Bulletin of the Transilvania University of Braşov
Series V: Economic Sciences • Vol. 15(64) No. 2 - 2022
https://doi.org/10.31926/but.es.2022.15.64.2.10

ELECTRIFICATION STRATEGIES ADOPTED BY SOME HIGHLY INNOVATIVE COMPANIES IN THE AUTOMOTIVE SEGMENT AND THE EFFECTS OF THEIR APPLICATION IN THE CONTEXT OF CLIMATE CHANGE*

Alexandra I. LAZĂR[1]

***Abstract*:** *Many representative innovative companies adopt electrification strategies taking into account both, - the constraints imposed by climate change with a direct impact on the economy and society -, and the consolidation of a competitive position.*
The changes that occur in the technological domain have a great influence on the electrification strategies, therefore, companies adopt plans to increase competitiveness through product quality, to ensure a balanced business portfolio.
Strong demand boosts R&D activities, in the sense that it guides them precisely and polarizes them on innovations achievement, imperiously required to satisfy the demand.
Starting from this premise, we will try to highlight the importance of electrification strategies, in the context of climate changes and the contribution of R&D activities to the creation of the necessary conditions for the successful implementation of these strategies.

***Key words*:** *R&D, strategy, automotive segment*

1. Introduction

According to a study by the Organization for Economic Co-operation and Development (OECD 2016) by 2060, air pollution could cause 6 to 9 million premature deaths, most of them in India, China, Korea and Central Asian countries, where the population is constantly growing. In China, by 2060, the number of premature deaths is expected to increase up to three times, compared to 2010 and up to four times higher in India. While

[1] Ph.D. Student of School of Advanced Studies of the Romanian Academy, National Institute for Economic Research "Costin C. Kiritescu", Bucharest, Romania, alexandra.lazar@ince.ro
* Paper presented at International Conference „Inclusive and sustainable economic growth. Challenges, measures and solutions" (ISEG 2022), may 2022, Brașov, Romania.

in both countries the mortality rate is constantly rising, in Western Europe it is declining due to efforts towards clean energy.

Therefore, pollution has a major impact on the health of the population because of high concentrations of ground-level ozone particle, nitrogen dioxide and sulfur. Cases of illness involve spending on medical services and absenteeism from work, which will lead to low labor productivity (Graff-Zivin, J. and Neidell M, 2012).

Directive 2008/50 / EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality sets limit values and targets for the assessment of pollutants, designates specialized institutions to carry out these tasks and implements action plans that take into account air quality, the environment and the reduction of road traffic (eg.: certain industrial activities). With regard to the auto industry, in 2010 the European Commission presented a strategy to encourage the development of green vehicles on the market and to mitigate the environmental impact of road transport.

The automotive industry is an essential, innovative and competitive industry in which it is imperative to support the achievement of investment objectives in R&D. For the development of the electric vehicle market, the setting of objectives is achieved through public-private partnerships (Jones, P., Levy, J., Bosco, J., Howat, J., Alst, J., 2018), an important player being the Government which can support the transition to electric vehicles by establishing its own implementing regulations (Aditya Mahalana, Zifei Yang, Francisco Posada, 2021) and by implementing long-term strategic plans to develop and improve battery-powered electric vehicles, hybrid electric vehicles and electric vehicles with fuel cells by optimizing CD&I investments (Åhman, 2006).

In view of the above, the analysis started from the observation that although one of the ways to reduce emissions from the automotive segment is to change the fuel, there are notable differences between some EU Member countries

According to the data provided by ACEA, for the period 2016-2020, the number of cars has been constantly growing.

Number of cars used in some european countries, 2016...2020 Table 1

Country	**2016**	**2017**	**2018**	**2019**	**2020**
UE	229202483	234364223	239001589	243491725	246345770
Estonia	703151	725944	746464	794926	808689
Germany	45803560	46474594	47095784	47715977	48248584
Hungary	3308495	3467861	3638374	3809670	3918923
Poland	21675388	22503579	23429016	24360166	25113862
Romania	5470578	5996377	6450750	6901236	7274728
Slovakia	2124972	2228118	2326787	2326787	2444478
Slovenia	1143218	1192358	1220814	1249364	1253984

(Source: Acea Report . Vehicles in use. Europe, The European Automobile Manufacturers Association (ACEA), january 2022, https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf)

According to Table 1, in 2020, from the total number of cars in the European Union, 19.58% are registered in Germany, 10.19% in Poland, 2.9% in Romania and 1.59% in Hungary, with 0.19, 0.11, respectively 0.02 percentage points more than in 2019. Given

the growing number of cars in most EU countries, we considered it imperative, in the context of the European Council's setting of performance standards, to reduce the used fuel. According to the data in Table 2, in 2020, most cars in the European Union used petrol and diesel.

