“Energy companies’ transparency: Toward competitiveness and SDG 7 progress”

AUTHORS	Inna Makarenko Pavlo Brin Anargul Belgibayeva Igor Orlov Zhanna Oleksich

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Inna Makarenko (Ukraine, Czech Republic), **Pavlo Brin** (Ukraine),
Anargul Belgibayeva (Kazakhstan), **Igor Orlov** (Ukraine), **Zhanna Oleksich** (Ukraine)

ENERGY COMPANIES' TRANSPARENCY: TOWARD COMPETITIVENESS AND SDG 7 PROGRESS

Abstract

The disclosure of information on sustainability by energy companies is a guarantee of increasing their competitiveness in achieving Sustainable Development Goal 7 and the post-war recovery of the Ukrainian energy sector. This paper aims to evaluate the sustainability transparency reporting of energy companies in Ukraine and connect the level of such transparency and their competitiveness. The study used the Transparency Index to analyze information disclosure on sustainability by 50 energy companies in Ukraine, the largest taxpayers. It is based on SDG, CSR, and ESG criteria and shows the companies' ratings. It was found that companies with a low disclosure of SDG, CSR, and ESG criteria have the largest specific weight (76%) among the respondents. The undisputed leader in sustainability transparency is Energoatom, while only 11 companies out of 50 surveyed have an A and B rating (the highest and higher level of transparency). The index was used as a factor variable in the non-parametric modeling of the relationship between the sustainability transparency of energy companies in Ukraine and their competitiveness (company return, profitability, and profit margin of taxes paid). A close, statistically significant, and inverse relationship was revealed between the Sustainability Transparency Index of energy companies and indicators illustrating their competitiveness besides profitability. The results of rating and clustering companies according to SDG, CSR, and ESG criteria can be used to improve their positive and negative investment screening procedures and increase their competitiveness on the way to SDG 7.

Keywords sustainability reporting, transparency, energy companies, investment attractiveness, stakeholders

JEL Classification M40, M41

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Inna Makarenko, Doctor of Economics, Professor, Sumy State University, Ukraine; Principal Lecturer and Research Lead, Prague City University, Czech Republic. (Corresponding author)

Pavlo Brin, Ph.D., Associate Professor, National Technical University "Kharkiv Polytechnic Institute", Ukraine.

Anargul Belgibayeva, Associate Professor, Department of Business and Services, Ualikhanov University, Kazakhstan.

Igor Orlov, Doctor of Economics, Professor, Department of Accounting and Audit, Ferenc Rákóczi II. Transcarpathian Hungarian Institute, Ukraine.

Zhanna Oleksich, Ph.D., Department of Accounting and Taxation, Sumy State University, Ukraine.

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INTRODUCTION

Ensuring the access of the general population to cheap energy sources involves large-scale energy investments, carried out considering ESG (environmental, social, governance) criteria and CSR (corporate social responsibility) of companies (Lahouirich et al., 2022). An essential task is to expand the energy infrastructure and its technological modernization to provide clean energy around the world that can both stimulate economic growth and contribute to the preservation of the environment today and in the future, thus achieving environmental security, creating jobs, improving health population, development of communities, especially rural ones (Kumar, 2020). Sustainable Development Goal 7: Clean and Affordable Energy (SDG 7) requires additional capital mobilization, especially in developing countries, considering the unprecedented deepening of the investment gap under the SDG by 56% to USD 3.9 trillion due to the energy crisis and the war in Ukraine (OECD, 2023). The Covid-19 pandemic also significantly deepened the gap (Alabdullah & Asmar, 2022; Kaya, 2022).

SDG 7 is of particular importance for achieving the goals of a circular economy (Ievdokymov et al., 2018) and the state's energy independence. According to Ukrinform (2023), the damage caused to Ukraine's energy, gas, and heat infrastructure by the invasion of Russia exceeds USD 10 billion. The war caused a financial crisis in the energy sector of Ukraine, especially at the level of regions close to hostilities (Kryshtanovych et al., 2022). The lack of necessary capital is the main problem that all enterprises in the energy sector face. Ukraine's acquisition of EU candidate status during the war activates the application of the Green Marshall Plan for Ukraine, which may provide for investment in the restoration of energy infrastructure, which will contribute to the energy security of Ukraine and Europe. The energy companies' transparency under these conditions becomes an essential factor in ensuring capital attraction by increasing the transparency of investment objects for institutional investors (Ibrahimov et al., 2022), channeling capital into projects to accelerate the SDG and SDG 7 progress in the energy sector of Ukraine.

1. LITERATURE REVIEW AND HYPOTHESIS

The companies' transparency is an integral part of sustainability and corporate social responsibility (CSR) (Brin & Nehme, 2021; Kuznyetsova et al., 2022); its positive impact on enterprise competitiveness is proven by Vilanova et al. (2009), Loikkanen and Hyytinen (2011), Navickas and Kontautiene (2013), Chen et al. (2016), Marin et al. (2017), Brin et al. (2022), Cavagnetto et al. (2022), Kim et al. (2023), and Prokopenko et al. (2023). The sustainability strategy and its reflection in the business environment through CSR (Djalilov, 2022; Surmanidze et al., 2022) in current conditions has turned from an acceptor of financial resources into a powerful tool for ensuring long-term competitive advantage.

