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ASSESMENT OF THE QUALITY OF REPORTING INFORMATION ON CO_2 EMISSION RIGHTS ON THE EXAMPLE OF ENERGY SECTOR GROUPS LISTED ON THE WARSAW STOCK EXCHANGE

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Abstract:
Poland is a participant to the European Union Emissions Trading System, which aims at reducing greenhouse gas emissions. Trading CO_2 emission rights has become a strategic area from the point of view of managing entities that emit CO_2. The aim of the paper is to investigate and identify discrepancies in the presentation and valuation of CO_2 emission allowances, CO_2 emission provision liabilities in reporting, and to assess the impact of these discrepancies on compliance with the true and fair view principle on top of the informative value of the financial statements. An in-depth qualitative analysis was used to examine disclosures of CO_2 emission rights in the 2020 consolidated financial statements coming from the largest energy sector groups listed in the WIG Energy Index of the Warsaw Stock Exchange in light of the relevant legal acts and literature. As a result of the research conducted, it was confirmed that groups of companies carry out a range of CO_2 emission rights balance classification and valuation. There were also significant discrepancies in the disclosure of information about the creation and valuation of provisions for liabilities due to CO_2 emissions. The discrepancies observed in the audited entities' balance-sheet presentations and valuation of the acquired CO_2 emission allowances and reserves resulting from IAS/IFRS in practice distorts the comparability of data presented in the financial statements. The research also revealed differences in scope of disclosed information, as well as its fragmentary nature. As a result, the comparison of data between groups in the energy sector in terms of their assets is impossible. Our study fills a research gap on the effects of using IFRS for the presentation and valuation of CO_2 emission rights in the Polish energy sector and the impact of a differentiated approach to disclosures on the true and fair view conception in financial reporting.

Key words: *CO_2, emission rights, energy sector, financial statement, IFRS*

INTRODUCTION

A financial statement is the primary source of financial information about an enterprise. The report provides the basis for assessing the financial situation (standing) of the entity. However, the condition for correctness and accuracy of such an assessment is a proper quality of financial statements [1, 2].

A financial statement must present data of adequate quality, compliant with the principles and guidelines contained in the accounting law and consistent with the accounting theory in order to properly perform its functions (information, control and analytical functions). The basis of the accounting concept underlying the quality of financial information is the true and fair view concept [3, 4, 5]. For many years, business practice has shown that certain company assets are of particular importance to its economic and sustainability image. One of such assets are CO_2 emission allowances. The accounting solutions adopted for the valuation and method of presenting the CO_2 emission rights in the financial statements have an impact on the quality of financial statements, and thus on the true and fair view of the financial situation of an entity [3, 6, 7].

For this reason, the research problem of this paper is the practical effect of applying solutions for CO_2 emission rights permitted in IAS/IFRS in the context of the true and fair view principle.

Emission of greenhouse gases such as CO_2 to the atmosphere is a significant factor affecting the climate change. This is also one of the greatest modern threat to humans. An effect of implementing the Kyoto Protocol is the EU Emissions Trading System (EU ETS), which is the basis of "the EU's climate policy and a key tool for reducing green-

house gas emissions [8]. This is the world's first major carbon market and remains the largest". The system covers around 40% of CO_2 emissions from sectors such as electricity, heating, industry, and aviation. In addition to the EU system, emission trading systems also operate, for example, in the USA and China, but they are diverse enough to create possible differences in the prices of emission allowances and impact competition. Under the EU ETS, emitters undertake to obtain and write off CO_2 emission allowances (EU allowances – EUA). According to the ETS Directive, some allowances (43% of all allowances with the possibility of an increase to 46%) is distributed by the European Commission as part of a free pool [9].

Due to the overarching goal of reducing emissions in the sectors covered by the ETS, the pool of free allowances available on the market is decreasing year by year, in line with the EU reduction targets, the implementation of which is monitored on an ongoing basis [10, 11].

Rigorous EU climate law is increasing the prices of CO_2 emission allowances [49]. In the years 2016-2017, the cost of the issue was EUR 5/ton. In 2020, prices were EUR 25 per ton, while in 2021 record price increases were observed. In December 2021, the recorded price was over EUR 90 per ton [48]. For example, in November this year, the Polish government sold 2,066,500 emission allowances, according to the data of the European Energy Exchange AG (EEX) (Central European electric power and related commodities exchange based in Leipzig). The price was EUR 87.45 for the EUA. At the previous auction, in September, the Polish government sold allowances for EUR 61.29 per EUA [12].

The increase in CO_2 emission prices has even become the subject of investigation by the European Securities and Markets Authority (ESMA), but the resulting report did not find any speculative transactions of which investment firms and non-financial counterparties were suspected due to their sudden appearance on the market in large numbers and conclusion of futures contracts [13].

In view of the above, it can be stated that trading in CO_2 emission rights has become a strategic area from the point of view of managing entities that emit CO_2, but it is also of interest to managers who see opportunities to make a profit on trading them.

Cost measurement in the energy sector, as in mining companies, is an extremely important factor affecting the financial result, due to the high share of fixed costs in the overall cost structure [14]. Both the allocated free rights and the purchased rights constitute assets which significantly contribute to costs in the event of their write-off as a result of CO_2 emissions, but may also be an important revenue element in the case of the sale of unused emission rights. Both factors, in the situation of the record increase in the prices of these rights seen in 2021, may significantly affect the financial and asset situation of entities, as well as the assessment of the effects of managing these entities. For this reason, information about an entity's or a corporate group's CO_2 emission rights may be of key importance for capital owners, investors, the government, and the public.

The effects of operations related to CO_2 emission allowances may be an important criterion for assessing management effectiveness, both in terms of the cost of manufacturing a product, and also asset value and the financial result disclosed in a financial statement [15].

