IEA-HEV-TCP Task 24:
Economic Impact Assessment of E-mobility

Final Report

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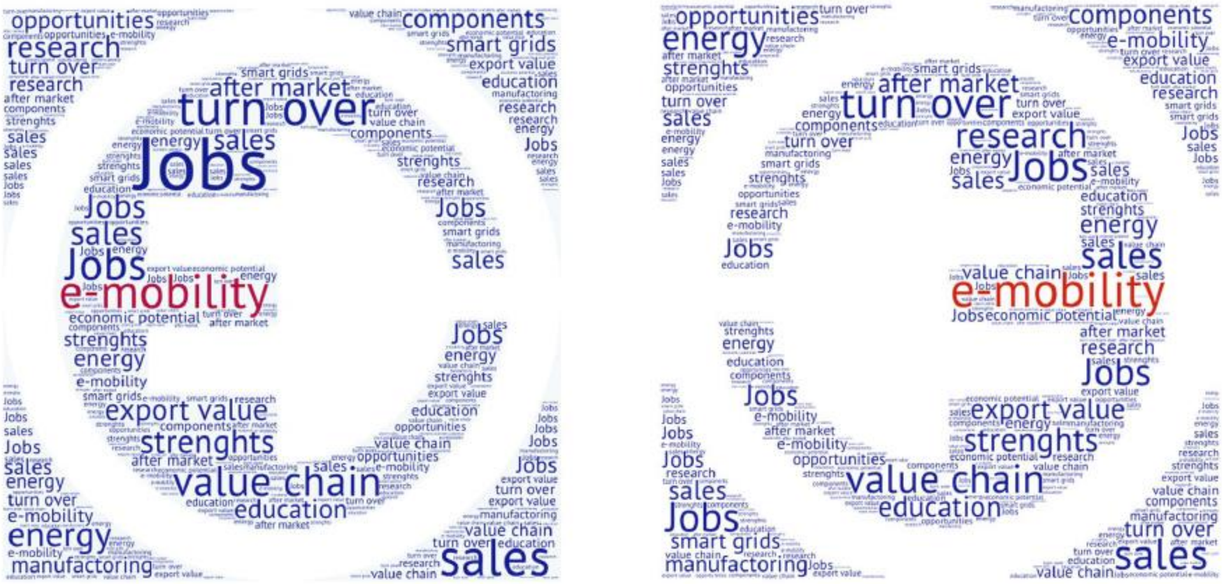

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Colophon

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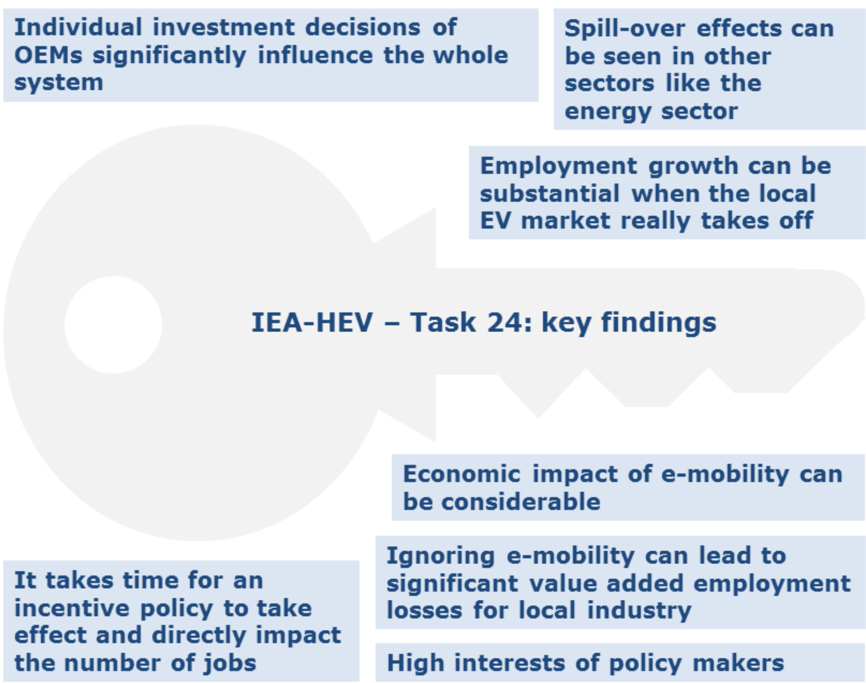
Management summary

Worldwide, policy makers are implementing supportive measures to facilitate the introduction or implementation of electric mobility in their region for many different reasons. Electric mobility has a great potential to solve some of our environmental, societal and economic challenges. The IEA-HEV-TCP Task 24 focused on the economic impact of the introduction of electric mobility.

In the project, key economic indicators were identified which each participant tried to describe for their country (number of jobs, production volume/turnover and export volume related to e-mobility). Common value chains for the manufacturing of electric vehicles, charging infrastructure, energy and mobility services were developed as part of the work, and the number of requested patents in the e-mobility sector for each Task 24 country was researched as well.

Each participant produced a full country report on the economic perspective in their own country. These country reports are Annexes to this final report which summarises and analyses the work that has been done in the Task, and includes 2-pagers on the country reports.

We initially intended to benchmark the results of the individual country reports. Although similar trends were identified in the participating countries, actual benchmarking proved to be impossible. It is difficult to compare the various data on the industry and the value of the e-mobility sector because of the different backgrounds from which data were collected, the different methods used to collect and analyse the data, and the timescale for which data were collected or available or estimates were made. Some important key messages could be noted from the work done, however:



Introduction

The IEA Implementing Agreement for co-operation on Hybrid and Electric Vehicle Technologies and Programmes (IA-HEV) was set up in 1993 as a basis for collaboration on pre-competitive research and the production and dissemination of information. In 2016 the name of the agreement changed to Hybrid and Electric Vehicles Technology Collaboration Programme (HEV-TCP). The work of the IEA-HEV-TCP is governed by the Executive Committee (ExCo), which consists of one delegate from each member country. The work is performed through a variety of Tasks that are focused on specific topics.

This report is the final deliverable of Task 24: *Economic Impact Assessment of E-Mobility*. The Task was approved in November 2013 and was executed from May 2014 until the end of 2016.

Worldwide, policy makers are implementing supportive measures to facilitate the introduction or implementation of electric mobility in their region for many different reasons. Electric mobility has a great potential to solve some of our environmental, societal and economic challenges. In June 2013, Cambridge Econometrics published its research, *Fuelling Europes Future*[1], which stated that by 2030, over 1 million jobs could be created by auto-sector innovation in advanced hybrid, battery-electric and fuel-cell vehicles.

Task 24 focused on the economic impact of the introduction of electric mobility. How can electric mobility strengthen the economic position of a country? What kind of economic growth can we expect in the electric mobility sector?

Many IEA-HEV-TCP member countries and some observer countries were interested in the topic addressed by Task 24, which is in fact a new theme for the IEA-HEV-TCP, and eight countries decided to work together on this Task.

In the project, key economic indicators were identified which each participant tried to describe for their country. Common value chains for the manufacturing of electric vehicles, charging infrastructure, energy and mobility services were developed as part of the work. To facilitate data collection and benchmarking, these value chains were kept simple and focused on passenger cars.

Each participant produced a country report on the economic perspective in their own country. These country reports are Annexes to this final report which summarises and analyses the work that has been done in the Task.

The Task 24 participants are Austria (Austria Tech), Belgium (VITO), Denmark (CleanTech Insight and Danish Electric Vehicle Alliance), France (ADEME), the region of Baden-Wuerttemberg in Germany (Wirtschaftsförderung Region Stuttgart), the Netherlands (Netherlands Enterprise Agency), the United States of America (Argonne National Laboratory) and Switzerland (e'mobile).

[1] http://www.camecon.com/how/our-work/fuelling-europes-future/

1 Overview of work done in Task 24

During the lifespan of the Task, eight meetings were held to discuss ongoing matters and key issues. The overview of meetings is as follows:

1. 20-05-2014 in Copenhagen, Denmark (coinciding with ExCo 40)
2. 22-10-2014 in Vancouver, Canada (coinciding with ExCo 41)
3. 01-04-2015 in Amsterdam, the Netherlands
4. 29-04-2015 in Gwangju, Korea (coinciding with ExCo 42)
5. 17-09-2015 teleconference
6. 10-12-2015 teleconference
7. 11-02-2016 teleconference
8. 12-04-2016 in Amsterdam, the Netherlands (coinciding with ExCo 44)

As one of the first items, a model country report was produced so that the individual country reports would contain more or less the same items. The model country report included descriptions of the chosen key indicators, common value chains and some methods to arrive at the final result. This chapter describes these separate elements.

The Task proposal aimed to use existing data as much as possible. Some countries commissioned a study, while others had to use whatever data they could find.

Another subject intended to be addressed in the Task was the number of requested patents per Task 24 country. The result is reflected in Section 1.4.

1.1 Key indicators

One of the problems encountered while starting work on the Task was the difficulty in comparing data amongst different countries. A set of key indicators was identified to help participants gather comparable data on the economic impact of e-mobility in their country:

- Number of jobs (FTE) in e-mobility, total and, if known, by specific segments of the value chain, indicating whether these are direct or indirect jobs;
- Production volume/turnover (€) related to e-mobility, total and, if known, by specific segments of the value chain;
- Export volume (€ or %) related to e-mobility.

Each participant could add other relevant data for their country to these indicators. Examples of other indicators used are the development of the actor network, or the impacts associated with specific components like advanced batteries.

Still, however, we faced the problem of economic data being sensitive (companies do not want to inform their competitors) and thus the need for anonymous data.

