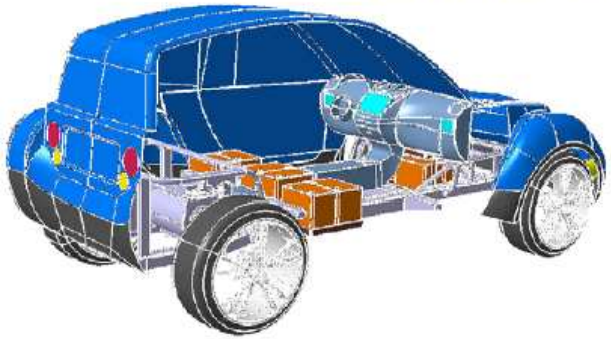
Zaragoza, 24 de marzo de 2009



Retos y Oportunidades de I+D+i en Transporte con Propulsión Eléctrica

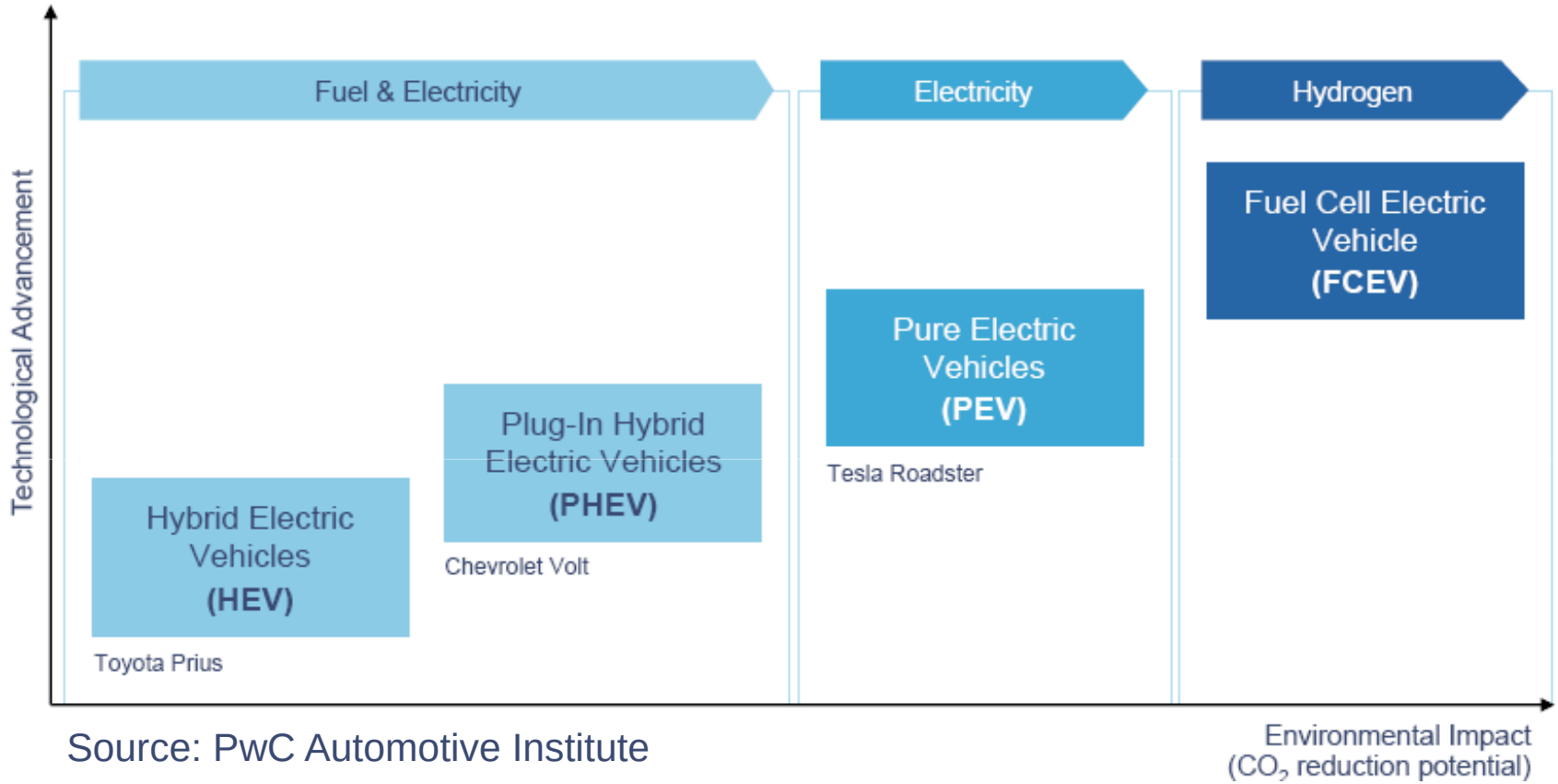
Cluster de Automoción de Aragón

Plugging into Tomorrow's Vehicles

Introduction
Feasibility & Affordability
Sustainability
Outlook

Introduction

Technological Spectrum of Vehicle Electrification



Source: PwC Automotive Institute

Government support, incentives for consumers and subsidies for suppliers and OEMs are key elements for the widespread success of PEVs. The scale, the durability of these driving measures and the success of hybrid vehicles will determine the progress of PEVs.

Introduction

Electric cars are not a new phenomena….

…preceded internal combustion engine by a few years

In the Beginning

- First electric vehicle by Gustav Trouvé in 1881
- In 1900, the US auto industry made 4.192 vehicles. 1.681 were steam powered, 1.575 electric and 936 had a gasoline engine

Gustave Trouvé (1881)

Current models

- Different PEVs are on the market, with different technologies. Lead acid and nickel batteries account for the majority of batteries.
- Prices for electric vehicles, either re-engineered or only available as electric vehicles, impose high costs that currently are passed on to consumers.
- Cruising ranges of current PEVs are relatively low.

The 1990's

- Electric vehicle by GM in response to the California Air Resources Board (CARB).

GM EV1 (1996-1999)