The research on the role of energy companies in ensuring SDG 7 progress is quite diverse. In particular, Hannan et al. (2021) and Caglar and Askin (2023) conclude that SDG 7 significantly impacts other SDGs. The opinion that the modern energy supply system affects the economy and social sectors, which in turn leads to various socioeconomic problems and challenges, is widespread (Kozmenko & Korneev, 2014; Salim et al., 2018; Simon, 2020; Luo & Li, 2022; I. Makarenko & S. Makarenko, 2022; Filatova et al., 2022; Harini et al., 2023; Msomi & Kandolo, 2023). Additional attention to the energy sector is attracted by the fact that energy has the greatest impact on nature, namely energy supply, associated not only with global warming but also with environmental problems (air pollution, ozone depletion, acid precipitation, greenhouse gases, water use, and radioactive emissions).

Thus, the disclosure of information on ESG criteria by energy companies and their efforts in CSR and SDG is the basis for making decisions about companies' investments and the establishment of trust and confidence of stakeholders in their results (Alharbi & Al-Adeem, 2022; Mishchenko et al., 2022; Riofrio-Carbajal et al., 2023), successful implementation of green and energy-efficient projects with the involvement of green financing (Khalatur & Dubovych, 2022; Aliamutu et al., 2023; Jati et al., 2023; Boros et al., 2023), and forming a positive company image.

The transparency of the Ukrainian energy sector at the macro level was evaluated using the Energy Transparency Index (DixiGroup, 2022), the value of which, as of 2022, is 39 points out of a possible 100, which is the lowest score in the last five years. The war in Ukraine and the introduction of martial law caused a sharp drop in the information openness of this sector in 2022; the indicator fell by 24 points (or –38.1%) compared to the 2021 assessment result and, according to the Index scale, fell to the zone of unacceptable transparency (DixiGroup, 2022). The electricity sector also lost transparency significantly and decreased by 33 points. However, the specified index is intended for aggregated assessment of the energy sector and its transparency monitoring.

The transparency evaluation of energy companies at the corporate level with an integral indicator is primarily based on ESG criteria. At the same time, the number of indicators in each methodological approach is different; some authors, in addition to environmental, social, and management indicators, also suggest technical indicators. A comparative analysis of approaches to assessing energy sustainability by ESG factors is presented in Table 1 in chronological order.

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Table 1. Comparison of methodological approaches for assessing sustainability criteria disclosure by energy sector companies

No.	Source	Scope of application	Number of environmental indicators	Number of social indicators	Number of management and economic indicators	Number of other (technical, resource, institutional, etc.) indicators	Total number of indicators
1	Afgan et al. (2000)	Energy systems	4	3	3	4	14
2	May and Brennan (2006)	Australia's power-generating sector	12	4	5	–	21
3	Kowalski et al. (2009)	Austria's power generating sector	4	12	1	–	17
4	La Rovere et al. (2010)	Sustainable expansion of the energy industry	5	3	3	4	15
5	Dorini et al. (2011)	Comparison of energy generation based on coal and biomass	13	2	2	5	22
6	Stamford and Azapagic (2014)	Great Britain's power-generating sector	11	19	7	6	43
7	Roldán et al. (2014)	Power generating companies of Mexico	4	2	4	2	12
8	Santoyo-Castelazo and Azapagic (2014)	Power generating sector	10	4	3	–	17
9	Maxim (2014)[1]	Power generating sector	2	4	1	3	10
10	Atilgan and Azapagic (2016)	Turkey's power-generating sector	11	6	3	–	20
11	Rahman et al. (2016)	Energy policy of Bangladesh	2	4	6	12	24
12	Behl et al. (2021)	India's power-generating sector	Integral E-Score Bloomberg	Integral S-Score Bloomberg	Integral G-Score Bloomberg	–	3
13	Naeem and Cankaya (2022)	Global power-generating companies	E-Score Thomson Reuters	S-Score Thomson Reuters	G-Score Thomson Reuters	–	3
14	Miao et al. (2023)	China's energy-saving policy	E-Score Hexun.com	S-Score Hexun.com	G-Score CSMAR database	–	3
15	This study [2]	Energy companies of Ukraine	7	11	13	–	31

Note: [1] This study highlights social and political indicators, but their content fully corresponds to social indicators. [2] Transparency evaluation indicators in the current study are distributed by CSR, SDG, and ESG criteria groups.

All considered methodological approaches for assessing the energy sustainability of companies since 2000 (Table 1) either use simple environmental, social, and management indicators, or an integrated assessment of each of three ESG criteria, according to a particular rating. An own set of indicators is proposed based on the analysis results. The feasibility of using the original set of indicators is due to the fact that after the introduction of the SDG methodology in 2015, it is possible to be more accurate in identifying the company's actions in sustainability. Secondly, certain enterprises implement some sustainability measures not having them. Considering the previous studies of energy companies' transparency, the current paper is focused on, unlike other additional SDG criteria (does the company pay attention in its report to the achievement of individual SDGs and their priority), particular CSR criteria. In addition to traditional environmental, social and management indicators, it considers anti-corruption criteria.

