Safe Small Electric Vehicles through Advanced Simulation Methodologies

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EXECUTIVE SUMMARY

This document describes the intentions of the consortium members for disseminating and exploiting the project results and findings.

Within the dissemination plan strategy and planned activities are described. For these dissemination activities already possible audience and main addressees where identified within the implementation phase of the project. This report will strengthen now this information transfer in terms of a coordinated activity also within the SEAM cluster. Moreover feedback and comments on the proposed methods and concepts from relevant stakeholders and/or dedicated activities (e.g. workshops) in the course of the project will be taken into account for the formulation of the “best practice guideline” at the end of the project.

While this Dissemination Plan defines the planned activities and its coordination by the partners, the second part of this report presents a plan for using and implementing new knowledge and project findings in detail and related activities and how they support exploitation.

APPROVAL STATUS

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<td>WP Leader approval</td>
<td>Daimler AG</td>
<td>Christian Mayer</td>
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<td>Approval on behalf of the PSC</td>
<td>Chalmers University of Technology</td>
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CONTRIBUTING PARTNERS

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<td>Document Manager</td>
<td>Daimler AG</td>
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REVISION TABLE

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Glossary

ACEA  European Automobile Manufacturer’s Association
ASTM  American Society for Testing and Materials
CA  Consortium Agreement
CEN  Comité Européen de Normalisation
CLEPA  European Association of Automotive Suppliers
EEVC  European Enhanced Vehicle-Safety Committee
ESV  Enhanced Safety of Vehicles (Conf.)
EU  European Union
Euro NCAP  European New Car Assessment Programme
HBM  Human Body Models
IMVITER  Implementation of Virtual Testing in safety Regulations
ISO  International Organization for Standardization
NCAP  New Car Assessment Programme
NHTSA  National Highway Traffic Safety Administration
PDB  Partnership for Dummy Technology and Biomechanics
SAE  Society of Automotive Engineers
SafeEV  Safe Small Electric Vehicles through Advanced Simulation
SEAM Cluster Project Cluster of the EU FP7 projects ALIVE, ENLIGHT, MATISSE & SafeEV
SEVs  Small Electric Vehicles
THUMS  Total Human Model for Safety
TRA  Transport Research Arena (Conf.)
TUC  THUMS User Community
VDA  Verband der Automobilindustrie
UNECE  United Nations Economic Commission for Europe
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1 Introduction

The general objective of this deliverable 6.1 – “Exploitation Plan” is to establish a basis for all project participants when it comes to the use of project results and describe in detail related dissemination and exploitation strategy and activities.

The WP itself has the same aim to promote dissemination and exploitation of project findings. In general industrial partners will focus on the exploitation (e.g. advanced simulation methods to be used on safety evaluation for SEVs) and scientific partners on the dissemination of the project results at relevant conferences and in dedicated scientific journals (e.g. SAE, EVC, iCrash).

The final results of this project will be transformed in a best practise guideline ready for use in industry.

The activities described in this Dissemination & Exploitation Plan are also coordinated and aligned with the exploitation activities with the project partners of the SEAM cluster projects MATISSE, ALIVE & ENLIGHT. This interaction is planned and tracked via WP8.

Exploitation has to be discussed in a more medium term perspective when it comes to real use (e.g. development of new products and/or application of methods) of the project results by the project partners within their own business or use and implementation of project findings in development, standards and methods by parties or organisations outside the consortium.
2 Contractual requirements

The ownership and finally use of project results are ruled in
- Article 10 “SEAM coordination”
- Article 11 “Ownership of Foreground Information”
- Article 12 “Access Rights”

of the Consortium Agreement of this project.

When it comes to dissemination of results
- Article 16 “Dissemination, Publicity and Press Releases”

defines the general rules for such activities.

Finally Annex I lists all the Background Information of the project partners which has to be considered in case of access to and use of this information in the course of the project and after completion of this cooperation

(Safe Small Electric Vehicles through Advanced Simulation Methodologies – SafeEV - Consortium Agreement - Ref No: FP7-SST-2012-RTD-1 / 314265)

2.1 Definitions

The next paragraph gives an overview of the relevant definitions used within the above mentioned articles of the CA. These definitions might be also relevant when later used within this report describing dedicated dissemination activities or individual partners exploitation plans. For this, it is generally understood that especially “Foreground” covers the project findings of an individual beneficiary or several of them and designates finally exploitable projects results.

