

Valeo Hybrids & Electric Vehicles Challenges and Opportunities

Pascal Colombani
Chairman, Valeo

Sharing Knowledge Conference

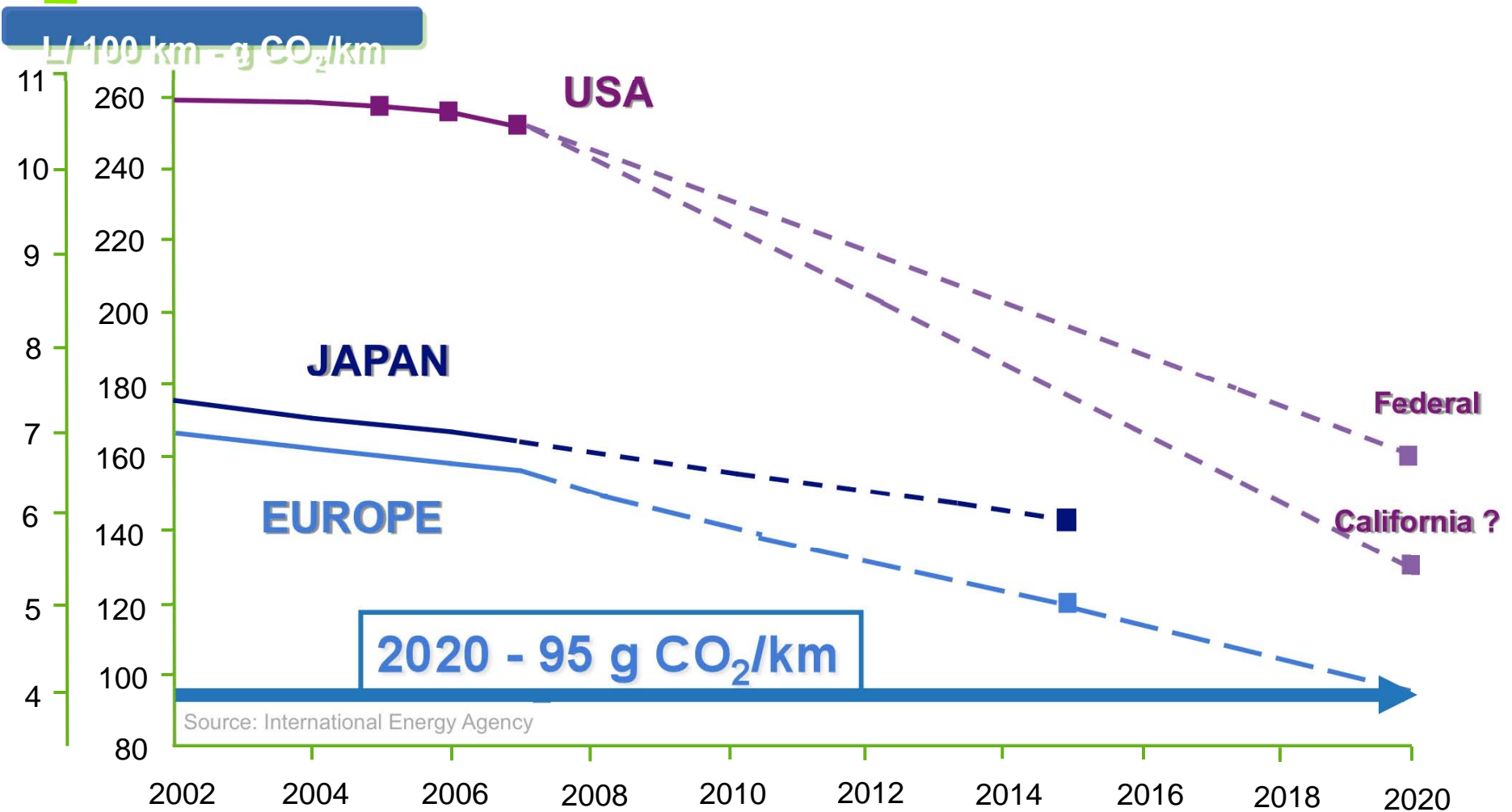
Mövenpick Hotel by the Dead Sea, Jordan, March 1, 2010





- **Context and customer attitude**
- **Hybrid worlds and technical considerations**
- **Industrialization and markets**
- **Infrastructures and new business models**

Environmental concerns, Security of Supply, CO₂ Regulations



CO₂ Reductions driven by regulations AND enduser expectations

Millions of electric vehicles ?



"The future belongs to the electric vehicle – using electricity from the power plug"

Martin Winterkorn,
CEO Volkswagen, 2008



"The Obama-Biden comprehensive New Energy for America plan will put 1 million plug-in hybrid electric cars on the road by 2015"

Barack Obama,
President of the United States



"Millions of electric vehicles will be rolling on German roads within the next 20 years"

