

ECONOMY AND FINANCE

THE TRANSITION TO ELECTRIC VEHICLES IN CEE

What Does It Mean for the Automotive Sector
in Central Eastern Europe?

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January 2023



The economies of Central Eastern Europe are heavily dependent on the automotive sector. The transition to e-mobility is changing the value chains. Engine and transmission manufacturing are particularly affected by this development.



Decisions in this sector are made by the large western automotive companies. Politicians in CEE have relatively little leverage to influence this.



Nevertheless, the region has a good chance to manage the transition to e-mobility. Hungary and Poland are among the major battery-producing countries in Europe today. However, competitive energy prices are a prerequisite for a successful transition. The Ukraine crisis threatens to have a negative impact here.

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WHAT DOES E-MOBILITY MEAN FOR THE ECONOMIES OF CENTRAL EASTERN EUROPE?

A rapid transition to electromobility is on the horizon in the global car markets. In the EU, the sale of new combustion engine cars will be effectively prohibited from 2035 onwards. Already in the years before that the limit values for CO₂ emissions laid down in the EU will force manufacturers to ensure a rapidly growing share of battery electric vehicles (BEV) in their sales.¹

However, the switch to e-mobility is only one aspect of a broader process of change in the automotive sector. Digitalisation will hit the automotive sector with full force in the next ten years: The connectivity of vehicles, the use of data generated by the vehicles and the growing importance of electronic assistance systems will significantly change the cost structure in passenger car production. These changes will have a profound impact on the entire value chain of the sector, from the raw materials needed to build the vehicles to their maintenance and repair up to their final recycling. According to the German Ifo Institute “the competitive environment in vehicle manufacturing will be completely reshaped in the next 10–15 years”.²

These trends are of utmost importance for the countries of Central Eastern Europe.³ No other countries in the world produce as many passenger cars per capita as Slovakia, the Czech Republic and Slovenia. One third of the EU's passenger car production today comes from the countries of Central Eastern Europe.⁴ A high proportion of the industrial workforce in these countries is employed in the automotive sector: The share of workers directly employed in the automotive sector in total industrial employment is 8.5% on average in the EU and 11.1% in Germany. In contrast, it is 16% in Slovakia, 15% in Romania, 13.8% in the Czech Republic, 13.1% in Hungary and 7.7% in Poland. In the Visegrad countries and Romania together, almost 800,000 people are directly employed in the automotive industry - one third of the total workforce in this sector in Europe.⁵

WHAT IS CHANGING WITH THE TRANSITION TO E-MOBILITY?

In the following, the most important changes associated with the transition to battery electric vehicles (BEV) will be briefly presented on three levels.

1) WHAT IS CHANGING IN THE VEHICLES?

The transition to electromobility means above all a fundamental change in the so-called powertrain. While much of the cars other parts remain the same, the way in which energy is stored, generated and distributed changes completely. In an electric car, there is no combustion engine, no exhaust and exhaust system, no alternator, no fuel tank, no fuel pump and filter and no complex multi-speed transmission. They are replaced by an electric motor, battery cells, cables for transmitting electricity and simple gearboxes.⁶ This BEV-powertrain is at the same time less complex and significantly more expensive. While an internal combustion engine has at least 1,000 parts, an e-powertrain consists of only a few hundred individual parts. However, this powertrain is significantly more expensive, mainly due to the high cost of the batteries.⁷

2) WHAT IS CHANGING IN VALUE ADDED?

The above-mentioned changes alter the value added in the automotive sector. The battery is by far the most expensive part of an electric vehicle: currently, the battery accounts for 30–40% of the car's total cost.⁸ The central reason for the high battery costs are the costs of its components: modern high-performance batteries need a lot of rare and scarce raw materials.⁹ The production of an average electric car requires over 200 kg of them, more than six times as much as for a combustion engine car.¹⁰ In total, a battery drive is significantly more expensive than an internal combustion engine: in 2020, according to PWC calculations, the cost of producing an electric powertrain was around €9,500, while a powertrain for a conventional car only cost €5,000 to produce.¹¹

¹ Price Waterhouse Cooper, Staying profitable in the new era of electrification – Powertrain study 2020, p. 1, <https://www.strategyand.pwc.com/de/en/industries/automotive/powertrain-study/powertrain-study-2020.pdf> (PWC 2020).

² Ifo Institute/Bavarian Chamber of Industry and Commerce, Ifo Institut/Bayerische Industrie- und Handelskammer, Fahrzeugbau – wie verändert sich die Wertschöpfungskette?, Munich, June 2019, here p. 3.

