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# Disclosure and Managerial Use of Regulatory Information in the Energy Industry: Evidence from Italy and the European Union

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# ABSTRACT

In recent times, energy companies have received increased attention in societal and political discourse. Climate change, environmental pollution, and rising electricity prices are some pressing concerns that have brought them into "the public eye", putting pressure to become more accountable towards multiple stakeholders, from investors to the broader community. Despite these challenges, too little effort has been devoted to investigating disclosure practices and the managerial use of regulatory information in this sector. This study addresses this gap by focusing on the electric sector, an intriguing context for investigation due to the convergence of three main characteristics.

First, the electric industry is highly regulated at both European and national levels, requiring companies to produce detailed quantitative and qualitative information for regulatory purposes. This aligns with the *compliance logic*. Second, electric companies also embrace the principles of the *business logic*. They compete in a competitive market environment, employing strategies akin to those of the private sector, driven by the pursuit of maximising financial value. Lastly, given their role as essential public service providers, electric companies engage with the *community logic*, which mandates their active involvement in environmental and societal matters, reflecting their broader commitment to social responsibility.

Based on these arguments, this thesis is organized into four parts. The initial part provides an overview of the sector. Section I explores the managerial use of accounting information produced for regulatory purposes in an Italian setting. The subsequent two sections extend the discussion to the European Union energy context. Section II presents empirical evidence on the quantity and quality of forward-looking disclosure, drawing insights from cross-industry comparisons, specifically energy and steel companies. Lastly, Section III centers its attention on Sustainable Development Goals (SDGs) reporting and control.

The first section examines whether Italian energy utilities use regulatory information for internal decision-making and control. It adopts an institutional lens to explore the extent to which the regulatory information imposed by the Italian Regulatory Authority for Energy, Networks, and Environment (ARERA) and used for decision-making and control influence their management control systems. Based on data from surveys and complementary semi-structured interviews with Italian energy utilities, the findings reveal that the large majority of the sampled firms use regulatory information for decision-making and control, though there are differences according to firm size and operating activity. Large-sized utilities and energy

distributors use the regulatory information for performance monitoring, benchmarking analysis, and investment decision-making. On the contrary, medium-sized utilities and energy traders produce the information solely for compliance and do not use it in their day-to-day activities, suggesting a tendency to couple formal structures and internal behaviors loosely. Further, this paper unveils that the regulatory requirements affected the control systems of energy utilities either radically or incrementally, leading to improved cost accounting systems, the creation of internal routines, and loop learning processes. These findings extend the managerial use of accounting information, providing novel insights from the Italian energy sector. To the best of my knowledge, this is the first attempt to explore the internal use of regulatory information in the Italian energy industry. The findings also enrich the institutional management accounting research by showing that external regulatory pressure has either a radical or an incremental influence on the management control systems of energy utilities. Overall, the findings highlight the regulator's role as a driver of performance control and improvement within the energy industry.

The second section examines the quantity and quality of forward-looking information within annual reports of European Union electric utilities, comparing them to those of steel companies for the period 2018-2021. Using a balanced panel of 200 firm-year observations, this paper investigates the impact on forward-looking disclosure of two factors: *i)* the release of relevant regulatory statements related to risk preparedness, environmental, and climate change in 2019, and *ii)* industry-specific regulatory pressures. Results from fixed-term panel analysis reveal that both electric and steel companies increased their forward-looking disclosure following the publication of the regulations. However, electric utilities surpassed steel companies in both the quantity and quality of forward-looking disclosure. These findings contribute to the existing literature on forward-looking disclosure by presenting contemporary and comparative insights on the level and quality of future-oriented information across two industries, namely the electric and steel sectors. Furthermore, the findings contribute to the forward-looking literature by confirming the positive influence of regulatory initiatives in triggering increased responsiveness among firms towards the future, ultimately leading to improvements in the quantity and quality of forward-looking information. In conclusion, the findings of this study can inform policy decisions to formulate supportive policies aimed at promoting the dissemination of forward-looking information and nurturing a future-oriented culture.

Finally, the third section serves a dual purpose. First, it investigates how comprehensively do electric utilities report on SDGs. Second, it investigates which management control

instruments and mechanisms these companies employ to manage and control their contribution to SDGs. The findings show that electric utilities already incorporate the SDGs into their reporting, although some goals receive more comprehensive coverage than others. Electric utilities primarily address SDGs related to industry innovation and biosphere preservation, while those related to societal well-being tend to receive less attention. Additionally, a more comprehensive SDGs reporting was observed among private-owned electric utilities than among public-owned ones, and electric utilities in developed markets showed higher SDG reporting levels than those in emerging markets. Regarding management control instruments and mechanisms used, the study reveals that electric utilities predominantly rely on administrative controls to address the SDGs, often combining administrative and cultural controls on one side and planning, cybernetic, and reward and compensation controls on the other. However, while the analysis suggests that electric utilities are on track to a more holistic approach to management controls for sustainable development, it also indicates room for improvement in governance structure, operational planning, and financial metrics. Overall, the findings contribute to the evolving SDGs literature by providing insights from the energy sector in the European Union, not only in terms of reporting but also in terms of control practices applied, thus enriching the ongoing discourse on the alignment between rhetoric and practical actions. The findings offer insights for guiding policy and managerial decisions. Policymakers can benefit from these insights to further encourage SDGs contributions, with initiatives for public-owned electric utilities and those in emerging markets. Meanwhile, managers can use these findings to improve SDGs reporting and better integrate controls to govern their progress toward sustainable development.

With its findings, this thesis enriches the existing body of literature on energy utilities by addressing research questions with practical implications. Firstly, it sheds light on whether regulatory requirements serve a practical purpose for firms in their internal decision-making and control processes. This insight can inform regulatory authorities in taking necessary actions to stimulate the internal use of regulatory information as well as uncover the reasons behind the underutilization of such information by some utilities. Secondly, it provides policymakers with insights into the level and quality of forward-looking disclosure by electric companies operating in the European Union, thereby encouraging the communication of forward-looking information and fostering a future-oriented culture. Furthermore, the findings provide critical insights into the active engagement of electric companies in discussions and actions related to their contribution to SDGs and recommend policy initiatives for a more responsive economy.

# CONTEXT

The European electric industry has undergone significant transformations in recent decades, driven by evolving regulations, technological advancements, and a growing environmental awareness. Historically, electric utilities operated as vertically integrated monopolies, maintaining control over all aspects of electricity generation, transmission, and distribution. Many of these utilities were publicly owned, reflecting the strategic relevance of electricity. While this structure ensured the provision of a reliable power supply, it also came with downsides including higher tariffs, inefficiencies, and limited incentives for investments. As a result, the latter half of the 20$^{th}$ century witnessed a wave of market liberalization initiatives that extended to the electric utilities, fundamentally altering their operating landscape.

European reforms have played a pivotal role in driving this market-oriented transformation. Notably, the Electricity Directive 96/92/EC and its successor, Directive 2009/72/EC, have been instrumental in shaping the European energy market. These directives mandated the separation of electricity generation, transmission, and distribution activities, dismantling monopolies that had long prevailed. Consequently, many previously vertically integrated, state-owned utilities privatized specific segments of their operations or introduced competition in these areas. The European directives also emphasized the importance of providing fair access to the electricity market for emerging players and independent power producers, thereby creating opportunities for private companies to enter the electricity generation and supply. In parallel, the directives introduced dedicated national regulatory authorities tasked with overseeing non-discriminatory practices, exercising cost control, and guaranteeing the fulfilment of public service obligations. As a result of these transformative measures, the electric industry now consists of a variety of participants, including large and small generators, independent power producers, transmission and distribution companies, and power traders. Each of these entities operates under the scrutiny of rigorous information disclosure requirements mandated by national regulatory authorities. The specifics of these requirements naturally vary based on whether the utility operates in a regulated or liberalized segment of the market.

Above all, electric utilities face the obligation to provide financial accounting information for regulatory purposes. One of the main requirements is known as Accounting Unbundling. Under this requirement, all electric utilities, irrespective of their role in generation, production, transmission, distribution, or sale are obliged to submit separate annual regulatory accounts, prepared in accordance with the accounting regulation rules. These accounts are designed to

separate the financial performance of individual business activities and segments, offering a transparent breakdown of costs and revenues specific to each one. Accounting Unbundling serves as the primary mechanism to ensure accurate allocation and reporting of costs and revenues. Its purpose is to promote transparency and prevent cross-subsidization. Furthermore, electric utilities involved in transmission and distribution must furnish detailed information concerning the operating costs they incurred in maintaining and operating infrastructure networks running smoothly and efficiently. In addition, distribution and transmission utilities must submit capital expenditure plans for infrastructure development and upgrades. Major investment projects necessitate regulatory approval, compelling these utilities to provide detailed information about these initiatives. This information allows regulatory authorities to make well-informed decisions regarding tariff structures and facilitates cost control measures. Conversely, electric utilities operating in liberalized or free-market environments, namely producers, generators, and traders, are subject to regulatory requirements centred on market behaviour and competition. These companies are obliged to transparently disclose information related to market concentration, generation capacity, production levels, pricing strategies, and the detailed breakdown of costs that constitute financial prices (e.g., grid connection charges, metering costs, renewable energy support costs, general system charges, taxes). The reporting of these metrics is necessary to prevent anti-competitive practices or abuses of market power.

Regulatory requirements encompass a wide spectrum of data, extending well beyond financial accounting information. Indeed, independent authorities demand a multitude of non-financial data concerning various facets of service quality. This includes information related to the operational aspects of service provision (e.g., generation capacity, electricity production volume segmented by energy source and geographical location). In addition, electric firms are mandated to report a plenty of indicators concerning the security and continuity of the service. These reporting obligations often focus on performance metrics such as the frequency and duration of electricity interruptions, which are measured through indices such as SAIDI (System Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index). Moreover, electric utilities report on the punctuality of service, outage information, and maintenance schedules. Besides quantitative data, regulatory authorities also demand qualitative information on customer service and responsiveness. This includes the records of customer complaints, the unpaid ratio, the rate of new customer acquisition, response time for service requests, and measures of customer satisfaction.

The reporting of financial and non-financial information to regulatory authorities is essential for preventing welfare losses and monitoring the public value of the energy industry. This practice safeguards consumer interests, promotes efficient resource allocation, and facilitates the attainment of regulatory objectives. Nevertheless, the collection and validation of this information come at a cost. Regulatory authorities shoulder the responsibility of establishing clear and transparent guidelines for cost allocation methods, data formatting, and validation procedures. These guidelines ensure not only the accuracy but also the economic validity of the information provided by operators. Regulatory authorities play a pivotal role in scrutinizing and validating this data, ascertaining the appropriate allocation of revenues and costs while maintaining cost-effectiveness. From the perspective of the companies operating within this regulatory framework, the production and submission of information to regulatory authorities also may require some effort. In certain cases, companies may need to implement more sophisticated cost accounting systems to meet information requirements and to properly track the revenues and costs associated with regulated and unregulated activities. Alternatively, some companies may already gather similar information for internal managerial purposes and may only need minor adjustments or reallocations to align with the specific regulatory requirements imposed by regulatory authorities (Pardina et al, 2008).

Regulatory requirements evolve with the evolving of the energy industry driven by the urgent need to tackle pressing global challenges, such as energy transition, climate change, and environmental sustainability. Today the electric industry is embarking on an ambitious journey toward a sustainable energy future, commonly known as the 'energy transition'. The energy transition represents a profound change in the way societies produce and consume energy. Electric utilities, with their environmentally sensitive role, are now compelled to reevaluate their business models. They must shift away from conventional fossil fuel sources such as coal, oil, and natural gas towards cleaner and more sustainable alternatives, notably renewable energy sources. This imperative arises from the growing awareness of the unprecedented challenges our planet confronts due to climate change and environmental pollution.

In many countries, electric utilities are facing increased pressure to assume a central role in mitigating the adverse consequences of climate change and to contribute to the ambitious decarbonization goals established in national programs following the 2015 Paris Agreement. Simultaneously, in September 2015, the United Nations launched Agenda 2030 for Sustainable Development, a worldwide initiative that delineates 17 Sustainable Development Goals (SDGs) and 169 targets to be reached by the year 2030. Agenda 2030 combines economic,

ecological, and social goals. Within this framework, several SDGs are closely intertwined with the electric utility industry. Particularly, SDG 7 (Affordable and Clean Energy) emphasizes access to affordable, reliable, and modern energy services while promoting the use of renewable energy sources and enhancing energy efficiency, SDG 9 (Industry, Innovation, and Infrastructure) recognizes the importance of sustainable infrastructure, including resilient and modern energy systems to support economic growth and environmental sustainability, and SDG 13 (Climate Action) which calls for immediate action to combat climate change and its far-reaching social spheres of sustainable development. impacts, includes enhancing resilience and reducing greenhouse gas emissions. In light of these sustainable goals, the electric utility industry must align its practices and actions with the principles of sustainable development, thereby contributing to the global pursuit of a more prosperous and inclusive future.

The COVID-19 pandemic significantly amplified the challenges faced by electric utilities, resulting in changes in electricity demand, disruptions in the supply chain, and price volatility. The pandemic crisis unequivocally brought to light the vulnerable and risky environment within which these firms operate, accentuating the need for sustainability, resilience, and forward-thinking strategies. In response to these challenges, the European Union has developed a series of regulations and concrete initiatives with the aim of accelerating the energy transition.

Central to these measures is the introduction of the European Green Deal in December 2019. The Green Deal represents an extensive and cohesive package of policy initiatives meticulously designed to steer Europe toward a sustainable, carbon-neutral future by 2050. At its core, this multifaced plan places a strong emphasis on mitigating climate change and fostering environmental responsibility. It encompasses a wide array of initiatives, ranging from a commitment to renewable energy sources and energy efficiency measures to the promotion of sustainable transportation and circular economy practices, alongside biodiversity preservation. All sectors of the economy are called to play their part and make their own contribution, each with varying degrees of involvement and commitment. Notably, the electric industry is a critical actor in this transformative journey, prompting the European Union to adopt the Clean Energy Package in the same year designed specifically for the energy sector.

The Clean Energy Package consists of a set of legislative proposals and regulations to promote cleaner and more sustainable energy systems within the European electricity market. In particular, this package comprises the Renewable Energy Directive which sets targets for European member states to achieve a 32% share of renewables in the energy mix by 2030; the Electricity Regulation and Electricity Directive intended to create a more integrated and

competitive internal electricity market; the Energy Efficiency Directive seeks to reduce energy consumption by 32.5% by 2030; the Governance Regulation requires European countries to establish integrated national energy and climate plans for the period 2021-2030; the Electricity Market Design Regulation introduces changes to the electricity market to accommodate the growing presence of renewable energy sources, the Regulation on Risk Preparedness requires member states to develop plans for identifying, evaluating, and managing various types of risks that could affect the electricity supply such as extreme weather, cyber-attacks, or fuel supply disruptions, with the ultimate goal to ensure the security of the electricity supply.

This brief introduction illustrates the main paths and challenges that electric utilities have faced over time and still continue to face. The energy industry is known for its complexity, involving a multitude of stakeholders and stringent regulation at both national and European levels. At present, the predominant challenges revolve around addressing issues related to climate change, decarbonization, and sustainability in its broadest sense. European regulations have played a critical role in steering the transformation of this sector, initially dismantling monopolies and subsequently guiding it toward the goals of energy transition and sustainable development. These challenges have assumed even greater significance and urgency today, especially in light of recent financial and health crisis, as well as the Ukraine-Russia conflict, which underline the growing vulnerability of the energy landscape.

# SECTION 1

## The use of regulatory information for managerial decision-making and control: survey and interviews from Italian energy utilities[1]

### 1.1. Introduction

Management accounting systems (MAS) provide valuable accounting information that helps managers in the process of decision-making, planning and control (Anthony, 1965; Simons, 1995; Otley, 2001; Zimmerman, 2005; Ahrens and Chapman, 2007; Marchi, 2011; Marchi 2015; Casas-Arce *et al*., 2022). The information provided by these systems is instrumental in performance evaluation, benchmarking, and monitoring analysis (Mia and Chenhall, 1994; Ferragina, 2007; Marchi, 2011). Moreover, it contributes to generate knowledge within the managerial work (Hall, 2010; Presti *et al.*, 2021). Despite the acknowledged importance of management accounting information, there is a need for more research to understand its use by managers (Hall, 2010; Casas-Arce *et al*., 2022), particularly within the context of public utilities where studies are limited.

This paper addresses this gap by focusing on the Italian energy sector, which is an interesting context to look at for two main reasons. First, the privatization initiatives of the mid-1990s affected electric and gas utilities leading to major changes in their financial and accounting information systems (Tsamenyi *et al*., 2006). Second, Italian electric and gas utilities are directly impacted by ARERA requirements and therefore must produce extensive quantitative and qualitative accounting information for regulatory purposes (hereafter, regulatory information). According to institutionalists (DiMaggio and Powell, 1983), this put coercive pressure on the companies. However, companies have different ways of responding to this pressure (Oliver, 1991). They can either conform to the requirements by introducing management accounting information and using it internally, or they can decouple by producing the necessary information solely for regulatory compliance without utilizing it internally (Meyer and Rowan, 1977; Scott, 2001; Boxenbaum and Jonsson, 2017).

[1] A similar version of the content in this section has been published in Management Control, authored by ALIU S., (2023). The official publication is accessible here https://doi.org/10.3280/MACO2023-002-S1003

Against this background, this paper sheds light on whether Italian electric and gas utilities use regulatory information for decision-making and control (*RQ1*). Coherently with prior studies (Conrad, 2005; Tillema, 2005; Tsamenyi *et al*., 2006; Nor-Aziah and Scapens, 2007; Culasso *et al*., 2016), the paper adopts an institutional lens to explore the extent to which the regulatory information imposed by ARERA and used for decision-making and control influence the management control systems (MCS) of electric and gas utilities (*RQ2*).

The findings reveal different behaviours according to the size and operating activity of the firms. Large-sized utilities and energy distributors fully conform with regulatory requirements by introducing management accounting information and using it for performance control, benchmarking analysis, and investment decision-making. By contrast, smaller utilities and energy traders adopt a passive compliance approach, indicating a divergence between formal structures and their actual behaviours. This difference in behaviour may be due to the lower managerial culture that characterizes smaller firms (Busco *et al*., 2007) or it may result from differing viewpoints among energy traders who, unlike ARERA, prioritize individual customer profitability.

The findings also reveal that those utility firms that use regulatory information for internal management purposes experienced a significant or incremental influence on their MCS due to ARERA requirements. Specifically, these requirements affected their cost accounting systems and contributed to the formation of internal routines, policies, and procedures. The ARERA requirements also motivated these companies to continually monitor their performance, facilitating efficient decision-making and continuous improvements in their operations.

This paper contributes in two ways. First, it adds to the management accounting literature by exploring whether electric and gas utilities use regulatory information for decision-making and control. To the best of my knowledge, this paper is the first to explore the internal use of regulatory information in the Italian energy industry. Second, this study enriches the institutional management accounting research by showing that the external regulatory pressure has a radical or incremental influence on the MCS of electric and gas utilities. Finally, the findings highlight the role of regulator as a driver of performance control and improvement within the energy industry.

This paper is structured as follows. The next section depicts the Italian energy sector. Section 3 reviews the literature and describes the theoretical framework. Section 4 explains the methodology. Sections 5 and 6 describe and discuss the findings based on the theoretical framework. The final section concludes the paper and offers suggestions for further research.

### 1.2. The energy sector in Italy

As in many other countries, the Italian energy sector has been subject to regulatory changes over the last twenty years. Originally, it was based on large and vertically integrated monopolies. From 1962-1999, the state-owned ENEL (Ente Nazionale per l'Energia Elettrica) became the incumbent monopoly for electric power in Italy, whereas the leading gas company was ENI (Ente Nazionale Idrocarburi). However, the presence of these incumbent companies resulted in operational inefficiencies, prompting a series of privatization initiatives in the public utility sector (Gilardoni, 2020).

The privatization of electricity and gas industry in Italy began in 1999, driven by the directives of the European Union (96/92/CE, 98/30/CE). The so-called Bersani and Letta Decrees were adopted with the aim of breaking down national monopolies and promoting competition within the sector (Luciani and Mazzanti, 2006). As part of these reforms, the state-owned electric company ENEL was required to reduce its production capacity from 80 to 50 percent, as "from 1.01.2003, no company is allowed to produce or import, directly or indirectly, more than 50% of the total energy produced and imported in Italy" (D.Lgs. 79/1999, art. 8, comma 1). Consequently, ENEL began a disinvestment process, and its capacity was split into three generation companies: Eurogen, Elettrogen, and Interpower. Similar transformations occurred in the gas sector, leading to increased diversification of gas importers and reducing the state-owned ENI's dominance in the market (Gilardoni, 2020). On the one hand, the European reforms of the 1990s opened up the energy sector to market competition. On the other hand, independent authorities were introduced to control costs, monitor service quality, and safeguard the public interest. Thus, private operators gained the ability to generate and sell energy in the free market, while local distributors and transmission companies became subject to critical regulatory oversight.

