

# Battery electric and plug-in hybrid vehicles deployment : Status and Prospects

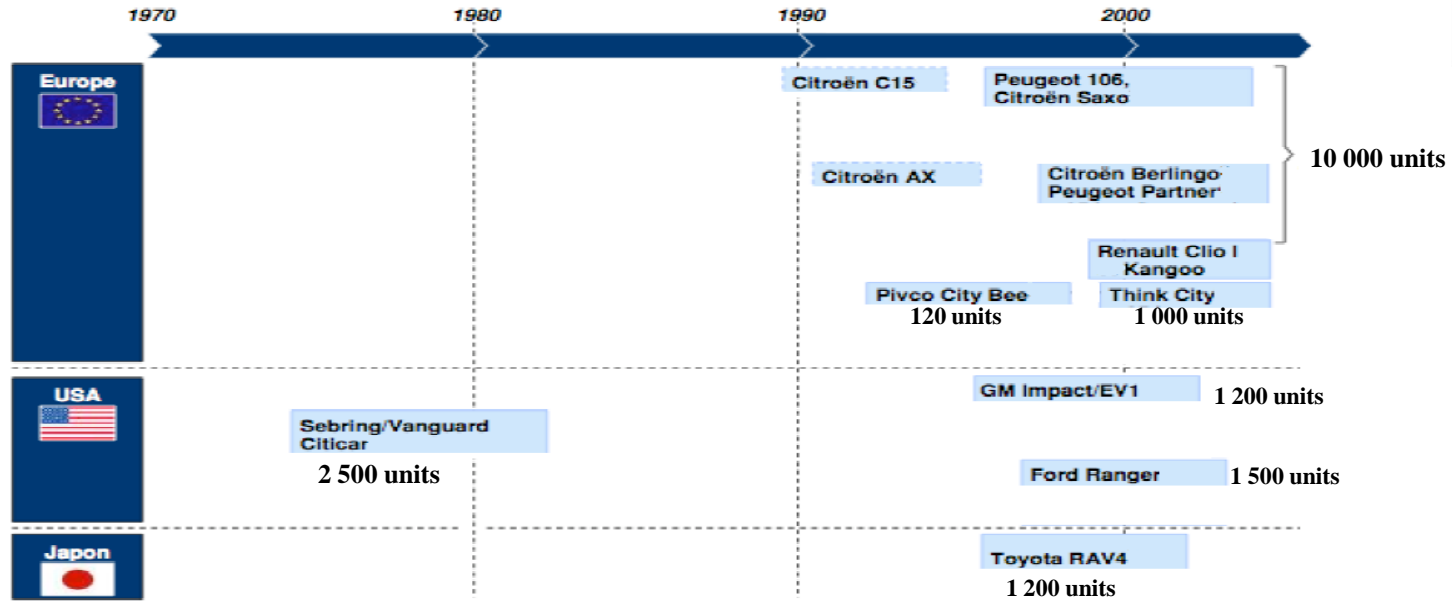
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**Workshop of CEPS Task Force on Transport and Climate Change on  
Strategies for the transition to electric mobility  
Brussels, June 13th, 2013.**

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*Ministry for Ecology, Sustainable Development and Energy, France*

# History of the EV Industry



Source: McKinsey

Only vehicles sold at 1000 units or more are represented

Production before 1940 is excluded

- Several attempts at international level
- Production volumes remained low

# A favorable context for the development of the sector

## -Need to develop less oil dependent vehicles :

- 97% of land transport depend on oil ;
- 32% of oil consumption done by 31 M private cars & 6 M utility vehicles ;
- 34% of CO2 emissions related to land transport.