³ In the context of this paper, Romania is also included in the region of Central Eastern Europe.

⁴ European Automobile Manufacturers' Association (ACEA), The Automobile industry pocket guide 2022-2023, (ACEA 2022), p. 23, https://www.acea.auto/files/ACEA_Pocket_Guide_2022-2023.pdf

⁵ Ibid, p. 14f.

⁶ Ifo Institute 2019, p. 18ff.

⁷ Boston Consulting Group, Shifting Gears in Auto Manufacturing, 2020, <https://web-assets.bcg.com/fd/de/20c24ec2407d9622175e45e84a2c/bcg-shifting-gears-in-auto-manufacturing-sep-2020.pdf>, here p. 1 (BCG 2020).

⁸ In the long term, it is estimated that the battery's cost share could drop to around 29%. European Trade Union Institute, The future of the automotive sector – Emerging battery value chains in Europe, ETUI, Brussels 2022, (ETUI 2022), here p. 19, https://www.etui.org/sites/default/files/2022-06/The%20future%20of%20the%20automotive%20sector-Emerging%20battery%20value%20chains%20in%20Europe_2022.pdf.

⁹ The International Energy Agency (IEA) estimates the share of raw materials in total battery costs at 50–70%. International Energy Agency, The Role of Critical Minerals in Clean Energy Transition, <https://iea.blob.core.windows.net/assets/ffd2a83b-8c30-4e9d-980a-52b6d9a86fdc/TheRoleofCriticalMineralsinCleanEnergyTransitions.pdf>, (IEA 2022) p. 13.

¹⁰ Ibid. S. 28.

¹¹ PWC 2020, p. 6.

The share of software and electronics (processors, chips, sensors, driver assistance systems) is also growing steadily and could represent around 10% of the vehicle value in a not too distant future.¹² With this change in the cost structure of a car, the value added tends to shift from the vehicle assembly at the car companies (OEM) to the producers of the installed components or the electronics and software used in the car.¹³

3) WHAT IS CHANGING IN EMPLOYMENT/WORK?

The switch to BEV will change the type, but, according to newer research, not so much the amount of work in the car assembly. The installation of an e-powertrain does in fact require much less labour than the installation of a classic powertrain: in the case of combustion engines, this step stands for about 7% of the total labour hours, in the case of battery-powered vehicles only for 2%.¹⁴ There is also a lower labour requirement for the production of the individual components of the powertrain.¹⁵ Overall, according to a calculation by the German Fraunhofer Institute for Volkswagen AG, it can be assumed that the labour required to build an electric powertrain, including the battery, is 41% lower than that for a conventional powertrain.¹⁶

However, this reduction in labour input for the installation and production of battery powertrains is compensated for elsewhere in the assembly process by an increase in labour demand, for example in wiring and charging the battery. All in all, the amount of work required for a BEV in production is not less than that for a vehicle with an internal combustion engine, the work just occurs elsewhere: Calculations show that the overall labour input per car during the production process will only be reduced by 3–4% with the transition to e-mobility.¹⁷

All in all, according to the assumptions of most studies available so far, due to the creation of new jobs in other fields (battery cells, electronics, etc.) the level of employ-

ment in the European automotive industry will change less dramatically than initially feared.¹⁸ The value chains of e-cars are not significantly less labour-intensive than value chains of combustion cars, if battery production is taken into account. What is shifting, however, is the demand for qualifications and skills: Researchers, engineers and technicians with electrical, electrochemical, mechatronic, software and industrial skills are increasingly in demand.¹⁹

WHAT DOES THIS MEAN IN CONCRETE TERMS FOR THE AUTOMOTIVE LOCATIONS IN CEE?

The region's competitiveness is based on a number of well-established comparative advantages: relatively low wages, proximity to the Western European market, EU membership and acceptable or low energy costs combined with high productivity. Wage costs in all CEE countries are at a maximum level of 1/3 of German wages.²⁰ These comparative advantages will persist in the coming years, also in terms of wage levels.²¹ Some factors may even become more important, such as the proximity of location and the deep integration with the German automotive cluster: battery cells are heavy and comparatively flammable; there is a tendency to locate their production close to car assembly facilities.²²

Nevertheless, the production facilities in CEE will be strongly affected by the upcoming technological changes. 80% of jobs in the automotive industry here are in the sector of components and parts production. Among them is a very high number of jobs in engine and transmission production, i.e. the areas most affected by the transition to e-mobility.²³ According to calculations by PriceWaterhouseCooper on behalf of the European automotive supplier association CLEPA, 43% of jobs in the powertrain sector are expected to be lost in Europe by 2040 as the jobs lost in

¹² ETUI 2022, p. 19.

