

Electric Vehicle – Groschengrab oder Cash Cow? Bietet Elektromobilität das Geschäftsmodell der Zukunft für traditionelle Automobilhersteller?

Electric Vehicle – Money Trap or Cash Cow? Is E-Mobility the Business Model of the Future for Traditional Automotive OEMs?

A. Krug, A. Neumann, A. Schlosser
Ricardo Strategic Consulting GmbH



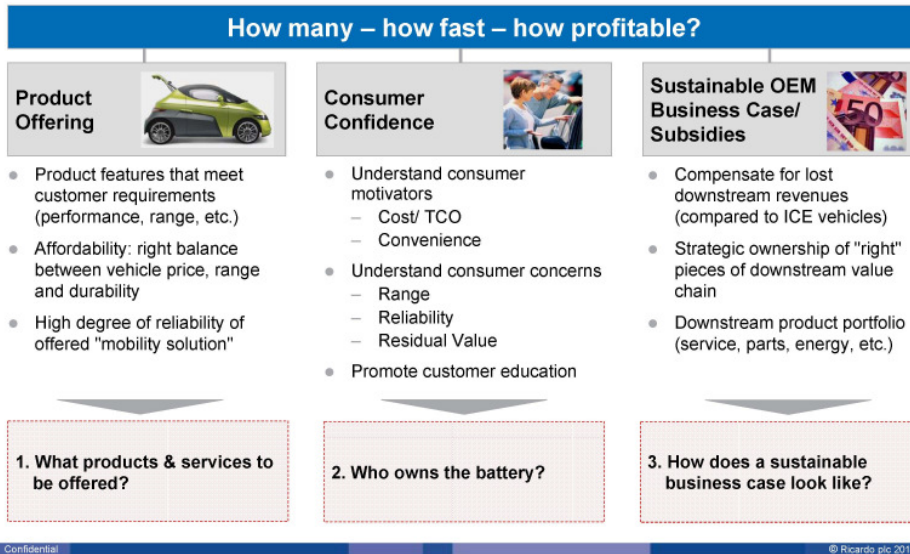
Electric Vehicle - money trap or cash cow?

Is e-mobility the business model of the future for traditional Automotive OEMs?

Aachen, October 4th, 2010

Introduction

EV uptake and overall profitability will depend on 3 key levers...



Confidential

© Ricardo plc 2010 2

Abb. 1: EV uptake and overall profitability will depend on 3 key levers

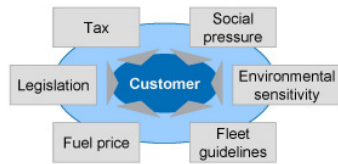
Products & Services

Consumer demand for EVs will be driven significantly by economic attractiveness and individual product perception



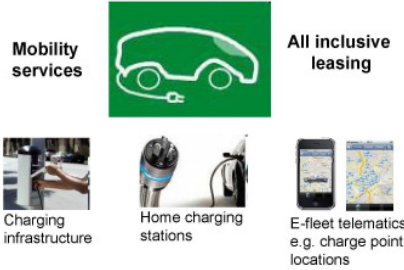
1st Question: What products & services need to be offered?

EV drivers from consumer's perspective



- Multiple drivers impact consumers' adoption of EVs
 - Fuels Cost
 - Tax
 - Congestion Charges
- Customers will have different motivators:
 - Urban / Rural
 - Lifestyle
 - economical situation, etc.
- But, high uncertainty regarding EV durability, feasibility and residual value of battery and vehicle

Product & Service Offering



- Adapt "traditional" model to mobility not ownership**
- "All-inclusive" mobility packages
 - Lease of ICE for longer distances
 - Car Clubs for daily commutes

Source: Ricardo Analysis

Confidential

© Ricardo plc 2010 3

Abb. 2: Consumer demand for EVs will be driven significantly by economic attractiveness and individual product perception

