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Market Introduction of Electric Cars: A SWOT Analysis

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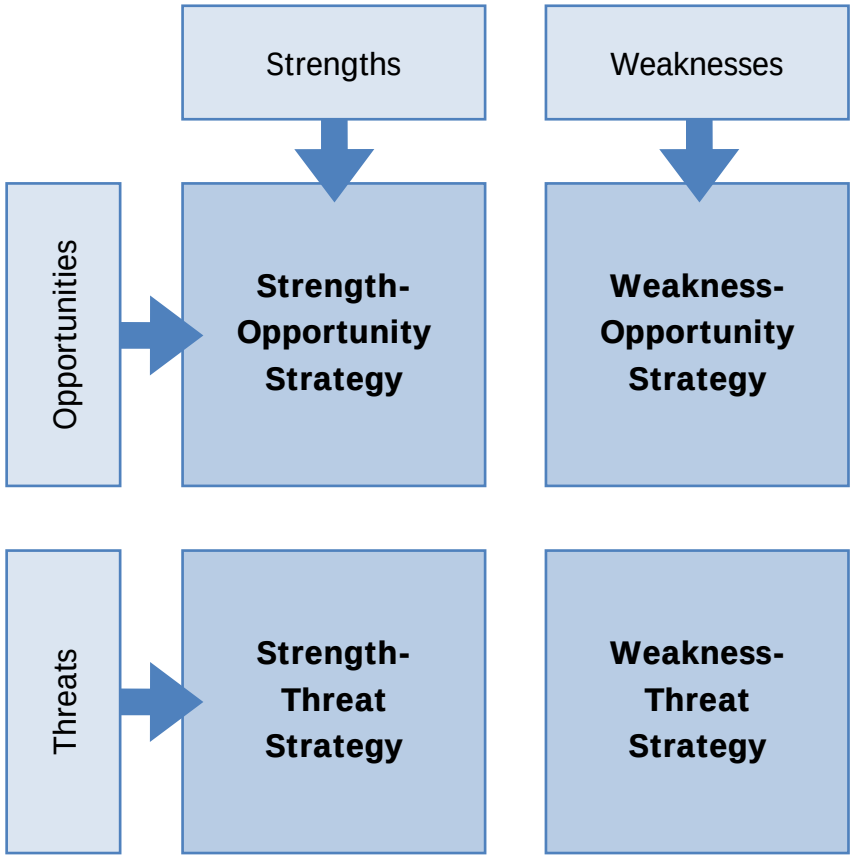

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Abstract

This paper investigates potential strategies for a car manufacture corporation in a market introduction stage of electric cars. A SWOT analysis is conducted on the example of the Volkswagen Group, examining strengths and weaknesses of the company, as well as opportunities and threats in the environment of the company. Regarding the analysis of the opportunities and threats, the PESTLE approach is used, i.e., the analysis of political, economic, social, technological, legal, and environmental segments. Several strategies are presented.

Content

1. Introduction

In this paper a SWOT analysis is applied from the viewpoint of the German car manufacture corporation Volkswagen (VW). VW put its first electric car called E-Up on the market in the end of 2013 and is going to release the E-Golf in 2014. Thus, VW is in a market introduction stage of electric cars. The objective of this paper is to find potential strategic approaches by identifying strengths and weaknesses of a company introducing electric cars to the market, and by analyzing the environment of the company in order to identify opportunities and threats in respect of the market introduction of electric cars.

We performed a SWOT analysis in two steps. At first, a desk research was conducted to gather information, which is structured into a matrix with four fields, i.e., strengths and weaknesses (internal analysis), as well as opportunities and threats (external analysis). The second part is used to explore different strategic options on the basis of the presented information. Correlating internal and external dimensions with each other results in four distinctive strategy groups. These represent different approaches to the purpose of a company's strategy (Pearce and Robinson, 2011):

- Strength-opportunity strategy: Try to use strengths to create competitive advantage and explore the opportunities.
- Strength-threat strategy: Use company's strengths to overcome environmental threats.
- Weakness-opportunity strategy: Take corrective action on weaknesses to be able to make full use of opportunities provided.
- Weakness-threat strategy: Be aware of and proactively correct weaknesses which in combination of threats could lead to serious consequences for the business.

2. Internal Analysis: Strengths and Weaknesses

The question to be answered in this section is: Which comparative advantages and disadvantages does VW expose in the German market for electric cars?

