

The Road To Vehicle Empowerment – Filled With Obstacles

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We Hear A Lot These Days About EVs... But Is It Real Or Is It Hype?



„Die Zukunft gehört den Elektroautos“

Dr. Martin Winterkorn, CEO VW



Bernd Bohr, CEO Bosch

„Die Euphorie um das Elektroauto ist schädlich“

**„It feels a little bit like the
Wild West right now“**

JB Straubel, CTO Tesla



It Is Easy To Lose Sight Of The Real Opportunity

- Electric vehicles flourished when they offered convenience and mobility superior to competitive offerings in the early 1900s
- But as soon as gasoline vehicles became affordable, reliable, easy to start and a refueling infrastructure evolved, the electric could not compete, largely due to characteristics of the battery resulting in non-competitive:

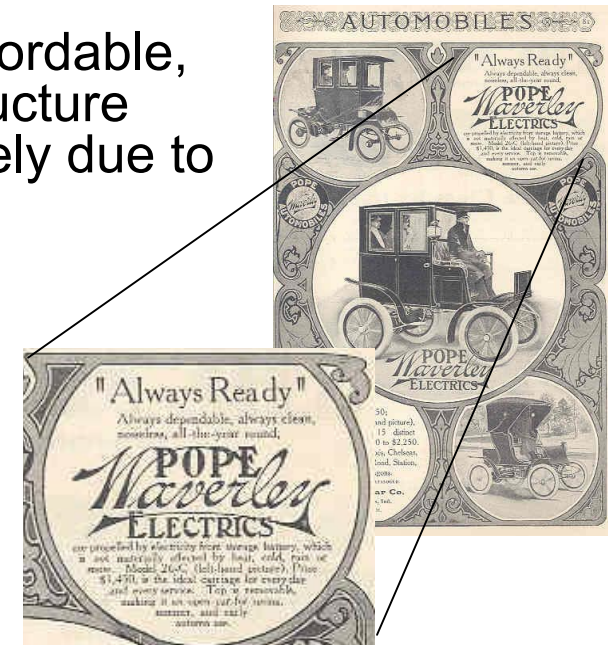
Range & Recharge Time



Source: U.S. National Park Service

“Young man, that’s the thing: you have it. Keep at it. Electric cars must keep near to power stations. The storage battery is too heavy. Steam cars don’t do either for they have to keep a boiler and a fire. Your car is self contained – carries its own power plant – no fire, no boiler, no smoke and no steam. You have THE thing. Keep at it!”