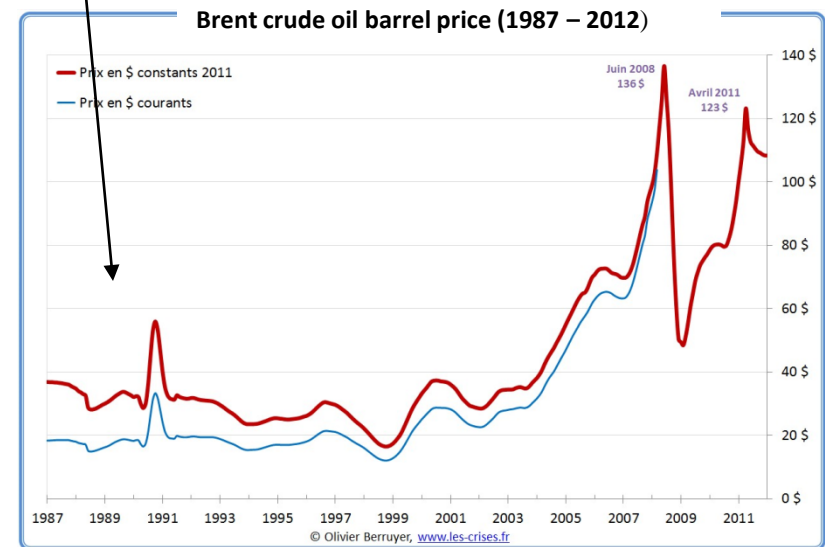
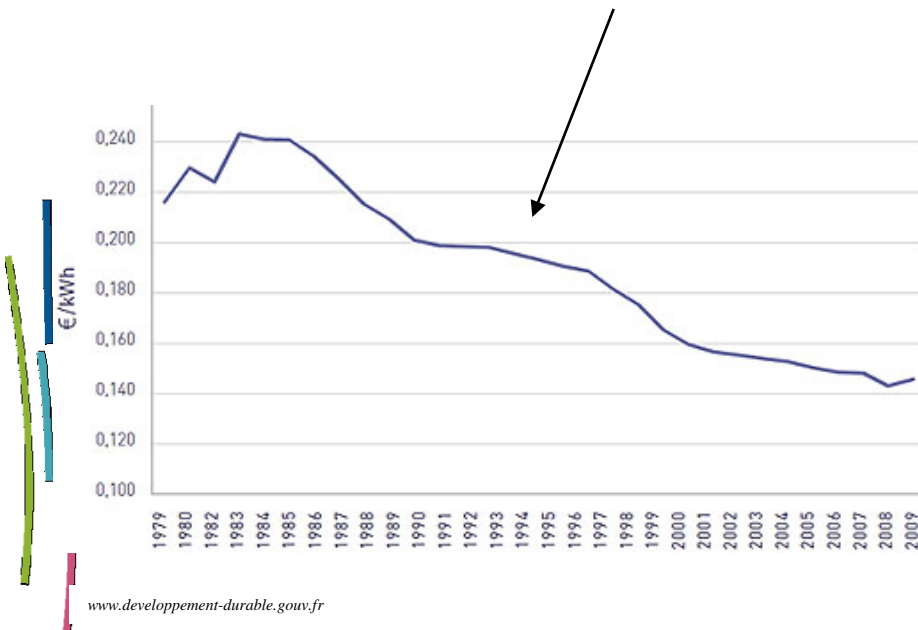


- 1 billion vehicles, 2 billion vehicles at least in 2030 ;
- more than 60% of oil would consumed for land transport ;
- transport would be responsible for, at least, 23% of the global CO2 emissions

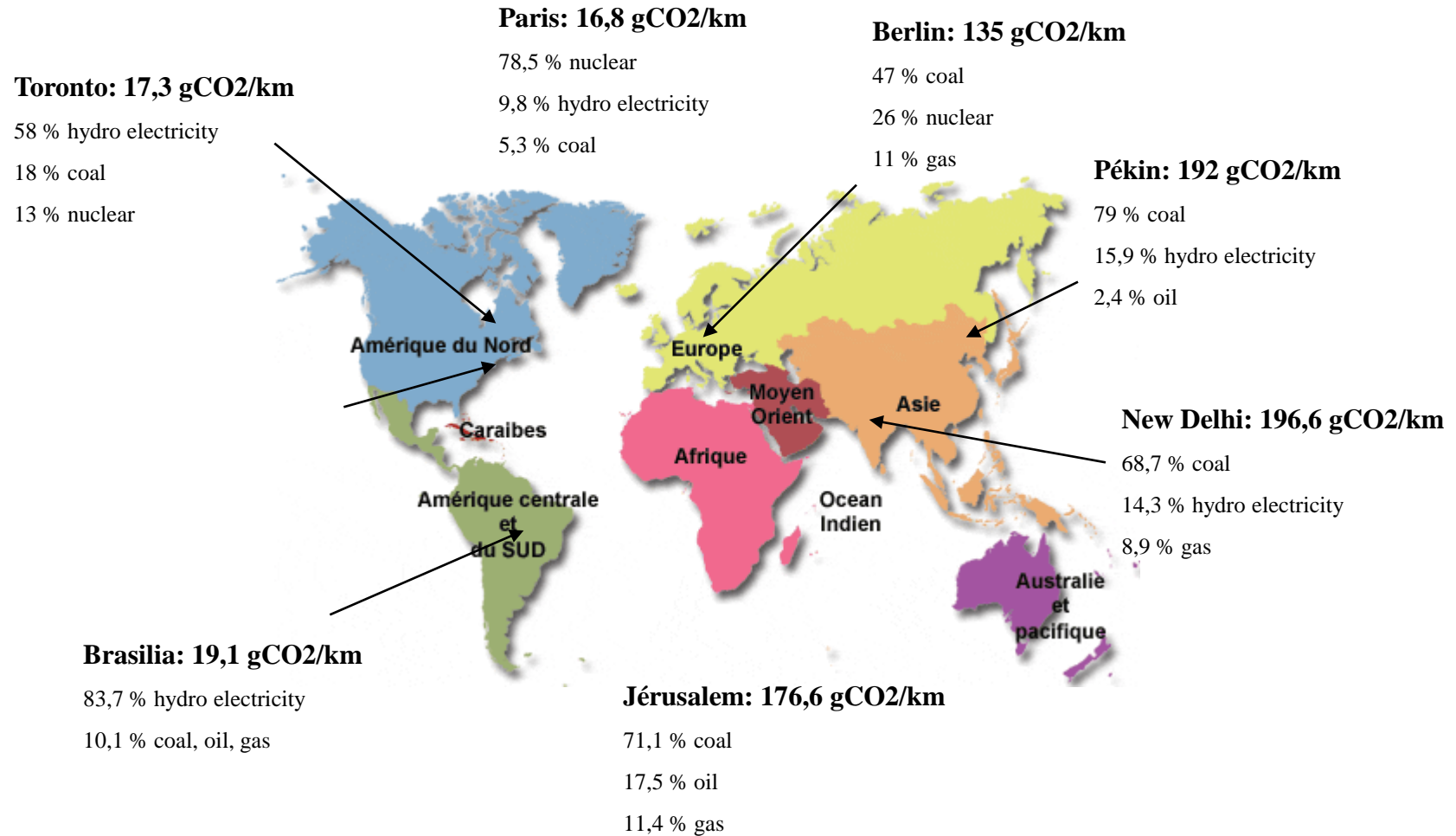
## - Need to reduce energy dependence on oil