2.1 Strength Analysis

VW combines a unique collection of various automotive brands under its roof, e.g., main brands such as Volkswagen, Audi, Seat, and Skoda, as well as luxury brands such as Porsche, Bugatti, Bentley, and Lamborghini. Each brand operates as an independent entity. This diversity allows every brand to focus on their respective markets and develop unique characteristics. This ability to reach a broad set of different customers with different needs represents one of the core strengths of VW. Also the tradition and values associated with the different brands create a marketing advantage over new entrants. Other automotive brands in different segments such as MAN and Scania trucks or Ducati motorcycles complement the overall portfolio. VW has a dominant position in the German automobile market. A look at the statistics of new cars' registrations in the year 2012 reveals a combined market share of 37.4 % for VW and other corporation Brands (Kraftfahrtbundesamt, 2013). This is coupled with a positive outlook, as the market share of all pictured brands has shown a growth trend. Despite great efforts to achieve a dominant market position and high investments resulting from it, the financial side of the operation also shows good results. In the fiscal year 2012, the company has been able to turn a record operating profit and continues to have a strong liquidity position (Volkswagen, 2013a).

2.2 Weakness Analysis

Despite the good overall position of VW and its brands within the German market, some specific weaknesses can be attributed to the development of electric cars. Looking at the present electric personal vehicles presented by VW, the models Up and Golf, the company chose a strategy to adopt electric drivetrains within existing production models, as both have been presented with traditional petrol and diesel drivetrains first. The necessity for VW to integrate batteries into the center tunnel of the E-Golf shows that technical compromises have to be made (Green Car Congress, 2013). An opportunity for innovation through design, which has been one of the important points around the establishment of the BMW i series, is not provided (Keichel, 2013). On the other hand, VW is relatively new to the market of electric vehicles resulting in a lack of experience. Until now, VW largely

concentrated on the development of conventional engine technologies to achieve fuel economy. Although VW participated in different field research projects on electric cars over several decades, no car was actually offered on the market until the end of 2013 with the introduction of the E-Up.

3. External Analysis: Opportunities and Threats

For the external analysis, the PESTLE approach is used (Müller-Stewens and Lechner, 2011). The term is an acronym and stands for the different forms of approaches this analytical framework takes to the business environment: political, economic, social, technological, legal, and environmental segments. The purpose of the PESTLE analysis is to split the environment in each of these dimensions and recognize the important drivers. The leading question of interest in this section is: Which tendencies and trends exist and decisions have been made in each of the following environmental segments and how do they possibly affect the future development of the electric car market in Germany?

3.1 Political Analysis

Regarding to Schwedes (2013), it was the incentive of politics, which started the recent surge in the development of electric personal vehicles. Metzger (2010) lists the topics in Germany as environmental protection, reduction on the dependence on oil imports, affordable and sustainable mobility, and competitiveness of the German car manufacture industry as an important part of the economy. This list can be found again among the priorities of political work stated by the German government, underlining their relevance. It is therefore not surprising, that the topic of electric mobility quickly gained interest from the political side. The German government states a defined goal of one million electric powered vehicles on German streets by the year 2020 (Die Bundesregierung, 2009). However, this goal should be viewed critically (Schwedes, 2013). On the other hand, according to Lieven et al. (2011), annual sales of about 175,000 electric vehicles are predicted in Germany. An investment of 500 million EUR was granted to support primarily technological projects. These include mostly research projects on battery technology and loading infrastructure, including funding of university research on those topics. In the light of these measures a clear interest of German politics in the development, manufacturing and use of electric cars in the country is recognizable. Nevertheless, the monetary investment is lacking behind other countries such as USA, China, or Japan, which contribute several billion USD to the respective research (Bundesministerium für Bildung und Forschung, 2009).

3.2 Economic Analysis

The economy in Germany still creates an ambiguous picture. The Organisation for Economic Co-operation and Development (OECD) predicts a steady gross domestic product (GDP) growth of 1.7 % in 2014 and 2.0 % in 2015, which is a clear upwards trend (OECD, 2013). Contrary to this development, the ongoing crisis in Europe hinders investments from the industry and causes skepticism among industrial corporations in Germany. As a consequence, investments in new equipment are still held back (Deutsche Wirtschafts Nachrichten, 2013). But there is reason to believe that this trend can be reverted in the future with further economic growth. The overall domestic economic situation creates possible opportunities for German manufacturers. A better financial position of the whole industry can be used to gain a technological advantage. It needs to be acknowledged, that the development of the market for electric vehicles is a long term investment. It is therefore not possible to use the momentary economic situation to make predictions about the actual growth of the market and purchasing power and willingness of private persons as well as the industry in the long term. A short-term market opportunity for electric cars could result from investments in corporate fleets and higher spending of private households might be noticeable. The most important macro-economic development, which influences the long term prospects of the market for electric cars, is the price of oil. In the last year, it stabilized at a high level and even declined slightly over the course of the year. Although comparing to the level in 2002, the price nearly quadrupled (U.S. Energy Information Administration, 2014). The expected long-term trend for oil prices also clearly shows in the upward direction. Some studies state an expected level of 300 USD/bbl. in 2035, which would mean a tripling compared to today's levels. This development will worsen the economics of petrol/diesel-fueled vehicles compared to their electric counterparts, which is a clear opportunity for this technology.