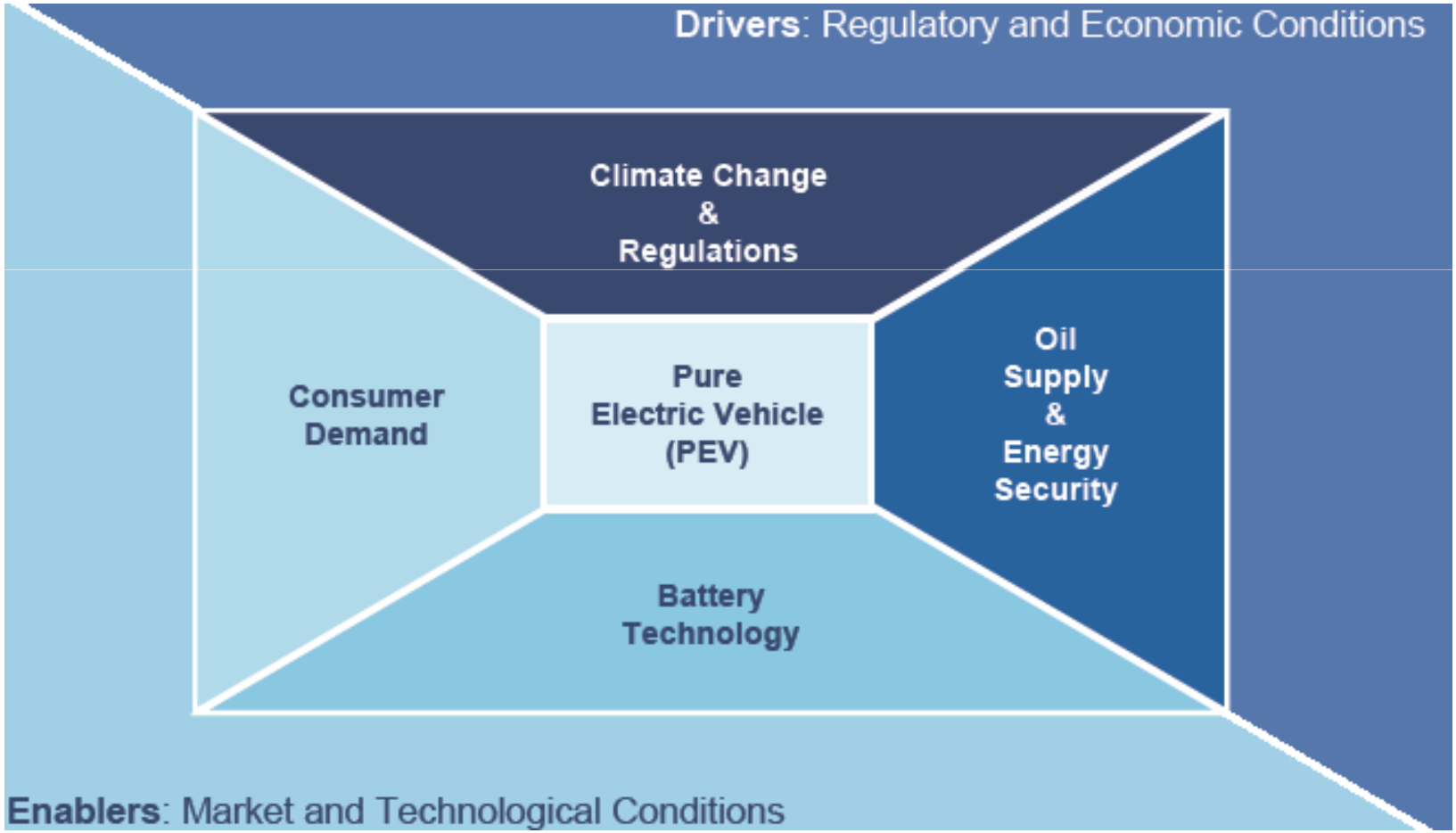
Future models

- All equipped with Lithium-Ion batteries.
- Range improved (300 – 400 km) .
- Most of the PEVs are small and compact cars, indicating that PEVs are adequate vehicles for cities and short- distance commuter runs.

Introduction

Drivers and enablers for PEVs

Cutting fuel consumption and greenhouse gases, such as CO2, and complying with environmental regulations are the main drivers for alternative powertrains and pure electric vehicles. However, current barriers like limited driving range (battery technology) and high cost for extended range (consumer demand) need to be overcome.



Feasibility & Affordability

With the prospect of higher PEV sales, the battery market continues to evolve

To enable the fast-paced change in technology to take advantage of the positive regulatory and economic conditions for PEVs, the number of battery technology providers in the market is multiplying.

Current State

- Small market (hybrid vehicles)
- NiMH batteries: limited range, high costs.
