



**Electromobility+**

*Electromobility+ mid-term seminar  
Copenhagen, 6-7 February 2014*

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Project coordinator

# EVREST: Electric Vehicle with Range Extender as a Sustainable Technology.



University of Stuttgart  
Chair of Building Physics



07-02-2014

EVREST – Presentation

- Project goal
- Project structure
- WPs progress, first results
- Management and dissemination
- Next steps and perspectives

# Goal and methodology

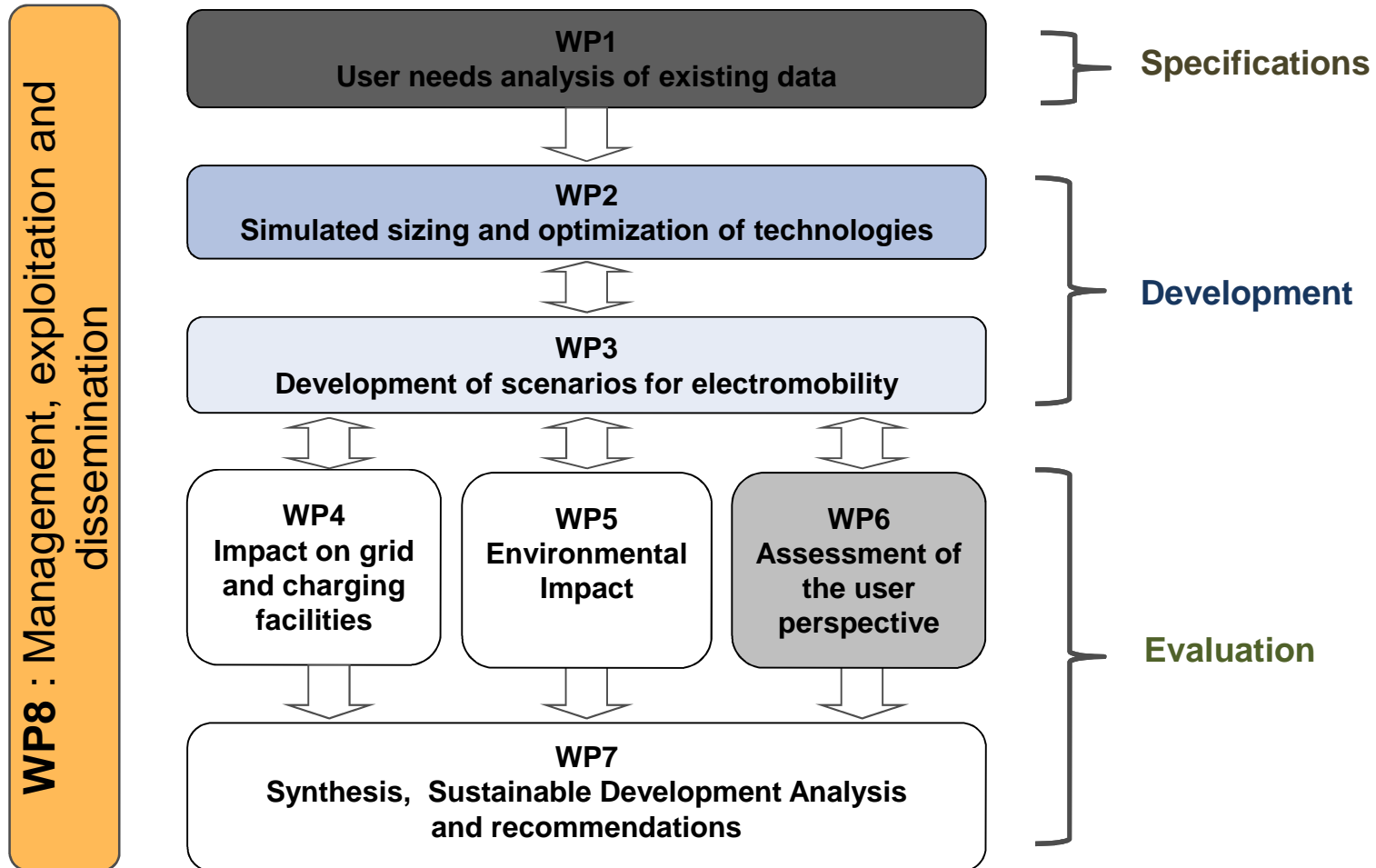
**Main objective:** to evaluate Extended Range Electric Vehicle as an optimized solution contributing to electromobility by addressing:

- Battery size (cost) according to the users expected range
- Driver psychological assurance (guaranteed range)

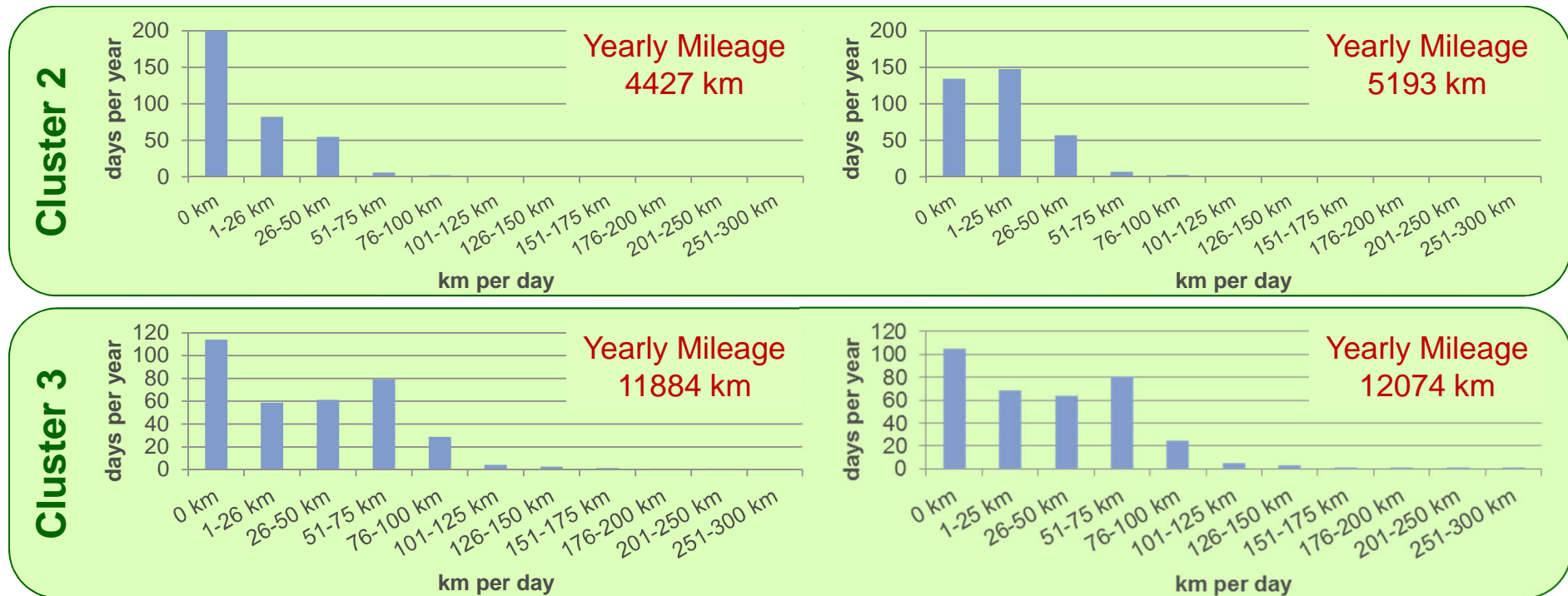
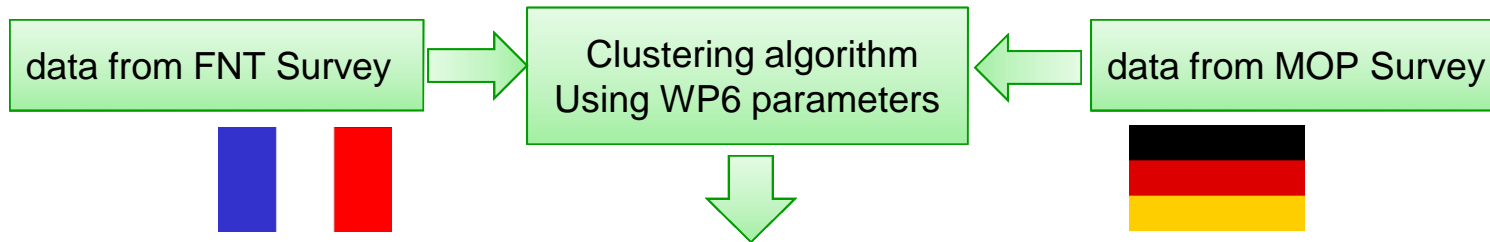