3.3 Social Analysis

The interest in electric cars can be attributed to two social movements. The first is the connection between society and technology, which grew stronger with the entry of information technology into daily lives. This becomes evident in the shift of status symbols to more advanced consumer electronics (The Tech Issue, 2012). Some parallels in the perception of electric cars and consumer electronics have actually been observed in studies (Dudenhöffer et al., 2013). Test-users have shown much higher interest rates in electric cars then first assumed by experts on the basis of objective analyses of received value for the asked price. Ahrend and Stock (2013) describe the process of technological innovation as an interaction between different partners, notably also the users of the technology. The authors also describe how to some extent an electric car is also not perceived as an automobile but as a part of an innovation process. This sense leads to a different judgment of the car's attributes, as the user has a feeling as being a part of the process. In this perception, electric car manufacturers have the opportunity to be able to find early adopters, which are willing to cope with their deficits for the sake of a personality statement. Another opportunity for the electric car market in Germany lies within the strong interest in environmental topics. Research on this issue by Franzen and Meyer (2004) attested Germany a relatively high index of environmental awareness, connecting this phenomenon mostly with a high economic wealth level. How strong the power of such movement could be, became evident during protests against nuclear power plants after the accident in Fukushima, Japan, as these led to a switch in political opinion and a faster exit from nuclear energy in Germany. As long as electric cars can be connected to the positive image of environmental friendliness and renewable energy sources, this interest creates a market opportunity, especially from prosperous society classes.

3.4 Technological Analysis

In scientific literature, the development of suitable batteries is frequently named as an essential, new technological challenge in the context of the electrification of personal vehicles. For example, Wallentowitz (2013) describes technological problems associated with batteries available today in detail. According to his work, specific energy density of modern lithium-ion batteries is 60 times worse than the one of petrol or diesel. This gap cannot be closed sufficiently by the higher efficiency of electric motors. Therefore, larger batteries have to be placed within the automobile to reach performance and range levels for a daily life usage of electric cars. Even with advances in technology, it is not expected to reach dramatically higher energy densities with Li-ion technology. The installation of large batteries has also other negative effects. A notably higher weight of cars worsens the economics, as additional energy is needed. Also the relatively high price of batteries raises purchasing costs of electric vehicles. To counter negative consequences of additional battery weight, new lightweight materials are used, which drives the price up further. These costs cannot be fully absorbed by the absence of components needed in traditionally powered cars (Proff, 2013). Other challenges are created through manufacturing and disposal/recycling of batteries, where energy-consuming and polluting techniques are necessary (Morche et al., 2013). One other technical challenge is the required dense charging infrastructure. As charging times of electric cars exceed normal fueling times, an appropriate logistic structure has to be implemented. If one considers two possibilities to charge the car, at home or away, different problems arise. Today car manufacturers usually offer a complementary wall box to charge the car at home in the garage (Volkswagen, 2013b). This solution contradicts the assumption, that electric cars will mostly be used in metropolitan areas, where most people do not own a garage and park their cars outside, as noted by Valleé et al. (2013). The authors give a comprehensive description of the problems arising. For commercial application, reasonable solutions may be found, as companies have mostly yards or fixed parking positions available. Private users have to divert to car parks, if such are available.

