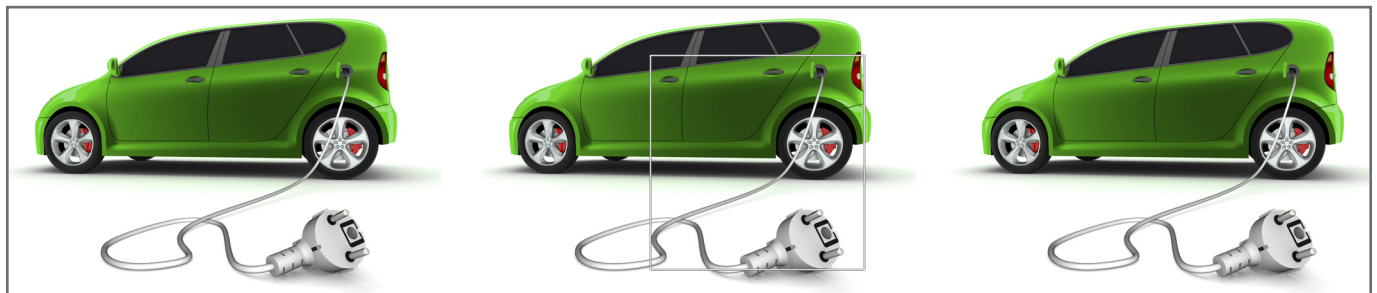


# Winning on the E-mobility Playing Field

*How to avoid a “red” business case for “green” vehicles*



In the middle of the current automotive crisis, everyone seems to be electrified. Most OEMs are investing significantly in developing e-technology and governments across the globe are rolling out plans to subsidize e-mobility. At the same time, the development of adequate business models is receiving little attention. As OEMs, utilities, infrastructure, leasing companies and service providers compete for the mobility budgets of the consumers, they all face a key question – which business models are viable on this new e-mobility playing field?

At all the major automotive events, such as IAA and Detroit Motor Show, sustainable mobility has become a key topic. According to Dr. Martin Winterkorn of the Volkswagen Group, “With e-mobility the automotive industry is facing the next technological leap,” and Dr. Zetsche identifies “Green luxury” as the key mega trend being strategically pursued by Daimler AG.

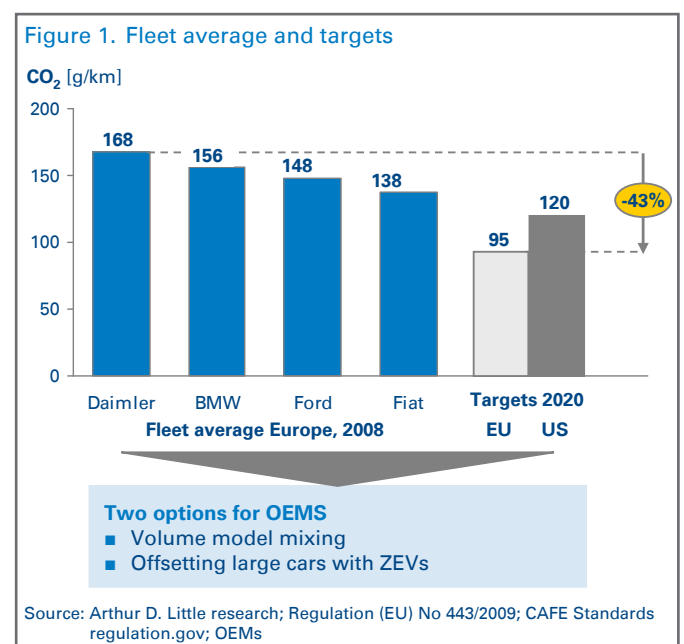
Pilot projects in multiple locations across the globe assess the technical feasibility with different levels of integration of public and individual transport services – encompassing 4- and 2-wheel transportation. Examples are the large-scale tests of the electric Smart in London and Berlin, BMW’s electric Mini and “project i” activities, Renault’s plans to supply the “Project Better Place” with electric cars, Mitsubishi’s i MiEV, and many more.

However, while the cars are being developed, little information is available on the customers who are to drive these cars, and on their specific needs. Moreover, although there are massive investments in “new” technology, few companies can show a sound financial plan or business case. At the moment, margins from combustion-engine-based cars, along with money from investors and taxpayers, are financing electro-mobility without any reasonable payback plan.

