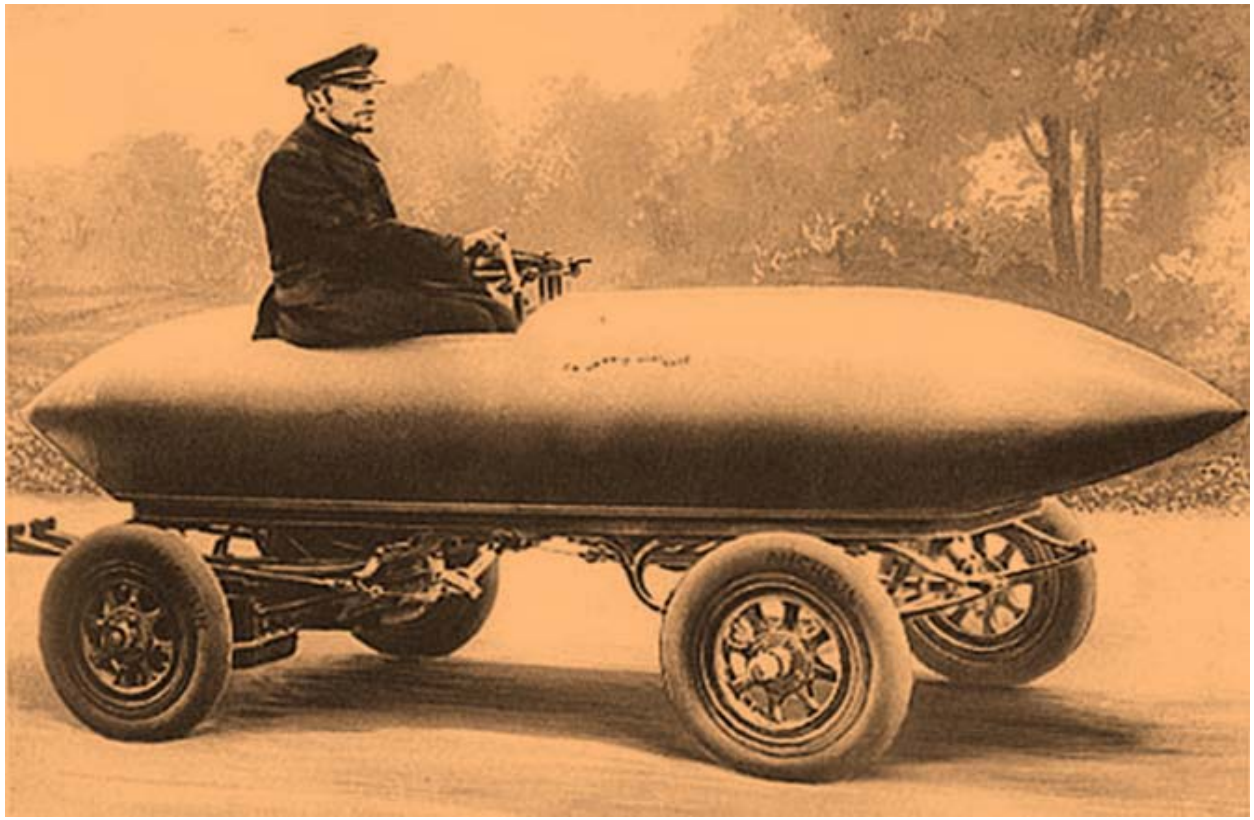
“La Jamais Contente”, 1899 Camille Jenatzy ; first 105.88km/h ,
, electric, 1450kg where the batteries are 50%.,

50kW in two motors ; 100 cells of Lead-Acid batteries. “

e-mobility NSR



e-mobility NSR

Vehicle Electrification is a way to:

Diversify Transportation Energy Sources **(CNG-HCNG-H_2, RES Electric Power)**
Increase Transportation Sector Efficiency

EV Problems:

Requires New approaches of Grid Management in the Power Sector
Smart Metering Systems /Vehicle to Grid Applications (V2G)
230-400 Volt 16-32-63-80 -125 Amp.
slow and fast charging systems

EV's have limited driving range

1. Energy Needs of EV's

A Well Designed 'Classical' electric car.