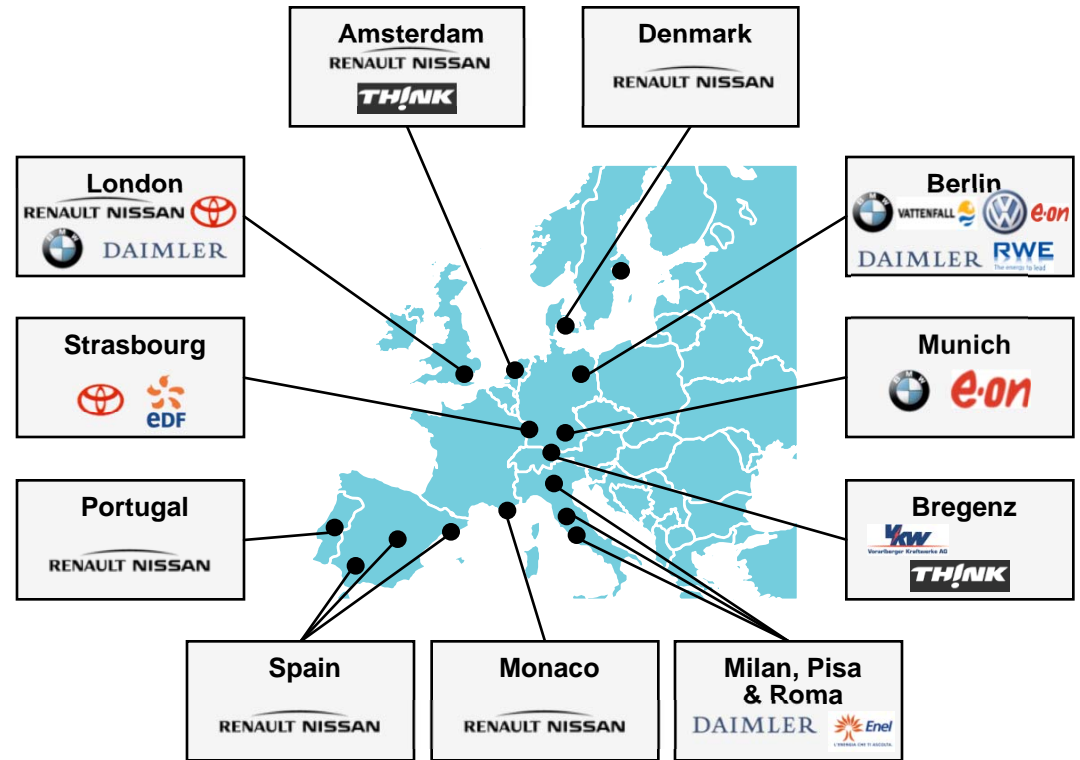
Jürgen Großmann,
CEO RWE



"Americans need one electric car per household. That's 100 million cars right there. And it can be done"

Shai Agassi,
CEO Better Place

EV / PHEV / HEV experimentations in Europe



Nice to have or must have?



Source: A.T. Kearney

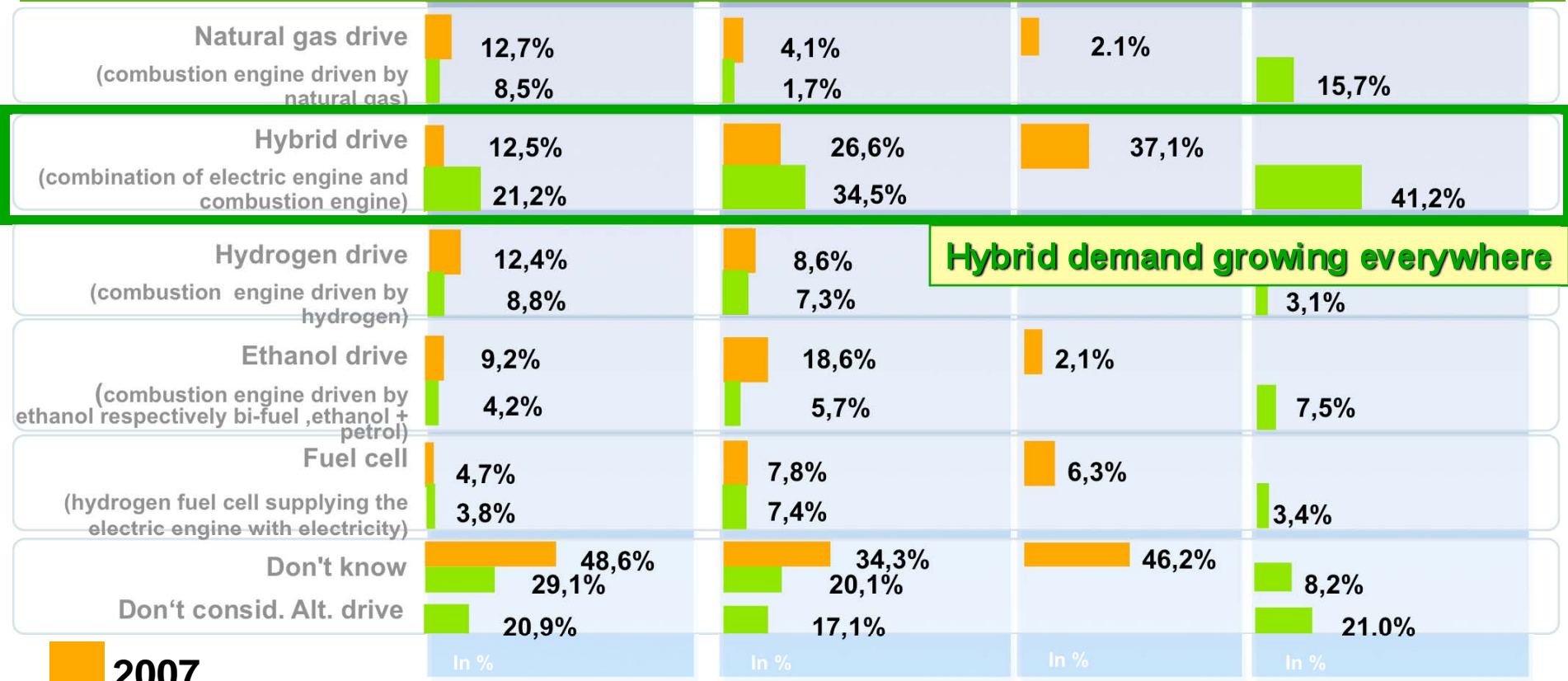


Automotive demand 2007 - 2008

Alternative Drive in the Future*



Which System would you prefer?