# Significant changes enabling this development

- Development of ecological awareness
- Awareness of new models (ex: Toyota Prius)
- Development of lithium-ion batteries (improved battery life)
- Consolidation of pollution regulations and incentives
- Oil barrel expensive (30\$ in 2002, 140\$ in 2008, 112\$ in 2012)
- Stability of electricity prices



# CO2 emissions from well to wheel depending on the place where the electricity is consumed



Sources: AIE

# Impact on electrical network

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- From a global point of view :
  - The energetical need of 2M EV (objective for 2020 in France) represents 1% of the French electricity consumption.
  - The current electricity production in France would enable to provide energy for around 20M EV
  - 100% of EV in the French fleet would need an extra 15% of the French electricity consumption (less than 3 nuclear plants)
- The problem of peak load remains to be addressed
  - strengthening of the network needed
  - use of the smart grid a possible solution : optimization of the production, distribution and consumption of electricity at an international level

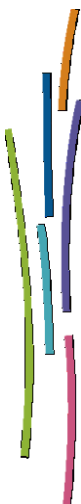
# Launch of the National Plan for deployment of battery electric and plug in electric vehicles in France

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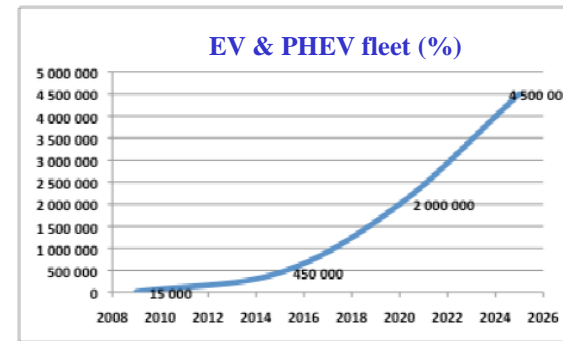
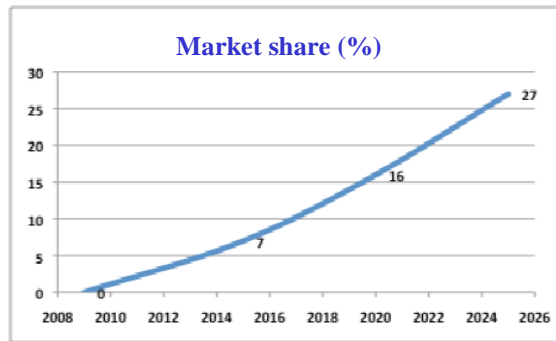
14 concrete actions to :

- Strengthen R&D and testing,
- Participate in the emergence of a new value chain,
- Develop infrastructure at home and at work,
- Develop public infrastructure,
- Anticipate the environmental issues.