Share of the number of cars used by fuel type in the total number of vehicles in some european countries, 2020 (%) Table 2

Country	Petrol	Diesel	Battery electric	Plug-in hybrid	Hybrid electric	Natural gas	LPG
UE	51,7	42.8	0.5	0.6	1.2	0.5	2.5
Estonia	57.7	40.3	0.2	0.0	1.6	0.3	0.0
Germany	65.2	31.2	0.6	0.6	1.5	0.2	0.7
Hungary	65.3	31.7	0.3	0.3	1.6	0.1	0.7
Poland	44.8	40.2	0.1	0.0	1.0	0.0	13.8
Romania	54.9	44.5	0.1	0.0	0.3	0.0	0.2
Slovakia	51.0	44.8	0.1	0.1	0.8	0.1	1.9
Slovenia	47.9	50.3	0.3	0.0	0.7	0.0	0.8

(Source: Acea Report . Vehicles in use. Europe, The European Automobile Manufacturers Association (ACEA), january 2022, https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf.)

Although most cars that used petrol were in Hungary, Estonia and Romania, their number decreased by 0.4, 1.1, and 1.5 percentage points compared to 2019.

Numerous studies suggest that sustainable competitive advantages involve significant investments in the R&D sector which electric car companies, plug-in and hybrid-electric car companies hope to recoup through the benefits of implementing a competitive electrification strategy.

Although in recent years, in the European Union the number of registrations has increased considerably, in 2020, the number of electric cars increased by only 0.3 percentage points, compared to 2019.

The analysis of ACEA (European Automobile Manufacturers 'Association) consultants points out that the use of electric cars by consumers is directly linked to a country's GDP per capita, which indicates that price accessibility remains a major issue. Almost three-quarters of total EU car sales are concentrated in Sweden, the Netherlands, Finland and Denmark, the countries with the highest GDP per capita and the highest share of GDP in R&D spending, 3.53%. , 2.29%, 2.94%, respectively, 3.03% which reveals the importance of the contribution of these activities to the successful implementation of electrification strategies.

2. The Importance of Implementing Electrification Strategies in Reducing Pollutant Emissions

In the literature there are papers that support the decisive role of electrification strategies implemented by innovative films in order to reduce pollutant emissions.

In light of this,very relevant are the practices of Mercedes-Benz and BMW, some of the world's largest manufacturers of luxury vehicles.

By 2025, the Mercedes-Benz Group aims for all manufactured cars to be electric, which will involve investments in the R&D sector of up to 40 billion euros. To implement the unique electric propulsion technology of axial flow motors which will lead to the development of high-performance motors, Mercedes-Benz Group will buy the internal electric motor company YASA, which will be a key part of the electrification strategy.

It will also implement the most advanced technology for the production of electric battery cells by setting up eight factories - Gigafactories - together with its partners around the world. This will add to the existing network of nine factories dedicated to the construction of battery systems. The new batteries, which will have a capacity of over 200 Gigabytes per hour, an unprecedented autonomy and a much shorter charging time, will be found in over 90% of Mercedes-Benz vehicles. The increase of the energy density of batteries by using silicon-carbon composite in the anode will be ensured by the partnership with SilaNano, a company that focuses on improving energy storage.

For a fast battery charging the group sets new charging standards - Plug & Charge. Charging time varies depending on the temperature of the environment and the battery, as well as the use of additional auxiliary consumers, such as heating.

Mercedes me Charge is one of the largest charging networks in the world and currently has over 530000 charging points AC (power between 4kW - 22kW) and DC (fast charge - power over 22kW) worldwide. In collaboration with Shell, Mercedes-Benz plans to expand the charging network by 2025 so that customers have better access to the charging network in Europe, China and North America.

Mercedes-Benz's electrification strategy focuses on launching the electric car with a real autonomy of over 1000 kilometers, with a single battery charge, which is equivalent to a consumption of less than 10 kWh of energy per 100 kilometers. In this context, new standards for electrical autonomy and efficiency are being set with the help of the new VISION EQXX electrical concept.

In 2023, Mercedes-Benz aims to produce eight electric vehicles, therefore, to increase battery production capacity and know-how, and for that the Group will work with GROB, a leader in the production of innovative batteries and automation systems.

Also in 2023, Mercedes-Benz plans to open a new battery recycling factory, in Kuppenheim, to develop and ensure a recycling capacity.

Another example is the BMW Group, which, by implementing its electrification strategy, is setting new standards in the automotive segment. Its main objectives are to reduce CO_2 emissions by up to 80% by the end of 2030 and reduce CO_2 emissions in the BMW Group's supply chain up to 20%. In this context, BMW is committed to producing 25 electrified models by 2023.

In order to achieve even greater flexibility regarding customer's needs, BMW is committed to the development of electrified vehicles by implementing fuel cell technology that uses the chemical energy of hydrogen (eg BMW and Hydrogen NEXT at the IAA).

