E-MOBILITY
THINK AHEAD OF THE FUTURE

STRATEGIC RE-POSITIONING FOR SUSTAINABLE GROWTH

IS YOUR STRATEGY READY?

IT’S ALL ABOUT
MAKING THE RIGHT CHOICE

RE-POSITION YOUR CORE BUSINESS

DO YOU HAVE SOLUTIONS FOR A
GAME CHANGING TRANSFORMATION?

YOUR LOCAL EXPERT
E-MOBILITY COMPETENCE CENTER
AUTOMOTIVE INDUSTRY IN TRANSFORMATION

Stricter emission regulations and the diesel scandal are pushing the powertrain of the future: e-mobility. The electrification of the car along with other trends will drastically change the components set-up of the future vehicle and radically impact the automotive landscape. As new entrants move onto the stage, traditional suppliers and OEMs now have to adjust their strategies in order to secure future growth.

China is the major manufacturing and sales market for electric vehicles. While Chinese OEMs were hardly able to keep pace with their Western competitors in the traditional vehicle segment, they are the trailblazers alongside Tesla when it comes to battery electric vehicles (BEV) and plug-in hybrids (PHEV). German suppliers should therefore seize the chance to rethink their positioning in order to be able to capture future market opportunities.

EAC has been active in key global automotive hubs, especially in Asia, since the mid-1990s. Our first-hand knowledge through local resources and existing networks enables us to apply our e-mobility competence to your individual organizational set-up. We will provide you with a customized strategy concept for a sustainable positioning in the long-run. Benefit from our extensive automotive and Asia insights and use us as a catalyst for your future success.

E-MOBILITY – A FUNDAMENTAL GAME CHANGER?

E-mobility offers various opportunities for existing and new players to achieve additional turnover potentials. However, a high degree of uncertainty requires thorough assessment of market conditions and impact factors.
OVERARCHING AUTOMOTIVE INDUSTRY TRENDS

Along with e-mobility, several other trends shape the automotive universe – traditional suppliers have to take action on many fronts in order to position themselves as a “supplier of the future”

ELECTRIFICATION

- Electrification with great impact on powertrain components, highly affecting supplier landscape
- Electric powertrains need fewer components with different manufacturing processes and alternative materials use
- Tighter emission regulations will encourage production and sales of EVs

<table>
<thead>
<tr>
<th>ELECTRIFICATION</th>
<th>MATERIAL USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FUEL CELL VEHICLE</td>
<td>WEIGHT</td>
</tr>
<tr>
<td>BATTERY ELECTRIC VEHICLE</td>
<td>STEEL</td>
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<tr>
<td>PLUG-IN HYBRID</td>
<td>ALUMINIUM</td>
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<tr>
<td>HYBRID</td>
<td>MAGNESIUM</td>
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<tr>
<td>INTERNAL COMBUSTION ENGINE</td>
<td>REINFORCED PLASTICS</td>
</tr>
</tbody>
</table>

AUTONOMOUS DRIVING

- Sensor and processing solutions are improving and will pave the way for autonomous driving
- On-going legalisation adjustment for autonomous driving in key global automotive markets
- Individual consumer benefits by reduction of commute burden (up to 1 hour per day)

CONNECTIVITY

- Human-machine interface and real-time data (car, geographic) as major business opportunities
- Automotive OEMs have to develop competence as software, system integration and service providers
- Connectivity enables automotive suppliers to build business relationships with end-consumers
GLOBAL E-VEHICLE GRAVITY CENTERS

China as major e-mobility hub in terms of sales and production – Western OEMs intensify their e-mobility activities with focus on China

- Existing governmental promotion but not as prominent as in China
- E-mobility development so far driven by Tesla; Traditional OEMs starting to enter e-mobility business
- Sales market currently equally divided between BEVs and PHEVs, PHEVs to grow stronger in future
- Tesla is building a “Gigafactory” for batteries in co-operation with Panasonic and other suppliers

- Governmental promotion strongly varies on country basis; stricter emissions legislation pushing e-mobility
- European OEMs intensify their e-mobility activities; China as their focus sales market
- Sales market currently equally split between BEVs and PHEVs, PHEVs to grow stronger in future
- Battery development and manufacturing rising

FOLLOWER

- Governmental promotion especially high in China
- China as e-mobility hub with high density of solid automotive companies focusing on e-mobility
- Battery development mainly driven by Asian players (China, Japan, S.-Korea)
- Indian government undertaking ambitious initiatives to promote hybrid and electric mobility

E-MOBILITY HUB

- Established Chinese e-mobility OEMs: Already with main focus on e-mobility
- Emerging Chinese OEMs: So far focus on internal combustion engines
- Global OEMs with China footprint: Except Tesla all still focused on internal combustion engines – but e-models in pipeline
- E-mobility start-ups: Emerging newcomers exploring e-mobility wave and correlated trends