- Dominated by Panasonic EV and Sanyo.

Future State

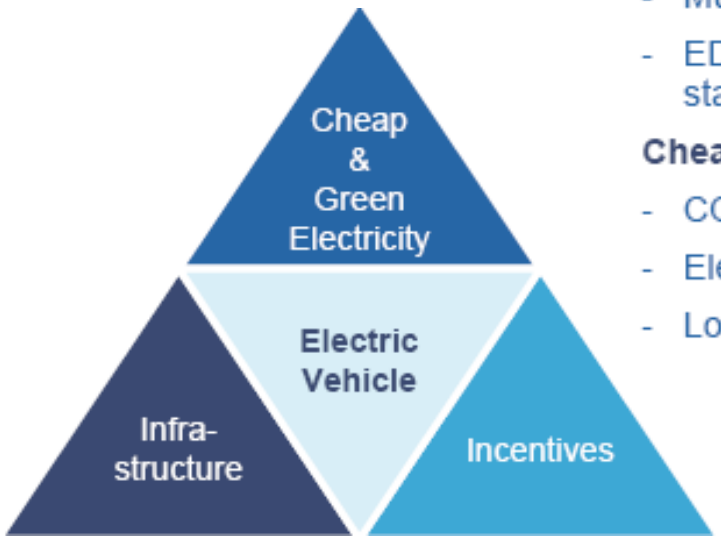
- Larger market.
- Li-XXX batteries: better range.
- Need of further CO2 reductions
- New entrants: Consortia, R&D Start Ups

Battery Suppliers \ OEMs / Alliance Groups	BMW	BYD	Chrysler	Daimler	Ford	GM	Honda	Hyundai	Mitsubishi	PSA	Ren-Nis	SAIC	Toyota	VW
A123						Li					Li			
AESC											Li			
BYD*		Fe												
Cobasys						Ni								
Compact						Li								
Continental				Ni/Li		Li								
Hitachi						Li								
JCS	Li			Li	Li							Li		
LG Chem						Li		Li						
Lithium EJ									Li	Li				
Panasonic EV			Ni			Ni		Li					Ni/Li	
Sanyo			Ni		Ni		Ni/Li							Li
Toshiba	TBD													

Feasibility & Affordability

Government support: case study France

Mass adoption of electric vehicles will require competitive pricing, a widespread network of charging stations, and availability of green and cheap electricity. Given the magnitude and scale of these initiatives, government support is a must.