## Proposed approach:

- To identify actual needs of European mobility through existing data
- To define and optimize the size of different solutions based on EREV from users' specifications
- To build scenarios for forecasting EREV possible diffusion
- To evaluate the solutions (use + technology):
  - Environmental aspects (LCA)
  - Acceptability (sociological, economical, ...)
  - Recharging facilities



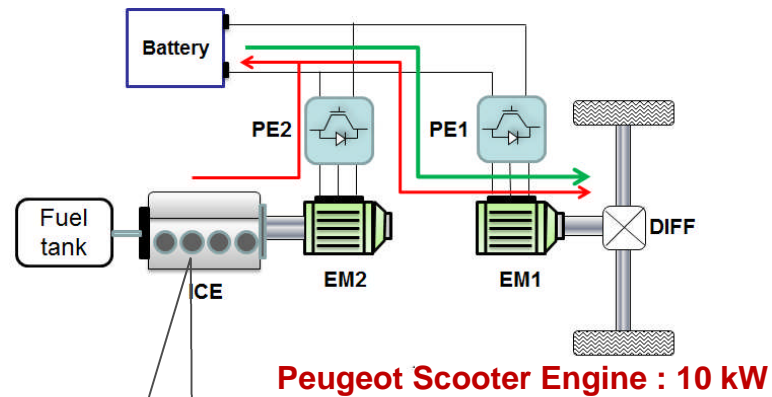
# WP1: Segmentation of car use profiles for EREV



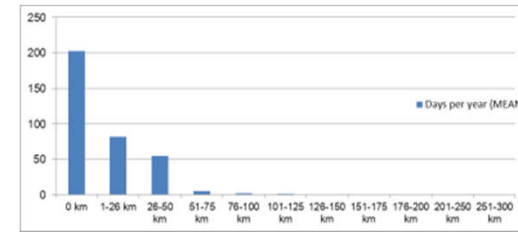
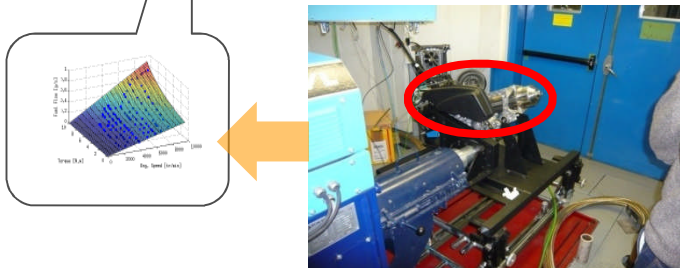
Small Class