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ELECTRIC VEHICLE SALES PROJECTION

GLOBAL ELECTRIC VEHICLE SALES 2016 - 2020

Electric vehicle sales with exponential growth, China expected to represent more than 50% of global sales in 2020 – fundamental change in OEMs and supplier landscape expected in China

**GROWTH PER YEAR**
- CHINA: +41%
- USA: +44%
- EU: +30%
- JAPAN: +90%
- SOUTH KOREA: +50%

**SALES PROJECTIONS**
- CHINA: 2016: 510,000 -> 2,000,000
- GLOBAL: 2016: 6,000 -> 80,000
- 2020: 220,000 -> 650,000
- 2020: 20,000 -> 100,000

Source: EAC Research and Estimation
SIGNIFICANT REDUCTION OF COMPONENT STRUCTURE

While component variety in e-cars will be significantly reduced, component complexity highly varies between powertrain components.

**INTERNAL COMBUSTION ENGINE (ICE)**

**COMPONENT INTENSITY**

Ø 30,000 PARTS / CAR

**FUEL SUPPLY SYSTEM**
- Fuel line
- Fuel pump
- Fuel tank
- Air filter
- Fuel filter
- Fuel injector

**ENGINE SYSTEM**
- Camshaft
- Engine block
- Cylinder head
- Piston
- Cooling
- Oil systems

**TRANSMISSION SYSTEM**
- Axle shaft
- Clutch
- Differential
- Flywheel
- Gear
- Knuckle

**BRAKING SYSTEM**
- ABS
- Brake disc
- Brake pump
- Brake rotor
- Brake shoe
- Caliper

**SUSPENSION STEERING**
- Axle
- Spring
- Steering arm
- Steering shaft
- Steering wheel
- Tie bar

**EXHAUST SYSTEM**
- Clamp & bracket
- Gasket
- Manifold
- Muffler
- Heat shield

**BATTERY ELECTRIC VEHICLE (BEV)**

**COMPONENT INTENSITY**

Ø 11,000 PARTS / CAR

**ENERGY SUPPLY SYSTEM**
- Battery cell
- Battery module
- Battery pack

**ENGINE SYSTEM**
- Rotor
- Stator
- Windings

**TRANSMISSION SYSTEM**
- Axle shaft
- Clutch
- Differential
- Flywheel
- Gear
- Knuckle

**REGENERATIVE BRAKING**
- ABS
- Brake disc
- Brake pump
- Brake rotor
- Brake shoe
- Caliper

**SUSPENSION STEERING**
- Axle
- Spring
- Steering arm
- Steering shaft
- Steering wheel
- Tie bar

**EXHAUST SYSTEM**
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**NOTE: EXTRACT OF COMPONENTS**

<table>
<thead>
<tr>
<th>Component Structure BEv Compared to ICE</th>
<th>ELIMINATED</th>
<th>SIMPLIFIED</th>
<th>NEUTRAL</th>
<th>MORE COMPLEX</th>
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<tbody>
<tr>
<td>ICE Fuel Line</td>
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<td>ICE Fuel Pump</td>
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<td>ICE Fuel Tank</td>
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<td>ICE Air Filter</td>
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<td>ICE Fuel Filter</td>
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<td>ICE Fuel Injector</td>
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<tr>
<td>ICE Camshaft</td>
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<td>ICE Engine Block</td>
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<td>ICE Cylinder Head</td>
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<td>ICE Piston</td>
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<td>ICE Cooling</td>
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<td>ICE Oil Systems</td>
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<td>ICE Flywheel</td>
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<td>ICE Gear</td>
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<td>ICE Knuckle</td>
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<td>ICE Axle Shaft</td>
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<td>ICE Clutch</td>
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<td>ICE Differential</td>
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<td>ICE Brake Rotor</td>
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<td>ICE Brake Shoe</td>
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<td>ICE Caliper</td>
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<td>ICE Abs</td>
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<td>ICE Steering Arm</td>
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<td>ICE Steering Wheel</td>
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<tr>
<td>ICE Tie Bar</td>
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<td>ICE Clamp &amp; Bracket</td>
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<td>ICE Gasket</td>
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<td>ICE Manifold</td>
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<tr>
<td>ICE Muffler</td>
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<tr>
<td>ICE Heat Shield</td>
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</tbody>
</table>

NOTE: EXTRACT OF COMPONENTS
### Strategic Options Depending on Turnover Impact

Timing of mainstream penetration and thus turnover impact will remain highly uncertain, therefore it is necessary for automotive players to develop several scenarios to be prepared for adequate responses to future changes.