### Push instead of pull – regulation will drive the commercialization of electric vehicles

Numerous studies from investment banks, research institutes and consulting companies have been trying to predict market volumes of electric vehicles. Forecasted market penetration rates range from 2% to 25% – all for the same year, 2020, which now is only one and a half model cycles away.

Given this enormous uncertainty, we think trying to solve this problem from a market pull perspective may be the wrong approach. In contrast, we see a fundamental trend in the regulatory framework for fleet CO<sub>2</sub> emission targets in the US and the EU, which will drive commercialization of electric vehicles. Given a current average emission of 140g/km to 160g/km for most OEMs, and yearly improvements of around 2% within conventional power train, OEMs will not be in a position to fulfill the targets which are currently under discussion (95g/km and 120g/km for the EU and the US respectively), risking penalties and negative press (see Fig. 1).



OEMs have two options to solve the issue – the first is a shift in their product portfolio towards small, light and efficient cars, while reducing the number of vehicles in the luxury and SUV segments. We believe this is unlikely on a large scale as most OEMs would put their highest margins at stake and the reduction of conventional engines' consumption requires substantial R&D investments as well as technology leaps.

The other, and perhaps more viable, option is to pursue an offsetting strategy using the framework provided by the EU and the US where electric vehicles are treated as "zero emission vehicles" (ZEV) for fleet average calculation. OEMs could continue to profit from the high margins of large vehicle business while developing new business models for ZEVs. Any electro-mobility business case for OEMs should reflect the alternative of not having (enough) ZEVs, with financial consequences in the form of penalties and lost customers due to unfavorable publicity.

The question for OEMs will therefore switch from "How many electric vehicles will the markets demand?" to "How many electric vehicles do we have to bring to market in order to meet our emission targets?"

By applying this rationale, we estimate that electric vehicles (including range extender and plug-in hybrids) will account for 10–20% of new car sales by 2020, and even higher in large cities and for premium OEMs that need to offset high CO<sub>2</sub> emissions.

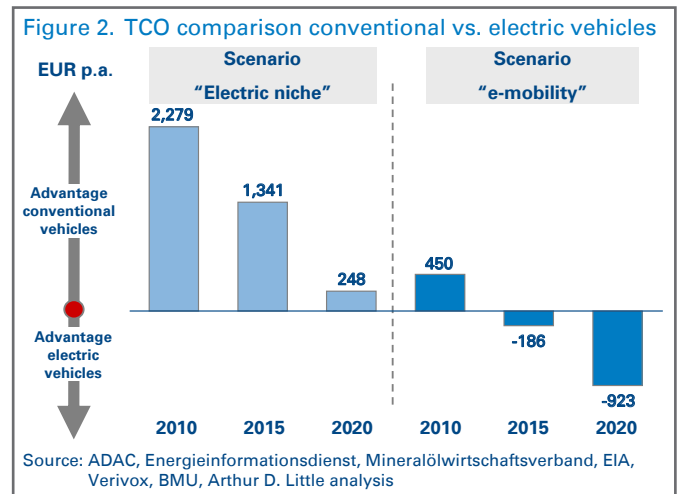
### Costs are not a "show stopper" from 2015 onwards

Even if OEMs have to plan for sales volume instead of waiting for market pull, they should take a very close look at the customers and their needs. At the moment there is a lot of focus on "green" high-end buyers with high purchasing power – but we are rather skeptical whether this growing, but still small, customer group will be enough to absorb a significant market volume over time, in line with the total market penetration scenario outlined above.

Following the logic of diffusion of innovation developed by Rogers (1963) and Moore (1991), the mass adoption and commercialization of electric vehicles will require significant product benefits or USPs, such as Total Cost of Ownership (TCO) advantages, compared to conventional combustion engines.