Cluster 2

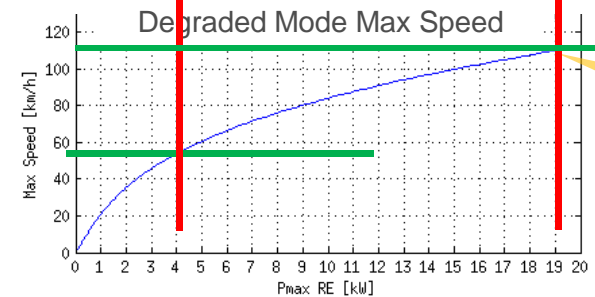
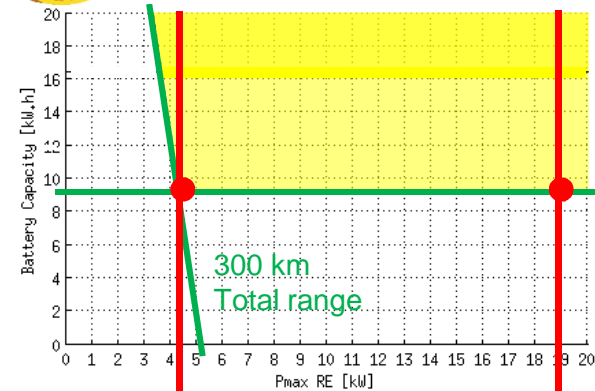
Vehicle and components models  
Using IFSTTAR-VEHLIB software