Incentives

- Consumer: tax rebates, free/preferential parking, tax free charging
- Government: 20% public transport fleet to be electric
- Industry: At the 2008 Paris Auto Show, President Sarkozy announced € 400 million in state support for development of non-polluting cars

Infrastructure

- Charging stations: Already present in large urban areas
- Municipal authorities sensitive to need of electric vehicles in urban areas
- EDF and Renault jointly announced plans to roll out a nationwide charging station infrastructure

Cheap & Green Electricity

- CO_2 free electricity: 77% generated by nuclear and 14% by hydro
- Electricity surplus: France exports electricity to neighbouring countries
- Low Cost: Among the lowest in Europe

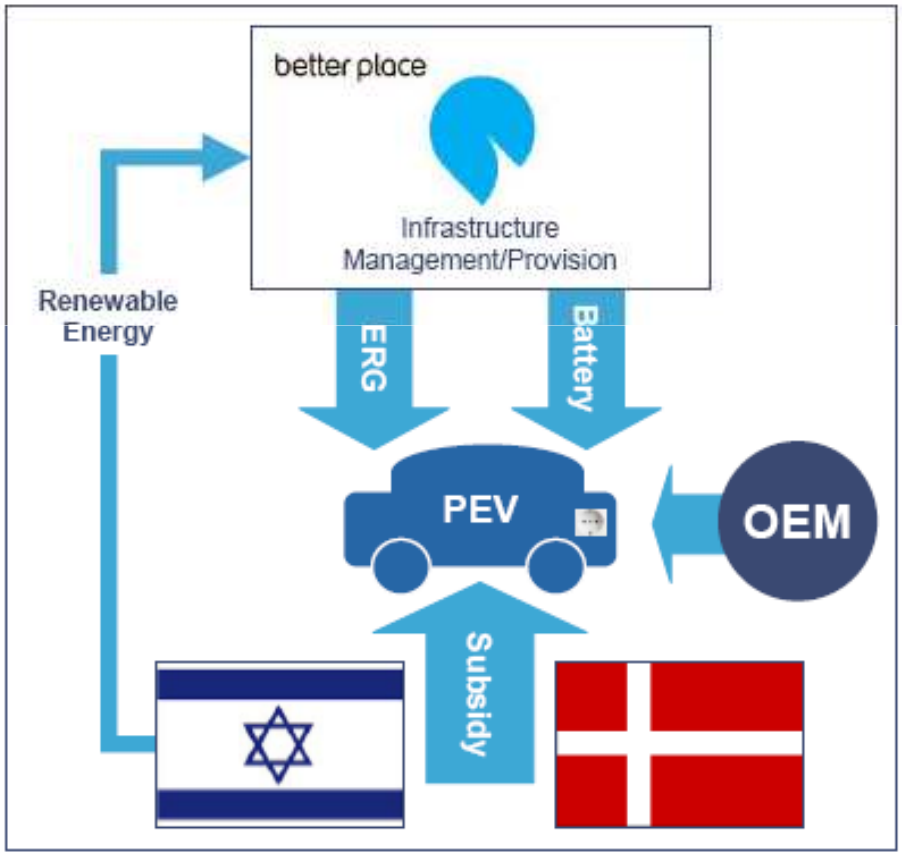
Source: PwC Automotive Institute

Feasibility & Affordability

A new business model ?

Similar to the model adopted by razor-blade manufactureres and mobile phone companies.