Products & Services

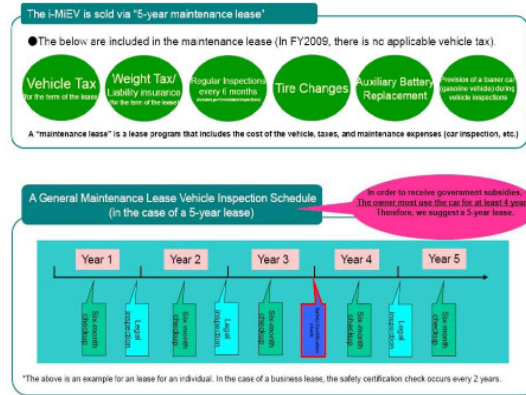
Mitsubishi responds to the customer expectations by offering a full service leasing package for a fixed monthly lease



All-inclusive product bundles

i-MiEV "Maintenance Lease"

EXAMPLE



- Full service "no hassle" product package
- High predictability of service and maintenance costs for customer
- Clear guidance for customer regarding service & maintenance requirements
- Short service intervals allow for continuous tracking of vehicle usage and hence learning about customer driving behavior and impact on vehicle/battery
- Same leasing logic applies to other manufacturers like Peugeot/Citroen

Source: Ricardo Analysis, Mitsubishi
Confidential

© Ricardo plc 2010 4

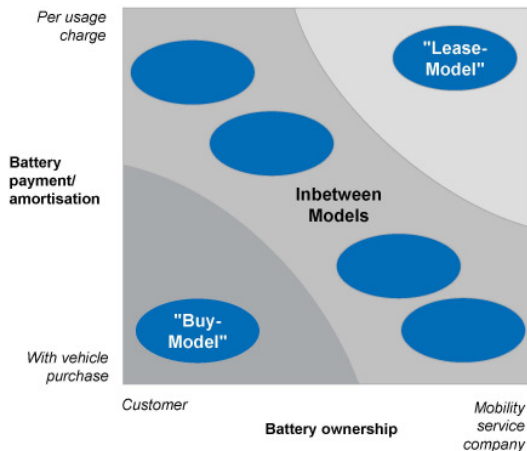
Abb. 3: Mitsubishi responds to the customer expectations by offering a full service leasing package for a fixed monthly lease

Battery ownership

Different strategic options related to battery ownership, payment mechanisms and infrastructure are currently being developed



2nd Question: Who owns the battery?



- **"Buy-Model"**
 - Customer "buys" vehicle and battery
 - Customer is fully responsible for battery charging and maintenance
 - Technology and supercession risks, depreciation etc. with customer
- **"Lease-Model"**
 - Customer "buys" vehicle and leases battery
 - Lease includes battery maintenance and charging control
 - Battery risks reside with OEM or mobility company

Battery lease models will drive EV acceptance significantly

- Battery price compensation
- Limitation of residual value risks
- Forcing of customer contact points

Source: Ricardo Analysis
Confidential

© Ricardo plc 2010 5

Abb. 4: Different strategic options related to battery ownership, payment mechanisms and infrastructure are currently being developed

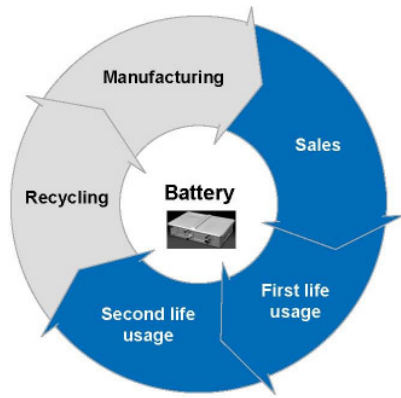
Battery ownership

Given the dominant role of the battery for a viable EV business case the battery life-cycle needs to be maximised