1.2 Common value chains

The participants also described the e-mobility industries in their respective countries, mapping the most important industry players in the different segments of the value chains. To facilitate this, common value chains were drawn up as part of the Task. These value chains were intentionally kept simple. We were uncertain of the format in which data would be available in existing studies that we used, so we abstained from using too much detail. Data collection and benchmarking would be easier this way too.

It was decided that the value chains had to be described at least for passenger cars. Countries were free to describe other modalities (such as buses, trucks and two-wheelers) if they wished or if it proved useful to do so in their country. Countries were also asked to specify the most important focus in the field of e-mobility in their country, or state the strengths and weaknesses (SWOT).

E-mobility is a multidisciplinary field, involving such aspects as mobility, energy, services and IT. Three common value chains were developed for electric vehicles, charging infrastructure and energy, the main features of which are shown in Figures 1-3. E-mobility can also be an enabler of networked (multi-modal) and shared mobility services.

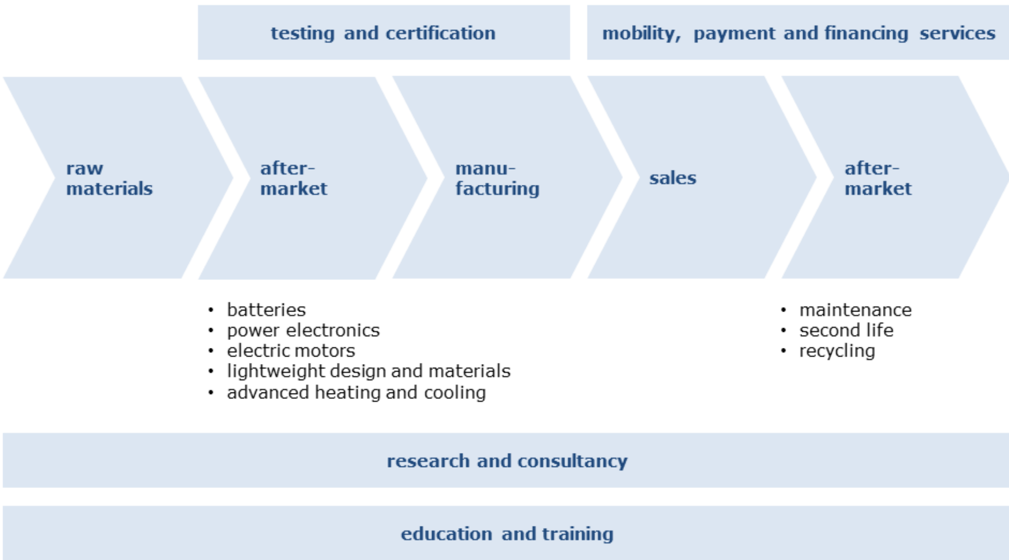


Figure 1: Vehicle value chain

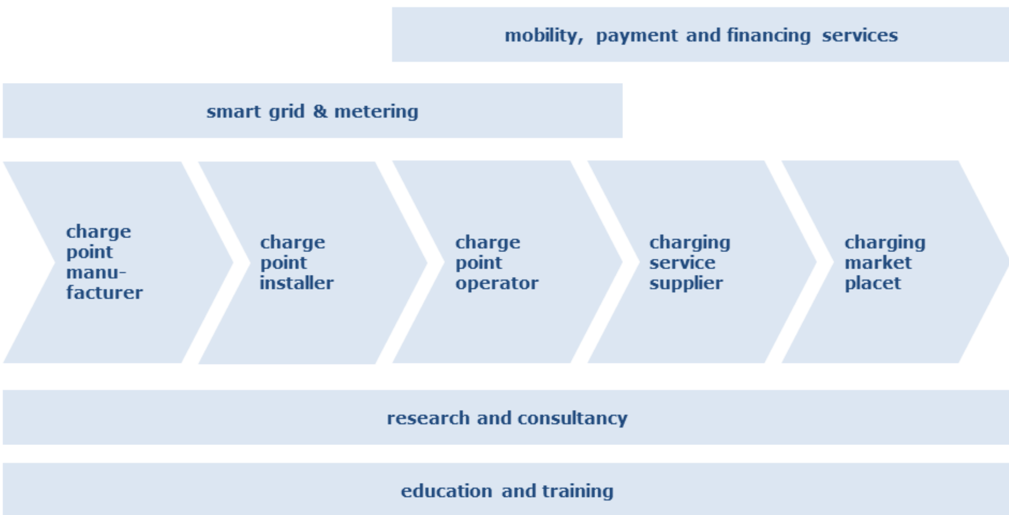


Figure 2: Charging infrastructure value chain

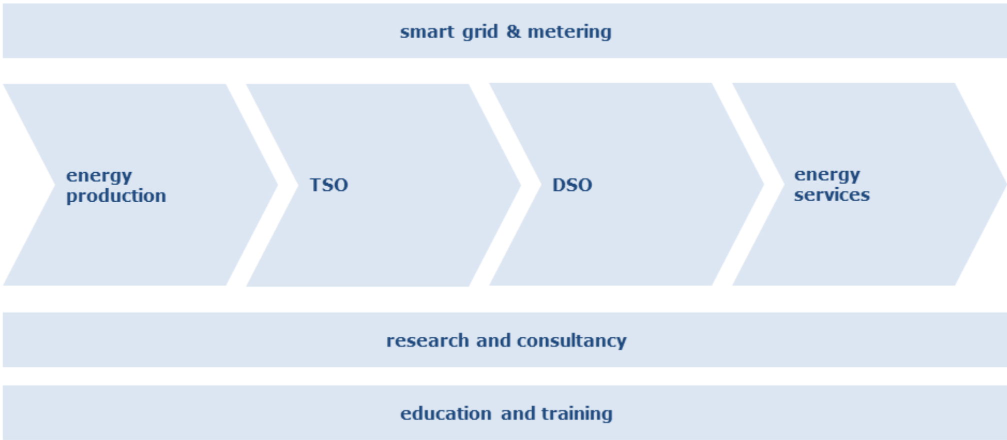


Figure 3: Energy value chain

1.3 Different methods used to calculate economic potential

Initially, we attempted to have one method used by all member countries to be able to evaluate and benchmark the results. That proved, however, to be impossible. The task also intended to use existing country data as much as possible, and as such, a variety of methods were used by the participants to determine the economic impact of e-mobility in their country. This section describes some of the different methods used.

1.3.1 Industry questionnaire as base, supplemented with existing data (Dutch report)

The Netherlands Enterprise Agency has worked together with a number of industry associations and CBS Statistics Netherlands (the Dutch national statistics office) to calculate the number of jobs related to the e-mobility sector in the Netherlands.

A questionnaire was developed, asking Dutch companies in e-mobility about the number of jobs, production/turnover volume, export volume and investments – for e-mobility as well as for the overall business activity of the companies surveyed (to determine how much of their business is devoted to e-mobility) – in 2014 and previous years. The questionnaire was distributed to members of two industry associations and to well-known companies in the field of electric vehicles, and was also posted on social media. The members of the industry associations were gently urged by a prominent, respected figure from the sector to complete and return the questionnaire. Trust is very important in this connection, as companies are hesitant to provide the economic information requested if they fear that their competitors will discover sensitive details of their business operations in this way. Individual company results were not published.

CBS Statistics Netherlands calculated a number of indicators on the basis of the replies to the questionnaire, and also provided a breakdown by sub-segment. They supplemented the data collected with the aid of a list of companies active in e-mobility and their own national database with economic data on Dutch companies. The proportion of business activity devoted to e-mobility as derived from the average answers to the questionnaire was applied to similar segments or companies of a similar size.

1.3.2 Number of electric vehicles as base (French report)

The France country report comprises an evaluation of the electric vehicle market. Only privately owned vehicles are included.

The value of expenditure (investment) on private electric vehicles is broken down as follows:

- Value of the vehicles at factory prices when manufactured in France, or at customs prices if imported (i.e. value of production and imports);
- Value of distribution margins.

For each of these components, the evaluation includes both the level of business (value of the market in millions of Euros) and the directly related jobs.

The value of the production and the market is estimated for the vehicles as finished products (i.e. no reference is made to upstream activities). This means that the evaluations therefore include neither the value of intermediate consumption nor that of specific components such as batteries, for example, due to a lack of reliable data.

The same principle was used to evaluate jobs: only direct jobs are included in the calculations, with indirect and spin-off jobs therefore being excluded.

1.3.3 Secondary data as base (Danish and Swiss reports)

1.3.3.1 Danish report

As the focus of the task was to collect already existing data, the Danish country report was based on secondary data such as reports, analyses, surveys etc. on the subject.

However, it was difficult to collect data about key elements of some of the country reports (e.g. descriptions of the e-mobility sector and the economic indicators). Research of relevant reports or analyses concerning relevant results for our analysis was unsuccessful.

Thus, it was decided to collect primary data for this part of the project, to the extent this was possible.

This was the case when describing the value chain, for example. The e-mobility sector does not have its own sector code at the central authority on Danish Statistics, thus it was not possible to extract a list of data of enterprises in the sector in Denmark. The project was therefore obliged to draw up this overview itself. The players may be 100 percent ‘pure’ electric vehicle players or they may have e-mobility as part of their business. The list was not exhaustive, but was believed to give a valid overview of players in the industry.

To examine the Danish core strengths within e-mobility the project was based on a previous assessment conducted by Invest in Denmark. A total of 22 short-listed market players in the value chain (providers of charging infrastructure, car importers, research communities, component suppliers and consultants) were interviewed about, among other things, their capabilities within the area of electric vehicles.
Regarding the assessment of the economic indicators, a questionnaire study was decided to be the most optimal method for collecting the economic data for the Danish country report.

