Impact of Greenhouse Gas Quota Trading of the Electrified Fleet in Germany on the Company's Greenhouse Gas Balance

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***Abstract*—In Germany, the greenhouse gas (GHG) quota allows fleet operators to generate additional revenue for their battery electric vehicles (BEVs) by selling their GHG quota savings to fossil fuel distributors. Using the example of the companies in the German stock index DAX, this paper examines from perspective of GHG quota sellers the extent to which this trade must be reported and how it is actually reported. The analysis shows that reporting is not mandatory and is not implemented in practice. Compared to scope 1 emissions in Germany, the proportion of GHG emissions by BEVs potentially shifted through the GHG quota is currently (2023) around 2 %. It can be assumed that this proportion will continue to rise in the future. In the case of SAP SE as an extraordinary example, the proportion of GHG emissions shifted by trading GHG quotas for BEVs in Germany could rise to 87.5% by 2030 of the company's global scope 1 emissions by 2030. Reporting on GHG quota trading therefore seems desirable in the future - also because the GHG quota is a sensible redistribution instrument to enhance the electrification of company's vehicle fleet which should not be misunderstood as greenwashing. However, mandatory reporting in a comparatively increased (net) GHG balance could reduce the incentive to participate in the GHG quota trading system.**

***Index Terms*--Battery powered vehicles, Commercial law, Emissions trading, Government policies, Low carbon economy**

I. Introduction

The greenhouse gas (GHG) quota is a market instrument to increase in Germany the share of renewable energies in the transport sector to fulfil the Renewable Energy Directive obligations by the European Union (EU) [1], [2]. It enables owners of battery electric vehicles (BEVs) and thus also companies that operate BEVs as part of their fleet to sell their saved GHG emissions to fossil fuel distributors. The actual GHG emission savings compared to a vehicle with a fossil combustion engine are credited threefold [3]. In this way, trading with the GHG quota shifts the (triple) savings in GHG emissions from the seller to the buyer, thereby increasing the seller's net GHG emission balance.

The extent to which this GHG quota trade must be reported by companies is unclear. GHG quota traders speak of a legal gray area in which they advise transparent reporting on the trading of GHG quotas and the use of revenues generated [4], [5]. Also there are (EU) sustainability reporting rules that include the disclosure of GHG emission data and have recently come into effect [6]–[8].

Therefore, it is of interest to what extent these EU reporting rules require transparent disclosure of GHG quota trading and how it is implemented in practice. In addition, the scale of the potential shift of GHG emissions through GHG quota trading must be quantified to assess the relevance of the question. To answer these questions, the paper analyses the effects of GHG trading on the GHG quota balance of fleet operators using the example of companies listed in the German share index (DAX) based on the following sub-questions:

- A: What is the current legal situation regarding reporting obligations on GHG quota trading?
- B: Do companies report on GHG quota trading?
- C: What would be the impact on the GHG balance if GHG quota trading had to be included in the GHG balance?

II. Methodology

Since large, listed companies have the most specific requirements for reporting on their activities, the companies listed in the DAX in November/December 2024 are taken as a basis. The DAX is the primary German stock market index, representing the 40 largest German stock corporations.

A: *Analysis of regulatory requirements*

The current requirements for the preparation of company GHG balances and general reporting concerning sustainability performance and environmental impacts are analyzed based on the relevant EU regulation. Since the financial year 2024, these topics are covered by the *EU Corporate Sustainability Reporting Directive* (CSRD) [6] which includes the *European Sustainability Reporting Standards* (ESRS) [7]. As the latest company reports are still based on the previously valid regulation, the *EU Non-Financial Reporting Directive* (NFRD) [8], this is also taken into consideration. In addition to a literature review of the corresponding regulatory documents,

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semi-structured expert interviews with auditors, a GHG quota consultant, a GHG quota trader, a sustainability manager and a fleet operator are conducted to gain a better understanding of the legislative requirements for company GHG balances.

Furthermore, specific legal guidance is searched on how to financially account for GHG quota trade under commercial law.

B: *GHG quota in corporate reporting*

To gain an overview of current reporting practices and the applied integration of GHG quota trading into sustainability reporting, the financial and non-financial resp. integrated reports of all 40 DAX companies are searched for keywords (Table I in the appendix). In addition, a keyword search is carried out on the online search engine Google for the keyword GHG quota in combination with the respective company name in English and German.

In the online survey (focused on answering sub-question C) a question regarding the GHG quota reporting was included.

C: *Potential GHG emission shift through the GHG quota*

Finally, the potential GHG emission shift is calculated, which arise when a company sells the GHG emissions saved by its BEV to fossil fuel distributors through the GHG quota. For a visualization of the methodical procedure explained in the following, see also Figure 1 in the appendix.

To quantify the GHG emission savings for different types of BEVs, the extended and updated GHG quota model from [9]–[11] is used (Table VIII in the appendix) with the current BEV estimation values [12]. Summing up the specific GHG emission savings of a company fleet (corresponding to fleet size and type of vehicles) results in the potential GHG emission shift. However, the data available on specific fleet sizes of DAX companies in Germany, broken down into the various vehicle classes, is inadequate. An attempt to rectify this issue was made with an online survey conducted among the 40 DAX companies in December 2024/January 2025.

The potential GHG emission shift is then set in relation to the respective company's total fleet GHG emissions in Germany to illustrate its dimension. For reasons of anonymization, the data collected in the survey is added together. Only percentage ratios (instead of absolute ratios) are given for individual anonymized companies, so that it is not possible to draw conclusions based on publicly available data.