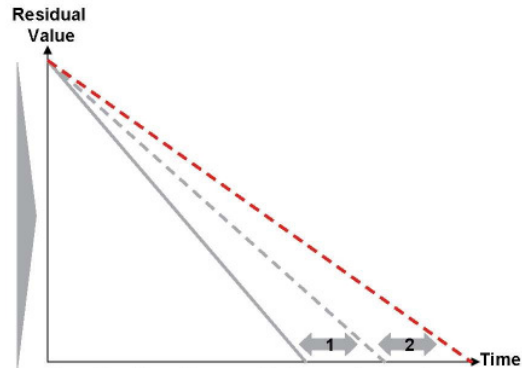


ILLUSTRATIVE

Battery life cycle



Extend First Life, Extract Second Life



1. Use telematics, monitoring systems and controlled charging to prolong first life
2. Develop end of life use to enhance residual values

Source: Ricardo Analysis
Confidential

© Ricardo plc 2010 6

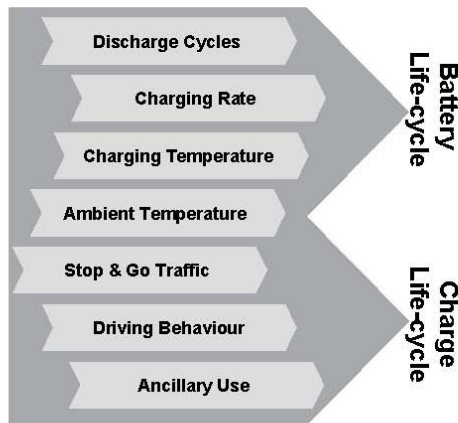
Abb. 5: Given the dominant role of the battery for a viable EV business case the battery life-cycle needs to be maximised

Battery ownership

Reducing consumer risk delivers real benefits for the consumer and value opportunities for the Mobility Company or OEM



Battery Risk Reduction



Battery "Owner" Benefit

- Management of re-charging significantly prolongs battery life
 - Data links to communicate SOH and SOC
 - Wireless and through charge cable
- Pro-actively manage battery life
 - Charge rate
 - Charge temperature
 - Depth of discharge
- Extend life and residual value
- Telematics deliver "real world" driving data
 - Enhanced GPS to find, route and reserve charging points
- Interventions to extend charge
- Extended and repeatable drive cycles
 - Reduced "range anxiety"

Source: Ricardo Analysis
Confidential

© Ricardo plc 2010 7

Abb. 6: Reducing consumer risk delivers real benefits for the consumer and value opportunities for the Mobility Company or OEM