The applicable regulatory sphere, in particular the International Financial Reporting Standards (IFRS) and International Accounting Standards (IAS) [16], allows for diverse approaches to the presentation of rights as an asset, the principles of creating and valuing provisions, and reporting costs, which offers managers a choice within the adopted accounting policy. Such a variety of possible approaches to the presentation and valuation of CO_2 emissions is widely discussed and criticized in the literature and by organizations influencing accounting regulations.

The aim of the paper is to investigate and identify discrepancies in the reporting presentation and valuation of CO_2 emission allowances and provisions for CO_2 emissions liabilities as well as to assess the impact of these discrepancies on compliance with the true and fair view principle in addition to the information value of financial statements. In order to achieve this goal, it was necessary to analyze the principles of disclosing CO_2 allowances and related provisions in the consolidated financial statements of corporate groups of the energy sector in Poland.

The research conducted concerned the largest groups from the energy sector listed in the WIG Energia Index of the Warsaw Stock Exchange. Our study fills a research gap regarding the effects of using IFRS in the presentation and valuation of CO_2 emission rights in the Polish energy sector and the impact of a diverse approaches to disclosures on the true and fair view concept in financial reporting.

The largest Polish energy companies are interesting entities for research due to several reasons. In Poland, as a result of the systemic transition process after 1989 and the changes that took place in the economy, per capita CO_2 emissions in 2019 were 35% lower than in 1980. However, taking into account the total emissions in 2018, Poland occupied the third place in the European Union (behind Germany and Great Britain) and fourth in 2019 (behind Germany, Great Britain, and France) in a ranking of the emission volumes per EU country [17].

Analyzing data from the five largest energy groups in Poland (PGE, Enea, Tauron, Energa, and ZE PAK), it should be noted that CO_2 emissions were reduced by 7.8% in 2020, and by 11.7% in 2019, respectively [18]. However, when analyzing the emissions of individual power plants in Poland, it should be noted that the one in Bełchatów, which belongs to the PGE Group and generates energy from lignite, ranked first as the largest "climate polluter" in the European Union for another consecutive year. The top 10 largest polluters in the European Union countries also include the power plants in Kozienice (which belongs to the Enea Group) and in Opole (owned by the PGE Group), while the remaining positions were occupied by power plants from Germany and Austria [19].

Companies of the Polish energy sector, due to high CO_2 emission levels and a shortage of emission rights, are purchasing emission rights on the free market. The increase

in the purchase prices for allowances is a factor influencing rising energy prices in Poland. It possibly also provides an opportunity to increase profits, which happened in the Tauron Group in 2021 in the energy sector [20].

The research showed a very high level of differentiation in the way of presenting the CO_2 emission rights held by the companies. The results also indicate significant differences in the scope of information disclosed in the supplementary information for shareholders and investors (notes). The indicated discrepancies also apply to solutions for valuation of provisions on emission rights selected by the companies.

In our opinion, the detected discrepancies significantly hinder the comparison of data between companies, and distort the accuracy of presenting the financial situation of the companies.

The structure of the paper was adapted to the purpose of the research. The first part presents the legislation background of accounting solutions in the context of trading in CO_2 emission rights. An analysis of the legal status was carried out with regard to the disclosure and valuation of the acquired allowances, as well as the related provisions for liabilities resulting from CO_2 emissions in the financial statements. The second part contains a review of the literature.

The third, empirical part, consists of a detailed in-depth analysis of consolidated financial statements of the largest energy sector groups listed on the Warsaw Stock Exchange WIG Energia Index. A comparison of the solutions used by these entities to present information on CO_2 emission rights was performed. Particular attention was paid to the scope of disclosures on the subject and the adopted principles of valuation.

The results of the analysis in relation to other studies are next presented. The last part contains conclusions resulting from the research, including recommendations regarding changes in regulations.

INSTITUTIONAL BACKGROUND

Accounting records, valuation and presentation of CO_2 emission rights in the financial statements are regulated at the level of national solutions and in IAS/IFRS. IAS/IFRS do not indicate a uniform model for reporting the acquired CO_2 emission allowances and their settlement. Comprehensive solutions are additionally included in the International Financial Reporting Interpretations Committee Interpretation 3 “Emission Rights”(IFRIC 3) [21]. In 2005, the International Accounting Standards Board (IASB) withdrew the Interpretation, thus justifying the necessity to modify it. The main problem was inconsistency in the valuation principles of allowances and related reserves. Since then, work has been underway to develop changes to the valuation.

In this context, it should be emphasized that entities preparing consolidated financial statements have the freedom to classify, measure, and balance sheet presentation of emission rights acquired and to create provisions in this respect.

In the light of IFRIC 3, the acquired CO_2 emission allowances are, in principle, intangible assets, and therefore are subject to the provisions of IAS 38 “Intangible assets” [16]. They are not subject to amortization, and their carrying amount is verified by means of an impairment test in accordance with IAS 36 “Impairment of Assets” [16]. The acquired rights, due to the adopted balance sheet classification, have an initial value of their purchase price. For intangible assets, the revalued amount model with the difference in equity is also allowed. Both valuation models are problematic in the context of the obligation to create provisions for CO_2 emission rights, which will be accounted for as part of the expected level of CO_2 emissions. EFRAG issued a negative endorsement advice and the IFRIC 3 was subsequently withdrawn by the IASB [22]

Provisions are formulated for the anticipated CO_2 emissions liability. It should cover the rights already held and the rights that are not available to settle (cover) the actual and projected level of CO_2 emissions. The basis for the valuation of provisions is their fair value, i.e., their market value in the case of an active market in allowances trading. By contrast, the provision for previously acquired rights should be measured at the acquisition price [16]. The recognition of provisions in the financial statements is often the subject of research in the literature [23]. Emission allowances allocated (free of charge) may be recognized as government grants and accounted for in accordance with IAS 20, Accounting for Government Grants and Disclosure of Government Assistance [16]. IAS 20 allows for two methods of accounting for grants: income and equity. The first of these rights assumes that the basis for their valuation is their fair value and they are accounted for (and disclosed in the statement of financial position) as deferred income recognized as profit or loss through operating income. Settlement may be performed by presenting the granted rights at fair value and as deferred income, written off against current income proportionally, taking into account the proportion of actual emissions to estimated annual CO_2 emissions. Thus, the financial result for the period will simultaneously include costs of the provision and settlement of income from grants [16].