The paper aims to assess the sustainability transparency reporting of energy companies in Ukraine, considering the specified criteria and its close connection with the companies' competitiveness in SDG 7 progress. The research hypothesis is formulated as follows:

H1: There is a relationship between the implementation and disclosure of SDG, CSR, and ESG criteria in the activities of energy companies and indicators of their competitiveness (investment attractiveness, financial efficiency, and stakeholders' loyalty).

2. METHODOLOGY

The Sustainability Transparency Index questionnaire was proposed to assess the energy companies' transparency in Ukraine, which was tested in the research process on the data of 50 energy companies from the database of the 200 largest taxpayers in Ukraine. First, their publicly available sustainability reporting in the broadest sense (non-financial reporting, reporting on CSR or ESG criteria) for the open last year (2021) or earlier periods in the absence of the latter was subject to investigation. In addition, the public websites of companies, their publicly available financial (annual, consolidated) statements, and management reports were investigated. In addition, data on their tax payments by key stakeholder groups from the database of the largest taxpayers of Ukraine for 2021 are provided for each company (Rating, 2021):

- land tax and environmental tax (environmental E criterion);
- income tax (including military tax) and single social security contribution (social S criterion);
- total taxes (governmental G criterion);
- income tax.

Table 2 shows the interest of critical stakeholders in increasing indicators. These indicators illustrate the impact of transparency on energy companies' key stakeholders. The return, profitability, and profit margins indicate the energy companies' transparency on their investment attractiveness and financial performance. Currently, the specified set of indicators (loyalty of stakeholders, investment attractiveness, and financial efficiency) can indirectly indicate the competitiveness of these companies.

The research methodology includes the following stages:

1) database formation on the disclosure of information by energy companies in Ukraine according to ESG and SDG criteria and the Sustainability Transparency Index questionnaire using the content analysis methodology and evaluation of each criterion according to binary variables (where 1 – compliance with the specified criterion; 0 – non-compliance with the specified criterion);
2) qualitative analysis of information disclosure by energy companies in Ukraine according to CSR, SDG, and ESG criteria;
3) quantitative analysis of the Sustainability Transparency Index of energy companies using the method of linear normalization, their clustering;
4) non-parametric modeling of links between the energy companies' transparency accord-

Table 2. The interest of stakeholder groups in the competitiveness and tax payments of energy companies (loyalty) indicators

Indicator	Stakeholder groups				
	Owners	Employees	Society	State	Local communities
Revenue	++	+			
Profit	+++	++[1]	++	+++[2]	
Profit margin	+++	++[1]	++	+++[2]	++[3]
Corporate income tax			+++	+++[4]	++[4]
Land fee			+		+++[5]
Ecological tax			+		+++[5]
Total taxes			+++	+++	+++
Single social security contribution		+++	+[7]	+[7]	+[7]
Personal income tax		+++[6]			+++[5]

Note: [1] Employees are interested in increasing profits and profitability, as this will affect their bonuses; [2] As a base for corporate income tax and as indirect evidence of the competitiveness of the state's economy; [3] As a base for corporate income tax and as an indirect indication of the competitiveness and investment climate in the region; [4] According to the proportion of revenues to the state budget and local budgets; [5] Replenishment of local budgets; [6] As indirect evidence of salary payment (the higher the tax, the higher the salary); [7] Dropped responsibility in case of disability. +++ – the most significant interest, ++ – average, and + – minimal, indirect.

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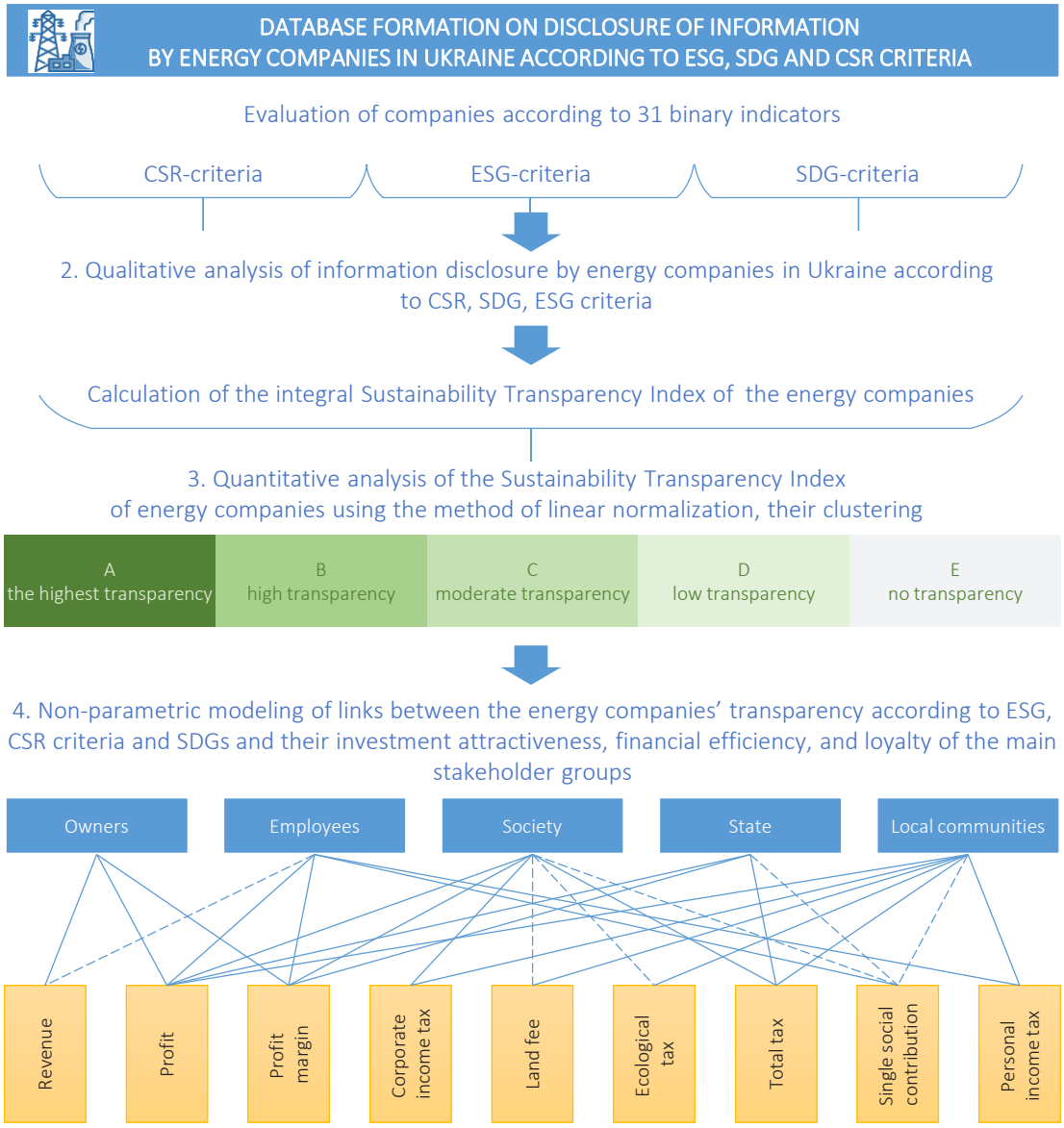