The questionnaire study was designed to be as simple as possible and undemanding for the operators in order to get the highest possible response rate . Eight questions were formulated, inspired by the Dutch participant in Task 24. The draft questionnaire study was circulated to selected players in the Danish sector for their comments on the choice of design. Based on their comments the option of anonymity was introduced in the questionnaire study in order to make it possible for companies to provide data that they would not usually share.

The questionnaire study was distributed electronically to 82 players in the electric vehicle sector. In connection with the assessment of the value chain and players in the e-mobility sector in Denmark, the project had identified a total list of 181 players. However, due to the time and resource constraints, only a small test sample group of the 181 was selected. The group was composed in such a way as to represent the overall target group.

1.3.3.2 Swiss report

In Switzerland, there is no available comprehensive market data on the economics of the e-mobility sector. The 2013 swissCAR (University of Zurich) report is the only recent research covering this field. Although its focus was on the structure of the automotive industry, the report provides some valuable information on the economic impact of e-mobility. The survey covers over 300 Swiss companies from the automotive sector. Of these, 7% indicated that electric mobility products belong to the most lucrative segments of their business. Information drawn from the swissCAR report was completed through desktop research by e’mobile. Some indications on the e-mobility market were drawn from the analysis of patents filed at the European Patent Bureau or the World Intellectual Property Office.

1.3.4 Supply-demand potential model as base (Austrian and German reports)

1.3.4.1 Austrian report

The Austrian results are based on a methodology developed by Fraunhofer which deducts potential value added and employment potential of e-mobility by combining vehicle and infrastructure component-level supply side potential with demand side market potential. Both studies started with a portfolio of different vehicle segments including a variety of drive trains as well as an infrastructure portfolio including slow, accelerated and fast charging. The studies carried out a detailed component-level analysis which allowed the matching of necessary components for e-mobility with existing Austrian competencies as well as global market potential.

1.3.4.2 German report

German analysis followed a similar methodology as that described for Austria. Starting with a portfolio of different drivetrain concepts, value creation was investigated at component level. Furthermore, key processes in the production of e-mobility-specific components were analysed. Market prices and market growth are based on secondary data research. Results were evaluated in a series of expert interviews.

1.3.5 Economic modelling as base (US report)

Argonne National Laboratory (Argonne), a part of the U.S. Department of Energy (USDOE), used input-output (I-O) analysis to estimate impacts of many aspects of e-mobility, including (a) the production of plug-in electric vehicles (PEVs) and (b) the electricity used to power them, (c) the construction of manufacturing capacity to produce PEVs and their batteries, and (d) the installation and operation of off-board electric vehicle supply equipment (EVSE).

Economic impacts include estimates of employment, earnings (roughly equivalent to income) and economic output in the industries that are directly engaged in the production of batteries, motor vehicles and EVSE (i.e. direct impacts) as well as in the supporting industries that comprise their supply chains (indirect impacts). Supply chain impacts are augmented by estimates of induced impacts as dollars are re-spent elsewhere in the economy. Because I-O analysis captures indirect and induced effects, its results are typically larger than those obtained from surveys or visual inspections at production or point-of-sale locations.

For this analysis, costs were estimated for each major aspect of e-mobility and allocated to appropriate sectors in RIMS II (Regional Input-output Modeling System), an I-O model developed by the Regional Product Division within the Bureau of Economic Analysis of the U.S. Department of Commerce. RIMS II contains 406 economic sectors and is based on the 2002 U.S. Benchmark Input-Output Table and 2008 regional data (for additional information about RIMS II multipliers and assumptions, see www.bea.gov/regional/rims/). Economic impacts were estimated for two scenarios: one of minimal PEV penetration based on the reference case in the USDOE’s 2015 Annual Energy Outlook (AEO Scenario) and one based on the targets of 10 U.S. states that are committed to introducing significant numbers of zero emission vehicles (ZEV Scenario).

1.4 Patent analysis

An overview of requested patents gives an indication of developments in R&D and innovation in a country, and gives some insight into the strengths and key innovation aspects of a specific industry.

A patent query was performed by the patent department of the Netherlands Enterprise Agency in June 2015, in which the sector of e-mobility was divided into eight subsections:

- Drive train technology
- Battery information systems
- Battery management
- Batteries
- Fuel cells
- Charging infrastructure
- Navigation
- Smart grids

The query involved international patent requests filed at the European Patent Bureau or the World Intellectual Property Office (WIPO).

The year 2013 was not fully complete in the base statistics at the time the query was done, so the data gave an incomplete overview of 2013. Patents have a secrecy period of 18 months, followed by some processing time before becoming visible in the statistics.

Tables were produced stating the number of patents in the different subsectors for the years 2005 – 2013 for Task 24 member countries. These were visualised for the years 2005, 2010 and 2013 to identify trends:

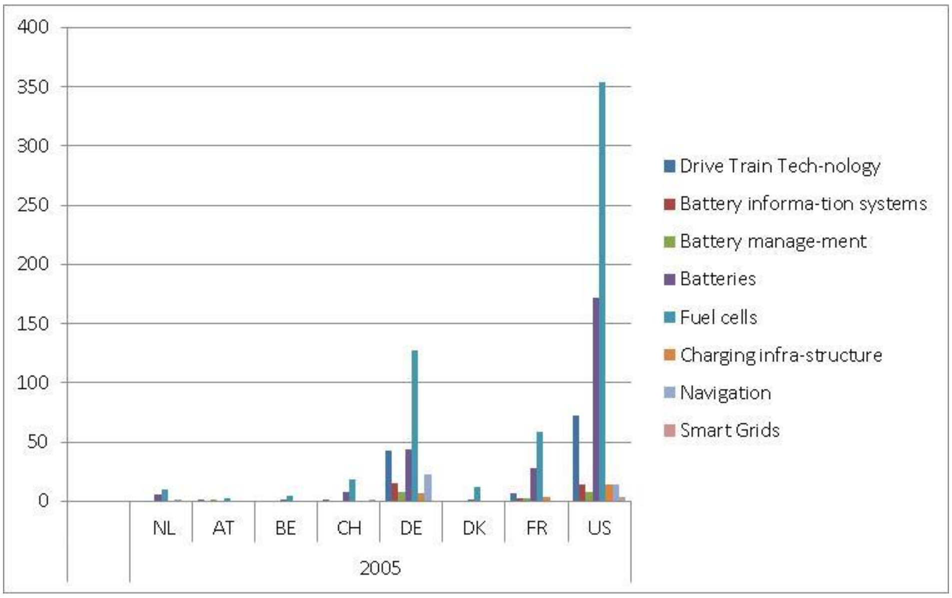


Figure 4: Number of patents in Task 24 member countries, year 2005

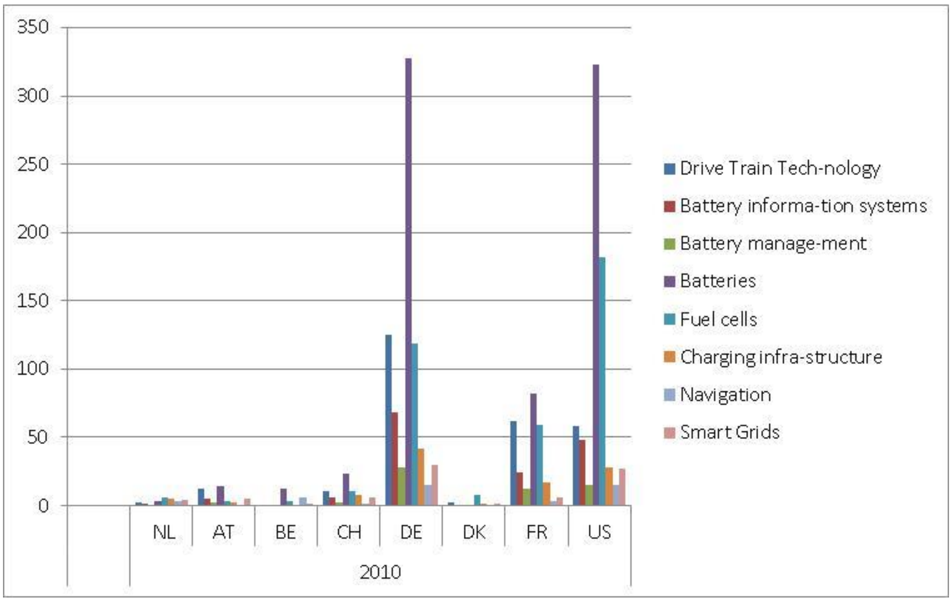


Figure 5: Number of patents in Task 24 member countries, year 2010

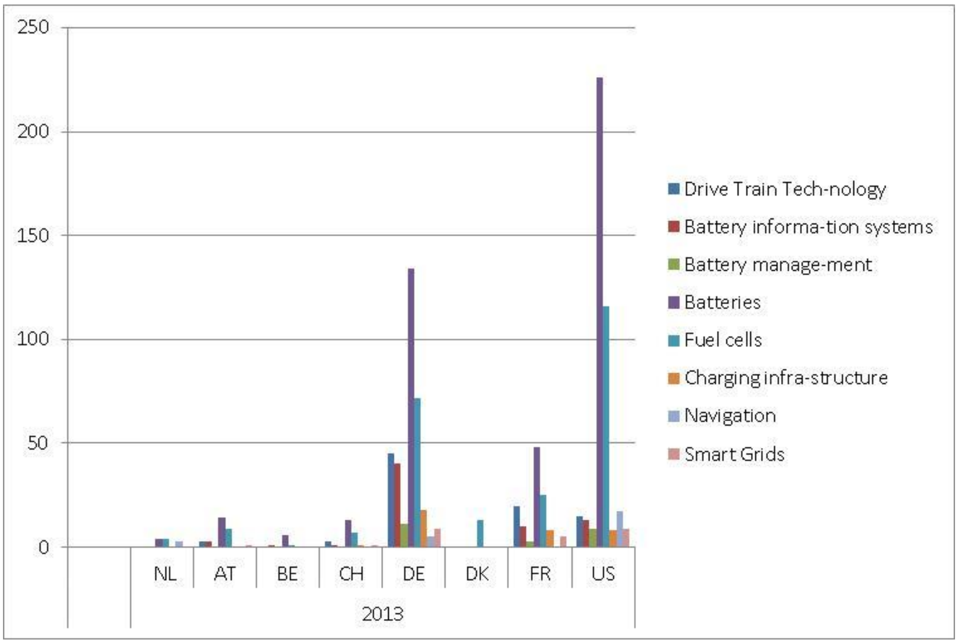


Figure 6: Number of patents in Task 24 member countries, year 2013

The query included all countries that have applied for patents, which made it possible to look at the trend per subsection and the division amongst countries in the world. The graph below presents the subsection of **Batteries**.