ARERA (Autorità di Regolazione per Energia, Reti e Ambiente) is the Italian authority responsible for regulating and monitoring electricity, gas, and, more recently, water and waste. The supervisory role of ARERA aims to manage the trade-off between operators' need for financial profitability and consumers' need for cost-effectiveness and adequate service quality. Among its functions, ARERA defines tariffs for regulated activities and ensures compliance with regulatory requirements. It disposes of control, inspection, and sanctioning powers (Gilardoni, 2020). Recently, ARERA has developed a reward/penalty system aiming to reward/punish firms that exceed/fail to achieve specific targets set by the authority.

ARERA requires electric and gas companies to produce quantitative and qualitative documentation for regulatory purposes, generally containing much more extensive information than those disclosed in their annual financial statements. The regulatory information requirements are mandatory. Some of them affect all the actors involved in the energy chain, others are specifically addressed per field of activity (production, transport, distribution, sale). The required information is compiled and uploaded by firms on the web portal of ARERA and is not accessible to the public. However, every year ARERA releases an Annual Report providing aggregate information about regulatory activities and the state of all public utility services of its competence (electricity, gas, water, waste).

The main regulatory requirements include Accounting Unbundling, investments, operating costs, information about prices and the quality of the service. First, all electric and gas utilities must produce annual regulatory accounts (Accounting Unbundling) consisting of (i) an income statement broken up by activity, (ii) a balance sheet broken up by activity, (iii) an explanatory note describing the type of accounting tool used, and (iv) supplementary physical and monetary measurements (Testo Integrato Unbundling Contabile TIUC, allegato A alla deliberazione 137/2016/R/com). According to this regulation, all electric and gas utilities must reclassify financials by differentiating costs and revenues deriving from the electric/gas business from those unrelated to the energy sector and then going into a more detailed segment classification. Smaller firms are allowed to produce simplified regulatory accounts composed of income statements broken down by activity type[2], as well as changes in tangible and intangible fixed assets. Note that ARERA can introduce changes in Accounting Unbundling reporting from year to year, requiring firms to disclose extra information. All this information serves to limit cross-subsidization between firms' divisions and check if there are any extra profits.

In addition, firms that provide infrastructure services, namely distributors and transport companies, must submit investments (Capex) and operating costs (Opex) incurred in the previous year and the preliminary ones for the current year (delibere 27 dicembre 2019, 568/2019/R/eel, 570/2019/R/gas). Conversely, firms that provide service in free markets, namely energy producers and traders, are required to disclose quarterly information about prices (per activity, type of customer) and a distinguished list of cost components (supply costs, grid connection charges, metering costs, renewable energy support costs, general system charges, taxes) (delibera 29 marzo 2018 168/2018/R/com).

[2] Accounting Unbundling is mandatory for electric and gas utilities with more than 100,000 customers. A simplified form is allowed for companies with less 100,000 customers and 1,000-5,000 GWh of energy sold.

The need for information rises beyond financial accounting data (Pardina et al., 2008). Electric and gas utilities must provide ample non-financial information concerning the quality of the service provided. This non-financial information encompasses aspects related to service security and continuity, such as punctuality of service, electrical outages, gas losses (delibera 23 dicembre 2019 566/2019/R/eel, delibera 27 dicembre 2019 569/2019/R/gas). Additionally, energy utilities must provide customer-oriented data including unpaid ratio, churn ratio, new customer acquisition rate, customer satisfaction (Testo integrato della regolazione della qualità commerciale dei servizi di vendita di energia elettrica e di gas naturale e della regolazione della qualità commerciale dei serivizi di distribuzione dell'energia elettrica e del gas delibera 21 luglio 2016 413/2016/R/com). All the above regulatory requirements have been instituted by the regulator to foster transparency within public utility firms (documento per la consultazione pubblicato da ARERA il 16 marzo 2006, atto nr. 08/06).

Table 1.1 provides a summary of the main reporting obligations mandated by ARERA.

Table 1.1 – ARERA Reporting Requirements for energy companies (main obligations)

| | **Accounting Unbundling** (Conti Annuali Separati) | **OPEX and CAPEX** (Costi riconosciuti) | **Prices** (Prezzi) | **Service Quality** (Qualità commerciale, sicurezza e continuità del servizio) |
|---|---|---|---|---|
| **Reference legislation** | Appendix A of the deliberation 137/2016/R/com | Deliberations 568/2019/R/eel; 570/2019/R/gas | Deliberation 168/2018/R/com | Deliberations 413/2016/R/com; 566/2019/R/eel; 569/2019/R/gas |
| **Purpose** | Prevent resource cross-transfers | Promote efficiency and quality | Protect consumers | Promote efficiency and quality |
| **Obliged parties** | All companies registered in ARERA Operator Database | Rate-regulated services (distribution, transport) | Electricity and gas sales companies | Commercial quality: all companies; Security and continuity of service: energy distributors |
| **Time frame** | Ex-post (90 days after approval of annual report) | Ex-ante | Ex-post (45 days after the end of each quarter) | Ex-post |
| **Addressed to** | ARERA (also to management?) | ARERA (also to management?) | ARERA (also to management?) | ARERA (also to management?) |

*Source: author's own elaboration*

## 1.3. Literature and theoretical framework

### 1.3.1. Managerial uses of accounting information

MAS provides valuable information that is primarily used by management for decision-making and control (Anthony, 1965; Simons, 1995; Zimmerman, 2005; Ahrens and Chapman, 2007; Marchi, 2011; Cinquini *et al*., 2015; Marchi, 2015; Casas-Arce *et al*., 2022). The internal use of accounting information helps managers make informed decisions and manage uncertain and complex events (Gordon and Narayanan, 1984; Chenhall and Morris, 1986). According to Marchi (2003), data alone does not inherently have value, but rather value is generated through the processing, organization, and contextualization of data, as well as its connection to other relevant information. It is when decision-makers interpret and use information proactively and intentionally that it becomes valuable (Marchi, 2003). The importance of using MAS for decision-making has grown due to increased market competition, technological advancements, deregulation of economies, and privatization of state-owned companies. While conventional MAS relied on historical internal data to monitor organizational performance, a contemporary approach has emerged, one that embraces a future-oriented perspective that incorporates both internal and external information (Marchi, 2011).

The information provided by MAS is primarily used for performance evaluation, measurement, and target setting (Merchant and Van der Stede, 2017). Performance evaluation is particularly important for companies with a divisional organizational structure. This process involves the use of both financial and non-financial information to measure performance. Financial metrics include profitability-related indicators such as return on assets, return on sales, and return on investments, while non-financial metrics relates to non-monetary qualitative measurements such as customer satisfaction and product quality (Abernethy and Brownell, 1997). After evaluating performance, companies typically set performance targets as part of the control process to encourage continuous improvements. Setting targets provide a clear direction for the organizations and motivates employees towards achieving specific goals (Chenhall and LangfieldSmith, 1998).

In addition, MAS provide benchmarking and monitoring information to support managers in identifying industry changes and competitors' strategies and then implement best practices and competitive strategies. More precisely, managers use benchmarking information to compare their organization's metrics, such as price, costs, productivity, customer service, quality, and profitability with those of competitors (Kaplan, 1983). This information can inform

strategic decision-making and help organizations maintain a competitive position in a turbulent market (Mia and Chenhall, 1994; Ferragina, 2007; Marchi, 2011; Mancini, 2016). Monitoring information is used to "know what is going on" and gain feedback to formulate appropriate strategies (Nicolò, 2013). By continuously monitoring key variables, mangers can detect deviations from plans and perform a thorough analysis of the causes to identify the necessary interventions (Ezzamel and Robson, 1995; Marchi, 2003; Marchi *et al*., 2003). The use of information for benchmarking and monitoring purposes can also help to identify potential crises at an early stage, facilitating strategic planning and the creation of conditions for risk mitigation (Migliaccio and Arena, 2021).

Another use of managerial accounting information is for organizational learning and knowledge generation (Hall, 2010; Presti *et al*., 2021). Accounting information plays a crucial role in developing knowledge within the managerial work environment (Hall, 2010), facilitating the creation of policies, procedures, routines, and corporate culture. Additionally, it can reveal problems that are not immediately apparent from everyday activities, providing managers with valuable insights into what is happening (Simon *et al*., 1954). For instance, Van der Veeken and Wouters (2002) noted that information on estimated and actual costs was vital for senior managers to understand which projects were causing problems.

Despite the acknowledged importance of management accounting information, there is a need for more research to understand its use by managers (Hall, 2010; Casas-Arce *et al*., 2022), especially in the context of public utilities where studies are limited. Among the few existing studies, Wanderley and Cullen (2012) investigated the impact of privatization in management accounting practices of a Brazilian electricity distribution company. Their findings revealed that privatization led to changes in the use of budget systems and management accounting information. Specifically, budgetary information and performance measurement systems were adopted for decision-making purposes only after the company was privatized. Other studies have shown that privatization has driven changes in the accounting and financial information systems of electric and gas utilities (Conrad, 2005; Tsamenyi *et al*., 2006).

Some papers focused on the role of management accounting practices in improving organizational efficiency. For example, Barrios Álvarez (2021) examined management accounting practices by a state-owned Colombian multi-utility. The study revealed that the accounting-budgeting-financial planning triad was employed as a management accounting tool rather than just a legal requirement. The authors concluded that management accounting practices actively contribute to enhancing efficiency within the organization, which is

consistent with earlier research (Conrad, 2005; Nor-Aziah and Scapens, 2007). However, Saukkonen *et al*. (2018) outlined a number of constraints associated with the use of management accounting information within an energy company. These limitations include a lack of managerial expertise in using management accounting tools, limited reflections during managerial interaction, divergent preferences among managers in using accounting information, and process structures ignoring managerial viewpoints.

This paper differs from the above studies in two ways. First, instead of examining how management accounting information has changed, it seeks to explore whether electric and gas firms use the accounting information that have to submit as mandatory requirements to the regulatory authority for internal management purposes. Second, while prior studies have a single-company focus, this research draws on evidence from the Italian electric and gas sector. The Italian electric and gas sector provides an interesting setting because it requires firms to produce detailed quantitative and qualitative accounting information for regulatory purposes that could also be employed for internal management purposes. This gives rise to the first research question:

*RQ1: Do electric and gas utilities use regulatory information for internal decision-making and control?*

### 1.3.2. Institutional theory and management accounting practices

This paper uses the theoretical lens of the New Institutional theory (NIS) to explain the extent to which the regulatory requirements imposed by ARERA and used for decision-making and control influence the MCS of electric and gas utilities. The institutional perspective is particularly suitable in this case since the Italian energy industry is heavily regulated at the European and national levels.

NIS views organizations as part of a broad inter-organizational network and cultural system rather than as standalone entities (Scott, 1987; Scott and Meyer, 1994; Selznick, 1996). Its fundamental tenet is that companies operate in an institutional context characterized by rules, norms, and beliefs that enforce socially acceptable organizational practices (DiMaggio and Powell, 1983; Barley and Tolbert, 1997; Oliver, 1997). Emphasis is placed on the external environment (political, economic, cultural, technological, social) which exerts pressure on organizations affecting their organizational practices, including accounting practices. NIS is centered around the notion of institutional isomorphism which posits that organizations face pressure to conform to a set of established norms, practices and routines, resulting similar or

isomorphic (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; 1991). DiMaggio and Powell (1983) identify three forms of institutional isomorphism: coercive, mimetic, and normative. *Coercive isomorphism* refers to organizations adopting practices in response to laws, rules, and regulations imposed by external regulatory bodies or the state. *Mimetic isomorphism* occurs when organizations copy other organizations they perceive as most successful or legitimate in their field. *Normative isomorphism* refers to pressure exerted by professional training institutions, such as universities and associations.

Organizations respond to external pressures in varied ways depending on their available resources (financial resources, reputation) and their ability and willingness to comply with such pressures (Oliver, 1991). They can either conform or decouple to varying degrees from the institutional field. Oliver (1991) identified five organizational responses to institutional pressure, including acquiescence, compromise, avoidance, defiance, and manipulation. Institutional theorists suggest that organizations may not always align their daily operations with the institutional pressure they face (Meyer and Rowan, 1977; Scott, 2001). Firms may comply with such pressure to present an image of efficiency and rationality to external parties as 'a ceremonial response' but without actually applying the information internally (Abernethy and Chua, 1996). Institutional theorist refers to this contrast between formal structures and actual practices as 'decoupling' (Meyer and Rowan, 1977; Scott, 2001; Boxenbaum and Jonsson, 2017). More specifically, decoupling can be tight coupling, loose coupling and counter-coupling depending on the level of consistency between formal structures and actual behaviors (Orton and Weick, 1990; Lukka, 2007). Tight coupling is typical of rational decision-making, while institutional complexities may require loose coupling. Counter-coupling involves contradictions amongst communication, actions, decision-making and organizational legitimacy.

The institutional approach has grown in popularity as a means of analyzing management accounting practices (Scapens, 1994; Granlund and Lukka, 1998; Goretzki *et al*., 2013; Quagli and Francioli, 2021). Lately, it has been adopted to provide an understanding of management accounting practices within public service organizations (Collier, 2001; Conrad, 2005; Tillema, 2005; Tsamenyi *et al*., 2006; Nor-Aziah and Scapens, 2007; Leotta and Ruggeri, 2012; Culasso *et al*., 2016; Macchia, 2021). Collier (2001) found that financial management reforms were implemented in a UK local police force in response to institutional demands for better effectiveness. The authors suggested that NIS theory is a useful theoretical framework to analyze how the police force handled external pressure. Conrad (2005) analyzed organizational

and management control changes brought by privatization in the UK's largest gas company. Similarly, Tsamenyi *et al*. (2006) found that the interplay between the regulatory environment, market forces, and intra-organizational power relations influenced the accounting and financial information systems of a leading electric company in Spain. In another study, Nor-Aziah and Scapens (2007) analyzed a Malaysian public utility and observed that over time budgets caused conflict between operation managers and accountants. As a result, budgets became loosely coupled to other organizational activities. Leotta and Ruggeri (2012) adopted a hybrid institutional perspective to explain how performance measurement systems changed in response to normative pressure to increase efficiency in healthcare organizations. Similarly, Culasso *et al*. (2016) adopted a hybrid institutional theory to explore whether utility firms have integrated enterprise risk management into their management accounting practices.

Coherently with prior contributions, this paper uses the theoretical lens of institutional theory to understand the extent to which regulatory requirements imposed by ARERA and used for decision-making and control influence the MCS of energy utilities. Thus, this paper addresses the second research question:

*RQ2: To what extent do regulatory information imposed by ARERA and used for internal decision-making and control influence the MCS of electric and gas utilities?*

### 1.4. Methodology

The data for this paper is gathered through an online survey, complemented by follow-up interviews. The survey methodology is particularly suitable for this study given its exploratory nature (Zikmund *et al*., 2013) and its focus on a single-country setting (Ittner *et al*., 2003). To enrich the survey findings, semi-structured in-depth interviews with eight key participants were carried out. Employing interviews as a follow-up to the online questionnaire enabled a comprehensive exploration of the research topic.

The questionnaire is organized to primarily collect information regarding *(i)* the *use* of regulatory information for decision-making and control and *(ii)* the *influence* of regulatory requirements on the MCS of those electric and gas utilities that use regulatory information for decision-making and control. The questionnaire particularly focuses on the internal use of Accounting Unbundling, operating costs, investments, and price data, which are the main accounting information that electric and gas utilities must produce for regulatory purposes. For the identification of the regulatory requirements, reference is made to the ARERA website at

the time of the investigation. Management control is an internal process that is managed and used for internal purposes within a company (Marchi, 2011). In this context, a holistic view of management control is adopted rather than focusing on just one aspect.

The survey includes dichotomic, closed, and open-ended questions. For some questions, respondents can choose multiple answers and add extra elements. Additionally, the questionnaire includes some general questions related to the main characteristics of respondents. As part of the survey, respondents are given the option to indicate the name of their company and their availability for an interview on the research topic. The length of the questionnaire sections is carefully considered placing the easiest questions at the start and the end to reduce the effects of errors (Andrews, 1984). Moreover, each possible answer is distributed randomly throughout the questionnaire to avoid possible biases. The questionnaire is evaluated and pilot-tested with two experienced academics and one expert in the field to obtain suggestions and improve its face validity.

Based on prior research (Lukka and Granlund, 1996), management accountants of middle-sized and large firms were chosen as the target group of this study since these firms have systematic cost accounting systems and are expected to utilize information for managerial purposes. Management accountants are the leading providers and interpreters of management accounting information (Wagenhofer, 2006). An initial list of 396 firms was obtained from the AIDA database (Bureau Van Dijk)[3]. Out of the 396 utility firms, 324 had an available mailing address. On 12 April 2022, an email was sent to these firms containing a link to the online survey asking them to address the email to the Management Control office. The respondents were encouraged to participate in the survey and informed that they could receive a summary of the results if they wished. An invitation with a link to the survey was also posted on LinkedIn.

Survey responses are collected from 12 April to 30 June 2022, with an email invitation sent on 12 April 2022, and two reminders sent on 21 April and 6 June 2022 as a follow-up procedure (Dillman, 2011). Of 324 emails, 33 returned with delivery problems due to invalid email addresses. In total, 291 valid invitations were sent. A number of 40 questionnaires (13.75%) returned correctly completed, but only 33 questionnaires (11.34%) were useable.[4] The final

[3] I identified active Italian companies (1st April 2022) belonging to the energy industry (ATECO 2007 code 3511-3513-3514-3521-3522-3523) with annual revenue greater than 10 million EUR.

[4] I excluded 5 LinkedIn questionnaires from firms with revenue under 10 million EUR and kept the questionnaire from the Group controller of a firm that had sent 3 responses.

response rate compares well with those reported in previous studies (Robinson *et al*., 2010; Nowotny e*t al*., 2022; Osma et al, 2023).

To complement the survey findings, follow-up semi-structured, in-depth interviews were conducted with a group of respondents who expressed their willingness to contribute further to the research (Boyce and Neale, 2006). Specifically, eight participants volunteered to participate in an interview by indicating their availability in the survey. Small numbers of interviews are particularly suitable when the research has an exploratory character (Farneti and Guthrie, 2009; Gates and Langevin, 2010; Barone *et al*., 2013). Interviews were conducted online via Microsoft Teams from June 2022 to September 2022, each lasting approximately 35 minutes. To maintain confidentiality, the interviews were transcribed and coded. Interviews allowed for in-depth discussions with survey participants, providing more ample responses compared to the online survey (Rubin and Rubin, 1995).

Table 1.2 offers an overview of the respondents' characteristics. Most of them are involved in the sale of energy (61%). Regarding size, in terms of sales revenue, most of respondents can be classified as large companies.

Table 1.2 - Respondents characteristics

| | *N* | *%* |
|---|---|---|
| Panel A: Operating activity | | |
| Distribution | 13 | 39.39 |
| Trade | 20 | 60.61 |
| Total | 33 | 100.00 |
| Panel B: Size (sales revenues) | | |
| 10-50 EUR million | 12 | 36.36 |
| > 50 EUR million | 21 | 63.64 |
| Total | 33 | 100.00 |

## 1.5. Results

### 1.5.1. Use of regulatory information for decision-making and control

This section focuses on the internal use of regulatory information among electric and gas utilities. According to the findings, nearly 70% of respondents use regulatory information for decision-making and control, whereas 30% state that they do not use the information produced for ARERA internally but rather follow a "tick box" approach to comply with the requirements. However, a more varied picture emerges according to the size and operating activity of the surveyed firms (Table 1.3).

Large-sized firms are more likely to utilize internally the information produced for ARERA compared to smaller utilities (76.2% versus 58.3%). Looking at the operating activities, I found that regulatory information is predominately used by energy distributors (92.3%) compared to energy traders (55%). Pearson's Chi-Square and Fisher's exact test confirm these results at a 5% significant level (degree of freedom=1, p-value < 0.05).

Table 1.3 - Use of regulatory information for decision-making and control

| | Total | | By Size | | | | By Operating Activity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Large | | Medium | | Distribution | | Trade | |
| | *N* | *%* | *N* | *%* | *N* | *%* | *N* | *%* | *N* | *%* |
| Yes | 23 | 69.7 | 16 | 76.2 | 7 | 58.3 | 12 | 92.3 | 11 | 55.0 |
| No | 10 | 30.3 | 5 | 23.8 | 5 | 41.7 | 1 | 7.7 | 9 | 45.0 |
| Total | 33 | 100.0 | 21 | 100.0 | 12 | 100.0 | 13 | 100.0 | 20 | 100.0 |

Notes: Respondents are classified by size and operating activity. 'Large' includes companies with more than 50 EUR million in sales revenue. 'Medium' includes firms with 10-50 EUR million in sales revenue. 'Distribution' includes firms that distribute electricity/gas, while 'Trade' includes companies that sell electricity/gas.