Hybrid demand growing everywhere

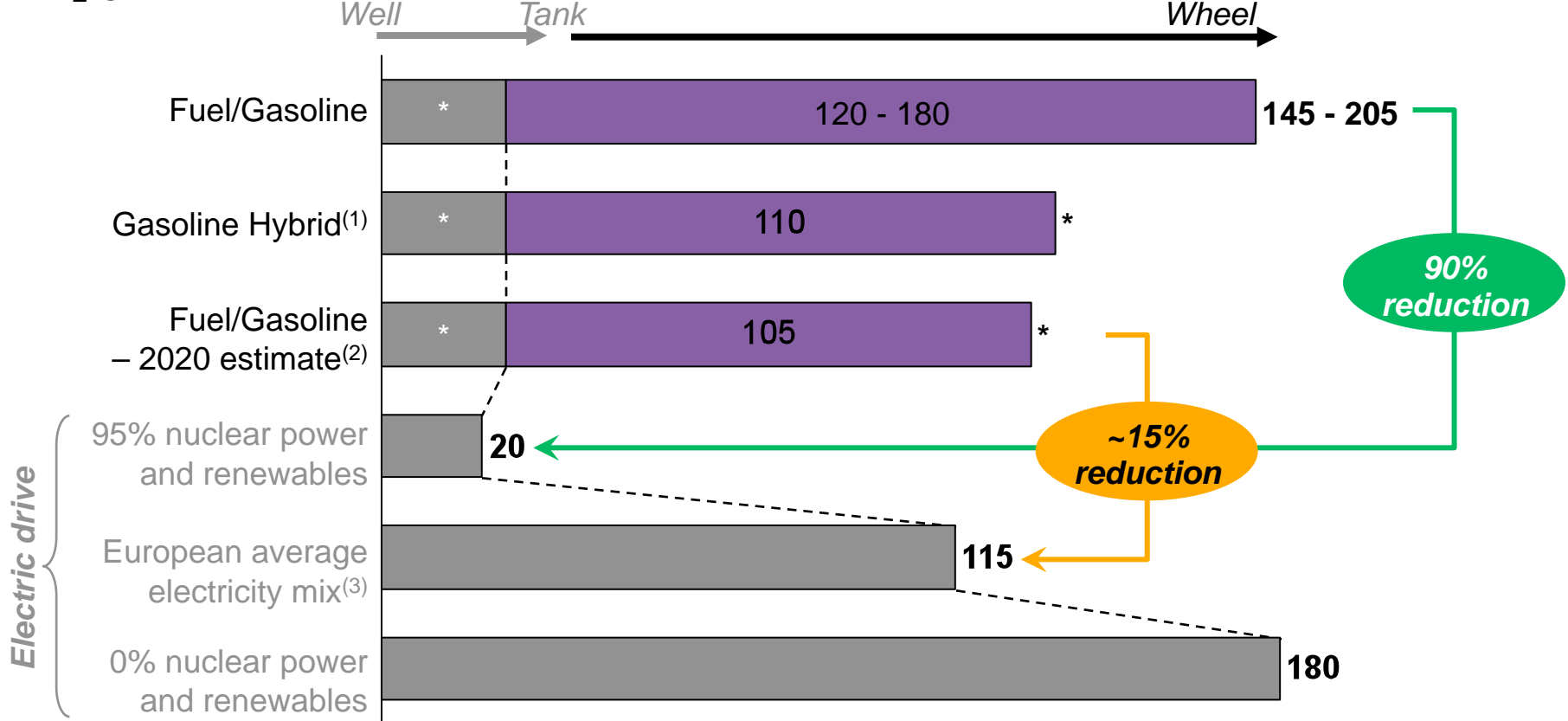
2007
2008

*Brand new car Buyers : 1790 *Brand new car Buyers : 782 * Prospective Car Buyers, n = 1.394* Prospective Car Buyers, n = 2347

EV technologies' CO₂ equation is not obvious, depending on the power source and traditional engines improvements

CO₂ emissions – well to wheel balance for an average car

- CO₂ g/km -



Notes: (1) Gasoline hybrid assumed to have 25% lower fuel consumption in combined city and highway driving
 (2) 30% reduction in oil consumption in 2020
 (3) 35% nuclear and renewables in 2009

Source: A.T. Kearney

Two hybrid worlds

Micro to Mild Hybrid World

Hybridization aiming at assisting the combustion engine

- Valeo launched their 1st Stop-Start in 2004 with Valeo's StARS (belt drive) system on the Citroën C3. Reinforced starters have been added to complete our micro-hybrid offer



EV to Full Hybrid World

Hybridization aiming at running the vehicle by electric propulsion

- From 1995 to 2005, Valeo developed electric drivetrain systems for the French OEM's Peugeot/Citroën and Renault
- More than 12 000 EV vehicles, more than 1 billion km driven