Figure 7: Battery patents globally, years 2005-2013

It was difficult to make other visual analyses involving all Task 24 participants, let alone involving all countries in the data, because of the difference in size of the countries and the difference in patents in e-mobility. Countries with large OEMs have much higher numbers of patents than others.

2 Overview of individual country results

Eight country reports were produced as one of the main results of this Task; most were written in 2015 or early 2016, which is reflected by the reported data. This chapter gives a short overview of the individual country results. The countries are presented in alphabetical order.

All complete country reports are added as an annex to this report.

2.1 Austria

The Austrian report presents the results of two studies on the economic potential of e-mobility in Austria. Both studies conducted a detailed component-level analysis for vehicles and infrastructure, thereby taking into account the importance of the automotive sector in Austria as well as its very high export share of around 90%.

The results are clear: The Austrian industry's strength in e-mobility-related components leads to a significantly higher economic potential of e-mobility compared to the conventional pathway. It is important to realise this potential and establish new e-mobility value chains which also result in a changed industry structure.

E-mobility value added in Austria covers important parts of the common value chain chosen as a shared model within Task 24. The number of electric cars (BEV, PHEV and FCEV) on the road reached around 10,500 by the end of October 2016, yet again a 61% increase on all of 2015. With more than 700 companies in the Austrian automotive sector, vehicle-related valued added, especially in terms of EV components, presents an important driving force. But there are also a number of companies engaged in charging infrastructure – ranging from charge point manufacturing to operations and related IT services. Even more varied is the still relatively nascent mobility services sector, with the diversity being helped by the fact that the majority of Austrian companies are small and medium-sized enterprises (SMEs).

Even though the understanding of e-mobility in Austria is deliberately broad – viz. "an intermodal mobility system of railway, e-commercial vehicles, e-busses, and e-passenger cars, e-scooters, and e-bicycles"[2] – the Austrian country report mainly focuses on passenger car-related and infrastructure value added. Whilst existing data sets clearly show the economic potential of e-mobility, it needs to be pointed out that no specific e-mobility industry data is available for Austria. As a result, there is a need to resort to conventional available data sets for e.g. the relevant automotive, energy, ICT or machinery industries with the related implication of potentially over- or understating impacts. In addition, e-mobility (together with other trends like automated driving or digitisation) *transforms* industries and creates new alliances – a process which will be with us for a number of years to come.

Bearing these caveats in mind, the country report on Austria focuses on economic potential in terms of value added and employment potentials and mainly relies on three sources:

[2] BMLFUW, BMVIT and BMWFW. 2012. *Implementation Plan: Electromobility in and from Austria.* https://www.bmvit.gv.at/en/service/publications/transport/downloads/electromobility_implementation.pdf. Accessed 17 January 2017.

- A study conducted in 2011 by Fraunhofer Austria and Vienna Technical University entitled "Electromobility – Chance for the Austrian Economy"[3], which was published by the Austrian industry as well as the Economics Ministry BMWFW;
- A 2016 update of this study led by Fraunhofer Austria entitled "EMAPP – E-Mobility and the Austrian Production Potential" focussing in particular on production technologies, which was commissioned by the Austrian Transport Ministry bmvit[4];
- For general trends and information on e-mobility in Austria: The annual "AustriaTech Monitoring report E-Mobility", which is commissioned by the Austrian Transport Ministry bmvit.[5]

The result of these first analyses shows a clear tendency, with the 2011 study quantifying the effect: e-mobility in Austria has a gross valued added potential of about €300 million through 2020, and €1.2 billion through 2030. Including indirect effects, this potential increases to €2.9 billion gross valued added. Related to this is an employment potential of 3,800 full-time jobs in 2020, which can be expected to rise to 14,800 in 2030. Including related effects, the authors expect 35,600 e-mobility-related full-time jobs in the automotive industry through 2030; in a best-case scenario employment potential could amount to 57,100 full-time jobs.

The 2016 updated E-MAPP specifically focussed on production potential and concluded that the potential for Austrian vehicle production between 2015 and 2030 translates into a potential increase of €1.6 billion gross value added and around 17,000 jobs. For Austrian producers of charging and H2 refuelling infrastructure, gross value added potential adds up to €250 million and around 2,800 jobs in the period up to 2030. According to E-MAPP, value added and employment potential for e-mobility related-components in Austria amounts to an increase in gross value added of about €200 million and around 2,700 jobs in the period from 2015 to 2030. In general, the Austrian industry's strength in vehicle components bears disproportionally high economic potential for e-mobility components when compared to conventional components. The authors conclude that ignoring e-mobility can lead to significant value added and employment losses for the Austrian automotive industry.

In terms of e-mobility patents, Austria's automotive industry presented the results of an innovation analysis in a 2016 report[6]: the Austrian automotive sector registers around 348 patents per year. Fifty patents specifically focus on E-Car research, so based on its inhabitants Austria has the second highest e-mobility inventor concentration in Europe.

[3] BMWFW (2011). *Elektromobilität – Chance für die österreichische Wirtschaft.* http://www.bmwfw.gv.at/Wirtschaftspolitik/wettbewerbspolitik/Documents/Elektromobilitaet_Chancef%C3%BCrdieoesterreichischeWirtschaft.pdf. Accessed 12 February 2016.

[4] Fraunhofer Austria, AMP and Virtual Vehicle Research Centre (2016). *E-MAPP. E-Mobility and the Austrian Production Potential.* https://www.klimafonds.gv.at/assets/Uploads/Presseaussendungen/2016/eMapp/E-MAPPStudie.pdf

[5] AustriaTech (2016). *Monitoringbericht Elektromobilität 2015.* http://www.bmvit.gv.at/verkehr/elektromobilitaet/downloads/emobil_monitoring_2015.pdf. Accessed 30 March 2016

[6] Österreichs Automobilimporteure (2016). *Leitbranche Automobilwirtschaft – Innovative Leistungen im Bereich der Umwelttechnologien.* http://www.automobilimporteure.at/wp-content/uploads/2015/06/Leitbranche-Automobilwirtschaft-2016.pdf

2.2 Belgium

The vehicle industry has always been an important industrial sector in Belgium. With a turnover of €25 billion, an export rate of 90% and 70,000 employees, it represents 10% of total Belgian exports and 10% of the industrial employment in Belgium today. Every year nearly 300,000 passenger cars and over 40,000 commercial vehicles, buses, coaches and bodies roll off the assembly lines. With these numbers, Belgium has one of the highest motor vehicle production figures per capita in the world. Besides the presence of OEMs, more than 300 automotive suppliers and some renowned research centres and universities are located in Belgium and create added value with activities ranging from research and design to production, testing and certification.

The vehicle industry is changing rapidly. Local vehicle assembly in particular has been under severe pressure in recent years due to several global trends. Even with a Belgian vehicle workforce renowned for its quality and efficiency, more and more vehicle assembly plants are closing and moving to low-cost countries. With the closure of the Ford Genk factory in 2014, 10,000 direct and indirect jobs in Belgium were lost. The government is proactively seeking solutions to recover these jobs and has developed action plans to mitigate the projected economic impacts of such factory closures. For future job creation, governments and industry have to make the right choices in a knowledge-intensive economy.

The vehicle industry in Belgium is transitioning to a clean and smart mobility industry. Within the automotive sector, the focus is no longer on making and selling ICE vehicles only. It is about offering a clean, comfortable and cost-efficient mobility service to the end customer. Electric vehicles can play an important role, especially when combined with the growth of renewable energy sources in the country's energy supply. The transport and energy sectors will become more and more interconnected, and this will create new economic opportunities for companies in this new e-mobility value chain (vehicles, charging infrastructure, ICT, mobility and energy services). Innovation can be an enabler for creating new jobs in this new e-mobility value chain.

The Flemish Government supported innovation in the field of electric mobility via the Flemish Living Lab Electric Vehicles programme (2011-2015). The Living Lab programme was an open innovation platform for testing new products and services related to e-mobility in real-life conditions. More than 70 local companies participated in this innovation platform, showing the interest and potential of e-mobility in Belgium.

But how can electric mobility strengthen the economic position of a country? To answer this question, Belgium and the Netherlands started up Task 24's "Economic impact assessment of e-mobility" and many other countries joined immediately, showing that countries invest in e-mobility not only for ecological purposes, but also for economic reasons.

Were we able to quantify the economic impact in jobs and turnover directly linked to electric mobility activities in Belgium? No.