Figure 1. Study methodology of the sustainability transparency reporting of energy companies

ing to ESG criteria, SDGs, and their investment attractiveness, financial efficiency, and loyalty of the main stakeholder groups.

Figure 1 presents the general sequence of the conducted study. The questionnaire for the sustainability transparency assessment of energy companies was improved in the first stage. Unlike Makarenko et al. (2020), this study added the SDG presence and prioritization in the reporting information of energy companies and the establishment of the specific target for reducing carbon emissions. Unlike I. Makarenko and S. Makarenko (2022), criteria for company reporting verification by auditors and the type of audit opinion were added, as well as a criterion for developing alternative energy. The search for the necessary criteria was carried out using content analysis. The importance of auditors' reporting verification criteria is confirmed by the extent of reliable and high-quality financial and non-financial reporting in making investment decisions (Shazly et al., 2022).

A qualitative analysis of information disclosure by energy companies used CSR, SDG, and ESG criteria, which allows for establishing the main problematic aspects of such disclosure at the second stage:

- CSR criteria (availability of sustainability information on the website or in the company's reporting, policies in the field of SDG and sustainability, management report, standards for the preparation of non-financial information and CSR, its verification);

- ESG criteria (disclosure of ESG and anti-corruption criteria);

- SDG criteria (availability of disclosure of the company's initiatives for different SDGs, especially SDG 7) and other relevant targets in greenhouse gas emissions and alternative energy.

To quantitatively analyze the level of sustainability transparency of energy companies, this paper developed the Transparency Index using the method of linear normalization described by Makarenko et al. (2020) and I. Makarenko and S. Makarenko (2022) and the corresponding grading scale:

1. A (80;100];
2. B (60;80];
3. C (40;60];
4. D (20;40];
5. E [0;20].

The final stage is designed to establish the closeness and direction of the connection between the sustainability transparency of energy companies and their competitiveness indicators. The methods for modeling the relationship between the studied indicators are based on checking the data for submission to the normal distribution law (Shapiro-Wilk test). Finally, the modeling uses rank correlation methods (Spearman and Kendall coefficient).

3. RESULTS

The study of the 50 largest energy companies' websites and reporting by binary variables at the stage of database formation was performed according to CSR, ESG, and SDG criteria of the improved Sustainability Transparency Index.

According to CSR, ESG, and SDG criteria, the database helped to qualitatively analyze information disclosure by energy companies in Ukraine. One hundred twenty-six companies and organizations of Ukraine are members of the UN Global Compact (UNGC) as of June 2023, and only four of them represent the energy industry: DTEK, Elementum Energy, AVGUSTA, and Atmosfera (United Nations Global Compact, n.d.), although many companies publish sustainability reports.

CSR indicators are used to assess companies' transparency. Forty-five companies (90%) have their website, which can be considered the first step on the way to ensuring transparency; twenty-three companies (46%) have an official sustainability policy (policy of interaction with stakeholders, environmental, social, and anti-corruption policies). Disclosure of sustainability information is carried out by submitting the Management Report (twenty-one companies, 42%), the Integrated Report (ten companies, 20%), individual sections of the annual report, or on the company's website (seven companies, 14%). The distribution of companies by types of disclosures is shown in Figure 2.