When asked how electric and gas utilities used the regulatory information internally, the results suggest that, above all, utilities use regulatory information for performance monitoring and benchmarking analysis. Specifically, they use the data generated for ARERA to monitor their own performance internally and compare it against the benchmarks established by the regulatory authority. Based on this analysis, energy utilities may revise their existing internal decisions or make new ones to meet or exceed ARERA's expectations. Some examples follow:

> "We see how we perform on the performance indicators that ARERA deems most important and internally with a continuous feedback loop say 'if ARERA is asking for that indicator is because in the future it wants to change the tariff regulation. So, let us shift the focus from Capex to efficiently driving operational costs." (Firm 11)

> "We use regulatory information to compare our performance to ARERA's targets and educate ourselves on what ARERA expects from us in terms of accountability and cost-efficiency. We then adjust our internal decisions to meet or exceed ARERA's expectations." (Firm 28)

According to respondents, performance monitoring and benchmarking analysis is particularly relevant because ARERA adopts a reward/penalty regulation scheme to assess the economic performance and service quality of energy utilities compared to the established targets. Under this system, companies with good/poor performance incur significant financial profits/losses. The potential for adverse consequences (financial losses) motivates utilities to implement

monitoring control systems in order to limit risks and prevent possible punishments from the authority:

> "We use performance measurement to track our adherence to the KPIs set by the authority. Our team of experts employ simulation models to predict ex-ante premiums or penalties that could impact our cash flows." (Firm 15)

Also, Firm 19 states:

> "Our goal is to receive recognition from the authority. By internally analyzing the regulatory information and examining our KPIs, we identify opportunities to improve our processes and earn economic rewards."

Additionally, the respondents highlighted the importance of feedback in facilitating their monitoring of investments, which are a key driver of value in this specific industry. By receiving feedback, electric utilities can rectify errors, resulting in better performance and identify opportunities to enhance efficiency and effectiveness in investment prioritizations. For example:

> "Once we prepare the information for ARERA, we see how things are going and say, 'This year we did really bad. Here it has deteriorated 100%. We have not invested enough in this area. Why?' Then we call the responsible and have a meeting to choose an appropriate strategy'." (Firm 20)

> "If we are not too efficient in terms of kWh consumption, then we decide to make investments that go in the direction of energy efficiency." (Firm 21)

Smaller utilities and energy traders tend to adopt a more passive approach. They often view regulatory information as a compliance requirement and do not use it for internal analysis. As one respondent noted:

> "For us, it is pure compliance. We do not use regulatory information for internal analysis. Our analysis focus on other issues. We have organized ourselves to provide the information requested by the authority, but, internally, it is not used." (Firm 13)

The main issue these firms highlight is that some regulatory information requirements (e.g., arrearage in final customers) are requested by ARERA at a level of detail and aggregation that differs from those used in their MAS. This can make it difficult for smaller firms to effectively use regulatory information for internal management purposes. Moreover, there may be a discrepancy between ARERA and the utility firms' viewpoints, with ARERA requesting a large amount of data to monitor the whole market, whereas energy traders prioritize their own customer profitability.

"Sometimes the way the information is (dis)aggregated is not very meaningful for our specific situation." (Firm 9, 12)

"ARERA does not take into account any deferment payment agreements with customers that are currently overdue. It only requires us to report the amount that should have been collected and the amount that went into arrears." (Firm 13)

Finally, when asked about which regulatory information requirement is reputed as most beneficial for their internal needs, the survey revealed that large utilities (78%) and energy distributors (93%) find Accounting Unbundling and investment reporting to be essential for their internal decision-making and business operations. Conversely, energy traders place more importance on price data (68%).

### 1.5.2. Influence of external regulation on management control systems

Survey results reveal that the top factors affecting the MCS in energy utilities are regulatory pressure (42%), followed by forward-looking culture and awareness (33%) and technology advancement (18%). On the side of internal factors, respondents indicated the importance of being able to appropriately use and interpret accounting data. As prior studies have shown (Quagli, 2004; Cadez and Guilding, 2008; Goretzki *et al*., 2013; Avallone *et al*., 2015; Culasso *et al*., 2016), forward-looking information is critical for enabling management accountants to make informed strategic decisions. Almost all managers surveyed underlined the crucial role of planning and control in the energy industry given its uncertain and volatile nature. On the side of external factors, participants pointed to the growth in ARERA requirements as one of the main factors affecting their MCS.

This section focuses on the impact of ARERA requirements on the MCS of electric and gas utilities. Survey results indicate that almost all firms that use regulatory information for decision-making and control have been affected by ARERA requirements (91.3%) independently of their size and operating activity (Table 1.4). This conclusion is supported by Pearson's Chi-Square and Fisher's exact test (degree of freedom of 1 and p-value greater than 0.05). Table 1.4 shows that these companies have experienced either an incremental (61%) or a radical influence (30%) in their MCS resulting from complying with ARERA requirements. The influence of ARERA was found to be predominately incremental for medium-sized electric firms. Only two firms (9%) reported no influence from regulatory pressure, likely due to their pre-existing managerial culture that prioritized the use of information for decision-making and control within their organization.

Table 1.4 - Influence of ARERA requirements on the MCS of energy utilities (only firms that use information for decision-making and control)

| | Total | | By Size | | | | By Operating Activity | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Large | | Medium | | Distribution | | Trade | |
| | N | % | N | % | N | % | N | % | N | % |
| Significant | 7 | 30.4 | 6 | 37.5 | 1 | 14.3 | 6 | 50.0 | 1 | 9.1 |
| Incremental | 14 | 60.9 | 8 | 50.0 | 6 | 85.7 | 4 | 33.3 | 10 | 90.9 |
| No influence | 2 | 8.7 | 2 | 12.5 | 0 | 0.0 | 2 | 16.7 | 0 | 0.0 |
| Total | 23 | 100.0 | 16 | 100.0 | 7 | 100.0 | 12 | 100.0 | 11 | 100.0 |

Notes: Respondents are classified by size and operating activity. 'Large' includes companies with more than 50 EUR million in sales revenue. 'Medium' includes firms with 10-50 EUR million in sales revenue. 'Distribution' includes firms that distribute electricity/gas, while 'Trade' includes companies that sell electricity/gas.

When asked how the ARERA requirements have influenced their MCS, electric and gas utilities reported that they had to overhaul their cost accounting systems and introduce more sophisticated accounting tools to meet specific reporting requirements (i.e., Accounting Unbundling). To comply with regulation, companies have revised their chart of accounts and modified their reporting systems to align them with the regulatory requirements. As one respondent noted:

> "Accounting Unbundling requirements helped us to speed up the creation of a cost accounting system and management reporting forms." (Firm 31).

The main changes mentioned include the segmentation of costs and "*periodic adjustments of cost centre allocations*" (Firm 12). Indeed, coercive pressure is put on more detailed classifications, with a shift from the segmentation of costs into activities towards a more granular segmentation into smaller business segments. As a result, energy utilities implemented cost accounting systems with enough flexibility to accommodate variations in demands. According to survey respondents, their cost accounting systems embed cost control and techniques capable of supporting strategic decisions that "*go hand in hand with ARERA requirements*" (Firm 15). As noted by four of the respondents:

> "We had to constantly adapt our cost accounting systems to regulatory accounting requirements." (Firm 2)

> "We modified our cost accounting systems by setting up changes in accounting attributes and inserting detailed items to comply with the regulation." (Firms 5, 10)

> "ARERA requirements are numerous and spread over the year. They frequently evolve with new requests or changes to the existing ones, affecting our MCS significantly." (Firm 9)

Another relevant influence was at the organizational level. Energy utilities reported that regulatory requirements have contributed to creating new routines, policies, and procedures within the work environment (Firm 27). Despite the administrative burdens associated with producing information for regulatory purposes, respondents noted that the systematic nature of ARERA requirements has improved efficiency in day-to-day activities. Two respondents commented that:

> "It is a fact of internal education. If we did not have to deliver data every year to ARERA, we probably would not have worried about creating structures that know where to put their hands." (Firm 20)

> "Much of the information we produce for ARERA is reused from other departments, so knowledge sharing and coordination are essential here." (Firm 12)

Companies also argued that regulatory pressure has had a positive impact on their performance by promoting a learning process. This is because ARERA requires them to report a number of indicators and imposes financial penalties in case of poor performance or poor service quality. As a result, they are stimulated to steadily monitor these indicators and create a feedback loop that helps them improve. Respondents underlined the role of ARERA in driving performance control and improvement through systematic regulatory requirements. Firm 20 provides an example:

> "ARERA requires us to report on service continuity indicators such as the number and duration of interruptions during the outage event and imposes financial penalties for electric losses. This incentivizes us to continuously monitor these indicators and creates a feedback loop that help us improve."

### 1.6. Discussion

The paper proceeds analyzing the findings through the theoretical lens of the NIS theory. This theoretical perspective suggests that the use of management accounting information can be viewed as an organizational response to external institutional pressure, indicating evidence of isomorphism and decoupling (Meyer and Rowan, 1977; DiMaggio and Powell, 1983; Scott, 2001). This section first identifies the regulatory institution that exerts pressure on the electric and gas industry. Then, it analyses the organizational responses, including convergence and divergence between formal structures and actual internal behaviors.

In the Italian energy sector, ARERA (the regulatory authority) represents the primary source of institutional pressure aimed at evaluating and monitoring the performance (in terms of economic and service quality) of electric and gas utilities through the introduction of a

reward/penalty system and by continuously demanding information for regulatory purposes. To comply with the requirements, energy utilities face coercive pressure from ARERA (DiMaggio and Powell, 1983; Dacin *et al.*, 2002), which was influential in the use of management accounting information for decision-making and control and in shaping the MCS of energy utilities. Coercive pressures from the regulatory environment include detailed segmentation of costs and revenues by activities or smaller business units, as well as the achievement of performance targets aimed at improving firms' efficiency.

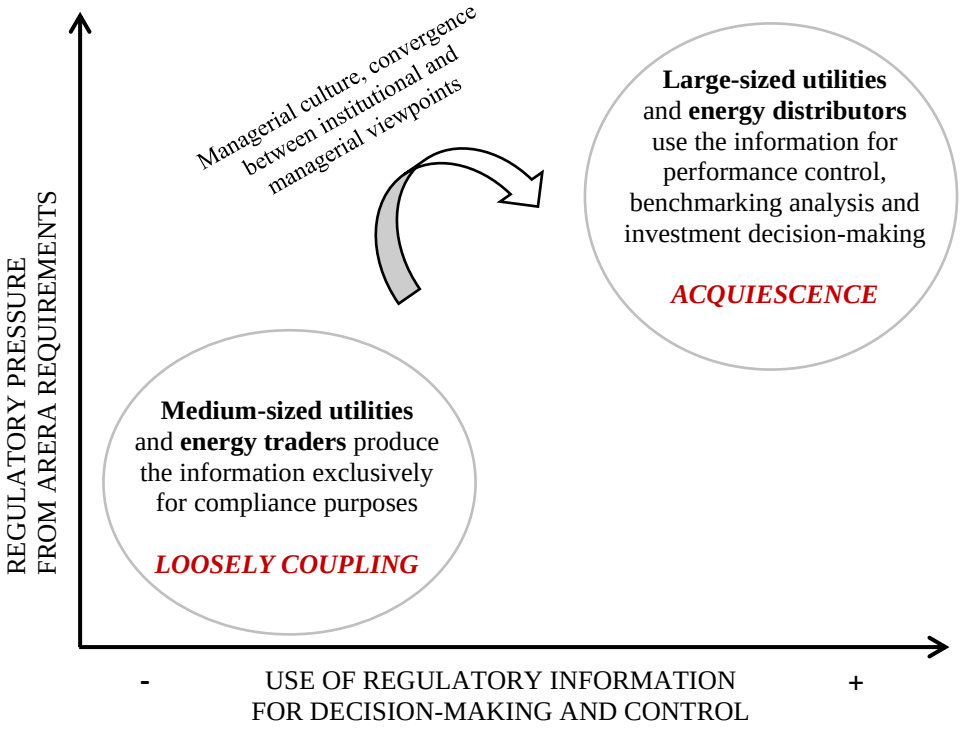
Looking at the organizational responses, it emerges that 70% of the surveyed firms fully conformed to ARERA requirements by introducing management accounting information and using it for internal purposes. These firms responded to regulatory pressure by developing corresponding internal accounting structures and using the information for benchmarking analysis, performance monitoring, and evaluation. This conformity can be considered institutional isomorphism (DiMaggio and Powell, 1983; Boxenbaum and Jonsson, 2017). As described earlier in the paper, the firms revised their chart of accounts and their cost accounting systems in a similar manner and were motivated by regulatory pressure to monitor their performance against ARERA's targets, identify underperforming areas, and prioritize investments accordingly. These firms were proactive actors (Oliver, 1991). The systematic ARERA requirements led to standardized procedures within these organizations, resulting in increased efficiency. The data also suggest that the information generated for ARERA was used by other departments within the energy companies. As noted by Firm 20, "*in this case, having well-organized structures that know where to put their hands and share their knowledge is essential*." This is an example of how regulatory coercive pressure can indirectly lead to the creation of shared organizational knowledge (Busco and Scapens, 2011).

However, firms exercise discretion in responding to institutional pressures, as noted by Oliver (1991). Episodes of divergence between formal structures and actual practices have been identified in the Italian energy sector. Accordingly, 30% of respondents produced the necessary information solely for regulatory compliance and did not use it in their day-to-day activities, suggesting a loose coupling phenomenon (Meyer and Rowan, 1977; Oliver, 1991; Scott, 2001; Boxenbaum and Jonsson, 2017). These firms complied with the institutional context and their constituents but left their actual routines largely unchanged (Westphal and Zajak, 2001). Institutionalist theorists suggest that this dichotomy between the institutional environment and actual behaviors may arise from a divergence between institutional and managerial viewpoints (Meyer and Rowan, 1977; Scott, 2001; Scapens, 2006). This might explain the resistance of

energy traders to adopt management accounting information for internal purposes, as revealed by the survey and interviews. As Firm 12 stated, "*ARERA has regulatory priorities to ensure efficiency in public utility services protecting the interests of all operators and users, whereas we are focused on our individual profitability*." Another possible explanation for the resistance could be the scarcity or lack of a managerial culture, particularly among smaller utilities, which may not fully perceive the potential benefits of using management accounting information (Busco *et al*., 2007; Lavia López and Hiebl, 2015).

As outlined in Figure 1.1, ARERA requirements have indeed been instrumental in motivating energy companies to use the regulatory information also for internal management purposes. However, formal requirements alone are not sufficient to ensure the adoption of institutional practices in daily operations. A harmonious convergence between the regulatory authority's perspective and managerial goals is necessary, along with cultivating a managerial culture that actively promotes the utilization of regulatory information in day-to-day activities.

Figure 1.1 – Overview of the results




*Source: author's own elaboration*

## 1.7. Conclusions

This paper has investigated whether Italian electric and gas utilities use for internal management purposes the accounting information that they have to submit as mandatory requirements to the regulatory authority (ARERA). It adopted the theoretical lens of NIS to understand the extent to which the regulatory information imposed by ARERA and used for internal management purposes influenced the MCS of energy utilities.

Based on data from 33 questionnaires and eight follow-up interviews, findings unveil that large-sized utilities and energy distributors comply with regulatory requirements and use them for decision-making and control. These companies were stimulated by ARERA requirements to use the information for performance control, benchmarking analysis and prioritization investment strategies. The regulatory (coercive) pressure influenced their cost accounting systems either incrementally or radically and contributed to the creation of internal routines, policies, and procedures as well as to the development of a loop learning process, thus encouraging firms to continuously monitor their performance.

Smaller utilities and energy traders produce the information solely for regulatory compliance and do not use it in their day-to-day activities, suggesting a tendency to loosely couple formal structures and internal behaviors. This may be attributed to the lower level of managerial culture that characterize smaller firms, which may not perceive the benefits of using managerial accounting information or may lack the resources and capabilities to implement it effectively (Busco *et al*., 2007; Lavia López and Hiebl, 2015). Additionally, differing viewpoints between managerial and institutional perspectives may also contribute to the passive compliance approach (Hopper and Powell, 1985).

This paper contributes to the management accounting literature in two ways. First, it extends prior literature on the managerial use of accounting information by public utilities. To the best of my knowledge, this article is the first to explore the internal use of regulatory information in the Italian energy industry. Second, it contributes to the institutional management accounting research by showing that regulatory (coercive) pressure affects the MCS of electric and gas utilities either radically or incrementally.

This paper has some limitations. First, this is a study conducted in a single country, which may constrain the generalizability of the findings. Furthermore, the research relies on a limited number of interviews. Future studies may extend the examination to other countries and regulated context (i.e., water utilities) to uncover differences and similarities in how managers use regulatory information. Moreover, in addition to firm size and type of operating activity,

future research could focus on other specific firm characteristics, such as ownership structure. This would offer further insights into how private-owned energy utilities, as opposed to their state-owned counterparts, utilize regulated information in their decision-making processes.

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## Appendices

Appendix 1.1 - Survey questionnaire[5]

### Part 1 - General Information

Company name (optional):
*Answer: ……..*

Sector:
*Answer 1: Electricity; 2: Gas; 3: Both*

Prevailing operating activity:
*Answer 1: Production; 2: Distribution; 3: Transport; 4: Sale*

Your role in the company:
*Answer: ……..*

1. How many employees work in your company's Management Control department?
   *Answer: ……*
2. What are the primary objectives of your company's Management Control department?
   (Please select up to three boxes)
   *Answer 1: Facilitating accurate cost calculations within activities; 2: Controlling cost efficiency; 3: Supporting strategic and policy decision-making; 4: Conducting cost-benefit analysis to guide operational choices; 5: Assessing the profitability of investments before implementation; 6: Informing tariff decisions; 7: Other (please specify)*
3. How has your company's management control system evolved in the last ten years?
   *Answer: ……*
4. Which department is responsible for producing documentation for ARERA?
   *Answer 1: Financial Reporting; 2: Planning and Control; 3: Finance; 4: Regulatory Affairs; 5: Other (please specify)*
5. How many human resources are involved in producing documentation for ARERA?
   *Answer: ……*
6. How much time does it typically take to produce documentation for ARERA?
   *Answer: ……*

### Part 2

7. Does your company's Management Control department use ARERA information requirements for decision-making and control?
   *Answer 1: Yes; 2: Yes, to some extent; 3: No; 4: Other (please specify)*
8. How does your company Management Control department use the information produced for ARERA internally?

[5] The survey was administered in Italian to the management accountants.

*Answer 1: To evaluate and make decisions about productivity-enhancing investments; 2: To make strategic pricing decisions; 3: To improve cost-effectiveness; 4: To prevent penalties; 5: Other (please specify)*

9. Which type of information prepared for ARERA does your company Management Control department find most useful for decision-making and control?
   *Answer 1: Accounting Unbundling; 2: Operating costs; 3: Investments; 4: Price data; 5: None of the above; 6: Other (please specify)*
10. Describe the main reasons why you repute the selected type of information as the most relevant.
    *Answer: ……*
11. To what extent has the ARERA information requirements influenced your company's management control system?
    *Answer 1: Significant influence; 2: Incremental influence; 3: No influence; 4: Other (please specify)*
12. What are the most significant changes that have been made to your company's management control system in the last five years as a result of the ARERA information requirements?
    *Answer: ……*
13. What is your opinion about how the ARERA information requirements have impacted your company's internal accounting systems?
    *Answer 1: Positive opinion; 2: Negative opinion; 3: Neutral; 4: Other (please specify)*
14. If you are interested in discussing the questionnaire topics in more detail through a short interview, please provide your e-mail address below.
    *Answer: ……*

Appendix 1.2 - Interview topic list

Use of ARERA regulatory requirements for managerial purposes: do you use ARERA regulatory requirements for internal purposes? Were they used before becoming mandatory? If yes, how are they used and for what type of analysis? Please provide examples.

Influence of ARERA requirements on MCS: have ARERA requirements influenced your company's MCS? If yes, how have the MCS been impacted? Please provide examples.

Which of the following statements best describe your situation:

a. We do not use ARERA requirements at all, and only produce the information because we are obliged to.
b. We did not use regulatory information for internal purposes in the past. ARERA requirements have stimulated us to use them.
c. We already use regulatory information internally. ARERA requirements increased the level of detail.
d. We already use regulatory information internally. ARERA requirements have not impacted us at all.