Hybrid / Electrical Vehicles on the market

Stop-Start

Mild Hybrid

Full Hybrid

Plug-In Hybrid

Full Electric



Smart



BMW 1&3



Saturn View



Saturn Aura



Mercedes S400



Honda Insight



Ford Fusion



Toyota Prius3



BYD F3DM



Toyota Prius 3



GM Volt



Nissan Leaf



iMiev



Renault ZE

+ Electric Drive

+ Electric Take-off

+ Engine Assistance

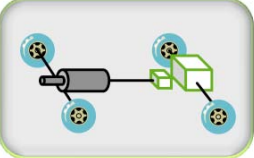


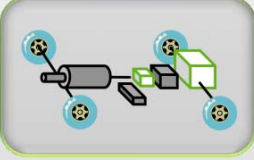


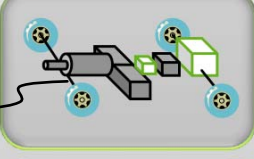

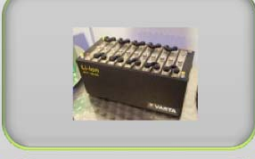
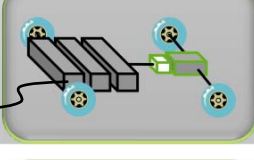


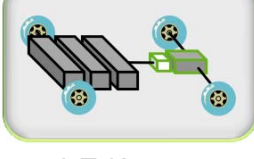

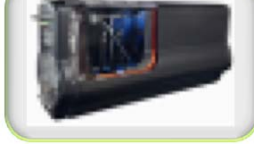
+ Kinetic Energy Recovery

Stop & Start



The Electric Vehicle landscape will be a continuum of powertrain solutions

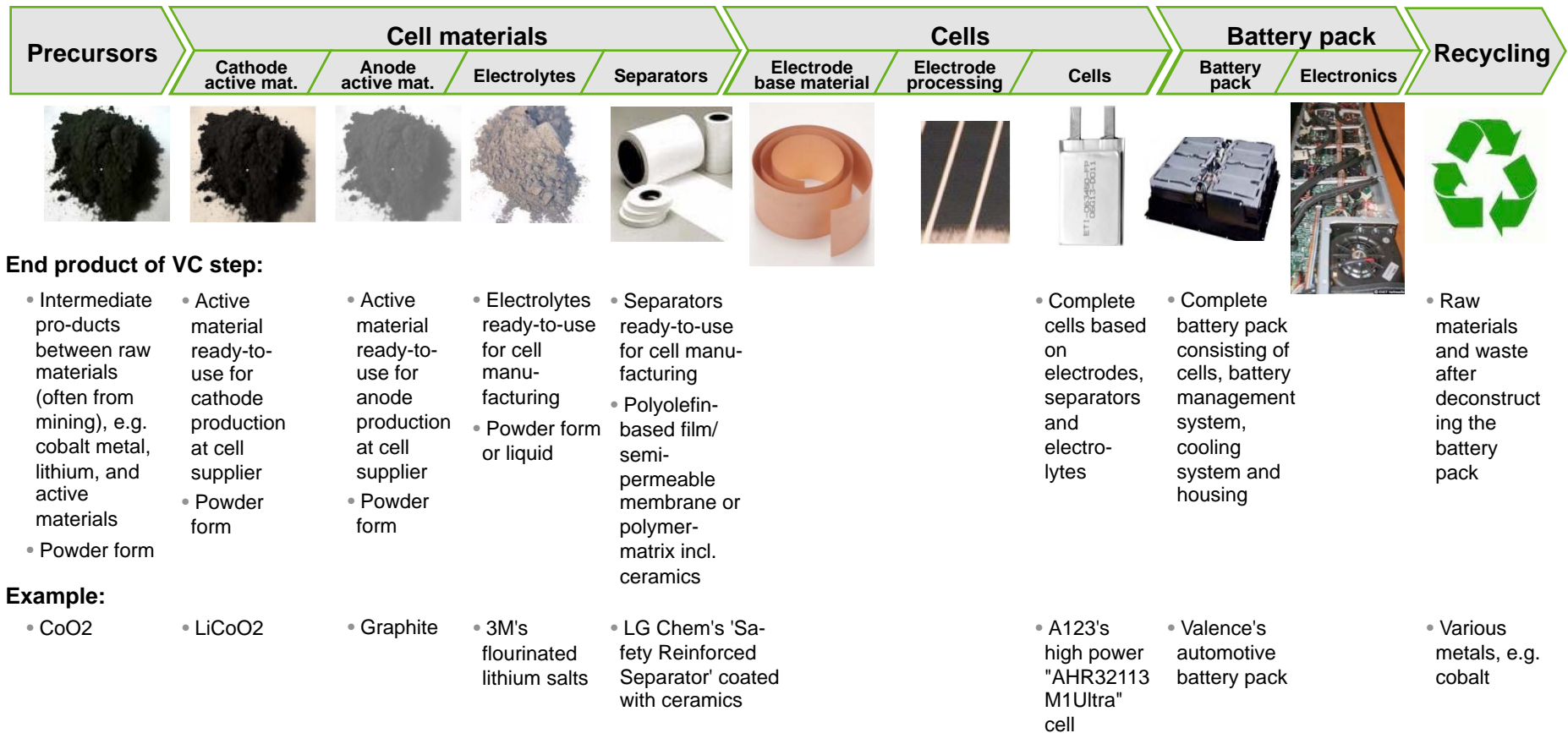
Future Passenger Car powertrain Portfolio

