ANALYSIS

LABOUR AND SOCIAL JUSTICE

THE BATTERY BOOM IN HUNGARY:

COMPANIES OF THE VALUE CHAIN, OUTLOOK FOR WORKERS AND TRADE UNIONS

Márton Czirfusz
February 2023

Hungary has become a global centre of battery manufacturing for electric cars. The value chain, employing around 30,000 people in the mid-2020s, is dominated by East Asian companies.

This study analyses the Hungarian battery value chain companies, working conditions, the policy context and challenges faced by trade unions.

FRIEDRICH EBERT STIFTUNG

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INTRODUCTION

The battery industry in Hungary started to grow in the late 2010s, following investment from primarily East Asian (South Korean, Japanese and Chinese) companies. According to the Hungarian government, 14,000 jobs had been created in battery manufacturing by autumn 2021. This number is expected to double by the mid-2020s. This latest manufacturing boom of the 2010s was driven by the automotive industry, and development has been dependent on German automotive value chains. The dependence on German automotive companies is being reorganised by the growth in the battery value chain, complemented by a new dependence on East Asian companies. The battery industry has also become central in government communication: hyperbolic press releases speak of 'biggest investments ever in Hungarian history'.

There have been relatively few comprehensive studies of the Hungarian battery industry. Academic research has mainly focused on the transition to electromobility in the automotive sector. NGOs have highlighted environmental problems caused by battery cell manufacturers but have not addressed the issue of working conditions. Trade unions have recently started to increase their membership in battery value chain firms. As the idea of the study stems from trade unions, the study puts workers and trade union challenges under the spotlight, evaluating current developments from the perspective of what workers can expect in the future. Methodologically, the analysis builds on different statistical databases, news sources, company reports and websites, together with expert interviews.

This report accompanies a longer Hungarian version.[1] The study is structured as follows:

- An overview of the Hungarian battery value chain, its main players and company backgrounds, including challenges for the Hungarian automotive industry's transition to electromobility.
- Review of current and future employment trends, challenges of vocational training in Hungary, current wage levels and working conditions in the battery industry.
- A discussion of European and Hungarian policy environments, particularly due diligence and supply chain transparency legislation. Analysis of the Hungarian government's investment promotion in the battery sector.
- Challenges and strategies for trade unions specifically in the battery industry, and concerning the green and just transition in general.
- An appendix with key data on companies in the Hungarian battery value chain.

1 Czirfusz, M. (2022): Akkumulátoripari fellendülés Magyarországon: az értéklánc szereplői, dolgozói és szakszervezeti perspektívák. Friedrich-Ebert-Stiftung, Budapest.

2

THE HUNGARIAN BATTERY VALUE CHAIN IN THE GLOBAL AND EUROPEAN DIVISION OF LABOUR

Section takeaways

- Hungary is positioned as a bridge between East Asian battery manufacturers and European automotive OEMs. This leads to a double dependency.
- Hungary is an ideal location for East Asian companies because of access to the EU market and relatively low production costs.
- Battery companies in Hungary cover the whole value chain with the exception of raw material mining and refining. There are no research and development units in Hungarian subsidiaries.
- East Asian parent companies differ in historical background and product portfolio.
- Parts manufacturers primarily supply cell manufacturers in Hungary. Embeddedness of the battery value chain in Hungary is low.
- Parallel to the expansion of the battery industry, the transition to electromobility has also started in Hungarian automotive companies. Companies linked to the conventional powertrain will remain crucial in Hungary, providing stable jobs in the 2020s.

With the transition to electromobility, automotive value chains have been restructuring. **Hungary is positioned as a bridge between Western European automotive companies and East Asian battery companies.** By encouraging battery companies to settle in Hungary, Hungarian industrial policy is consolidating the country's position in automotive value chains. Due to the labour-intensive and low added-value nature of battery production, this transition is a downgrading process in the automotive value chain, rather than an upgrading.[2]

The production value of the economic class 'Manufacture of batteries and accumulators' (NACE 27.20) was 1846 million EUR in Hungary in 2020, the second highest in the European Union after Germany with 4387 million EUR.[3] The growth of the sector in recent years is unique in Europe, accounting for 1.6% of total Hungarian manufacturing value added in 2020.[4]

The battery accounts for 30-50% of the value of electric cars, making it a strategic component in automotive manufacturing.[5]

Hungary and other Eastern European countries are ideal locations for East Asian (mainly Chinese and South Korean) companies that dominate the battery industry, as they provide access to the EU market. Production costs are kept low due to state subsidies for investment, cheap land (particularly important for gigafactories), cheap natural resources (water and energy) and the availability of cheap, flexible labour. Because of the weight of the battery, the factories are located close to vehicle assembly plants. Western European original equipment manufacturers (OEMs) also benefit from the low cost of Eastern European batteries.[6]

Today, the battery value chain is almost complete in Hungary, except for raw material production and refining. East Asian parent companies can be classified as the following main types.

2 Szalavetz, A. (2022): Transition to electric vehicles in Hungary: A devastating crisis or business as usual? Technological Forecasting & Social Change, 184., 122029.

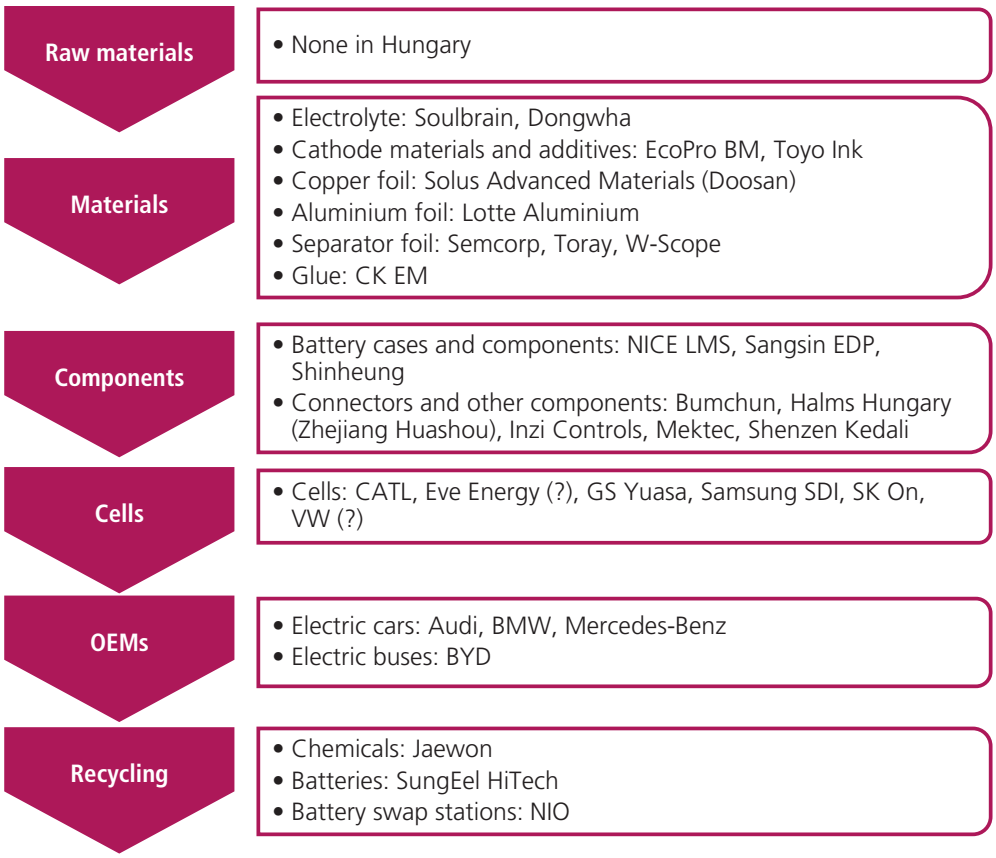
3 Poland was presumably also before Hungary, the 2019 production value in Poland was 2718 million EUR.

4 Eurostat (2022): Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E).

5 Berthold, D., Haug, I., Schade, W. (2022): The future of the automotive sector. Emerging battery value chains in Europe. Report 2022.02. ETUI, Brussels.

6 Pavlínek, P. (2022): Transition of the automotive industry towards electric vehicle production in the east European integrated periphery. Empirica.

Figure 1
The battery value chain and its Hungarian players (as of December 2022)



Source: self compilation, based on HIPA and other news. Unconfirmed investments are marked with (?).

- **Electronics industry players, established during the 1970s and 1980s boom,** initially producing electronic components for the electronics industry and later expanding into the battery industry.
- **Automotive electronics and metal suppliers,** which expanded their product range to batteries, building on their expertise in the automotive industry. Metals companies are either specialised in the automotive industry or are broader spectrum companies.
- **Companies having produced batteries or components for electronic devices,** scaled up to produce batteries or components for electric vehicles and energy storage solutions.
- **Chemical companies with a long history** that have started producing batteries or battery components.
- **New automotive players** emerging in the 2010s, producing only electric cars.

In addition to the plants in operation, Figure 1 lists investments under construction, announced and expected in Hungary.[7] The following discussion introduces parent company profiles and their activity in Hungary.

- **Raw material production** includes the extraction and refining of raw materials used in batteries. The main resources in contemporary lithium-ion batteries are cobalt, lithium, graphite, manganese and nickel. Mineral occurrences are geographically concentrated.[8] Most raw material sources are controlled by Chinese companies and raw materials are processed in China.[9] In Hungary, the only significant local raw material is lithium. Its geothermal extraction is listed as one of the proposed objectives of the Hungarian battery industry strategy.[10]
- **Materials** manufacturers produce the main components found 'inside' battery cells.
  - **Current collector foils** are usually made of aluminium and copper in present technologies. In Hungary, these are produced by South Korean companies. Solus Advanced Materials (formerly Doosan and Volta Energy Solutions) specialised in

7 This part builds on a compilation of data from company websites, the company register, official annual financial reports of the companies, news of the Hungarian Investment Promotion Agency (HIPA) and other media sources.

8 González, A., de Haan, E. (2020): The battery paradox. How the electric vehicle boom is draining communities and the planet. SOMO, Amsterdam.