If the equity method is used, the grant value should be shown in addition to the financial result as equity items. The alternative solution permitted in IAS 20 is the zero valuation of the allocated allowances, showing allowances received free of charge only in off-balance sheet records [16]. It is important that the indicated methods have different balance sheets as well as profit and loss effects.

The mentioned rules contained in IFRIC 3 do not exclude an application of other options for classifying the acquired CO_2 emission rights [24]. Their basis is the purpose of obtaining these rights. If the entity acquires the rights in order to resell them, it may recognize them as a component of inventories and measure them in accordance with IAS 2 “Inventories.” The value of the distribution of rights is estimated using one of the following methods: specific identification, average price, or FIFO (first in first out) [16]. This is also consistent with this standard that the rights can be written off for the purpose of accounting for the

actual CO_2 emissions as a component of materials with reference to provisions for the cost of product manufacturing. Another solution that is within the limits set by IAS 1 is the recognition of emission rights as a separate item of fixed assets or current assets [16].

Therefore, the IAS/IFRS solutions allow for different variants of reporting the CO_2 emission rights acquired by an entity in the statement of financial position, as well as their valuation. The reference to the cost of creating provisions and the basis for their estimation are also ambiguous. Entities should create a reserve for CO_2 emission rights based on an ongoing monitoring of actual emissions. The provision for the emissions in the part covered by the purchased rights should be formulated at the purchase price. The provision for the part not covered by the rights to be held or due is formulated at the amount of the purchase prices of the contracted rights or at the market price as of the balance sheet date [16].

In addition to international regulations, each country has the right to develop local accounting requirements. In Poland, besides the overriding Accounting Act, detailed guidelines were issued by the Accounting Standards Committee on the accounting recognition of greenhouse gas emission allowances [25]. In line with this position, the acquired and granted CO_2 emission rights are recognized in the accounting books and in the balance sheet as an intangible asset, regardless of their intended use (use for own needs, for sale, or possibly other ways of disposal). At the same time, an entity is obliged to disclose the accrued income, which is settled on other operating income in parallel to the amortization write-offs. The basis for the valuation is the purchase price. In the case of granted emission rights, the purchase price is the product of the unit selling price of the emission rights as of the date of their granting and the number of rights thus received. In turn, the fees for the allocated CO_2 emission allowances and other fees related to the participation of the entity in the emission allowance trading system should be referred to the production cost of the products or the cost of sold allowances, depending on the type of transaction, in the period when they are calculated. CO_2 emission rights as an intangible asset are subject to amortization. The amount of amortization is determined as the product of the emission rights used in a given period and the unit purchase price [25].

The method of recognizing revenues from sale as other operating revenues is important with regard to the reported effects of operations related to emission rights.

If the number of unused emission allowances is lower than expected to be used in the financial year, the entity is obliged to recognize a provision on this account by means of a write-off as accrued liabilities charged to the costs of manufacturing products. The write-off is made in the value of missing CO_2 emission allowances as the product of the number of emission allowances missing for settlement and the unit market (sale) price of emission allowances, determined on the basis of market quotations as of the balance sheet date, taking into account concluded futures contracts for the purchase or sale of emission allowances [25].

Pursuant to the position of the National Accounting Standards (NASs), detailed qualitative and quantitative data should be presented in the additional information. In the opinion of the authors of this paper, the scope of disclosures is sufficient to correctly assess the management of CO_2 emission rights in the entity, and also allows for a correct assessment of the financial condition.

LITERATURE REVIEW AND RESEARCH QUESTIONS

The global average CO_2 concentration has increased by 40% over the industrial era, rising from 278 parts per million (ppm) in 1750 to 318 in 1960, 390 ppm in 2011, 400 ppm in 2016 and 411 ppm in 2019 [26]. The greatest contribution to this skyrocketing greenhouse gas emissions has been human activity in such sectors as transport (responsible for the emission of 23% of CO_2 worldwide due to the consumption of oil and energy), production of electricity (coming from the consumption of fossil fuels such as coal and natural gas), agriculture and animal husbandry (increasing the concentration of nitrogen in the soil, which promotes the release of nitrous oxide) [27].

At the international level, efforts have been made for a long time to reduce greenhouse gas emissions. On May 9, 1992, the United Nations Framework Convention on Climate Change was ratified by 199 countries in New York, which was the first climate convention adopted, assuming international cooperation in combating climate change by limiting greenhouse gas emissions. Poland became a party to the Convention in 1994. The Convention was supplemented by the Kyoto Protocol, ratified by Poland in 2002. In accordance with the provisions of that protocol, Poland undertook to reduce greenhouse gas emissions by 6% in 2008-2012 compared to the base year 1988. At the end of 2012, Poland managed to reduce the emissions by 30.1% [28]. In addition, in 2016, Poland ratified the Paris Agreement, which covered all states as parties to the Agreement, and not only developed countries, as had been the case with the Kyoto Agreement [29].

CO_2 emission allowances are an interesting and difficult-to-value asset of an entity as far as its financial statements are concerned. Operations related to the acquisition and use to cover CO_2 emissions on top of the disposal of these rights may also deliver an important instrument to be adopted by managers in order to determine the assets and financial results of an entity or group disclosed in its financial statements.

On the one hand, the allocation of CO_2 emission allowances is intended to cover an entity's own needs regarding CO_2 emissions, resulting from the adopted production level and the technology used [30, 31]. The generated surplus (achieved, for example, through environmental investments) can be sold by the entity. On the other hand, in the case of insufficient number of allocated rights, the entity can buy them on the market. For most entities in the energy sector, the necessity to purchase additional

CO_2 emission allowances on market terms is a large expense, with radical effects on their financial situation and the cost of energy production [32].