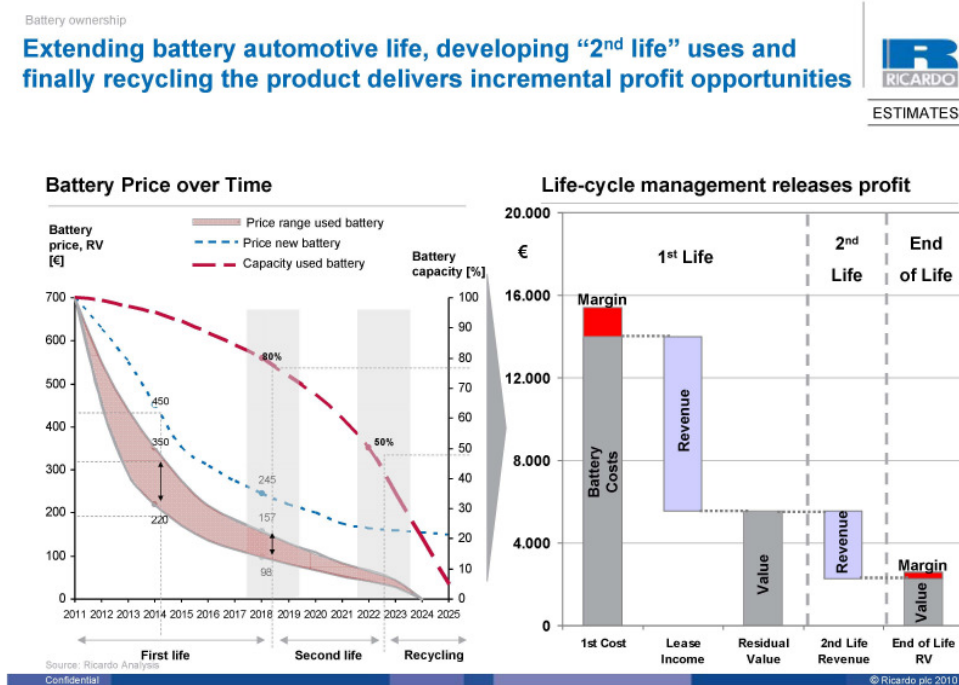


Abb. 7: Extending battery automotive life, developing “2nd life” uses and finally recycling the product delivers incremental profit opportunities

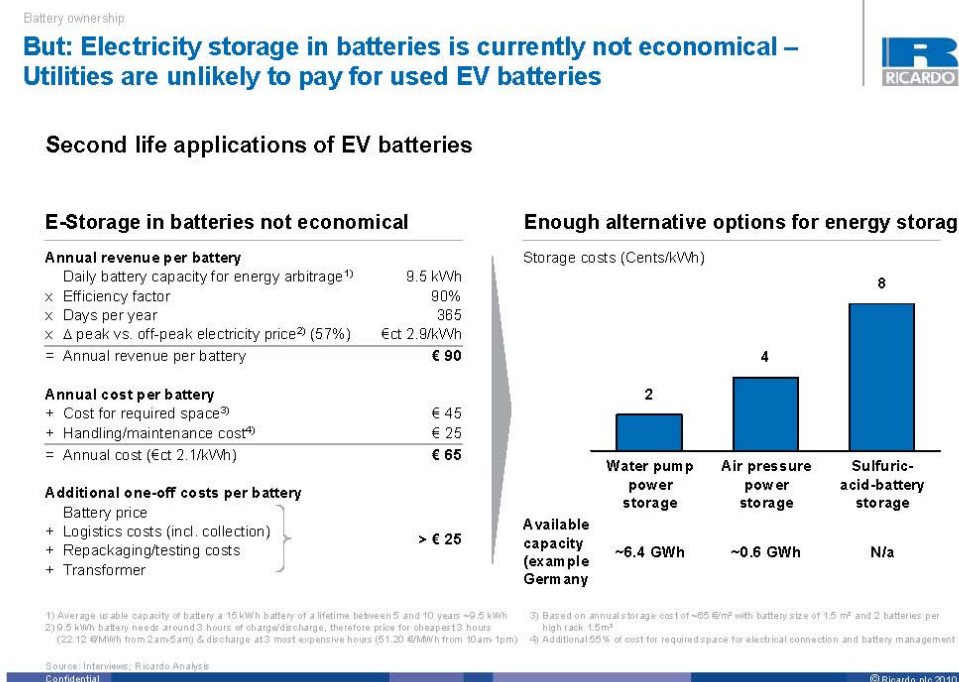


Abb. 8: But: Electricity storage in batteries is currently not economical – Utilities are unlikely to pay for used EV batteries