9 Leutert, G. (2020): Due diligence across the battery supply chain. Global Worker, 2.

10 Ministry of Innovation and Technology (2021): Reference material. A suggested action plan for the Hungarian battery industry with the input of national industrial players. Ministry of Innovation and Technology, Budapest.

the production of copper foils for the electronics industry and has expanded its product range to battery applications. Lotte Aluminium serves various sectors with aluminium products and is part of the Lotte conglomerate. Companies are registered in NACE division 24 (Manufacture of basic metals).

  - **Active materials for electrodes (anode, cathode) and additives** are produced by chemical companies. In Hungary, the Japanese company Toyo Ink will supply carbon fibre cathode additives to SK On's battery plant, and EcoPro BM, a South Korean company, will produce cathode material in Debrecen.
  - Liquid **electrolyte,** a chemical product, is currently used in lithium-ion batteries. Their Hungarian factory is the first site within the EU for two South Korean companies. Dongwha started out as a timber products manufacturer and expanded into the chemical industry, producing electrolyte for the electronics industry. Soulbrain, founded in the 1980s, produces various materials for the electronics industry, including electrolyte for lithium-ion batteries.
  - **Separator foils** are made by plastic manufacturers. Among the confirmed Hungarian investors, Chinese Semcorp is the world's largest manufacturer of separator foils. Toray is a broad-spectrum Japanese chemical company, and Japanese W-Scope's main activity is the production of separator foils.
  - **Glues** are produced by the South Korean company CK EM, a subsidiary of paint manufacturer ChoKwang Paint, founded in 1947.
- Various **components** for batteries are also being increasingly produced in Hungary.
  - Three South Korean companies produce **battery cases and their components.** All three companies have their first EU factory in Hungary. NICE LMS is a broad-spectrum light metals company with automotive, electronics and military products in addition to battery components (the Hungarian subsidiary only produces battery components). NICE LMS is part of the NICE Group, a financial services company. Shinheung is mainly active in the production of battery components; the Hungarian subsidiary sells to the Hungarian Samsung SDI plant. Sangsin started as an electronics supplier in the 1980s and manufactures components for energy storage systems.
  - **Connectors and other components** are produced by South Korean Bumchun and Inzi Controls, Chinese Halms and Shenzhen Kedali as well as Japanese Mektec. Bumchun manufactures components for information technology devices and has expanded into electromobility-related products. Inzi Controls is an automotive electronics company. Halms' parent company (Zhejiang Huashuo Technology Co., Ltd.) and Kedali manufacture aluminium components for the automotive industry. Mektec produces flexible printed circuit boards for the automotive and electronics industries. Hungarian subsidiaries are only active in the battery production sector.
- The largest companies in the battery value chain are **cell manufacturers**. South Korean Samsung SDI is part of the Samsung conglomerate, SK On is a large South Korean chemical company, and Chinese CATL started as an electronics battery manufacturer in the late 1990s. GS Yuasa, which set up a small-scale factory in Hungary, is a Japanese battery manufacturer with almost 130 years of experience. Among the unconfirmed investments, Eve Energy is a Chinese battery company founded in 2001 (with a widely reported site in Debrecen). Volkswagen, with a rumoured investment in Győrszentiván, is a German vehicle manufacturer.
- Among the **OEM manufacturers,** Audi has produced electric motors and powertrain in Győr for several years; electric cars will be manufactured there from 2029. Mercedes-Benz has assembled electric cars in Kecskemét since 2021, with additional models based on two new platforms to be launched in 2024 and 2025. BMW will commence production in Debrecen in 2025 with an electric model. BYD's electric bus factory in Komárom was inaugurated in 2017. Suzuki's Esztergom plant is not expected to produce electric cars before 2025.
- Battery **recycling** will be an expanding field in the coming decade. Two plants of the South Korean chemical company Jaewon recycle chemicals from the SK On Hungary plant. SungEel Hitech specialises in recycling battery waste from Samsung SDI's plant. Electrolyte producer Dongwha also recycles NMP solvents, as does Jaewon. The Chinese electric car manufacturer NIO, founded in 2014, set up a battery exchange station manufacturing location in Hungary.

The importance of Hungarian sites in the company is differentiated. The main groups are the following:

- **Major battery cell companies.** Their Hungarian sites are significant in the global company. Samsung SDI's Hungarian battery factory is their first EU site. SK On's plants in Komárom and Iváncsa are the company's only cell factories in the EU. CATL's Debrecen plant is their second location in Europe. With an annual capacity of 100 GWh the latter will be one of the largest gigafactories in Europe.[11] GS Yuasa is an exception with a comparatively small production site.
- **Hungarian subsidiaries dependent on Hungarian battery manufacturing and being important locations within the parent company.** Revenues of the Hungarian companies are almost 100% domestic, the Hungarian subsidiary is often the first (and in many cases the only) site in the EU. Hungarian pro-

11 Heimes, H. (ed.) (2022): Battery Atlas 2022. Shaping the European lithium-ion battery industry. Production Engineering of E-Mobility Components, (PEM), RWTH Aachen University, Aachen.

Figure 2
Location of the new companies of the Hungarian battery value chain (plants in operation and announced; as of December 2022)

Source: own compilation, based on HIPA and other news

duction is dependent on orders from cell manufacturers in Hungary. Shinheung, Sangsin and Bumchun sell almost just-in-time to Samsung SDI's Göd plant; Nice LMS supplies Samsung SDI and SK On; almost all Inzi Controls' turnover is domestic. SungEel HiTech recycles waste of the Göd plant, Jaewon that of SK's Komárom plant. Electrolyte producers Dongwha and Soulbrain and cathode material producer EcoPro BM will also be crucial for the parent company once production starts. Semcorp's and W-Scope's separator foil plants will be the companies' first site in the EU; which, according to press reports, will also export.

– **Hungarian subsidiaries being contract manufacturer for the parent company.** Copper foil producer Solus Advanced Materials (Doosan's) Hungarian plant accounts for one tenth of the parent company turnover. The copper foil is sold by the Hungarian subsidiary to the parent company, which places orders based on its long-term contracts. Samsung SDI and SK On operate on a similar model, with Hungarian subsidiaries selling battery cells to the South Korean parent company.
– **Hungarian subsidiary linked to a European subsidiary.** Mektec is owned by Mektec's subsidiary in Germany, and not the parent company NOK Corporation. The Hungarian plant sells its products to Mektec Group's subsidiary registered in Germany.
– **Minor-sized Hungarian subsidiary.** This is the case for the foil manufacturers Toray and Lotte: compared to global companies with 50-60 thousand employees, a Hungarian company with 100-200 employees is small. Toyo Ink's Hungarian site will be of similar relative size. NIO's Hungarian battery swap station plant is also a marginal site in the company's production.

Players in the Hungarian battery value chain are concentrated in three regions (Figure 2).

– **Northwest Transdanubia,** one of the central areas of post-1990 reindustrialisation (such as Győr, Komárom and Tatabánya). Cell manufacturing companies include SK On in Komárom, and the rumoured battery factory in Győrszentiván. Main components can all be sourced from the region. BYD, an OEM electric bus manufacturer, is located in Komárom, initially as a supplier to Nokia, which has now left Hungary. Location factors include automotive and manufacturing traditions in Tatabánya, the presence of the electronics industry in Komárom and the well-established chemical industry in Nyergesújfalu. SK On employs several thousand people, while other companies have typically created a few hundred jobs.
– **The wider Budapest area.** This region is home to two cell producers, SK On's Iváncsa factory and Samsung SDI's Göd plant. Electrolyte producers, cathode material producers and component producers have also settled in this area. SungEel's plants recycle waste from the Göd factory. The cell manufacturers employ thousands of people, and materials and components producers employ hundreds of workers. The chemical plants are typically smaller. In the case of Göd, Samsung's unused television factory site was an important factor in deciding its location. The Iváncsa factory is a greenfield investment, while other plants take advantage of the large labour market and favourable transportation connections around Budapest.
– **Eastern Hungary** is becoming a new cluster of the battery value chain, as a consequence of recently announced investments. With the exception of GS Yua-

sa's plant, all of these sites will be large-scale plants with at least 300 employees, with some employing thousands of workers (the separator foil factory in Nyíregyháza will create 1200 jobs, cell manufacturer CATL 9000 jobs). In Debrecen, CATL and the battery value chain may directly supply BMW's electric car plant from the mid-2020s.

Detailed supplier relations are usually not disclosed in investment announcements, and will only be possible to investigate once production has started. No information is currently available on how existing Hungarian companies are being integrated into the expanding battery value chain. However, based on scattered information from various sources and the experience of the electronics industry boom of the past decades, Hungarian-owned companies will possibly play a minor role in the value chain by only providing some services (site construction, cleaning, etc.). **Further analysis would be needed to identify which players could remain in the country long term,** as the sector goes through relatively rapid technological changes. The Hungarian government hopes to stabilise the automotive value chains in Hungary by subsidising investments in the battery value chain.

There is no research and development activity in Hungarian subsidiaries of the battery value chain companies. Research and development are mostly undertaken from their East Asian headquarters.[12] Companies often install high-tech machinery in Hungarian plants, but this does not constitute research and development activity. It is questionable whether the Hungarian research and development ecosystem (universities, research institutes, R&D companies) might be integrated into the Hungarian (or the expanding European) battery value chain, as envisaged by the Hungarian battery strategy.[13]

Hungarian OEM manufacturers' current battery supply strategies are the following:

- Audi does not yet produce electric cars in Hungary. Samsung SDI's Göd factory supplies Audi's other production sites.[14] Volkswagen Group, the Audi parent company, has its own battery manufacturing capacities; one of the possible cell manufacturing locations is near Győr.[15]
- BMW does not intend to produce batteries in large quantities, and will source batteries from external suppliers through long-term contracts.[16] CATL and BMW agreed in September 2022 that CATL will dedicate an annual battery production capacity of 20 GWh in Europe and 20 GWh in China to the BMW group for the Neue Klasse models, launching in Debrecen.[17]
- BYD is able to supply its electric bus production factory with its own batteries.
- Mercedes-Benz will supply its Kecskemét plant from CATL's battery factory in Debrecen. It will also build its own battery production capacity in the future, in a joint venture with Stellantis and TotalEnergies.[18]
- Few details have yet to be disclosed regarding Suzuki's plans for an electric car manufacturing in Hungary.

12 See the financial reports of the companies, as well as Szalavetz, A. (2022): Transition to electric vehicles in Hungary: A devastating crisis or business as usual? Technological Forecasting & Social Change, 184., 122029.