Most companies are large and medium-sized enterprises obliged to prepare a management report starting from 2019 (for the 2018 reporting year). This requirement is contained in the Law of Ukraine No. 996-XIV as of July 16, 1999, "On

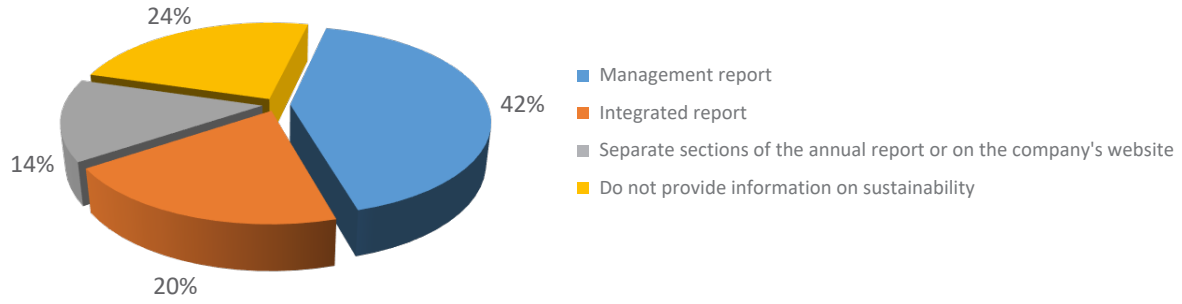

Figure 2. Distribution of energy companies by type of sustainability reporting, 2021

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Accounting and Financial Reporting in Ukraine." It is detailed in the Procedure for Submission of Financial Statements approved by Resolution of the Cabinet of Ukraine No. 41 as of February 28, 2000, and Methodological Recommendations on the preparation of the management report, approved by order of the Ministry of Finance of Ukraine No. 982 as of December 07, 2018. However, not all companies prepare this legally established report regularly. Twelve companies need to provide information on sustainability in any form. Of course, this does not speak in favor of their transparency.

Some companies use the following standards in their sustainability reports: CSR as benchmarks for their activities, in particular ISO 14001 (eleven companies); ISO 26000 (three companies); ISO 31000 (ten companies); ISO 37001 (ten companies); ISO 45001 (ten companies); AA1000 (twelve companies), which is a positive sign. Only eleven companies have shown the description of the SDGs, their incorporation, and prioritization, and only nine companies have reports verified by an independent auditor, which does not favor their transparency.

Thirty-three companies describe the social and management components, and thirty-two illustrate the environmental component according to ESG criteria. Separately, the fight against corruption should be noted as an essential component of the sustainability concept. According to the 2022 results, with 33 points, Ukraine shared only 116th place in the global ranking of countries (Transparency International, 2023); Denmark, with 90 points, followed by Finland, New Zealand, and Norway, is the leader in the fight against corruption. Twenty-seven companies (54%) of the Ukrainian energy sector have included an anti-corruption component in their sustainable development policy, including the ISO 37001 standard.

Individual energy companies pay attention to the achievement of the SDGs; the number of companies for each SDG is presented in Figure 3. However, only every fifth enterprise of the energy sector in Ukraine aims to provide access to affordable, sustainable, and modern energy sources, which needs to be increased.

Ensuring energy security is the most critical issue during martial law, the primary way to use renewable energy sources. A positive trend in the Ukrainian energy sector is that twenty-four companies (48%) were engaged in developing alternative energy sources and declared their intentions on their pages. Table A1 (Appendix A) shows indicative results of the Sustainability Transparency Index assessment of energy companies in Ukraine for 2021 during the quantitative analysis of the Sustainability Transparency Index of energy companies. The average value is 29.6% for a maximum

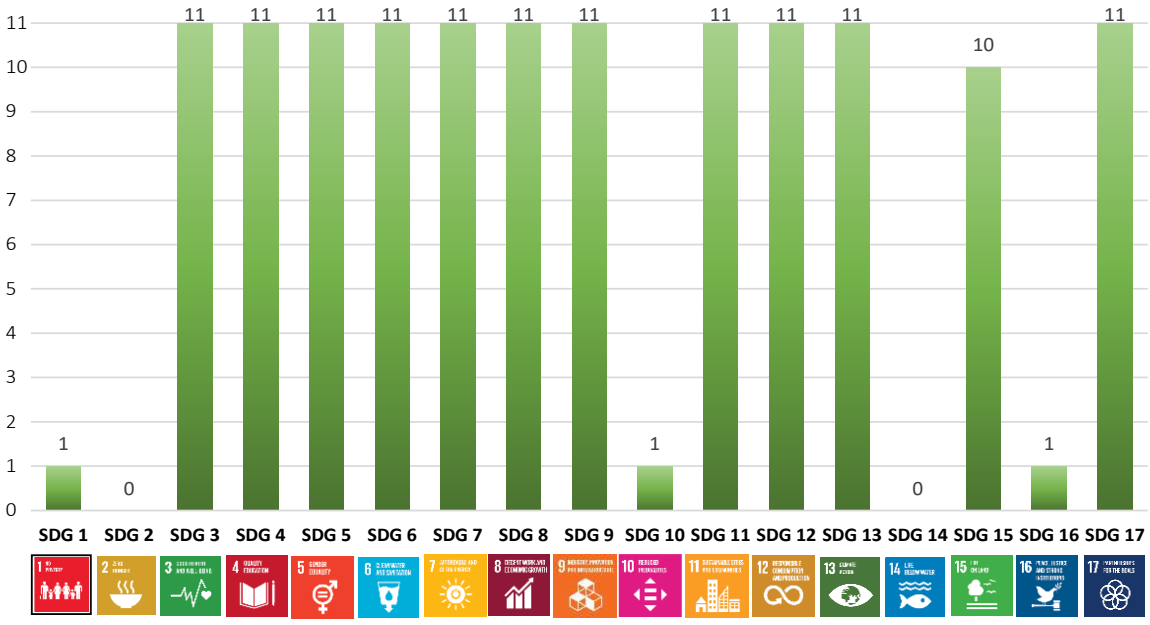

Figure 3. Distribution of energy companies by frequency of SDGs mentioned in reporting, 2021