In an additional analysis, the data set is supplemented with the base year 2023, using publicly available data from [13]–[15]. Simplifying assumptions are made such as a BEV share of 9% [16] or a fleet of N1 vehicles (light commercial vehicle up to 3.5 tons) only. The calculated GHG emission shifts are compared with the scope 1 GHG emissions worldwide 2023 of the respective companies (this is the latest data available). Scope 1 emissions are the company‘s direct GHG emissions including the GHG emissions of the company's own vehicles [17]. The GHG emissions potentially shifted in Germany are compared to the scope 1 emissions worldwide, as there is no reported data of national scope 1 emissions.

More specific data is available for some DAX companies, e.g. more specific information on fleet GHG emissions instead of general, overarching scope 1 emissions, more specific information on the proportion of BEVs in the fleet or more specific statements on Germany instead of global scope 1 emission. Here, exemplary calculations are made on how trading the GHG quota with the German BEV fleet potentially shifts GHG emissions.

In addition to the vehicle fleet, potential revenues from GHG quota trading for the operation of public charging stations are also considered.

Finally, an outlook for the year 2030 is given for companies with a 100% BEV target in 2030 or a scope 1 net zero target in 2030 (on the assumption that this goes along with 100% BEV). It is simplified that the fleet size will remain the same. The vehicles are multiplied by the 2030 GHG quota input value for N1 vehicles. The result is compared with the global scope 1 emissions for 2023 minus the partially specified fleet GHG emissions values (as BEVs have no GHG emissions).

Lastly, the financial value of the GHG quotas for BEVs traded by DAX companies is estimated. As before, a share of 9% BEVs from the assumed fleet sizes (available from 24 of 40 DAX companies), all of which participate in the GHG quota, is assumed for this purpose. The corresponding GHG savings per BEV are added together and multiplied by the average GHG quota value for 2023 (240 €/t_CO_{2eq} [18]–[20]).

For more detailed assumptions and input values see Table II - VII in the appendix.

III. RESULTS

A: *Analysis of regulatory requirements*

Until 2023, companies in the EU were obliged to report on their sustainability performance according to the NFRD [8] which does not require a GHG balance. However, as Table III (in the appendix) shows, all DAX companies have already prepared voluntary GHG balances and reported on their overall sustainability performance according to voluntary standards. Common voluntary standards such as the *Global Reporting Initiative Sustainability Reporting Standards* (GRI Standards) [21] base their GHG accounting recommendations on the *Greenhouse Gas Protocol* (GHG Protocol) [17] which gives guidance on how to categorize, calculate and report on GHG emissions.

From 2024, the NFRD was replaced by the CSRD [6] which extends the sustainability reporting obligations and the group of obligated companies. The GRI Standards and other international frameworks such as the GHG protocol were taken into consideration when developing the CSRD. Timeline and final scope of the CSRD are currently uncertain as it has – contrary to the deadline set by EU regulation (July 2024) – not been adopted to German law yet (March 2025). Also, EU regulators are currently discussing a reduction of reporting requirements under the CSRD and related regulations [22].

Based on the currently valid version of the CSRD, companies that already had to report under the NFRD (listed companies with more than 500 employees) have to deliver their first CSRD report for the financial year 2024. In the following years, the obligation to apply the CSRD will gradually be extended depending on the companies' turnover, total assets and number of employees [6], [23], [24].

Whereas the CSRD sets the legislative framework, the associated ESRS [7] specify the data points to be reported for various categories under the subject areas Environment, Social and Governance. Companies only have to report for those categories that are considered relevant for their operations based on their own materiality assessment. The ESRS environmental standard set *ESRS E1 climate change* is, however, relevant for most companies as almost every product or service is associated with GHG emissions.

ESRS E1 climate change also includes datapoints for gross GHG emissions subdivided into the categories scope 1, 2, and 3. The application requirements specify that the undertaking shall "not include any removals, or any purchased, sold or transferred carbon credits or GHG allowances in the calculation of scope 1 GHG emissions" and similarly for scopes 2 and 3 [7]. It is thus clearly stated that reported GHG balances shall not be affected by any applied market instrument such as GHG emission trading schemes or the German GHG quota but only display the actual gross balance. It is, however, possible to report on the influence of such market instruments on the GHG balance voluntarily in a separate step.

Auditors consulted in an expert interview emphasized that the CSRD overall demands transparent reporting on sustainability performance and actions; relevant details must not be concealed. Whether GHG quota trading should be explicitly mentioned in the report therefore depends on the individual scope and influence of the trading activities. Voluntary reporting should only take place if it is relevant and does not cover up other, non-reported but more relevant aspects. Otherwise, there is a legal risk.

Regarding specific legal guidance on how to financially account for GHG quota trade, the Institute of Public Auditors (IDW) in Germany has published a draft statement on accounting for GHG emission allowances and GHG quota trading under commercial law in November 2024. This draft gives guidance for sellers and buyers of GHG quota contracts on how quota trading should be reported in the balance sheet and income statement [25].

B: *GHG quota in corporate reporting*

In the 2023, financial and non-financial or integrated reports of all 40 DAX companies no explicit mention on the GHG quota trading could be found either in the reports themselves or in the supplementary keyword combination used for the online search engine Google.

With a response rate of 3 out of 40 DAX companies, the conducted online survey is not fully representative and does not provide additional insights in this regard.

C: *Potential GHG emission shift through the GHG quota*

According to [14], 71.5% of DAX & Mid-Cap-DAX companies were participating or considering to participate in the GHG quota trading for BEVs in spring 2022. According to the online survey (response rate 3 out of 40), 2 out of 3 companies participate in the GHG quota. The non-participating company stated "no knowledge of it" as the reason.