Powertrain concept	Primary and secondary powertrain	Primary and secondary energy storage
 <p>Combustion engine</p>	 <p>Gasoline / Diesel</p>	 <p>Conventional tank</p>
 <p>Hybrids (series / parallel)</p>	 <p>Medium size electromotor</p>	 <p>Small battery</p>
 <p>Plug-in Hybrid</p>	 <p>Medium size gasoline / diesel</p>	 <p>Medium size battery</p>
 <p>Electric vehicle</p>	 <p>Electromotor</p>	 <p>Large size battery</p>
 <p>Fuel cells</p>	 <p>Fuel cell</p>	 <p>H2 tank</p>

Source: A.T. Kearney

Lithium-ion battery, a major building block of EV

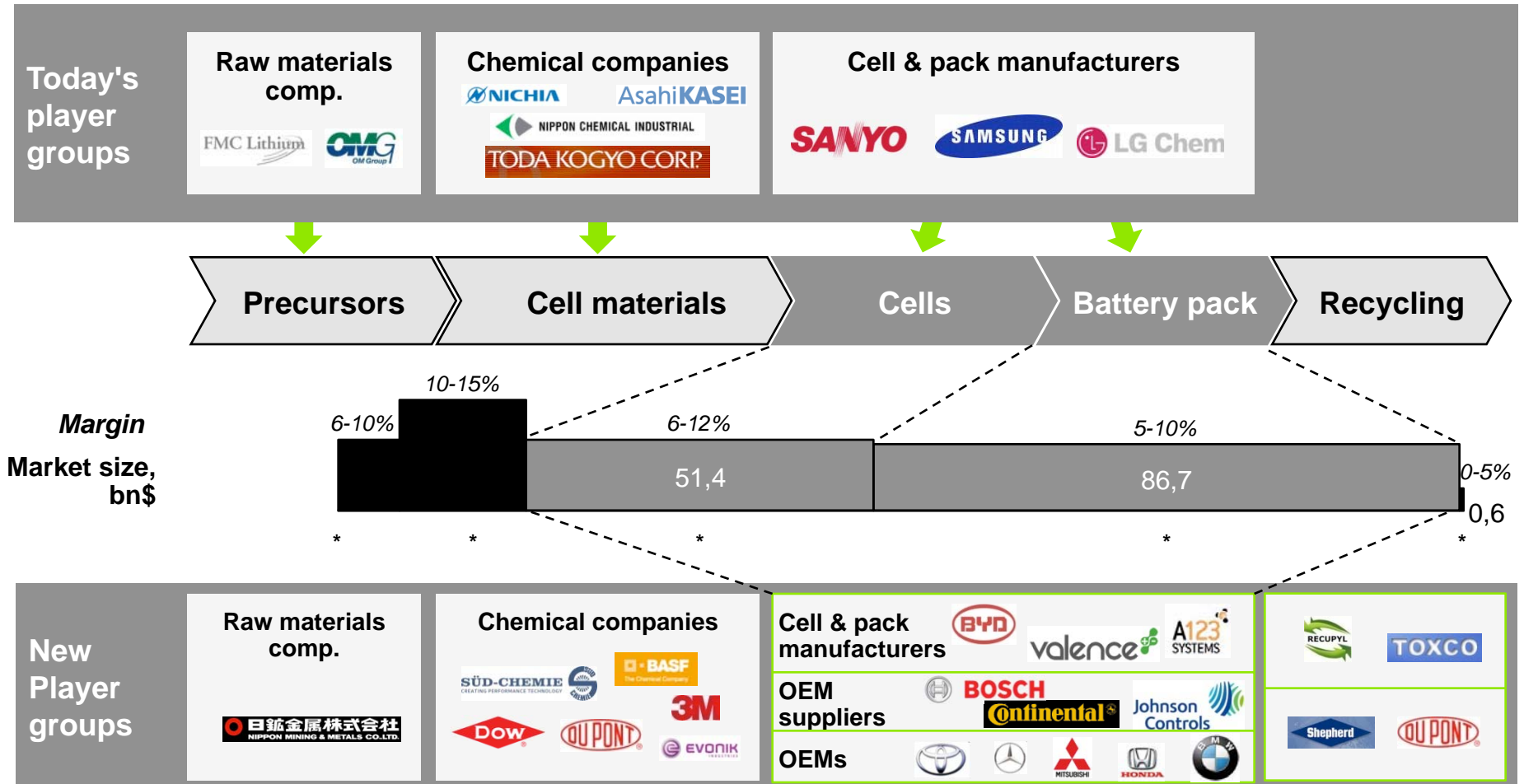
Lithium-ion battery production & assembly value chain



Within the Lithium-ion battery value chain, initial steps are material driven, later ones are mechanics & electronics

Asian suppliers dominate battery markets – OEM have struck alliances on cells and packs with key suppliers

Key player groups entering automotive LIB market and profit pool
 - Estimated margin and turnover 2020, bn\$, % -



Source: A.T. Kearney

Longer term considerations

- Lower cost Li-Ion batteries
- Optimization of engine electronic management
- Optimization of comfort, security, lighting (LED), thermal equipment, solar panels
- More radical solutions with a rethinking of vehicle architecture