Appendix 1.3 – List of companies included in the study.

| NO. | COMPANY | INDUSTRY |
|---|---|---|
| 1. | AUGUSTA RATIO SPA | ELECTRIC AND GAS |
| 2. | IREN SPA | ELECTRIC AND GAS |
| 3. | ALTOGARDA POWER SRL | ELECTRIC |
| 4. | SKY GAS & POWER SRL | ELECTRIC AND GAS |
| 5. | SIED SPA | ELECTRIC |
| 6. | AMGAS SRL | ELECTRIC AND GAS |
| 7. | GELSIA SRL | ELECTRIC AND GAS |
| 8. | AXPO ITALIA SPA | ELECTRIC AND GAS |
| 9. | GRUPPO SOCIETA' GAS RIMINI SPA | ELECTRIC AND GAS |
| 10. | ACEA SPA | ELECTRIC AND GAS |
| 11. | CRISTOFORETTI SERVIZI ENERGIA SPA | ELECTRIC AND GAS |
| 12. | SORGENIA SPA | ELECTRIC |
| 13. | GOLDENERGY SRL | ELECTRIC AND GAS |
| 14. | EVISO SPA | ELECTRIC |
| 15. | IRETI SPA | ELECTRIC |
| 16. | ALERION CLEAN POWER SPA | ELECTRIC |
| 17. | CONFINDUSTRIA ENERGIA ADRIATICA SOC. CONS. ARL. | ELECTRIC AND GAS |
| 18. | COMPANY NO. 18 | ELECTRIC |
| 19. | EDISON SPA | ELECTRIC AND GAS |
| 20. | ACEGASAPSAMGA SPA | ELECTRIC AND GAS |
| 21. | ERG SPA | ELECTRIC |
| 22. | A2A SPA | ELECTRIC AND GAS |
| 23. | FINTEL GAS E LUCE SRL | ELECTRIC AND GAS |
| 24. | IREN MERCATO SPA | ELECTRIC AND GAS |
| 25. | ALPERIA SPA | ELECTRIC AND GAS |
| 26. | ENERGIA CORRENTE SRL | ELECTRIC AND GAS |
| 27. | COMPANY NO. 27 | ELECTRIC |
| 28. | EGEA SRL | ELECTRIC AND GAS |
| 29. | ASCOPIAVE ENERGIE SPA | ELECTRIC |
| 30. | NEWATT SRL | ELECTRIC AND GAS |
| 31. | REPOWER SPA | ELECTRIC AND GAS |
| 32. | BIM BELLUNO INFRASTRUTTURE S.P.A. | ELECTRIC AND GAS |
| 33. | AZIENDA ENERGIA E GAS – AEG COOP | ELECTRIC AND GAS |

# SECTION 2

## Driving forward-looking disclosure in the energy industry: a panel data analysis at the European Union level

### 2.1. Introduction

Recent geopolitical uncertainties, health crisis, pressing environmental risks, and climate change have called attention to the evolving and vulnerable landscape within which firms operate, accentuating the demand for future-oriented disclosure (Carnegie *et al*., 2022; Vitolla *et al*., 2023). In response, the European Union embarked on a series of transformative regulatory initiatives in 2019, aimed at guiding companies toward a more sustainable and resilient future. Of particular note, The European Green Deal which calls upon companies to rethink their business models sustainably to contribute to the ambitious goal of achieving climate-neutrality by 2050 (EC, 2019a). This initiative has laid the ground for new disclosure requirements in the financial market community, integrating sustainability factors in investment decision-making process (CONSOB, 2021).

Among the other sectors, the electric industry has been significantly affected by the regulatory initiatives. Notably, the Clean Energy Package includes a set of measures with the ultimate goal to reform the electricity market, facilitating its transition to clean energy by 2030 (EC, 2019b). As a result, energy companies are facing growing stakeholder demand for sustainability (Slacik and Greiling, 2020) and increased investor pressure for forward-looking disclosure (Vitolla et al., 2023). Forward-looking disclosure is crucial for providing investors with useful information about future plans, strategies, risks, opportunities, and projected results (Quagli, 2004; Menicucci, 2018). Firms can choose to disclose voluntary future-oriented disclosure, thereby reducing information asymmetries with investors and agency costs (Jensen and Meckling, 1976; Healy and Palepu, 2001)

The purpose of this paper is to empirically test the influence of regulatory pressure on the quantity and quality of forward-looking disclosure within the annual reports of European Union electric utilities for the years 2018 to 2021. Specifically, this study investigates whether the publication of relevant regulations in 2019 contributed to an increase in the extent and quality of forward-looking disclosure. Additionally, the paper examines whether electric utilities,

which operate in a highly regulated environment, provide greater disclosure quantity and quality compared to firms subject to relatively lower regulatory demands, such as steel firms.

Results from panel analysis reveal a rise in both the quantity and quality of forward-looking information after the release of regulations in 2019. Moreover, the findings show that electric utilities outperform steel firms in terms of disclosure quantity and quality. Therefore, it is possible to conclude that both the publication of regulations and industry-specific regulatory pressure have exerted a positive effect on the quantity and quality of forward-looking information.

With its results, this paper enriches the limited literature on corporate disclosure in the electric industry. Firstly, the paper provides contemporary insights in the European context. Secondly, by shedding light on the level and quality of forward-looking disclosure in a context of public interest that has been relatively underexplored, the study offers insights to standard setters in their discourse of further addressing forward-looking information in management commentaries. Thirdly, it contributes to the forward-looking literature by confirming the positive impact of regulatory pressure on both the quantity and quality of forward-looking information.

The rest of the paper is organized into six sections. Section two reviews the literature and is followed by a section outlining the development of the research hypotheses. Section four describes the research design. Section five presents and discusses the empirical results. The final section concludes the paper.

### 2.2. Literature review

Corporate disclosure, in terms of both quantity and quality, has long interested the academic community, thus being profusely investigated in the empirical literature over the years, with studies driven by diverse research purposes (for a review, see Core, 2001; Healy and Palepu, 2001; Lundholm and Van Winkle, 2006). Agency theory has played a central in explaining disclosure practices, serving as the predominant theoretical framework in empirical investigations (Jensen and Meckling, 1976).

Prior empirical research has largely examined the determinants of disclosure, seeking to understand the factors that influence companies' choices to voluntarily reveal information (Ahmed and Courtis, 1999; Depoers, 2000; McChlery *et al*., 2015). While consensus prevails on the positive relationship between firm size and disclosure, empirical findings concerning

other firm-specific attributes are mixed and inconclusive (Wallace *et al*., 1994; Meek *et al*., 1995; Raffournier, 1995; Depoers, 2000; Camfferman and Cooke, 2002; Chavent *et al*., 2006). Another stream of the literature focused instead on the consequences of voluntary disclosure, indicating that companies that make extensive voluntary disclosure tend to experience a reduction in their cost of capital, improved stock liquidity, increased firm value, and an increased following by financial analysts (Diamond and Verrecchia, 1991; Healy and Palepu, 2001; Botosan, 2006; Lambert *et al*., 2007; Hao, 2023).

While extensive literature has addressed corporate disclosure quantity and quality, studies focusing specifically on the energy industry are scarce. Some studies have examined the disclosure of electric utilities during their transition toward privatisation. Hooks *et al.* (2001) assessed the quality of annual reports from 33 electricity retail and distribution companies in New Zealand. Their findings revealed that, in general, the disclosure of information was limited and inadequate. Additionally, they observed a lack or scarcity of key financial and non-financial performance measurements. Bhojraj *et al*. (2004) analysed voluntary disclosure practices of 81 US electric utilities, focusing on customer base protection strategies and plans for new opportunities. The authors found that companies with high stranded costs tended to increase disclosure on new opportunities only after regulatory authorities had established cost-recovery methods, while disclosure on customer base protection strategies was positively affected by capital market incentives. One year later, Bradbury and Hooks (2005) examined how electric companies in New Zealand responded to increasing competition due to privatisation. They found out that companies reduced the disclosure of forward-looking information and segment data. However, the authors observed that this decrease in disclosure was only temporary.

Other studies have focused specifically on risk disclosure behaviour of energy companies. Repetto (2005) found that environmental risk disclosure in annual reports of electric generation companies was insufficient. Dobler *et al*. (2014), on the other hand, found that energy utilities disclosed more risks in their 10-K fillings than other high-pollution industries in the US. Abdelrehim *et al*. (2017) used institutional theory to analyse a six-year risk disclosure behaviour of an oil company, and their findings suggested that risk disclosure reflected the risk perceptions and attitudes of the prevailing patterns of social relations within the company. By analysing listed oil and gas firms, Arena *et al*. (2021) showed that voluntary risk disclosure increased with the level of mandatory risk disclosure during 2009-2014. On the contrary, Mcchlery and Hussainey (2021) found no relationship between voluntary and mandatory risk

disclosure in the UK oil and gas industry. Instead, their findings suggested that factors such as firm size, gearing, quality of audit firms, level of the stock exchange, and organisational visibility were influential in driving risk disclosure.

Only a limited number of studies have examined the impact of regulations on the disclosure attitude of energy firms. Among these limited studies, Archambault and Archambault (2005) examined statements disclosure using the 1915 Moody's Analyses of Investments. Their findings revealed that utility firms, subject to higher regulatory pressure, were more prone to report income statement information compared to industrial firms. Freedman and Park (2014) investigated the influence of a regulation that required electric utilities participating in the Regional Greenhouse Gas Initiative to disclose climate change-related information. The authors concluded that the regulation positively impacted firms' climate change disclosure. Likewise, Visani *et al*. (2020) found that the presence of regulation was associated with an increase in the disclosure of non-financial GAAP measures by oil and gas firms. Conversely, the study conducted by Mcchlery and Hussainey (2021) revealed that mandatory reporting did not have a significant impact on the disclosure of reserve quantum in the UK oil and gas industry.

Summing up, this brief literature review shows that most of the studies have analysed the quality of corporate annual reports in years immediately after the privatization process or have focused on specific types of information. Further, these studies have some other limitations. They overlook the significant regulatory pressures faced by electric utilities, have a non-European focus and lack up-to-date evidence. This paper addresses this gap by examining the influence of regulatory pressures on the disclosure of forward-looking information within the annual reports of European electric utilities for the years 2018 to 2021. Furthermore, the paper offers a comparative analysis of forward-looking disclosure between electric utilities and steel companies to investigate if the industry-specific pressure has an influence on disclosure.

### 2.3. Hypotheses development

The above literature review underlines the need for further investigation on the disclosure of forward-looking information, particularly within a risky and under-investigated context, such as the electric industry (Vitolla *et al*., 2023). This study first investigates whether there is an increase in the disclosure subsequent to the release of relevant regulatory statements in 2019.

The accounting year 2019 was critical for many industries, particularly for the electric and steel industries, which confronted a number of regulatory developments that intensified the

demand for greater accountability. Firstly, the unexpected Covid-19 pandemic event caused significant disruptions in operations and supply chains, accompanied by price fluctuations, thereby highlighting the vulnerability of these industries (Hoang *et al.*, 2021).

Further, the pressing urgency to combat climate-change and environmental pollution spurred the European Union to take decisive actions in 2019 across various sectors of the economy. In particular, the following acts: the "European Green Deal" with the ambitious objective for companies of achieving climate neutrality by 2050 (EC, 2019a), the EU Taxonomy Political Agreement (EC, 2019b) establishing guidelines for a unified European classification of eco-sustainable activities, Disclosure Regulation (Regulation (EU) 2019/2089) imposing new disclosure transparency requirements for financial market participants and integrating sustainability factors into investment decision-making processes.

In parallel to these regulations, the European Union has introduced targeted measures within the energy sector, notably highlighted by the "Clean Energy Package". Adopted in 2019, this package comprises eight legislative acts designed to facilitate the transition to clean energy using renewable energy sources and to strengthen energy resilience (EC, 2019). The Clean Energy Package paves the way for the creation of a new electricity market by introducing an updated Electricity Directive (Directive (EU) 2019/944) and Regulation (Regulation (EU) 2019/943), a new Regulation on Risk preparedness (Regulation (EU) 2019/941) and a revised Regulation for the cooperation of Energy Regulators (Regulation (EU) 2019/942).

The above-mentioned regulatory developments of 2019 (see also Table 2.1) have highlighted the rapidly evolving and vulnerable environment in which these companies operate, accentuating the relevance of providing future-oriented information. Consistent with the agency theory, firms can take advantage of this opportunity to disclose forward-looking information, thus reducing information asymmetries with investors and regulators (Jensen and Meckling, 1976; Eisenhardt, 1989; Healy and Palepu, 2001).

Based on these arguments, it is expected that the sampled companies will increase both the quantity and quality of their future-oriented disclosures from the period 2018 to 2019-2021. Thus, the first set of hypotheses is formulated as follows:

**H1.** After the publication of relevant regulatory statements relating to risk preparedness, environmental, and climate change, the quantity of forward-looking disclosure increased.

**H2.** After the publication of relevant regulatory statements relating to risk preparedness, environmental, and climate change, the quality of forward-looking disclosure increased.

Table 2.1 – Summary of key regulatory initiatives in 2019

| Timeline | Event | Description |
|---|---|---|
| 2 and 3 December 2019 | The United Nation Climate Change Conference COP 25 | Madrid hosted the longest climate summit in history. During this event, significant strides were made in laying the foundation for the reduction of harmful emissions and addressing the climate emergency. |
| May 2019 | Adoption of Clean Energy for all Europeans Package | Clean Energy Package consists of eight legislative acts aimed at facilitating the transition to clean energy. It outlines objectives and targets to address key issues: energy security, energy efficiency, decarbonisation of the economy, research innovation and competitiveness. |
| 5 June 2019 | Publication of Electricity Directive and Regulation | These initiatives are intended to revamp the European internal electricity market in terms of energy security, decarbonisation, and electrification. |
| 5 June 2019 | Publication of a Regulation on Risk Preparedness in the electricity sector | The objective of this regulation is to formulate consistent plans for the prevention and management of electricity crises. |
| 5 June 2019 | Publication of a Regulation for the Cooperation of Energy Regulators | This regulation stresses the importance of collaboration among energy regulatory authorities to ensure that the proper functioning of the market. |
| 11 December 2019 | Presentation of the European Green Deal by the European Commission | The Green Deal is a package of policy initiatives aimed to reach climate neutrality by 2050. It involves all sectors of the economy, notably transport, energy, agriculture, buildings, and industries such as steel, cement, ICT, textiles, and chemicals. |
| 18 December 2019 | The European Council and the European Parliament reached a political agreement on the Taxonomy Regulation for Sustainable Activities | The EU Taxonomy for sustainable activities became effective in 2020 and applies to large public interest companies, listed small medium enterprises, and financial market participants. It mandates them to identify environmentally friendly economic activities. |
| 19 December 2019 | Disclosure Regulation | The regulation requires financial market participants to disclose sustainability information to investors. |

*Source: author's own elaboration*

Second, this study examines whether the disclosure of electric utilities, which are subject to stringent regulations, differs from that of steel companies, operating in a comparatively less regulated environment.

Although both industries face critical regulatory pressure due to their energy-intensive operations and environmental impacts, their respective experiences with regulatory demands vary notably. Electric utilities, in particular, operate within a highly regulated environment and must comply with all governing regulations imposed by European and national regulatory authorities (Schuelke-Leech *et al*., 2015). These companies, as providers of a public utility service, are expected not only to fulfil their operational responsibilities but also to meet social

and environmental obligations in their strategic decision-making (Alexius and Grossi, 2018). Their high-level environmental contribution and their hybrid ownership structure further place them into the public eye. Electric companies also grapple with multiple financial and environmental risks (Vitolla *et al*., 2023).

In contrast, steel companies contend with relatively reduced regulatory pressure and risks, mainly attributable to their involvement in manufacturing rather than in service-oriented activities. Moreover, albeit the environmental impact of the steel industry remains significant, it is lower when compared to the electric industry (European Environment Agency, 2014; EC, 2022), leading them to less stringent regulatory requirements.

Against this background, it is expected that electric utilities will surpass steel firms in terms of both the quantity and quality of forward-looking information. Accordingly, the second set of hypotheses is formulated as follows:

**H3.** The quantity of forward-looking disclosure in the electric industry is higher compared to the steel industry.

**H4.** The quality of forward-looking disclosure in the electric industry is higher compared to the steel industry.

### 2.4. Research design

#### 2.4.1. Sample and data

To test the research hypotheses, a comparative analysis was conducted between the forward-looking disclosure of electric utilities and the disclosure provided by a sample of steel firms. The choice was informed by the shared characteristics of these industries, both capital-intensive and significant contributors to greenhouse gas emissions[6] (Flues *et al*., 2015; Maia *et al*., 2023). According to the global energy think tank Ember, following coal, the one to watch is steel (Ember, 2019). However, the two industries face different degrees of regulatory pressure, which makes this context suitable for testing the research hypotheses. The electric industry operates within a heavily regulated environment, necessitating compliance with a plenty of national and European regulations (Schuelke-Leech *et al*., 2015). They contend with various financial and environmental risks (Vitolla *et al*., 2023) and are under pressure to contribute to

[6]Steel industry is responsible for around 7% of global and 5% of the EU total CO2 emissions (EC, 2022), while electricity is responsible for 30% of global and 26% of the EU total CO2 emissions (European Environment Agency, 2014).

the climate change phenomena. In contrast, the steel industry operates in a relatively less regulated environment, resulting in lower levels of regulatory constraints.

The sample was drawn from the S&P Capital IQ database (18 January 2023) and includes all companies listed in EU-developed markets, resulting in a total of 45 electric companies. From this list, ten firms that were classified as electric utilities but were not involved in the generation, transmission, distribution, or sale of electricity were excluded. Five companies were also excluded due to missing data. The final sample comprises 30 electric utilities. Similarly, the steel firms resulted in an initial list of 24 firms.[7] After removing four companies due to missing reports, the final sample of steel firms consisted of 20 companies. Table 2.2 summarizes the sample selection process.

The investigation included the annual reports published by companies during 2018-2021. The annual reports were downloaded directly from the corporate websites and individually examined for each of the 50 companies, resulting in a total of 200 reports examined.

Table 2.2 – Sample selection

| | Electric companies | Steel companies |
|---|---|---|
| Population of companies listed in EU-developed markets | 45 | 24 |
| Exclusion of companies wrongly classified | (10) | 0 |
| Exclusion of companies with no annual reports available | (5) | (4) |
| Final sample | 30 | 20 |
| *Years* | *4* | *4* |
| Total observations | 120 | 80 |

### 2.4.2. Empirical model

To test the research hypotheses, a panel data analysis was performed to capture variations across entities over time (Inchausti, 1997). In panel data analysis, three regression models are applicable: pooled, fixed effect and random effect. To justify the choice of the model, two tests were conducted (Cameron and Trivedi, 2010). The Breusch-Pagan Lagrange test (1980) showed a p-value below 0.01, leading to the rejection of the null hypothesis that favour pooled model. Subsequently, the Hausman test (1978) concluded that the fixed effect model is preferable to the random effect, with a p-value below 0.01. Therefore, four distinct fixed effect

[7] The sample was selected using the same criteria as for the electric utilities. In addition, the search results were cross-checked with the Amadeus database (under code NACE Rev 2. 241-242-243), but no additional firms were found beyond those already included in the sample.

multivariate regression models were estimated[8], incorporating robust errors and controlling for firm specific factors.

### 4.2.1. Dependent variable

The dependent variable in this study is forward-looking disclosure, assessed by analysing its quantity and quality separately (Beretta and Bozzolan, 2008). Therefore, two disclosure score indices are constructed: one to measure the extent of forward-looking disclosure, and the other to assess the quality of forward-looking information presented by the sampled companies. Disclosure indices are employed by several studies and have been proven to be valuable tools for measuring disclosure albeit their limits (Marston and Shrives, 1991; Beattie *et al*., 2004; Chavent *et al*., 2006). A list of narrative and financial items was developed based on previous studies (Botosan, 1997; Quagli, 2004; Patelli and Prencipe, 2007; Avallone, 2008) focusing specifically on two categories of information, namely strategic-related information (STRAT) and risk-related information (RISK). The final list consists of 32 items (see Appendices).

The quantity of disclosure (DISQUANT) is measured using a binary variable. A score of 0 was assigned if the firm did not provide any information related to the item, and a score of 1 if the information was reported. The DISQUANT index is the ratio of the total number of disclosed items to the maximum number of disclosure items possible.

**DISQUANT** = Actual quantity of disclosure/ Total possible quantity of disclosure

$$= \frac{\sum_{i=1}^{m} d_i}{\sum_{i=1}^{n} d_i}$$

where $d$ = 1 if the item $d_i$ is disclosed and 0 if item $d_i$ is not disclosed; $m$ = the number of items disclosed and $n$ = the maximum number of disclosure items possible.

The quality of disclosure (DISQUAL) is measured using a three-level scale (Botosan, 1997). A score of 1 was assigned if the firm provided some disclosure related to the item but in a generic, non-specific manner, a score of 2 if the firm provided firm-specific disclosure but in qualitative terms, and a score of 3 if the information was provided in both qualitative and quantitative terms. The DISQUAL index is calculated by summing the total number of items disclosed, each weighted according to their respective levels of detail (k = 1,2,3). The resulting

[8] For the second set of research hypotheses, a fixed effect was performed using the Least Square Dummy Variable (LSDV) instead of the conventional fixed effect panel due to the dummy variable nature of REG INDUSTRY.

sum is then divided by the maximum possible value, which is determined by multiplying the maximum number of disclosure items possible per the maximum value of disclosure quality possible (in this case, equals 3).

**DISQUAL** = Actual quality of disclosure/ Total possible quality of disclosure

$$= \frac{\sum_{i=1}^{m} d_i \times k_i}{\sum_{i=1}^{n} d_i \times w_i}$$

where $d$ = 1 if the item $d_i$ is disclosed and 0 if item $d_i$ is not disclosed; $k$ = is a floating variable ranging from 1 to 3 according to the detail of disclosure provided by the company; $m$ = the number of items disclosed; $n$ = the maximum number of disclosure items possible; $w$ = the maximum value possible of the disclosure quality (in the present case, equals 3).