13 Ministry of Innovation and Technology (2021): Reference material. A suggested action plan for the Hungarian battery industry with the input of national industrial players. Ministry of Innovation and Technology, Budapest.

14 GoSaveTime (2021): Audi Battery packs and cells. A comprehensive overview.

15 Kisalfold.hu (2022): Az Audi vezetői egy asztalhoz ültek a győrszentiváni civilekkel – „konstruktív egyeztetésen vettünk részt". kisalfold.hu, október 24.

16 Berthold, D., Haug, I., Schade, W. (2022): The future of the automotive sector. Emerging battery value chains in Europe. Report 2022.02. ETUI, Brussels.

17 CATL (2022): CATL and BMW Group reach framework agreement on cylindrical battery supply.

18 Mercedes-Benz Group Media (2022): Mercedes-Benz expands battery supply partnership with CATL on its way towards going Electric-Only: New production site in Hungary.

3

WORKERS IN THE HUNGARIAN BATTERY VALUE CHAIN: EMPLOYMENT AND SKILLS

Section takeaways

- More than 30,000 jobs will be created across the entire Hungarian battery value chain from the mid-2010s to the mid-2020s.
- The labour shortage poses significant challenges for companies. Labour shortage does not automatically lead to better working conditions or higher wages.
- Total employment in the wider Hungarian automotive industry, including the battery industry, is expected to remain stable over the next two decades.
- The production of electric cars is leading to a foxconnisation of the automotive industry, where the share of unskilled jobs is high, wages are low and employment is highly flexible.
- Current retraining and vocational training programmes in Hungary and in the EU are struggling to provide necessary skills for the battery industry. There is only a partial overlap between vocational training sites and battery plant sites in Hungary.
- Salaries in the Hungarian battery industry are slightly higher than in companies with similar activities in the raw material and component manufacturing sectors. A living wage for assembly line workers can only be achieved with overtime, bonuses and other allowances.

According to data from the former Ministry of Innovation and Technology, **14,000 jobs were created in the Hungarian battery value chain between 2016 and autumn 2021.**[19] This figure will reach 30,000 by the mid-2020s.

The number of employees in the Manufacture of batteries and accumulators (NACE 27.20) has grown rapidly in recent years. Figure 3 also includes employees at Samsung SDI's Göd plant and the launch of production in SK On's Komárom plant. The number of employees has increased in 2021 and 2022.

Apart from SK's two Hungarian companies (SK On Hungary Kft., SK Battery Manufacturing Kft.) and Samsung SDI, some suppliers are also statistically classified in the NACE 27.20 industrial class. **As companies of the value chain belong to different divisions of manufacturing, employment effects on the whole battery value chain cannot be measured in aggregated statistical data.** Even companies in the same chain link are sometimes registered in different subdivisions of the industrial classification. For example, we will see rising employment figures in Copper production (NACE 24.44 – e.g. Solus Advanced Materials) and in the Manufacture of plastic plates, sheets, tubes and profiles (NACE 22.23 – e.g. W-Scope, Toray) in the coming years. Temporary agency workers at companies of the battery value chain are registered in NACE 78.20 (Temporary employment agency services), which further limits the utilisation of aggregated statistics.

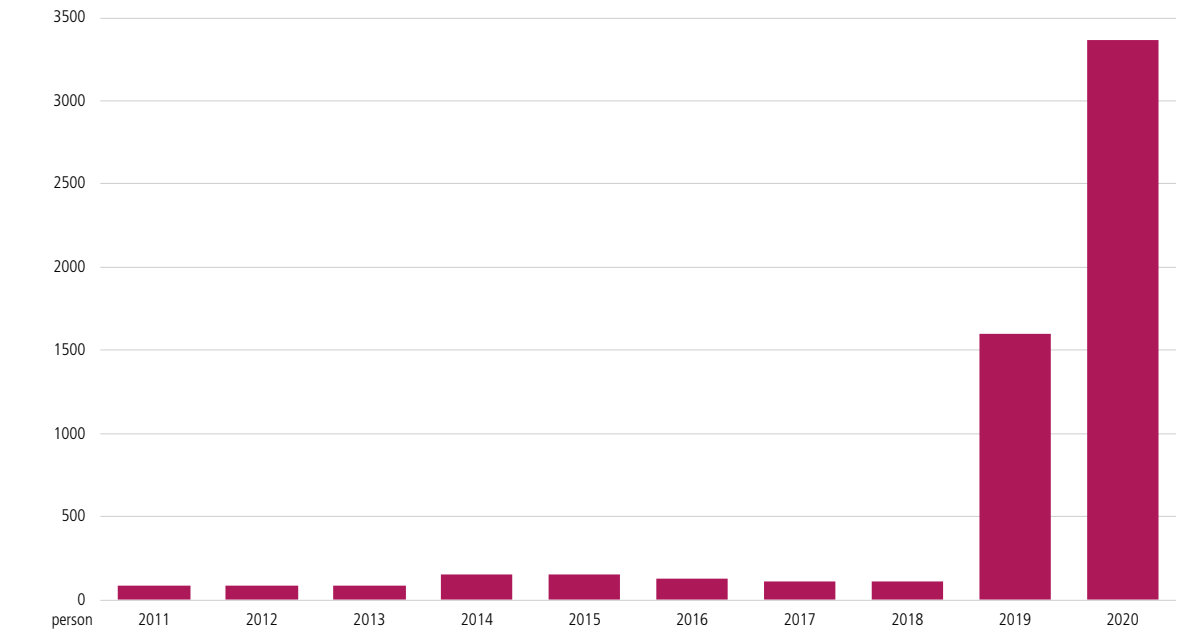
Similar to other countries in the region, securing employees in the labour shortage environment has been problematic due to high fluctuation rates among workers.[20] Workers can be recruited through different company strategies which demonstrate a variegated development of segmented labour markets.

- **Attracting local workers with higher salaries, wider employee benefits and better working conditions.** Most players of the battery value chain

19 Kaderják, P. (2021): The Hungarian Battery Industry Strategy 2030. Hungarian Battery Day, Budapest.

20 Pavlínek, P. (2022): Transition of the automotive industry towards electric vehicle production in the east European integrated periphery. Empirica.

Figure 3
Number of employees in the manufacture of batteries and accumulators (NACE 27.20, full-time equivalents)



Data source: Hungarian Central Statistical Office Dissemination database.

have moved to manufacturing centres, where unemployment was already low and labour shortage is commonplace. Companies are attracting workers from each other in the wider functional urban areas (e.g. Tatabánya–Komárom–Győr; Debrecen–Nyíregyháza). The clustering of battery companies means that labour is often attracted from other value chain companies. Hungarian-owned small and medium-sized companies are likely to be the losers in the continuous flow of workers between firms.

– **Increasing the catchment area with company bus services.** Workers may be secured by provision of free company bus transfer from settlements further from the plant (see Figure 4 for Samsung SDI). This strategy is feasible for larger companies, especially cell manufacturers. Nevertheless, battery companies are entering already saturated labour markets. Also in new industrial locations, such as the Debrecen area, the labour pool for manufacturing companies is limited. In Komárom, cross-border commuting of Hungarian-speaking workers from Slovakia has a long tradition; at SK's plant, the share of Slovak nationals is around 20%.[21] However, salaries earned in Hungary are in a continuous devaluation in EUR, the currency in Slovakia, which makes the cross-border recruitment strategy vulnerable.
– **Recruiting Hungarian nationals through temporary agencies.** One of the possible solutions to the labour shortage is recruitment from Hungary, the classical domestic direction being migration from the East to the Northwest and the Budapest agglomeration. This process is severely constrained by the rising cost of housing (especially house prices, as more than 90% are homeowners), which makes it almost impossible for an assembly worker to cover housing costs. In many cases, temporary agencies also provide accommodation for domestic manufacturing employees.
– **Recruiting foreign nationals through temporary agencies.** The Hungarian government has made it easier to employ workers with Serbian and Ukrainian citizenship in certain occupations, which include many jobs in the battery value chain. Ukrainian workers are commonplace in companies in the battery value chain, a case in point being the high proportion in Samsung SDI's Göd factory.[22] Agencies selected by the government can hire workers from fifteen countries in all jobs without a work permit. Jobs in the Hungarian automotive and the electronics industry are becoming less attractive to Ukrainian nationals, as higher wages are available in The Czech Republic, Poland, or Western Europe. Agencies see recruitment from Southeast Asia as a promising option, given the automotive and electronics manufacturing experience of workers in that region.[23]
– **Recruiting through 'school cooperatives'.** Young people, especially during tertiary education, often work through 'school cooperatives' which are similar to temporary work agencies. As the cost of living for

21 dr. Ruppert Márton – Interjú: Zöldmezős sorozat beruházás | recruiTECH BLUE.

22 Tamásné Szabó, Zs. (2021): Rengeteg ukrán munkahelyét „védi" a kormány a gödi Samsung-gyárban, ahol helyiek alig dolgoznak. 24.hu.

23 On details see: Czirfusz, M. (2022): Regional Risk Assessment. The Electronics Industry in Hungary. Electronics Watch, Amsterdam.

students rises and the number of foreign students in higher education increases, these groups can offer battery companies a cheap, flexible workforce that is less protected by labour law. Debrecen, as a university town and a centre for the battery industry, could be a prime location for this form of employment in the coming years.