Because of the limited resources within Task 24, we had to search for existing studies and information available today. This made it difficult because within Belgium, unlike in other countries, no dedicated studies on economic figures existed. However, based on a desk research supplemented with information from the Flemish

Living Lab Electric Vehicles and sector federations like Agoria and ASBE, an overview of the main stakeholders active in e-mobility today was collected. More details can be found in the country report in the annex.

Were we able to detect a growth in e-mobility activities in Belgium ? Yes.

The Flemish Living Lab Electric Vehicles (2011-2015) was a good initiative to stimulate innovation and very valuable for companies to develop new knowledge, products and services. But it was also obvious that supporting innovation alone was not enough to achieve a major breakthrough in the roll-out of electric mobility. Even given the fact that Belgium is an ideal region to introduce electric mobility due to short geographical distances and an energy system capable of installing charging infrastructure combined with renewable energy, we didn't see a major breakthrough.

But since the beginning of 2016 the number of electric vehicles on the road in Belgium has grown significantly. Within the action plan "clean power for transport", new policy measures have been set up to stimulate the use of alternative fuelled vehicles and related infrastructure. More details on these policy measures can be found in the country report in the annex.

More electric vehicles on the road means more services like sales, maintenance and after-service, but more and more charging infrastructure, energy and mobility-related services are also possible. An important trend to mention is that we not only see growth in electric passenger cars. The market share of electric passenger cars in Belgium was 1.82% in 2016 (source : http://www.eafo.eu/content/belgium). In addition, the interest in electrification of vehicles used for public transportation such as electric buses is growing fast. The fastest growing market within electric mobility is that of pedelecs, which are becoming more and more popular for younger people and for commuting, and which already had a market share of 23% in 2014.

For the economic impact on local OEMs and suppliers, we see that more and more companies are playing an important role in the electric mobility value chain. Renowned companies like Umicore, LMS-Siemens PLM Software, PEC, Leclanché and Punch Powertrain play an important role as suppliers in the e-mobility sector. But many more Belgium suppliers can be found in the country report in the annex. Local OEMs like Van Hool, VDL Bus Roeselare, Mol CY and E-trucks are also focussing more and more on the electrification of buses and heavy-duty vehicles. More details can be found in the country report in the annex.

For countries with a local passenger car manufacturing industry, individual investment decisions of OEMs significantly influence the whole system, not only in the countries where the OEMs are based, but also for the supply network in components and services in surrounding countries. For Belgium, Audi Brussels made a big announcement related to electric vehicles.

Figure 8: Audi e-tron quattro concept study as shown at Frankfurt Motor Show 2015 (Source: Audi)

As of 2018, Audi Brussels will exclusively produce the first battery-electric SUV from Audi for the world market. This means Audi Brussels is becoming a key player for electric mobility within the entire Volkswagen Group. Audi Brussels will not only assemble the Audi e-tron, it will also have its own battery production site. Audi Brussels currently offers employment for 2,500 workers, and thanks to the new Audi e-tron project these jobs will be maintained after 2018. A qualification offensive will be foreseen to build up the needed knowledge and skills related to e.g. high voltage technology and aluminium Leichtbau. The site in Belgium will thus become a key plant for electric mobility within the Volkswagen Group. This will be an enabler for activities related to electric mobility at local suppliers, universities and research institutes.

Belgium is in a good position to play an important role in different parts of the e-mobility value chain. The Belgian e-mobility industry contains many innovative OEMs, suppliers and universities/research institutes to develop and/or produce new products and services in the different e-mobility value chains: electric vehicles (passenger cars, buses, light electric vehicles, and others), components such as batteries (and recycling, BMS, etc.), charging infrastructure, mobility and energy services. More details can be found in the country report in the annex.

2.3 Denmark

Denmark has established a number of positions of strength within smart grid technology and e-mobility, which means that Denmark has a good basis for benefitting from the opportunities that the e-mobility industry can offer.

The possibilities of a powerful e-mobility sector in Denmark are also strengthened by factors such as: short geographical distances and relatively high population density; the population’s positive basic attitude toward green energy, which the energy system also provides; and the fact that a relatively large proportion of the population lives in such a way that it is relatively simple to install equipment for home charging.

It is estimated that the commercial Danish positions of strength within e-mobility are related to:

- Components
- Infrastructure
- Mobility services

1) In relation to the production of EVs, components and equipment, the analysis shows that Danish companies have established positions of strength within areas like power electronics, BMS, apps and telematics.

2) In terms of smart grid technology, the assessment is that Denmark has a head start due to the high share of wind power integration and decentralised combined heat and power production. Denmark thus already has a smart grid version 1.0 in place. Combined with a nationwide charging infrastructure for EVs since 2012 and four charge point operators in free competition, this offers valuable experiences with respect to integrating the EVs into the energy system and in terms of the marked build-up and testing.

In terms of research and development activities, Denmark is also at the forefront in the smart grid area. Danish universities are international knowledge hubs for the development of advanced electro-technical systems; according to the EU, 22% of European smart grid R&D, test&demo and implementation projects take place in Denmark. Several international firms like Siemens, IBM and ABB have placed developmental resources in Denmark with reference to this front-runner position. The Danish energy sector is also a proactive driver, e.g. in relation to expanding smart meters.

3) In terms of mobility services and concepts, Denmark is also part of the leading pack of countries. This is supported by the vast and long experience with real-life tests and demonstrations of EVs and other mobility concepts. At least 83 national EV projects have been launched and about 63% of public funding has been given to market trial projects with EVs and mobility concepts. This provides a solid basis for the development of new business models and services.

From an international perspective, Denmark is in a position in which it can play a key role in niche e-mobility areas in the development of future EVs. But this development presupposes an attractive home market where e-mobility products and solutions can be tested and innovated. The development of the future Danish e-mobility industry is hard to predict in a situation where the phasing in of registration tax on EVs can negatively affect the e-mobility industry.

Finally, it is also important to mention that the report merely provides general considerations on development and research, and market conditions within the e-mobility industry. It is the project's clear opinion that the area and the subject can benefit from a more detailed analysis.

2.4 France

Estimate of the domestic market

In France, the electric vehicles market only began to develop very recently, with the total number of electric vehicles registered rising from just a few hundred in 2010 to 17,268 in 2015, representing a domestic market of €355 million.

The electric vehicle market has been experiencing exponential growth since 2010. Over the period as a whole, the number of electric vehicles in France has been multiplied by nearly 100.

The value of the domestic market is estimated using a method of quantity * price. The quantity corresponds to the registrations (in units) of electric vehicles in France.

Sales of electric vehicles in units from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Yearly registrations of EV in number of unit	184	2.630	5.663	8.779	10.561	17.268

Prices previously obtained are used for estimating the value of the domestic market. The estimated domestic market includes distribution margins, which must be reprocessed to obtain a "manufacturers / importers' price market" (assuming that margins are the same for vehicles imported or locally produced). These margins are estimated based on data from INSEE's annual survey of automotive companies.

Domestic market in € value from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Average purchase price in €	28.826	28.223	28.966	35.908	32.588	32.957
Average purchase price w/o VAT in €	22.033	21.546	24.219	30.024	24.379	24.655
Average manufacturers / importers price in €	19.655	19.220	21.605	26.783	21.748	21.994
Domestic market of EV in number of unit	184	2.630	5.663	8.779	10.561	17.268
Distribution margins in €	389.463	5.481.590	11.768.092	18.730.565	24.909.668	42.960.873
Domestic market of EV in €	3.218.700	45.302.397	97.256.962	154.798.055	205.865.021	355.048.541

Estimate of domestic production

Nevertheless, production of electric vehicles in France is a relatively recent phenomenon, representing 20,669 units in 2015. The domestic production value is estimated at €361 million.

Production of electric vehicles in France is relatively recent. Most models offered on the domestic market are indeed produced abroad.

The only models of electric vehicles produced in France since 2012 are the Renault Zoe (Flins site), the Mia Electric (Cerizay) and the Smart Fortwo in Alsace.

Domestic production of electric vehicles in units from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Domestic production of EV in number of unit	34	301	498	10.655	13.236	20.669

The value of domestic production is assessed from the estimate of the domestic production in units and the average price collected from the decomposition of sales and prices in France.

Domestic production of electric vehicles in € value from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Domestic production in M€	2	43	98	155	205	361

Estimate of foreign trade

For 2015, imports are estimated at 6,525 units representing €168 million, and exports at 9,926 units representing €174 million.

As there is no public data on foreign trade of electric vehicles with enough details, all estimates are presented from the following equilibrium relationship:
Domestic market + exports = production + imports

Foreign trade of electric vehicles in units from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Domestic production of EV in number of unit	34	301	498	10.655	13.236	20.669
Domestic market of EV in number of unit	187	2.630	5.663	8.779	10.561	17.508
Imports of EV in number of unit	150	2.329	5.165	2.586	4.072	6.525
Export of EV in number of unit	-	-	-	4.462	6.748	9.926

Foreign trade of electric vehicles in € value from 2010 to 2015:

(in M€)	2010	2011	2012	2013	2014	2015
Domestic market	3	45	97	155	206	355
Imports	1	39	90	51	94	168
Domestic production	2	43	98	155	205	361
Exports	-	37	91	51	93	174

Estimate of foreign trade Full Time Employees (FTE)

For the production of electric passenger cars, Full Time Employees (FTE) related to domestic production are estimated at 825 FTE. Concerning the business of distributing electric vehicles, FTE are estimated at 577. The employment rate related to maintenance of EVs is lower, with a total of 172 FTE. Considering domestic production, the EV sector employs around 1,574 FTE.

FTE are estimated using the ratio of production / employment collected from INSEE data for the automotive sector for the years 2006 to 2013, and are linearly interpolated for 2014 and 2015.