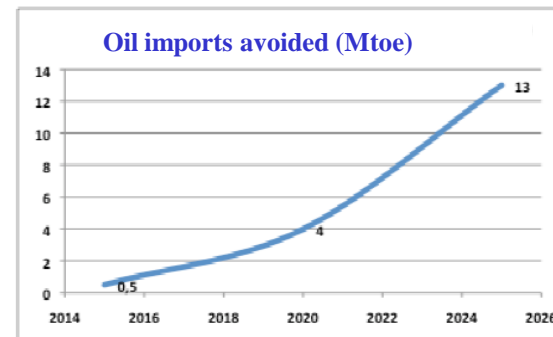
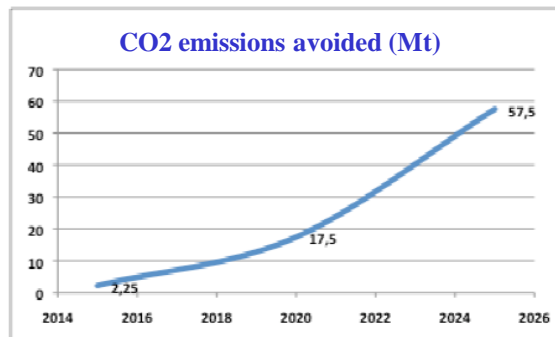


# Ambitions for France

- Important market shares rise for the EV / PHEV compared to other vehicles, and a huge increase in the fleet :



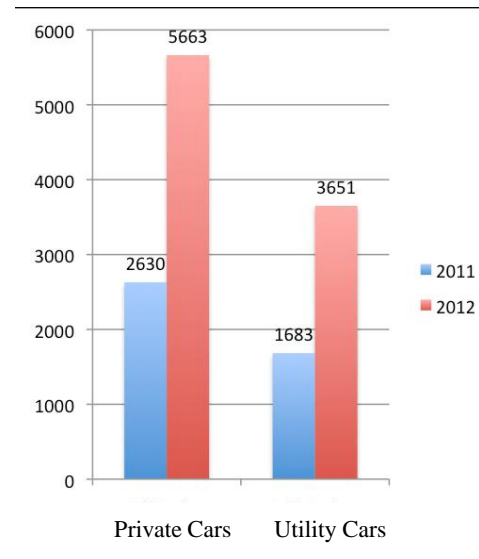
- CO2 emissions and oil imports avoided:





# Some first encouraging figures

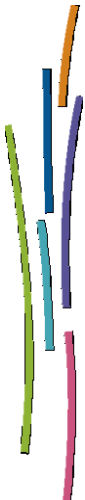
- In 2012, 35% of the new EV in EU were registered in France VE
- In France, in a decreasing automotive market (-14%), sales of electric cars have doubled in the first quarter of 2013 compared to the first quarter of 2012
- Arrival on the market of promising new models (ex: Renault Zoé) ; PHEV market has emerged in 2012 with the first vehicles proposed (Volvo V60 Plug-in, Toyota Prius Plug-in, Opel Ampera)



EV sales in France in 2011 & 2012

# Some of the National Plan actions in details & examples of initiatives

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# Group tenders

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- Constitute a large enough buying power to get a lower or equal TCO to the equivalent thermal vehicles
  - Launched on April, 23rd 2010
  - Applications received in June, 2010
  - Receipt of final bids in July, 2011
- 3 lots, delivered from 2012 to early 2016 :
  - 15 637 light-weight utility vehicles (Renault Kangoo ZE)
  - 3 074 compact vehicles (Peugeot Ion)
  - 2 600 vehicles with 4 or 5 seats (Renault Zoé & Fluence, MIA Electric)
- At least 25% of the vehicles acquired by the French administrations will be EV or PHEV
  - Order forecasts for 2013 : 449 HV & 257 EV

# Infrastructure development

- Minimal infrastructure to « reassure » the drivers : in March 2013, 5766 charging points open to the public (1800 in July 2012)
- Beyond 2013, the objectives are ambitious :

<i>Thousands of units</i>	2015	2020	2025
Home and work	900	4 000	9 000
Parking : slow charge	60	340	750
Parking : fast charge	15	60	150
<b>Total</b>	<b>975</b>	<b>4 400</b>	<b>9 900</b>

- The shared infrastructure will represent 10% of the charging points, but 5% of the uses

# Infrastructure development



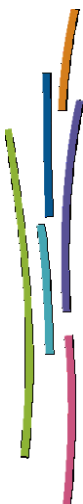
- 2 Expressions of Interest managed by ADEME (Agency for the Environment and Energy Control) :
  - Support of pilot communities engaging in the deployment of charging infrastructure
  - Support of groups of municipalities with more than 200,000 inhabitants
- 1 Expression of Interest managed by « Caisse des dépôts et Consignations »
  - Cities labeled "EcoCities" can apply under the program "City of Tomorrow".
- A total budget of € 50 million is allocated to operations supported within the framework of these 3 programs,
  - Support rate of 50% of the investment cost (equipment, civil engineering, engineering and network connection ...) in the case of normal (3KVA) or accelerated (22KVA) charging infrastructure installed on the street, out of concession,
  - Support rate of 30% of the investment cost in the case of fast charging infrastructure (43KVA) installed on public roads or gas stations open to the public.