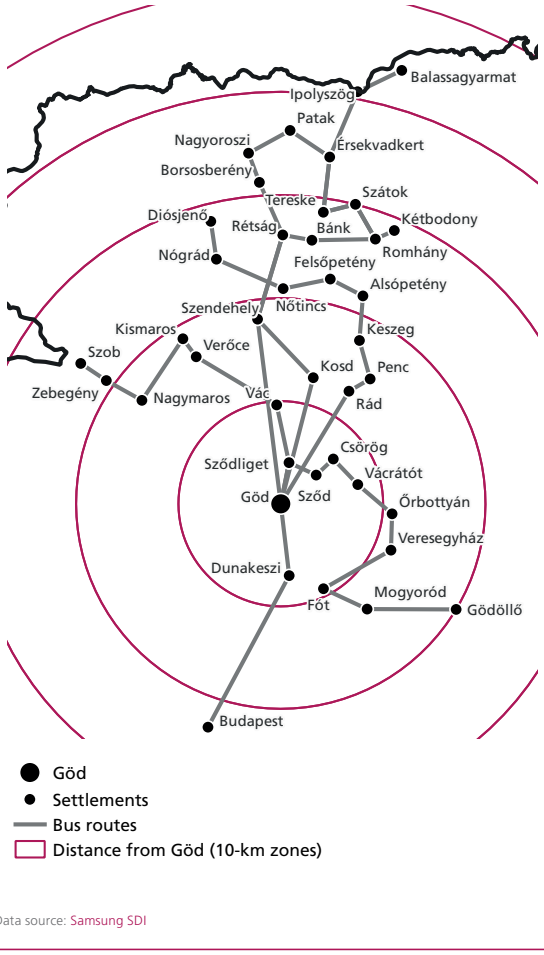
Estimates and projections of the employment impact from the transition to electromobility are mixed. The figures reported for Europe (or the European Union) predict contradictory outcomes. European estimates rarely include calculations at the national level; at most, they provide figures for Eastern Europe as a whole.

Demand-side estimates calculate employment impacts based on the expected future number of electric and hybrid cars. Fraunhofer ISI's 2020 figures estimate 400–1000 GWh/year battery manufacturing demand for European car manufacturing.[24] This will be reached through projects announced until 2022. Estimates made for the European Association of Automotive Suppliers (CLEPA) calculated employment impacts in powertrain value chains between 2020 and 2040. Employment in Eastern Europe could rise or stagnate if the phasing out of the conventional powertrain is slow, but could fall dramatically if electric powertrain is adopted quickly. Hungary was not included in national level estimations.[25] Boston Consulting Group estimated that employment figures in the automotive industry will be almost the same in 2030 as in 2019, with 5.6 million workers in Europe.[26]

Supply-side estimates calculate employment figures based on the labour intensity of known battery manufacturing capacities. For 2030, 900 GWh / year capacity was announced by mid-2022, which might be potentially scaled up to 1200–1800 GWh later on.[27] Current cell factories produce 1 GWh / year with 58 workers,[28] which is projected to decrease to 30 workers by 2030.[29] **Hungarian cell manufacturing is relatively labour intensive,** CATL's Debrecen gigafactory, starting production in 2025, will produce 1 GWh / year with 90 workers.[30]

Skills needed in the transition to electromobility, including battery manufacturing, are also changing. This is due to different factors. Firstly, the production of electric cars is less labour-intensive than that of combustion engine vehicles. In Hungary, Audi's engine plant in Győr and conventional powertrain suppliers are significantly affected by this change. Secondly, parts of battery production are highly automated, although cell production remains relatively labour-intensive.[31] Finally, electric car production necessitates less skilled workers. Battery production, especially, is characterised by deskilling processes and a large share of unskilled jobs, similar to the electronic industry. This change is described as the **foxconnisation of automotive manufacturing**.[32]

Figure 4
Company bus routes of Samsung SDI's Göd factory (November 2022)



Data source: Samsung SDI

24 Michaelis, S., Rahimzei, E., Zienow, J., Persichetti, A. (2020): Roadmap Batterie-Produktionsmittel 2030 (Update 2020). VDMA Batterieproduktion, Frankfurt am Main.

25 PwC Strategy& (2021): Electric Vehicle Transition Impact Assessment Report 2020–2040. A quantitative forecast of employment trends at automotive suppliers in Europe.

26 Kuhlmann, K., Küpper, D., Schmidt, M., Wree, K., Strack, R., Kolo, P. (2021): Is E-mobility a Green Boost for European Automotive Jobs? Boston Consulting Group.

27 Thielmann, A., Neef, C., Hettesheimer, T., Ahlbrecht, K., Ebert, S. (2021): Future Expert Needs in the Battery Sector. Report March 2021. EIT Raw Materials GmbH, Berlin.

28 Berthold, D., Haug, I., Schade, W. (2022): The future of the automotive sector. Emerging battery value chains in Europe. Report 2022.02. ETUI, Brussels.

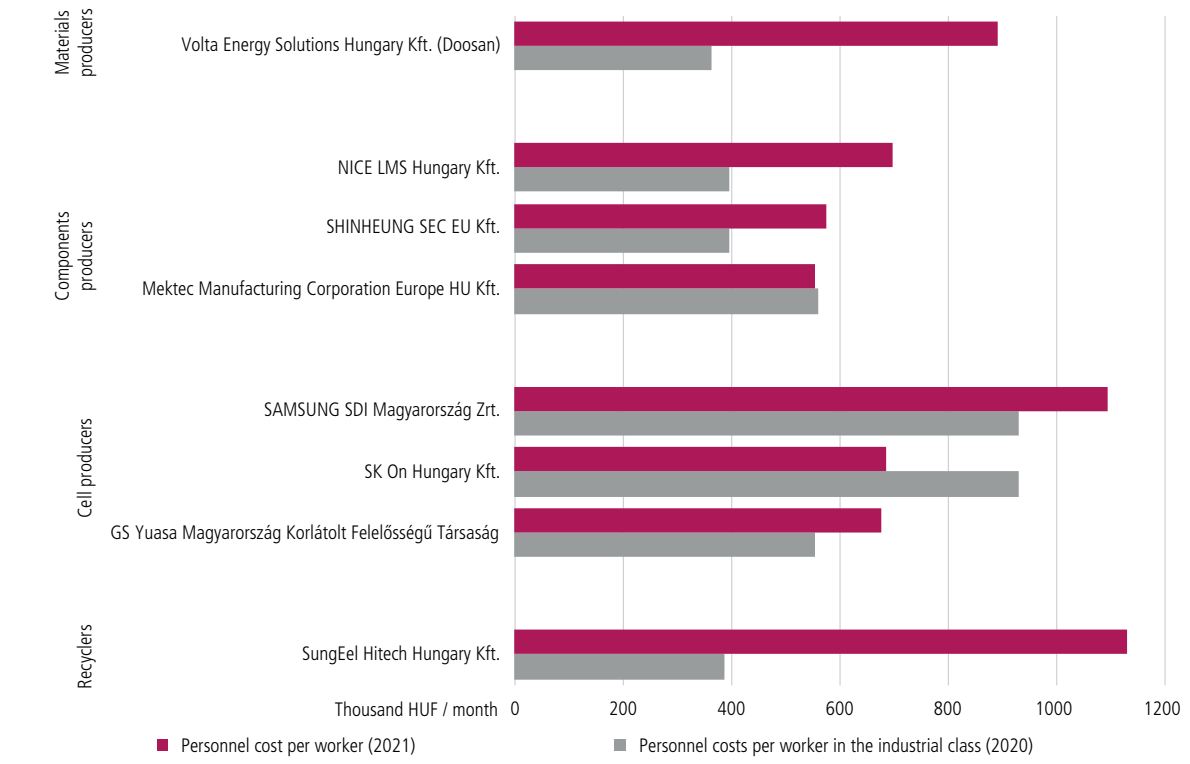
29 Thielmann, A., Neef, C., Hettesheimer, T., Ahlbrecht, K., Ebert, S. (2021): Future Expert Needs in the Battery Sector. Report March 2021. EIT Raw Materials GmbH, Berlin.

30 HIPA (2022): CATL's New Battery Plant To Become Hungary's Largest Greenfield FDI Project Ever.

31 ALBATTS (2021): Sectoral Skills Intelligence and Strategy for the European Battery Sector. Deliverable D3.6 Analysis of Sectoral Intelligence – Release I.

32 Lüthje, B. (2022): Foxconnisation of Automobile Manufacturing? Production Networks and Regimes of Production in the Electric Vehicle Industry in China. In: Teipen, C., Dünhaupt, P., Herr, H., Mehl, F. (eds.): Economic and Social Upgrading in Global Value Chains. Palgrave Macmillan, Cham.

Figure 5
Wage levels in companies of the Hungarian battery value chain (thousand HUF/month)



Data sources: annual company reports, Dissemination database of the Hungarian Central Statistical Office

The composition of the workforce is also an important feature of battery production.[33] According to reliable estimates, the share of blue-collar workers is around 72.5% in the whole battery value chain and 80-90% in cell production. The latter corresponds with figures for the Hungarian companies. One of SK's Hungarian subsidiaries employs 70% physical workers, with 70% of Samsung SDI's employees work on the assembly line.[34]

The European Commission estimates that 800,000 people in the EU will need to be retrained in the battery value chain by 2025.[35] Currently, there are difficulties in retraining throughout the whole value chain, especially at technician level. Vocational training in the battery industry is extremely limited across EU member states. **In Hungary, the battery industry strategy foresees the retraining of 40,000 people by 2025.**[36] This number may cover the real needs, but experts do not see this retraining capacity in the vocational and adult education system.

In Hungarian vocational education and training, basic knowledge on electromobility is mainly provided in machinery and vehicle manufacturing curricula. Curricula in the chemical sector will not provide the necessary specialists for battery production. In the electronics and electrotechnology sectors, the specific skills needed for battery production, such as high voltage skills, are absent. Some dual training programmes are also based on cooperation with battery manufacturing companies, for example the Vocational Training Centre in Vác and Samsung SDI in Göd. As vocational training is lacking in several locations of the battery value chain, the embeddedness of the companies in local labour markets will be limited.

Foreign (third country) nationals are increasingly being attracted to 'solve' the labour shortage in unskilled jobs, such as machine operators or assemblers. 'Importing' migrant workers through temporary work agencies is seen as more expedient and cheaper by the government than providing training for disadvantaged, low-skilled workers in Hungary.[37]

33 Dispan, J., Meißner, H-R. (2011): Elektromobilität. Wirkungen auf regionale Wertschöpfungsketten und auf die Beschäftigung in Baden-Württemberg. IG Metall Bezirksleitung Baden-Württemberg, Stuttgart.

34 Tamásné Szabó Zs. (2021): Rengeteg ukrán munkahelyét „védi" a kormány a gödi Samsung-gyárban, ahol helyiek alig dolgoznak. 24.hu.

35 European Commission (2021): Statement by Vice-President Šefčovič on the second IPCEI on batteries in the context of the European Battery Alliance.

36 Ministry of Innovation and Technology (2021): Reference material. A suggested action plan for the Hungarian battery industry with the input of national industrial players. Ministry of Innovation and Technology, Budapest.