FTE related to manufacturing of electric vehicles from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Domestic production in M€	2	43	98	155	205	361
FTE / M€	2,30	2,08	2,23	2,24	2,26	2,28
FTE	5	89	218	348	464	825

FTE related to distribution of electric vehicles from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Domestic production in M€	0	5	12	19	25	43
FTE / M€	14,26	13,38	13,40	13,41	13,43	13,44
FTE	6	73	158	251	334	577

FTE related to maintenance of electric vehicles from 2010 to 2015:

	2010	2011	2012	2013	2014	2015
Annual maintenance cost for an EV in €	729	734	711	721	728	733
EV stock	3.725	6.355	12.016	20.797	31.364	42.595
Maintenance in M€	2,72	4,66	8,54	14,99	22,86	31,22
FTE / M€	5,68	5,65	5,85	5,56	5,52	5,52
FTE	15	26	50	83	126	172

2.5 German region of Baden-Wuerttemberg

The automotive industry is the largest industry sector in Germany, accounting for €404 billion in 2015, providing 792,500 jobs. Currently, there are 41 OEM sites located in Germany. German OEMs provide one-third of global automotive R&D expenditure, with R&D investments amounting to €19.7 billion in 2014. The German automobile industry includes 100,000 employees in R&D.

Germany's policies in support of e-mobility entered a new phase in 2016. Whereas former policies mainly focused on RTD funding and demonstration projects, nowadays the market ramp-up is also addressed. New regulations, tax exemption and a buyer's premium constitute a supportive environment for e-mobility. The registration of new vehicles shows a growing share of electric vehicles (still at a low level) from 1.4% until June 2016 to 2.4% in October 2016.

Task 24 – Economic Impact Assessment of E-Mobility investigates the economic position of individual countries and aims at getting a better understanding of the value chain for e-mobility. The country report for Germany focuses on the automotive cluster in Baden-Wuerttemberg, where in-depth studies on the impact of e-mobility on employment are available. Baden-Wuerttemberg is home to the most important automotive cluster in Europe.

The studies conducted a detailed analysis based on all relevant components of vehicles and a realistic scenario of the global market development for electric vehicles. The most recent study furthermore investigated the capability of the existing value chain to unlock the theoretical market potential. Whereas the potential calculated from market growth and shares indicates up to 24,000 additional jobs in Baden-Wuerttemberg in 2025 compared to 2013, the realistic picture accounts for 18,000 additional jobs in the same period.

The report elaborated by Wirtschaftsförderung Region Stuttgart in cooperation with Innovationhouse Deutschland covers vehicle production and its corresponding value chain only. An overall assessment of the economic impact needs to take into account after-sales services and new business opportunities related to e-mobility as well. As electric vehicles are less complex than combustion engine cars, services in workshops subsequently tend to be lower, resulting in a decrease of employment, whereas services around e-mobility and charging infrastructure provide new job opportunities. Whether this will result in overall employment growth or loss goes beyond the scope of this report.

Figure 9: OEMs and suppliers in Germany (source: GTAI 2015)

Whether a specific country or region will be able to develop in such a direction depends on singular events as well. The decision of an OEM for a new production site significantly influences the whole value chain. As an example, the Porsche production of the "Mission E" will start in Stuttgart Zuffenhausen. About 1,200 additional jobs will be offered by Porsche 2020 in a new plant, along with 200 more in its development. Further impact is expected in employment along the value chain. The future development of Germany's automotive sector mainly depends on appropriate investment decisions being made at the right moment. It will be crucial for the German economy as a whole not to miss the right moment to transition (combustion) vehicle production to the next stage of mobility industries.

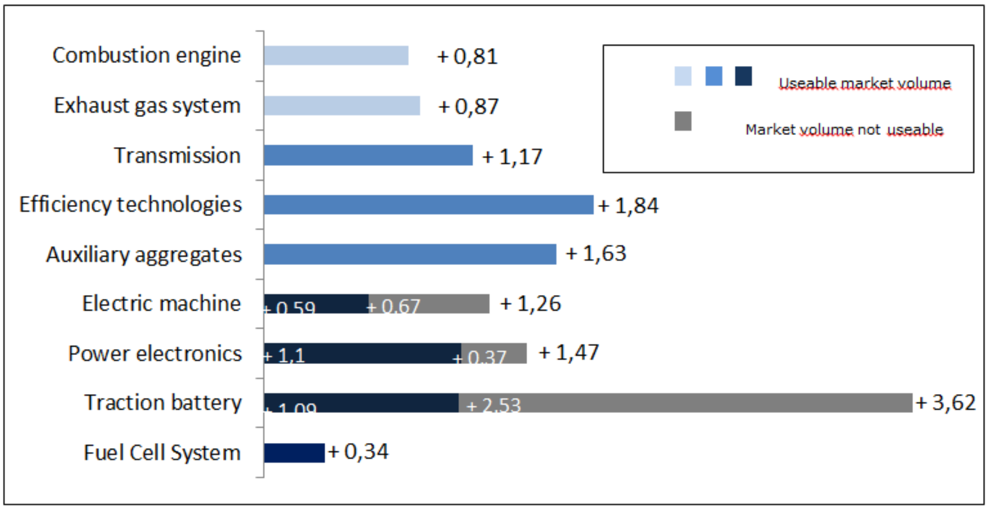


Figure 10: Useable change of the market volume in Baden-Wuerttemberg in 2025 compared to 2013 in billion Euro (E-Mobil BW Structure Study "Electromobility" 2015)

2.6 The Netherlands

The Netherlands has seen steady growth in both the number of electric vehicles and the charging infrastructure. In 2015, 9.7% of new vehicle registrations were for electric vehicles, while about 1% of the total passenger car fleet was electric. In October 2016 the milestone of the 100,000th registration of an electric vehicle was reached in the Netherlands.

Green growth is one of the major reasons why the Ministry of Economic Affairs in the Netherlands encourages electric driving. The position of the Netherlands as a frontrunner in e-mobility has helped an active e-mobility sector to develop in the country. Companies have been able to develop crucial knowledge and experience in the home market. As a result, Dutch organisations are active in almost all segments of the value chains for vehicles, charging infrastructure and energy. The Dutch country report describes the main industry and market players.

Most business activity takes place in the subsections of:

- New (custom-made) vehicles (boats, buses, trucks, scooters and LEVs);
- Charging infrastructure;
- Drivetrain technology, range extenders, EMS (components);
- Smart grids and metering;
- Mobility services (such as leasing).

The strengths of Dutch businesses also lie in these sectors. Dutch companies export products and services, particularly in the fields of charging infrastructure and the related smart grids and metering. The manufacturing of electric vehicles (not passenger cars but most other modalities) is also on the rise.

Dutch e-mobility companies were surveyed to collect data on the economic impact of e-mobility in the Netherlands. CBS Statistics Netherlands calculated the results and was able to add to the data with the aid of its national database and a list of companies active in e-mobility.

Direct employment in e-mobility has increased almost tenfold since 2008, from 350 FTEs in 2008 to 3,200 FTEs in 2014. Although growth has slowed a little during the past year, the number of jobs in this field still increased by 25% compared with 2013. Please refer to Figure 11.

Figure 11: e-mobility economic indicators (Source: CBS Statistics Netherlands)

A breakdown of these data into market clusters shows that employment is highest in the services sector (financing, payment, mobility and other services) and in the manufacture and retrofitting of vehicles. The market segment comprising the manufacture and retrofitting of (custom-made) vehicles contributes the most to production and added value, whereas the charging infrastructure and smart grids segment shows the fastest growth in these indicators.

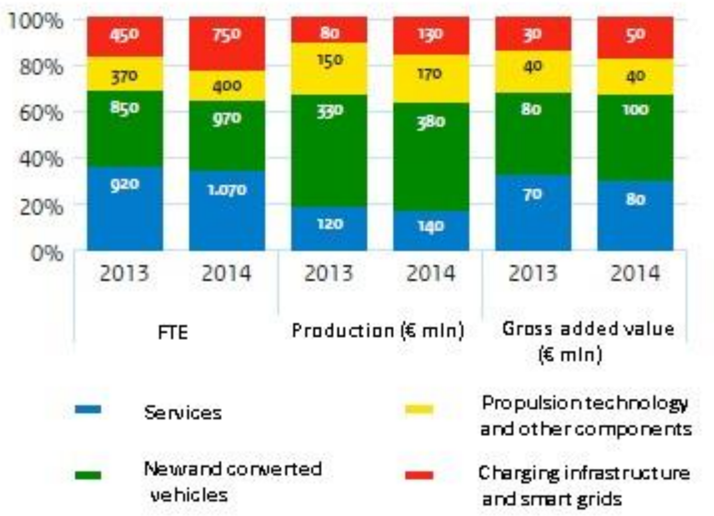


Figure 12: Breakdown of economic indicators by market segment (Source: CBS Statistics Netherlands)

The quantitative data collected on exports were not sufficient to allow concrete conclusions to be drawn, but they do indicate a rise in the number of Dutch companies exporting their knowledge and experience in the field of e-mobility.

In early 2015, research company CE Delft used various scenarios to estimate the number of jobs in electromobility in the Netherlands in 2020, arriving at figures somewhere between 5,400 and 18,850 with a mean prediction of around 10,000 jobs in 2020.