# Infrastructure development

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- Integration of charging points in new buildings
  - Decree n° 2011-873 of July, 25 2011 on the charging points dedicated to EV and PHEV in the buildings
  - The provisions of the decree apply :
    - for new buildings for which the building permit was submitted after January, 1st 2012,
    - for existing buildings (tertiary activity) from January, 1st 2015.



# Example of initiative : Autolib' in Paris region

- 46 towns and partners to offer a new mobility service in the Paris region

- Infrastructure :

- 800 stations (1 120 at the end of 2013)
- 1 800 vehicles (3 000 at the end of 2013)
- Around 6 parking spaces by station
- 120 Autolib' information locations at the end of 2013



- Proposed rates :

- 1 year subscriptions: 12€ p. month + 5€ for ½ h, 4€ the additional ½ h, 6€ beyond
- 7 days subscription : 15€ + 7€ for 1/2 h, 6€ the additional ½ h, 8€ beyond
- 24h subscription : 10€ + 7€ for 1/2 h, 6€ the additional ½ h, 8€ beyond

- In 1 year : 50 000 subscribers, 800 000 transactions, 8 million kilometers

# Example of initiative : Twizy Way by Renault

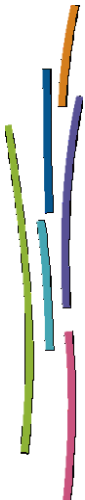
- Carsharing implemented in the urban community of Saint-Quentin-en-Yvelines (78)
- From September 2012 :
  - 50 vehicles deployed
  - 27 km<sup>2</sup> covered by the service
  - Available on the parking spaces in the area
- Operation :
  - Viewing locations Twizy via smartphone application or internet (booking possible up to 15 minutes before use)
  - Flash code on the vehicle readable from a mobile phone connected to Internet
  - 15€ registration fee and billing of 0.29€/min to 11.90€/h





# Thank You for your attention

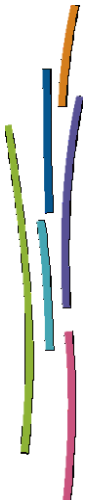
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# Supplements

# Special regulations for EV & PHEV

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# Regulations completed

Batteries (REESS, R100)

Electrical security vehicle and battery

Safety use, exigences directives basse tension R100

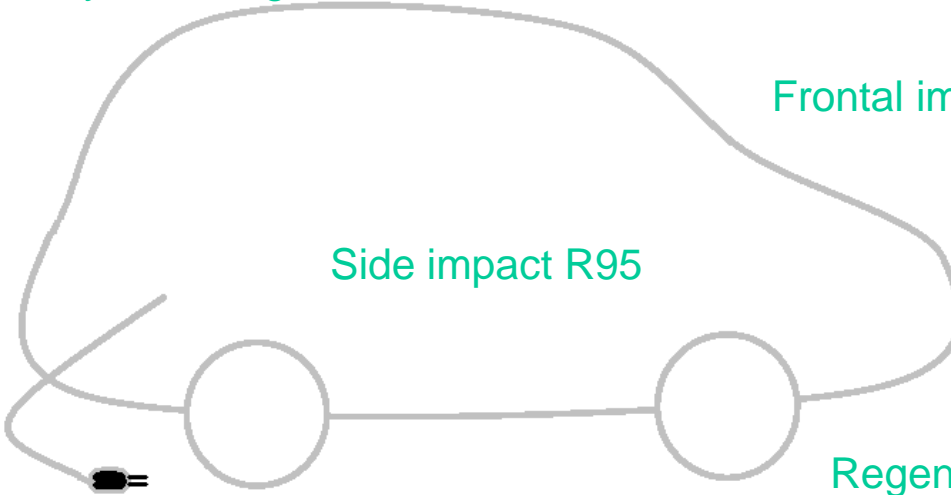
Frontal impact, steering column ascent R12