Better Place's Business Model



Source: PwC Automotive Institute

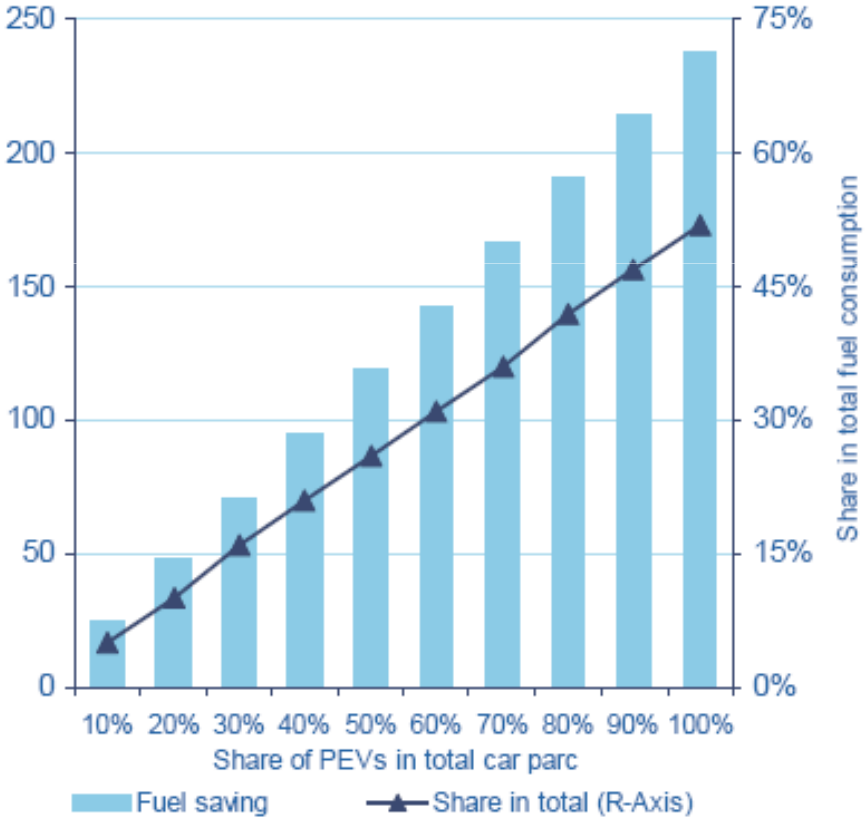
- Better Place would own the batteries and the recharging infrastructure – known as the ERG (Electric Recharge Grid).
- Vehicle costs will be subsidised by government and OEM incentives.
  - Better Place says some vehicles would even be free.
- Thus far, the Israeli and Danish governments have signed up.
  - Both are compact countries with concentrated commuter areas in relatively small geographic areas.
  - Additionally, Israel has difficult relations with many of the oil-producing nations and Denmark has a widespread windpower network (nearly 20% of energy needs in 2007).
  - Better Place in talks with up to 25 other countries.
- The first OEM to join with Better Place is Renault-Nissan.
  - Others are currently engaged in talks.
  - Renault expects to sell 10-20k in 2011 and 100k in 2012.
    - Aided by Better Place, and separate deals with the Portuguese government, Kanagawa prefecture, Tennessee, and the French government's October 2008 announcement that it will invest in an electric car infrastructure that will be in place by 2011.

Sustainability

Conversion of EU vehicle fleet will reduce carbon footprint

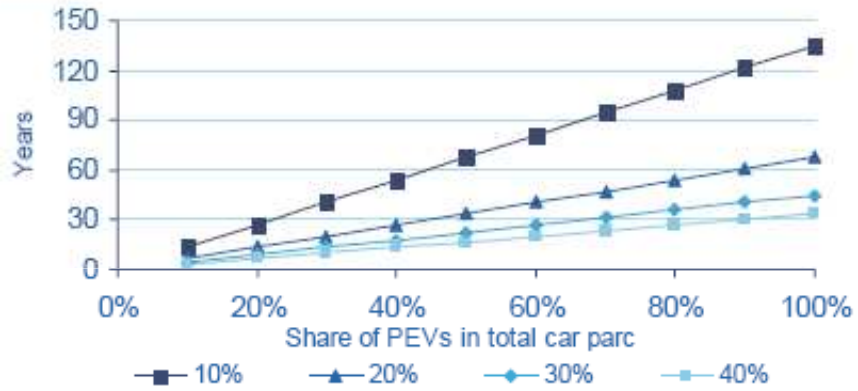
Substitution of ICE powered vehicle by PEVs would enable up to 240 billion litres of fuel to be saved in the UE-15, equalling more than 50% of annual consumption. However, substituting the current car parc with PEVs will require significantly more time.