¹³ BCG 2020, p. 11.

¹⁴ BCG 2020, p. 9.

¹⁵ Studies show that the total number of labour hours required for the powertrain components of BEV is 15–30% lower than for an ICEV (if battery cell production is not taken into account). European Parliament, Policy Department for Economic, Scientific and Quality of Life Policies, The Future of the EU Automotive Sector, Strasbourg 2021 (EP 2021), [https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695457/IPOL_STU\(2021\)695457_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/STUD/2021/695457/IPOL_STU(2021)695457_EN.pdf), p. 38.

¹⁶ Fraunhofer IAO (2020) Employment 2030: effects of electric mobility and digitalisation on the quality and quantity of employment at Volkswagen. https://www.volkswagenag.com/presence/stories/2020/12/fraunhofer-studie/6095_EMDI_VW_Summary_um.pdf, (Fraunhofer 2020).

¹⁷ BCG 2020 p. 11, and Fraunhofer 2020, long version, <https://publica-rest.fraunhofer.de/server/api/core/bitstreams/c024ab94-b0c0-4fd8-a69f-902aa9bfc9cd/content>, here p. 26.

¹⁸ ETUI 2022, p.32–33. In the short term, the volume of work required in Europe could even increase: In order to meet the fleet-wide emission targets for the transition phase until 2030, many manufacturers are relying on hybrid vehicles. This type of vehicle is particularly complex due to the dual drive system and is correspondingly labour-intensive. BCG 2020, p. 9–13.

¹⁹ EP 2021, p. 25.

²⁰ Petr Pavlínek, Transition of the automotive industry towards electric vehicle production in the east European integrated periphery, *Empirica*, November 2022, <https://link.springer.com/article/10.1007/s10663-022-09554-9>.

²¹ This is the assessment of a study commissioned by the Hans Böckler Foundation: Martin Schwarz-Kocher, Martin Krzywdzinski and Inger Korflür (eds.), Standortperspektiven in der Automobilindustrie: Die Situation in Deutschland und Mitteleuropa unter dem Druck veränderter globaler Wertschöpfungsstrukturen, Hans Böckler Foundation, February 2019 (HBS 2019), here p. 131.

²² BCG 2020, p. 14.

²³ Pavlínek 2022, p. 27. Martin Krzywdzinski, Globalisation, decarbonization and technological change: challenges for the German and CEE automotive supplier industry, in Béla Galgóczi (Ed.), Towards a just transition: coal, cars and the world of work, ETUI, Brussels 2019, p. 215–241.

the internal combustion engine sector will not be completely compensated by the parallel growth in the e-powertrain sector.²⁴

However, the change associated with the transition to electromobility will be slower in the CEE region than in Western Europe. All analyses assume that the production of combustion engines will continue much longer in Central Eastern Europe than in Western Europe and will be concentrated there in the future.²⁵ This longer phasing out of combustion engines leads to a certain delay in the occurrence of the negative employment effects associated with the transition to E-mobility. Employment, according to the estimates of CLEPA, will peak around 2030. Nevertheless, a decline in employment in the powertrain sector also in the countries of Central Eastern Europe is to be expected. The impact will be strongest in Romania, where 48% of the jobs in this sector might disappear. Poland is expected to see a 20% decline whereas in the Czech Republic, the number of jobs in the powertrain sector is expected to remain stable.²⁶ The Polish Economic Institutes expects a decline in the production value of conventional powertrains by 35% in Poland and by about 50% in Slovakia and Hungary by 2035. However, according to the institute's optimistic estimate, this will be more than offset by gains in other areas (battery cell production), so that overall a strong increase in production and export values can be expected in the V4 countries.²⁷

THE GREAT IMPORTANCE OF BATTERY CELL PRODUCTION FOR LONG-TERM DEVELOPMENT

The question of how the transition to electromobility will affect the economies of Central Eastern Europe depends to a large extent on whether the region can succeed in attracting battery cell production or, in the case of Poland and Hungary, in maintaining its current excellent position in this area. Due to the characteristics of battery cells, it is expected that battery manufacturing will seek proximity to vehicle assembly (and vice versa). However, battery cell production itself is a highly capital- and energy-intensive process with a high degree of automation and a rather low employment effect.²⁸ The CEE countries are particularly interesting for the East Asian battery cell producers which currently dominate the global market: they offer access to the EU market

at favourable costs and proximity to the big vehicle assembly cluster in the region.²⁹