37 On third-country electronics industry workers and their vulnerability, see: Czirfusz, M. (2022): Regional Risk Assessment. The Electronics Industry in Hungary. Electronics Watch, Amsterdam

Some companies of the Hungarian battery value chain were already established in 2021, so data on salaries is already available. Figure 5 shows the salaries of some companies with significant production in 2021 and average salary levels in 2020 in the respective industrial class (four-digit NACE sector). The data only allows for indicative comparisons.

Wage levels at material producers and recyclers are higher than the sector average. Wages at component manufacturers are at or slightly above the sectoral average. Among battery cell producers, Samsung SDI has higher personnel costs per worker than SK On and GS Yuasa. Samsung SDI's annual report also gives data on average personnel costs for physical workers, which is broadly in line with the sector average. As data includes salaries paid to own employees, differences at the two large cell manufacturers are also affected by temporary agency work. Agency workers are present in significant numbers at Samsung SDI, but not at SK. Samsung SDI and SK On account for a dominant share of the workers in the Manufacture of batteries and accumulators industrial class (NACE 27.20) nationally, so a convergence between company figures and the sector average is expected.

The share of personnel costs in company turnover varied significantly across the value chain. **For the two large cell manufacturers, personnel costs accounted for 4.4-6% of turnover.** These figures might change as expansion of the plants concludes, production reaches full scale and employment levels stabilise.

Temporary agency work is common practice in companies of the battery value chain and is likely to grow in the coming years. Exact data on the number of temporary agency workers in each company is unavailable, but expenditure is reported by some firms. For example, at Samsung SDI, the ratio of direct workers' personnel costs and expenditure on agency workers were 10:6; at INZI Controls and Shinheung, 10:3 to 10:4. SK, on the other hand, recruited 1400 direct workers for its Komárom plant and no indirect workers. [38] Temporary agency workers are legally entitled to the same salaries as direct workers in Hungary. At the same time, temporary agency workers often receive free accommodation which improves their salary package compared to direct workers.

Assembly line workers can earn a living wage only with overtime work and bonuses. Relatively low basic salaries are 'compensated' with bonuses and fringe benefits; jobseekers even look for overtime opportunities in job advertisements and count on bonuses. [39] Continuous production is standard among cell manufacturers and some suppliers, cell manufacturers have 12-hour shifts in assembly. Some suppliers offer increased bonuses above the minimum set by the Labour Code: for example, up to 60-80% for night work instead of the legal minimum of 30%. In autumn 2022, operator jobs at the two large cell manufacturers were advertised with gross hourly wages of 1800-1900 HUF, and 1700-2100 HUF at suppliers.

Occupational health and safety is a crucial issue in the battery industry. Almost all steps in battery production involve increased occupational health and safety risks, except installation in cars. The increased exposure to chemicals is relatively unknown for workers previously employed in the automotive or electronics industries. In recent years, several cases of occupational health and safety risks or issues have been identified at large Hungarian cell manufacturers.[40]

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38 dr. Ruppert Márton – Interjú: Zöldmezős sorozat beruházás | recruiTECH BLUE.

39 On details see: Czirfusz, M. (2022): Regional Risk Assessment. The Electronics Industry in Hungary. Electronics Watch, Amsterdam

40 Bodnár, Zs., Szopkó, Z. (2022): Samsung's battery factory in Göd fined for seriously endangering its workers. Atlatszo; Bodnár, Zs., Mayer, V. (2022): Astronomical government investments in battery production continue – But at what price? Atlatszo.

4

POLICY ENVIRONMENT

Section takeaways

- EU strategies and the EU-level policy environment are generating additional demand for electric cars, including the products of battery manufacturers in Hungary.
- The EU industrial policy aims to establish a battery value chain of EU players. The Hungarian government's battery strategy aims to build a parallel value chain.
- EU and Member State legislation on due diligence, batteries and supply chain transparency could contribute to better working conditions for the Hungarian battery industry in the medium term, despite the shortcomings of the legislation.
- The Hungarian government is supporting the development of the battery value chain with the same instruments as in other sectors. Cash grants to companies have already exceeded HUF 200 billion. The government has spent even more on infrastructure development for the investments than on cash grants.
- Investment support in the battery industry allows battery companies to get a faster return on their investment. In contrast, workers' needs are considered neither by the central state nor by municipalities.

The EU policy environment for the battery industry is built on **strategic documents of the green transition.** These include the European Green Deal, [41] which aims to transition to net zero greenhouse gas emissions by 2050, necessitating investments in batteries, the Fit for 55 Package, which accelerates the transition towards alternative fuel cars, thereby increasing demand for batteries,[42] and the REPowerEU plan[43] of 2022, which aims at transitioning towards clean energy sources. This latter will be particularly challenging as the energy needs of the Hungarian battery production cannot be covered from sustainable sources.

Various industrial organisations are helping to implement EU strategies related to batteries. **The European Battery Alliance, established in 2017, is the most important pan-European player in the sector.** Parent companies (Dongwha, EcoPro BM; OEM manufacturers BMW and Daimler AG) or German subsidiaries (CATL, Samsung SDI, Toray) of battery value chain firms in Hungary are members of the European Battery Alliance. Domestic Hungarian members include the state-owned energy holding MVM and the electronic industry player Videoton, which also produces batteries for household electronic appliances.[44]

A rediscovered instrument of EU industrial policy is the **'Important Projects of Common European Interest' (IPCEI).** State aid for IPCEI projects is compatible with internal market rules. **IPCEI Batteries and IPCEI European Battery Innovation (EuBatIn) are two initiatives in the battery industry** which aim to strengthen research and development by EU-based companies. BMW is the only Hungarian battery value chain company participating in the collaboration, developing lithium-ion battery cells and setting up a pilot cell production plant.[45] Therefore, BMW is disembedding the company from the value chain dominated by East Asian firms in the long term.

The Hungarian government's battery strategy is based on a bridge position between East Asian players and German OEMs. It is still unclear whether companies resided in Hungary will integrate into the 'European' value chain in the future, or rather, the Hungarian government's aim is not to enter the European Battery Association's 'strategic cartel'.[46]

A similar organisation to the European Battery Alliance at the national level is the **Hungarian Battery Alliance (HUBA),** also a member of the European Battery Alli-

41 On details see the European Commission website.
42 On details see the European Council website.
43 On details see the European Commission website.
44 On details see the EBA250 website.
45 On details see the IPCEI Batteries website.
46 The term is used for the European Battery Alliance by Pichler, M., Krenmayr, N., Schneider, E., Brand, U. (2021): EU industrial policy: Between modernization and transformation of the automotive industry. Environmental Innovation and Societal Transitions, 38., 140–152.

ance. HUBA was established with the support of the former Ministry of Innovation and Technology to represent the interests of the Hungarian players in the battery value chain.[47]

Apart from strategic documents and industrial alliances, EU legislation is also affecting battery value chain development. From the wide range of EU legislation, **due diligence and value chain transparency legislations will be decisive for the development of the sector in the coming years.**

The principle of due diligence states that companies should take steps to avoid actual or potential adverse impacts during their operations. More specifically, due diligence refers to respecting human rights in corporate operations, such as ensuring labour rights throughout the supply chain.

At international level, due diligence is based on United Nations, OECD and ILO guidelines. Within the EU, the due diligence directive will be decisive for company operations. **The European Commission's proposal on the due diligence directive** covers all sectors and whole supply chains, for both human rights and environmental due diligence, aimed at companies above a certain size.[48] **All Hungarian battery industry players are expected to be directly or indirectly subject to the due diligence directive if it is adopted in its current form.** Cell manufacturers and major materials producers (the latter especially if they have several European plants) will be direct subjects of the directive, if they employ at least 500 people (including agency workers) and their net global turnover is above 150 million euros. Smaller companies, such as component manufacturers will be subjects of the legislation, because they are supplying other firms being direct subjects of the directive. However, the impact of the directive in Hungary may be limited, because enforcement will be member state competence, meaning that monitoring, sanctioning and compensation of victims will depend on the functioning of Hungarian authorities and courts.

In addition to the EU's due diligence directive proposal, **the proposed batteries directive could also have a major impact on the Hungarian battery industry.**[49] Supply chain due diligence is one of thirteen measures in the proposed regulation. From the perspective of the Hungarian battery industry, the draft regulation is disadvantageous, as it focuses on due diligence during the extraction and refining of raw materials rather than the whole value chain, including cell production. The harmonisation of national law with the new regulation will be decisive in how workers in the Hungarian value chain are protected.

Due diligence has been introduced in national legislation of European countries.[50] Among them, **the German 'supply chain law' (Lieferkettensorgfaltspflichtsgesetz – LkSG; shortly Lieferkettengesetz[51]) will have a major influence on the Hungarian manufacturing industry, including the Hungarian battery value chain.** German automotive OEMs are direct subjects of the law, so if batteries made in Hungary are used in cars manufactured by these companies, the law could also affect workers in Hungarian cell plants.

The Hungarian government is supporting the domestic development of the battery value chain with the same instruments as in other sectors and in previous years. State aid for investments is of a similar amount to other Eastern European countries, such as Poland. Large cell manufacturers, as flagship projects, secured state aid between 100 million and 200 million euros.[52] Main forms of subsidies are the following:

- cash grants, mostly through the VIP cash subsidy scheme,
- various grants, sometimes awarded to all applicants,
- tax credits,
- soft loans,
- public investments, typically infrastructure developments.

The total amount of cash grants, grants, tax credits and soft loans awarded to battery industry players has already exceeded 200 billion HUF.

Table 1 shows the investments in which the government has already decided on **VIP cash subsidies.** The table does not include state aid for investments by automotive suppliers for the transition to electromobility. In total, the government has awarded nearly 190 billion HUF state aid for over 1,500 billion HUF investment since 2018, meaning that **the Hungarian government has directly paid one eighth of battery value chain investments.** For some investments, the shares seem relatively high due to dividing investments and cash grants into several phases. Such is the case of BMW, where the total investment is worth 2 billion EUR, approximately 800 billion HUF, instead of the 34.6 billion HUF investment part listed in the table. Typical state aid intensities range between 10 and 20%.

Most of the state aid granted by individual government decisions is considered compatible with the EU internal

47 On details see the organisation's website.

48 European Commission (2022): Proposal for a Directive of the European Parliament and of the Council on Corporate Sustainability Due Diligence and amending Directive (EU) 2019/1937.