3.5 Legal Analysis

Two topics emerge in the context of the introduction of electric cars. The first of these are the binding norms on greenhouse gas emissions of new cars imposed by the European Union. Despite long resistance by the German government new legislation has been introduced in 2013. At the core of the program are the limitations on the allowance of carbon dioxide emissions of new cars from 2015 to 130g/km and even tighter 95g/km from 2020 on (European Union, 2013). These numbers represent a fleet average, meaning that a balance over the whole registered fleet of a manufacturer

should not exceed these rather than every single model. Manufacturers would face financial penalties for not complying with these restrictions. On the other hand bonuses for very low-emitting vehicles improve the fleet accounting balance in the legislation. This way an incentive to invest in zero emission vehicles is established, creating an opportunity to improve the balance and being allowed to build bigger premium vehicles with higher emission profile without facing penalties. With regard to norms and regulations, Morche et al. (2013) note that as of now there is no specific regulation on registration of electric cars in Germany. All cars are registered according to the same standards as their conventional counterparts. Also technical norms and standards have not been fully developed. Even basic questions as the type of the loading plug have been only recently clarified. This drawback is on the other hand a clear opportunity for the automotive industry to influence the decisions. There is reason to assume that more norms and regulations will emerge over time as the technology matures.

3.6 Environmental Analysis

Environmental topics have been the driving force behind discussions on electric cars at least for the last 30 years. Negative press about forest declines in Germany and ongoing ecologic debates already led to an electric car boom in early 90s, but this movement could not sustain itself over a long period (Schwedes, 2013). Indeed, the pollution produced by conventional personal vehicles is a major problem today. Currently over 10 % of greenhouse gas emissions in the EU are attributable to passenger cars according to Gass et al. (2014). Yet, compared to other countries or regions the problem of pollution is not imminently evident in Germany. Only occasional reports on exceeding dust particle norms reach the German public. The analyses of the German federal agency on environmental topics reinforce an overall positive picture on the development of air pollution in the recent years (Umweltbundesamt, 2013a). The same graphic indicates on the other hand, that the most advances were achieved in the early 90s and the development stagnated in the recent years. Some pollutants even increased recently, indicating that new ways of countering these effects are needed. The same agency reminds of the ongoing problems considering the concentration of pollutants in metropolitan areas (Umweltbundesamt, 2013b). Here the new technology of electric cars is an opportunity to revitalize the process of countering the air pollution. An urgent need, as it is obviously actually felt for example in megacities in China, cannot be recognized in Germany. Pollution problems are not evident and not enough as a standalone topic to vitalize the market for electric vehicles. Therefore, there exists a threat that electric cars will lose the focus of the public and governments, as it has been already the case, if other factors also change in the unfavorable direction (Schwedes, 2013).

4. Recommendations, Limitations, and Conclusion

After conducting an internal and external analysis, the key issues are presented in Table 1.

Table 1
Internal and external analysis of the Volkswagen Group in the context of a market introduction of electric cars in Germany

Internal analysis	
Strengths	**Weaknesses**
• Unique collection of diverse brands with tradition and specific attributes • Strong R&D and innovation • Cost-saving platform concepts • Dominant position in the German market • Strong financial results and good liquidity position • Additional services along the value chain	• E-models are based on the same design as conventional variants • Lack of experience with market production of electric cars
External analysis	
Opportunities	**Threats**
• Direct and indirect governmental support of technology, infrastructure and market development • Higher corporate and private investments as a result of a picking up economy • Rising oil prices • Affection for technology and electronic products • High awareness of environmental issues • Growing share of renewable sources in the German energy mix • Bonuses from EU on CO_2 emissions for zero emission vehicles • Corporate customers making up the majority of the buyers of new cars • Growing market with low competition • E-cars as part of a new mobility system	• Possible reduction of political interest if goals cannot be achieved • Problems associated with Li-ion batteries with no alternative available for a long time • Difficulties to implement charging infrastructure in metropolitan areas • No sufficient need for further environmental protection • Price gap between customer acceptance and actual e-car prices

The second step of the SWOT analysis involves a comparison of different external and internal factors and a construction of strategic options on the basis of the provided information. One possible strategy from each of the mentioned groups will be formulated as an example. It has to be kept in mind, that other strategies may also be possible.

Strength-opportunity strategy: An interesting strategy in this context would be to try to use VW's carsharing service Quicar as a marketing brand, creating contact of potential customers – a lot of young and open to technology types of people among them. Electric cars would be indeed a part of a flexible mobility concept of urban population. This way potential customers could set aside the fear of restrictions imposed by the significantly smaller range of electric cars and recognize that the available opportunities can satisfy the most of their needs. If there still should exist points where the range of an electric car might not be enough, there could be a conventional alternative available.