Side impact R95

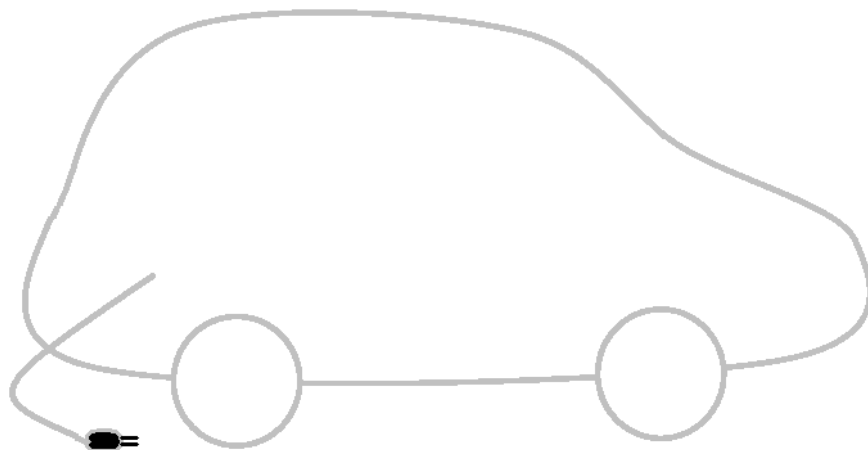
Front impact R94

Regenerative braking system R13-H

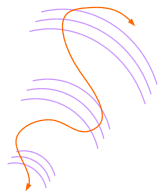
Electromagnetic compatibility ; vehicle and network R10



# Further work in progress



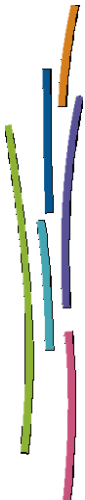
Noise



Compatibilité électromagnétique entité chargeur embarqué R10

# EV & PHEV charging

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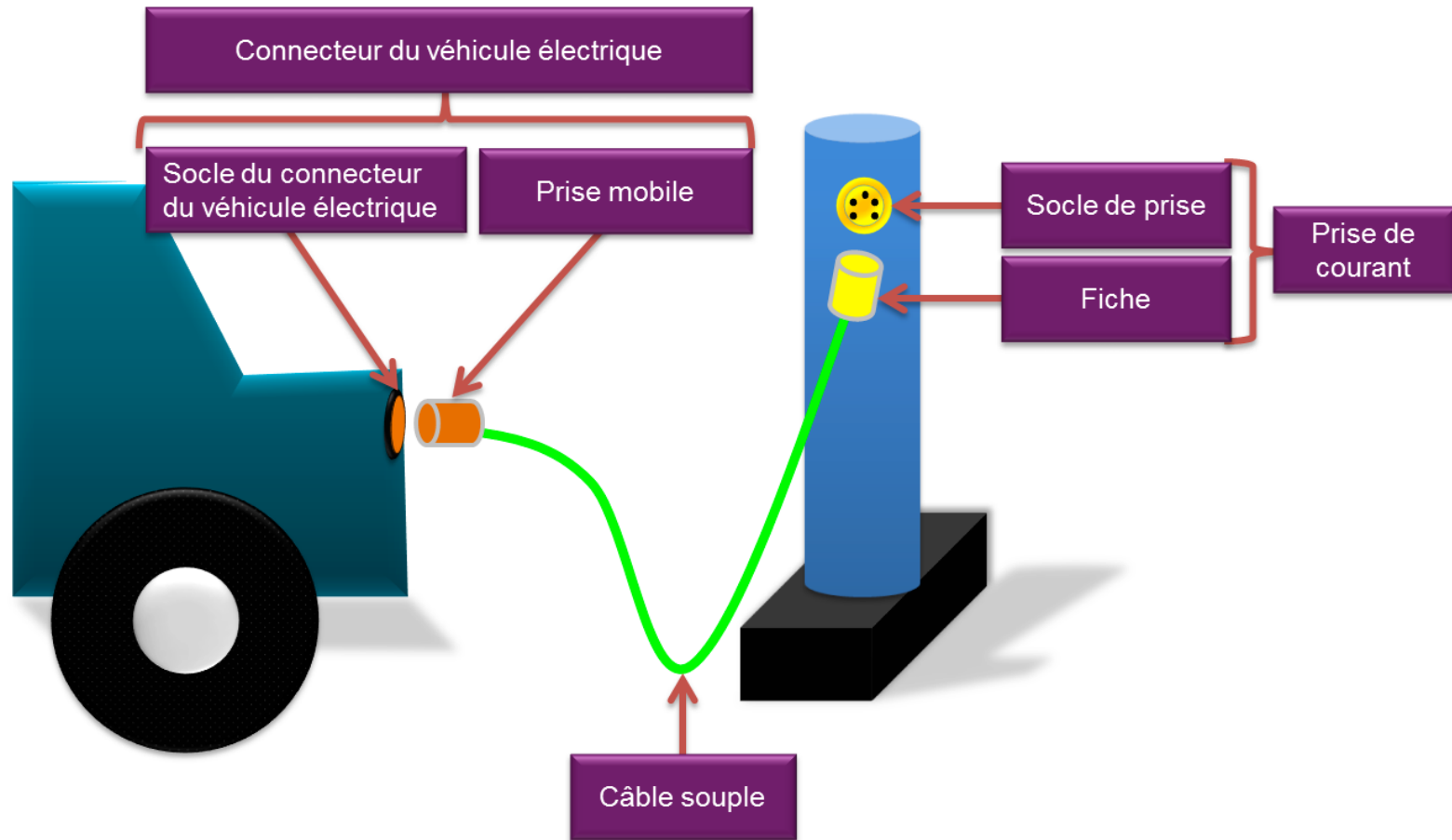