### 4.2.2. Independent variables

To investigate the influence of regulatory pressure on forward-looking disclosure, this study employs two independent variables: regulatory timing (REG YEAR) and industry-specific regulatory pressure (REG INDUSTRY). REG YEAR is a dummy variable that equals 0 for the year preceding the publication of relevant regulatory statements (2018), and 1 for the subsequent years following the publication of such regulations (2019-2021). REG INDUSTRY is quantified by assigning a score of 1 to electric utilities, known for encountering substantial regulatory pressure, while firms subject to lower regulatory scrutiny, specifically steel firms, are assigned a score of 0.

### 4.2.3. Control variables

The regression models include a set of control variables that represent traditional disclosure determinants, such as firm size, leverage, profitability, and growth.

The first control variable is SIZE, which has been found to be positively associated with disclosure pattern (Meek *et al*., 1995; Hossain *et al*., 1995; Ahmed and Courtis, 1999; Depoers, 2000; Camfferman and Cooke, 2002; Chavent *et al*., 2006; Hussainey and Al-Najjar, 2011).

Additionally, the model controls for the ambiguous relationship between profitability and disclosure. Prior research that examined the relationship between disclosure and firm profitability has produced mixed results in terms of both direction and statistical significance. Some studies confirm a positive relation (Lang and Lundholm, 1993; Wallace *et al*., 1994), while others affirm an inverse correlation (Belkaoui and Kahl, 1978; Wallace and Naser, 1995), and some conclude the absence of a statistically significant correlation (McNally *et al*., 1982;

Raffournier, 1995). Likewise, prior literature has produced conflicting findings on the relationship between leverage and disclosure. Some studies affirm a positive relation between firm leverage and disclosure (Meek *et al*., 1995; Ahmed and Courtis, 1999; Chavent *et al*., 2006), while other studies find no significant relationship (Raffournier, 1995; Depoers, 2000).

Finally, the models include market-to-book value as a control variable, which is commonly used in the literature as a proxy for growth. Growth-oriented companies typically contend greater information asymmetries and agency costs in comparison to non-growth counterparts (Eng and Mak, 2003). Moreover, companies characterized by a high market-to-book value are often viewed favourably by the market, as they are perceived to possess future growth potential. These factors collectively may serve as incentive for increased disclosure.

SIZE is determined by the natural logarithm of market capitalization, a choice driven by the fact that all the sampled companies are publicly listed. PROFITABILITY is measured by the EBITDA margin. LEVERAGE is measured using the debts-on-total-assets ratio. GROWTH is quantified by the market-to-book value of equity.

All variables included in the model and their definitions are illustrated in Table 2.3.

Table 2.3 – Definition of variables and expected signs.

| Variable | Definition | Expected sign |
|---|---|---|
| *Dependent variables* | | |
| DISQUANT | Ratio of the total number of items disclosed to the maximum number possible. | |
| DISQUAL | Ratio of the total number of items disclosed to the maximum number possible weighted by the level of disclosure detail | |
| *Independent variables* | | |
| REG YEAR | Dummy variable that equals 0 for the year before the publication of relevant regulatory statements (2018) and 1 for the years 2019-2021 | + |
| REG INDUSTRY | Dummy variable that equals 1 for electric utilities and 0 for steel firms | + |
| SIZE | Natural log of market capitalization | + |
| PROFITABILITY | Ratio of EBITDA to total revenues | ? |
| LEVERAGE | Ratio of total debts to total assets | ? |
| GROWTH | Ratio of the market value of the equity to the book value of the equity | + |

Given the research design and variables, four regression models are derived:

***(1)*** $DISQUANT = \beta_0 + \beta_1\ REG\ YEAR + \beta_2\ SIZE + \beta_3\ PROFITABILITY + \beta_4\ LEVERAGE + \beta_5\ GROWTH + \varepsilon$

***(2)*** $DISQUAL = \beta_0 + \beta_1\ REG\ YEAR + \beta_2\ SIZE + \beta_3\ PROFITABILITY + \beta_4\ LEVERAGE + \beta_5\ GROWTH + \varepsilon$

***(3)*** $DISQUANT = \beta_0 + \beta_1\ REG\ INDUSTRY + \beta_2\ SIZE + \beta_3\ PROFITABILITY + \beta_4\ LEVERAGE + \beta_5 GROWTH + \varepsilon$

***(4)*** $DISQUAL = \beta_0 + \beta_1\ REG\ INDUSTRY + \beta_2\ SIZE + \beta_3\ PROFITABILITY + \beta_4\ LEVERAGE + \beta_5\ GROWTH + \varepsilon$

## 2.5. Results

### 2.5.1. Descriptive statistics

Table 2.4 presents descriptive statistics for companies in the sample (Panel A) and statistics for the dependent variable and its categories divided by industry (Panel B).

On average, sampled companies report a market capitalization of 7.727 million and an EBITDA margin of 18%. The average debt-to-asset ratio (LEVERAGE) is 0.30 and the average market-to-book ratio (GROWTH) is 1.45. As regards the dependent variables, the mean value of DISQUANT is 42.9% (median of 44%) with a range of 6-88% and a standard deviation of 18.5%. The DISQUAL variable has a mean of 25.2% (median of 25%) with a range of 2-63% and a standard deviation of 14%.

Panel B of Table 2.4 shows that electric utilities present a mean DISQUANT value of 50.5% (median of 53%) with a range of 16-88% and a standard deviation of 14.6%. Disclosure appears to be concentrated in the realm of narrative information. Further, electric companies disclose a good volume of both risk-related and strategic information. Turning to the DISQUAL variable, its mean is 30.6% (median of 29.5%) with a range of 7-63% and a standard deviation of 12.8%. A decline in the quality of future-oriented disclosure was observed across all dimensions.

The steel industry presents an average DISQUANT value of 31.3% (median of 29.5%) with a range of 6-66% and a standard deviation of 17.7%. Narrative and risk-related information score the highest, but the content in their annual reports remains relatively limited as highlighted also by the low percentage. This is further accentuated by the low DISQUAL value, which drops to 17% (median of 15%). These descriptive statistics indicate that, on average, electric utilities surpass steel firms in terms of future-oriented disclosure, both in quantity and quality, providing initial support for H3 and H4.

Table 2.4 - Descriptive statistics of all the variables

| Variables | Obs. | Mean | Std. dev. | Min. | Median | Max. |
|---|---|---|---|---|---|---|
| **Panel A – Summary statistics for dependent and independent variables** | | | | | | |
| DISQUANT | 200 | 0.429 | 0.185 | 0.06 | 0.44 | 0.88 |
| DISQUAL | 200 | 0.252 | 0.140 | 0.02 | 0.25 | 0.63 |
| REG YEAR | 200 | 0.75 | 0.434 | 0 | 1 | 1 |
| REG INDUSTRY | 200 | 0.6 | 0.491 | 0 | 1 | 1 |
| SIZE | 200 | 7.727 | 2.572 | 0.215 | 8.272 | 11.34 |
| PROFITABILITY | 200 | 0.180 | 0.234 | -0.963 | 0.138 | 0.994 |
| LEVERAGE | 200 | 0.298 | 0.214 | 0 | 0.280 | 1.407 |
| GROWTH | 200 | 1.445 | 1.561 | -12.2 | 1.245 | 6.49 |
| **Panel B – Dependent variable and its components by industry** | | | | | | |
| *Electric Industry* | | | | | | |
| DISQUANT | 120 | 0.505 | 0.146 | 0.16 | 0.53 | 0.88 |
| NARR | 120 | 0.555 | 0.145 | 0.23 | 0.59 | 0.86 |
| FIN | 120 | 0.393 | 0.229 | 0 | 0.4 | 0.9 |
| RISK | 120 | 0.522 | 0.153 | 0.11 | 0.56 | 0.83 |
| STRAT | 120 | 0.483 | 0.206 | 0 | 0.5 | 0.93 |
| DISQUAL | 120 | 0.306 | 0.128 | 0.07 | 0.295 | 0.63 |
| NARR | 120 | 0.334 | 0.138 | 0.09 | 0.32 | 0.73 |
| FIN | 120 | 0.246 | 0.160 | 0 | 0.23 | 0.73 |
| RISK | 120 | 0.307 | 0.139 | 0.06 | 0.28 | 0.7 |
| STRAT | 120 | 0.307 | 0.163 | 0 | 0.31 | 0.81 |
| *Steel Industry* | | | | | | |
| DISQUANT | 80 | 0.313 | 0.177 | 0.06 | 0.295 | 0.66 |
| NARR | 80 | 0.385 | 0.197 | 0.09 | 0.385 | 0.73 |
| FIN | 80 | 0.154 | 0.223 | 0 | 0 | 0.7 |
| RISK | 80 | 0.378 | 0.225 | 0.06 | 0.39 | 0.78 |
| STRAT | 80 | 0.227 | 0.196 | 0 | 0.14 | 0.79 |
| DISQUAL | 80 | 0.17 | 0.116 | 0.02 | 0.15 | 0.45 |
| NARR | 80 | 0.213 | 0.129 | 0.03 | 0.21 | 0.47 |
| FIN | 80 | 0.078 | 0.121 | 0 | 0 | 0.43 |
| RISK | 80 | 0.201 | 0.139 | 0.02 | 0.19 | 0.48 |
| STRAT | 80 | 0.132 | 0.128 | 0 | 0.07 | 0.52 |

Notes: All variables are defined in Table 2.3. The information is categorized based on its nature (narrative versus quantitative) and type (strategic-related versus risk disclosure). NARR: narrative information. FIN: quantitative information. STRAT: strategic-related information (management future objectives and strategies and forecast financial results). RISK: information about risks.

Table 2.5 shows the Pearson correlation coefficients for all variables included in the regression model. As illustrated in Table 2.5, the highest correlation coefficients are between SIZE and DISQUANT (0.7503) and SIZE and DISQUAL (0.7363). These results are consistent with findings from prior literature on corporate disclosure (Meek *et al*., 1995; Hossain *et al*., 1995; Ahmed and Courtis, 1999; Depoers, 2000; Camfferman and Cooke, 2002; Chavent *et al*., 2006; Hussainey and Al-Najjar, 2011). In addition, SIZE is positively and significantly correlated with REG INDUSTRY (0.6109), suggesting that larger firms are subject to greater public accountability demands and widely scrutinized, probably due to their higher visibility compared to smaller counterparts. Finally, a positive and significant relation exists between REG YEAR and both DISQUANT and DISQUAL. Similarly, a positive and statistically significant correlation characterizes the relationship between REG INDUSTRY and both

DISQUANT and DISQUAL. These results provide the initial basis for the research hypotheses advanced in this study.

Table 2.5 - Pearson correlation matrix among dependent and independent variables

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| 1. DISQUANT | 1.0000 | | | | | | | |
| 2. DISQUAL | 0.9308*** | 1.0000 | | | | | | |
| | (0.0000) | | | | | | | |
| 3. REG YEAR | 0.1393** | 0.1717** | 1.0000 | | | | | |
| | (0.0491) | (0.0150) | | | | | | |
| 4. REG INDUSTRY | 0.5109*** | 0.4790*** | 0.0000 | 1.0000 | | | | |
| | (0.0000) | (0.0000) | (1.0000) | | | | | |
| 5. SIZE | 0.7503*** | 0.7363*** | 0.0467 | 0.6109*** | 1.0000 | | | |
| | (0.0000) | (0.0000) | (0.5157) | (0.0000) | | | | |
| 6. PROFITABILITY | 0.0468 | 0.0421 | -0.0215 | 0.4610*** | 0.3681*** | 1.0000 | | |
| | (0.5148) | (0.5581) | (0.7651) | (0.0000) | (0.0000) | | | |
| 7. LEVERAGE | -0.3177*** | -0.2636*** | 0.0273 | -0.0944 | -0.3498*** | -0.0611 | 1.0000 | |
| | (0.0000) | (0.0002) | (0.7014) | (0.1839) | (0.0000) | (0.3952) | | |
| 8. GROWTH | 0.3210*** | 0.3465*** | 0.0794 | 0.4231*** | 0.5216*** | 0.2439*** | -0.1676** | 1.0000 |
| | (0.0000) | (0.0000) | (0.2738) | (0.0000) | (0.0000) | (0.0007) | (0.0202) | |

Notes: All variables are defined in Table 2.3. P-value in parentheses. **, *** significant at 5% and 1% respectively.

### 2.5.2. Multivariate results and discussion

H1 and H2 predict that the quantity and quality of forward-looking disclosure is positively associated with the release of relevant regulatory statements, while H3 and H4 predict that the quantity and quality of forward-looking disclosure is positively associated with the regulatory pressure of the industry. Regression results are reported in Table 2.6.

The four regression models are carried out on 200 observations and are significant at 0.01 confidence level. To ensure the reliability of the results, a check for multicollinearity among the independent variables was conducted using the Variance Inflation Factor (VIF). All variables showed VIF values below two, which is well under the threshold recommended in the literature (Hair *et al*., 2019). This finding indicates the absence of severe multicollinearity problems, allowing for the inclusion of all independent variables in the regression analysis.

To test whether the quantity and quality of forward-looking disclosure is positively associated with the release of regulatory statements, REG YEAR is set as an independent variable in Regressions (1) and (2). As illustrated in Columns (1) and (2) of Table 2.6, the coefficient of REG YEAR is positively and significantly related with both the quantity and quality of disclosure (at p-value < 0.01). This indicates an increase in the volume and quality

of forward-looking information following the publication of regulatory statements relating to risk preparedness, environmental, and climate change issues. H1 and H2 are therefore verified.

Regarding the impact of industry-specific regulatory pressures on forward-looking disclosure, REG INDUSTRY serves as the independent variable in Regressions (3) and (4). The coefficient of REG INDUSTRY is positive and statistically significant related with both DISQUANT and DISQUAL (at p-value < 0.01), thereby confirming H3 and H4. These outcomes indicate that regulatory pressure exerted at the industry level indeed stimulates both the quantity and quality of forward-looking information.

In summary, the results highlight the significant and positive influence on the quantity and quality of forward-looking disclosure of pivotal regulatory documents, particularly the European Green Deal and the Clean Energy Package. These findings are meaningful, indicating that regulatory initiatives have triggered increased responsiveness among firms towards specific themes, consequently stimulating the disclosure of strategic and risk-related information within the electric and steel industries. Nevertheless, the results also point to electric utilities outperforming steel companies in both disclosure quantity and quality, suggesting that the positive impact on forward-looking disclosure is primarily derived from industry-level regulatory pressures. Altogether, these findings emphasize the influential role played by regulations in improving future-oriented disclosure.

As concern the control variables, SIZE shows a positive and statistically significant relationship with both DISQUANT and DISQUAL, in line with findings from prior literature. On the contrary, PROFITABILITY and LEVERAGE show significance in Regressions (1) and (2) but not in Regressions (3) and (4). These results are consistent with previous studies which have revealed mixed results (Leftwich *et al*., 1981; McNally *et al*., 1982; Raffournier, 1995). Regarding the control variable GROWTH, an interesting observation is its negative coefficient. One possible explanation is that companies already perceived as overvalued by the market might not feel compelled to engage in extensive voluntary disclosure. Moreover, the lack of statistical significance implies that the mere presence of firm overvaluation does not *per se* drive the communication of prospective information, nor does it exert an influence on its quality.

Table 2.6 – Multivariate panel regression results

| | Expected sign | (1) DISQUANT | (2) DISQUAL | (3) DISQUANT | (4) DISQUAL |
|---|---|---|---|---|---|
| REG YEAR | + | 0.0360*** | 0.0458*** | | |
| | | (0.0106) | (0.0102) | | |
| REG INDUSTRY | + | | | 0.0917*** | 0.0539*** |
| | | | | (0.0232) | (0.0172) |
| SIZE | + | 0.0920*** | 0.0468*** | 0.0550*** | 0.0435*** |
| | | (0.0236) | (0.0185) | (0.0040) | (0.0034) |
| PROFITABILITY | ? | -0.0008 | -0.0003 | -0.0026*** | -0.0020*** |
| | | (0.0011) | (0.0006) | (0.0003) | (0.0003) |
| LEVERAGE | ? | 0.0482 | 0.0021 | -0.0864 | -0.0005 |
| | | (0.0895) | (0.0758) | (0.0496) | (0.0417) |
| GROWTH | + | -0.0024 | -0.0013 | -0.0132** | -0.0058 |
| | | (0.0047) | (0.0039) | (0.0054) | (0.0036) |
| N | | 200 | 200 | 200 | 200 |
| Prob>chi2 | | 0.0000 | 0.0000 | 0.0000 | 0.0000 |
| R-squared | | 0.5461 | 0.5461 | 0.6415 | 0.6251 |

Notes: Results from Regression (1) are reported in Column (1), (2) in Column (2), (3) in Column (3), (4) in Column (4). All variables are defined in Table 2.3. Heteroskedasticity-adjusted robust standard errors are shown in parentheses.
**, *** indicates statistical significance at 5% and 1% level respectively

### 2.5.3. Robustness check

As a robustness check, three supplementary tests were conducted: a t-test, an alternative model, and the re-estimation of regressions using alternative measures. In all cases, no significant differences were found with the findings from this study.

*T-test: two samples assuming equal variances*

Table 2.7 presents differences in mean values of DISQUANT and DISQUAL, considering separately pre- and post-publication of regulatory statements, and firms with high and low industry pressure. Sampled companies demonstrate statistically greater disclosure quantity and quality for future-oriented information after the release of regulatory statements in 2019, with their mean surpassing the pre-2019 levels. Similarly, a significant difference in disclosure was observed between electric and steel companies. On average, electric firms surpassed their steel counterparts in both disclosure quantity (50.47% versus 31.21%) and quality (30.66% versus 17.03%) of forward-looking information. These t-test results corroborate the research hypotheses.

Table 2.7 – T-test results showing differences in the quantity and quality disclosure across the sub-samples

| Variable | | Obs | Mean | Difference | t-statistics | df |
|---|---|---|---|---|---|---|
| **Panel A: Pre- and post-publication of relevant regulatory statements in 2019** | | | | | | |
| DISQUANT | Post-2019: 1 | 50 | 0.4425 | 0.03** | 1.66 | 98 |
| | Pre-2019: 0 | 50 | 0.3831 | | | |
| DISQUAL | Post-2019: 1 | 50 | 0.2660 | 0.02** | 2.18 | 98 |
| | Pre-2019: 0 | 50 | 0.2102 | | | |
| **Panel B: Firms facing high and low regulatory pressure of the industry** | | | | | | |
| DISQUANT | High pressure: 1 | 30 | 0.5047 | 0.02*** | 4.46 | 48 |
| | Low pressure: 0 | 20 | 0.3121 | | | |
| DISQUAL | High pressure: 1 | 30 | 0.3066 | 0.01*** | 4.11 | 48 |
| | Low pressure: 0 | 20 | 0.1703 | | | |

Notes: All variables are defined in Table 2.3. **, *** indicates statistical significance at 5% and 1% level respectively.

*Different models in comparison*

In the main analysis, I employed fixed effect regression models due to the panel nature of the data, considering variations over time and between entities. Nevertheless, prior studies have also performed multivariate OLS regressions, by calculating the mean value of the data across time (Cooke, 1989; Depoers, 2000; Eng and Mak, 2003; Patelli and Prencipe, 2007). Consistent with this approach, I re-estimated four OLS multivariate regressions with robust standard errors. Additionally, to ensure the robustness of the results, I ran an alternative panel model to the fixed effect, specifically the pooled model.

In Table 2.8, Equations (1) and (2), the pooled panel model and multivariate OLS regressions indicate that REG YEAR has a positive and statistically significant coefficient. This outcome further reinforces the impact of regulatory publications on the quantity (H1) and quality (H2) of forward-looking disclosure, confirming the robustness of the results. In addition, the analysis of pooled panel models and multivariate OLS regressions show that the coefficient of SIZE is positive and statistically significant, consistent with the main model. The coefficient of PROFITABILITY is negative, as observed in the main model, and statistically significant. This contrasts with the outcomes of the main model where the variable PROFITABILITY was not statistically significant.