According to the data obtained from the online survey, the total share of BEVs is 16% and varies between 2% and 25% per company. Based on these numbers, 2.0% of the fleet GHG emissions in Germany are potentially shifted through GHG emissions trading by these companies. It varies from 0.6% to 13.3%. If these companies had a 100% BEV fleet in 2030, the GHG emissions traded through the GHG quota would increase by 749% to 6,469%.

In the additional analyses shown in Figure 2 in the appendix (more detailed in Table III in the appendix), 24 DAX companies are analyzed. The potential GHG emission shift through the GHG quota in 2023 compared to worldwide scope 1 emissions was in average 0.3%. Of a particularly high proportion are the shares for service industry as Deutsche Bank AG (3.3%), SAP SE (1.4%) and Deutsche Telekom AG (0.7%) whereas they are under rounded 0.0% for manufacturing industry as Heidelberg Materials AG, RWE AG and BASF SE.

Table IV in the appendix shows that if instead of scope 1 emissions more specific GHG emissions such as GHG emission values of the fleet worldwide or even only specific for Germany are considered, the share of the potential shift of GHG emissions through the GHG quota increases. In relative terms, especially for Vonovia SE (+2.136%), DHL Group (+1.000%) and Henkel AG & Co. KGaA (+976%), in absolute terms, particularly at Deutsche Bank AG (23.0% assumed traded GHG emissions from GHG quota compared to GHG emissions owned or leased vehicles worldwide), Deutsche Telekom AG (2.9% compared to direct GHG emissions fuels of the vehicle fleet in Germany) or Vonovia SE (2.4% compared to GHG emission of the fleet in Germany). The more specific fleet GHG emissions data shows that in 2023, fleet GHG emissions account for a significant share of scope 1 emissions, more than half at SAP SE (74.9%), Deutsche Telekom AG (58.3%) and Siemens AG (54.3%).

There is a potential GHG quota shift effect not only for BEVs, but also for the operation of public charging stations shown in Table V in the appendix. The largest charging station infrastructure of the DAX companies is provided by E.ON SE (0.25% of scope 1 emissions worldwide) and Volkswagen AG (0.03% of scope 1 emissions worldwide).

As a comparative update, an approximation with the current BEV rate at DAX companies (about 30% [15]) with the 2023 average global scope 1 emission value for DAX companies can be made. According to this, the potential GHG emission shift through the GHG quota is about 1.1%.

Several DAX companies have published BEV targets for the year 2030. Allianz SE, Bayer AG, E.ON SE and Siemens AG are part of the EV100 initiative of the climate group, which aims for 100% BEVs in the light vehicle class (N1) by 2030 [26]. Some DAX companies have a "net zero 2030" target for scope 1, which should also include 100% BEVs (Table VI in the appendix). Assuming a 100% BEV fleet for these companies in 2030, the share of the potential GHG emission shift through the GHG quota rises compared to scope 1 worldwide, in the case of SAP SE as a maximum example from 1.43% to 87.81% (more detailed in Table VII in the appendix).

In 2023, the traded GHG quota value generated by the assumed 10,745 BEVs of DAX companies is around 2.7 million and by public charging stations (E.ON SE,

Volkswagen AG, BMW AG and Vonovia SE) about 1.6 million €.

IV. Discussion

A: *Analysis of regulatory requirements*

Reporting on gross GHG balances, that reflect the actual GHG emissions of companies in accordance with the GHG protocol, is a widely accepted and applied practice in CSRD and voluntary standards. This is a comprehensible approach since market instruments such as the GHG quota do not directly change the actual amount of emitted GHG emissions. Depending on the dimension of the GHG emission shift through the GHG quota and similar market instruments, it could be of interest to report a separate net GHG figure including the GHG emission shift. Further aspects on the impact mechanism of the GHG quota are discussed in the section *Reflections on the GHG quota market mechanism* below.

Apart from the gross GHG balance, the question whether GHG quota trade should be reported under the CSRD or not depends on the individual scope of GHG quota trading and its relevance compared to overall activities of the company. In this respect, the extent to which GHG quota trading can be considered relevant may be debatable.

This might also be the reason that practitioners (fleet and sustainability managers) as well as GHG quota traders often perceive reporting requirements for GHG quota trading as a legal gray area [4], [5]. Some fear that selling GHG quota contracts could be seen as greenwashing by customers or the public (also raised in [27], for example) and therefore hesitate to participate in GHG quota trade.

The current development of GHG quota financial accounting regulation with [25] shows that a standard guidance for GHG quota is necessary after a long period without clarifying instructions. This need for action also indirectly confirms legal gray areas regarding the GHG quota. Therefore, in order to counteract general uncertainties in dealing with reporting obligations, official legal guidance could also be helpful in the course of the German adoption of the CSRD.

B: *GHG quota in corporate reporting*

Since the first CSRD reports for 2024 are due in spring 2025, it is not yet possible to analyze the reporting companies' implementation of the new regulatory requirements. For the hereby analyzed non-financial reports, it is therefore only possible to look at the reporting based on the currently applicable NFRD and additional voluntary standards such as the GRI Standards. They represent a good basis for CSRD reporting although they do not cover all its aspects.

The fact that not one single reference for GHG quota trading is found in the financial and non-financial reports of all DAX companies (this also applies to first 2024 reports published by the March 2025 ([28]–[45]) and their online presentation is remarkable since a large proportion participates in GHG emissions trading [14]. Reasons for this have not been identified yet, but the information could be regarded as not relevant or, for example, companies are concerned about bad publicity following GHG trading information (e.g. greenwashing accusations).

These results oppose the fact that THG quota traders recommend reporting (e.g. [4], [5]).