# « Livre Vert » (Green Book)

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- Guide to assist local authorities in the implementation of their projects (published in April 2011 and available on the website of the Ministry) :
  - financial terms of the State intervention
  - design of charging infrastructure
  - economical deployment mode
  - issues related to the regulation and standardization
  - etc...

# External components involved in the charging process

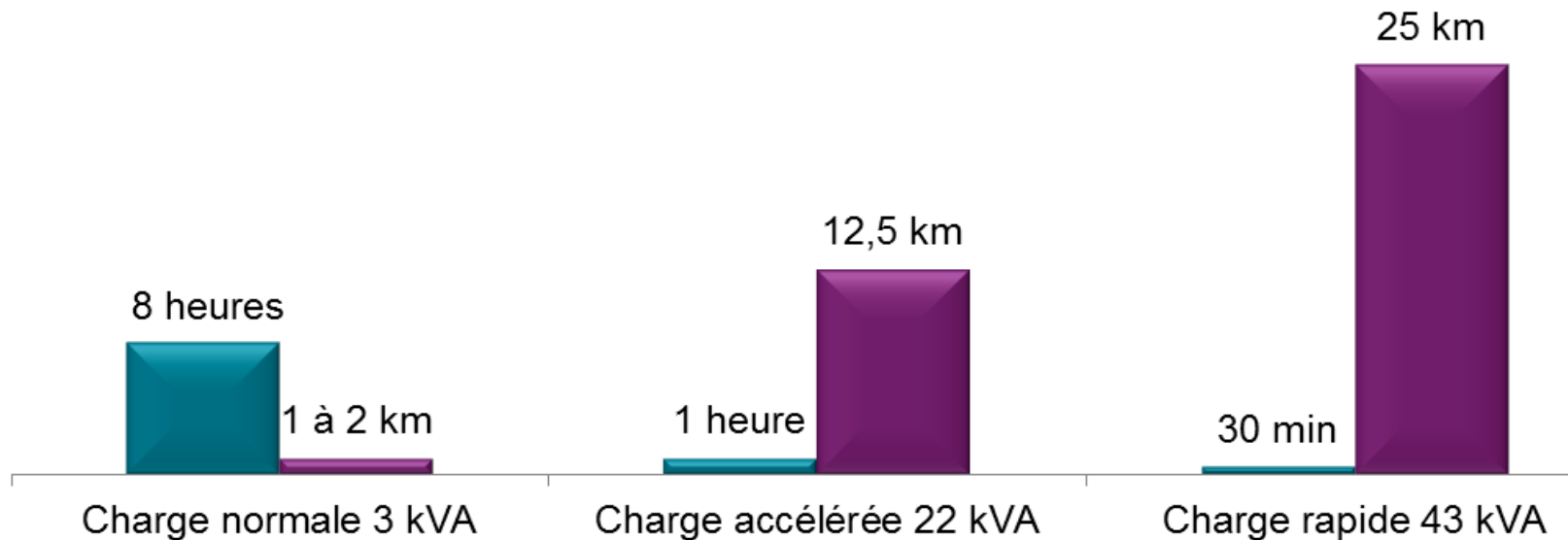




# Different charging powers





Theoretical duration of the complete charging of electric vehicle with a capacity of 25 kWh

- Durée théorique pour un plein de 25 kWh
- Nombre de km récupérés en 5 minutes de charge



# Different sockets adapted to use

## Main types of basis in Europe

Type de socle de prise	Illustration	Description	Compatible puissances élevées	Conforme à la réglementation française coté infrastructure
Type E/F		Socle de prise type « domestique » <sup>13</sup> – Compatible avec le Mode 1 ou 2	Non	Oui
62196-2 Type 1		Socle de prise actuellement dédiée coté véhicule, non envisagée côté infrastructure.	Oui	n/a (uniquement véhicule)
62196-2 Type 2		Socle de prise conforme à certaines réglementations nationales en Europe, élaborée pour le Mode 3.	Oui	Non (absence d'obturateur)
62196-2 Type 3		Socle de prise conforme à la réglementation française, élaborée pour le Mode 3.	Oui	Oui

# Terminals designed according to the powers proposed

## Charge normale 3 kVA

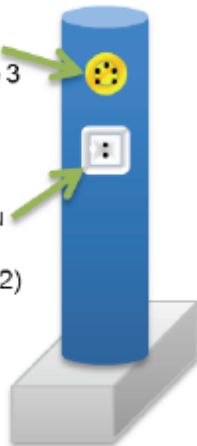
**Deux types de connecteurs** pour répondre à la diversité de la demande (VE, VHR, ancienne génération, scooter, quadricycles etc..).