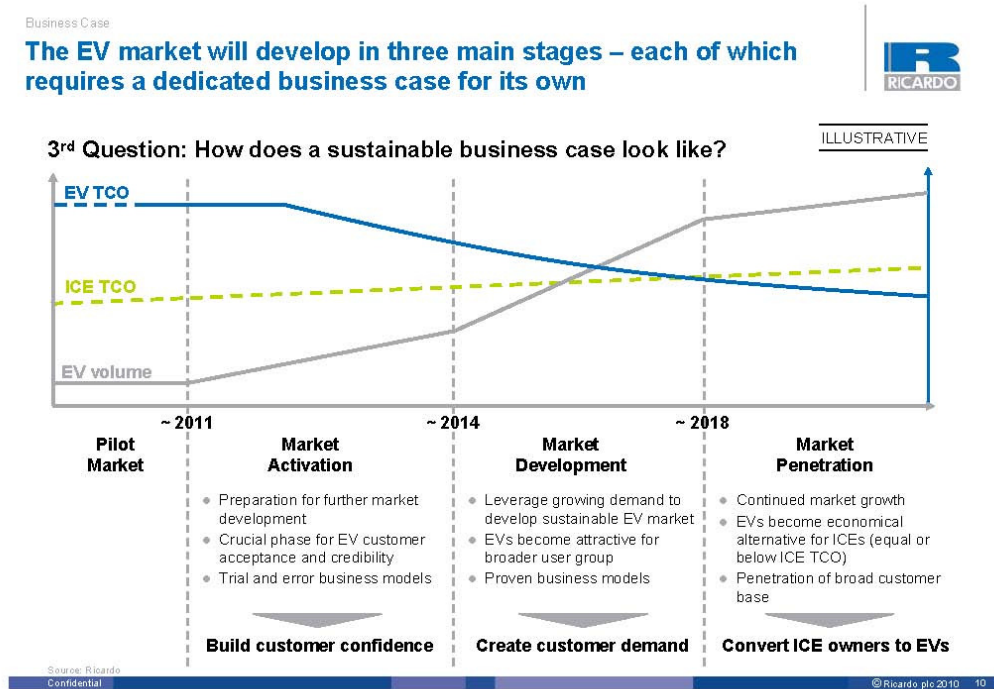


Abb. 9: The EV market will develop in three main stages – each of which requires a dedicated business case for its own

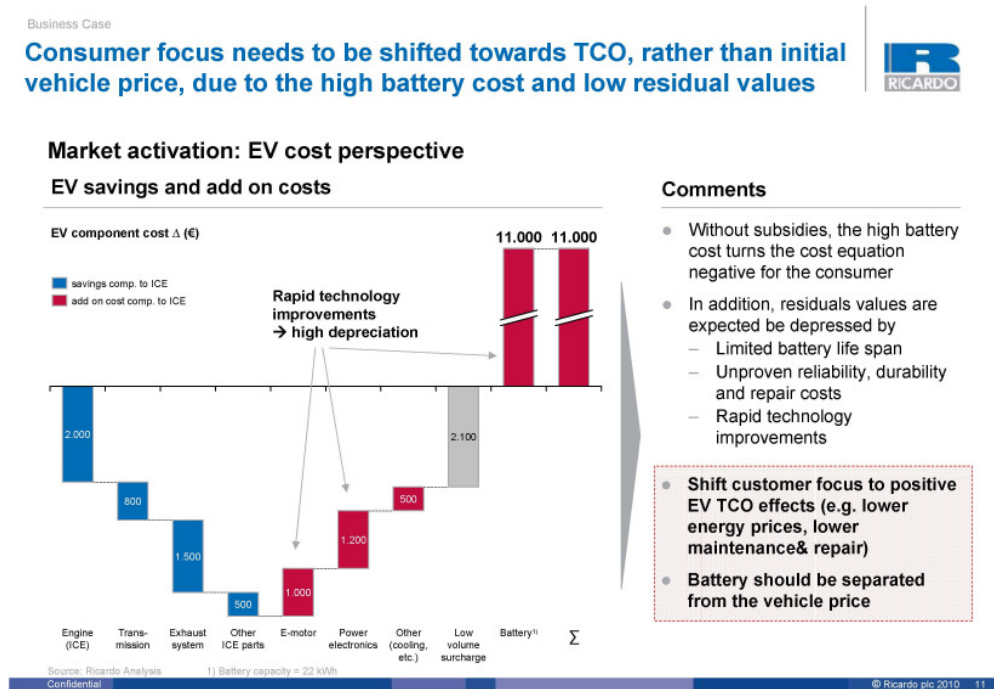


Abb. 10: Consumer focus needs to be shifted towards TCO, rather than initial vehicle price, due to the high battery cost and low residual values