Thomas A. Edison to Henry Ford, August, 1896

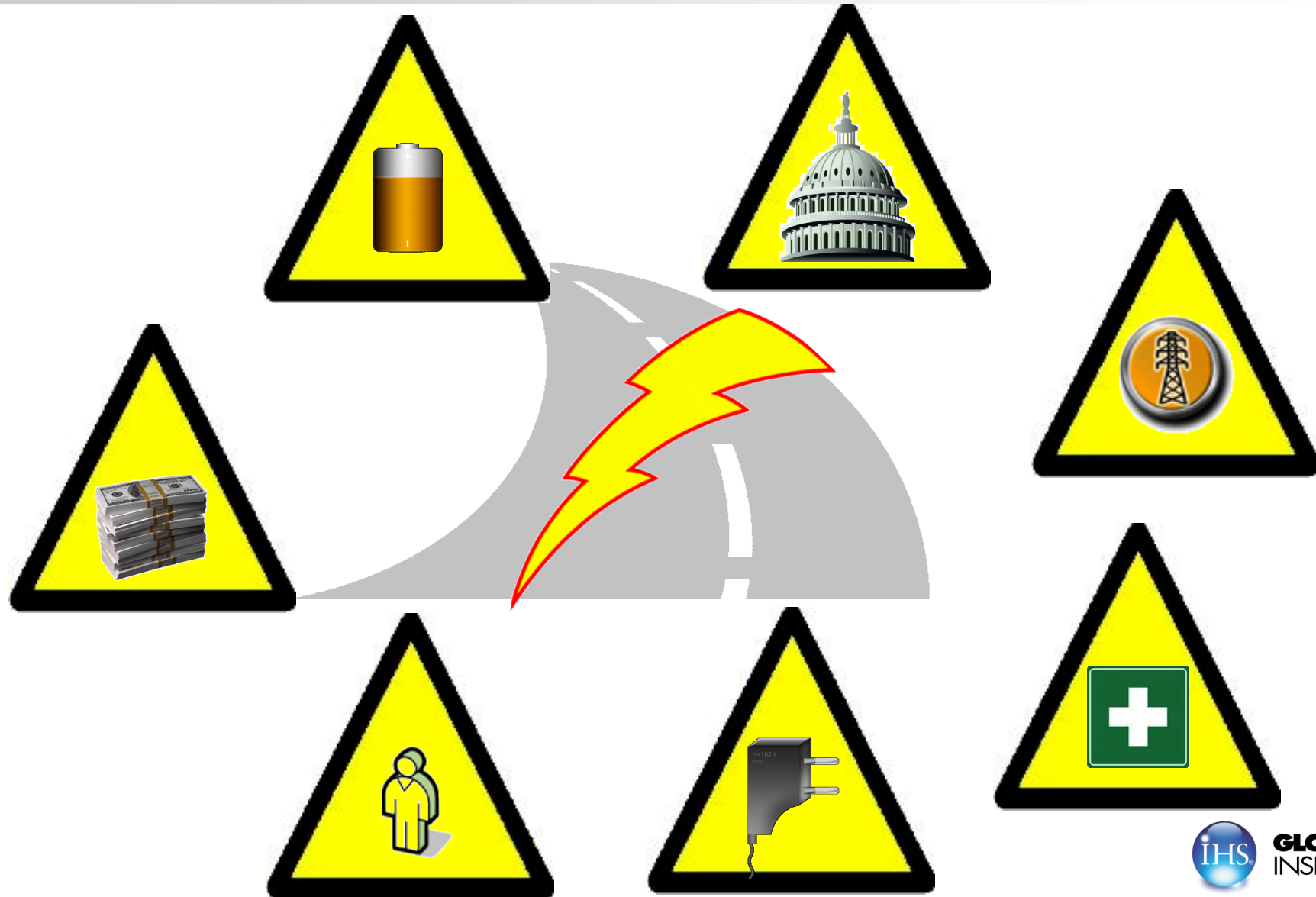


Why EVs now?

- Has anything changed enough that the outcome will be different now, or will today's prototypes also end up in museums?
- What are the milestones to watch as indicators of a shift to grid-based powertrains?
- Should you invest?
 - If so, in which technologies?
- Will entrants new to the automotive industry be the automotive powerhouses of the 21st century?



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EV Market Drivers

- Major driver is oil
 - Concern about the cost, security & availability of long-term oil supply
- Economic and Social Issues
 - Sustainability
 - Degradation of environmental and health conditions
 - Stringent fuel efficiency standards
 - Binding greenhouse emission targets.
- Ultimately its a combination of all of these, and more, that has spurred on PEV technological developments

EV Market Outlook : EU



- Historically the European consumer has displayed an awareness of environmental and efficiency issues.
 - Goodwill towards initiatives contributing towards affordable sustainable mobility for the better good.
- EU looks like a solid future market for the PEV vehicles under practically all scenarios.
 - Market volumes are dependent on external factors such as infrastructure and government support.
- Strong feelings towards “national champions”
 - Positive for European PEV manufacturers if it can be sustained

EV Market Outlook : US



- PEV largest handicap remains the cost
 - Expectation of reduced cost penalty
- Expectation that PHEV will be better suited to the US market
 - Consumer independence related to range anxiety
- Strong sense of Nationalism
 - Reducing dependence of foreign oil
- Government mandatory involvement undesired
 - Individual rights are a founding principle
 - The carrot works much better than the stick in the US

EV Market Outlook : China



- Chinese automotive industry is going to become a major global player during the next few decades.
- China needs to find a sustainable solution regarding future powertrain
 - Many available options (ICE/HEV/bio-fuels/Fuel cell/PEV)
 - Likely a diversified powertrain solution
- China's vehicle market is huge and diversified.
 - Ratio of vehicles per thousand people is low
 - Currently about 70 million electric bicycles in China
- Long term, China is embracing PEV as main-stream solution.



Source: BBC

EV Market Summary

- Electrification of the vehicle is proving to be disruptive.
 - 2030 Global Market Shares
 - PHEV Share: 8.6%
 - BEV Share: 9.9%
- The vehicle market of the future will experience some significant changes.
 - New technologies
 - New stakeholders and symbiotic collaboration
 - New Entrants
- Whatever the future market outcome, and notwithstanding a clear opportunity for the PEV technology, there remains a clear role for conventional optimized ICE solutions and hybridization.



**Thank you for
your attention!**

Any Questions?