USE
means the direct or indirect utilisation of FOREGROUND INFORMATION or BACKGROUND INFORMATION in research activities or for developing, creating, making (including have made) and/or marketing a product or process, or for developing, creating and/or providing a service, but not including the right to grant sub-licences.

FOREGROUND INFORMATION
means the results, including information, whether or not they can be protected, which are generated in the PROJECT; such results include without limitation rights related to copyright, design rights, patent rights, plant variety rights or similar forms of protection.
BACKGROUND INFORMATION
means information, whether or not they can be protected, which is held by BENEFICIARIES prior to their accession to the PROJECT or which is developed outside of this project and is then voluntarily introduced in the PROJECT by the relevant owning BENEFICIARY. Such information include without limitation rights related to copyright, design rights, patent rights, plant variety rights or similar forms of protection

ACCESS RIGHTS
means licenses and user rights in respect of FOREGROUND INFORMATION and BACKGROUND INFORMATION

NEEDED FOR USE
means that without the grant of such ACCESS RIGHTS the USE of own FOREGROUND INFORMATION would be technically or legally impossible, significantly delayed or require significant additional financial or human resources.

2.2 SEAM cluster coordination – Use of Information

Especially to be emphasised in terms of ownership and use of results is the fact, that SafeEV is part of a cluster of projects – namely ENLIGHT, ALIVE and MATISSE. Concrete activities which are coordinated with these projects are already described in Annex III of the CA. SafeEV WP8 will manage the information flow and coordinate common activities in the course of the project respectively the SEAM cluster.

Concerning exchange of information and use of results (Deliverables) the following section of Article 10 should be highlighted:

“…..The concrete activities coordinated with these other projects are described in ANNEX III which also includes a table with concrete input and output flows from SafeEV to and from the SEAM cluster and specific projects therein. The BENEFICIARIES agree that the information flows as defined in the ANNEX III are considered as needed for the execution of this PROJECT and all contributing parties to involved DELIVERABLES agree to such DELIVERABLES being shared for carrying out the work. As such, sharing of these DELIVERABLES does not constitute a breach of confidentiality, nor does it imply any right to any other USE not being the USE needed to carry out the research & technological development work.
For the avoidance of doubt, the owning BENEFICIARY of such DELIVERABLES to be shared with the SEAM cluster shall give its prior written consent to the process of this DELIVERABLE being shared…..”

The SEAM cluster was initiated in order to coordinate and harmonise the four projects SafeEV, ENLIGHT, ALIVE and MATISSE. Main purpose of the SEAM cluster is to realise and monitor synergies between the four projects on RTD and demonstration level and to execute joint dissemination and exploitation activities.
3 Dissemination

Only one main task is formulated in Annex 1 of the project for WP6 which addresses dissemination and exploitation activities and the role of the partners in this area.

Beside the common dissemination activities (see 3.1 – 3.5) and in support to the communication activities of the Commission services the consortium may be requested (on an annual basis or upon request) to provide the Commission with a 2 pages information sheet which will be drafted in a standard format communicated by the Commission. The Commission services may also request on illustration (picture, schema or drawing) to illustrate such communication material.

A first project information was requested by the Commission in October 2013 for the edition of the SST projects synopsis, which was responded accordingly.

The project is also asked to contribute to relevant dissemination, international cooperation and information exchange activities of interest to the Commission such as those within the scope of the European Green Cars Initiative.

Also for this EGVI dissemination area already a contribution was prepared. SafeEV has provided a slideshow which overviews concisely their objectives and major outcomes to the European Green Vehicles Initiative Association for the TRA 2014 in Paris.

The key audience and main addressees of dissemination activities are already defined in the Description of Work respectively during the implementation phase of this project. Nevertheless, this list will be updated continuously in the course of the project and will follow also feedback from dedicated and cooperative activities (SEAM workshops, network activities etc.).

Most of the activities started in month one. Five main categories were identified to build the core of the dissemination strategy of this project. These will be described in the following paragraphs.

3.1 Project oriented dissemination & information platform

Just after launch the project SafeEV had its own website (www.project-safeev.eu) making project information available online. It was further developed during the first project period and will be regularly updated throughout the project. The site is interactive and contains project and partner description. It also builds the “first point of contact” for any interested parties which intend to get in contact with the consortium or searching for results, information to download or further links.
For this a newsletter was created, which will be send regularly to registered recipients. The registration can be done via this website. Also all public reports listed on the website and will be made available by direct download.