2.7 The United States of America

Today, e-mobility in the U.S. is confined primarily to passenger travel via battery-electric and plug-in hybrid electric vehicles (i.e. BEVs and PHEVs, collectively known as PEVs). While connected and autonomous vehicles, smart phone-enabled mobility apps, electric two-wheelers, fuel cell-electric vehicles and various forms of web-based mobility services may become major players in the future, the current e-mobility space is largely limited to light-duty PEVs and the infrastructure to support them. As shown in Figure 13, PEV sales have risen steadily in the past five years, growing from less than a thousand units in 2010 to 118,882 in 2014 (Miller 2015[7]). While most use nickel metal-hydride (NiMH) batteries, an increasing share (of hybrid-electric vehicles or HEVs as well as PEVs) use lithium ion (Li-Ion) batteries. It is estimated that 2.65 gWh of Li-ion batteries were installed in e-drive vehicles sold in the U.S. in 2014 (Miller 2015). Six models account for over 83% of U.S. sales:

[7] Miller, J. (2015) *Insights into U.S. EV Market Evolution*, EVI Workshop, Goyang, Korea, May. Available at https://www.iea.org/media/workshops/2015/towardsaglobalevmarket/A.4US.pdf

Nissan Leaf, Chevy Volt, Tesla Model S, Toyota Prius PHEV, Ford Fusion Energi and Ford C-Max Energi (Zhou 2016[8]). Cumulative PEV sales totalled 287,261 at the end of 2014, 401,284 at the end of 2015, and 512,137 through September 2016 (Zhou 2016). Revenue from the sale of PEVs was estimated at $4.63 billion in 2014.

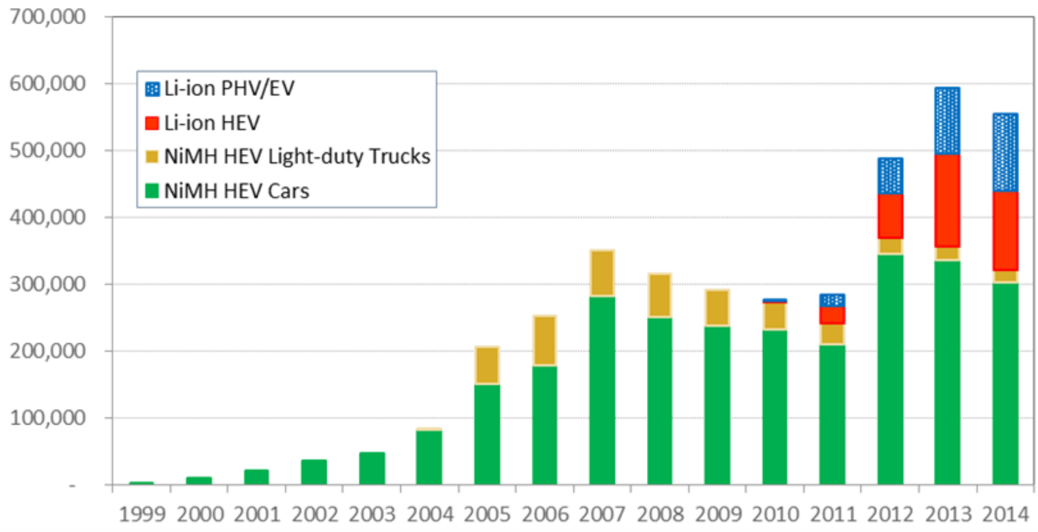


Figure 13: PEV/HEV Sales in the U.S. Market by Battery Technology, 1999–2014 (Miller 2015)

Consisting of Level I, II and III Electric Vehicle Supply Equipment (EVSE), the U.S. charging infrastructure includes private residential and workplace units, public units at various sites, and a network of direct-current fast chargers (DCFCs) including "superchargers" available to Tesla owners. While most PEVs are charged at home (often overnight), an increasing number of workplace and commercial units are being deployed. According to the USDOE's Alternative Fuels Data Centre (AFDC), approximately 11,700 public charging locations with nearly 30,000 charging outlets were in operation in the U.S. in 2015 (USDOE/AFDC 2015) and another 130 locations with over 400 outlets were in various stages of development.

The country report summarises recent trends in the number of PEVs on U.S. roads, investment in vehicle and battery production, and gross employment, earnings (or income) and economic output under two future scenarios. Impacts are estimated from projected vehicle sales, attributed sales of electricity and private infrastructure to support those vehicles, expenditures for vehicle and infrastructure production facilities and for installing and operating public charging. Estimates are developed for two scenarios: minimal PEV penetration reflecting the USDOE's Annual Energy Outlook (AEO Scenario), vs. more rapid PEV uptake from deploying zero emission vehicles (ZEV Scenario). In the AEO Scenario, PEV penetration remains on the order of 1% of light-duty vehicle (LDV) sales through 2030. In the ZEV Scenario, LDV penetration rises to 1.5% of sales in 2020, 5% in 2025 and 6.5% in 2030.

As shown in Figure 14, employment associated with PEV deployment rises from roughly 55,000 in 2015 (including over 20,000 induced jobs) to 110,000 in the AEO Scenario and 600,000 in the ZEV Scenario.[9] In the ZEV Scenario, approximately 9% of gross employment associated with PEVs occurs in the battery industry.

[8] Zhou, J. (2016) *E-Drive Sales Data*, Monthly reports available at http://www.anl.gov/energy-systems/project/light-duty-electric-drive-vehicles-monthly-sales-updates

[9] Employment estimates assume U.S. production of PEVs and all key components. While some batteries were imported in 2015, all batteries are assumed to be sourced domestically once Tesla's giga factory becomes fully operational (in 2017). By contrast, EVSE imports are assumed to continue. Thus, these estimates include impacts associated with EVSE sales and installation but not impacts associated with EVSE manufacturing.

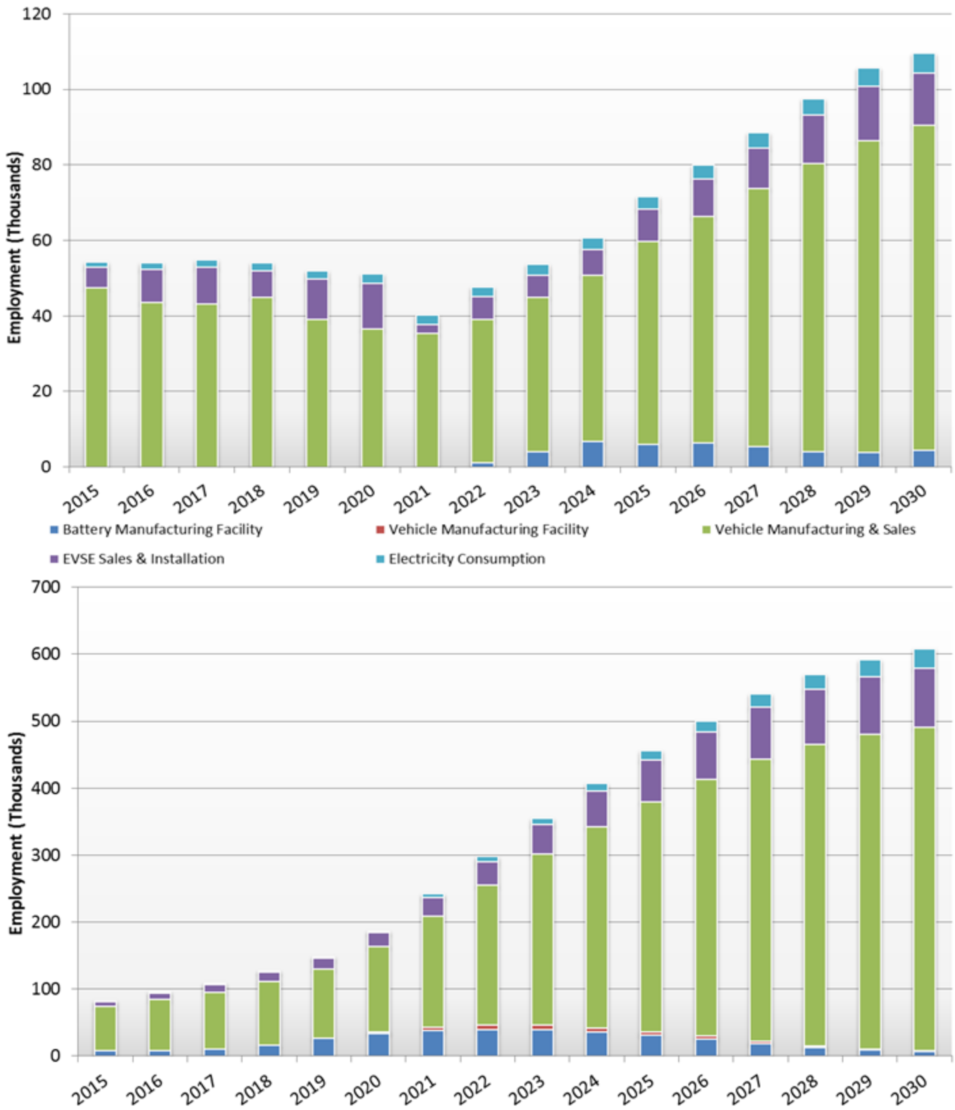


Figure 14: Gross Employment Associated with PEV Production and Use under AEO and ZEV Scenarios, 2015–2030

2.8 Switzerland

<u>Automotive industry</u>
Switzerland no longer had relevant car manufacturers. Nevertheless, its automotive sector is as important as the watch industry in terms of export volume. In 2014, more than 300 companies with 24,000 employees and a total turnover of an estimated CHF 9 billion supplied different kinds of vehicle components to the international car industry in general, and to German car manufacturers in particular.

In 2013, swissCAR (University of Zurich) conducted a survey of the automotive industry. In this survey, 7% of the participating companies indicated that products for e-mobility belong to the most lucrative segments of their business. A desktop study conducted by e'mobile in January 2016 identified 174 companies and organisations in the field of e-mobility. Most of these companies manufacture EVs or vehicle components including batteries. swissCAR is planning to conduct another survey in 2017. e'mobile expects that the share of companies with significant activities in the e-mobility sector will have shown significant growth since 2013.