of 100%. It indicates a relatively low level of disclosure of sustainability information and CSR, CSR, and ESG criteria in the reporting of energy companies. This conclusion is entirely consistent with the qualitative analysis of the state of such disclosure. It allows the grouping of energy companies following the index scale into five clusters corresponding to the index ratings (Table 3).

The distribution of energy companies within clusters is carried out from the highest values of the Transparency Index (A) to the lowest (E). 76% of the studied energy companies have a low (D) and very low (E) level of sustainability transparency. Four companies from group E have a zero-index value, indicating the absence of any information about companies' sustainability. Five companies have critically low values of this index – 3.2%. It negatively affects their competitiveness and investment attractiveness, especially in the context of the post-war recovery of the energy industry.

Table 3. Grouping of Ukrainian energy companies according to the Sustainability Transparency Index

Rating	Score range, %	Number of companies	Companies
A (80;100]	80.6-90.3	3	WIND POWER LLC, KIYEVENERGO PC, SE "NNEGC "ENERGOATOM"
B (60;80]	64.5-77.4	8	DTEK KYIV GRIDS PRJSC DTEK ODESA GRIDS JSC DTEK DNIPRO GRIDS JSC DTEK KYIV REGIONAL GRIDS PrJSC DTEK SHIDENERGO LLC DTEK DONETSK GRIDS JSC DTEK DNIPROENERGY JSC
C (40;60]	41.9	1	UKRHYDROENERGO PJSC
D (20;40]	22.6-35.5	16	ZHITOMIROBLENERGO JSC DNIPRO ENERGY SERVICES LLC KHERSONOBLENERGO JSC STATE ENTERPRISE "ENERGORYNOK" VOLYNOBLENERGO, PJSC DONBASENERGO PJSC ZAPOROZHYE OBLENERGO, OJSC KHMELNYTSKOBLENERGO JSC KHARKIV CHPP-5 PJSC CHERNIGIVOBLENERGO PJSC PRYOZERNE 1 LLC POLTAVAOBLENERGO JSC MYKOLAIVOBLENERGO, JSC NPC "UKRENERGO" SC GUARANTEED BUYER PRYKARPATTYAOBLENERHO, OJSC
E [0;20]	0-19.4	22	D.TRADING LLC TRADE HOUSE RGC LLC VINDKRAFT UKRAINA LLC TOV "DV NAFTOHAZOVYDOBUVNA KOMPANIYA" SUMYOBLENERGO JSC ZAKARPATTYAOBLENERGO PRJSC RIVNEOBLENERGO PRJSC CHERNIVTSIOBLENERHO AT SOLAR BOLGRAD LLC LVIVOBLENERGO PRJSC CHERKASKE KHIMVOLKNO PJSC Euro-Reconstruction, LLC SOLAR ENERGY PLUS, LLC PRJSC KIROVOGRADOBLENERGO KHARKIVOBLENERGO, JSC VINNITSAOBLENERGO, JSC CHERKASSYOBLENERGO, PJSC CENTRENERGO PJSC COMMUNAL UTILITY KYIVTEPLOENERGO TERNOPILOBLENERGO JSC FIRM "TECHNOVA" LLC ENERGOINVEST LLC

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Table 4. Shapiro-Wilk test for testing pairs of factor and outcome variables for the studied energy companies for the normality of distribution

Variable	Observation	Shapiro-Wilk test statistics	V-covariance order	z-score	Prob>z
STI	48	0.85199	6.741	4.06	0.000
Revenue	48	0.53418	21.216	6.499	0.000
STI	49	0.85623	6.655	4.037	0.000
Profit	49	0.6726	15.155	5.79	0.000
STI	39	0.85246	5.719	3.664	0.000
Total taxes	39	0.37453	24.247	6.699	0.000
STI	33	0.87381	4.308	3.038	0.001
Corporate income tax	33	0.45665	18.55	6.074	0.000
STI	29	0.91128	2.75	2.087	0.018
Land fee	29	0.60409	12.271	5.173	0.000
STI	30	0.91321	2.759	2.098	0.018
Environmental tax	30	0.50136	15.849	5.713	0.000
STI	39	0.85304	5.697	3.656	0.000
Personal income tax	39	0.32328	26.234	6.865	0.000
STI	30	0.91321	2.759	2.098	0.018
Single social security contribution	30	0.33727	21.065	6.302	0.000
STI	48	0.85199	6.741	4.06	0.000
Profit margin	48	0.60635	17.929	6.141	0.000

D cluster shows a better situation, disclosing individual index criteria, such as verification of reporting and ESG criteria. Despite the lack of disclosure under the SDG, certain companies from this cluster provide information on other goals, such as specific targets for reducing greenhouse gas emissions or developing alternative energy.