Finally also direct links to the SEAM cluster and the individual SEAM projects are established on the website.

**Figure 3.1: Overview SafeEV website – Page “Results”**

### 3.2 Scientific publications and contribution to conferences

The participation in international conferences and contribution to scientific publications makes it possible to communicate SafeEV objectives and findings to wide expert public.

The academic partners will especially contribute and prepare publications to conferences and journals. Target conferences are e.g. SAE, ESV, iCrash and target journals are Journal of crash worthiness, Journal of Accident Research and Prevention, Journal of Vehicle Dynamics, Journal of Injury Prevention, Journal of Biomechanics.
Most of the (scientific) partners in the consortium are closely and well involved in the scientific community or even members of a programme committees or editors of mentioned journals which will make it possible to submit a number of specific publications and issues on project findings and results.

Already publications of the first project results were made via contribution to the following, dedicated conferences – see table 3.1.a. The second table (table 3.1.b) gives an outlook on already accepted papers for publication in upcoming conferences in 2014. The third table indicates conferences where publication of the project should be announced (table 3.1.c).

<table>
<thead>
<tr>
<th>Conference Event / Journal</th>
<th>Date of publication</th>
<th>Titel</th>
<th>Leading Partner</th>
<th>Authors &amp; Coauthors</th>
<th>Main project results communicated</th>
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*Table 3.1.a: Overview of SafeEV publications / scientific papers & Conferences to be addressed.*
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<th>Date of publication</th>
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*Table 3.1.b: Overview of SafeEV publications / scientific papers & Conferences to be addressed.*
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*Table 3.1.b (continued): Overview of SafeEV publications / scientific papers & Conferences to be addressed.*
### Table 3.1.c: Overview of SafeEV publications / scientific papers & Conferences to be addressed.

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<thead>
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<th>Leading Partner</th>
<th>Authors &amp; Coauthors</th>
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<td>SAE World Congress 2015</td>
<td>May 2015</td>
<td>A tool chain for virtual testing of Small electric vehicles</td>
<td>ViF</td>
<td>Andreas Teibinger, one person from each partner</td>
<td>Results from WP 3 and project results in general</td>
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<tr>
<td>24th ESV Conf. 2015 Gothenburg</td>
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<tr>
<td>IRCOBI 2015 2015</td>
<td>unk</td>
<td>A proposal for integrating pre-crash vehicle dynamics into the occupant injury protection evaluation of small electric vehicles.</td>
<td>Chalmers</td>
<td>Marianne Andersson, Jac Wismans, Mats Svensson, Christian Mayer, Pronoy Ghosh</td>
<td>WP 3 Advanced simulation methodology for integrated pedestrian / occupant safety in SEVs</td>
</tr>
</tbody>
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This list follows the dissemination strategy and further road map for publications below:

**First year dissemination**
- Generate attention for SafeEV to wide expert public
- Communication of project objectives and tools & methods which will be used

**Second year dissemination**
- Communication of first project results (scenarios / prognosis → basis for further activities).
- Demand information & feedback from expert public and related initiatives / research

**Third year dissemination**
- Ongoing status report / results from project core activities
- Communication of first project findings & recommendations

**Final / Fourth year dissemination**

- Final project results and recommendations
- Provide guidelines to expert public and other stakeholders
- Initiate follow up activities (including SEAM Cluster)
- Initiate exploitation of results (including SEAM Cluster)

### 3.3 Implementation of project findings – interest groups & relevant stakeholders

Mainly the industrial partners (Daimler, CRF, VW, Pininfarina, Bosch) will initiate and coordinate cooperative activities in the project phase when it comes to implementation, demonstration and exploitation of the project results. This will be done via communication and direct transfer of project findings to interest and working groups (e.g. TUC, ACEA, VDA, CLEPA). Also relevant stakeholders in the area of vehicle and traffic safety (e.g. NCAP, EEVC, UNECE) will be addressed via dedicated activities.

Similar to the communication via the scientific community (3.2) the current network activities of the (industry) project partners will be used as a first level dissemination channel.