Data presented in the financial statements, including the data on CO_2 emission rights, not only have to be true, but also properly compiled as a compact, structured, internally consistent set, and should reflect a true and fair overview of the entity's financial and property standing at the balance sheet date. This means that showing true information in the financial statements, i.e., information consistent with the material truth, does not yet guarantee the fulfillment of the true and fair view principle relating to the entire picture of the economic entity standing [33, 34, 35, 36]. The main issue is the correct valuation of the asset and equity, requiring the use of an appropriate parameter and method of valuation. Free choice of the valuation method should be allowed in the accounting law only if it does not distort the true and fair view of the financial situation of the entity. In line with IAS/IFRS, financial information should be error-free, neutral, and complete [16].

The literature has long postulated that financial statements should include consistent, comparable data on greenhouse gas emission rights, because their absence violates the "true and fair view" principle [37, 38, 39, 40, 41].

Günther pointed to the strong influence of global climate policy on accounting, especially on financial reporting [42]. The author emphasized the relationship between the climate policy and the approach to the resources and effects of business operations. A similar study done in the US showed the impact of greenhouse gas emission allowance operations on the emitters' balance sheet in addition to profit and loss account [43]. The effects of carbon rights reporting disclosures are investigated by authors around the world [44, 45, 46, 47, 48, 49, 50].

Buk pointed out the differentiation of approaches to showing greenhouse gas emission rights in the financial statements [51]. Meanwhile, Tušan used the example of the legal situation in Slovakia, showing the impact of the adopted valuation method of emission allowances on the assessment of an economic entity's financial situation [52].

Critical voices concerning binding legal regulations (IAS/IFRS) presented in the literature indicate the lack of transparency and excessive freedom in terms of balance sheet classification and valuation of CO_2 emission rights, as well as within the choice of methods for formulating and settling provisions for liabilities due to CO_2 emissions. The authors took up the indicated problem in order to verify the situation in particular entities that are listed as the largest CO_2 emitters in Poland, and which belong to energy groups listed on the Warsaw Stock Exchange in the WIG Energia Index as subsidiaries.

Based on the analysis of the literature and legal regulations regarding accounting for CO_2 emission rights, the following research questions were formulated:

Q1: Does allowing a highly free choice of presentation and valuation of acquired CO_2 emission allowances in balance sheets according to the IAS disturb the maintenance of comparability of balance sheet data between energy sector groups in Poland?

Q2: Does the lack of clear rules for the creation and valuation of provisions for liabilities due to CO_2 emissions in the IAS disturb their correct interpretation and distort the comparability of information disclosed by groups in the energy sector in Poland?

Answers to the above questions are crucial from the point of view of the principle of faithful presentation in the financial statements, and thus for meeting the true and fair view requirement.

RESEARCH DESIGN

The paper uses a qualitative research method based on multiple case studies. A case study is a research method used to describe, test, and generalize a theory, thanks to which such features as innovation, testability and empirical validation due to the connection with practice are achieved [53]. A content analysis of a text was a method used for the collection of relevant data and information from financial statements.

The research consisted of the study and in-depth analysis of the whole text of the consolidated financial statements, with particular emphasis on the notes revealing more detailed information (supplementary information for shareholders).

The research sample involved energy sector corporate groups listed in the WIG Energia index of the Warsaw Stock Exchange, whose consolidated reports for 2020 (downloaded from corporate web sites) were analyzed in order to answer the research questions.

The WIG Energia index brings together the largest 12 groups of the sector, which includes the "top 10 polluters" in Poland, in terms of the level of CO_2 emissions [19, 54]. Four groups were eliminated from the research sample: ONDE (the group produces energy and installations for photovoltaic farms), ML SYSTEM (producer of photovoltaic energy) and PHOTON (the group produces "clean" energy in a hybrid and photovoltaic system) as entities producing green energy and not emitting CO_2. The INTER RAO Lietuva Group, which works in wholesale and retail trade in electricity in the Baltic States and wind energy, was also excluded from the study. Furthermore, the ENERGA Group, which belongs to the ORLEN corporation, was added. The indicated group is one of the largest energy producers in Poland. The financial statements for 2020 of the following ten groups were analyzed:

- Elektrociepłownia "Będzin" GROUP (BEDZIN),
- CEZ Group (CEZ),
- ENEA GROUP (ENEA),
- Kogeneracja Group (KOGENERA),
- Polenergia Group (PEP),
- Polska Grupa Energetyczna (PGE),
- TAURON Polska Energia Group (TAURON),
- Grupa Kapitałowa Zespołu Elektrowni Group of the Power Plant Complex PĄTNÓW-ADAMÓW-KONIN (ZEPAK),
- Energa Group (ENERGA).

The following problems were examined by means of an in-depth qualitative analysis of the consolidated financial statements for 2020:

- the amount of CO_2 emissions disclosed in the consolidated financial statements,
- the way of presenting CO_2 emission rights in the consolidated statement of financial position,
- the valuation method adopted for the valuation of CO_2 emission rights acquired and received free of charge and the level of information on the method of valuation,
- disclosures of establishing provisions for CO_2 emissions.

RESULTS AND DISCUSSION

Based on the analysis of the consolidated financial statements issued by the groups from the WIG Energia Index, a comparative summary of results was prepared. Table 1 shows the comparison of the CO_2 emissions disclosed in the consolidated financial statements by the surveyed groups for the year 2020.