Table 2.8 – Multivariate results of the effect of REG YEAR on forward-looking disclosure

| | (1) Dependent variable: DISQUANT | | | (2) Dependent variable: DISQUAL | | |
|---|---|---|---|---|---|---|
| **Variable** | **FE** | **Pooled** | **OLS** | **FE** | **Pooled** | **OLS** |
| REG YEAR | 0.0360*** | 0.0466** | 0.0422** | 0.0458*** | 0.0457*** | 0.0424** |
| | (0.0106) | (0.0196) | (0.0231) | (0.0102) | (0.0140) | (0.0170) |
| SIZE | 0.0920*** | 0.0633*** | 0.0599*** | 0.0468** | 0.0483*** | 0.0416*** |
| | (0.0236) | (0.0037) | (0.0047) | (0.0185) | (0.0032) | (0.0041) |
| PROFITABILITY | -0.0008 | -0.0020*** | -0.0019*** | -0.0003 | -0.0016*** | -0.0016*** |
| | (0.0011) | (0.0003) | (0.0005) | (0.0006) | (0.0003) | (0.0004) |
| LEVERAGE | 0.0482 | -0.0747 | -0.0729 | 0.0021 | 0.0034 | -0.0013 |
| | (0.0895) | (0.0460) | (0.0583) | (0.0758) | (0.0392) | (0.0496) |
| GROWTH | -0.0024 | -0.0089 | -0.0119 | -0.0013 | -0.0028 | 0.0010 |
| | (0.0047) | (0.0045) | (0.0087) | (0.0039) | (0.0035) | (0.0069) |
| N | 200 | 200 | 100 | 200 | 200 | 100 |
| Prob > F | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| R-squared: | | | | | | |
| Within | 0.3255 | | | 0.3208 | | |
| Between | 0.5807 | | | 0.5792 | | |
| Overall | 0.5461 | 0.6001 | 0.6286 | | 0.5919 | 0.6188 |

Notes: All variables are defined in Table 2.3. **, *** indicates statistical significance at 5% and 1% level respectively. Heteroskedasticity-adjusted robust standard errors are shown in parentheses.

As illustrated in Table 2.9, Equation (3), REG INDUSTRY and SIZE have positive and statistically significant coefficients in the pooled panel model and multivariate OLS regression. This result further corroborates the result of H3, confirming the impact of industry-specific regulatory pressure on forward-looking disclosure quantity. PROFITABILITY records a negative and significant coefficient across all models. Similar to the main model, the OLS regression shows a negative, statistically significant coefficient for GROWTH, while this significance is not maintained in the pooled panel model.

Concerning Equation (4), the coefficient of REG INDUSTRY is positive and statistically significant in panel models. In the multivariate OLS regression analysis, the coefficient is positive but lacks statistical significance. This implies that companies limit themselves to offering qualitative and generic prospective information, while the shift from quantitative to qualitative disclosure remains incomplete. However, due to persistent statistical significance observed in two types of panel models (fixed-effect and pooled) and t-test results, it is possible to conclude that REG INDUSTRY significantly influences forward-looking disclosure quality. As for control variables, their coefficients and significance remain consistent in all models.

Table 2.9 – Multivariate results of the effect of REG INDUSRY on forward-looking disclosure

| | (3) Dependent variable: DISQUANT | | | (4) Dependent variable: DISQUAL | | |
|---|---|---|---|---|---|---|
| **Variable** | **FE** | **Pooled** | **OLS** | **FE** | **Pooled** | **OLS** |
| REG INDUSTRY | 0.0917*** | 0.0872*** | 0.1015** | 0.0539*** | 0.0493*** | 0.0572 |
| | (0.0232) | (0.0235) | (0.0445) | (0.0172) | (0.0175) | (0.0344) |
| SIZE | 0.0550*** | 0.0556*** | 0.0579*** | 0.0435*** | 0.0440*** | 0.0447*** |
| | (0.0040) | (0.0042) | (0.0072) | (0.0034) | (0.0035) | (0.0066) |
| PROFITABILITY | -0.0026*** | -0.0025*** | -0.0026*** | -0.0020*** | -0.0020*** | -0.0020*** |
| | (0.0003) | (0.0004) | (0.0006) | (0.0003) | (0.0003) | (0.0005) |
| LEVERAGE | -0.0864 | -0.0833 | -0.1025 | -0.0005 | 0.0013 | -0.0077 |
| | (0.0496) | (0.0490) | (0.0896) | (0.0417) | (0.0406) | (0.0778) |
| GROWTH | -0.0132** | -0.0113 | -0.0240** | -0.0058 | -0.0037 | -0.0092 |
| | (0.0054) | (0.0049) | (0.0117) | (0.0036) | (0.0037) | (0.0105) |
| N | 200 | 200 | 50 | 200 | 200 | 50 |
| Prob > F | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| R-squared | 0.6415 | 0.6187 | 0.6945 | 0.6251 | 0.5883 | 0.6610 |

Notes: All variables are defined in Table 2.3. **, *** indicates statistical significance at 5% and 1% level respectively. Heteroskedasticity-adjusted robust standard errors are shown in parentheses.

*Alternative measures*

To further validate the results, the regression models were re-estimated changing the control variables. This implied reclassifying the SIZE variable as the natural logarithm of total assets, PROFITABILITY as the ROA ratio, and LEVERAGE as the debts-to-equity ratio. At a significance level of 0.01, the regression results show that REG YEAR, REG PRESSURE, and SIZE are positively related with both DISQUANT and DISQUAL, confirming the robustness of the main tests.

## 2.6. Conclusions

This paper addresses the impact of regulatory pressure on the level and quality of forward-looking information in the European electric industry during the period 2018-2021. The study examines the potential role of regulatory publications in shaping forward-looking disclosure and confronts the quantity and quality of future-oriented information provided by electric utilities, a highly regulated industry, with a sample of less regulated counterparts, specifically steel companies.

The results reveal that regulatory pressure has a significant and positive impact on the quantity and quality of forward-looking information. Following the publication of regulations on risk preparedness, environmental and climate change, both electric and steel companies

increased their disclosure quantity and quality. However, electric utilities exhibited a more pronounced increase in both quantity and quality compared to steel firms. Overall, the findings are consistent with the argument that regulatory pressure serves as a driving factor in improving the quantity and quality of information disclosure, thus reducing information asymmetries between firms and investors.

The findings contribute to the literature on forward-looking disclosure in annual reports by presenting contemporary and comparative insights on the level and quality of future-oriented information across two industries, the electric and steel sectors. Additionally, the findings may be of interest to policymakers and regulators, underscoring the pivotal role played by regulatory initiatives of 2019 and by industry-specific regulations in enhancing firms' forward-looking disclosure quantity and quality.

This study is subject to several limitations. Firstly, it investigates the quantity and quality of forward-looking information over a specific timeframe, relying on annual reports as the primary data source. Secondly, the scope of the analysis is confined to comparing electric utilities' disclosure with one single industry (i.e., steel), which may hinder generalizability of the results. Thirdly, the sample is limited to publicly listed energy companies operating in European Union stock markets.

To overcome these limitations, future research avenues can be pursued. Future studies should consider diverse data sources, including business plans, for a more comprehensive examination of forward-looking disclosure. Furthermore, future investigations should encompass a broader spectrum of energy companies, both listed and non-listed firms in Europe. Finally, extending the analysis to cover additional years and industries has the potential to offer enriched and nuanced insights.

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## Appendices

Appendix 3.1 - List of items included in the disclosure index.

| | |
|---|---|
| ***Strategic-related information*** | |
| 1. Management's strategy | Narrative |
| 2. A statement of corporate objectives | Narrative |
| 3. Planned actions to be taken in future years | Narrative |
| 4. Description of major factors influencing the business | Narrative |
| 5. Financial targets forecast | Quantitative |
| 6. Sales forecast | Quantitative |
| 7. EBITDA forecast | Quantitative |
| 8. Investments forecast | Quantitative |
| 9. Capital expenditure forecast | Quantitative |
| 10. Debts forecast | Quantitative |
| 11. Profit forecast | Quantitative |
| 12. Dividends forecast | Quantitative |
| 13. Volume forecast | Quantitative |
| 14. Cash flow forecast | Quantitative |
| ***Risk-related information*** | |
| 15. Description of risks and opportunities affecting the business | Narrative |
| 16. Information about strategic risks | Narrative |
| 17. Information about risks related to the macro-economic scenario | Narrative |
| 18. Information about risks related to the competitive environment | Narrative |
| 19. Information about risk related to climate-change | Narrative |
| 20. Information about financial risks | Narrative |
| 21. Information about operational risks | Narrative |
| 22. Information about risks related to legal/regulatory compliance | Narrative |
| 23. Information about risks related to IT | Narrative |
| 24. Information about risk related to the company's reputation | Narrative |
| 25. Information about risks related to new investments | Narrative |
| 26. Information about risks related to production disruptions | Narrative |
| 27. Information about risks related to projects | Narrative |
| 28. Information about risks related to infrastructure and assets | Narrative |
| 29. Information about procurement and supply risks | Narrative |
| 30. Information about risk related to customers | Narrative |
| 31. Information about risks related to service quality | Narrative |
| 32. Information on other relevant risks | Narrative |

Appendix 3.2 – List of companies included in the study.

| NO. | COMPANY | COUNTRY | INDUSTRY |
|---|---|---|---|
| 1. | A2A SPA | ITALY | ENERGY |
| 2. | ACEA SPA | ITALY | ENERGY |
| 3. | ACERINOX SA | SPAIN | STEEL |
| 4. | ADMIE SA | GREECE | ENERGY |
| 5. | AFARAK GROUP SE | FINLAND | STEEL |
| 6. | ALLEIMA AB | SWEDEN | STEEL |
| 7. | APERAM SA | LUXEMBOURG | STEEL |
| 8. | ARCELORMITTAL SA | LUXEMBOURG | STEEL |
| 9. | BITROS SA | GREECE | STEEL |
| 10. | E.ON SE | GERMANY | ENERGY |
| 11. | EDISON SPA | ITALY | ENERGY |
| 12. | EDP - ENERGIAS DE PORTUGAL SA | PORTUGAL | ENERGY |
| 13. | ELASTRON SA | GREECE | STEEL |
| 14. | ELECTRICITÈ DE FRANCE SA | FRANCE | ENERGY |
| 15. | ÉLECTRICITÈ DE STRASBOURG SA | FRANCE | ENERGY |
| 16. | ELIA GROUP SA/NV | BELGIUM | ENERGY |
| 17. | ENBW ENERGIE BADEN-WÜRTTEMBERG AG | GERMANY | ENERGY |
| 18. | ENDESA SA | SPAIN | ENERGY |
| 19. | ENEL SPA | ITALY | ENERGY |
| 20. | ENGIE SA | FRANCE | ENERGY |
| 21. | ERG SPA | ITALY | ENERGY |
| 22. | EVN AG | AUSTRIA | ENERGY |
| 23. | FORTUM OYJ | FINLAND | ENERGY |
| 24. | HERA SPA | ITALY | ENERGY |
| 25. | IBERDROLA SA | SPAIN | ENERGY |
| 26. | IREN SPA | ITALY | ENERGY |
| 27. | MAINOVA AG | GERMANY | ENERGY |
| 28. | MVV ENERGIE AG | GERMANY | ENERGY |
| 29. | N. LEVENTERIS SA | GREECE | STEEL |
| 30. | NORDIC IRON ORE AB | SWEDEN | STEEL |
| 31. | NV BEKAERT SA | BELGIUM | STEEL |
| 32. | ØRSTED A/S | DENMARK | ENERGY |
| 33. | OUTOKUMPU OYJ | FINLAND | STEEL |
| 34. | PUBLIC POWER CORPORATION SA | GREECE | ENERGY |
| 35. | RAMADA INVESTIMENTOS E INDUSTRIA SA | PORTUGAL | STEEL |
| 36. | RED ELÉCTRICA CORPORACIÓN SA | SPAIN | ENERGY |
| 37. | REN - REDES ENERGÉTICAS NACIONAIS SA | PORTUGAL | ENERGY |
| 38. | RWE AG | GERMANY | ENERGY |
| 39. | SALZGITTER AG | GERMANY | STEEL |
| 40. | SIDMA S.A. STEEL PRODUCTS | GREECE | STEEL |
| 41. | SSAB AB | SWEDEN | STEEL |
| 42. | TERNA - RETE ELETTRICA NAZIONALE SPA | ITALY | ENERGY |
| 43. | TERNIUM SA | LUXEMBOURG | STEEL |
| 44. | THYSSENKRUPP AG | GERMANY | STEEL |
| 45. | TUBACEX SA | SPAIN | STEEL |
| 46. | TUBOS REUNIDOS SA | SPAIN | STEEL |
| 47. | UNIPER SE | GERMANY | ENERGY |
| 48. | VEOLIA ENVIRONNEMENT SA | FRANCE | ENERGY |
| 49. | VERBUND AG | AUSTRIA | ENERGY |
| 50. | VOESTALPINE AG | AUSTRIA | STEEL |

# SECTION 3

## Reporting and controlling Sustainable Development Goals: evidence from energy utilities in the European Union

### 3.1. Introduction

Over the past years, a growing debate has emerged about the necessity to rethink economic systems in favour of sustainable development. In this vein, the United Nations introduced the Agenda 2030 for Sustainable Development with the intent to stimulate sustainable practices and foster a more equitable, prosperous, and environmentally conscious global environment. The Agenda 2030 is a comprehensive plan that interrelates economic, ecological, and social issues through an ambitious set of 17 sustainable development goals (SDGs) and 169 targets (UN, 2017). The SDGs represent therefore a global push for sustainability and resilience (Caiado *et al*., 2018), necessitating collective actions from all members of society, with firms assuming a crucial role in their achievement (Scheyvens *et al*., 2016; Redman, 2018).

In particular, electric utilities face increased public pressure from multiple stakeholders to demonstrate their contributions to SDGs. This impetus arises from their mixed ownership structure and their public mission as utility service providers (Traxler and Greiling, 2019). Moreover, their negative environmental footprint has brought them into the public eye, as major contributors to pollution and greenhouse gas emissions (Maia *et al*., 2023). As such, SDGs reporting and control have become both an urgent imperative and an opportunity for these companies to prove their commitment to sustainable development. Within this context, the implementation of management controls assumes a crucial role in addressing sustainable value through concrete actions, rather than mere "good intentions" (Lueg and Radlach, 2016).

Against this background, this paper aims to explore SDGs reporting and control in the electric industry. In pursuit of this aim, the study addresses two research questions. First, how comprehensive is SDGs reporting provided by electric utilities? The comprehensiveness of SDGs disclosure is assessed using an SDG Reporting Index. Second, how do electric utilities use management controls to contribute to the SDGs? To answer this question, a content analysis is performed based on the well-known framework of Malmi and Brown (2008).

This study combines the lens of strategic stakeholder and legitimacy theories to interpret the results. From a strategic stakeholder theory perspective, SDGs initiatives are seen as a means to gain a competitive advantage and strategic win-win opportunities. On the other hand, the legitimacy theory posits that companies function as social systems operating under a societal contract (Shocker and Sethi, 1973; Suchman, 1995). To succeed, they must harmonize with socio-political expectations for sustainable development (Deegan, 2002). The combination of strategic and legitimacy theory is particularly appropriate when examining energy utilities. Operating as hybrid organizations, these companies encounter the exigence of balancing economic, ecological, and social development (Argento *et al.*, 2016). Consequently, their engagement with SDGs becomes pivotal in meeting societal expectations while concurrently preserving a competitive advantage (York, 2016; Slacik *et al*., 2022).

The results shed light on the level of SDGs reporting and control in the European electric industry. Concerning SDGs reporting, the findings reveal an ongoing shift towards more comprehensive reporting of companies' contributions to SDGs, with room for improvement. On average, SDG 9 received the most attention, while SDG 2, SDG1, and surprisingly SDG 7 scored lower. Furthermore, the study unveils that ownership structure and operating country have an influence on SDGs reporting. In terms of SDGs control, the results suggest that electric utilities are likely to combine administrative and cultural controls on one hand, and planning, cybernetic, and reward and compensation controls on the other. However, the implementation of management controls for SDGs appears to be in an early stage compared to the concept of MCS as a package of Malmi and Brown (2008). Despite a tendency to combine some MCS, they are still loosely coupled. Nevertheless, from the results, it emerged that electric companies are increasingly adopting MCS for SDGs to contribute to sustainable development.

This paper adds to the evolving field of SDGs research by shedding light on the current state of company-level SDGs reporting and control in the European electric industry. Additionally, the literature that considers sustainability discourse and action together is scarce (Traxler *et al*., 2020), with a call for more research exploring the use of MCS for sustainable development (Lueg and Radlach, 2016). Hence, this paper contributes to bridging this gap by providing insights on which MCS are mostly used by electric utilities to address SDGs challenges.

The remainder of the paper is structured as follows. The next section provides a review of the literature. Section 3 focuses on the theoretical background of the research. Section 4 is dedicated to the research design. The findings of the research are presented in Section 5. Section 6 provides a detailed discussion of the results. The final section concludes the paper.

## 3.2. Literature review

### 3.2.1. Sustainability reporting in energy companies

Sustainability reporting practices in the electric industry have received increased attention from the scientific community in recent times. Prior studies have largely focused on identifying factors that influence the reporting behaviour of electric companies (Chang, 2013; Bae, 2014; Alrazi *et al*., 2016; Rahman *et al*., 2019; Traxler and Greiling, 2019; Slacik and Greiling, 2020). Among this category of studies, Chang (2013), investigating 25 listed Chinese companies, found that sustainability reporting was positively affected by state ownership, ownership concentration, financial leverage, and long-term debts. In contrast, Bae (2014) suggested that private-owned firms were more likely than public firms to voluntarily disclose sustainability information, particularly if they stand to gain legitimacy from their higher level of performance. Through an empirical analysis across 35 countries, Alrazi *et al*. (2016) found that firms operating in countries with a strong environmental commitment tend to disclose comprehensive sustainability information. The authors also found that disclosure was influenced by firm size, age of the assets, listing status, and media exposure. Consistent with this, Traxler and Greiling (2019) showed that firms listed on a stock exchange had higher compliance with GRI indicators compared to non-stock-listed firms, but they found no link between ownership and sustainability reporting. In the same year, Rahman *et al*. (2019), showed that electricity-generating companies that follow GRI guidelines or hold an ISO 14001 certification were more prone to disclose sustainability information voluntarily.

Other studies have examined the level and nature of sustainability reporting. Moseñe *et al*. (2013), focusing on the main Spanish wind energy producers, showed that the level of disclosure of these firms was incomplete, descriptive, and limited. Similarly, Alrazi (2014) analyzed the carbon-related information provided by electric companies in Malaysia and concluded that the disclosure was low and mainly characterized by declarative statements. On the contrary, Braga *et al*. (2014) observed an improvement over the years in the level of sustainability disclosure among companies operating in the Brazilian electric power sector. Looking at the type of information, the study conducted by Sartori *et al*. (2017) revealed a predominance of economic indicators in the GRI reports of Brazilian electric companies. Through an empirical analysis across 28 countries, Traxler and Greiling (2019) concluded that electric utilities tended to prioritize economic indicators over environmental and social ones.

Also, Mamun (2022) observed that economic indicators were predominately used by Australian electricity retailers. Other studies have highlighted a preponderance in the use of ecological indicators instead (de Rosario *et al*., 2011; Slacik and Greiling, 2020). Furthermore, research has indicated that electric utilities tend to favour positive environmental information (Kim and Lyon, 2011).

Scholars have only recently shifted their attention towards SDGs disclosure practices. Manes-Rossi and Nicolò (2022) examined the SDGs disclosure of 15 electric utilities during 2017-2019 using a checklist of seven quality criteria. Their findings revealed that a symbolic approach prevailed among the firms rather than a substantial one. Maia and Garcia (2023) focused on the decarbonization efforts of 39 electric companies. They analyzed business plans to assess climate-change reporting and used the Science-Based Target Initiative tool to evaluate concrete actions. Their findings indicate that electric firms reported on their climate-change initiatives, with 87% of them linking their actions to SDG 7 and SDG 13. However, the research also indicated that these electric firms did not reduce decarbonization. In another study, Scandurra and Thomas (2023) analyzed the integrated reports of eight major Italian electric companies. The authors found that these companies were making efforts in environmental and social domains but had not fully embraced the path to sustainable development.

While these studies provide valuable insights into the sustainability activities of electric utilities, it is evident that the attention given to SDGs reporting in this sector is in its infancy. Moreover, these studies have primarily focused on the environmental dimension overlooking the comprehensive nature of SDGs reporting, which encompasses economic, environmental, and social dimensions. Against this background, this study addresses the first research question:

***RQ1:*** *How comprehensively do electric utilities report on SDGs?*

### 3.2.2. Management control for sustainable development in energy companies

To date, only a limited number of studies have investigated the embeddedness of sustainability into the MCS of energy-intensive companies. Among these limited studies, Magrini and dos Santos Lins (2007) analyzed a 10-year period to examine the integration of environmental management into the strategic planning of an oil and gas company. Their findings revealed that the company only made sustainability a priority after a serious accident occurred in year 2000. The company then adopted a more proactive approach towards environmental management,

integrating it closely with strategic planning and increasing investments in the area. Likewise, Argento *et al*. (2022) observed that sustainability was not fully integrated into the organizational practices of an Italian multi-utility. The authors found that the sustainability control system of the company operated in parallel to the main MCS, suggesting a potential lack of integration. On the contrary, Ranjan and Das (2015) showed that the Indian coal mining industry exhibited a high level of integration of environmental management aspects within its core managerial functions. Focusing on the electric sector, Slacik *et al*. (2022) explored the implementation of sustainability management control systems using in-depth interviews with seven Austrian electric companies. The authors found that electric companies mainly used administrative and cultural controls, with sustainable managers serving as bridging actors between top-level management and the operational level.