Cluster C includes PJSC "UKRGYDROENERGO," which could be considered exemplary if the criteria of the Central Bank were not presented among the criteria. The company includes all CSR and ESG criteria in its reports but does not incorporate and prioritize the achievement of the SDGs in its disclosures.

Cluster B comprises DTEK group companies with standard policies in sustainability, CSR standards, disclosure of ESG criteria, and SDG. The experience of this group is positive for other companies from the point of view of introducing International Standards for sustainability reporting in the Global Reporting Initiative (GRI Standards, the main version of compliance (Core); UN Global Compact; International standards of interaction with stakeholders of the AA1000 series (Institute of Social and Ethical Accountability); Standard ISO 14001:2015, ISO 45001, ISO 37001:2016 "Anti-Corruption Management," ISO 31000 AND COSO ERM; UN Sustainable Development Goals for the period up to 2030.

"NNEGC "Energoatom" is a leader in sustainability transparency (cluster A). The correctness of findings, in particular the leadership of the specified company, is also confirmed (CGPA & CSR Ukraine, 2021).

At the stage of non-parametric modeling of the relationship between the sustainability transparency reporting of energy companies and their competitiveness (investment attractiveness, financial efficiency, loyalty of key stakeholders), the collected data were first checked for normality.

While checking the collected array of data (Sustainability Transparency Index, income, profit, profit margin, land tax, and environmental tax, income tax (including military tax), profit tax, and total taxes) on subordination to the ordinary distribution law (Table 4), the null hypothesis was rejected for all pairs of variables at the accepted significance value of $\alpha = 0.05$.

Thus, the results of the Shapiro-Wilk test (all obtained calculated values $\alpha < 0.05$) indicate the need to use non-parametric methods for studying the correlation between indicators since the data are not normally distributed. Given this, non-parametric methods of paired rank correlation of Spearman and Kendall were used (Table 5).

Considering that not all studied enterprises had sufficient data for all studied variables (some com-

Table 5. Spearman's and Kendall's rank correlation coefficients for the Sustainability Transparency Index of energy companies' reporting and their competitiveness indicators

Indicator	Revenue	Profit	Total taxes	Corporate income tax	Land fee	Environmental tax	Personal income tax	Single social security contribution	Profit margin
Number of obs	48	49	40	33	29	30	39	30	48
Spearman's rho									
rho	−0.850	−0.202	−0.961	−0.537	−0.535	−0.514	−0.809	−0.621	−0.014
Prob	0.000	0.163*	0.000	0.002	0.003	0.004	0.000	0.000	0.924*
Kendall's rank									
tau–a	−0.681	−0.169	−0.893	−0.419	−0.384	−0.336	−0.664	−0.483	−0.007
tau–b	−0.701	−0.174	−0.921	−0.433	−0.405	−0.354	−0.685	−0.509	−0.007
Prob	0.000	0.086*	0.000	0.001	0.003	0.009	0.000	0.000	0.950*

Note: * $\alpha > 0.05$, statistically insignificant correlation coefficients.

panies refuse to disclose certain information for taxes), the number of observations in each case varies. It also indicates the low transparency level of Ukraine's energy companies. However, the correlation between the Sustainability Transparency Index and profit and the profit margin is not statistically significant only in two cases.

In all other cases, a statistically significant very close (income, total taxes, and income tax) and considerable correlation (profit tax, land tax, environmental tax, single social contribution) is observed for both Spearman's and Kendall's (primarily tau-b considering the associated ranks) coefficients. But the correlation is inverse, which is in full accordance with the results obtained for the Indian energy sector by Behl et al. (2021), Jha and Rangarajan (2020), and Friedman (1962) regarding the impact of CSR on the economic performance of companies. The fundamental explanation for this effect is the negative impact of CSR, ESG, and SDG activities of companies on their competitiveness in the short term.

The additional context of Ukrainian energy companies is also reinforced by the predominance of companies with limited information or no such disclosure (no website, no consent to disclose information). Particular emphasis can be placed on the peculiarities of tax administration and planning in Ukrainian energy companies, mechanisms of proper corporate governance and management, along with anti-corruption measures, which are at a low level and indicate insufficient transparency regarding paid tax payments for the benefit of specific categories of stakeholders of energy companies and their communication in general.

CONCLUSION

The study aims to assess the sustainability transparency reporting of energy companies in Ukraine and its close connection with the companies' competitiveness (investment attractiveness, financial efficiency, and loyalty of key stakeholders) during the post-war recovery and SDG 7 progress.

In contrast to existing studies on energy companies' transparency, in addition to the widely recognized ESG criteria, this paper checked the presence of information disclosure for the entire spectrum of 17 SDGs, especially SDG 7, additional targets in the field of reducing greenhouse gas emissions and introducing alternative energy technologies, and other criteria for CSR initiatives and verification of company reporting.

A qualitative analysis of the transparency of energy companies revealed insufficient attention to disclosing information on sustainability, its goals, and CSR. The quantitative analysis confirmed the results of the qualitative research. It established that only 11 Ukrainian energy companies have a high level of transparency (clusters A and B), corresponding to the range of values of the Sustainability Transparency Index of 60-100%. At the same time, the rest of the companies have a relatively low level of incorporation of SDG, CSR, and ESG criteria into their activities and, accordingly, reporting procedures.