C: *Potential GHG emission shift through the GHG quota*

The share of 71.5% of DAX companies that participated or considered participating in GHG quota trading in spring 2022 can be considered high in light of the fact that the legal basis for the reform of the GHG quota did not come into force until September 2021 [46] and the BEV class-specific estimated values for non-public charging stations, which only finally enable BEV participation, were not published until December 2021 [47]. It can be assumed that the GHG quota participation rate has further increased over time. At the same time, the revenue per BEV has roughly halved in 2023 compared to 2021/2022 and roughly halved again in early 2025 compared to 2023 [11], [18]–[20], [48], which reduces the financial incentive to participate. For the higher vehicle classes N2 and N3, on the other hand, significantly higher estimated values were published in summer 2023 [12], which more than compensated for the GHG quota value drop.

The data situation on fleets of DAX companies is poor. Reporting provides more specific data only in some cases. The analysis of the available data shows that fleet GHG emissions account for a significant proportion of scope 1 emissions. The electrification of the fleet is one of the most important decarbonization measures taken by German companies [49], therefore more transparency can be expected here in the future.

Scope 1 emissions generally vary depending on the sector [50], as does the percentage share of GHG emissions in scope 1. Thus, the proportion of the potential GHG quota shift varies. For the analyzed DAX companies, the share of 0.33% potential GHG emission shift through the GHG quota of BEVs registered in Germany compared to the scope 1 emissions worldwide in 2023 seems low and corresponds roughly to the size of the potential shift through the operation of large public charging stations by DAX companies. It should be noted that the actual proportion could be significantly higher if a regional benchmark would be used (e.g. fleet GHG emissions in Germany), which could not be chosen in this analysis due to the poor data basis and the attempt to use a standardized methodological approach that includes as many DAX companies as possible. For example, the analysis shows a significant increase for those companies for which better data is available with a global fleet GHG emissions benchmark or even more for companies with fleet GHG emissions in Germany as a benchmark (Deutsche Telekom AG and Vonovia SE). The results of the online survey are also roughly in the same size of around 2% compared to national fleet GHG emissions.

Depending on the sector and the relevance of fleet GHG emissions in the companies' scope 1 emissions, the potential GHG emissions shift in 2030 rises. In the case of SAP SE as an extraordinary DAX example it could account for up to 87.81% of their worldwide scope 1 emissions, assuming that total scope 1 emissions in 2030 are on same level as in 2023. In fact, SAP SE and some other DAX companies plan to have net zero emissions in scope 1 in 2030. As scope 1 emissions continue to fall (in general, EU legislation sets climate neutrality as a target for companies by 2050 [6], [51]), the GHG quota share compared to the scope 1 emissions will continue to rise.

Besides the misleading worldwide scope 1 as benchmark, the actual share is also underestimated in this analysis: The GHG quota emission saving value per BEV increases due to several factors, such as a higher share of renewable energy in the German grid electricity [52]. In addition, over time BEV fleets are tending to increase [15], [16] and scope 1 emissions are falling as a result and beyond [6], [51]. Also, not all fleet vehicles belong to the N1 vehicle class and therefore have significantly higher GHG quota values (e.g. N3 compared to N1 by a factor of around 10 [12]). The expected expansion of the public charging infrastructure by DAX companies will also increase the GHG quota contracts generated. Finally, the GHG emissions already potentially shifted upstream and downstream (scope 3) or, in some cases, GHG emissions included in scope 3 such as those from leased BEVs, are neglected.

For DAX companies the financial redistribution, which correlates with the amount of potential GHG emissions shift through the GHG quota, of BEV owning and of charging station operation are roughly the same size. It should be noted that in the financial redistribution calculation the number of BEVs is underestimated, as it can be assumed that the other 16 DAX companies with insufficient data on fleet size also participate in GHG quota trading. [52] shows how the GHG savings are converted into financial revenues through the GHG quota.

Regarding the GHG balance, it should be noted that with the electrification of the vehicle fleet the company-related GHG emissions from mobility may change from scope 1 (combustion of fossil fuels in the company's own fleet as direct GHG emissions) to scope 2 (electricity as indirect GHG emissions from external energy procurement).

In summary, the potential GHG emission shift through the GHG quota trade is increasing. Therefore, future non-reporting does not appear to be appropriate. Instead, GHG quota participation should be reported transparently. This can also be used as an opportunity in corporate communications to show how revenues generated by the GHG quota are used to finance the company's internal drive transition.

Reflections on the GHG quota market mechanism

On the basis of the GHG quota as a market instrument for increasing the share of renewable energies in the transport sector, the distributors of fossil fuels must prove that their fuel mix has increasingly lower GHG emissions in the balance sheet compared to fossil fuels, e.g. in 2030 reduced by 25.1% [53], [54]. This is more than what they can achieve themselves by blending in biofuels. This means that suppliers of fossil fuels are forced to increase their own share of renewable energies in the transport sector, for example by bringing electricity into the transport sector themselves via charging stations or green hydrogen via hydrogen filling stations and thereby lower their GHG emissions in their total fuel mix. Alternatively, they purchase GHG quota contracts from third parties and thus co-finance the drive transition at these third parties. These third parties can be companies such as the investigated DAX 40 companies that sell the GHG savings from their electrified vehicle fleet. If a net instead of a gross GHG balance would be required, these companies were penalized for the GHG quota trading by having to add the GHG savings sold in their (net) GHG balance sheet (possibly even disproportionately through the GHG quota multiple crediting factor [10]). This would reduce the company's own motivation to electrify its vehicle fleet. However, the idea of the GHG quota is to promote the switch to electromobility - and not to penalize those involved.

