

E-Mobility in Germany – Entering the Market Ramp-up Phase

Di Bitonto, Stefan; Trost, Rico
Germany Trade & Invest (GTAI)
Stefan.DiBitonto@gtai.com, Rico.Trost@gtai.com

Abstract

Electric mobility is one of the key factors for a clean and sustainable transportation system. Germany, with its so-called “Energiewende,” has become a leading research and development centre for electric mobility. The German Federal Government has set ambitious targets for electric mobility and has spared no resource pursuing them.

Keywords: Introduction, Demonstration & Marketing, Public Policy & Promotion, Urban Electric Mobility

1 Introduction

Germany, with its so-called “Energiewende” has the chance to tie its energy transition to a transportation transition. By providing new technologies, German supplier companies are able to connect the automotive, the energy and the information and communication technology (ICT) sectors with one another. Researching the effect of the integration of EVs into a smart grid, by temporarily storing locally produced renewable energy, is one main focus area of the R&D activities in Germany right now. Connecting mobility services is another approach to make mobility more efficient.

2 Motoring Ahead

Germany has twin ambitions: to become both the top provider and the leading market for electric vehicles. At the end of 2015, there were around 40,000 electric vehicles (comprising pure electric, range-extended and plug-in hybrid) on German roads, supported by an infrastructure of around 6,000 public charging stations and with 400 high-speed charging stations more to be added over the next two years at motorway stations. The National Electromobility Development Plan has set a target of one million fully and partially battery-powered electric vehicles being on the roads by 2020 as Germany seeks to establish itself as a lead market and supplier for e-mobility solutions. Germany’s top politicians are keen for electric vehicles (EVs) to become an increasingly common sight on the country’s autobahns. Not only that, but they want the German automotive industry to be the leading producer. “Yes they are ambitious targets,” said Federal Minister for Transport and Digital Infrastructure Alexander Dobrindt. “But I think we will achieve them.”

To that end, within the German Cabinet a working group has been coming to an agreement on a so-called ‘environment bonus’, in order to get more EVs on the road. The agreement would include a bonus for purchasers of EVs, to be financed through a 1c/l tax increase on petrol and diesel. The figure under debate at the moment is around EUR 5,000, ultimately meaning a government fund for the bonus of some EUR 700-800m. “We have to get some more movement in the market,” said Bavarian Environmental Minister Ulrike Scharf. “We need... a meaningful financial stimulus for potential buyers of EVs.”

Manufacturing high-quality EVs that can persuade consumers to switch from gas guzzlers and developing battery technology requires huge investments from auto producers. Indeed, German automotive manufacturers are investing record amounts in R&D. The latest figures from the German Association of the Automotive Industry (VDA) show that annual R&D expenditure stands at USD 18.2 billion. That's equivalent to around one third of Germany's total R&D spend. There are now some 100,000 people working on R&D in the branch on everything from drive technologies to driverless vehicles – an aspect which is making huge advances.

But having excellent EVs is not enough by itself. Mr. Dobrindt has stressed the ways in which the government is encouraging uptake: “We are now entering the market. Our Electric Mobility Act gives consumers further incentives to purchase an electric vehicle.” He went on to note that significant investments will be made in charging infrastructure: “We aim to make it possible in future to drive an electric vehicle from Germany's North Sea coast to the Zugspitze in the south of the country.”

So what is happening in Germany to ensure the aims the government has set are achieved?

2.1 A History of Auto Leadership

It took Carl Benz eight years to sell his first 25 Motorwagens after the first was built in 1885. Today, around 13 million cars roll off German assembly lines at home and abroad every year. The industry is the fuel-injecting motor under the bonnet of the country's economy: It accounts for around 20 percent of the country's total industrial revenue and supports 756,000 jobs. The multipliers are significant too: 21 of the world's top 100 automotive suppliers are based in Germany. German cars – as with many other things bearing the legend ‘Made in Germany’ - are synonymous with good engineering, reliability, and luxury. Strategically, the German car industry's response to the global financial crisis was to invest heavily in R&D, ensuring both employee protection in tough times, and also that as and when the global economy recovered, German cars would be the most advanced. The onset of the electric car presents the reputed German car manufacturers with both a challenge and a mammoth opportunity.

2.2 Electrifying developments

The arguments in favor of electric vehicles (EVs) are clear. The internal combustion engine has been fine-tuned by engineers around the world for over 130 years and yet they convert a mere 22 percent of the primary energy they are supplied with into actual movement. If the fuel supply chain is taken into account, the figure falls to 19 percent.

EVs – despite being a new technology – already achieve an efficiency of around 79 percent. The small losses in the upstream energy chain mean that they convert 64 percent of primary energy into kinetic energy.

For this reason, EVs will play a vital role in the context of the *Energiewende*, Germany's program to switch to renewable energy. Of course, e-mobility only makes a material difference if the source of the energy is also renewable. The *Energiewende* calls for the emission of greenhouse gasses to be reduced by 80 to 95 percent by 2050 compared to 1990 levels. For the transport sector, this implies that the majority of car journeys need to be made with pure electric or plug-in vehicles recharged with energy from renewable sources.