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Non-parametric modeling of the relationships between energy companies' transparency in CSR, ESG criteria, and SDGs and their competitiveness revealed a close relationship between them. At the same time, the correlation is inverse, which indicates the high cost of measures to maintain CSR and sustainability initiatives in the energy sector in the short term, the influence of national characteristics of the energy sector in Ukraine, and requires further research in the long term.

These developed methodological principles for assessing the sustainability transparency reporting of energy companies in Ukraine have practical significance for investors when conducting company screening procedures considering SDG, CSR, and ESG criteria and identifying reserves for increasing their competitiveness on the way to CSR 7. Increasing the transparency of reporting of these companies will help attract investment capital and increase their transparency.

AUTHOR CONTRIBUTIONS

Conceptualization: Inna Makarenko, Zhanna Oleksich.
Data curation: Pavlo Brin, Anargul Belgibayeva, Igor Orlov.
Formal analysis: Pavlo Brin, Anargul Belgibayeva, Igor Orlov.
Funding acquisition: Inna Makarenko.
Investigation: Pavlo Brin, Anargul Belgibayeva, Zhanna Oleksich.
Methodology: Inna Makarenko, Pavlo Brin, Anargul Belgibayeva.
Project administration: Inna Makarenko, Zhanna Oleksich.
Resources: Inna Makarenko, Pavlo Brin, Anargul Belgibayeva, Zhanna Oleksich.
Software: Inna Makarenko.
Supervision: Inna Makarenko.
Validation: Pavlo Brin, Anargul Belgibayeva, Igor Orlov.
Visualization: Pavlo Brin, Anargul Belgibayeva, Igor Orlov.
Writing – original draft: Pavlo Brin, Anargul Belgibayeva, Igor Orlov.
Writing – review & editing: Inna Makarenko, Zhanna Oleksich.

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APPENDIX A

Table A1. Results of STI evaluation for the Ukrainian energy companies

No.	Company	STI, %	Rating
1	SE "NNEGC "Energoatom"	90.3	A
2	"KIYEVENERGO" PC	80.6	A
3	"WIND POWER" LLC	80.6	A
4	JSC "DTEK ZAKHIDENERGO"	77.4	B
5	DTEK DNIPROENERGY JSC	74.2	B
6	DTEK DNIPRO GRIDS JSC	71.0	B
7	DTEK DONETSK GRIDS JSC	71.0	B
8	DTEK KYIV REGIONAL GRIDS PrJSC	71.0	B
9	DTEK SHIDENERGO LLC	71.0	B
10	DTEK ODESA GRIDS JSC	67.7	B
11	DTEK KYIV GRIDS PRJSC	64.5	B
12	"UKRGYDROENERGO" PJSC	41.9	C
13	PRYKARPATTYAOBLENERHO, OJSC	35.5	D
14	SC GUARANTEED BUYER	32.3	D
15	NPC "UKRENERGO"	32.3	D
16	MYKOLAIVOBLENERGO, JSC	29.0	D
17	POLTAVAOBLENERGO JSC	29.0	D
18	KHMELNYTSKOBLENERGO JSC	25.8	D
19	CHERNIGIVOBLENERGO PJSC	25.8	D
20	DONBASENERGO PJSC	25.8	D
21	ZAPOROZHYE OBLENERGO, OJSC	25.8	D
22	KHARKIV CHPP-5 PJSC»	25.8	D
23	PRYOZERNE 1 LLC	25.8	D
24	ZHITOMIROBLENERGO JSC	22.6	D
25	KHERSONOBLENERGO JSC	22.6	D
26	STATE ENTERPRISE "ENERGORYNOK"	22.6	D
27	VOLYNOBLENERGO, PJSC	22.6	D
28	DNIPRO ENERGY SERVICES LLC	22.6	D
29	TERNOPILOBLENERGO JSC	19.4	E
30	COMMUNAL UTILITY KYIVTEPLOENERGO	19.4	E
31	CENTRENERGO PJSC	19.4	E
32	ENERGOINVEST LLC	19.4	E
33	FIRM "TECHNOVA" LLC	19.4	E
34	VINNITSAOBLENERGO, JSC	16.1	E
35	CHERKASSYOBLENERGO, PJSC	16.1	E
36	KHARKIVOBLENERGO, JSC	12.9	E
37	PRJSC KIROVOGRADOBLENERGO	9.7	E
38	LVIVOBLENERGO PRJSC	6.5	E
39	CHERKASKE KHIMVOLKNO PJSC	6.5	E
40	Euro-Reconstruction, LLC	6.5	E
41	SOLAR ENERGY PLUS, LLC	6.5	E
42	CHERNIVTSIOBLENERHO AT	3.2	E
43	ZAKARPATTYAOBLENERGO PRJSC	3.2	E
44	SUMYOBLENERGO JSC	3.2	E
45	SOLAR BOLGRAD LLC	3.2	E
46	RIVNEOBLENERGO PRJSC	3.2	E
47	VINDKRAFT UKRAINA LLC	0.0	E
48	D.TRADING LLC	0.0	E
49	TOV "DV NAFTOHAZOVYDOBUVNA KOMPANIYA"	0.0	E
50	TRADE HOUSE RGC LLC	0.0	E