The more BEVs or other GHG quota fulfillment options participate in the GHG quota, the greater the supply of GHG quota contracts will be. In the general market mechanism of the GHG quota, the additional supply, e.g. due to the increasing market ramp-up of electromobility, is to be offset by the effect that demand is also stimulated by an annually increasing GHG quota. In addition, the GHG quota is automatically increased if certain threshold values for electromobility are exceeded [52]. At the same time, any additional supply of GHG quota trading volume reduces the potential revenue for the seller. As a consequence, for more cost-intensive alternative fulfillment options such as green hydrogen production, which relies on higher revenues from the GHG quota trading, this could be critical for their business case (e.g. [55]). However, this responsibility lies less with the individual companies and more with policy makers, who could adjust for example through an adjustment of the multiple crediting factor accordingly [10].

The potential greenwashing question is more about what the company uses the GHG quota revenues for. If they are used for the company's internal transition, such as purchasing BEVs or building charging infrastructure (e. g. in [52]), the GHG quota makes sense in terms of the transition and also in terms of the overall goal of GHG emissions saving, even if the GHG quota itself does not directly save GHG emissions. When the revenues are used for profit maximization, this comes less into effect.

V. CONCLUSION

The CSRD and other voluntary reporting standards require to publish a gross GHG balance. Therefore, currently there is no legal obligation to include traded GHG quotas in GHG emission reporting. No DAX company currently reports publicly (financial and non-financial reporting respectively integrated reporting and public relations) about its GHG quota trading. At the same time, it can be assumed that most DAX companies participate in GHG quota trading.

One reason for this lack of reporting could be that the potential GHG emissions shift through the GHG quota with an average of 0.33% compared to worldwide scope 1 emissions can be considered not relevant. However, fleet GHG emissions can account for a significant proportion of companies' scope 1 emissions. In the upcoming years, the share of the potential GHG emissions shift through the GHG quota will increase significantly, especially as both GHG quota trading by companies will increase due to increasing BEV fleets and scope 1 emissions will continue to fall. In future reporting at the latest, the proportion of potential GHG emissions shifting due to the GHG quota will therefore have reached a level that should be shown or at least noted in the company's GHG balance reporting.

An analysis of non-financial reports for the fiscal year 2024, which will be published in spring 2025, could show whether the new CSRD leads to a different reporting in this respect.

VI. APPENDIX

	Shift BEV emissions					Shift charging stations
	Online survey	Additional analysis				
		General	Specific			
base for calculating emission savings with the GHG quota model	Fleet specific data in Germany	Fleet specific data in Germany				Operated public charging stations in Germany
comparative overall emissions	Fleet emissions in Germany	Scope 1 emissions worldwide	Fleet specific emissions	Share of BEVs in fleet	Germany-specific emissions	Scope 1 emissions worldwide

Figure 1: Methodological approach for potential GHG emission shift through the GHG quota

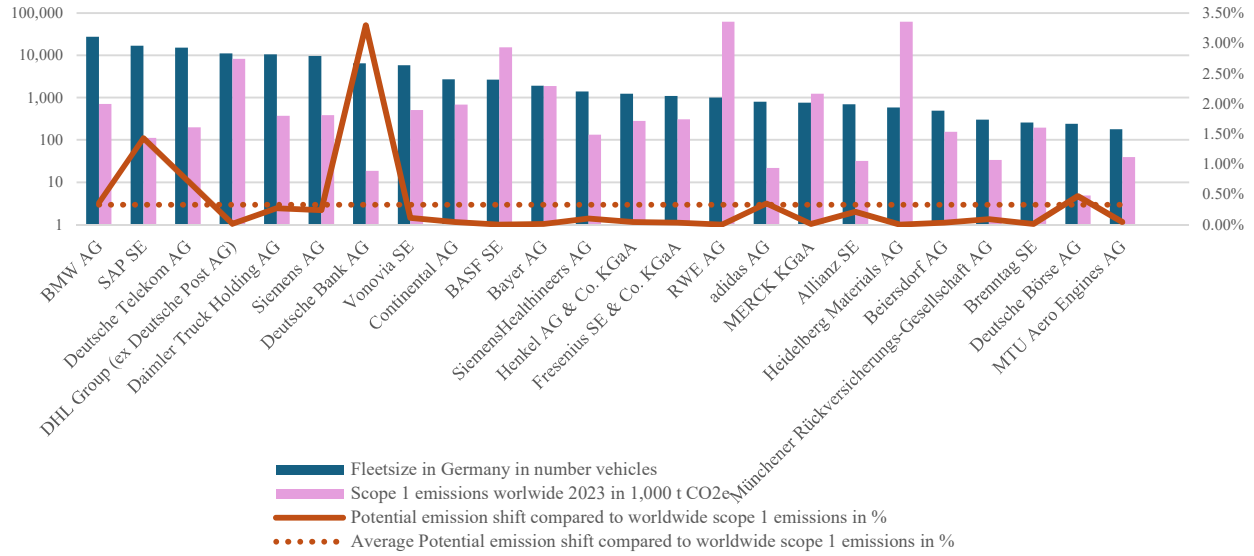

Figure 2: Worldwide scope 1 emissions in 2023 (logarithmized), fleetsize in Germany (logarithmized) and BEV share of DAX companies

TABLE I. GHG QUOTA KEY WORD ANALYSIS FINANCIAL AND NON-FINANCIAL REPORTING & GOOGLE

	Keywords
English	Greenhousgas Quota, GHG quota, GHG reduction quota,
German	Treibhausgasminderungsquote, THG Quote, THG-Minderungsquote

The keywords were looked up in financial and non-financial resp. integrated reports of all 40 DAX companies (reference date 01.01.2024) for the year 2023 in the corresponding language [56]–[118]. In addition, on online search engine Google each keyword was combined in English and German with the company's name and the first 20 results were examined. The search was conducted in calendar week 1 in 2025.