EU-15 Fuel Saving Potential Scenarios
2006 (Billions of Litres)



Source: PwC Automotive Institute

EU-15 Substitution Time Depending on Annual Market Share
2006

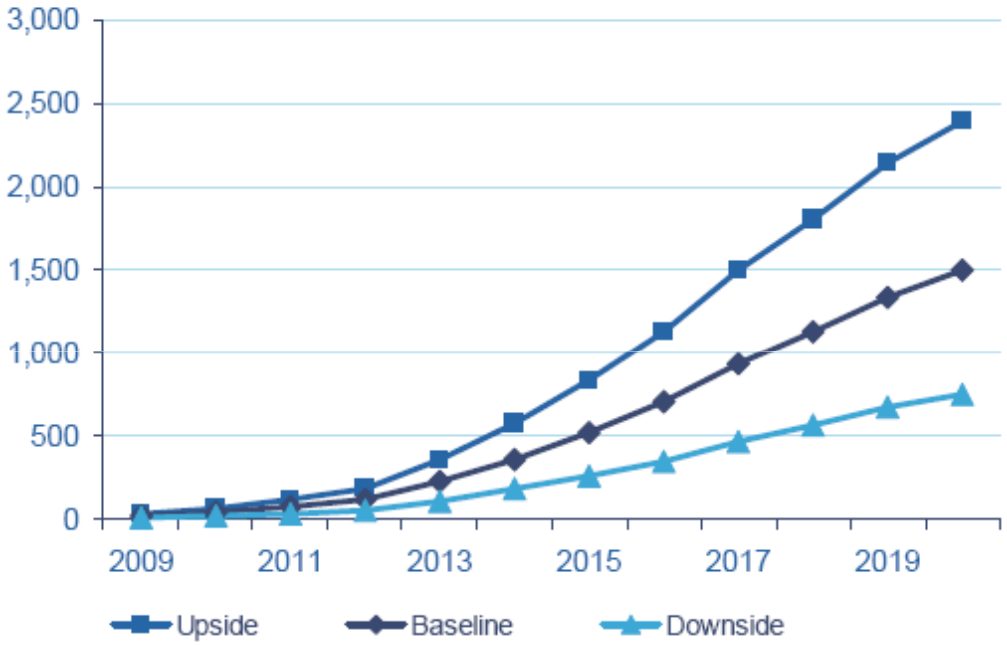


- If 10% of the annual sales in the EU-15 were PEVs, it would take 13 years for the share of the total car parc to reach 10%
- If the annual take rate was 20% in the EU-15, the substitution time would be roughly 7 years.
- However, even if the PEV share would be ‘only’ 10%, the EU-151 could save 25 bn litres of fuel (Belgium + Denmark).

Outlook

Depending on drivers and enablers, several scenarios are thinkable.

Pure Electric Vehicle Assembly Forecast Scenarios
2009 – 2020 (Thousands)



Source: PwC Automotive Institute

Upside Scenario

- Favourable regulations, fast technological progress, and growing oil prices enable PEVs to obtain market share quickly.
- Consumer acceptance promoted by a set of incentives and convenient mobility concepts.
- Many urban areas providing PEV fleets.

Downside Scenario

- Regulatory framework lacking enforcement, and battery suppliers and OEMs delaying market launches due to immature technologies.
- Poor infrastructure to support the convenient use of PEVs.
- Too few metropolises use PEV fleets.

Outlook

Pure Electric Vehicles have a bright future, but arer not the only option

Due to stricter environmental regulations, and increased ecological awareness of consumers, the drivers for PEV's are strong. OEMs, suppliers and governments are pushing the enablers toward maturity indicating a widespread use of electric vehicles in the mid- and long-term.

1 Technology

- Battery technology is becoming more sophisticated, with Li-Ion the technology of choice to make PEVs worthwhile. Decisions still need to be made on cathode choice – although it is likely in the mid-term that several options will co-exist.

2 Costs

- Costs of the technology to give PEVs an acceptable driving range are still an issue. Without coordinated support of the charging and battery infrastructure / incentives, the next generation PEVs will remain niche.

3 Infrastructure

- Infrastructure investment must carefully target areas with high urban population density and short commutes in countries where renewable energy sources prevail.

4 CO_2 Reduction

- The energy mix of a country determines the overall CO_2 effect. Using fossil fuels to generate electricity saves fuel and therefore CO_2, however, additional CO_2 is generated at the energy plant. Using renewable energy to move PEVs forward would be an ideal solution.

5 Government Support

- Governments have announced tax breaks, exemptions from congestion charges, etc. to promote PEVs. In addition to consumer incentives, infrastructure investments and subsidies are needed to support the wider adoption of PEVs.

Thanks !!

For further information

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