- If **light materials** are used,
- **light batteries**
- **a high efficiency motor** and drive of maximally 90% efficiency,

a 10kWh/100km is sufficient.

With a high efficiency drive, 4,9 kWh mechanical

Some 50% of kinetic energy can be recuperated, or 1.39kWh for 50 stops in 100km.

The total gets about 10kWh/100km

- **However this asks a "Redesign" of**
- **the chassis**
- **drive systems**
- **converters**

A classic ICE car + driver + luggage **weights 1400kg,**
the energy for 100km at 20m/s is **19.6 MJ**

2. The practical "state of the art battery":

100Wh/kg order of magnitude of the practical selling for **LiFePO4**, lithium iron phosphate, somewhat more for low peak power, somewhat higher for high peak power.
The LiFePo4 **does not explode** like overcharged Li-Ion batteries.
Some 25% in weight increase can be the housing and conductors:
So using the chassis as housing and the series connection, so a higher voltage reduces the final weight.

http://en.wikipedia.org/wiki/Rechargeable_battery
http://en.wikipedia.org/wiki/Lithium_iron_phosphate

The LifePO4 may have a **cycle life of 3000 charges**, so sufficient for electric vehicles, may be also for hybrid vehicles and plug-ins.
Open circuit voltage typical 3.45V
The LiFeP04 battery has not the tendency to explode like the Li-ion in laptops or mobile phones (type Li-ion and explosion in google)
Li-ion batteries use the expensive Cobalt element.

3. EV Range Extension, using Fuel Cells " $3kW_e$ "

(FCRE/ **F**uel **C**ell **R**ange **E**xtender)

Initial concept validation
Delivery for testing and integration 2 EV's March 2012
$3kW_e$ Fuel Cell Range Extender for Think City -1 Delivery VAN: October 2012

4.Ultralight Single Person Covered EV "E l b e v Concept"

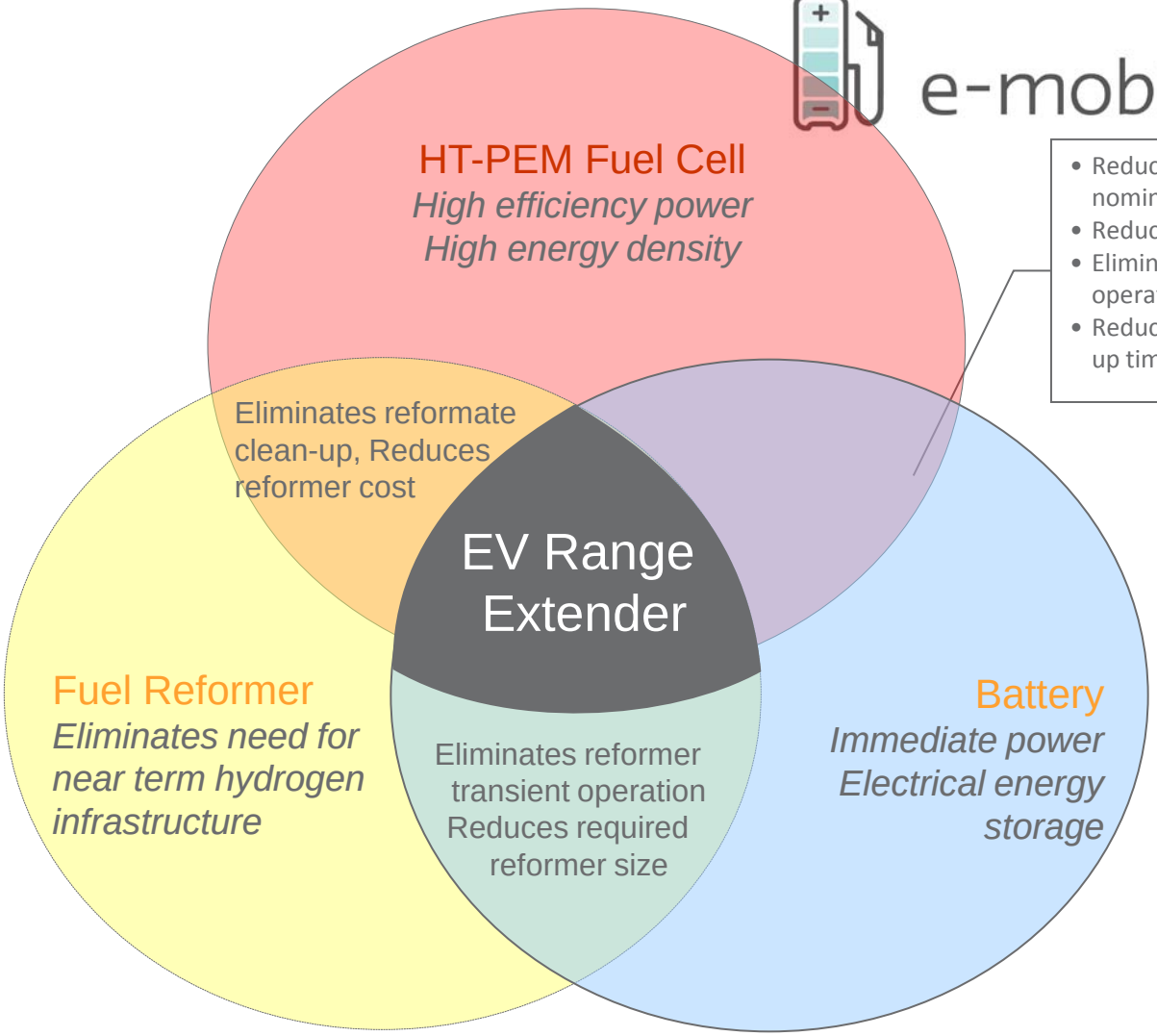
elbev = ecologic low budget electric cars.