TABLE II. ASSUMPTIONS FOR POTENTIAL GHG EMISSION SHIFT THROUGH THE GHG QUOTA

Item	Value	Context & Reference
Share of BEVs in the company fleet	9%	Average value for large companies (all company sizes 10% BEV) [16], DAX companies 2022 6,4% BEV [6], 2017 1,7% BEV [13]. In 2025, the BEV share in DAX companies is already about 21.6% (M1) and 39.3% (N1) [15].
Average scope 1 emissions per DAX company	246,126 t_CO_{2e}	As there are large differences in the 2023 scope 1 emissions (RWE AG consumes about 160,000 times more scope 1 emissions than Hannover Rück SE (see Table III), the median value is used instead of the mean value (4,026,398 t_CO_{2e})

TABLE III. FLEET SIZES IN GERMANY AND WORLDWIDE SCOPE 1 EMISSIONS OF DAX COMPANIES AND POTENTIAL GHG EMISSION SHIFT THROUGH THE GHG QUOTA 2023

DAX Company	Vehicles in Germany in 2017 [13]	Vehicles in Germany in 2022 [6]	Vehicles according to other sources	Potential GHG emission shift through the GHG quota 2023 with BEV share of 9% in t CO_{2e}	Worldwide scope 1 emissions 2023 in t_CO_{2e}	Potential GHG emission shift compared to worldwide scope 1 emissions
adidas AG	**800**	-	-	75.98	21,779 [65]	0.35%
Airbus SE	-	-	-	-	1,486,000 [66]	-
Allianz SE	520	**700**	-	66.49	31,774 [67]	0.21%
BASF SE	2,000	**2,700**	-	256.45	15,530,000 [69]	0.00%
Bayer AG	2,300	**1,900**	-	180.46	1,890,000 [118]	0.01%
Beiersdorf AG	544	**500**	-	47.49	154,960 [71]	0.03%
BMW AG	-	**27,400**	-	2,602.45	713,933 [64]	0.36%
Brenntag SE	-	**300**	-	28.49	194,245 [72]	0.01%
Commerzbank AG	-	-	-	-	17,418 [73]	-
Continental AG	**2,700**	-	-	256.45	690,000 [74]	0.04%
Covestro AG*	-	-	-	-	930,000 [76]	-
Daimler Truck Holding AG	-	**10,500**	-	997.29	369,000 [77]	0.27%
Deutsche Bank AG	**6,500**	-	-	617.37	18,735 [56]	3.30%
Deutsche Börse AG	**240**	-	-	22.80	4,900 [79]	0.47%
Deutsche Telekom AG	-	16,200	**2023: 15,096 [119]**	1,433.82	199,000 [63]	0.72%
DHL Group (ex Deutsche Post AG)	50,000	**11,100**	-	1,054.28	8,260,000 [57]	0.01%
E.ON SE	-	-	-	-	2,010,000 [81]	-
Fresenius SE & Co. KGaA	**1,100**	-	-	104.48	308,000 [82]	0.03%
Fresenius Medical Care AG & Co. KGaA	-	-	-	-	260,800 [83]	-
Hannover Rück SE	-	-	-	-	389 [85]	-
Heidelberg Materials AG	600	**600**	-	56.99	61,780,000 [86]	0.00%
Henkel AG & Co. KGaA	1,300	**1,200**	-	113.98	283,000 [58]	0.04%
Infineon AG	-	-	-	-	246,126 [88]	-
Mercedes-Benz Group AG	-	-	-	-	538,000 [90]	-
MERCK KGaA	780	**800**	-	75.98	1,236,000 [92]	0.01%
MTU Aero Engines AG	-	**200**	-	19.00	39,600 [94]	0.04%
Münchener Rückversicherungs-Gesellschaft AG	**304**	-	-	28.87	33,903 [96]	0.09%
Porsche AG	-	-	-	-	17,638 [98]	-
Porsche Automobil Holding SE	-	-	29 [99]	-	- [99]	-
QIAGEN N.V.	-	-	-	-	13,375 [100]	-
Rheinmetall AG	-	-	-	-	143,386 [102]	-
RWE AG	**1,000**	-	-	94.98	61,900,000 [103]	0.00%
SAP SE	16,500	**17,000**	-	1,614.66	112,800 [59]	1.43%
Sartorius AG	-	-	-	-	13,103 [105]	-
Siemens AG	13,500	**9,700**	-	921.31	387,000 [60]	0.24%
Siemens Energy AG	-	-	(worldwide 5,300 [108])	-	163,000 [108]	-
SiemensHealthineers AG	-	**1,400**	-	132.97	133,000 [61]	0.10%
Symrise AG	-	-	-	-	290,424 [111]	-
Volkswagen AG	-	-	-	-	4,030,000 [113]	-
Vonovia SE	4,400	-	**2023: 5,795** [62]	550.41	508,204 [62]	0.11%
Zalando SE	-	-	-	-	5,193 [116]	-
Average						0.33%

On December 27, 2024, Covestro AG was replaced in the DAX by Fresenius Medical Care AG [120]. As neither company has published any data on the size of the company fleet, this has no effect on the analysis. Fresenius Medical Care AG was not included anymore in the online survey.

The companies marked in **bold** are included in the analysis with the number of vehicles marked in **bold**.