Peugeot Scooter Engine : 10 kW



Cost Based Performance Based



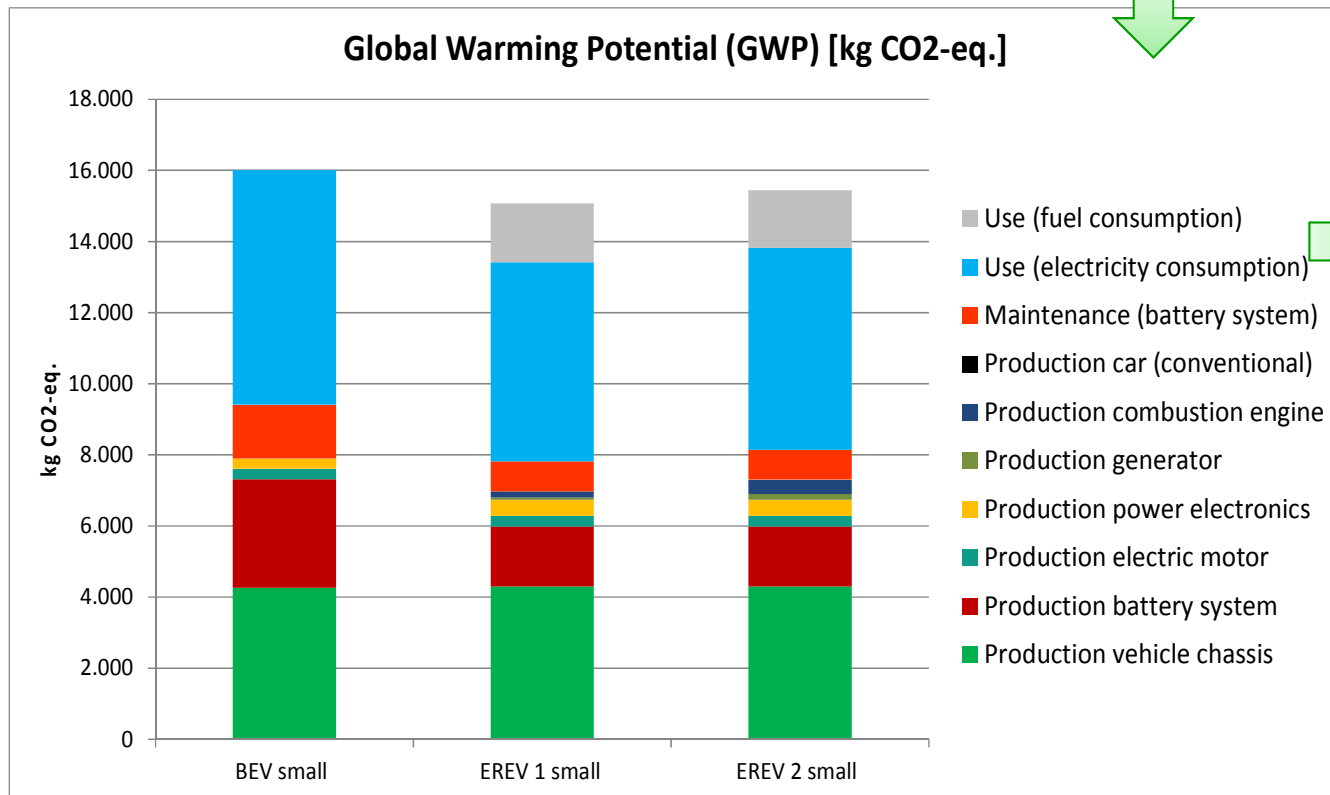
Based on an item of WP6 Survey

Simulation results :