Keio University Prototype



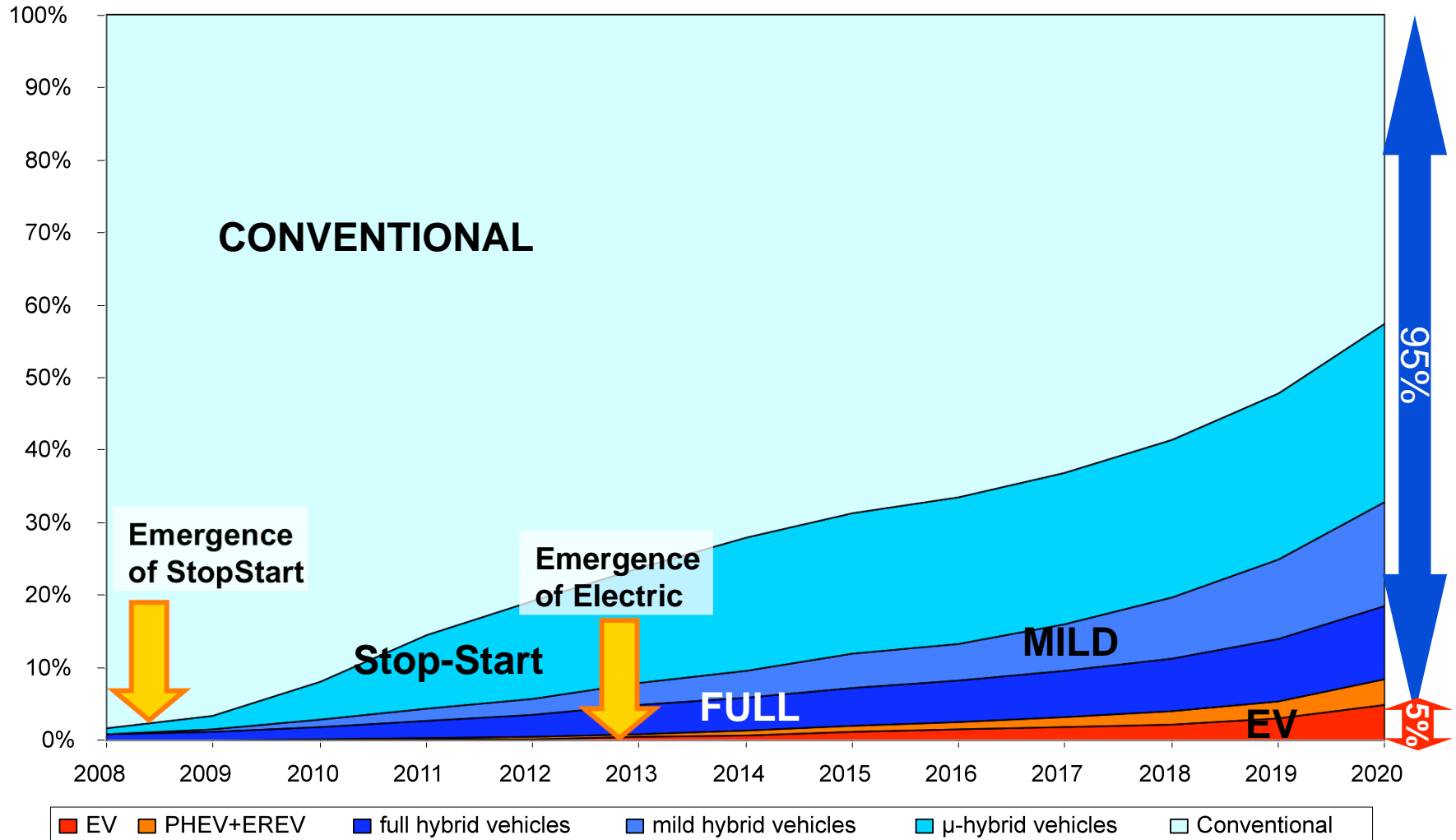
Constraints remain battery cost, autonomy, and infrastructure for charge

- **Battery cost will decrease but remain high**
- **Fast recharge of battery**
- **Fast change of battery**
- **Deployment and cost of infrastructures**



World Powertrain Market 2008-2020

Hypothesis: Oil barrel ~\$100 2012, \$120 2015, \$150 2020, Battery: 400€/kWh 2012, 300 €/kWh 2020