Arthur D. Little has analyzed two scenarios (see Fig. 2) modeling the following relevant parameters:

- Residual value of the car and battery
- Cost impact of the battery
- Energy cost (oil price and electric power)
- Subsidies/taxes on electricity vs. conventional fuels



### The results allow two conclusions:

**Firstly**, the cost side is not a "show stopper" in the case of broader e-mobility acceptance. The TCO is calculated without any subsidies – though subsidies are likely to be widely adopted in many markets in the beginning. If strong subsidies for electric vehicles are applied the picture looks even brighter, decreasing the TCO disadvantage from 1,341 EUR p.a. to less than 600 EUR p.a. by 2015 (scenario "Electric niche"). In China, subsidies of 6,700 EUR and in the US, up to 7,500 USD per electric vehicle purchased have already been announced. In Germany, subsidies of up to 5,000 EUR per electric vehicle are being discussed, although there is still uncertainty regarding funding.

**Secondly**, losses in residual value determine, to a large extent, the TCO of electric vehicles. According to our analysis residual values amount to up to two thirds of the TCO, with the short technology cycles of battery and vehicle being the main drivers. As a consequence, viable business models will need to address this issue. Beyond the call for subsidies, the only options are fostering intense or multiple usage over the life cycle and/or disconnecting the battery from the vehicle combined with a replacement infrastructure. Both business models are currently being tested and imply a different usage pattern.

Obviously, the relative TCO calculation will highly depend on the individual use cases of the customers, e.g. how much, where and when are customers driving; will there be subsidies in the specific market; are there traffic restrictions for the respective home city and how much tax will there be on electricity and conventional fuel. Consequently OEMs will have to know much more about their individual customers' situations than they know today, which is likely to lead to a completely new segmentation logic.

### Viable business models will need to go beyond the traditional automotive value chain

With the average household spending about 500 EUR on mobility services per month (with an upward trend for the

future), mobility is a more attractive market than ever. Recent developments suggest that e-mobility will, however, change the industry structure, with new players emerging at the consumer end, e.g. Better Place, as well as in the technology supplier domain, e.g. A 123.

Business models will open up and offer opportunities beyond the traditional automotive value chain (see Fig. 3). We will see utility companies, infrastructure providers, suppliers, telcos or newly formed service providers entering this space alongside OEMs, all competing for mobility budgets.

After identifying target volumes and the customer needs, automotive companies have to answer a third question – how and where to compete? Our analysis suggests that four predominant business models will emerge (see Fig. 3).

### 1. The Mega-OEM

There will be a race among traditional and emerging OEMs for technology leadership and economies of scale. Only a few OEMs are likely to lead, and their products will be used under different brands, as an increasing number of smaller OEMs realize that they will not be able to bear the cost and technology capacity of developing their own electric vehicles – an example being the Peugeot iOn, a vehicle based on Mitsubishi's i MiEV.

We suspect that far too many OEMs are pursuing the "Mega-OEM" strategy at the moment, most of them risking heavy investment in proprietary solutions without a clear path for payback over the next 10 years.

### 2. "Intel inside" – standard-setting supplier

The second option is an adaptation of the "Intel inside" approach deployed in the personal computer industry. Some very powerful large Tier 1 suppliers, but also emerging players like BYD from China, will try to establish de-facto standards, offering OEMs a complete modular package of electric vehicle technology – from battery and electric engines, power electronics up to complete vehicle architectures where only the interior and exterior styling will be adapted to the OEMs' customers' requirements.

The potential of this strategy, currently being pursued by Magna for example, can be observed in some Ford concept electric vehicles with large Magna branding on the batteries – Ford being one of the largest OEMs worldwide with vast know-how, but still ready to accept a co-branded concept car.

### 3. City mobility shop

Large cities worldwide are increasingly concerned about the impact of traffic on quality of life for their citizens. With budget pressure increasing, city entrance fees, following London's "Congestion Charge" example, are likely to spread. There is a strong possibility that local authorities will push for alternative mobility concepts centered on local "clean" concepts such as electro-mobility. A look at France's EDF and Tokyo's Electric Power Company TEPCO shows that semi-public utility companies are likely to cooperate with automotive OEMs and authorities to provide electro-mobility solutions for large cities. As the recharging infrastructure can be linked to privileged parking spaces in inner cities, the power of a combined business model is intriguing.