The benefits of EVs go beyond lower greenhouse gas emissions: They don't emit harmful particulates on the streets of our cities, meaning cleaner and safer air; they are almost silent, which improves quality of life for urban citizens and frees up previously noise- and air-polluted land for alternative development; and, of course, EVs reduce dependence on oil.

2.3 A bumpy road, starting to smoothen

Despite the myriad plus-points, the adoption of electric vehicles into fleets has remained stubbornly slow. High prices, limited performance, and limited infrastructure have put consumers off making the switch, while the lower price of oil has also contributed.

However, EV adoption is looking up in Germany. Prices are falling as batteries become cheaper, economies of scale take effect on higher-volume production lines, and competition between models increases. In 2015 an extra 12 models were added to the existing 17 already being made by German producers. Charging infrastructure is expanding steadily, making EVs ever more convenient. Range and performance are increasing, with mid-level EVs now able to travel 100 miles on a single charge while top-of-the-range vehicles can travel up to 265 miles and out-accelerate top-end sports cars.

It's perhaps no surprise then that EV sales are starting to grow in Germany. There are currently around 40,000 electric vehicles registered in the country, up from around 24,000 a year ago. Roland Berger consultancy predicts that there will have been 292,000 EVs produced in Germany by the end of 2017.

McKinsey's 2015 Electric Vehicle Index from July 2015 concludes that Germany will establish itself as the largest producer of electric vehicles in the coming years. The report states that 36 percent of worldwide electric vehicle production could take place in Germany by 2019.

2.4 The framework

This growth is not only due to improvements in EV technology. The Federal Government wants Germany to become the leading producer of EVs as well as the leading EV market and has created a solid framework to reach these twin goals.

In 2009, the government laid down its aims in the National Development Plan for Electric Mobility (NEPE). The plan was developed jointly by the Ministries for the Environment (BMUB), Economics (BMWi), Transport (BMVI) and Research (BMBF) and now constitutes the foundation of Germany's electric mobility policy.

In May 2010, the government constituted the National Electric Mobility Platform (NPE) to realize the plan. The platform consists of representatives from politics, industry, science, local authorities and consumers arranged into seven cross-industry working groups of around 20 members. The working groups cover drive technology, battery technology, charging infrastructure and network integration, standardization and certification, materials and recycling, qualification and training, and framework conditions.

The NPE makes regular progress reports to the government and did so most recently in December 2015.

2.5 Germany: The leading EV producer

The NPE calls for the German automobile industry and its equipment manufacturers to maintain and expand their leading role. It's a challenge that the German car industry has accepted. By the end of 2015, there were 29 German electric vehicle models on the market. No other country produces such a wide range of electric vehicles.

All of the manufacturers now offer pure-electric and/or hybrid cars, from BMW's multi-award-winning i3 and Volkswagen's eGolf and e-up! to Audi's A3 e-tron hybrid, Daimler's B-Class Electric Drive and even Porsche's Panamera E-Hybrid.

The government wants this momentum to grow and has placed particular focus on battery technology, noting that establishing production capacities for cell and battery systems and the respective life cycle management in Germany will safeguard the German automotive industry's strategic ability to act. The battery is the determinant of the vehicle's efficiency, and thus counts as the single vehicle element with the greatest wealth creation share – up to 40% of total added value.

At the same time, establishing new business models in the e-mobility sector will open up opportunities for new products and services and thus for additional growth.

2.6 Germany: The leading EV market

As mentioned, the government's second aim is for Germany to become the leading market for EVs. It has even put a figure on the target: one million electric vehicles on the country's roads by 2020. The NPE has highlighted that achieving this goal will require the government to redouble its efforts to increase EV and plug-in hybrid uptake, including the EUR 700-800m purchase bonus program mentioned above.

In September 2014, a new law was adopted to this effect and came into force in early 2015. The Electric Mobility Act (EmoG) enables municipalities to introduce new incentives for EVs such as free parking (often next to charging stations) or special access rights. Special EV registration plates will make it clear which vehicles are eligible for the new benefits.

Politicians have stressed that the legislation enables municipalities to make e-mobility more attractive in a way that makes most sense in their respective local setting. For example, they introduce measures in areas where air quality or traffic noise is an issue, allow EVs to use bus lanes, or reserve parking with charging points for plug-in vehicles.

The law applies to EVs, particularly environmentally friendly plug-in hybrids, as well as fuel cell vehicles. To be eligible, hybrids must not produce more than 50 grams of CO₂ per kilometer (97 g/mi) or be able to travel at least 30 km (approx. 18.6 mi) on electric drive alone (from 2018: 40 km - approx. 24.9 mi). The limit means that the vast majority of short trips can be made solely on electric drive.