49 European Commission (2020): Proposal for a Regulation of the European Parliament and of the Council concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020.

50 For a comparison see: ECCJ (2022): Comparative table: Corporate due diligence laws and legislative proposals in Europe.

51 On the law and its preparation see the summary of the ministry.

52 Investments might be divided into several phases. For the list of the largest Eastern European projects see: Pavlínek, P. (2022): Transition of the automotive industry towards electric vehicle production in the east European integrated periphery. Empirica.

Table 1
VIP cash subsidies for investments in the Hungarian battery value chain, as of November 2022

Value chain	Company name	Investment value (billion HUF)	VIP cash subsidy (billion HUF)	VIP cash subsidy share	Decision year
Materials	Volta Energy Solutions Hungary Kft. (Doosan)	31.3	4.7	15.0%	2020
	Volta Energy Solutions Hungary Kft.	75.1	8.5	11.3%	2021
	LOTTE ALUMINIUM Hungary Kft.	44.2	1.1	2.5%	2022
Compo-nents	Bumchun Precision Hungary Kft.	13.3	2.7	20.0%	2020
	INZI Controls Hungary Kft.	14.8	1.6	11.0%	2020
	Mektec Manufacturing Corporation Europe HU Kft.	6.4	0.6	10.0%	2020
	SHINHEUNG SEC EU Kft.	3.1	0.8	25.0%	2019
Cells	GS Yuasa Magyarország Kft.	8.8	0.5	5.3%	2019
	SAMSUNG SDI Magyarország Zrt.	5.9	1.2	21.0%	2020
	SAMSUNG SDI Magyarország Zrt.	367.4	33.7	9.2%	2021
	SK Battery Hungary Gyártó Kft.	97.5	8.2	8.4%	2018
	SK Battery Manufacturing Kft.	199.1	28.5	14.3%	2021
	SK On Hungary Kft.	592.6	76.4	12.9%	2021
OEMs	AUDI HUNGARIA ZRt.	41.2	6.4	15.5%	2019
	BMW Manufacturing Hungary Kft.	34.2	12.3	36.1%	2018
	BYD Electric Bus&Truck Hungary Kft	6.2	0.9	14.8%	2018
Total		**1541.0**	**188.0**	**12.2%**	**–**

Data source: Hungarian Government (kormany.hu)

market.[53] However, **some state aid for battery value chain investments had to be authorised by the European Commission because of their size.**

- **The approval process of the 33.7 billion HUF (108 million EUR) state aid for Samsung SDI, launched by the government in May 2018, is still ongoing.** The preliminary assessment by the EU concluded that state aid was not necessary to attract investment to Hungary and that the government could divert the investment away from a less developed Polish region – which is prohibited. In addition, the Commission could not rule out that the Göd investment was linked to the closure of a small cell production plant in Austria.[54] To support Samsung SDI's investment in Göd, the government also changed the regional aid map, which was approved by the European Commission.[55] If this change had not been made, no investment in Göd would have been eligible for such state aid.
- The European Commission investigated the 28.5 billion HUF **state aid to SK** for the expansion of the Komárom plant. This was approved in 2021, as was the 76.4 billion HUF subsidy for the construction of the Iváncsa plant in 2022.
- Toray's 4.7 billion HUF investment subsidy was also approved by the European Commission, but this cash grant is missing from the government database.

The second group of subsidies is various grants. The scheme with primary relevance in past years both in the battery industry and in other sectors was the Subsidy to improve competitiveness. This scheme was launched during the COVID-19 pandemic to support new investment and 'job retention'. SK (Komárom and Iváncsa plants), Samsung SDI and GS Yuasa all received more than 100 million HUF from this scheme. Details of the grants are presented in the Appendix. **Training grants from the National Employment Fund** are also available for battery value chain companies to reduce investment costs by subsidising training of the workers. For example, SK Battery (Komárom plant) received 188.6 million HUF in 2020 for this purpose.

Third, a development tax incentive is available for investors to reduce corporate income tax. Toray has received such a tax incentive for its 130.8 billion HUF investment: between 2023 and 2032, the company can reduce its corporate tax payable by a total of 16.9 billion HUF.[56]

53 The regulatory background is the Commission regulation (EU) No 651/2014.

54 See the details in the European Commission database.

55 For details see SA.46346 (2016/N) Amendment to the regional aid map for Hungary (2014-2020) for the period 2017-2020.

56 On the scheme, see the summary by PwC. On the Toray case, see the European Commission database.

Fourth, investment costs can be reduced through soft loans from public sector financial institutions. Shinheung (2.89 billion HUF) and SungEel Hitech (178.6 million HUF) both received such preferential loans from EXIM Hungary, the Hungarian export credit agency.[57]

Soft loans are also provided by international financial organisations.

- Volta Energy Solutions Hungary Kft. (formerly Doosan, a subsidiary of Solus Advanced Materials) received a 28 million USD loan from the European Bank for Reconstruction and Development (EBRD) in November 2021 for the expansion of its copper foil plant in Tatabánya. The company carried out an environmental and social impact assessment and committed to the introduction of a collective agreement within five years.[58]
- Preferential loans can be provided by parent companies. SK On's parent company, for example, received a 2 billion USD loan in mid-2022 in the form of loan guarantees and insurance from three export credit agencies (Euler Hermes, Korea Trade Insurance Corporation, Export-Import Bank of Korea). SK On intends to use the funds for its Iváncsa investment in Hungary.[59]

Fifth, infrastructure development financed by the central government and municipalities reduces the cost of battery investments. These may include the preparation of industrial sites as well as the construction or extension of network infrastructures (electricity, gas, water, sewage). Calculating the amount of such subsidies is relatively difficult, because the relevant government legislation is subject to frequent amendments (e.g. due to cost overruns), and some investments benefit not only battery value chain companies but also other companies or the general public. For example, for SK's Iváncsa plant, the government decided in 2021 to develop water pipelines, the local electric power system, roads and railways, totalling approximately 90 billion HUF.[60] Compared with the company's investment of 681 billion HUF, this is of significant value, even exceeding the 76.4 billion HUF VIP cash grant received by the firm. Samsung SDI's Göd development is supported by infrastructural development of 32 billion HUF, SK's Komárom factory will be supplied with water after a 12 billion HUF infrastructural development.[61] Debrecen's Southern Economic Zone where Semcorp, EcoPro BM and CATL will be located, is being developed from 87.8 billion HUF government funding, in addition to previous industrial park development financed from EU subsidies.

In total, the government provides more indirect funding through infrastructure development for battery value chain companies than the approximately 200 billion HUF direct subsidies.

Investment promotion in the battery industry is the responsibility of several ministries within a fragmented structure. In addition to the ministries, the Hungarian Investment Promotion Agency (HIPA) assists foreign investors in a one-stop shop service model.

The government and HIPA see Hungary as a homogeneous country; there is no evidence of regional development thinking in the location of investment, apart from the clustering of value chain companies. Local communities are not involved in decision-making about locations; investments are not linked to local economic development strategies. Directing battery value chain investments to reindustrialised areas and new centres, such as Debrecen, **lead to huge challenges for local economic and social policy, as local 'resources' are not available.** Most investments are greenfield, built on arable land, which is questionable from an environmental sustainability point of view. Provision of water and energy (electricity, natural gas) involves significant public investments and deprives local communities of local ecosystem services, such as by exploiting water resources. The provision of 'human resources', i.e. workers, is also limited. Neither the central state nor municipalities provide the conditions for the social reproduction of workers, such as housing, public services for a growing population and vocational training.

State aid for investment in its various forms leads to a faster return on investment for battery companies. There is no impact assessment on whether social and environmental benefits, such as supporting the green growth, outweigh social and environmental costs, such as pollution, environmental dispossession as well as long-term damage to the health of workers and residents.

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57 See the details in the European Commission database.

58 See the whole document on the EBRD website: Volta Energy Solutions Hungary Kft.: Non-Technical Summary.

59 Részletesen lásd: SK On (2022): SK On secures USD 2 billion as investment funds for battery business in Europe.

60 Bodnár, Zs., Mayer, V. (2022): Astronomical government investments in battery production continue – But at what price? Atlatszo.

61 Bodnár Zs. (2021): Újabb tízmilliárdok Mészáros Lőrinc cégeinek a gödi és a komáromi iparterületek közműfejlesztéseire. Átlátszó.

5

CHALLENGES AND STRATEGIES OF WORKER REPRESENTATION

Section takeaways

- Building trade union membership in a greenfield context might be challenging in the battery value chain.
- The participation of Hungarian trade unions in global union federations will be of increasing importance, as battery value chains are becoming global.
- Building on due diligence principles and regulations might improve working conditions in the Hungarian battery industry.
- Trade unions could manage issues such as workplace violence, occupational health and safety, and vocational retraining in the short term.
- New worker demands may emerge during a green and just transition in some workplaces, such as early retirement and reduction of working hours without pay cuts.
- Trade unions can be effective advocates for a just transition as a social change, including articulating demands towards the state.
- Strong trade union advocacy for a just transition requires additional organisational capacities.

The development of the battery value chain in Hungary poses new challenges for employee representation. Challenges and strategies in the short and long term are summarised here, based on interviews, and both domestic and foreign examples.

Among the short-term challenges and issues, the first is the **challenge of building trade union membership in a greenfield environment.**

- Some parent companies of battery value chain firms in Hungary do not respect the freedom of association and obstruct the establishment of trade unions. This interference was reported at Samsung's Hungarian electronics subsidiary for example.[62] There is also no trade union at Samsung SDI's Göd factory.
- Fluctuation of worker numbers is challenging for trade unions, leading to constant erosion of membership. If, however, workers are hired by other battery value chain companies in the region, previous membership might be advantageous when building new local branches.
- Building membership is hampered by the high proportion of temporary agency workers and foreign workers at many companies. It has become difficult for trade unions to build and maintain worker solidarity; trade unions would need additional capacity to organise non-Hungarian workers.
- A lack of experience with East Asian companies as employers is also often mentioned as a challenge. The lack of experience sometimes leads to generalisations that it is more difficult to negotiate with Chinese or South Korean companies. East Asian companies have varied company cultures of employee-employer relations, and even Hungarian subsidiaries have different positions within the parent company or the value chain – having an impact on trade union bargaining power.