SafeEV activities are tracked in the **TUC – THUMS USER COMMUNITY** ([www.tuc-project.org](http://www.tuc-project.org)). Focus is especially on the discussion and definition of dedicated methods for post processing of HBM simulation results and injury risk assessment. TUC represents a group of THUMS user, namely Audi, Autoliv, BMW, Daimler, Opel, Porsche, Toyota, VW and LMU (Ludwig Maximilians University Munich) as coordinator, which initiated this platform (Collaborative Project) end of 2012 to set up a framework and harmonize general and administrative requirements for the implementation of FE- Human Body Models in vehicle and traffic safety applications.

SafeEV activities are also communicated to and within **PDB ([www.pdb-org.com](http://www.pdb-org.com))** - Partnership for Dummy Technology and Biomechanics, which was founded in 2002 as a cooperative venture between German car manufacturers in the competitively neutral field of crash test dummy technology, biomechanics and simulation. Since Feb. 2014 a sub-group addressing the use and general implementation of virtual HBM to development and assessment methods is installed in this organisation.

A direct link via a project partner also exists to the **EEVC –European Enhanced Vehicle-Safety Committee** and its WG 12 “Crash Dummies”. Another relevant EEVC WG in terms of exploitation of project findings is WG 22 “Virtual Testing”.

Beside these direct transfer of project results by personal / partners contact workshop events are seen as most appropriate activity.
3.4 Deliverables

Especially the deliverables play an important role when it comes to dissemination and transfer of results to other interest groups & expert public. Finally they also may be used as reference for subsequent research and new initiatives within H2020 – as is currently the case.

For this, all technical deliverables (just D8.2 & D8.3 – Summary on annual meeting of the liaison board – are confidential) are classified as public report and will be made available via the project website.

3.5 Workshops / Final dissemination workshop

As already mentioned, dedicated project events and workshops within the course of the project and at the end (Final dissemination workshop) will allow exchange and discussion with relevant stakeholders, other initiatives and interest groups in a more sustainable manner compared with just publications. Relevant experts & interest groups, as also listed under 3.3, will be invited. Finally the feedback from these expert public / events will be incorporated in the final recommendations and best practice guidelines.

A first semi-public workshop is planned to be organised in early 2015. Main focus of this event will be the dissemination and transfer of project findings from WP2 & WP3 (Transfer of “Small EV safety requirements”). So the target group respectively key audience for this event will be mainly the project partners from the SEAM cluster projects.

The final event is already agreed within the DoW and will be organised with the partner project MATISSE and hosted by IKA (RWTH Aachen Univ.). All SEAM cluster projects and relevant experts & interest groups (EuroNCAP, EUCAR/ACEA, EEVC) will be invited as well. Due to the character of the project mainly animations and digital media will be used. The hardware demonstrators should then illustrate the valid application of the projected tool chain. The outcome of this open workshop will be reported in a selective deliverable D6.2 and will be integrated into the final BPGs, as mentioned above.
4 Exploitation

4.1 Exploitation strategy

The exploitation strategy of this initiative is mainly determined by the specific character and content of the research and project objectives.

On the one hand the main objective of this project is to develop and demonstrate a complete new assessment methodology for a vehicle class (or mobility mode), which up until now are not subject of regulatory or consumer testing requirements. So, ideally, stakeholders in this area might take offer the complete approach respectively methodology, tools and criteria ("tool chain").

For this, this core result could be seen and defined as a pilot for a new generation and widely accepted assessment method. The basis for such a pilot is already provided by a long term process for which IMVITER delivered latest and relevant requirements. This general process for implementation of Virtual Testing in safety regulations and/or assessment was initiated 2006 by the CARS21 initiative and continuously further developed within research projects and even the EC regulatory framework. Figure 4.1 illustrates this background and the optional continuation by a “SafeEV pilot”.

![Figure 4.1.: Steps in the implementation of VT in safety regulations and –assessment and context of a “SafeEV pilot”](image)

On the other hand, SafeEV is also providing all relevant components respectively “chain links” for a virtual testing environment & tool chain needed for the evaluation of pedestrian & occupant protection and increased compatibility of SEVs. So, also exploitation of partial
results and specific findings will be promoted by project activities and even more by exploitation plans of the partners. The next paragraph highlights especially these more specific areas and dedicated project findings.

4.2 Exploitable results

4.2.1 Prognostic and forecast methodologies

Not directly addressed in the objectives – even more important is this SafeEV finding which might be used, in a general perspective and sustainable dimension, as a general approach for a prognostic and, may be, widely used forecasting method also in other traffic and mobility areas.