Thanks to efficient technology and to all-wheel drive electric propulsion, the BMW iX sets new standards in sustainability. It generates 45% less emissions than an SUV with a

diesel engine. The sustainability of the BMW iX is also due to the use of natural or recycled materials. For example, the inside skin is tanned using a natural olive leaf extract and contains no chromium residue, the control island of the optional Clear & Bold specification is made of wood certified by Forest Stewardship Council (FSC) and the upholstery and rugs are made of Econyl (a form of nylon that is made entirely of waste, an environmentally friendly alternative to the original product that is made from an oil derivative).

Dingolfing, the BMW Group's biggest factory in Europe, has seen a decline in resource consumption and emissions over the last ten years due to the use of innovative production technologies and equipment. The new power center is based on highly efficient power generation, with the help of a power center that combines electricity and heat (CHP). The gas is transformed into electricity and the heat resulting from this process is exploited as an energy source. With the help of CHP and Germany's largest photovoltaic panel system, the Dingolfing factory produces almost half of its own electricity demand, the other half representing green electricity from external energy suppliers. Also, due to the implementation of an innovative pressing system, the factory recycles 99.8%.

3. Conclusions

The german Mercedes-Benz and BMW groups are focusing their efforts on product/ process innovation, with the general objectives pursued in their electrification strategies being that of reducing air pollution and strengthening their competitive position in the market.

Electrification strategies will pave the way for the implementation of innovative technologies to mitigate climate change and ensure progress through investments in electricity infrastructure. Its successful implementation and the clear setting of targets for reducing carbon dioxide emissions through the use of low-energy sources is the key to setting a path for the future.

Air quality remains a persistent problem in Europe, harming health and ecosystems, with most European countries exceeding the legal limits for at least one key air pollutant.

Due to the establishment of strict environmental regulations, the improvement of energy efficiency, the tendency of the automotive industry to give up the manufacture of polluting vehicles, environmental performance has improved in recent decades. But despite these improvements, the car industry continues to be responsible for a significant burden on our environment in terms of pollution and waste generated. In this regard, the main directions of action for reducing pollution can be outlined in the automotive segment: the implementation of measures to discourage the driving of polluting vehicles, such as road taxation based on carbon dioxide emissions, thus encouraging the use of less pollutants fuels; manufacture of partially or fully electric vehicles; significant investments in digitization and electrification; investments in charging infrastructure.

Although electric vehicles make a significant contribution to reducing the impact of climate change and air quality, it should be noted that they do not dominate the auto

market because, at the moment, their purchase price is quite high and battery technology and charging infrastructure are far from be fully developed.

Looking ahead, infrastructure improvement is needed so that charging points become as numerous as conventional refueling stations and the award of purchase subsidies, which bring the price of electric vehicles to a level similar to that of conventional ones. It should be noted, however, that simply replacing conventional vehicles with partially or fully electric vehicles will not solve the problems associated with transportation. In order for transport to become a sustainable sector, innovative solutions must be considered to reduce vehicle dependency, namely the use of car-sharing systems, and the development of better infrastructure for public transport.

References

ACEA Report. *Vehicles in use. Europe 2022*, https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf.

ACEA Report. *Vehicles in use. Europe, January 2021*, https://www.acea.auto/files/ACEA-report-vehicles-in-use-europe-2022.pdf.

Åhman, M., 2006. *Government policy and the development of electric vehicles in Japan Energy Policy*, 34(4), pp. 433-443.

Comisia Europeană. 2010. *O strategie europeană privind vehiculele ecologice și eficiente din punct de vedere energetic*, https://eur-lex.europa.eu/legal-content/RO/TXT/PDF/?uri=CELEX:52010DC0186&from=RO.

Graff-Zivin,J., Neidell, M., 2012. The impact of pollution on worker productivity. *American Economic Review*, 102 (7), pp. 3652-3673.

Jones, P., Levy, J., Bosco, J., Howat, J., and Alst, J., 2018. *The Future of Transportation Electrification: Utility, Industry and Consumer Perspectives*. Lawrence Berkeley National Laboratory, https://escholarship.org/uc/item/92m984bs.

Mahalana, A., Yang, Z., Posada, F., 2021. Indonesia transport electrification strategy. *International Council on Clean Transportation,* working paper 2021-36, october 2021 .

OECD, 2016. *The Economic Consequences of Outdoor Air Pollution***.** OECD Publishing, Paris.

Parlamentul European, Consiliul Uniunii Europene, *Directiva 2008/50/CE a Parlamentului European și a Consiliului din 21 mai 2008 privind calitatea aerului înconjurător și un aer mai curat pentru Europa*, https://eur-lex.europa.eu/legal-content/ro/txt/pdf/?uri=celex:32008l0050&from=ro.