Second, with the development of the global battery value chain, **the participation of Hungarian trade unions in global trade union federations, such as IndustriALL, is becoming more valuable.** During the Hungarian reindustrialisation of the 2010s, European trade union contacts were developed, particularly the cooperation with German trade unions. In the battery value chain, German OEMs have less leverage and may not necessarily be able to influence employment relations in Hungary to the extent that they currently do in the automotive value chain.[63]

62 On details see Perényi, Zs., Rácz, K., Schipper, I. (2012): The Flex syndrome. Working conditions in the Hungarian electronics sector. SOMO, Amsterdam.

63 See for example IndustriALL Global Union (2021): Organizing along the battery supply chain.

Third, **working conditions in the Hungarian battery value chain might be improved through the principle of due diligence.**

- **Trade unions and works councils can monitor due diligence** during internal audits and independent external monitoring. Trade union and works council cooperation networks could be used to channel information on working conditions to other companies of the value chain. The geographical proximity of value chain actors in Hungary, including OEMs, may lead to an easier exchange of information and more rewarding actions. OEM manufacturers have different degrees of internal regulation on due diligence. BMW, for example, has a relatively strict code of conduct.[64]
- When due diligence violations occur, **companies' internal grievance mechanisms** can be used to exert pressure, especially if the parent company can be approached, complaints are investigated independently and adequate compensation can be obtained. [65] These corporate policies may be more extensive in companies that have joined the UN Global Compact (UNGC).[66] These include Samsung SDI, SK, Lotte Aluminium, GS Yuasa, NOK Corporation (Mektec's parent company) and NIO.
- **Corporate sustainability reports** could include due diligence commitments, including those on labour rights and working conditions.[67]
- **Due diligence, respecting workers' rights and decent working conditions can be made compulsory by organisations providing financing.** Knowing this increases trade unions' room for manoeuvre. Funding organisations also usually operate complaint reporting mechanisms.[68]

Fourth, **some working conditions are potentially worse in the battery industry than in the automotive or electronics industries.** Gender inequalities and the risks of gender-based workplace violence are higher, as the percentage of female workers is increasing. IndustriALL plans to focus on this issue in future.[69] Occupational health and safety is a serious concern at cell and materials producers particularly.[70] In addition to accidents with a short-term risk of health damage, the long-term effects of exposure to toxic or carcinogenic substances will need to be monitored by trade unions and workers' representatives for occupational health and safety. Cooperation with and direct pressure on employers is inevitable, as occupational health and safety inspectorates as well as labour inspectorates are understaffed in Hungary. Low fines and lengthy procedures do not serve as a deterrent.

Lastly, **trade union claims of vocational training and retraining** for the electromobility transition are also challenging. Trade unions can demand that employers provide the necessary workforce for the transition to electromobility through retraining current employees and not through lay-offs and hiring new workers. However, trade union experience in neighbouring countries shows weak retraining pressure from workers towards employers, as workers do not feel that their jobs are under threat from the electromobility transition.[71]

Among the long-term challenges and issues in the battery value chain, the green and just transition is the most important and complex matter which might be addressed by trade unions.

First, the green and just transition transforms potential worker demands.

- Trade unions can be partners in the **development of early retirement programmes.** This could be particularly important for workers having spent decades on the assembly line who may not transition to new workplaces in the near future.[72]
- In companies affected by the electromobility transition, including battery value chain firms, the issue of the **just transition might be included in collective agreements.** This could help ensure environmentally sustainable working conditions.[73]
- **The costs of the just transition must not be borne by workers:** good quality jobs and a living wage must be guaranteed, and must be reflected in long-term trade union demands.[74]

64 See for example Transport & Environment (2022): New rules to support battery industry in Europe under attack in Council. Briefing.

65 Such internal grievance and internal whistleblowing mechanisms are run, for example, by SK, Solus Advanced Materials and EcoPro BM.

66 On UNGC principles see its website.

67 See for example SK parent company's report: SK innovation (2022): SK innovation Affilates Human Rights Management Report.

68 For example, Volta Energy Solutions Hungary Kft. must comply with the EBRD Environmental and Social Policy. Complaints might be submitted through the EBRD website (Independent Project Accountability Mechanism). EBRD reports on its investigations about the complaints are public.

69 IndustriALL Global Union (2022): Making workers heard along the battery supply chain.

70 See for example Bodnár, Zs., Szopkó, Z. (2022): Samsung's battery factory in Göd fined for seriously endangering its workers. Atlatszo

71 Gažo, P., Martišková, M., Smith, T.S.J. (2021): Slovakia. Transition of the automotive industry to an ecological mobility industry. In: The need for transformation. Challenges for the international automotive sector. Voices from unions, workers, climate movement, industry. Rosa-Luxemburg-Stiftung, Brussels, 171–206.

72 See for example Gažo, P., Martišková, M., Smith, T.S.J. (2021): Czechia. Transition of the automotive industry to an ecological mobility industry. In: The need for transformation. Challenges for the international automotive sector. Voices from unions, workers, climate movement, industry. Rosa-Luxemburg-Stiftung, Brussels, 134–170.

73 This, however, might be challenging, as the idea of just transition is too abstract compared to more concrete demands, such as higher wages. See: Gažo, P., Martišková, M., Smith, T.S.J. (2021): Slovakia. Transition of the automotive industry to an ecological mobility industry. In: The need for transformation. Challenges for the international automotive sector. Voices from unions, workers, climate movement, industry. Rosa-Luxemburg-Stiftung, Brussels, 171–206.

74 See for example Tasini, J. (2022): A trade union guide of practice for a Just Transition. IndustriAll Global Union, Geneva.

- **Reducing working hours could be a particularly conflicting issue in the just transition.** According to research, the green transition is causing such changes in the global economy and manufacturing, that a reduction of working hours might be demanded in core countries. At the same time, **the reduction of working hours in core countries is only possible by increasing or maintaining long working hours in the European and global periphery, including Hungary.**
- In relation to the just transition, several sources call for **strengthening social dialogue.** In Hungary, works councils are mostly weak, and their institutionalisation in some Chinese, Japanese and South Korean enterprises can be challenging. Some sources also argue that the failure of social dialogue in Europe and worldwide over recent decades demonstrates that radical political and economic change cannot be achieved solely through social dialogue.[75]

Second, **trade unions can effectively advocate for a just transition as a wider social change.** This might lead to improvements in working conditions in the battery value chain. Trade unions can highlight social conflicts related to the green transition which are not addressed by NGOs working on environmental issues due to their ecological focus. In this way, trade unions can represent global and class-based redistribution aspects of the 'sustainability revolution'.[76] Trade unions can **draw attention to the illusion of the green transition creating good jobs with high wages.** The opposite is true: low-wage, low-union jobs are being created in large numbers,[77] also in the Hungarian battery industry.

Thirdly, trade unions can make demands towards the state.

- **Trade unions can be partners in initiatives to enshrine just transition and sustainability issues in law, for example in the constitution or labour law.**[78] As the Hungarian government serves the needs of battery industry companies, this approach can presumably only be possible in the long term.
- Trade unions can call for the just transition in **national-level institutions of social dialogue**.[79]
- Establishing a **Just Transition Fund** is also among the demands in several countries. The Fund is a redistribution mechanism from beneficiaries of the green transition to social groups that have been impacted during the green transition. In Hungary, the introduction of extra-profit taxes in 2022 and sectoral special taxes could set a precedent for such measures.[80] At the same time, the Hungarian government has been careful not to impose special taxes on foreign-owned companies embedded in global production networks, including those in the battery value chain. Also, the low corporate tax rate in Hungary does not allow for a large state fund augmented by taxing profits. Moreover, critics of just transition funds argue that market-based instruments cannot ensure a socially just transition, and that trade unions should rather take a critical view of public policy proposals based on redistribution. [81]
- Trade unions can **partner with progressive movements in the education sector** to transform vocational education and training for a just transition.
- **Trade unions might become active players in local and regional growth coalitions.** Local growth coalitions are formed by local public actors (e.g. municipal and regional governments, educational institutions), employers (e.g. chambers of commerce) and employee organisations (e.g. trade unions), and aim to develop the local economy in a way that preserves local jobs, provides good quality jobs and increases social wellbeing.[82] In Hungary, however, local growth coalitions are non-existent. The local state is weak, local state actors are dependent on central state political decisions and financing. The central state does not involve municipalities in decisions on major investments, including those in the battery value chain. Around the Göd and Iváncsa cell factories, special economic zones have

75 On details see Sweeney, S., Treat, J. (2018): Trade Unions and Just Transition. The Search for a Transformative Politics. Trade Unions for Energy Democracy Working Papers, 11.

76 Dörre, K., Blöcker, A., Holzschuh, M. (2020): Schlussbemerkung: Über die Auto- und Zulieferindustrie hinaus – Große Transformation und gesellschaftlicher Wandel. In: Blöcker, A., Dörre, K., Holzschuh, M. (Hrsg.): Auto- und Zulieferindustrie in der Transformation. Beschäftigtenperspektiven aus fünf Bundesländern. Otto Brenner Stiftung, Frankfurt/Main, 139–142.

77 Tasini, J. (2022): A trade union guide of practice for a Just Transition. IndustriAll Global Union, Geneva.

78 For a detailed elaboration of the German example see: Dörre, K., Blöcker, A., Holzschuh, M. (2020): Schlussbemerkung: Über die Auto- und Zulieferindustrie hinaus – Große Transformation und gesellschaftlicher Wandel. In: Blöcker, A., Dörre, K., Holzschuh, M. (Hrsg.): Auto- und Zulieferindustrie in der Transformation. Beschäftigtenperspektiven aus fünf Bundesländern. Otto Brenner Stiftung, Frankfurt/Main, 139–142. The Fundamental Law of Hungary also states that '[p]roperty shall entail social responsibility', but its enforcement is almost non-existent, especially regarding sustainability issues.

79 Metta, J., Guisset, A., Vereycken, Y., Van Overbeke, T., Bachus, K., Hofgärtner, R., Lenaerts, K., Meylemans, L. (2022): Building capacities and strategies of trade union involvement in shaping a just transition towards a sustainable and decarbonised industry. Research Institute for Work and Society, KU Leuven, Leuven.