Added & novelty value of this methodology is created via the combination of four different phases and use of dedicated methods & surveys.

Basic information on more general future trends in the first phase is obtained from a Delphi study and a public survey (“A Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem” (Linstone & Turoff, 2002)). Within these surveys the participants should predict urban traffic and accident scenarios based on their experience and knowledge. In the second phase it is necessary to identify appropriate target accident types. These accidents are analysed according to their relevance based on accident frequency and injury severity. This will define so-called baseline scenarios. The definition of this baseline enables the evaluation of possible future accident scenarios. Due to a lack of real-world accident data to use the real world accident approach a stochastic simulation is used. Future accident scenarios in the simulation are predicted by integration of pre-crash safety systems (e.g. autonomous braking).

In the final phase future accident scenarios are predicted using the baseline and the general trend from the Delphi survey results.

Figure 4.2 gives an overview of the proposed method.

Within SafeEV the method was used to predict future accident scenarios with focus on small electric vehicles, but the principle transfer and application to other vehicles, road users or mobility modes is given by the combination of these three phases whereby each phase or subroutine could be aligned to the targeted forecast area independently (e.g. general trend from Delphi study could be also used for prediction of goods transport in urban areas).
4.2.2 Numerical methods and virtual models

One of the main objectives of SafeEV is to deliver **key building blocks** that are required for virtual certification and virtual testing of small electric vehicles. Due to the fact, that for this second generation of SEVs for urban areas (below M1 category → L7e // 400-550 kg) currently only limited recommendations concerning vehicle safety respectively just a few regulatory requirements are formulated and compared to traditional vehicles, where in the past experimental testing and homologation was the main concept, the introduction of virtual testing methods towards virtual certification will be promoted. Such a Virtual Testing and the use of advanced evaluation methods, including the development of appropriate criteria for the assessment of SEVs, will substantially support and accelerate the introduction of these safer small electric vehicles for urban areas in the next decades.

SafeEV will implement already existing **advanced human body models** and related Finite Element and Multi Body simulation technique within the projected evaluation procedure for assessing the crashworthiness of future SEVs. Also **advanced and new criteria** with the use...
of HBM will be discussed and proposed for virtual certification & evaluation and finally as exploitable result.

As a second and also new aspect with the implementation of a virtual tool chain the influence and so the evaluation of active safety systems will be demonstrated. With the simulation models and methods developed in SafeEV it will be possible to assess a full-integrated simulation of the pre-crash phase in order to optimise active safety / pre-crash based protection systems. With this approach also the influence of variations in occupant pre-crash behaviour will be included in simulation methodology.

Finally the exploitation of numerical models and virtual methods resulted from the project is mainly linked with a general trend towards virtual testing & assessment. The CARS 21 report formulated the first statement for this process and the EU project IMVITER, as already mentioned (see figure 4.1), provided dedicated protocols and guidelines for all parties concerned with such a development. Figure 4.3 shows the timeline of a general implementation of Virtual Testing in regulatory acts developed and communicated within the IMVITER project. Aligning now the projected SafeEV timescale and addressed vehicle generation near-perfect match for expected application and use of this SafeEV result area can be postulated.

Figure 4.3.: Virtual Testing implementation Roadmap (IMVITER).
4.2.3 Contribution to standards

General and again ideally we could think about implementation of the complete evaluation tool chain for SEVs into a new virtual assessment protocol or finally new regulatory acts.

Beside this especially two main findings of SafeEV have the potential to be implemented or be taken into account for future standards:

> Identified (urban) accident scenarios and transfer to proposed test scenarios.
> Advanced Criteria for safety evaluation – especially with the implementation of HBM to assessment procedures a first use case was demonstrated – nevertheless for some body regions still some more biomechanical research respectively criteria definition is needed.

4.3 Risk & Limitations

A general risk arises when the technologies or numerical methods might be available but not usable within the projected area or will not reach a certain level of acceptance which might be needed for widespread application and even implementation to regulatory acts.

Nevertheless, due to the fact, that a general trend towards Virtual Testing and/or the implementation of numerical methods can be assumed, some risk might just exist for the timescale.

Also "costs" can be identified as possible risk which might prevent that project key findings exploited and implemented to a future assessment framework. If Hardware Testing is still be seen as a cheaper or more efficient compared with Virtual Testing in this specific assessment area (SEVs), a wide dissemination of the project findings might be, at least, also delayed.