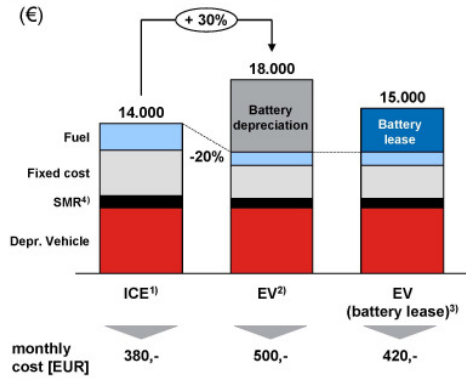
Business Case

Higher price/TCO acceptance of early EV adopters offers opportunities during market activation phase



Market activation – Price/TCO

TCO calculation (15.000km, 36 months)



Assumptions and Findings

- Vehicle sales price for ICE and EV (without battery) on city car level
- Battery price EUR 500/KWh in 2012
- Depreciation for 3-years-period:
 - 50% vehicle depreciation
 - 60% battery depreciation
- Battery leasing fee: EUR 110/month (15.000 km p.a.)

- EV TCO premium of almost 30% compared to ICE
- Significant subsidy required to meet ISO TCO
- But: Early adopters are willing to spend EV-premium price, offering the chance for skimming strategy

1) Diesel compact car 3) EV (battery lease): battery leased for EUR 110 / month
 2) Battery EUR 11.000 4) SMR: Service, Maintenance & Repair
 Source: EurotaxGlass 2010, ADAC, Ricardo analysis

Confidential

© Ricardo plc 2010 12

Abb. 11: Higher price/TCO acceptance of early EV adopters offers opportunities during market activation phase

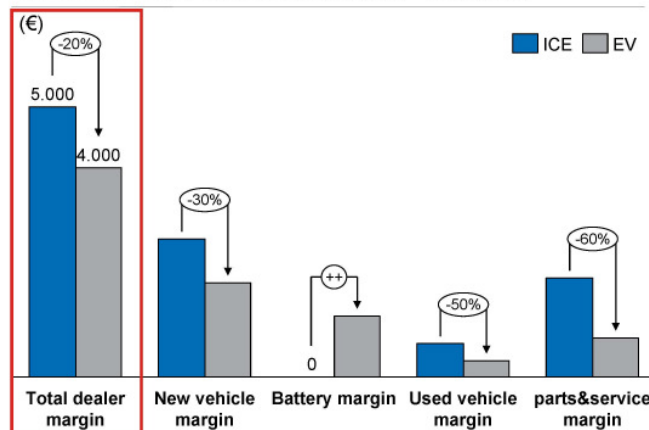
Business Case

Even with an aggressive battery margin, the dealer lifetime value of the EV is significantly lower than for an ICE



Market activation – Dealer revenue potential

Comparison dealer vehicle lifetime value – EV vs. ICE



Comments

- Comparison based on average passenger vehicle sales price in Germany
- Even with a aggressive battery margin, the overall EV dealer margin will be significant lower than today
- Only additional revenue source may be the battery

- Lower service and maintenance cost ≈ .i. € 2,500 over 5 years
- Pushing EV vehicle sales requires additional incentives on dealer level

Source: Zentralverband des deutschen Kraftfahrzeuggewerbes (ZdK), Kraftfahrtbundesamt (Kfz), Ricardo

Confidential

© Ricardo plc 2010 13

Abb. 12: Even with an aggressive battery margin, the dealer lifetime value of the EV is significantly lower than for an ICE

Business Case

The EV value chain is emerging: new players entering the game with key role of public authorities, but rules of the game not defined yet