According to an ETUI study on the transition to electromobility (ETUI 2022), labour and energy costs are the two most important evaluation factors for the choice of location for battery cell production for car manufacturing. Together they account for more than 50% of the evaluation points. Central Eastern Europe countries have very good scores for these two factors. In the overall assessment of all relevant battery location factors, Hungary and the Czech Republic are just behind Germany as the country with the best overall score among the significant automotive producers in Europe.³⁰ Poland, Slovakia and Romania, however, are clearly behind in this assessment, also compared to France and Spain. The lowest score is achieved by Italy.³¹

An overview of the investments made or planned so far in battery cell production in Europe confirms this assessment at least partially. The current leading position of Hungary and Poland in battery cell production capacities in Europe – number 1 and 2 in GWh produced in 2022 – is about to change in the coming years.

Existing and planned battery cell production in Europe
(as of December 2022)

Country	GW
Germany	545
Hungary	217
Great Britain	145
Norway	125
France	121
Italy	118
Poland	115
Sweden	110
Spain	100
Portugal	45
Czech Republic	15
Slovakia	10

Source: <https://battery-news.de/index.php/2022/12/09/batterieproduktion-in-europa-dezember-2022/>

However, these numbers do not consider the possible consequences of the war in Ukraine, which has a significant

²⁴ PriceWaterhouseCoopers, strategy&/CLEPA (European Association of Automotive Suppliers), Electric Vehicle Transition Impact Assessment Report 2020–2040 (PWC 2021), <https://clepa.eu/wp-content/uploads/2021/12/Electric-Vehicle-Transition-Impact-Report-2020-2040.pdf>, p. 38.

²⁵ The share of vehicles with combustion engines - which also includes hybrids - will most likely continue to account for a significant share of vehicle sales worldwide for decades to come. Autozeitung, Der Verbrenner ist ein Goldesel, <https://www.autozeitung.de/verbrennungsmotor-zukunft-hersteller-199971.html>.

²⁶ PWC 2021, PP. 61–68.

²⁷ Polish Economic Institute, Electric vehicle battery exports will triple by 2030, PEI, Warsaw, 26.10.2022, <https://pie.net.pl/en/electric-vehicle-battery-exports-in-the-eu-will-triple-by-2030/>.

²⁸ ETUI 2022, p. 33.

²⁹ Martin Czifrusz, Batterieboom in Ungarn: Perspektiven der Akteure der Wertschöpfungskette, der Arbeitnehmer und der Gewerkschaften, paper commissioned by FES-Budapest, forthcoming.

³⁰ Sweden and Norway have even better ratings due to the availability of cheap green energy, but these countries only have a comparatively small automotive industry.

³¹ Ibid. S. 21–23.

impact on the energy supply of Germany and the countries of Central Eastern Europe. Especially the “land locked countries” in the middle of the continent were strongly oriented towards Russian pipeline gas in their energy supply strategy.³² Alternative supply routes (e.g. for LNG) are costly and difficult to realise in the short term. The conditions for wind energy in the region are worse than in regions nearer to the sea or countries with large coastal shelves. Given the relevance of the energy costs for battery cell production, it is conceivable that these recent events will negatively influence the development of battery cell production in CEE

HOW SHOULD POLITICS AND TRADE UNIONS DEAL WITH THE CHANGE?

The means for politics and economic actors in the EU-CEE region to influence the development of automobile production are extremely limited. The automotive industry in the region is almost completely controlled by foreign firms, especially from Germany. Location and technology decisions of crucial importance are not made locally, but in the corporate headquarters. Since the plants in CEE are essentially assembly sites, hardly any research and development takes place there. Jobs and investments in these areas are much rarer than in Western Europe.³³ These circumstances have a major impact on the way the region can adapt to and influence the upcoming changes in the car industry.

The situation in CEE is characterised by a number of basic factors that remain relevant with regard to the transition to e-mobility:

- The technological innovation capacity in the region is low. This applies both to the factories of the large car manufacturers and to their suppliers in the region. Despite a consistent upgrading of the technological and organisational standards of production and supply in CEE, no innovation impulses comparable to the situation in Western Europe or Germany will emanate from the automotive sector in the CEE countries.³⁴
- The full transition to the production of battery-powered vehicles will take longer than in Western Europe. In the internal division of labour of the large car companies, Central Eastern Europe will function for a long time as a production location for vehicles with combustion engines. There will still be considerable demand for these vehicles outside Europe beyond 2035. The change in employment structures will therefore

proceed more slowly and the number of jobs and turnover in the powertrain sector will even increase temporarily.³⁵