Limitations for the projected tool chain respectively the application of numerical methods are already identified for some assessment areas in the course of the project (see Deliverable D2):

For fire and electric safety no virtual assessment or criteria can be considered yet respectively is not expected within the projected timeline for SEVs (2015).

Also for active safety and related evaluation of the respective sensors it is stated in D2 that without inclusion of “real data” from validation drives of a car equipped with the according sensors a validation is finally not possible respectively a pure simulative assessment is not applicable now or in the near future.
4.4 Exploitation plan per partner

4.4.1 Kompetenzzentrum – Das Virtuelle Fahrzeug Forschungsgesellschaft mbH

ViF is an internationally operating research centre that develops affordable, safe and environmentally friendly vehicles for road and rail.

The mission of ViF is as followed:

- to build a sustainable and durable bridge between science and industry
- to provide competitive advantages for our clients and partners by fostering a rapid transition of basic research into industrial application
- to use our position as a major hub of the Styrian R&D network and international research partners to offer post-graduates and highly qualified scientists and researchers a state-of-industry work environment
- to investigate and develop essential new technologies that will be implemented in future automotive and drive train concepts.

The key areas of research and development at the VIRTUAL VEHICLE are combining numerical simulation and experimental validation and developing a comprehensive system simulation up to the complete vehicle.

Therefore the results of SafeEV are of deep interest. In particular, ViF will apply the results of its contribution to SafeEV to enhanced and widened combination of FE simulation and experimental validation, to improve virtual testing knowledge, Human Body modelling and injury criteria and safety of electric vehicles, especially of small vehicles to consolidate their engineering services for the automotive branches. We expect that the results achieved within SafeEV will support us to increasing our service portfolio for the future.

4.4.2 Volkswagen AG

The Volkswagen Group’s goals are to offer attractive, safe and environmentally sound vehicles that are competitive in increasingly challenging markets and to set world standards in their respective class. Hence, Volkswagen Group Research, as a partner of SafeEV, will not only use the project’s results within VW Group Research itself, but also will distribute these to their customers consisting of all Volkswagen Group brands. Brands such as Audi, Porsche, Seat, Skoda and Volkswagen passenger cars will be in the focus for the exploitation of the SafeEV’s project results.

Although VW’s main area in SafeEV is the pedestrian simulation work using the Finite Element human body model THUMS, all other project results, for instance the outcomes of the first two work packages dealing with future accident scenarios and the resulting...
proposition of relevant test scenarios for SEVs is of great interest. Hence these results will be distributed within the Volkswagen Group as well. The same applies to the results coming from the occupant simulations and especially the pre-crash simulation results in which VW is not directly involved within the SafeEV project. In the background of the whole tool chains which are to be developed in SafeEV, there will be many discussions and hopefully agreements concerning the extraction as well as the interpretation of results gained by the application of human body models. These will not only affect the development and the proposed virtual testing of SEVs, but also are of great interest for the development and optimisation of safe vehicles in general. In addition to the internally related exploitation, VW will present project results at relevant external forums dealing with human body models, such as the Partnership for Dummy and Biomechanics (PDB) and THUMS User Community (TUC), in which they are actively involved.

4.4.3 Daimler AG

Daimler AG with its businesses Mercedes-Benz Cars, Daimler Trucks, Daimler Financial Services, Mercedes-Benz Vans and Daimler Buses, is a globally leading producer of premium passenger cars and the largest manufacturer of commercial vehicles in the world. Daimler sells its products in nearly all the countries of the world and has production facilities on five continents. As an automotive pioneer, Daimler and its employees willingly accept an obligation to act responsibly towards society and the environment and to shape the future of safe and sustainable mobility with groundbreaking technologies and high-quality products.

The development areas and the world-wide market of these brands and products form the basis and framework for the Daimler internal dissemination and exploitation of the SafeEV results. The main technical dimension is then given with a general and extensive implementation of numerical methods and tools within a digital development process of all product lines.

The SafeEV tool chain will directly be discussed and, where applicable, be used as update or best practice guideline for related simulation methodologies. Particular attention is given for all kind of methods which will allow further improvement of Integrated Safety. For this, also findings from WP1 & WP2 related to future forecast and/or effectiveness analysis of safety systems are of great interest.