Table 1

Comparison of the amount of CO_2 emissions disclosed in the 2020 consolidated financial statements by the surveyed groups

Group of entities	Balance at the start of the period	Acquired	Free received/sold/ other	Write-off	Balance at the end of the period
Będzin	PLN 13.174K	-	PLN 82K /0/0	PLN 13.174K	PLN 82K
ENERGA	-	1.663Kt	79K t/0/0	1.742K t PLN 197M	
CEZ for own use	53.728K t	12.861K t	2.646K t/ 5K t/ (4.568)K t; reclassification (2.977)K t	28.364K t	no data
	CZK 21.011M	CZK 5.520M	0/ CZK (1.960)M reclassification CZK(1.657)M	CZK 7.401M	
CEZ for sale	22.485K t	148.341K t	0/144.913K t/ (59)K t; reclassification 2,977K t	no data	29.059K t
	CZK 14.002M	CZK 95.238M	0/ CZK 99,112M / CZK(12)M/ reclassification CZK 1.657M		CZK 13.054M – fair value measurement CZK 24.840M
ENEA	PLN 137,5 128K	PLN 2.436,061K	-/ -/ 13K (other)	PLN 1.282,117K	2.529,059K
KOGENERA	no data	no data	no data	no data	no data
PEP	no data	no data	no data	no data	no data
PGE	PLN 1.611M	PLN 6.629M	no data	Write-off PLN (3.414)M Sale PLN (2.646)M	PLN 1.774M
TAURON	Long-term: PLN 161.976K Short-term: PLN 690.225K	Long-term: PLN 141.241K Short-term: PLN 368.839K	no data	Long-term: reclassification PLN (35.807)K Short-term: write-off PLN (776.602)K reclassification PLN 35.807K, transfer to assets for sale PLN (14,201)K	Long-term: PLN 267.410K Short-term: PLN 304.068K
ZEPAK	1.107,945 t PLN 93,217K	5.561,000 t PLN 528,438K	29,370 t -	(6.609,317) t PLN (618,090)K	88.998 t PLN 3.565K Left for purchase: 5.421,262 t PLN 636.947K

Source: own study based on the consolidated financial statements by the groups for 2020.

Table 1 shows a very significant variation in the disclosure of information on CO_2 emission rights. Some reports disclose only quantitative data, and few include quantitative data. The reports of the CEZ, TAURON and ZEPAK groups revealed the broadest range of information, but none of them can be treated as a model. Among the studied groups, only ZEPAK, ENEA and CEZ presented data on CO_2 emissions in tons. The ČEZ Group was the only one to use

a very detailed presentation with a division into rights acquired for own needs and rights acquired for sale. Few reports provided full information on the movements in CO_2 rights. KOGENER and PEP groups do not provide such data at all. Therefore, the compilation shows that it is not possible to compare data between groups.

When analyzing the results of the comparison, a general conclusion can be drawn that the studied groups generally did not present detailed and transparent information on the emission rights held and the emission volumes, despite compliance with the IFRS. This is in line with the results of research discussed in the literature. Montenero et al studied financial reporting on emission allowances and greenhouse gas emissions within the European Union Emissions Trading Scheme in 85 Portuguese and Spanish companies and assessed the scope of reporting as varied and insufficient. They confirmed that companies that are under unspecific accounting treatments resulting from IFRS have a possibility to present transactions with different levels of transparency. In their article, they called for amendment to the IFRS regulation, introducing the full recognition of assets and liabilities, hence ensuring more transparency and less discretion in the financial reports [49].

Another examined problem was the method of presenting CO_2 emission allowances in the consolidated statement of financial position and the principles of their valuation adopted by the groups, in addition to the scope of the presented accounting policy in the area. Table 2 compares the presentation methods in the consolidated statement of financial position and the valuation of CO_2 emission rights.

Table 2 indicates that in each of the studied groups, various solutions were adopted regarding the method of presenting the value of CO_2 emission rights in the consolidated statement of financial position. The values assigned to these rights were recognized as an item of intangible assets, inventories, or as separate items of fixed and/or current assets. Most of the reports lacked basic information on the adopted solution in the description of the accounting principles/policy employed. Another problem is that the groups adopted various solutions regarding valuation, in particular those related to the rights received free of charge. Some of the studied entities valued them at PLN 0 and showed them only in off-balance sheet records. In this case, that part of the group's resources is invisible to the user of the financial statements, which makes it impossible to assess the group's situation from the point of its CO_2 emission allowances. The second group of entities measured at fair value against the corresponding subsidies. In the case of the second solution, a correspondingly higher balance sum was generated. It is worth emphasizing that only in one case the note contained extensive explanations of the adopted solutions on top of detailed quantitative and qualitative summaries.

Table 2

Comparison of the presentation of CO_2 emission rights in assets and disclosures of the valuation principles

Group of entities	Presentation in the financial statement				Valuation principles	Notes
	Intangible assets	Separate item of fixed assets	Inventory	Separate item of current assets		
Będzin	Rights obtained free of charge and for consideration: – rights obtained free of charge in open order against the corresponding subsidy (IAS 20); – the expected allocation of rights not yet registered is recognized against the corresponding deferred income	no such information provided	no such information provided	no such information provided	Rights acquired free of charge measured at fair value; rights purchased at the purchase price and valued as of the balance sheet date at the current price given on an industry website. Fees for granting rights, including registration fees, do not constitute the value of these rights and are settled over time. The fees paid are included in the cost of sales in proportion to their use in a given settlement period	Failure to indicate the adopted solutions in the accounting principles/policy; detailed presentation of the adopted principles and methods by means of a separate note
ENERGA	no such information provided	no such information provided	The acquired rights are recognized as a separate item of inventories and measured at cost; rights received free of charge recorded off-balance sheet	no such information provided	The acquired rights are valued at the purchase price; rights received free of charge are valued at zero	No separate note

Table 2 Continued

Comparison of the presentation of CO_2 emission rights in assets and disclosures of the valuation principles