- There is a risk associated with this development: If, in the meantime, successful clusters for the production of battery electric vehicles emerge elsewhere in Europe, the CEE region could be permanently weakened as a production region. The region therefore has a great interest in actively participating in the transition to e-cars from the very beginning. Current investment decisions by German automotive companies in Hungary and Poland indicate that this could succeed.
- Politics has little influence on transnational corporations and their investment decisions. The most important instrument remains subsidy policy, especially for the location of battery cell production, as well as extensive administrative concessions to the demands of important potential investors.
- The greatest danger for Central Eastern Europe as a production location is energy costs and the problem of energy supply. There is a threat of production capacities migrating to locations with better and “greener” energy supplies (not least Spain comes to mind as a large car manufacturing country with a good supply of gas and solar power and considerable hydrogen potential).
- At the same time, the comparative advantages that led to the relocation of car and component production from Western to Central Eastern Europe in the past are still effective today: Lower wages with well qualified workers, EU membership, lower energy prices, proximity to markets, relatively modern production facilities with high productivity. These factors do not fall away with the transition to e-mobility, but must be used in new and different ways.

In this situation, the efforts of politicians and trade unions should focus on the following:

- The governments of the region should strive to bring both battery cell production and the production of e-cars to CEE already now. It also seems possible to make the countries more attractive for battery production by strengthening the extraction of relevant raw materials. For example, there are known larger lithium deposits in both the Czech Republic and Serbia that can be developed, setting standards for more sustainable raw material extraction.
- The availability of skilled workers will become an increasingly important argument for location decisions, especially in the field of battery cell production. Here it is important to focus on education and training ef-

³² <https://www.imf.org/en/Blogs/Articles/2022/07/19/blog-how-a-russias-natural-gas-cutoff-could-weigh-on-european-economies>, 15.12.22.

³³ Pavlínek 2022, here also Table 3 and Table 4.

³⁴ On the upgrading of manufacturing in CEE over the last decades see especially HBS 2019. In Europe taken together, the automotive sector is, according to its own figures, responsible for 32% of the total expenditure on research and development, ACEA 2022, p. 89.

³⁵ CLEPA 2022.

forts and expand retraining opportunities in the existing manufacturing networks. On the other hand, the lower labour demand in battery production (compared to combustion engine components) can alleviate the growing problem of labour shortages in CEE which increasingly threatens to become an obstacle to investment.³⁶

- National suppliers should be generously supported by the state in their attempts to adapt to the changing world in the automotive sector and to develop the new technologies. This also applies to the chemical industry, which is comparatively well developed in the region. Investors, especially those from outside Europe, should be encouraged to locate more R&D functions and higher-value management jobs in the region.
- Skilled workers will also be crucial in the second major change process, the digitalisation of mobility. Here, too, the supply potential must be strengthened and school, tertiary and in-service training in the STEM sector improved. The capacity bottlenecks in Western Europe suggest that higher-skilled R&D activities could also be relocated to CEE in the future; this process must be encouraged and supported.³⁷
- The stable availability of energy at competitive prices will be one of the biggest problems facing the economies of Central Eastern Europe in the post-Ukraine world. At the same time, as very CO₂-intensive economies, they are under pressure from the EU climate targets. Here, it is important to develop and consistently implement sustainable solutions that correspond to the specific conditions of the region.

³⁶ See for these arguments esp. Pavlínek 2022.

³⁷ McKinsey, Rethinking European automotive competitiveness: The R&D CEE opportunity, 23.1.2020, <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/rethinking-europe-an-automotive-competitiveness-the-r-and-d-cee-opportunity>.

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IMPRINT

Publisher:
Friedrich-Ebert-Stiftung Budapest
1054 Budapest | Fővám tér 2–3.
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Editing & Design: pertext, Berlin | www.pertext.de

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ISBN 978-615-6289-31-5

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The economies of Central Eastern Europe are heavily dependent on the automotive sector. The transition to e-mobility is changing production structures and value chains. Engine and transmission manufacturing, which are particularly strong in CEE, are especially affected by this development.



The relevant decisions in this sector are made by the large western automotive groups. Politicians in CEE have relatively little leverage to influence these decisions. Hungary and Poland are now among the major battery producing countries in Europe, but this situation will change as new gigafactories in Western Europe will start production.



Nevertheless, CEE has a good chance to successfully manage the transition to e-mobility. The greatest risk is the impact of the Ukraine war on energy production in the region, which was heavily dependent on Russian pipeline gas. Competitive energy prices are a prerequisite for future competitive battery production.

Further information on the topic can be found here:
<https://eastern-europegrowth.fes.de/>