Due to the fact, that Daimler already has implemented numerical Human Body Models to its (safety) development process as a supplemental evaluation tool, all findings in this area will also directly be discussed for use and internal exploitation. In parallel, especially these project results will also be actively transferred to and discussed on precompetitive platforms like PDB or the THUMS User Community.
Related to safety of SEVs, Daimler will also make use of the results to support the recommendations formulated within the recently published VDI position paper concerning Electromobility & Safety.

Finally the SafeEV findings will be incorporated into a medium- and long-term strategy concerning Virtual Testing for which already results from former initiatives like APROSYS and IMVITER are implemented.

### 4.4.4 Centro Ricerche Fiat S.C.p.A.

CRF will exploit the tool chain developed within SafeEV through the inclusion/integration of its main contents (best practices, new testing configurations and evaluation criteria for protecting pedestrian and occupants, new methodologies, etc.) into existing internal guidelines, procedures and operational instructions: this will permit the practical application of the gained knowledge on a wider range of future projects focusing on small vehicles (very innovative as well as more traditional ones), especially for what concerns the Virtual Testing related aspects and/or technologies.

The main findings of Safe EV project will in fact contribute to that overall and continuous improvement/update process of numerical simulations methodologies, to be applied in the daily CAE activities supporting the development of safer (small) vehicle designs, that is typically present, promoted and pursued inside OEMs, according to its known beneficial effects in terms of increased industrial competitiveness and time/cost reduction.

SafeEV best practices/guidelines will be exploited not only through their already mentioned integration within internal CRF vehicle development processes; they will be also relevant as a starting point and/or valuable background for future research work and other initiatives, related to evolutionary steps in the passive/active safety field (e.g. virtual testing introduction as part of regulations, car-to-car compatibility in front and side impacts, new crash tests, etc.), that are traditionally among the activities followed by CRF (EC projects, International Working Groups like ISO and EEVC ones, etc.).

The above described ways of exploitation, other than the tool chain and the best practice guidelines, are applicable to the other relevant project results, too (i.e. the Reference Electric Vehicle Model REVM1, the solutions developed for it vs. improved pedestrian and occupant protection in the considered crash scenarios, etc.).
4.4.5 Pininfarina S.P.A.

The main results of Safe EV project will contribute to improve Pininfarina CAE methodologies.

Small electric vehicle is a field in which Pininfarina is interested as a flexible partner offering competitive products and engineering services to its Customers, even if SafeEV results and concepts could also be exploited on traditional internal combustion engine vehicles.

Lightweight materials is also an area of interest for Pininfarina, involved in other Funded Programs related to this topic, so SafeEV will contribute to increase Company knowledge in this field concerning the safety aspect.

SafeEV best practices/guidelines will be also relevant as a starting point for future works both in research and in development. In this perspective these guidelines will be integrated into Company ones in order to represent a consistent background also for internal training of young engineers.

4.4.6 Chalmers University of Technology

By participating and working in the SafeEV project, Chalmers will strengthen its position in the fields of human body modelling, injury criteria, injury biomechanics, virtual testing, assessment methods and other crash safety aspects of small vehicles.

Chalmers will use the results and knowledge from the SafeEV project for courses and other educational activities. The experiences and knowledge gained in the SafeEV project will also be used in future research projects, as well as being brought into other fora, e.g. the EEVC working groups.

Chalmers will disseminate non-restricted results within SAFER (SAFER – Vehicle and Traffic Safety Centre, 26 partners from the industry, the academia, and other institutes, see http://www.chalmers.se/safer/EN/about ).

4.4.7 Université de Strasbourg

Dissemination of results from Safe-EV at UNISTRA level exists at three levels as follows:

i) Scientific dissemination

UNISTRA, in conjunction with other partners will publish scientific papers related to pedestrian accident conditions, and to head and neck injury risk assessment methods, both outside and inside the vehicle. Contribution to conferences and workshop is also part of this section.
ii) Dissemination in standard bodies

UNISTRA will present advanced head and neck injury risk assessment methods and tools at EEVC WG12 and ISO GT12-WG6 in the context of automotive safety but also in standard bodies related to helmet testing (CEN, ASTM, …)

iii) Commercial or industrial exploitation

The head and neck injury risk assessment tool which will be implemented into the toll chain within SafeEV is based on SUFEHM (Strasbourg University Finite Element Head Model). This model has been coupled to THUMS human body model and is available via licensing.