Extract from PTE TDP 2010-2020

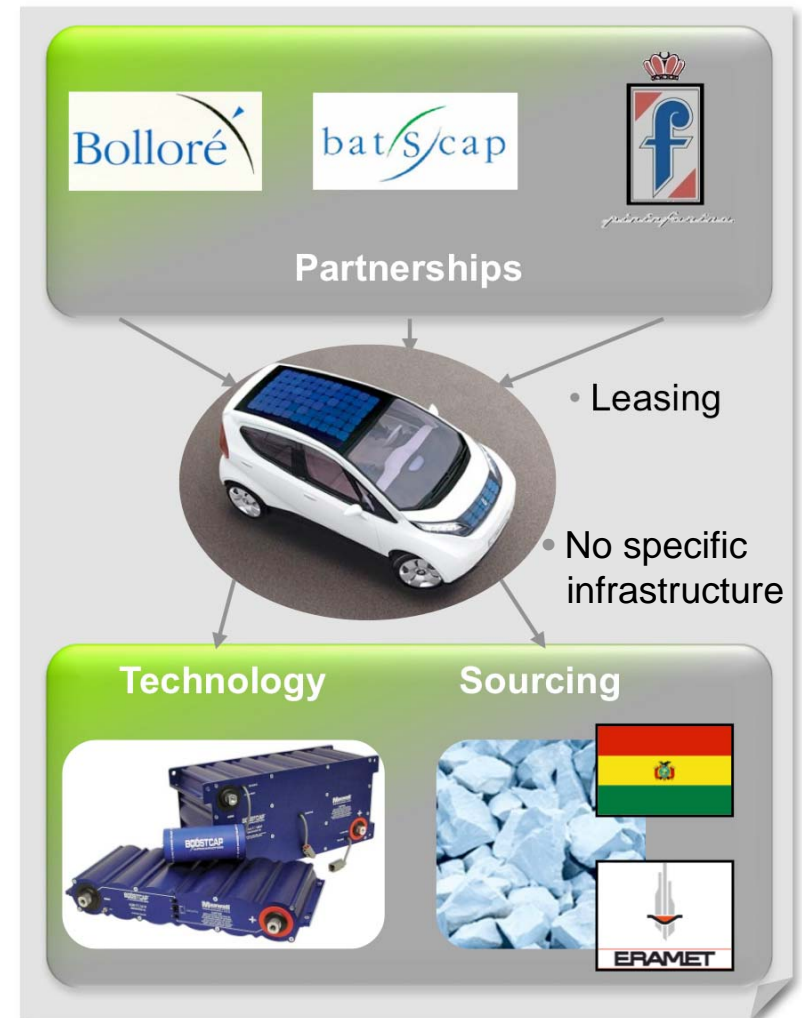
Source: PTE Hybrid Database – Release July 2009

New EV-mobility business model will arise, e.g. Renault & Better Place or Bolloré concept

The Renault-Better Place project (Israel)



The Bolloré concept



Source: A. T. Kearney

Other players can be attracted by new business models in the EV-mobility market

Distribution of electric cars



The diagram illustrates the distribution of electric cars. On the left, logos for Europcar, SIXT, Hertz, and AVIS are listed. A large green arrow points from these logos to a central map of France labeled "Network of ~ 500 agencies". Below the map is a green box labeled "Own maintenance network".

- Use of commercial presence
- Knowledge of automotive market, as well as maintenance capacities
- Possible "dual" offering: EV-week & petrol-weekend

Charging of electric vehicles

Charging Infrastructure



The "Charging Infrastructure" section features logos for VINCI PARK, abertis, and JCDecaux. To the right is a photograph of a charging station in a parking garage.

- Possible mandatory pressure of public authorities to install charging stations to get additional concessions

