allow for full exploitation of this new freedom, while responding to changing future market demands.

**Methodology:**

To achieve this key objective, the ELVA project generates, investigates and analyses innovative design concepts for electric vehicles. It delivers a wide range of advanced modular architectures which enable at least the same high level of intrinsic safety as known from current best in class conventional vehicles at minimal weight, maximised energy efficiency, optimized ergonomics & loading space at affordable costs as well as acceptable levels of comfort and driving performance.

In particular ELVA delivers best practices and evidence based design rules for modular lightweight and safe architectures specific to electric vehicles.

These practices and design rules will feed into and partially replace existing experience-based design methodologies, which have been developed over more than a century of vehicle design around the internal combustion engine.

ELVA will achieve a substantial impact with regard to a greener road transport system and a competitive car industry due to the strong involvement of leading industrial partners including car makers that together are expected to produce a substantial part of all electric vehicles sold in Europe in the next decade.

**Parent Programmes:**

FP7-TRANSPORT - Transport (Including Aeronautics) - Horizontal activities for implementation of the transport programme (TPT)

**Institute type:** Public institution

**Institute name:** The European Commission
**Funding type:** Public (EU)

**Lead Organisation:**

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<tr>
<th>Rheinisch-Westfälische Technische Hochschule Aachen</th>
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<tr>
<td><strong>Address:</strong> Templergraben 52062 Aachen Germany</td>
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<tr>
<td><strong>Organisation Website:</strong> <a href="http://www.rwth-aachen.de">http://www.rwth-aachen.de</a></td>
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<td><strong>EU Contribution:</strong> €533,000</td>
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**Partner Organisations:**

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<th>Renault Represented By Gie Reginov</th>
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<tr>
<td><strong>Address:</strong> Quai Alphonse Le Gallo 13/15 92100 BOULOGNE-BILLANCOURT France</td>
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<td><strong>Organisation Website:</strong> <a href="http://www.renault.com">http://www.renault.com</a></td>
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<td><strong>EU Contribution:</strong> €392,269</td>
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<th>Centro Ricerche Fiat - Societa Consortile Per Azioni</th>
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<tr>
<td><strong>Address:</strong> Strada Torino, 50 10043 ORBASSANO (TO) Italy</td>
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<td><strong>Organisation Website:</strong> <a href="http://www.crf.it">http://www.crf.it</a></td>
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<td><strong>EU Contribution:</strong> €516,069</td>
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<td><strong>EU Contribution:</strong> €250,200</td>
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<td><strong>Address:</strong> Vahrenwalder Strasse 9 169 HANNOVER Germany</td>
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<td><strong>Organisation Website:</strong> <a href="http://www.conti-online.de">http://wwwconti-online.de</a></td>
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<td><strong>EU Contribution:</strong> €373,330</td>
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Volkswagen

Address:
Berliner Ring 2
1894 WOLFSBURG
Germany

Organisation Website:
http://www.volkswagen.de

EU Contribution: €500,011

Chalmers Tekniska Hoegskola Ab

Address:
41296 GOTHENBURG
Sweden

Organisation Website:
http://www.chalmers.se

EU Contribution: €334,519

 Technologies:
- Electric road vehicles
- Third generation passenger EV

Development phase: Research/Invention

Key Results:
The results of the final assessment, which also included a life cycle assessment, were summarised in a collection of documents regarding design practices, rules, freedoms and constraints especially concerning electrical components, body and chassis of electric vehicles. This collection is publicly available as future reference for all institutions and persons interested in the conceptualization of (electric) vehicles. This is in line with the very open dissemination strategy the ELVA partners have followed since the beginning of the project. All findings and achievements have been actively published towards the research community and public and consequently are used as a reference by many initiatives now.

Innovation aspects

The first phase of the project was thus investigating technology options that were regarded as being realistically available from 2020. While these were rather easy to identify, the expectations and requirements of potential future customers were difficult to find and to understand. Based on an analysis of several publications and studies as well as internal data and, not to forget, a pan-European customer survey, it was concluded that the expectations were very close to what conventional vehicles are offering at the moment. This is particularly the case for the autonomous range.

Based on profound technical knowledge and better understanding of customer needs, a creative phase began. This was characterized by two routes, one being driven by the project partners themselves, while the other one involved external institutions. A public design contest was launched that brought advanced designs and architectures to light showing how they are seen by expert designers and other interested persons. In the end, three designs were awarded and used for the further development. From the internal route, a comprehensive collection of technical ideas on different levels emerged, that was a useful input to the detailed concept development in the following.

Centro Ricerche Fiat (CRF), Renault and Volkswagen were each responsible to develop a vehicle concept meeting the requirements and expectations that were analysed in the beginning while taking into account the awarded designs and using the conceptual ideas of all partners. Within this second phase of the project, advanced vehicle concepts were virtually developed into a level of detail that allowed in the end an assessment against all key criteria of importance for a vehicle development. In two development loops, the concepts were brought to a level that is at least equal than comparable conventional vehicles of the same class. It must be stated though that the architecture of these three
concepts is not radically different compared to conventional vehicles, but uses well-established
approaches were they showed to be useful.

Strategy targets

Innovating for the future: technology and behaviour

- Promoting more sustainable development
- Integrated urban mobility

Readiness

The ELVA project has also identified needs for future research. These are partly already addressed with
the DELIVER project, in which an urban electric delivery vehicle is developed and build-up as a hardware
demonstrator that will allow experiencing and assessing the prospects of this propulsion technology and
its implications on the vehicle architecture in reality. Furthermore, the projects SafeEV, ENLIGHT, ALIVE
and MATISSE, which are together forming the so-called SEAM cluster, are working on aspects of
advanced material application and increased safety of electric and alternatively powered vehicles. They
will go into a level of detail that could not be reached by the ELVA project due to its very broad scope,
creative scope and limited resources in terms of time and budget.

For a successful establishment of a European market for electric vehicles – in line with the European
Green Cars Initiative – further scientific and technical research is required. The ELVA project has shown
the prospects of increased modularization in many parts of the electric drivetrain. This is particularly the
case for electric motors and obviously the battery. It is recommended to catch up the basic ideas of the
ELVA project, which were also discussed with projects such as Easy Bat, OSTLER and SmartBatt, within
the next work programme. On a higher level, urban mobility and its interaction with dedicated vehicles
should be addressed. It is not to forget that several components of the electric drivetrain require more
research while it remains at the same time a grand societal challenge to decrease injuries and fatalities
in traffic further.

The ELVA project has looked into many aspects of future individual mobility and may serve the research
community as a future reference.

Documents:

- Final Report (Final report)

STRIA Roadmaps: Transport electrification, Vehicle design and
manufacturing

Transport mode: Road transport

Transport sectors: Passenger transport, Freight transport

Transport policies: Environmental/Emissions aspects, Societal/Economic issues

Geo-spatial type: Urban