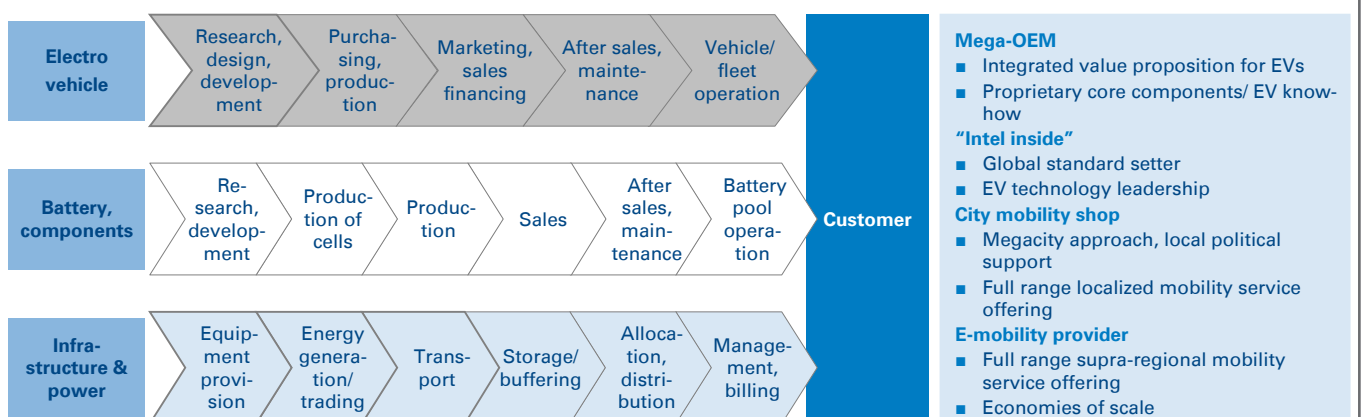
### 4. E-mobility provider

Traditional mobility providers from rail, aviation and car rental businesses will actively seek opportunities to increase their share of travelers' mobility budgets. Moreover, the positive effects of a "green" mobility solution on image will become an important asset in an industry where the impact of sustainability policy will gain force.

Players, such as Sixt, Lufthansa and Deutsche Bahn, are highly likely to become pioneers of electro-mobility business models. Their presence in major hubs worldwide allows them not only to implement the infrastructure needs of electric cars, but also to address affluent travelers directly when arriving from long-distances and searching for a means to enter a city.

Rental car companies, Deutsche Bahn with its Flinkster car sharing concept and automotive OEMs with initiatives such as car2go from Daimler are researching customer needs and

Figure 3. New playground across value chains generates four major strategic options



Source: Ifmo "Mobilität 2025"; Arthur D. Little

implications for their offering. We think that seizing direct contact to the customer will become even more important in this context. Thus competition will emerge in mobility concepts for electric vehicles, with traditional OEMs, leasing companies and mobility service providers re-defining their roles.

### Conclusion: An electro-mobility agenda for automotive companies

- OEMs should not wait for customers to unleash “market pull” towards electric cars, or for reliable market forecasts. Given the size of the technology shift required and customers’ uncertainties regarding costs, mileage and usability, it is up to the industry to entice customers into electric vehicles. OEMs must also bear in mind that any business case for e-mobility has to reflect the option of not being able to offset emissions from conventional cars. Fast and flexible offerings with a high degree of convenience are crucial in the initial stages of market offering, along with a proper sales/after sales concept.
- The value chain has to be managed actively to address new mobility and customer types efficiently. Areas of competitive importance should be defined, and investment in engineering & development must be balanced with innovative branding, sales, provision and service strategies, including new processes for the e-mobility offering.
- Total Cost of Ownership (TCO) will be key in closing the gap from current low use to mass adoption of electric vehicles. Cutting the cost of components to reduce TCO will not suffice; efficient residual value management and secondary market consideration also have the potential to deliver competitive advantages.
- OEMs should focus primarily on markets where they can best meet customer needs. It will be better to serve a selected customer group with a holistic mobility package than to invest effort and cost in every electric vehicle segment to win customers. The influence of governments plays a role but the long-term perspective also needs to be considered. No government will subsidize electro-mobility forever.
- Business model innovation is key to success in the e-mobility market. A wider playing field beyond the automotive value chain will be the scene of competition. OEMs should focus on the sweet spots where their know-how generates an USP. A mobility product is being tailored – not a car. “Price list vehicles” will be hard to sell in the early years.

To succeed in the new electro-mobility markets, OEMs will need to do more than simply develop “new” car technology. Facing uncertainties about market size, customer needs and industry structure, a clear ambition-driven strategy will become more important than ever.

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