Knowing that :

- **Weight,**
- **Motor** and
- **Battery-efficiency** **is important,** one can look at **"Ultra Light EV.**

So the concept of the "ELBEV" has been calculated at the lab.
It is realistic to design a single person covered car using a curb weight lower than 100kg.

e-mobility NSR



- Reduces required fuel cell nominal power
- Reduces required battery size
- Eliminates fuel cell transient operation
- Reduces fuel cell required start-up time

WP 5 Tasks Automotive tests of EV's:

"Automobile Power Test Bench" for determination of static and dynamic characteristics and **battery aging profiles.**
A three phase power analyser will measure both at input and output of power converters for determination inverter efficiency and motor / generator efficiency.
This power analyser can also be used **for measurements on power converters** for **battery charging systems** and in **vehicle inverters.**
Data-acquisition and logging of driving parameters, electrical and mechanical parameters, interfacing with in **Vehicle CAN-bus.**
Data analysis using Matlab programming on 64 bit Workstation 'Vehicle to Grid' aspects:

Bidirectional electric power converters coupling DC links to Electrical Power Grid and connecting DC link to synchronous and asynchronous AC machines.
A photovoltaic 20kW peak continuously monitored with data accessible using a web server.
Wind Energy Research:
Optimisation of generators, performance measurements on power converters, wind power measurements and control strategies.

e-mobility NSR

Fieldtest Demonstration Program

Introduction **110 units** of Field test HEV-EV'- (OEM & Retrofit) in Flanders Region
First 5 OEM EV's delivered **February 2012**
Target **40** OEM "WitGeelKruis" (EV's for WGK-nurses, home care daily services)
65 Smart Retrofit **(homologation november 2012**)
2 e-Bus Tecnobus (Home-Work Shuttle & Tourism)
2 FCRE (Validation) **March 2013**
1 **HEV-Truck** (city-distribution during the night) **March 2012**

SURVEY **Ecoscore** Service Cars Flanders Region Public Services

Service Fleet in 2008 2.258 vehicles
in 2011 3.497 vehicles

90% diesel
10% benzine
1 CNG (compressed natural gas)
6 LPG/GPL
4 Hybride (HEV)
- 2007: 60% of the cars Ecoscore > 62
- 2008: 70% of the cars Ecoscore > 62
- 2009: 70% of the cars Ecoscore > 65
-2010: 80% of the cars Eco score > 65.

Subject of the introduction of HEV-EV's in the Public Service Fleet Flanders Region

An EV **on mixed electricity** **Ecoscore** = 85,3
An EV on **CNG Powerstation** **Ecoscore** = 85,7
An EV **on Renewable Power** **Ecoscore** = 96,7