4.4.8 RWTH Aachen University

By giving students an insight in latest research activities, updating the lecture materials for the lecture “Structural Design of Vehicles” and promoting the conduction of scientific thesis in this field, ika will use the results of SafeEV in educational activities.

In addition ika will extract knowledge of the research project SafeEV to create engineering support activities for European OEMs and Tier 1 suppliers.

Furthermore, ika will reinforce its leading position with respect to different aspects, including improved knowledge of virtual testing procedures, comparison of different FE codes, Human Body Modelling, injury biomechanics, pedestrian safety, passive safety of electric vehicles and crash compatibility of small vehicles.

4.4.9 Graz University of Technology

TU Graz will benefit from already achieved and planned project results in different areas. As some of the TU Graz research topics are for example, Accident Reconstruction, Biomechanics, FEM, Accident Statistics, Integrated Safety, Battery Safety, the novel and advanced methodologies developed within the SafeEV project are capable of improving the output in future studies and can be used within the next decade/s.

The developed knowledge on one hand will influence upcoming project activities, enhancing the research work with industry partners and optimizing the results. The focus on pedestrian and occupant protection involving advanced FE-models will help to find new project partners and strengthen already existing collaborations. A bigger part in FEM methodology is the development of HBM tools which will be in focus in the upcoming years in many projects.

On the other hand, for educational reasons, which are of course part of the general university fundamentals, the outstanding results are an excellent opportunity to address students in this research area (master thesis/PhD). Some of the results will be integrated in lectures/laboratory
tutorials for an updated state of the art educational background of those students which will possibly work for some partners in the near future. The submitted and planned publication from this project will support all these activities.

4.4.10 Robert Bosch GmbH

Bosch Corporate Research is responsible for the advance development of new technologies and innovations in areas such as automotive electronics, car multimedia, energy and body systems, safety and security systems, SW engineering and digital signal processing of the whole Bosch group.

Bosch plans to use the project SafeEV to extend and strengthen its knowledge in small electric vehicles. Particular focus is laid on adequate safety measures, e.g. in view of Active, Passive and Integrated Safety for lightweight vehicles. Thereby, the experience basis in virtual modeling of crash signals of vehicles is subsequently extended. Furthermore the knowledge base concerning the virtual tool chain for safe vehicle design including human body modeling as prototype for future engineering tools is enlarged.

Finally, Bosch will use the outcome of the research project SafeEV to enhance its knowledge basis in order to support European vehicle manufacturers in creating safe and competitive small electric vehicles.

4.4.11 Swerea Sicomp AB

Swerea plans to use SafeEV to strengthen its collaborations with other EU partners interested in using composite materials on an industrial scale. The results of the simulations made for pedestrian safety will be used by Swerea to design safer vehicle components using composite materials in the future, as the internal knowledge of human body impact modelling will be increased by the project.

The demonstrator components manufactured by Swerea in WP5 of the project can be showcased at dissemination events by the other partners. These are selected based on the selected safety solutions from WP4. The demonstrators can be shown in conjunction with the simulation results run in WP5.
5 Summary

This document describes the intentions of the consortium members for disseminating and exploiting the project results and findings.

First of all, the contractual requirements for dissemination activities and the use of project findings are repeated and clearly arranged. Especially to be emphasised in terms of ownership and use of results is the fact, that SafeEV is part of a cluster of projects – this is highlighted accordingly.

Within the dissemination plan strategy and planned activities are described. For these dissemination activities already possible audience and main addressees where identified within the implementation phase of the project. This report will also strengthen now the information transfer in terms of a coordinated activity also within the SEAM cluster.

Five main categories are identified to build the core of the dissemination strategy of this project. These categories and its current status are described within this report:

- Project oriented dissemination & information platform
- Scientific publications and contribution to conferences
- Implementation of project findings - interest groups & relevant stakeholders
- Deliverables
- Workshops / Final dissemination workshop

The second part of this report presents the exploitation plan for using and implementing new knowledge and project findings in detail and related activities of the partners and how they support exploitation. On a first level, SafeEV and its project findings might be accepted and seen as a pilot for the implementation of virtual testing and virtual type approval and will be exploited “en bloc”. Nevertheless, three categories of exploitable results are identified as well for more specific application areas:

- Prognostic and forecast methodologies
- Numerical methods and virtual models
- Contribution to standards

Also Risk & Limitations are discussed in this part of the report.
6 References