- EREVs components characteristics
- Electricity and fuel consumption



# WP5: Interim results – Small vehicles, Cluster 2 Germany

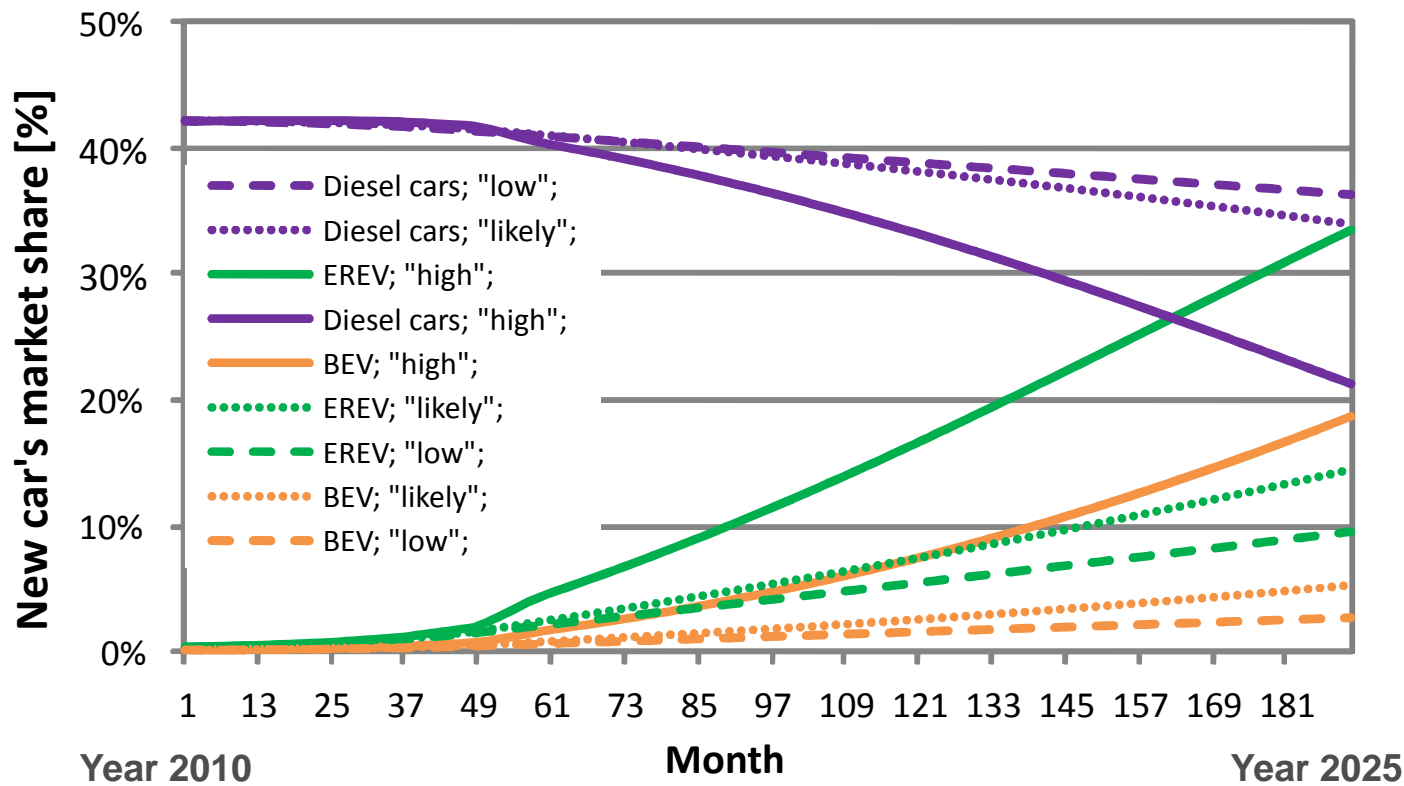


**Further work**

Graphical illustration of spatially differentiated LCA results with GIS Software

# WP3: Preliminary results – example of German car market

- Scenarios setting: Development of 3 future framework scenarios for electromobility (**optimistic (high)**, **pessimistic (low)** and **most likely**), Collection of 21 indicators for France, Germany, Austria (for the base year 2010 – and prognosis 2025),





# WP4: Simulation of EREV usage and application in the Stuttgart metropolitan area

## Simulation of EREV usage

- Multi agent simulation model mobiTopp
- Stuttgart metropolitan area



- Three EREV scenarios
- Model extension to one week
- Implementation of EREVs

Electric car mileage;  
time of battery charging

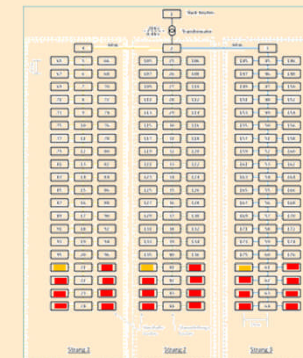
## Impact of EREV usage on the energy system

- Electricity generation
- Distribution grid: Critical mass of simultaneously charging EREVs in two test grids

The 10<sup>th</sup> car...



The 8<sup>th</sup> car...



... is critical

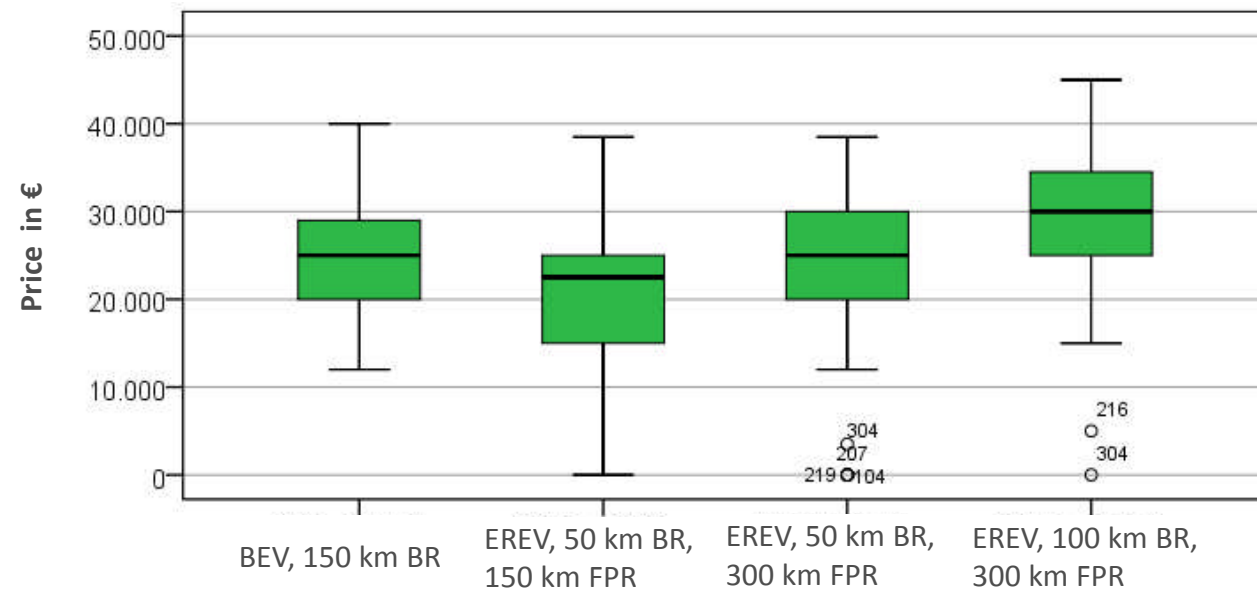
# WP6 – user perspective on critical aspects of EREVs