Since the market introduction of the new generation of BEVs, EREVs and PHEVs in 2011, electric passenger car sales have steadily increased and roughly doubled every year since 2013. In 2014, EVs accounted for a market share of about 1%. Therefore, our estimate of the overall impact on the Swiss economy amounts to an annual turnover of about CHF 0.8 billion.

Sales of small electric vehicles and electric scooters have remained stable at about 2,000 units a year for a few years now. Sales of electric trucks and light utility vehicles show no significant development. E-bikes and pedelecs have been very successful in Switzerland for several years now. Almost 66,000 units were sold in 2015. This success is largely due to the fact that a couple of very innovative Swiss manufacturers are pushing market development. The market volume amounts to an estimated CHF 0.3 billion.

Charging infrastructure
The swissCAR survey identified 16 manufacturers of charging infrastructure in 2013. The head offices of 12 companies are located mostly in the Zurich area, and 50% were founded after the year 2000. They are mainly service providers and hardware importers. Only a few manufacture charging stations in Switzerland. The survey estimates the total number of employees in this sector at about 60 persons in 2013. In 2012, the survey participants produced approximately 5,600 charging stations and exported 1,800 mainly to Germany, France and Austria.

European patents
The overview of requested patents is an indicator for developments in R&D and innovation of a country, thus also indicating its economic potential (see 1.4). By far the largest number of patents filed by Swiss companies belongs to the battery categories, followed by fuel cells. Most of the patents were registered in the years 2010 to 2012 (approximately 60 per year). Michelin (87), ABB Group (45) and Belenos Clean Power Holding AG (30) requested the highest number of patents. As Michelin and ABB are multinational companies, these patents' influence will not be limited to the Swiss automotive components market. Belenos Clean Power Holding was the most active purely Swiss-owned company in this query. Meanwhile, this firm has set a focus on small and particularly powerful batteries for cars as well as other applications.

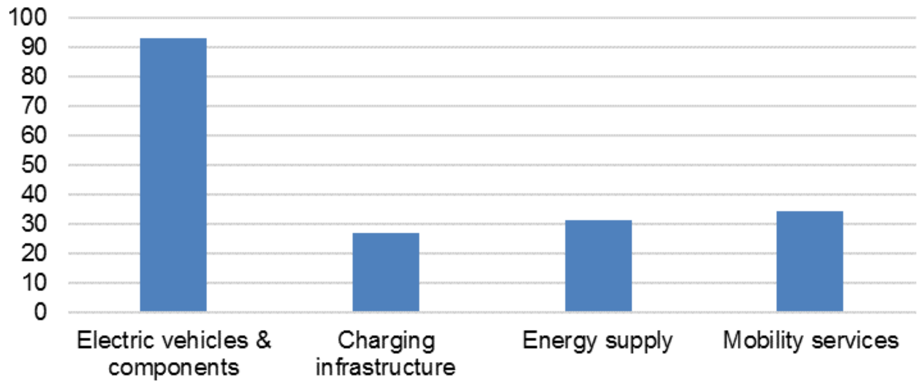


Figure 15: Swiss companies and organisations in the e-mobility sector (Source: e'mobile)

3 Conclusion

3.1 Key messages

The **economic impact of e-mobility can be considerable**: that is the common thread of all country reports. Initially we intended to benchmark the results of the individual country reports. Although similar trends were identified in the participating countries, actual benchmarking proved impossible. It is difficult to compare the various data on the industry and the value of the e-mobility sector because of the following reasons:

1) the different backgrounds from which data were collected (passenger cars only, or other vehicles such as trucks or light electric vehicles as well).
2) the different methods used to collect and analyse the data (described in more detail in Section 1.3).
3) the timescale for which data were collected or available (2013, 2014, 2015) or estimates were made (2020, 2025, 2030).

What the project made clear though, is that **employment growth can be substantial when the local EV market really takes off**. For example, the US country report shows that employment associated with PEV deployment rises from roughly 55,000 in 2015 to 110,000 in the AEO Scenario and 600,000 in the ZEV Scenario, both for 2030. In the German region of Baden-Wuerttemberg, the realistic market development scenario indicates 18,000 additional jobs in 2025 compared to 2013. In the Netherlands, a study estimated a mean potential of 10,000 jobs in e-mobility in 2020 (compared to 3,200 jobs in 2014). One thing to realise is that investigation of the economic impact needs to take into account both the gains in turnover and jobs by e-mobility and related businesses, as well as the loss of turnover and jobs in the combustion engine sectors. Most country reports do not yet address this issue.

For countries with an automobile manufacturing industry, **individual investment decisions of OEMs significantly influence the whole system**, not only in the countries where the OEMs are based, but also for the supply network of components etc. in surrounding countries.

The further growth of the e-mobility sector causes economic impact and employment growth both within and beyond the e-mobility sector itself. **Spill-over effects can be seen in other sectors like the energy sector**: batteries for the e-mobility sector can be re-used in stationary grid-applications, and more and more energy services making use of the flexibility of electric vehicles will enter the market. That will be an enabler for more and more ICT/big data/Internet of Things-related jobs.
The development of new products and services not only leads to new jobs, but the supporting activities like education, training, testing and consulting will also grow as e-mobility becomes more and more important.

Another lesson to be learned from the results of the country reports is that **ignoring e-mobility can lead to significant value added and employment losses for local industry**.

Unfortunately there still is a lack of economic impact assessment data (not much existing data, or sensitive data; see individual country reports for details), but there is a **high level of interest from policy makers**. More and more countries are interested in the economic effect of electric vehicles. For the Netherlands and the United Kingdom, this already is one of the major reasons to stimulate e-mobility. Canada will be commissioning a study on the economic impact.

Eventually, it could be interesting to highlight the interests of comparing economic impact assessments at an international level— not only to learn different methodologies, but also to indirectly analyse how effective incentives policies are from one country to another. Information learned from HEV-TCP Task 1 (EV development of HEV-TCP member countries) combined with the results of this Task 24, provides valuable insights into the challenges of making mass deployment scenarios for EV a reality. A key message is to be patient. **It takes time for an incentive policy to take effect and directly impact the number of jobs**. On the other hand, the automotive industry needs to evolve, and government support is needed during this transition. Also relevant is the fact that the impact of policies is strongly related to the position of a technology along the innovation adoption curve (higher impact of RTD funding in early phases, buyer’s premium may speed up from early adopters to early majority).

In addition to the economic impact addressed in this project, one should not forget the impact of the transition to electric vehicles on energy transition, climate issues and the health and quality of life of citizens.

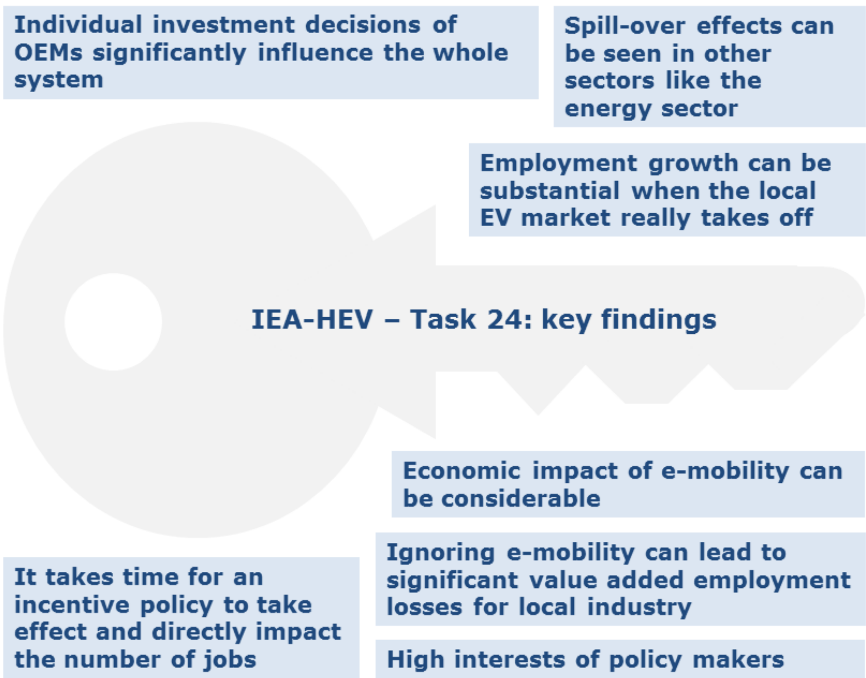


Figure 16: Key messages IEA-HEV-TCP Task 24

3.2 Notes on the methods used

Many participating countries struggled with uncovering the key economic indicators. The impression is that by using an industry questionnaire, data are collected in the most "productive" and reliable way for the actual situation. A key requisite for this, however, is that the e-mobility industry needs to somehow be organised on a national scale.

In the US, the manufacture and sale of PEVs represents over 80% of the e-mobility expenditures examined in the analysis and accounts for the bulk of estimated gross impacts. Going forward, all PEVs are assumed to be produced in the US and thus significant impacts (on total employment, earnings and economic output) are projected. By contrast, impacts associated with EVSE sales and installation, electricity consumption and the construction of facilities to manufacture PEVs are much lower overall, and lower still under modest market penetration assumptions (as in our AEO Scenario). Induced effects are substantial, accounting for approximately 40% of the total impacts estimated in this analysis. The ability to capture indirect and induced effects is a major advantage of economic modelling.

4 Annex : Country Reports

In alphabetical order:

- Austria
- Belgium
- Denmark
- France
- German region of Baden-Wuerttemberg
- Netherlands
- Switzerland
- United States of America