CEZ	Rights acquired for own needs classified as long-term	no such information provided	no such information provided	The acquired rights for own needs classified as short-term are shown as a separate item of current assets.	Acquired rights are valued at purchase price; rights allocated free of charge are valued at zero	There is a separate note on the nature and changes to CO_2 emission rights. Detailed quantitative and quantitative data are presented in the note
ENEA	no such information provided	no such information provided	no such information provided	The register of CO_2 emission allowances is kept separately for each facility in the following groups of rights: a) green CER, b) EUA free and purchased.	Acquired rights are stated at cost; emission allowances granted free of charge are recognized as zero; allowances granted free of charge for a given financial year, but not transferred to an account in the Group's allowance register, the exact number of which is unknown, are recognized if they meet the definition of assets.	Detailed description of the solutions adopted as part of valuation, recording and reporting in an extensive note.
KOGENERA	no such information provided	no such information provided	no such information provided	Item: CO_2 emission allowances purchased for redemption.	Rights received free of charge are recognized at zero value, while rights acquired are recognized at cost. Due to the specific nature of sales, the disposal of CO_2 emission allowances is measured using the detailed identification method.	There is no information about the valuation in the accounting policy. The valuation principles are presented in a separate note.
PEP	The carbon dioxide emission rights granted free of charge were not included in the balance sheet at the time of their granting and in subsequent periods. No details on the valuation in the accounting policy, no notes on CO_2 allowances					
PGE	no such information provided	Some allowances classified as long-term.	no such information provided	Some allowances classified as short-term.	EUA received free of charge are presented at nominal value, i.e., at zero. The purchased emission allowance units are recognized at the purchase price. The disposal of CO_2 emission allowances purchased for own needs is valued using the detailed identification method included in the National Investment Plan.	There are no references to the solutions adopted for CO_2 emission allowances in the accounting policy.
TAURON	no such information provided	Some allowances classified as long-term.	no such information provided	Some allowances classified as short-term.	EUA received free of charge are presented at nominal value, i.e., at zero. The purchased emission allowance units are recognized at the purchase price. The disposal of CO_2 emission allowances according to FIFO against the corresponding provision amount settlement, which takes place on the date of redemption of these rights.	A detailed description of the solutions adopted in the field of valuation, recording, and reporting. Detailed disclosures regarding the value of purchase, write-off, and reclassification can be found in the extensive note.
ZEPAK	Rights acquired free of charge and against payment for own needs.	no such information provided	no such information provided	Item: emission rights.	EUA received free of charge are presented at nominal value, i.e., at zero. The purchased emission allowance units are recognized at the purchase price.	Details on the number of allowances held, purchase, and write-off values are provided in the notes.

Source: own study based on the consolidated financial statements of groups for 2020.

The results obtained indicate a lack of comparability of data on CO_2 emission rights between the groups and signals difficulties in assessing the effects of managing these rights against all assets and the capital of a given group. The indicated discrepancies in the valuation can be related to the results of other studies. Buk drew attention to the various possibilities of valuation of CO_2 emission rights, based on the example of the fuel and energy sector [51]. According to Czech researchers, the recognition of emission allowances as intangible assets is not entirely accurate. This item could also be recognized as marketable securities or inventory. In the Czech accounting system, emission allowances are disclosed as fixed assets because intangibles are not placed in current assets. The researchers highlighted that emission allowances and related transactions significantly influence a financial position and performance of a company reported in its financial statements [50]. The consequences of using various methods

of valuation and reporting of CO_2 emission allowances were also the subject of studies conducted by Tušan on the example of national regulations and IAS/IFRS in Slovakia. The author showed the direct impact of the adopted solutions on the results of financial analysis in order to assess the financial and asset standing of an economic unit [52].

Results indicated in Tables 1 and 2 and discussed above confirmed that allowing a very large choice of presentation and valuation in the balance sheet by the IAS regarding acquired CO_2 emission allowances disturbs the maintenance of comparability of balance sheet data between energy sector groups in Poland. This is an affirmative answer to the first research question.

Table 3 presents the results of subsequently studied disclosures regarding the recognition of provisions in the analyzed financial statements.

Table 3

Comparison of the presentation of CO_2 emission rights provisions in financial statements

Group of entities	Provision title	Rules for creating and reversing provisions
Będzin	Provision for CO_2 emission allowances is broken down into short-term and long-term. The note on provisions distinguishes this type of provision, presenting detailed information on changes in the provisions and valuation principles.	The provision is formulated for liabilities resulting from the emission of pollutants, which are valued as a product of the number of allowances necessary for write-off in connection with the released emission and the unit cost (purchase price) of emission allowances held by the group and due as of the balance sheet date (measured at market value). The unit cost of allowances to cover the estimated emissions is calculated according to the FIFO method. Provisions for air emissions are recognized as prime cost of sales.
ENERGA	Provision for the emission liability. The accounting policy presents basic information on the procedure for creating and measuring provisions in this respect.	The provision is formulated for the part of CO_2 emissions covered by the purchased allowances, at the purchase price. In the part not covered by owned or contracted allowances – based on the contracted purchase prices of allowances, and based on market prices as of the balance sheet date.
CEZ	Provision for liabilities for CO_2 emissions. The accounting policy involves detailed principles for the creation and valuation of provisions for liabilities due to CO_2 emissions. There is no explanatory information about this type of provisions in the note on provisions (while some other types of provisions are described in detail).	The provision for the coverage of CO_2 emissions from acquired rights is measured at their purchase price. The provision for the rights requiring acquisition is calculated at market value. The principles for the reclassification of rights, including those intended for sale, are described in detail.
ENEA	Provision for the purchase of CO_2 emission rights. The note on provisions contains extensive explanations regarding the provision for certificates of origin and energy certificates. However, no detailed information on provisions for the purchase of CO_2 emission allowances has been provided.	The assessment of the provision includes an assumption on the free allocation of CO_2 emission allowances to which the Group was entitled in 2020.
KOGENERA	Provision for shortage of CO_2 emission allowances. The description of the provision shows that it includes the value of the allowances already acquired and the value of the allowances in shortfall in relation to the actual and estimated CO_2 emissions.	The provision for actual CO_2 emissions is recognized in the amount exceeding the received subsidies in the form of free CO_2 emission allowances (at market prices). The estimated expenditure necessary to fulfill the obligation to write off CO_2 emission allowances is based on the detailed identification method, taking into account the allocation of the purchase of allowances to a given year. The increase in the provision level in 2020 results from the lower level of granted CO_2 emission allowances for generating entities and is the result of the higher purchase price of the contracted allowances.
PEP	No information is available on the provisions for CO_2 emissions.	
PGE	Provision for the liability for CO_2 emissions is assigned to a given year. The report contains a fairly detailed description of the principles of creating and valuing provisions.	The provision is formulated in the amount of the most appropriate estimate of the expenditure necessary to fulfill the present obligation as of the reporting date. The estimation of the expenses necessary to fulfill the obligation to write off CO_2 emission allowances is based on the detailed identification method, taking into account the allocation of both free and purchased allowances to a given year. The cost of the formulated provision is presented in the statement of comprehensive income in operating activities, and recorded as cost of sales by function, as well as taxes and fees in a comparative system.