**Câble non attaché**  
(sauf exceptions \*)

Connecteur  
conforme au  
62196-2 Type 3  
(Mode 3)

Connecteur  
conforme au  
Type E/F  
(Mode 1 ou 2)



## Charge accélérée 22 kVA

**Un ou deux types de connecteurs** pour les bornes permettant de délivrer de la charge accélérée (22 kVA) \*\*.

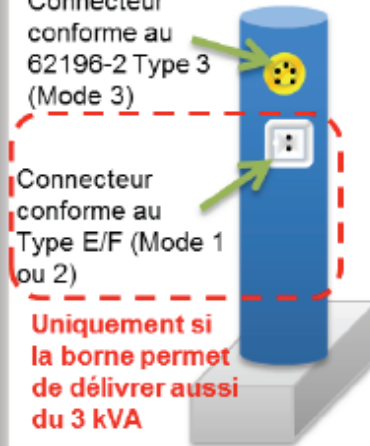


**Câble non attaché**  
(sauf exceptions \*)

Connecteur  
conforme au  
62196-2 Type 3  
(Mode 3)

Connecteur  
conforme au  
Type E/F (Mode 1  
ou 2)

**Uniquement si  
la borne permet  
de délivrer aussi  
du 3 kVA**



## Charge rapide 43 kVA

**Deux câbles attachés** pour répondre à la diversité de la demande (courant alternatif/ Mode 3 - ou continu /Mode 4).



**Câbles attachés**



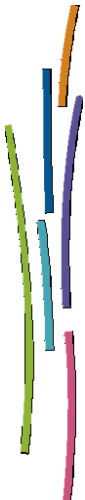
# Security of charging points

- Safety specifications relating to installation of charging infrastructure in parking garages open to the public or integrated into a high-rise building (favorable opinion of the Central Safety Committee February 2, 2012)
- Some of the main points of these specifications :
  - Charging points only possible on groundfloor, groundfloor +1 or level –1 if no sprinkler or water spray systems, or large ventilation system
  - Limitation on the number of charging points (20 for a 3 000 m<sup>2</sup> area)
  - Limitation on the power simultaneously deliverable (125 kVA)
  - etc



# Focus on Charging EV & PHEV in a private home

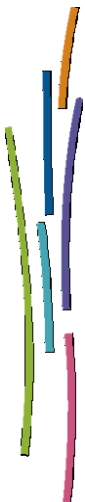
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# State of electrical installations in private home

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- According to a study by Promotelec in 2009 (statistical analysis of 6000 diagnoses on an average fleet age of 25): :
  - 72% of facilities have abnormalities on at least three minimum requirements for safety ,
  - 27% of homes have electrical equipment unsuitable for use,
  - 35% of homes have outdated equipment. .



# State of electrical installations in private home

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- According to a study by Legrand and Schneider Electric:
  - Trials in late 2010 on domestic load profile taken VE condition (10A, 13A or 16A for 8 hours a day, 5 days out of 7)
  - 15 sockets tested (5 brands)
- NF C 61-314 compliant domestic sockets are adapted to the equipment of the house with no time limit and with full security
  - They can not, however, support the load imposed by an energy transfer of an EV for the highest intensities.

# Need to adapt to electrical power installations

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- Limitation of power at home :
  - if the installation is provided with a wall charging point dedicated to the charging of EV (installation diagnostic and mounting of the terminal by a certified installer), the EV will be loaded in 16A mode
  - if the installation is not checked (or in case the charging point is occasional), the EV will be loaded in 10A mode
  - if the installation is checked and compliance is ensured, and if a charging point is dedicated to the EV, it will be loaded in 13A mode





# Implementation of recommendations

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- Difficulties in establishing a regulatory perspective
  - National specificities (grids, fleet, deployment ambitions,...)
- A focus on incitement and not on the obligation :
  - definition of safety criteria (eg modulated load managed by the vehicle depending on configuration)
  - incitement to check the electrical installation, compliance and installation of a wall power outlet (sale information, etc ...)