TABLE IV. POTENTIAL GHG EMISSION SHIFT THROUGH THE GHG QUOTA WITH SPECIFICIZIED EMISSIONS

DAX Company	Specificized GHG emissions instead of scope 1 emissions worldwide (+) If applicable, supplemented by correction of the GHG saving considered in the GHG quota 2023	Value	Potential GHG emission shift compared to specificized GHG emissions	Specificized GHG emissions compared to scope 1 emissions worldwide
BMW AG	company cars worldwide	113,431 t_CO_{2eq} [64]	2.29% (+587%)	15.9%
	+ operating 56 public charging points in Germany [121]	71 t_CO_{2eq}	2.35% (+647%)	
Deutsche Telekom AG	direct GHG emissions fuels vehicle fleet worldwide	116,008 t_CO_{2eq} [63]	1.24% (+172%)	58.3%
	Direct GHG emissions fuels vehicle fleet in Germany	50,358 t_CO_{2eq} [122])	2.85% (+396%)	
Deutsche Bank AG	owned or leased vehicles worldwide	2,682 t_CO_{2eq} [56]	23.02% (+698%)	14.3%
DHL Group	road transport GHG emissions worldwide	1.050.00 t_CO_{2eq} [21]	0.1% (+1,000%)	12.1%
Henkel AG & Co. KGaA	vehicle fleet worldwide	9,000 t_CO_{2eq} [58]	0.41% (+976%)	10.3%
SAP SE	GHG emission mobile combustion corporate cars worldwide 2023	84,500 t_CO_{2eq} [59]	1.91% (+134%)	74.9%
Siemens AG	fleet GHG emissions worldwide 2023	210,000 t_CO_{2eq} [60]	0.44% (+183%)	54.3%
	fleet GHG emissions worldwide 2024	191,000 t_CO_{2eq} [123]	0.48% (+200%)	
	+ BEV share of 17.6% (2023) with 1.700 BEV [60]		0.85% (+386%)	
	+ BEV share of 38.2% (2024) with 3,700 BEV [123]		2.04% (+850%)	
SiemensHealthineers AG	fleet GHG emissions worldwide	64,000 t_CO_{2eq} [61]	0.18% (+180%)	48.1%
Vonovia SE	GHG emission values of the fleet worldwide*	23,458 t_CO_{2eq} [62]	2.35% (+2,136%)	4.6%
	GHG emission values of the fleet in Germany*	22,872 t_CO_{2eq} [62]	2.41% (+2,191%	
	+ operating 58 public charging points in Germany [121]	73 t_CO_{2eq}	2.73% (+2,482%).	

* based on the average emissions and the distance traveled

TABLE V. POTENTIAL EMISSION SHIFT THROUGH THE GHG QUOTA BY PUBLIC CHARGING STATIONS

DAX Company	Amount public charging points	Amount of electricity charged at public charging stations in one year	Reduction in GHG emissions counted towards the GHG quota (2023: 352.78 g CO_{2eq}/kWh)	Share specificized GHG emissions to scope 1 emissions
BMW AG*	56	3,591.6 kWh*****	71 t_CO_{2eq}	0.01%
E.ON SE**	3,999		1,266 t_CO_{2eq}	0.25%
Volkswagen AG***	1,002		5,053 t_CO_{2eq}	0.03%
Vonovia SE****	58		73 t_CO_{2eq}	0.01%

* BMW AG Niederlassung Stuttgart, BMW AG Niederlassung München BMW AG -Werk Regensburg BMW AG operate together 31 charging stations with 56 charging points with an average charging power of 22 kW [121].

** E.ON Drive Infrastructure GmbH and E.ON Drive GmbH operate together 2.934 charging stations with 3.999 charging points with an average charging power of 36 kW [121].

*** Volkswagen AG, Zweigniederlassung Werk Kassel; Volkswagen AG, Zweigniederlassung Konzern Aftersales Kassel; Volkswagen AG, Standort Braunschweig, Volkswagen AG, Werk Emden, Volkswagen AG, Werk Salzgitter, Volkswagen AG - Werk Wolfsburg, Volkswagen AG - Forschung und Entwicklung operate together 504 charging stations with 1,002 charging points [121].

**** Vonovia Mess Service GmbH and Vonovia Energie Service GmbH operate together 28 charging stations with 58 charging points with an average charging power of 22 kW [121].

***** 2023 was the average daily amount of electricity charged at public 22 kw charging points 9.84 kWh (median 13.70 kWh) [124]. Calculated over the year (365 days), this corresponds to the assumed value. It is assumed that charging is done with grid electricity and not PV or wind electricity (which would enable higher revenues by the GHG quota [11]).

TABLE VI. SCOPE 1&2 NET EMISSIONS 2030 TARGETS

DAX Company	Scope 1&2 target 2030	Base year	Note
adidas AG	**-100%** [65]		
Airbus SE	**-100%** [66]		
Allianz SE	**-100%** [67]		
BASF SE	-25% [69]	2018	
Bayer AG	**-100%** [118]		
Beiersdorf AG	**-100%** [71]		
BMW AG	-80% [64]	2019	per vehicle
Brenntag SE	-40% [72]	2020	
Commerzbank AG	- [73]		
Continental AG	-20% [74]	2023	
Covestro AG	-60% [76]	2020	
Daimler Truck Holding AG	-42% [77]	2021	
Deutsche Bank AG	-46% [56]	2019	
Deutsche Börse AG	-42% [79]	2022	
Deutsche Telekom AG	**-100%** [63]		
DHL Group (ex Deutsche Post AG)	-42% [57]	2021	
E.ON SE	-75% [81]	2019	
Fresenius SE & Co. KGaA	-50% [82]	2020	
Fresenius Medical Care AG & Co. KGaA	- [83]		
Hannover Rück SE	- [85]		
Heidelberg Materials AG	- [86]		
Henkel AG & Co. KGaA	**-100%** [58]		
Infineon AG	**-100%** [88]		
Mercedes-Benz Group AG	-80% [90]	2018	
MERCK KGaA	-50% [92]	2020	
MTU Aero Engines AG	-60% [94]	2019	
Münchener Rückversicherungs-Gesellschaft AG	**-100%** [96]		
Porsche AG	**-100%** [98]		
Porsche Automobil Holding SE	- [99]		included in Porsche AG
QIAGEN N.V.	-42% [100]	2020	
Rheinmetall AG	- [102]		
RWE AG	-68% [103]	2022	
SAP SE	**-100%** [59]		
Sartorius AG	**-100%** [105]		
Siemens AG	**-100%** [60]		
Siemens Energy AG	**-100%** [108]		
SiemensHealthineers AG	**-100%** [61]		
Symrise AG	**-100%** [111]		
Volkswagen AG	-50.40% [113]	2018	
Vonovia SE	- [62]		
Zalando SE	-80% [116]	2017	until 2025

Companies with a scope 1 & 2 net zero emission target in 2030 are marked in **bold**.