Table 3 Continued
Comparison of the presentation of CO_2 emission rights provisions in financial statements

TAURON	Provision for liabilities due to CO_2 emissions (detailed note with values concerning production, reintegration, use), Provision for penalty payment for CO_2 emissions not covered by allowances. Both provision titles are described in detail.	The Group companies covered by the EU ETS are obliged to write off the allowance for each ton of carbon dioxide emitted in a given year by 30 April of the following year. The provision is charged to operating costs (taxes and charges) in the amount of: • in the part covered by the rights held as at the balance sheet date: – at zero value – in the case of allowances received free of charge, – at the purchase price – in the case of purchased allowances; • in the part not covered by the rights held as at the balance sheet date: – first of all, at the values resulting from the concluded forward transactions for the purchase of allowances intended to fulfill the obligation for the current year, – then at the market value of the allowances missing to fulfill the obligation as at the balance sheet date or at the value of any penalty – in line with the intention to fulfill the obligation. As of the date of writing off allowances, emission allowances classified as short-term intangible assets are recognized against the corresponding provision for gas emission liabilities.
ZEPAK	Provisions for CO_2 emission liabilities (for the value of acquired and to-be-purchased rights), Provision for the return of allowances. The first type is described in detail, while there is no information about the second type of reserve. The content of the description of the provisions (note) shows that the group takes into account the allocation of free, additional allowances, provided that the declared capital expenditure is incurred. It can be assumed that the second type of provision is related to the indicated situation.	The provision for actual CO_2 emissions is recognized in the amount exceeding the subsidies received as free CO_2 emission allowances (at market prices). The estimated expenditure necessary to fulfill the obligation to write off CO_2 emission allowances is based on the detailed identification method, taking into account the allocation of the purchase of allowances to a given year. The cost of the formulated provision is presented in the profit and loss account in operating activities and recorded in the calculation system under the cost of sales item and in the comparative system, under taxes and fees. The provision is formulated using the net liability method in the amount of: – in the part covered by the rights held at the respective value (at the purchase price – as purchased, at zero value – as received), in the uncovered part – at the lower value of the market value of the rights necessary to fulfill the obligation, and in the part for which forward transactions with execution were acquired for next year. The trade and other receivables include an advance payment for the purchased CO_2 emission rights.

Source: own study based on the consolidated financial statements of the groups for 2020.

The results of the research showed a different approach to creating provisions for CO_2 liabilities. Some groups formulated provisions for the missing allowances to cover the expected CO_2 emissions (provision for the purchase of CO_2 emission allowances). In several cases, a provision was formulated for allowances already acquired and planned for purchase, to be settled (written off) under the actual and estimated gas emissions. Different approaches to creating provisions have result-affecting consequences. Provisions in this respect are treated as the result of basic operating activities and are charged to the cost of manufacturing the products. Therefore, the value of the formulated provision directly affects this cost, and thus the result on basic operating activities. The valuation of the provision may depend on whether it is formulated for the value of rights already acquired, contracted or planned to be purchased. In the first case, the basis for the valuation of the provision will be the acquisition price. In the second case, it is related to the purchase price stated in the contract. In the last case, the basis is the market value of the allowances as at the provisioning date. The groups' use of different approaches to provisioning results in the non-comparability of the operating result displayed in the consolidated statement of comprehensive income.

It should be noted that in two cases, other types of provisions related to CO_2 emissions were also disclosed. The first of them – a provision for the return of allowances – was reported by the ZEPAK Group. It was not described sufficiently, and probably it related to the conditional allocation of additional allowances after meeting the condition of incurring the declared investment outlays. The second provision for the payment of a penalty for CO_2 emissions without coverage of the allowances held was reported by the Tauron Group.

The appropriate presentation of the adopted accounting policy in this regard is of great importance to the correct interpretation of the information on provisions for CO_2 emission liabilities. The analysis of financial reports shows that the groups provide only general information on the subject, often in a note covering all provisions. The lack of detailed explanations in the accounting policy in this respect, in practice, prevents the correct assessment of a group's financial situation with regard to CO_2 emissions. Almost none of the analyzed reports did include detailed principles for the creation and valuation of provisions.

The arbitrariness of the method to create provisions resulting from the lack of detailed regulations in IFRS in this respect was also discussed in the literature.

Kuzior, having analyzed listed companies, pointed to the lack of more detailed information on provisions. Although another group of provisions was investigated, a similar effect was demonstrated [23].

According to Reizinger-Ducsai, referring to the IFRIC 3 Interpretation "Emission Rights" [24], a variety of rules on

the presentation and valuation of provisions makes it impossible to compare the financial situation of entities. The author also mentioned that one of the reasons for the rejection of the IFRIC 3 was the debatable proposal to include the costs of fines or sanctions due to a shortage of rights in the valuation of the provision [41].