Other studies have explored barriers and drivers of integrating sustainability into MCS. Analyzing an oil and gas company, George *et al*. (2016) identified the limited involvement of finance and other supporting departments as a primary obstacle to embedding sustainability into performance management systems. These departments often "lack awareness about the potential benefits of sustainability for achieving business goals and generating revenue". In the same year, Herremans and Nazari (2016) examined how external pressure has influenced sustainability control systems and processes focusing on a sample of Canadian petroleum firms. Through interviews with managers and stakeholders, the authors found that mandatory requirements for sustainability reporting did not lead to well-developed internal systems. However, companies were forced to develop a formal, adaptive, compliance-based system first, which was then followed by the informal values-based system. The study also showed that managerial motivations and relationships with stakeholders influenced these systems.

Other papers stressed the importance of cultivating a supportive culture to promote sustainability within organizations. In a recent paper, Sathasivam *et al*. (2021) interviewed 12 managers and employees from a Malaysian electrical company to explore their efforts towards meeting SDGs. The study revealed that the company engages in Green Human Resource Management, particularly through green employee involvement and training. Based on these findings, the authors concluded that organizational culture plays a crucial role in attaining environmental sustainability goals. In accordance with this, Argento *et al*. (2022), analyzing an Italian multi-utility, stated "the use of a sustainable management control system by actors who share a common understanding and have shared expectations of sustainability is paramount". The study of Soares *et al*. (2018) examined the relationship between culture and

sustainability reporting among Brazilian electric companies. Drawing on Cameron and Quinn's (2006) cultural typology, the authors found that most electric companies had a hierarchal culture, characterized by a formal work environment and a preference for stability and control. Additionally, findings indicated a positive association between having a strong balanced culture and the reported sustainability indicators.

To summarize, prior research has primarily focused on the motivations for integrating sustainability into MCS or has explored one single aspect of management control (e.g., culture). Though research on sustainability is growing, there remains a lack of knowledge when it comes to understanding how energy companies are managing and controlling sustainable value. To fill this research gap, this study addresses the second research question:

***RQ2:*** *How do electric utilities use their MCS to contribute to the SDGs?*

### 3.3. Conceptual and theoretical framework

In the management control literature, different approaches are used to systemize and illustrate the control practices available to organizations (Simons, 1994; Malmi and Brown, 2008; Merchant and Van der Stede, 2017). Malmi and Brown (2008) adopt a holistic perspective categorizing controls into administrative, planning, cybernetic, cultural and, reward and compensation domains. In planning controls, a distinction is made between action and strategic planning. Administrative controls cover organizational structure, governance, and procedures and policies. The largest differentiation arises within cybernetic controls, including various components like budgets, financial, non-financial, and hybrid measures. Regarding cultural controls, distinctions are drawn between value-based, clan, and symbolic controls, while reward and compensation controls lack differentiation. By including formal and informal controls, and procedural and institutional elements, Malmi and Brown's (2008) framework stands as the most comprehensive and widely utilized in the field (Guenther *et al*., 2016; Traxler *et al*., 2020).

From a theoretical point of view, this paper combines the instrumental perspective (specifically, strategic stakeholder theory) and the socio-political perspective (specifically, legitimacy theory). Both theories are extensively employed in the field of sustainability reporting, emphasizing the profound influence of stakeholders on companies' reporting decisions (Hyatt and Berente, 2017; Silva *et al*., 2019; Zhang and Zhu, 2019). This study draws upon two differing perspectives, as the combination of plural perspectives offers enriching

insights and captures the nuances of diverse social realities (Parker, 2005; Spence *et al*., 2010). This approach is particularly suitable in the specific context of energy utilities due to their peculiar characteristics (Traxler and Greiling, 2019).

At the core of the strategic stakeholder theory lies the premise that companies consider environmental and social matters as instrumental in achieving specific corporate objectives (Hansen and Schaltegger, 2016). According to this theory, companies actively engage in environmental or social initiatives because they recognize the strategic potential for 'win-win' opportunities that can lead them to gain a competitive advantage (Jones, 1995). In this view, building mutually beneficial relationships with stakeholders holds instrumental value in improving companies' efficiency and organizational performance (Harrison *et al*., 2010; Jones *et al*., 2018). Following this perspective, companies address issues that are strategically relevant to their stakeholders and aspire to excel in them. As such, the adoption of advanced control mechanisms in these areas is intuitively expected (Özsözgün, 2014; Garcia *et al*., 2016).

From the legitimacy theory perspective, companies are viewed as social systems that operate within society through a social contract (Shocker and Sethi, 1973; Suchman, 1995). According to this theory, companies must address external socio-political expectations in order to maintain their 'license to operate' in the ecosystem and ultimately thrive (Deegan, 2002). This entails a commitment to sustainable development, achieved by aligning their actions with prevailing social norms, beliefs, and values. Failure to meet these social expectations poses a threat to a company's legitimacy (Dowling and Pfeffer, 1975; Suchman, 1995; Deegan, 2014). Following this stream of thought, companies are inclined to report and utilize control mechanisms with the primary aim of creating a favourable impression on stakeholders, rather than being intrinsically driven by the genuine interest in generating sustainable value. The legitimacy theory has been widely adopted (Deegan, 2002; Deegan *et al*., 2002) and continues to be a prevalent framework for understanding socio-environmental reporting and control behaviours (Dumay *et al*., 2018; Deegan, 2019).

The adoption of both strategic stakeholder theory and legitimacy theory is particularly suitable in the context of energy utilities (Traxler and Greiling, 2019). These companies, often referred to as hybrids, face critical pressure from a multitude of internal and external stakeholders who have become increasingly sensitive to sustainability issues. Additionally, as hybrid organizations, energy companies must combine economic and societal goals (Hansen and Schaltegger, 2016). As a result, they are expected to contribute to SDGs to both meet society's expectations and keep a competitive advantage (York, 2016).

## 3.4. Research design

### 3.4.1. Sample

The sample of electric utilities was drawn from the S&P Capital IQ database (8 March 2023) and included all public companies and private companies with public debt operating in European Union member countries. This resulted in a total of 63 electric companies. From this list, 15 firms that were classified as electric utilities but were not involved in the generation, transmission, distribution, or sale of electricity were excluded. Additionally, 7 firms were excluded due to missing reports and 11 firms were excluded because their reports were not available in English or Italian. Two firms were further eliminated as they did not address SDGs in their reports. The final sample consists of 28 electric companies. Table 3.1 summarizes the sample selection process.

Table 3.1 – Sample selection process

| **Sampling process steps** | **No. of companies** |
|---|---|
| Population of electric companies operating in EU member countries | 63 |
| Exclusion of companies that do not provide electric service | (15) |
| Exclusion of firms with missing reports | (7) |
| Exclusion of firms with no reports available in English or Italian language | (11) |
| Exclusion of firms with no reference to SDGs | (2) |
| Final sample | 28 |

The focus of this study is on European electric utilities which constitutes a suitable context to conduct this research for two main reasons. First, electric utilities are among the primary polluters and greenhouse gas emitters, accounting for 30% of global and 26% of the European total $CO_2$ emissions (European Environment Agency, 2014; Maia *et al*., 2023). As a result, these companies are facing increased political, regulatory, and social scrutiny which can threaten their legitimacy and license to operate (Talbot and Boiral, 2018). Therefore, there is an increased expectation for them to make efforts to contribute to SDGs (Manes-Rossi and Nicolo', 2022). Second, the European Union region was chosen due to its significant commitment to sustainable development (Garcia-Meca and Martinez-Ferrero, 2021). The European Union has been a pioneer in promoting sustainability reporting and has undertaken different initiatives to institutionalize it (Baumüller and Sopp, 2022). These include the EU Directive 95/2014 and the Corporate Sustainability Reporting Directive, which entered into force on January 2023 and expands the scope and reporting requirements of Directive 95/2014 (EC, 2022). Also, the European Financial Reporting Advisory Group (EFRAG) is actively

working on developing sustainability reporting standards to enhance the comparability and reliability of non-financial reports among European companies (Agostini *et al*., 2022). More recently, the European Sustainability Reporting Standards have been considering the SDGs a top priority emphasizing the need for companies to report their contributions to SDGs (European Reporting Lab, 2021; Agostini *et al*., 2022).

The investigation included integrated reporting, sustainability reporting, and annual reports to ensure that all information was mapped. Table 3.2 provides an overview of the sampled companies and the types of reports that were included in the analysis. Most electric utilities operate in European developed markets (68%). The companies can be differentiated by their listing status and ownership structure. In terms of listing status, 19 out of 28 companies (68%) are publicly listed on stock exchanges. Regarding the ownership structure, 18 firms (64%) are publicly owned or have a majority shareholding by the state, government, or municipalities.

Table 3.2 – Sample composition

| Company No. | Market | Listing status | Public % | Private % | IR (Latest) | SR (Latest) | AR (Latest) |
|---|---|---|---|---|---|---|---|
| 1. | Emerging | Listed | 73.10 | 26.90 | | | 2022 |
| 2. | Developed | Non-listed | 0.00 | 100.00 | | 2021 | |
| 3. | Emerging | Non-listed | 100.00 | 0.00 | | 2022 | 2022 |
| 4. | Emerging | Non-listed | 100.00 | 0.00 | | | 2021 |
| 5. | Emerging | Listed | 69.80 | 30.20 | | 2021 | 2021 |
| 6. | Developed | Listed | 0.00 | 100.00 | | 2022 | 2022 |
| 7. | Developed | Listed | 83.88 | 16.12 | 2022 | | |
| 8. | Emerging | Listed | 79.50 | 20.50 | | | 2021 |
| 9. | Emerging | Listed | 79.86 | 20.14 | | | 2021 |
| 10. | Emerging | Listed | 79.68 | 20.32 | | | 2021 |
| 11. | Emerging | Non-listed | 100.00 | 0.00 | | | 2022 |
| 12. | Developed | Listed | 0.00 | 100.00 | | 2022 | 2022 |
| 13. | Developed | Listed | 93.50 | 6.50 | 2022 | | |
| 14. | Emerging | Listed | 0.00 | 100.00 | | 2021 | 2021 |
| 15. | Developed | Listed | 23.59 | 76.41 | | 2022 | |
| 16. | Developed | Non-listed | 100.00 | 0.00 | | | 2022 |
| 17. | Developed | Non-listed | 53.10 | 46.90 | | 2022 | 2022 |
| 18. | Developed | Non-listed | 100.00 | 0.00 | | | 2022 |
| 19. | Developed | Listed | 51.26 | 48.74 | | 2022 | 2022 |
| 20. | Developed | Listed | 0.00 | 100.00 | 2022 | | |
| 21. | Developed | Listed | 8.70 | 91.30 | | 2022 | |
| 22. | Developed | Listed | 50.10 | 49.90 | | 2022 | 2022 |
| 23. | Developed | Listed | 0.00 | 100.00 | | 2021 | |
| 24. | Developed | Listed | 20.00 | 80.00 | | 2022 | 2022 |
| 25. | Developed | Non-listed | 100.00 | 0.00 | | 2022 | 2022 |
| 26. | Developed | Listed | 29.85 | 70.15 | 2022 | | |
| 27. | Developed | Non-listed | 100.00 | 0.00 | | 2022 | 2022 |
| 28. | Developed | Listed | 51.00 | 49.00 | | 2022 | 2022 |

Notes: A random number was assigned to each company. Market classification is based on the criteria used by the S&P Capital IQ database. Abbreviations: IR integrated reporting, SR sustainability reporting, AR annual report.

### 3.4.2. Methodology

To investigate the first research question, a comprehensive analysis of the reports was conducted. The latest reports, available in English or Italian language, were obtained from the websites of electric utilities. The cutoff date for the report selection was set at 30 April 2023. The assessment of the reports was based on the linkage between SDGs and GRI indicators, as identified by SDGs Compass, an initiative developed by the GRI, the UN Global Compact, and the World Business Council for Sustainable Development (GRI, 2022). This approach ensures comparability between reports, as each SDG is associated with a set of GRI indicators.

A scoring system was developed to assess SDGs reporting based on a two-stage scale level. A score of 0 was assigned if a firm did not report on an indicator, a score of 1 if the firm partially reported on the indicator, and a score of 2 if the firm fully reported on the indicator. Subsequently, an SDG Reporting Index (SRI) was constructed to measure the level of comprehensiveness in each SDG.

$$\frac{\sum indicators\ disclosed\ within\ SDG\ category\ \times level\ of\ comprehensiveness\ \ provided}{\sum max\ no.of\ \ indicators\ possible\ within\ SDG\ category \times\ \ max.level\ of\ comprehensiveness\ possible}$$

To investigate the second research question, a content analysis was performed. Content analysis has been largely used in the field of business research (Bryman and Bell, 2015). The information was coded using MAXQDA software, based on the analytical framework derived from MCS package of Malmi and Brown (2008). The framework of Malmi and Brown (2008) was chosen because it is considered to provide a comprehensive understanding of MCS, including institutional and processual elements, formal and informal controls (Guenther *et al*., 2016). Appendix 3.1 shows the data produced for the content analysis.

## 3.5. Results

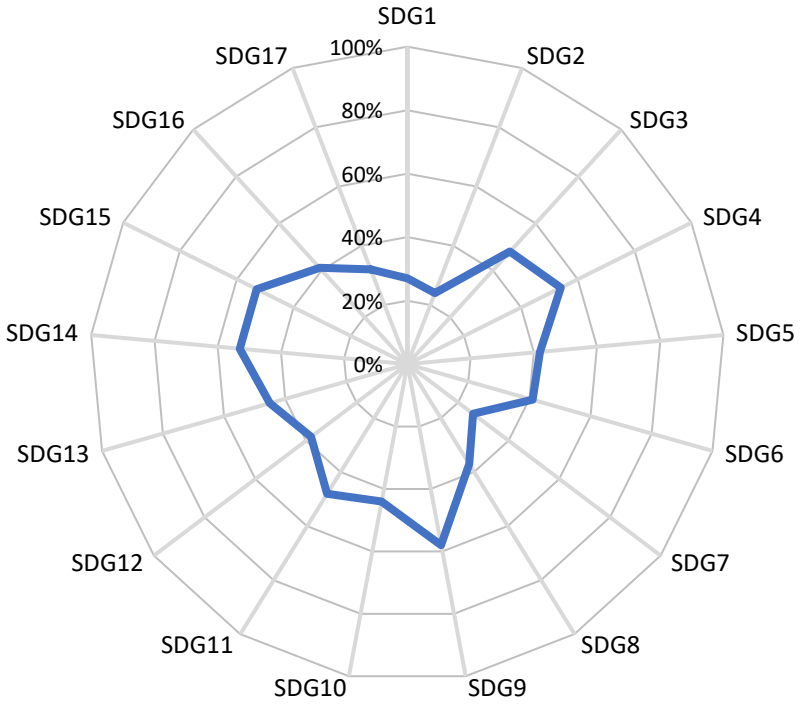
### 3.5.1. Reporting on SDGs

The first-level findings reveal that the electric utilities included in this study made references to the SDGs in their published reports, suggesting that nowadays SDGs practices have become an integral part of corporate disclosure (Fonseca and Carvalho, 2019; Silva, 2021; Manes-Rossi and Nicolo', 2022). However, instead of covering all SDGs, electric companies tend to prioritize specific goals that retain relevant for their operations.

Figure 3.1 shows the level of comprehensiveness among the 28 companies in reporting SDGs. The analysis unveils that, on average, SDG 9 (Industry, innovation, and infrastructure) reached the highest score (58%). Additionally, SDG 4 (Quality Education) achieved 54%, followed closely by SDG 14 (Life below water, 53%), SDG 15 (Life on land, 53%), and SDG 13 (Climate action, 45%). These SDGs cover various critical issues such as sustainable infrastructure investment, employee well-being, water resource management, biodiversity conversation, waste management, and energy direct and indirect greenhouse gas emissions.

On the other hand, the SDGs that obtained the lowest scores are SDG 2 (Zero hunger, 24%) and SDG 1 (No poverty, 27%). Half of the electric utilities did not mention these goals at all, and over three-quarters of the companies merely made a passing mention but without providing comprehensive information about their initiatives towards contributing to these goals. Surprisingly, energy utilities reported limited and inadequate information regarding also for SDG 7 (Affordable and clean energy, 26%). Indeed, only a few of them provided details concerning their efforts to promote affordable and clean energy solutions through efficiency initiatives.

Figure 3.1 - Level of comprehensiveness of SDGs reporting




*Source: author's own elaboration*

Furthermore, the analysis identified Company 6 (SRI=89%), Company 21 (SRI=85%), and Company 15 (SRI=82%) as the top performers in terms of overall comprehensiveness in reporting on the SDGs. Statistical tests were then conducted to investigate potential differences in SDGs reporting based on firm-level characteristics, such as firm size, listing status, operating country, and ownership structure (Table 3.3). The results revealed significant influences of certain features on the comprehensiveness of SDGs reporting, such as the operating country and ownership structure. Notably, electric utilities in developed markets differed significantly in their SDGs reporting compared to those operating in emerging markets. On average, firms in developed markets provided more comprehensive information on SDGs compared to those in emerging markets.

Similarly, a significant difference in the comprehensiveness level of SDGs reporting was observed between state-owned and private-owned electric utilities. Private-owned firms showed a higher level of SDGs disclosure compared to their public-owned counterparts. By contrast, the analysis did not find significant differences in terms of listing status, and firm size, suggesting that these factors did not significantly influence the comprehensiveness level of SDGs.

Table 3.3 – T-test results showing differences in SDGs reporting across the sub-samples

| | Obs | Mean | P-value (two-tailed) | t-statistics | df |
|---|---|---|---|---|---|
| **Panel A: Ownership structure** | | | | | |
| Private-owned: 1 | 10 | 0.589 | 0.006*** | 3.022 | 26 |
| Public-owned: 0 | 18 | 0.331 | | | |
| **Panel B: Operating market** | | | | | |
| Developed: 1 | 19 | 0.510 | 0.004*** | 3.116 | 26 |
| Emerging: 0 | 9 | 0.240 | | | |
| **Panel C: Firm size (revenues)** | | | | | |
| Large:1 | 14 | 0.494 | 0.133 | 1.550 | 26 |
| Small:0 | 14 | 0.353 | | | |
| **Panel D: Listing status** | | | | | |
| Listed | 19 | 0.514 | 0.189 | 3.286 | 26 |
| Non-listed | 9 | 0.233 | | | |

Notes: *** indicates statistical significance at 1% level.

To measure the magnitude of the differences observed, an effect size analysis using Cohen's d test was conducted (Cohen, 2013; Gignac and Szodorai, 2016). The results showed that both operating country and ownership exhibited a Cohen's d value greater than one. This suggests

that the difference between the means of the groups observed[9] exceeds one standard deviation, indicating a "very large" effect size (Sawilowsky, 2009). In other words, the observed differences in terms of operating countries and ownership are not due to random chance but rather represent a strong difference in the comprehensiveness of SDGs reporting.

### 3.5.2. Controlling SDGs

Table 3.4 presents the MCS used by the sampled companies in their pursuit of the SDGs 2030. Overall, findings reveal that electric utilities predominantly rely on administrative controls to address SDGs (28 companies). To a lesser degree are exerted planning controls (20 companies), cybernetic and cultural controls (18 companies), and reward and compensation controls (16 companies). The subsequent sections provide more detailed insights of how electric utilities use individual sub-elements of the MCS package.