80 See the summary by PwC on extra-profit taxes.

81 See for example Dörre, K., Blöcker, A., Holzschuh, M. (2020): Schlussbemerkung: Über die Auto- und Zulieferindustrie hinaus – Große Transformation und gesellschaftlicher Wandel. In: Blöcker, A., Dörre, K., Holzschuh, M. (Hrsg.): Auto- und Zulieferindustrie in der Transformation. Beschäftigtenperspektiven aus fünf Bundesländern. Otto Brenner Stiftung, Frankfurt/Main, 139–142.

82 On local growth coalitions see Holzschuh, M., Becker, K., Dörre, K., Ehrlich, M., Engel, T., Hinz, S., Singe, I., Sittel, J. (2020): „Wir reiten das Pferd, bis es tot ist!" Thüringens Auto- und Zulieferindustrie in der Transformation. In: Blöcker, A., Dörre, K., Holzschuh, M. (Hrsg.): Auto- und Zulieferindustrie in der Transformation. Beschäftigtenperspektiven aus fünf Bundesländern. Otto Brenner Stiftung, Frankfurt/Main, 78–138.; as well as Pichler, M., Krenmayr, N., Schneider, E., Brand, U. (2021): EU industrial policy: Between modernization and transformation of the automotive industry. Environmental Innovation and Societal Transitions, 38., 140–152.

been established which effaced the jurisdiction of municipalities. Local political leaders do not ally with trade unions, and in many cases local governments do not have any ties with the management of large local companies either. Municipal leaders often limit their focus on job-creation, disregarding the quality of jobs. Finally, trade unions might be critical of growth coalitions, since growth contradicts the sustainability and just transition paradigm.

– Trade unions can advocate for **social and environmental responsibility considered by decision-making on public money.** At present, this is not factored in to state aid regulations or state lending practices.[83] Social and environmental due diligence in public procurement, related also to batteries and electric vehicles, can be a trade union demand.[84]

Strong trade union advocacy regarding the just transition requires additional capacities on the part of trade unions. In Hungary, as in other Eastern European countries, trade unions do not have enough employees and experts to deal with the issue of the just transition.[85] Trade union capacity-building is thus a challenge in both the short and long term. In addition, the need to transfer trade union strategies on the just transition – usually developed at national or confederation level – to lower levels of the organisation, such as sector or regional branches, is also challenging.[86]

83 On details see Czirfusz, M. (2021): Covid-19 crisis management and the changing situation of workers in Hungarian manufacturing. Friedrich-Ebert-Stiftung, Budapest.

84 See for example the Low Emission Vehicle programme of Electronics Watch.

85 Gažo, P., Martišková, M., Smith, T.S.J. (2021): Slovakia. Transition of the automotive industry to an ecological mobility industry. In: The need for transformation. Challenges for the international automotive sector. Voices from unions, workers, climate movement, industry. Rosa-Luxemburg-Stiftung, Brussels, 171–206.

86 Metta, J., Guisset, A., Vereycken, Y., Van Overbeke, T., Bachus, K., Hofgärtner, R., Lenaerts, K., Meylemans, L. (2022): Building capacities and strategies of trade union involvement in shaping a just transition towards a sustainable and decarbonised industry. Research Institute for Work and Society, KU Leuven, Leuven.

6

APPENDIX

Data on Companies of the Hungarian Battery Value Chain (as of December 2022)

Value chain	Company name	Product	Headquarter	Hungarian production site
Materials	Soulbrain HU Kft.	Electrolyte	South Korea	Tatabánya
	Dongwha Electrolyte Hungary Kft.	Electrolyte, solvent recycling	South Korea	Sóskút
	ECOPRO GLOBAL HUNGARY Zrt.	Cathode material	South Korea	Debrecen
	TOYO INK Hungary Kft.	CNT dispersion (cathode)	Japan	Újhartyán
	Volta Energy Solutions Hungary Kft. (Doosan)	Copper foil	South Korea	Környe
	LOTTE ALUMINIUM Hungary Kft.	Aluminium foil	South Korea	Tatabánya
	Toray Industries Hungary Kft.	Separator foil	Japan	Nyergesújfalu
	W-Scope Hungary Plant Kft.	Separator foil	Japan	Nyíregyháza
	SEMCORP Hungary Kft.	Separator foil	China	Debrecen
	CK EM Solution HUN Kft.	Glue	South Korea	Heves
Components	Sangsin Magyarország Kft.	Battery case	South Korea	Jászberény
	NICE LMS Hungary Kft.	Battery case	South Korea	Vác
	Kedali Hungary Kft.	Component	China	Gödöllő
	Bumchun Precision Hungary Kft.	Component	South Korea	Salgótarján
	SHINHEUNG SEC EU Kft.	Component	South Korea	Monor
	Mektec Manufacturing Corporation Europe HU Kft.	Component	Japan	Pécel
	INZI Controls Hungary Kft.	Component	South Korea	Komárom
	Halms Hungary Kft.	Component	China	Debrecen
Cells	GS Yuasa Magyarország Kft.	Battery cell	Japan	Miskolc
	SAMSUNG SDI Magyarország Zrt.	Battery cell	South Korea	Göd
	SK Battery Manufacturing Kft.	Battery cell	South Korea	Komárom
	SK On Hungary Kft.	Battery cell	South Korea	Komárom, Iváncsa
	Contemporary Amperex Technology Hungary Kft.	Battery cell	China	Debrecen
	EVE Energy (?)	Battery cell	China	Debrecen (?)
	VW (?)	Battery cell	Germany	Győrszentiván (?)
OEMs	AUDI HUNGARIA Zrt.	Electric powertrain, electric car	Germany	Győr
	BMW Manufacturing Hungary Kft.	Electric car	Germany	Debrecen
	BYD Electric Bus&Truck Hungary Kft	Electric bus	China	Komárom
	Mercedes-Benz Manufacturing Hungary Kft.	Electric car	Germany	Kecskemét
Recycling	JWH Kft.	Additives	South Korea	Komárom
	SungEel Hitech Hungary Kft.	Batteries	South Korea	Szigetszentmiklós, Bátonyterenye
	NIO Power Europe Kft.	Battery swap stations	China	Biatorbágy

.. no data / not applicable; VIP: VIP cash subsidy; SIC: subsidy to improve competitiveness.

Data source: HIPA (News), kormany.hu, annual reports of companies.

Investment (billion HUF)	Cash grant provided by the government (billion HUF)	Workplaces created / to be created	Revenue (billion HUF, 2021)	Average number of employees (2021)	Wage expense per worker per month (thousand HUF, 2021)
7.0	0.4 (?)	45	4.2	15	1587
11.0	..	90	–	8	1933
264.0	..	631	–	–	..
7.0	..	45	0.1	4	1312
31.3+75.1 (two phases)	4.7+8.5 (VIP) + 3.7 (tax rebate)	181+100	10.3	247	893
44.2	1.1 (VIP)	107	–	37	1149
127.5	4.5 + 10.4 (tax rebate)	188	–	125	1079
300.0	..	1200	–	–	..
65.5	..	440	–	2	679
3.8	0.38	8	–	–	..
10.5	0.3 (SIC)	150	8.3	23	2198
5.2	..	60	1.1	54	697
14.2	..	330	–	–	..
13.3	2.7 (VIP)	200	5.0	137	553
3.1	0.8 (VIP)	300+135	37.3	649	575
6.4	0.6 (VIP)	251	22.4	458	554
14.8	1.6 (VIP)	122	4.4	42	1179
17.0	1.7 (VIP)	300	–	1	11
8.8	0.5 (VIP) + 0.3 (SIC)	51	1.5	41	676
100.0+367.4 (two phases)	1.2 (VIP) + 33.7 (VIP, pending EU approval) + 0.6 (SIC)	600+1200	738.1	2452	1096
97.5+199.1 (two phases in Komárom)	8.2 (VIP) + 28.5 (VIP) + 0.1 (SIC)	410+1000 (two phases in Komárom)	–	555	308
592.6 (Iváncsa)	76.4 (VIP) + 0.3 (SIC)	2500	175.0	1276	687
≈3000.0	..	9000	..	..	..
..	..	..	..	..	..
..	..	..	..	..	..
≈120.0	6.4 (VIP – electric transition) + 8.5	500 (electric powertrain)	2847.4	12058	1147
≈800.0	12.3 (VIP)	≈1500	0.0	22	45870
6.2	0.9 (VIP)	300	13.5	279	541
..	..	..	1142.1	4535	733
6.0	..	41	17.6	43	1109
(?)+9.3	..	(?)+100	5.4	30	1132
5.6	1.7	several hundred (?)	–	–	..

ABOUT THE AUTHOR

Márton Czirfusz is co-founder of the Periféria Policy and Research Center, based in Budapest, Hungary. He is also a member of the Working Group for Public Sociology 'Helyzet', and research associate at the Centre for Economic and Regional Studies, also in Budapest. He studied geography at the Eötvös Loránd University, Budapest, and received his PhD in human geography at the same institution. His main research interest is the economic geography of labour in Hungary. In addition, he has years-long research experience on urban change in Budapest and housing issues.

czirfusz.marton@periferiakozpont.hu

IMPRINT

Publisher:
Office Budapest Friedrich-Ebert-Stiftung
1056 Budapest | Fővám tér 2–3.
Tel.: +36-1-461-60-11 | Fax: +36-1-461-60-18
fesbp@fesbp.hu

https://budapest.fes.de/

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ISBN
978-615-6289-34-6

THE BATTERY BOOM IN HUNGARY:

COMPANIES OF THE VALUE CHAIN, OUTLOOK FOR WORKERS AND TRADE UNIONS

Hungary has become a global centre for battery manufacturing in recent years. The study analyses the Hungarian battery industry from the perspective of workers and trade unions. The study argues that high-value-added jobs providing a living wage represent only a small share of new jobs in the sector.

The Hungarian battery value chain is dominated by East Asian companies. Companies will employ around 30,000 people by the mid-2020s but finding the workers will be challenging. The government has provided more than 200 billion HUF cash grants for the investments and financed more than that in infrastructure development at production sites.

Trade unions face new challenges in the transition to electromobility. Apart from short-term challenges of organising members, negotiating for better salaries and helping solve acute occupational health and safety issues, they also need to find their role in current debates of the green and just transition.

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