2.7 Charging the EV revolution

As of November 2015, Germany had 5,500 public charging stations. Whilst it is recognized that the majority of charging will be done at home or the workplace, the government is keen to expand public charging infrastructure, including adding high-speed charging columns to enable motorway travel.

A test route for longer journeys has already been established on the A9 motorway, which connects Berlin and Munich via Leipzig and Nuremberg. Federal Minister for Transport and Digital Infrastructure, Alexander Dobrindt announced that around 400 additional high-speed charging posts will be established at motorway services stations to give Germany a basic supply network with quick-charging points.

It is an aim that is shared by Minister Gabriel: “We [...] want the expansion of both private and publicly accessible charging infrastructure to continue. To promote this aim, the Federal Ministry for Economic Affairs will adapt the legal regulations as necessary to ensure the security, interoperability and intelligent networking of charging facilities,” he said.

2.8 Innovation is the key

Innovation is central to success in the automotive industry and even more so when it comes to developing and competing with EV technologies.

In 2011, the NPE’s second report highlighted that R&D efforts needed to be strengthened and accelerated dramatically if the government’s twin targets are to be achieved. The report laid out plans for Showcase Regions and the rapid development of key technologies, cross-industry and technology sector integration, and intermodal services. A total volume of EUR 4 billion was foreseen for the NPE market preparation phase. International firms have taken notice of the staggering sums being pumped into R&D in Germany and have followed suit. Investments in battery technology in particular have picked up.

More recently, the NPE stated that the country is now “on track toward its goal of becoming a leading player in the international electric mobility market.” It has described the government’s market preparation strategy, which focuses on R&D, standardization, education, and qualification, as successful.

A KPMG study (2015) finds that German OEMs are considered to be leading the way in the fields of connectivity and self-driving cars - arguably the most important automotive trends for the future. Germany already occupies a leading international position in terms of e-mobility technologies. By the end of 2015, around 30 e-model series will be manufactured by German OEMs.

3 Showcase Regions for Electric Mobility

With the Showcase Regions for Electric Mobility which started in 2012 in Germany, and came to a partial end in 2015 with some projects extended and others having run their natural course, the Federal Government introduced a new instrument for bundling the expertise across the systems of energy supply, electric vehicles and traffic systems. The Showcase Regions (see figure 1) are large-scale regional demonstration and pilot projects in which companies, scientific institutes and government can cooperate to try out innovative elements of electric mobility and make it possible for people to really experience them, even internationally.

Each Showcase is a closed system with strict geographical boundaries. Within each system, framework conditions are tested, such as measures through experimentation clauses, and knowledge is gathered concerning e.g. user behaviour, customer needs, infrastructure requirements, coupling of electric vehicles with renewable energies and the effects on the environment and climate. These four Showcases were chosen from a total of 23 Showcase bids due to their high level of innovation. The Federal Government is made EUR 180 million available over the three-year duration of the program.

4 The road ahead

Hopes of rapid success for EVs have proven to be overly optimistic. Adoption rates around the world are currently much lower than had widely been expected - and Germany is no exception. It is clear that there is a long way to go.

Despite the delayed start of several projects, a series of first project successes, in terms of the public visibility of electric mobility within the Showcase Regions and the testing of new technological solutions, were realized. The four Showcase Regions identified the right issues and contribute significantly to the solution of barriers in electric mobility. The structured network of experts from across the wide range of industries and drivers in the field is unique.

Although the technology has already proven itself in everyday life partially, there is a need for further research and development to improve the operational capability and to reduce costs, especially. To achieve

the 2020 targets, the country needs a bridge to the market. The Showcase Regions provided a regional framework to support the roll-out of the market and to respond quickly to new challenges. For instance, the lack of viable operating and financing models for the charging infrastructure, hinders consumers to replace their old cars with new efficient vehicles. The identification of this has been of great strategic value. That being said, the benefits of EVs are clear, Germany has put a solid framework in place, EVs and charging infrastructure are improving, and German manufacturers are investing record amounts in R&D. The conditions are primed for the German automotive industry and market to take pole position in the EV revolution.

5 References

[1] National Platform for Electric Mobility (NPE).

6 Figures



Figure 1: Showcase Regions for Electric Mobility

- Baden-Württemberg
Living Lab BWe mobil
- Bavaria-Saxony
Electromobility Connects
- Berlin-Brandenburg
International Showcase of Electric Mobility
- Lower Saxony
Our Horsepower Turns Electric

(Source: www.schaufenster-elektromobilitaet.org/)

Authors



Stefan Di Bitonto:

Master of International Economics, Berlin School of Economics, Germany

As senior project manager for transportation technologies at Germany Trade & Invest (GTAI), he is responsible for attracting and supporting international investors - mainly in the automotive industry - to Germany.

Stefan.DiBitonto@gtai.com



Rico Trost:

Master of International Business & Consulting, Berlin School of Economics and Law, Germany

As project manager for transportation technologies at Germany Trade & Invest (GTAI), he is responsible for attracting and supporting international investors - mainly in the automotive industry - to Germany.

Rico.Trost@gtai.com