– First survey with 61 participants – participant profile:

- Potential early EV customers (applicants/participants in EV field trial)
- Sufficient practical experience with limited-range mobility
- Mobility profile: substantial daily distances (average: 111 km)

– Is an **EREV** concept **generally accepted** by potential EV costumers?

BR = battery range  
FPR = full-performance range



# Contribution to key dimensions

## « technological strategies »:

Provide inputs for manufacturers and decision makers about:

- EREV technology with different battery sizing
- The expected performances (range, speed, LCA)

## « Socio economic issues »:

- EREV penetration scenario's up to 2025
- Use and user patterns, social acceptability of EREV

## « Research and development »:

- vehicle architecture: EREV power train design  
integrated methodology directly linked to use data.



# Project management and dissemination

- 6 project meetings : 2 Paris, Chemnitz, Karlsruhe, Vienna, Lyon
- Expert workshop, Vienna June 2013
- Deliverables D1.1 and D1.2 available
- Advisory board constituted (Renault, BMW, Austrian Federal Ministry for Transport)
  
- Project website : <http://www.evrest-project.org/>
- Project shared space: <http://listes.ifsttar.fr/wws/info/evrest-partners>
  
- **2** TRA2014 Conference accepted papers, to be presented in april 2014 in Paris



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# Next steps and perspectives

- WP2: Catalogue of EREV designs (ongoing deliverable) and study of the Fuel Cell based EREV
- WP3: Framework and trends for electromobility including EREV (ongoing deliverable)
- WP4: Assigning EREV use to households in the Stuttgart metropolitan area and assessing impact on the grid
- WP5: More detailed and spatially differentiated LCA of the selected designs of EREV
- WP6: Finalize surveys and conclusions on users perspectives
- WP7: Setting the methodology of the results synthesis
  
- Dissemination of the project results
- Possible extension of the developed approach to other kind of vehicles



Thank you for you attention.