Electric Vehicle Value Chain

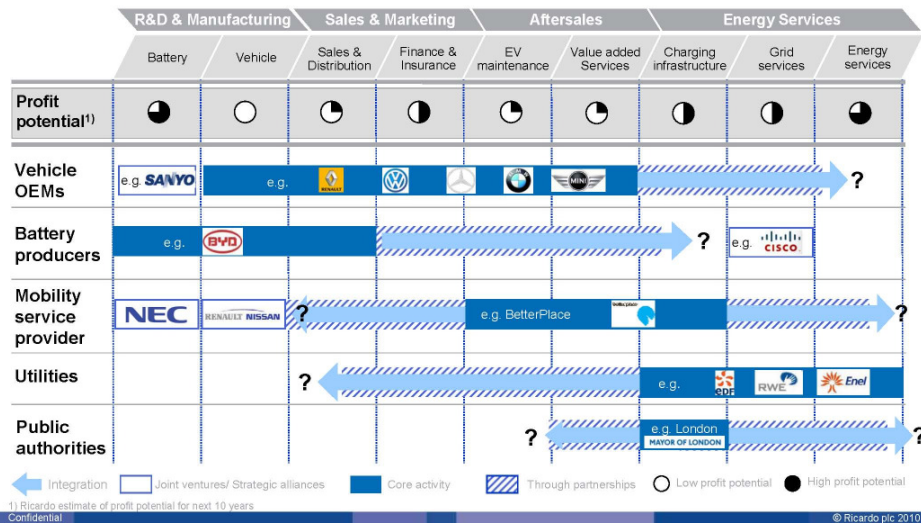


Abb. 13: The EV value chain is emerging: new players entering the game with key role of public authorities, but rules of the game not defined yet

Business Case

In summary – Attractiveness of EV business depends heavily on speed of market ramp up and incidence of technology breakthrough



Key take aways

Adapt "traditional" model to mobility not ownership

- EV product offering must proactively address customers requirements and fears regarding product feasibility, durability and residual value

Battery lease models will drive EV acceptance significantly

- Specific sales/lease offers for EVs and batteries will become common for EVs
- Especially in the early market phases manufacturers need to bear associated battery risks

Consumer focus needs to be shifted towards TCO

- EV's may require a change in the traditional purchase model for vehicles, offering an opportunity for a longer term OEM/customer relationship

Money trap or cash cow?

- Higher price acceptance during market activation phase will allow OEM to sell EVs on a cost plus base
- But: Mid- and long term profitability requires substantial technology breakthrough and fast market ramp up

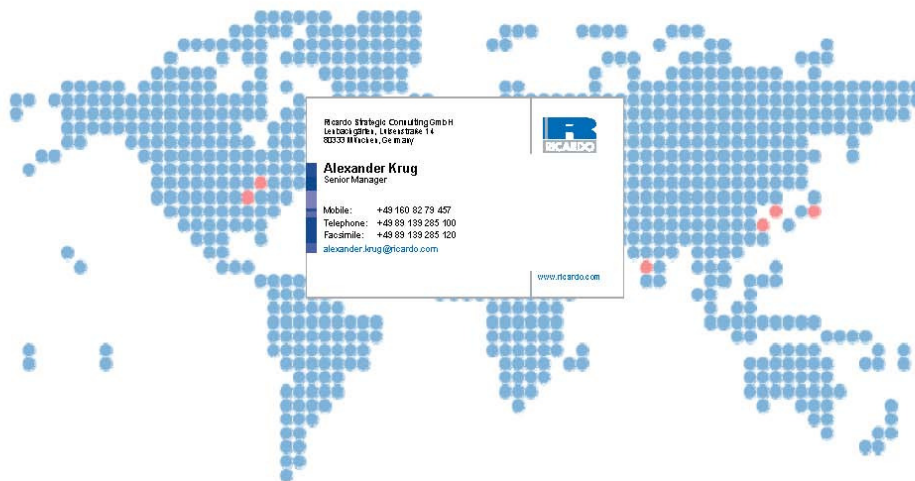
Source: Ricardo Analysis

Confidential

© Ricardo plc 2010 15

Abb. 14: In summary – Attractiveness of EV business depends heavily on speed of market ramp up and incidence of technology breakthrough

Contact details



Confidential

© Ricardo plc 2010 10

Abb. 15: Contact details