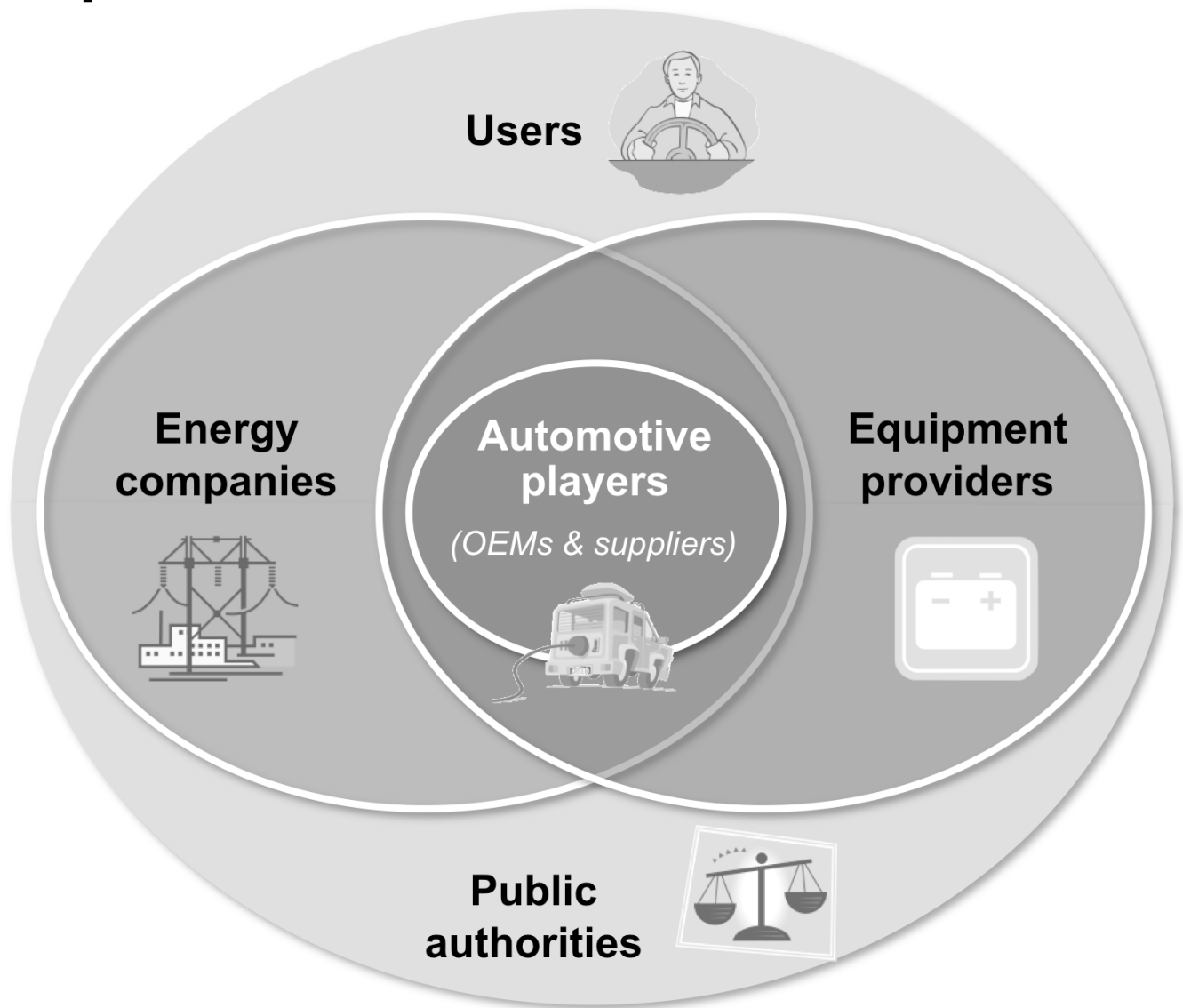
Fuel Distribution



The "Fuel Distribution" section features logos for TOTAL and bp. To the right is a photograph of a car at a charging station.

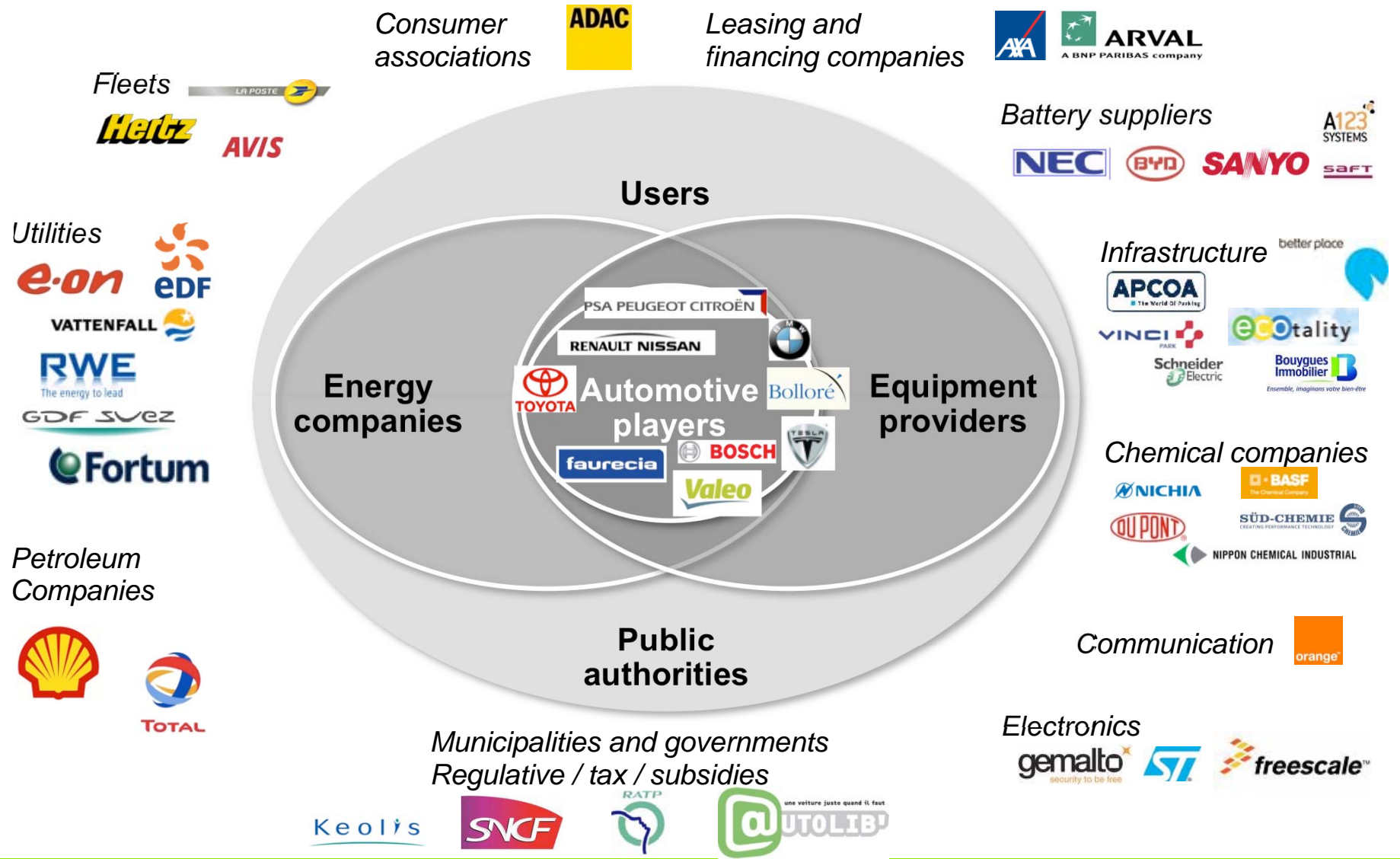
- Pro's: diversification & image, control of distribution turnover erosion
- Con's: resale of electricity with limited added-value

A wide range of stakeholders will be shaping the EV landscape



Source: A.T. Kearney

Major actors as well as new entrants have a potential to occupy the EV landscape



Source: A.T. Kearney