The above comparison shows that the use of IAS/IFRS in the studied consolidated reports for the creation and valuation of provisions for liabilities due to CO_2 emissions disturbs their correct interpretation and distorts the comparability of information disclosed by groups in the energy sector in Poland. This is an affirmative answer to the second research question.

The results presented above contribute to the literature, where one can find critical voices regarding the ways of treating the emission rights under IAS/IFRS, including the International Financial Reporting Interpretations Committee (IFRIC) Interpretation 3 "Emission Rights" (IFRIC 3) [24].

The EFRAG drew attention to the consequences of various bases for the valuation of CO_2 emission rights and the established provisions for emission liabilities. Negative endorsement advice issued by EFRAG was one of the reasons, why IFRIC 3 was subsequently withdrawn by the IASB [22].

Montero et al critically assessed the use of IAS/IFRS solutions concerning CO_2 emission rights. In the authors' opinion, such practices lead to a more selective approach in choosing the accounting solution and increases the probability of not disclosing some information [49]. Giner, based on his research, proposed the introduction of unified solutions for disclosing information on entitlements in financial statements. He also criticized the freedom in the selection of solutions used in IAS/IFRS and economic practice [30].

The lack of detailed, harmonized regulations leads to too much freedom in the adopted accounting approaches and limits the transparency of disclosures. There are many voices in the literature calling for a change in the currently applicable international legal regulations in the area of CO_2 emission reporting. Disclosures of carbon dioxide emissions are important for external stakeholders who are looking for true and reliable information about the amount of the gas emitted and the rules for recognizing and accounting for emission rights. It is necessary to regulate the financial reporting principles in this regard in detail [37, 38, 39].

The literature has indicated that the IASB's efforts to create an efficient framework of accounting standards are too slow. Rathee and Kapil examined accounting policies for the treatment of emissions, credits and renewable energy certificates of six regions and countries – Europe, Austria, Germany, Spain, USA and India, and showed that the reporting was not comparable [40]. Moreover, the authors found that the lack of common guidelines for CO_2 emission rights across countries and industries could also be a strong obstacle to exploiting the results to reduce carbon dioxide emissions and encouraging investment in renewable energy worldwide.

Also Garcia-Torea et al, after a comprehensive analysis of disclosures in the financial statements for 2015 and 2016 by CO_2 emitters operating in eight different industries, concluded that implementing the European Union Emissions Trading System did not improve the chaotic and incomplete disclosures of emission rights, and current reporting practices are far from enabling an adequate assessment of the financial impact and risks in carbon markets [46].

The results of our research on energy companies operating in Central and Eastern Europe, previously not analyzed in the scope on the balance sheet effects of trading in CO_2 emission rights, are congruent with the results presented above.

CONCLUSIONS

For entities in the energy sector in Poland, CO_2 emission rights are resources of strategic importance. They constitute an asset, and if they are written off in connection with the emissions released, they become a product manufacturing in conjunction with provisions for liabilities due to the emissions. They can also be a source of revenue if the entity disposes of unused allowances. Trading CO_2 emission rights is also associated with incurring certain costs, e.g., fees for the allocation of allowances and for participation in auctions, which also directly affects the financial result (recognizing them as a cost) or does it indirectly (including initial acquired rights measured at cost). The correct assessment of operations related to the rights, carried out by the management board of an entity, and in particular a group of entities, requires a disclosure of an appropriate set of financial information in the financial statement (consolidated financial statement), as well as its presentation reflecting the adopted classification. The applied solutions should result from the applicable accounting law and provide a true and fair view of the financial and asset standing of the entity. According to the IFRS Conceptual Framework, financial information should be useful in decision making, and it meets such a criterion if it is, among others, relevant, complete, and comparable.

The analysis carried out in this paper showed that most of the largest energy groups present incomplete information in their consolidated financial statements, which makes it difficult, or even impossible, to correctly interpret the information disclosed. This applies, inter alia, to the presentation and valuation of rights, as well as the valuation of provisions or fees. The fragmentary nature of this information, combined with the lack of data on the actual emissions in terms of quantity and value, makes it difficult to properly assess the effects of operations on emission rights. For other studies, such a result may be a manifestation of information avoidance.

At the same time, the results obtained indicate diversity in the presentation of the acquired rights (e.g., as an intangible asset, an inventory component, a separate item of fixed assets, a separate item of current assets, or mixed solutions). If this fact is combined with a different approach to the valuation of rights and the lack of sufficient information on the rights received, it becomes obvious

that this information is not comparable between groups. Taking into account the fact that the analyzed groups include the largest polluters in Poland, such a situation may raise financial information users' serious concerns. At the same time, it should be stressed that the freedom enjoyed by the studied groups is not in contradiction with IAS/IFRS, which allow for various solutions. The results of other studies, as well as the analysis of the national solutions' legal status (resolution of the NASs), indicate that they are more structured, detailed, clear and comprehensive. However, the largest emitters are listed companies that are subject to IAS/IFRS.

Given the presented results, it is recommended to standardize the solutions allowed under IAS/IFRS, especially within the scope of reporting presentation and valuation. It is also postulated to develop the scope of mandatory disclosures, including information on the actual CO2 emissions in terms of quantity and value, which will facilitate the assessment of an entity's financial situation, as well as of the effects of managing such an entity, and in particular, a group of entities.

The results of our research are encouraging in terms of their continuation concerning the intentional actions of managers. An incomplete or insufficiently transparent set of information on CO_2 emissions, emission rights, on top of related provisions and fees may be a result of the companies' managers intentionally avoiding a complete presentation of the effects of operations regarding this asset.

The reason may be the desire to hide data on environmental pollution, as they may be negatively perceived by current and potential shareholders and investors.

A possible further research could contribute to supplementing the literature on the relationship between carbon emissions and goodwill, or corporate value [44, 45, 47].

The small size of the research sample, as well as the lack of detailed financial analysis regarding, for example, the impact of disclosure of CO_2 emissions on goodwill, was a certain limitation in the research, which the authors intend to go beyond in the next stage of the research.

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