<table>
<thead>
<tr>
<th>Impact Factors</th>
<th>External</th>
<th>Internal</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Politics (e.g. legislation and subsidies)</td>
<td>Product portfolio</td>
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<tr>
<td></td>
<td>Consumer perception</td>
<td>Process technology chains</td>
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<tr>
<td></td>
<td>Technology progress (e.g. battery)</td>
<td>Employees (knowledge base and skills)</td>
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<tr>
<td></td>
<td>Energy prices (e.g. oil vs. electricity)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Turnover Impact</th>
<th>Affected Components</th>
<th>Partially Affected Components</th>
<th>Neutral Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH</td>
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<td>LOW</td>
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</table>

### Strategic Options

**Invest**
- Investment in future growth components
- Acquisitions of future technologies
- Co-operations/alliances with emerging players

**Develop**
- Usage of profitable business fields as on-going income source
- Further development of existing know-how, securing current market share and competitive edge

**Exit**
- Divestment from business areas with limited future growth potential

### Identify Your Need for Action

Game-changing disruption is happening on your watch - is your strategy ready?

<table>
<thead>
<tr>
<th>Key Challenges</th>
<th>Action Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unpredictable Future</td>
<td>Prepare for Uncertainty</td>
</tr>
<tr>
<td>QEMs and suppliers struggle with significant uncertainties with regards to future of automotive sector</td>
<td></td>
</tr>
<tr>
<td>Risk of Loosing Momentum</td>
<td>Assess Scenarios Impact on Your Business</td>
</tr>
<tr>
<td>High dependency on ICE technology – risk of being driven out of the market by new e-players</td>
<td>Define scenarios-dependent impacts on your product portfolio, turnover and profitability, customer access, organization and assets</td>
</tr>
<tr>
<td>Gain Share in EV-Profit Pool</td>
<td>Re-Shape Value Proposition</td>
</tr>
<tr>
<td>Find the right strategy to become a driver of change and benefit from disruptive technology</td>
<td>Discover opportunities, design new business models and shift from purely ICE hardware provider to integrated and innovative player</td>
</tr>
<tr>
<td>Transform Scenarios into Action</td>
<td>Integrate in E-Value Chain</td>
</tr>
<tr>
<td>Shortage of knowledge and resources within organization to drive e-mobility</td>
<td>Actively collaborate within the e-mobility value chain, create beneficial interactions and partnerships, build new businesses and win new customers</td>
</tr>
</tbody>
</table>
EAC SUPPORT

Traditional approaches to strategy look to the past to predict the future – we look ahead for it

<table>
<thead>
<tr>
<th>CONTENT</th>
<th>EAC APPROACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CREATE SCENARIOS</td>
<td>GENERATE FIRST-HAND KNOWLEDGE</td>
</tr>
<tr>
<td>Elaboration of alternative outcomes and multiple plausible futures for e-mobility development</td>
<td>EAC uses a regional-specific industry network as major source of information for scenarios planning based on analysis of most powerful trends</td>
</tr>
<tr>
<td>UNDERSTAND IMPACT ON YOUR BUSINESS</td>
<td>DESIGN A PORTFOLIO OF OPPORTUNITIES</td>
</tr>
<tr>
<td>Impact analysis of e-mobility scenarios on product portfolio, customer structure, turnover, profitability and value chain</td>
<td>EAC conceives, designs and scales scenario-based business models to minimize uncertainty</td>
</tr>
<tr>
<td>CHANGE STRATEGIC PARADIGMS</td>
<td>DEVELOP STRATEGY ADJUSTMENT MEASURES</td>
</tr>
<tr>
<td>Scenario-based individual value creation: value chain adjustment, product differentiation, market focus</td>
<td>EAC elaborates and prioritizes action demand measures (e.g. diversification and active portfolio management, new sales channels, regional footprint)</td>
</tr>
<tr>
<td>MAKE IT HAPPEN</td>
<td>GUIDE AND FACILITATE STRATEGIC PERFORMANCE</td>
</tr>
<tr>
<td>Leverage and facilitate partnerships within e-mobility ecosystems and implement your new business model</td>
<td>EAC supports focused execution by putting into place expedient milestones, targets, learning programs and interconnect through our e-mobility network</td>
</tr>
</tbody>
</table>

EAC EXPERTISE AT A GLANCE

FUNCTIONAL COMPETENCIES
- STRATEGY
- M&A
- OPERATIONAL EXCELLENCE

OFFICES IN
- MUNICH
- SHANGHAI
- MUMBAI
- MOSCOW

EMERGING MARKETS
- CHINA
- INDIA
- SOUTH EAST ASIA
- NORTH ASIA
- RUSSIA
- CEE

INDUSTRY COMPETENCIES
- MOBILITY
- INDUSTRIALS
- INFRASTRUCTURE
- ENVIRONMENT
- CHEMICALS
- HEALTHCARE
- CONSUMER GOODS
- ADVANCED TECHNOLOGIES

YOUR LOCAL EXPERT IN EMERGING MARKETS SINCE 1992
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