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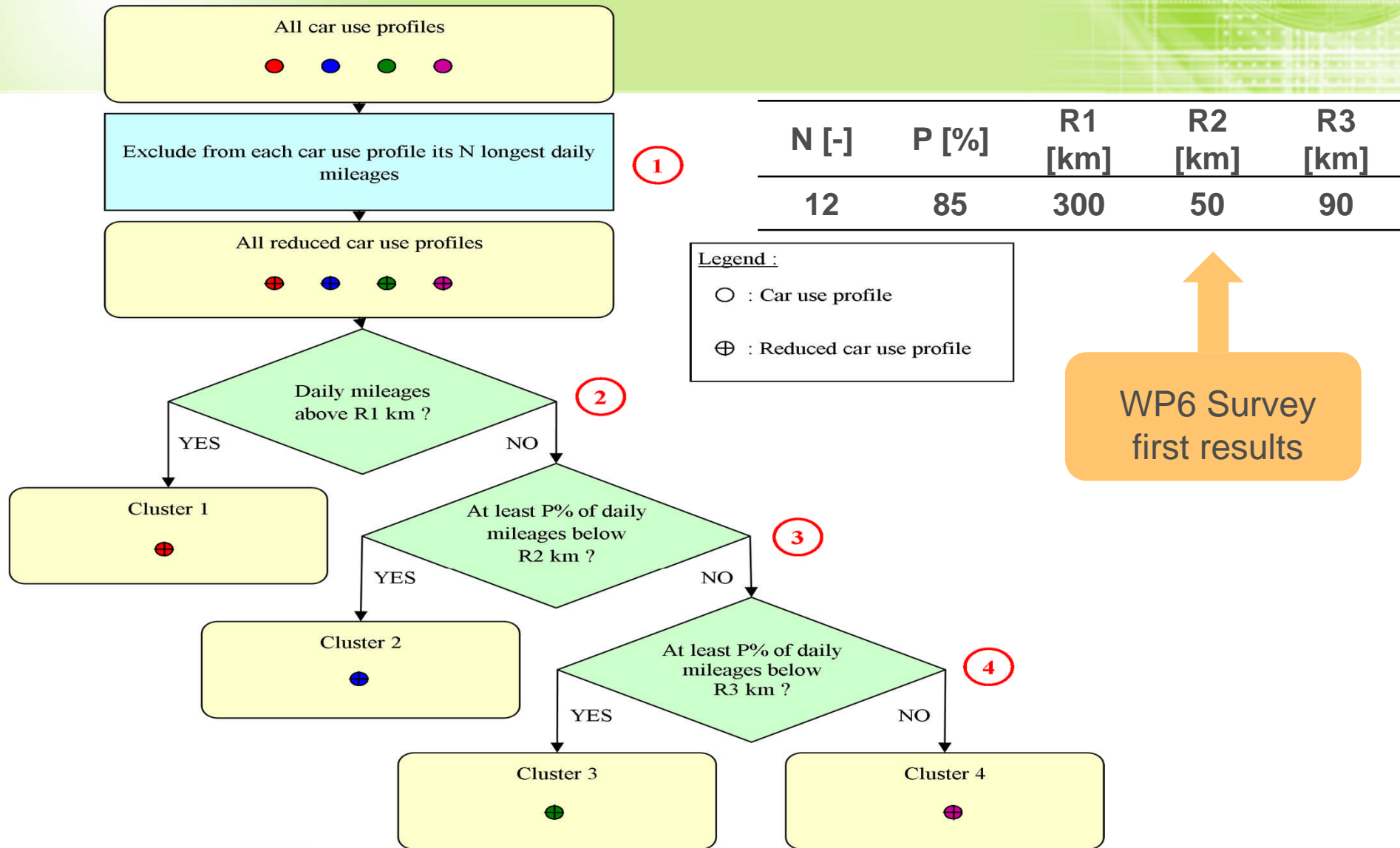




# WP2: Example of Simulation results















Small Class	Reference BEV 	Cluster 2 ICE Cost Based 	Cluster 2 ICE Cost Based 
Battery Size (kW.h)	16	9	9
RE Size (kW)	-	5	5
Weight	1200	1159	1159
Yearly elec. Consumption (kW.h/y)	 /  771 / 904	628	767
Yearly gasoline Consumption (L/y)	-	52	49
<b>12 years Total Cost (€)</b>	 /  <b>30820 / 32210</b>	<b>27070</b>	<b>28280</b>
<i>Purchase</i>	29600	25150	25150
<i>Energy during 12y</i>	1200 / 2600	1920	3130

# WP1 : Segmentation of car users profiles





# Consortium Engineering & Human Science

<b>IFSTTAR (coordinator)</b> Institut Français des Sciences et Technologies des Transports, de l'Aménagement et des Réseaux		 France
<b>KIT</b> Karlsruher Institut für Technologie		 Germany
<b>TUC</b> Technische Universität Chemnitz		 Germany
<b>LBP-GaBi</b> Universität Stuttgart	 University of Stuttgart Chair of Building Physics	 Germany
<b>BOKU</b> University of Natural Resources and Life Sciences Vienna Institute for Transport Studies		 Austria
<b>CNRS</b> Centre National de la Recherche Scientifique. Laboratoire Economie des Transports.		 France
<b>Peugeot Scooters</b>		 France



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