Strength-threat strategy: A strategy in this combination arises from the threat of high costs emerging from the production of electric cars. There is a possibility to counter these with economies of scale by using the modular concept and incorporating electric drivetrains in models across different brands. A competitive advantage could be used this way to outperform the competition on prices at the same time providing individual cars to a broad range of customers. A realization was already created by VW with its MQB platform (Modularer Querbaukasten, engl.: Modular Transversal Toolkit), a system regardless of model, vehicle size or brand. MQB shares a common engine-mounting core for all drivetrains, i.e., conventional, hybrid, and electric, reducing weight and costs.

Weakness-opportunity strategy: One of the identified weaknesses is the missing unique identity of electric cars in the VW portfolio. On the other hand, corporate customers actually care more about economics and reliability. Companies might be open to invest in new technologies. This is especially true, if they can portray themselves as environmental friendly at the same time. VW should therefore actively market its electric cars to fleet customers, broadening the customer base, creating economies of scale and quickly gain experience with new technologies.

Weakness-threat strategy: A clear threat to the success of electric cars lies within their costs. VW is at a disadvantage in this field, because of the lacking experience with this technology. The company has to be aware of that threat and use its strengths like innovative spirit and a good financial position to actively invest in research. Also stronger ties with experienced suppliers might help to fill the gap in experience and further lower the cost base, simultaneously providing know-how.

In terms of limitations, these strategies are limited to VW and to the German market. Other car manufacture corporations can take this paper as a guideline for a strategic planning regarding the market introduction of electric cars, but should consider their own, particular strengths and weaknesses to combine them with their specific environments according to the country and market the company is located. Hence, opportunities and threats might vary from region to region. Another limitation is that the different factors and strategy options derived are all weighted equally. Contradicting options can emerge and interdependencies may be overlooked. As a consequence the choice of strategy to implement remains subjective to the particular company (Müller-Stewens and Lechner, 2011). Some mistakes can be made in the selection process. An overemphasis of one of each factors, be it a too strong confidence in internal strengths or fear of threats limiting options, are a likely consequence, as is failure to create a sustainable competitive advantage (Pearce and Robinson, 2011).

The purpose of this paper was to develop strategic options for the introduction of electric cars to the market in Germany on the example of the Volkswagen Group. To achieve this goal the method of the SWOT analysis was used. Along the concept of this method, a resource based internal analysis of the company and a market based environmental analysis have been conducted.

References

1. Ahrend, C., Stock, J., 2013. Der Benchmark ist noch immer das heutige Verhalten. In: Keichel, M., Schwedes, O. (Eds.), Das Elektroauto – Mobilität im Umbruch, Springer Fachmedien, Wiesbaden, pp. 105-125.
2. Bundesministerium für Bildung und Forschung. 2009. Nationaler Entwicklungsplan Elektromobilität der Bundesregierung. <http://www.bmbf.de/pubRD/nationaler_entwicklungsplan_elektromobilitaet.pdf> (accessed 29.12.2013).
3. Deutsche Wirtschafts Nachrichten. 2013. Deutsche Unternehmen wollen nicht investieren. <http://deutsche-wirtschafts-nachrichten.de/2013/11/19/deutsche-unternehmen- wollen-nicht-investieren/> (accessed 29.12.2013).
4. Die Bundesregierung. 2009. Auszug aus dem Bericht an den Haushaltausschuss Konjunkturpaket II, Ziffer 9 Fokus „Elektromobilität“. <http://www.foerderinfo.bund.de/_media/elektromobilitaet_konjunkturpaket_ii.pdf> (accessed 29.12.2013).
5. Dudenhöffer, F., Bussmann, L., Dudenhöffer, K. 2013. Absatzprognosen und Technologiesprung-Produkte. In: Proff, H. (Ed.), Herausforderungen für das Automotive Engineering & Management, Springer Fachmedien, Wiesbaden, pp. 66-81.
6. European Union. 2013. Reducing CO2 emissions from passenger cars. <http://ec.europa.eu/clima/policies/transport/vehicles/cars/index_en.htm> (accessed 29.12.2013).
7. Franzen, A., Meyer, R. 2004. Klimawandel des Umweltbewusstseins? Eine Analyse mit dem ISSP 2000. Zeitschrift für Soziologie 33(2), 119-137.

8. Gass, V., Schmidt, J., Schmid, E. 2014. Analysis of alternative policy instruments to promote electric vehicles in Austria. Renewable Energy 61, 96-101.

9. Green Car Congress. 2013. Volkswagen's first two production battery-electric vehicles debut at Frankfurt. <http://www.greencarcongress.com/2013/09/20130911-vw.html> (accessed 08.01.2014).