TABLE VII. POTENTIAL GHG EMISSION SHIFT IN 2030

DAX Company	Scope 1 2023 worldwide in t_CO_{2eq} (Table III)	If available specified GHG emissions in t_CO_{2eq} (Table IV)	Scope 1 emissions worldwide in 2030 in t_CO_{2eq} (scope 1 emissions 2023 - specificized GHG emissions 2023)	Fleet size in Germany in vehicles (Table III)	Potential GHG emission shift through the GHG quota 2030 with BEV share of 100% in t CO_{2e}	Potential GHG emission shift compared to worldwide scope 1 emissions
adidas AG	21,779		21,779	800	1,169	5.37%
Allianz SE	31,774		31,774	700	1,023	3.22%
Bayer AG	1,890,000		1,890,000	1,910	2,792	0.15%
Beiersdorf AG	154,960		154,960	490	716	0.46%
Deutsche Telekom AG	199,000	116,008	82,992	15,096	22,068	26.59%
Henkel AG & Co. KGaA	283,000	9,000	274,000	1,240	1,813	0.66%
Münchener Rückversicherungs-Gesellschaft AG	33,903		33,903	304	444	1.31%
SAP SE	112,800	84,500	28,300	17,000	24,852	87.81%
Siemens AG	387,000	210,000	177,000	9,680	14,151	7.99%
SiemensHealthineers AG	133,000	64,000	69,000	1,400	2,047	2.97%

TABLE VIII. GHG QUOTA

Formula for the GHG quota assumed GHG emission saving		$((FossilBaseValue * (1 - GHGQuota_{Year})) - (SpecificGHGEmissions_{grid\ electricity} * SpecificDriveTrainFactor_{battery\ electric\ drive}) * SpecificMutlipleCreditingFactor_{electricity}$							
		2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Fossil base value in g_CO_{2eq}/kWh		338.76							
		94.1 $\frac{g\ CO_{2eq}}{MJ}$ (§ 3 38. BImSchV [3], assumed to stay equal) * 3.6 $\frac{MJ}{kWh}$							
GHG quota$_{Year}$		8%	9.35%	10.60%	12.10%	14.60%	17.60%	21.10%	25.10%
		§37a(4) BImSchG [53]							
Fossil target value in g_CO_{2eq}/kWh		311.66	307.09	302.85	297.77	289.30	279.14	267.28	253.73
		FossilBasisValue * (1 - GHGquota$_{Year}$)							
Specific drive train factor battery electric drive		0.4							
		Annex 3 38. BImSchV [3], assumed to stay equal							
Grid electricity in g_CO_{2eq}/kWh		486.00	496.80	446.40	402.77	359.14	315.51	271.89	228.26
		[125]	[126]	[127]	Analogous to [10] and the political energy transition targets in §1 and §4a EEG 2023 [128] and annex 2 §4 of the Federal Climate Protection Act ("Bundes-Klimaschutzgesetz" - KSG [129], a value of GHG emissions of 141 g_CO^2/kWh for grid electricity is assumed. According to § 5 38. BImSchV [3], the actual 2030 value would be taken 2032 as average value for the GHG quota in. From 2023, a linear decline is assumed.				
Multiple crediting factor electricity		3							
		§ 5 38. BImSchV [3], assumed to stay equal							
GHG saving for grid electricity including multiple credit factor in g_CO_{2eq}/kWh		351.78	325.10	372.87	409.98	436.93	458.80	475.58	487.29
Estimated values in kWh per BEV vehicle	**M1**	2,000	2,000						
	M2	2,000	2,000						
	M3	72,000	72,000						
	N1	3,000	3,000						
	N2	2,000	20,600						
	N3	2,000	33,400						
		[47]	[12], assumed to stay equal						
GHG quota emission saving value per BEV in t_CO_{2eq}	**M1**	0.70	0.65	0.75	0.82	0.87	0.92	0.95	0.97
	M2	0.70	0.65	0.75	0.82	0.87	0.92	0.95	0.97
	M3	25.33	23.41	26.85	29.52	31.46	33.03	34.24	35.08
	N1	1.06	0.98	1.12	1.23	1.31	1.38	1.43	1.46
	N2	0.70	6.70	7.68	8.45	9.00	9.45	9.80	10.04
	N3	0.70	10.86	12.45	13.69	14.59	15.32	15.88	16.28

M1 Passengers vehicle with no more than eight seats in addition to the driver's seat (=car)
M2 Passengers vehicle with more than eight seats in addition to the driver's seat and a maximum authorized mass of up to 5 tons
M3 Passengers vehicle with more than eight seats in addition to the driver's seat and a maximum authorized mass of more than 5 tons
N1 Commercial vehicle with a maximum authorized mass of up to 3.5 tons
N2 Commercial vehicle with a maximum authorized mass of more than 3.5 tons and up to 12 tons
N3 Commercial vehicle with a maximum authorized mass of more than 12 tons

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