10. Keichel, M. 2013. Ganz neue Möglichkeiten. In: Keichel, M., Schwedes, O. (Eds.), Das Elektroauto – Mobilität im Umbruch, Springer Fachmedien, Wiesbaden, pp. 73-103.

11. Kraftfahrtbundesamt. 2013. Kurzbericht Neuzulassungsstatistik 2012. <http://www.kba.de/cln_031/nn_191078/DE/Statistik/Fahrzeuge/Neuzulassungen/ MarkenHersteller/2012_n_kurzbericht_pdf,templateId=raw,property=publicationFile.pdf/2012_n_kurzbericht_pdf.pdf> (accessed 08.01.2014).

12. Lieven, T., Mühlmeier, S., Henkel, S., Waller, J.F. 2011. Who will buy electric cars? An empirical study in Germany. Transportation Research Part D 16(3), 236-243.

13. Metzger, M. 2010. Mobilität der Zukunft – Strategie der Bundesregierung. In: Deutsch-Japanischer Wirtschaftskreis (DJW), Reihe Wissen und Praxis, Nr. 22, Chancen und Grenzen der Elektromobilität. Japanische und deutsche Strategien für einen nachhaltigen Klimaschutz.

14. Morche, D., Schmitt, F., Genuit, K., Elsen, O., Kampker, A., Friedrich, B. 2013. Fahrzeugkonzeption für die Elektromobilität. In: Kampker, A., Valleé, D., Schnettler, A. (Eds.), Elektromobilität – Grundlagen einer Zukunftstechnologie, Springer-Verlag, Berlin, pp. 149-234.

15. Müller-Stewens, G., Lechner, C. 2011. Strategisches Management, 4th ed., Schäffer-Poeschel Verlag, Stuttgart.

16. OECD. 2013. OECD Economic Outlook. <http://dx.doi.org/10.1787/eco_outlook-v2013-2-en> (accessed 29.12.2013)

17. Pearce II, J.A., Robinson, R.B. 2011. Strategic Management, 12th ed., McGraw- Hill Irwin, New York.

18. Proff, H. 2013. Geschäftsmodelle zwischen technischen Herausforderungen und betriebswirtschaftlichen Notwendigkeiten im Übergang in die Elektromobilität. In: Proff, H. (Ed.), Herausforderungen für das Automotive Engineering & Management, Springer Fachmedien, Wiesbaden, pp. 2-23.

19. Schwedes, O. 2013. Objekt der Begierde. In: Keichel, M., Schwedes, O. (Eds.), Das Elektroauto – Mobilität im Umbruch, Springer Fachmedien, Wiesbaden, pp. 44-72.

20. The Tech Issue. 2012. Modern Technology as a Status Symbol: What Your Tech Devices Say About You. <http://source.southuniversity.edu/modern-technology-as-a- status-symbol-what-your-tech-devices-say-about-you-75132.aspx> (accessed 08.01.2014).

21. Umweltbundesamt. 2013a. Indikator: Emissionen von Luftschadstoffen. <http://www.umweltbundesamt.de/indikator-emissionen-von-luftschadstoffen> (accessed 29.12.2013).

22. Umweltbundesamt. 2013b. Luftqualität in Ballungsräumen. <http://www.umweltbundesamt.de/daten/luftbelastung/luftqualitaet-in- ballungsraeumen> (accessed 29.13.2013).

23. U.S. Energy Information Administration. 2014. Petroleum & Other Liquids. <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=rbrte&f=m> (accessed 29.12.2013).

24. Valleé, D., Schnettler, A., Kampker, R. 2013. Infrastruktur. In: Kampker, A., Valleé, D., Schnettler, A. (Eds.), Elektromobilität – Grundlagen einer Zukunftstechnologie, Springer-Verlag, Berlin, pp. 59-102.

25. Volkswagen. 2013a. Factbook 2013. <http://www.volkswagenag.com/content/vwcorp/info_center/de/publications/2013/03/Factbook2013.bin.html/binarystorageitem/file/Factbook_2013.pdf> (accessed 08.01.2014).

26. Volkswagen. 2013b. Der neue E-Up. <http://www.volkswagen.de/content/medialib/vwd4/de/dialog/pdf/up-/e-up-katalog/_jcr_content/renditions/rendition.download_attachment.file/e- up_katalog.pdf> (accessed 08.01.2014).

27. Wallentowitz, H. 2013. Fokus Batterie. In: Keichel, M., Schwedes, O. (Eds.), Das Elektroauto – Mobilität im Umbruch, Springer Fachmedien, Wiesbaden, pp. 127-152.

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