Table 3.4 – Overview of the MCS used by the sampled companies to contribute to the SDGs

| | **N** | **%** |
|---|---|---|
| **Administrative controls** | **28** | **100** |
| *Policies and procedures* | 28 | 100 |
| *Strategic and Operative structures* | 12 | 43 |
| *Only Strategic structures* | 2 | 7 |
| *Only Operative structures* | 4 | 14 |
| **Cybernetic controls** | **18** | **64** |
| *Financial measurements* | 10 | 36 |
| *Non-financial measurements* | 18 | 64 |
| **Planning controls** | **20** | **71** |
| *Strategic planning* | 20 | 71 |
| *Operational planning* | 3 | 11 |
| **Cultural controls** | **18** | **64** |
| *Values* | 18 | 64 |
| *Clans* | 2 | 7 |
| *Symbols* | 2 | 7 |
| **Reward and compensation** | **16** | **57** |
| **Total electric utilities** | **28** | **100** |

#### *Administrative Controls for SDGs*

The presence of administrative controls was observed in relation to i) policies and procedures, ii) organizational structure and design. Regarding policies and procedures, electric utilities have established comprehensive sets of policy documents and guiding principles to address SDGs within their organizations. The prevailing approach involves adopting broad ethical and

[9] Country: Group 1 included companies operating in developed countries. Group 2 included companies operating in emerging countries. Ownership: Group 1 included private-owned firms. Group 2 included public-owned firms.

environmental policies that govern the conduct of the entire company. These policies have, in most cases, undergone revisions to include guidelines for addressing the SDGs. Additionally, energy utilities have developed specific manuals to tackle environmental and social challenges, such as climate change, biodiversity conservation, and the cultivation of an inclusive corporate culture. To give an example:

> "To contribute to SDGs objectives, we have a Code of Ethics that establishes group-wide ethical principles and commitment, complemented by other policies such as the Integrity Policy, the Policy of Respect for Human and Labour Rights, the Climate and Environmental Policy, and the Biodiversity Policy, which are implemented through specific procedures." [Company 6, IR 2022, p. 99]

The analysis reveals a close interconnection between administrative and cultural controls. Notably, electric companies frequently adopt formal procedures to demonstrate the alignment of their SDGs commitment with their core values. These procedures serve as tangible evidence that sustainability values are deeply embedded and actively monitored by governing bodies. This finds support in the statements of Company 21 and 24, which state as follows:

> "We have a General Sustainable Development Policy that further develops the principles reflected in the Governance and Sustainability System and that contains the guidelines governing the conduct of the directors, officers, and employees within the framework of the Purpose and Values of the Group." [Company 21, SR 2022, p.31]

> "Our Code of Conduct and ethics include the ethical values of respect, integrity and sustainability, offering a global framework of conduct for the organization's professionals." [Company 24, SR 2022, p.200]

Larger energy utilities recognize the importance of extending sustainability measures beyond internal controls. As a result, they have broadened their actions to enforce sustainable practices among their primary stakeholders, particularly their suppliers. By incorporating sustainability criteria into their protocols for supplier selection and engagement, energy utilities actively advance SDGs not only within their internal operations but throughout the entire supply chain. This approach underlines that sustainable development is an integral component of these firms' philosophy, as shown in the following two examples:

> "We introduced our Supplier Code of Conduct in 2021 as a shared set of values and an important criterion for the selection and development of our suppliers. Alongside economic criteria, it places great importance

on business ethics, integrity, compliance with working standards and environmental protection when selecting, evaluating and monitoring new and existing business partners' processes." [Company 13, IR 2022, p.58]

"Our business partners play a vital role in our ability to deliver on our vision and provide value to our stakeholders. We have developed a Code of Conduct for business partners (…) We respect the planet, individuals, and the community at large, and we require our business partners to act in a socially, ethically, and environmentally responsible manner." [Company 22, SR 2022, p.32]

Regarding organizational structure, 43% of electric utilities employ a two-tier sustainability governance model. This involves external oversight via a Supervisory Board and internal oversight through a Sustainability Development Committee, both operating at a strategic level. The Supervisory Board directs the strategy, while the Sustainability Development Committee, formed by top management representatives, collaborates with the board to formulate a strategy in harmony with SDGs commitment. At the operational level, dedicated Sustainability Offices drive the translation of strategic goals into everyday practices, acting as a bridge between high-level objectives and on-the-ground execution. The adoption of this two-tier sustainability governance allows electric utilities to monitor SDGs progress. Regular meetings are instituted to ensure the ongoing evaluation of performance against sustainability objectives. These efforts are exemplified by the following quotes:

"The supervisory and management bodies steer sustainability topics (including climate change, biodiversity) and appoint members of the Sustainable Development Committee. The Sustainable Development Committee discusses sustainability policies and programmes and proposes solutions for the implementation within the Group. The Sustainability Function coordinates the sustainability activities and ensures the implementation of sustainability programmes. In 2022, there were a total of 4 meetings on climate-related questions and 2 meetings on health and safety." [Company 1, AR 2022, p. 286]

"Sustainability and integrity are integrated into processes and decision-making across our organization. Our Board of Directors is the highest authority to oversee our sustainability work, while the Group Executive Team is accountable for our sustainable programmes, with special support from the Sustainability Development Committee." [Company 22, SR 2022, p. 43]

The analysis also identified cases of less robust governance structures in the form of one-level sustainability governance systems. Specifically, two electric utilities reported having solely strategic structures in place, without reference to operative structures. In contrast, four electric

utilities relied on operative structures exclusively. This scenario is commonly observed among smaller electric utilities that lack a dedicated committee for overseeing SDGs contributions. Instead, these companies rely on operative working groups to diffuse awareness of sustainable development within the organization. For instance, Company 10 reported the following:

> "Management Board is responsible for the management of sustainable development. For the purposes of sustainable reporting and management, it has set up a special Working Group on Sustainable Development." [Company 10, AR 2021, p. 32]

***Planning Controls for SDGs***

Out of the 28 energy companies analyzed, 20 of them (71%) exercised planning controls to actively pursue SDGs. These companies infused sustainable development considerations into their strategic decision-making processes. In particular, they formulated strategic priorities that were informed by the perspectives and interests of their stakeholders. Moreover, to drive Agenda 2030 effectively, electric utilities complemented their strategic priorities with a set of sustainability targets, serving as KPIs to track their advancement towards SDGs ambitions. An example comes from Company 3:

> "To ensure that operational and financial targets are met in an environmentally and socially responsible way, and to foster innovation, the strategy also sets a sustainability target with three sub-targets. The Group is committed to developing innovative products, services, and processes that contribute to the UN Sustainable Development Goals, with sub-targets and expected results for the climate, corporate social responsibility, and innovation." [Company 3, SR 2022, p.11]

The findings unveiled that all 20 companies included long-term objectives in their planning process, suggesting a strategic planning orientation rather than an operational one. Indeed, short-term objectives were established in only three cases. Company 24 articulated the following perspective:

> "In 2019 we established eleven sustainability objectives with a 2030 vision. During 2022, we defined mid-term objectives to achieve our 2030 ambition. These goals contribute directly to the achievement of the United Nations Sustainable Development Goals." [Company 24, SR 2022, p. 72]

Moreover, a notable observation was the frequent coexistence of planning controls and cybernetic controls. A prevalent practice involved the formulation of a number of strategic

objectives paired with financial or non-financial indicators and corresponding targets. These targets encompassed specific environmental and social goals, ranked by the companies based on priority. Notably, the emphasis leaned primarily towards objectives concerning growth in renewables, climate actions, workplace safety, and inclusivity promotion. A specific example is provided by Company 27:

> "One of our strategic targets for 2025 is securing a fossil-free energy supply. By 2025, our intention is to reduce $CO_2$ emission intensity to less than 86 g CO2e/kWh." [Company 27, SR 2022, p. 20]

In addition, energy utilities synergistically combined planning controls with administrative controls to foster a culture centred around the principles of sustainable development. The sustainability-oriented objectives stemmed from sustainability policies and strategic plans aligned with the priorities of the 2030 Agenda and its 17 SDGs. As illustrated below, companies formalized their strategic objectives related to environmental protection through the application of specific policies:

> "The protection of biodiversity is one of the strategic objectives of our environmental policy and is regulated by a specific policy "Biodiversity Policy" adopted in 2015 and renewed in 2023." [Company 15, SR 2022, p.319]

Furthermore, a clear interplay emerged between planning controls and cultural controls. In fact, while underlying their strategic direction and priorities, the fundamental values and beliefs that guide companies toward SDGs were either implicitly or explicitly evident. The quote from Company 3 emphasized the importance of shared values and beliefs:

> "To achieve the ambitious goals set in our Strategy for 2022-2026, the internal culture of the organization… is essential." [Company 3, SR 2022, p. 89]

### *Cybernetic Controls for SDGs*

Among the 28 companies analyzed, evidence of applying cybernetic controls for SDGs was found in 18 of them. These companies employed measures and indicators to assess their social and environmental management practices. In terms of financial measures, the study revealed that only 10 firms (36%) made a connection between their financial metrics and their dedication

to sustainability. Specifically, they used traditional financial indicators such as EBITDA, ROI, and ROA to measure their performance in sustainability. However, it should be noted that sometimes the connection between cybernetic controls and SDGs resulted relatively weak. Company 21 stated the following statement in its Sustainability Report:

> "For us, ESG issues are integrated into the strategy and operations and are therefore directly linked to our financial performance. This approach, which we call ESG+F, is reflected in our activities and business model. This commitment is reflected in the inclusion within the Group's ESG objectives of two targets relating to the financing strategy that will enable the company to continue to lead the sustainable financing market." [Company 21, SR 2022, p.226]

A larger proportion of the energy utilities (18 firms representing 64% of the sample) employed non-financial indicators to quantify their sustainability efforts. These indicators often aligned with metrics from the GRI framework and were frequently used in combination with planning controls to support strategic objectives. Specifically, these energy firms have set indicators to measure their progress in critical domains such as decarbonization (measured by $CO_2$ g/kWh), waste (measured by kt), and renewable energy generation (measured in GW). Regarding social goals, companies are monitoring workplace safety (measured by Total Recordable Injury Rate, TRIR and Lost Time Incident Rate, LTIR), employee training (measured by annual hours per employee) and gender inclusivity (female representation in %). To give some examples:

> "Our key focus is on health and safety at work: to have zero fatal accidents in 2025. Also, we target to have TRIR of own employees below 1.90 level in 2025." [Company 1, AR 2022, p. 30]

> "Our target is to reduce emissions to less than 10 g $CO_2$e/kWh by 2025, which will be 98% lower than in 2006." [Company 22, AR 2022, p.20]

As previously mentioned, it was observed that energy utilities have integrated cybernetic controls into their planning mechanisms, thus linking strategic objectives, targets, and metrics to control for sustainable development initiatives. The sampled companies categorized financial and non-financial metrics in alignment with their strategic goals and corresponding targets to measure progress towards their SDGs efforts. The following quote is illustrative of this integrated performance management approach:

> "We monitor the implementation of our strategy by means of a holistic performance management system. Our goal system comprises the five dimensions of financial, strategic, customers and society, environment, and employees. Specific targets have been defined in each goal dimension and their achievement is continuously measured using KPIs. Quantitative target values are currently set for the KPIs for the 2025 strategy horizon. The KPIs enable us to measure the degree to which sustainable goals are achieved." [Company 13, IR 2022, p. 39]

### *Cultural Controls for SDGs*

Out of the 28 sampled companies, 18 (64%) made a link between cultural controls and SDGs. These companies predominately adopted value-based controls, integrating social and environmental values into their strategy, mission, and vision. It was observed that electric utilities tended to embrace both environmental and social value-based controls, with four firms focusing solely on the environmental dimension. Regarding the use of value-based controls, different practices were observed. Primarily, the energy utilities commonly intertwined value-based controls with administrative controls. This involved formally embedding sustainability values into internal policies, making their devotion to SDGs official, and ensuring broad adherence to these values across the organization. The following examples stated:

> "The core values of integrity, honesty, and respect for people and the environment are at the heart of our business operations. They are defined in our Code of Conduct as well as in the Sustainability Policy." [Company 23, SR 2021, p.29]

> "The values underpinning our approach to sustainability are set out in the Code of Ethics and are given substance in its mission, which in turn is aligned with the United Nations SDGs." [Company 26, IR 2022, p.70]

In some cases, energy companies opted to express their sustainable development-related values in a less formal manner, often through their mission or vision statement, offering insights of their beliefs and principles. For example, Company 12 articulates its vision as follows:

> "Our vision inspires us. It outlines our long-term objective: *A successful energy transition for a sustainable world*." [Company 12, IR 2022, p.32]

In addition to value-based controls, the study also found that electric utilities utilized clan controls and symbol controls as a means of strengthening their commitment toward

sustainability. Concerning clan controls, two electric utilities employed these mechanisms to nurture sustainability through employee engagement. For instance, in Company 7, volunteer employees orchestrated collaborative workshops on climate issues, raising awareness within the organization. Likewise, in Company 28, women employees actively contributed to shaping SDGs-related strategy, fostering a diverse and inclusive approach.

As for symbol controls, two educational initiatives were identified, serving as visual reminders of the companies' dedication to sustainability. These symbol controls were designed to enhance employee awareness and stimulate their active involvement in achieving sustainability goals:

> "We installed a clock in the main office to showcase the time left to reach GHG reduction targets." [Company 1, AR 2022, p. 169]

> "The walls of the main office of the Group were adorned using a carbon monotype technique. They depict fit trees and endangered species due to the climate change." [Company 11, AR 2022, p. 62]

***Reward and Compensation Controls for SDGs***

Among the components of the MCS, reward and compensation controls were least commonly exercised. Only 16 companies out of the analyzed firms implemented mechanisms to incentivize employees towards sustainability practices through rewards and compensation. These controls were often employed in conjunction with planning, cybernetic, and administrative controls, further reinforcing the integration of sustainability into the broader management control framework.

Notably, companies formalized their commitment to SDGs in their remuneration policies, including long-term sustainability objectives. Therefore, the compensation of top-level executives and employees was tied to the achievement of financial and non-financial performance benchmarks. These benchmarks typically constituted a portion of variable remuneration, ranging from 10 to 30%, encompassing environmental, social, or both dimensions. An illustrative example is provided below:

> "In line with our desire to promote integrated performance based on both finance and CSR, the annual variable compensation of the Group's senior executives is based on financial and CSR criteria. The CSR criteria, which represents up to 15% of the variable compensation consists of a climate criterion (carbon intensity) and two social criteria (LTIR and Commitment Index)." [Company 7, IR 2022, p.237]

The predominant approach among energy utilities was to incentivize employees who successfully attained sustainability targets through performance-based rewards. In select cases, companies also provided benefits to encourage employee engagement in sustainability initiatives, such as car-sharing programs. Moreover, certain companies acknowledged and honoured colleagues who contributed to health, safety, and environmental matters through special awards. Examples of such instances are:

> "The mobility programme's framework suggests using car sharing and the Group will allocate a certain monthly budget to cover such services." [Company 1, AR 2022, p. 169]
> "With our Healthy, Safety and Environment Award, we pay tribute to colleagues every year who have promoted these issues in a special or visible way." [Company 16, AR 2022, p. 47]

### 3.6. Discussion

Regarding RQ1, the results reveal that electric utilities' reporting on SDGs differs both between firms and across individual SDGs. On average, SDG 9 received the highest attention at 58%, followed by SDG 4, SDG 14, SDG 15, and SDG 13. However, the overall level of contribution to SDGs is relatively low, with few SDGs not surpassing SDG Reporting Index above 50%. Particularly, SDG 2, SDG1, and SDG 7 obtained the lowest scores. The findings also unveil that, on average, firms operating in developed markets provide more comprehensive information on SDGs compared to those operating in emerging markets. Similarly, private-owned firms show a higher level of SDGs disclosure compared to their public-owned counterparts. No statistically significant differences were found concerning firm size and listing status in relation to SDGs reporting.

The findings indicating that electric utilities are actively addressing environmental issues are not surprising. As major polluters, they face critical pressure to contribute to the 2030 Agenda, striving to maintain legitimacy and positively influence societal perceptions (Suchman, 1995). Particularly noteworthy is that electric firms are not limiting their reporting to SDGs strictly related to their core business activities (e.g., climate action). Instead, they are directing efforts towards the sustainable use of water and biodiversity conservation, both of which pose risks related to electric utilities' operations. For instance, concerning biodiversity, the noise produced during the operations and maintenance of power plants can have disruptive effects on species. As for water, its sustainable use is particularly relevant for hydroelectric power generation. This suggests that electric utilities are adopting a holistic approach,

contributing to sustainable development across all aspects of their operations. Notably, the emphasis on the social dimension makes SDG 4 the second most addressed. Through training programs, meetings, and workshops, they are attempting to increase awareness among employees about critical social and sustainability issues.

The lower scores on SDG 2 and SDG 1 can be attributed to their macroeconomic dimension, where companies may struggle to identify clear win-win opportunities (Van der Waal and Thijssens, 2020; Manes-Rossi and Nicolo', 2022). Of particular concern is the low score on SDG 7, signalling the need for electric firms to intensify efforts in providing modern and renewable energy services. On a positive note, the progress on SDG 9, which achieved the highest score, is encouraging. This suggests that companies are moving towards more affordable and clean energy by investing in sustainable and innovative infrastructures. Moreover, the fact that most SDGs scored an average between 40-50% indicates that electric utilities are progressing toward more comprehensive reporting on their contribution to SDGs.

The finding of a higher level of SDGs disclosure among firms operating in developed markets is understandable due to the stronger culture of sustainable development in these nations. Conversely, the fact that private-owned firms outperform is perplexing. One would naturally expect that public-owned firms, driven by their public mission to demonstrate sustainable value, should excel in SDGs reporting (Traxler and Greiling, 2019), especially considering the greater pressure they face on reputation and legitimacy compared to their private-owned counterparts. One possible reason behind this result could be the regulatory burden faced by public-owned firms, which often prioritize compliance requirements over SDGs reporting. Another possible reason is that private-owned electric utilities may be motivated by the opportunity to increase profits from environmentally conscious customers and investors, leveraging their sustainability efforts as a competitive advantage (Bae, 2014).

The lack of difference observed in terms of firm size and listing status could be related to the nature of public limited companies included in the sample. From a legitimacy perspective, these companies face critical reputational and legitimacy pressure from European directives. The reports analyzed in this study suggest that firms are aligning themselves with sustainability reporting practices even before the directive came into effect. However, from a strategic stakeholder theory, it is plausible that some firms may use reporting for greenwashing behaviours or impression management to influence investors' decisions or social perceptions.

Regarding RQ2, the findings reveal that electric utilities primarily rely on administrative controls, which contrasts with the study of Lueg and Radlach (2016) suggesting a preference

for informal control to address sustainable development. However, electric utilities tend to employ a combination of management control mechanisms in their pursuit of SDGs, integrating both formal and informal controls. Specifically, the results show a combination of administrative and cultural controls on one side, and a combination of planning, cybernetic, and reward and compensation controls on the other side. Additionally, it was observed that electric utilities extended these control mechanisms to other stakeholder groups, particularly their suppliers. Nevertheless, the findings of the present study indicate that, apart from a few cases, the use of MCS is not fully cohesive, but rather partly integrated.

From a legitimacy perspective, electric utilities use combinations of MCS as a means to enhance their standing with final customers and regulators in the face of increasing societal pressure for SDGs practices. Recent European policies now demand companies to disclose their SDGs-related strategies and actions (European Lab, 2021), urging them to embrace social and environmental aspects and cultivate a culture of sustainable development. In line with this, electric utilities employ MCS to gain approval from regulatory bodies by increasing their compliance efforts, potentially reducing the risk of facing stricter regulations in the future (Caroll and Shabana, 2010). Therefore, according to this perspective, electric utilities employ management controls to "make an impression" on stakeholders rather than driven by a genuine commitment to SDGs

From a strategic stakeholder perspective, electric utilities choose the SDGs that hold strategic relevance for their stakeholders and strive to outperform in these areas using management controls. In this view, electric utilities strategically combine management controls for SDGs as a means to gain a competitive advantage. Notably, companies that use MCS for SDGs are more likely to enhance their social and environmental performance compared to those companies that do not use them. Consequently, the implementation of MCS for SDGs could be a tool for electric utilities to monitor their SDG-related strategic objectives, eventually allowing them to get positive outcomes from their SDG-related activities. Moreover, the finding that electric utilities are expanding their control instruments to their suppliers aligns with the strategic stakeholder theory, indicating a broader integration of SDGs into MCS (Hansen and Schaltegger, 2016).

Table 3.5 summarizes the management control mechanisms and instruments used by the investigated electric utilities to control and manage sustainable development. Overall, the findings from this study reveal that administrative controls are predominantly relied upon, but cultural controls, planning, cybernetic controls, and reward and compensation systems are also

used. However, while our analysis suggests that electric utilities are moving toward a more holistic approach to management controls, it also indicates room for improvement.

Table 3.5 – Control instruments used by electric utilities to control and manage SDGs

| **Administrative Controls (Σ 28)** | **Planning Controls (Σ 20)** | **Cybernetic Controls (Σ 18)** |
|---|---|---|
| *Policies and procedures(Σ28)* | Strategic planning (Σ 20) | *Financial measurements(Σ10)* |
| Sustainability Policy | Operational planning (Σ 3) | Sustainable EBITDA share |
| Human Rights Policy | **Cultural Controls (Σ 18)** | EBITDA for low-carbon products |
| Code of Conduct | *Values (Σ18)* | % Green Financing |
| Supplier Code of Conduct | Environmental values | ROI |
| Stakeholder Engagement Policy | Social values | *Non-financial measurements (Σ18)* |
| Climate Action Policy | Vision and mission | GHG emission intensity |
| Just Transition Policy | Code of Conduct | Installed green capacity |
| Energy Efficiency Policy | Beliefs | % presence females |
| Biodiversity Policy | *Clans (Σ2)* | Total Recordable Injury Rate |
| Diversity and Inclusion Policy | Workshops by volunteers | Customer Satisfaction Index |
| *Two-tier Sustainability Governance (Σ12)* | *Symbols (Σ2)* | |
| Sustainability Development Committee | Climate clock | |
| Sustainability Development Offices | Images of endangered plants and animal species on walls | |
| *One-tier Sustainability Governance (Σ6)* | **Reward and Compensation Controls (Σ 16)** | |
| Working groups | Basic remuneration | Awards for innovative ideas |
| | Surplus rewards | |

*Source: author's own elaboration*

## 3.7. Conclusions

This study contributes to the recent SDGs literature providing evidence from the European Union electric industry. Moreover, it adds value to the ongoing debate surrounding "corporate sustainability talk and practice" (Cho *et al*., 2015), by offering insights into how management control systems are adopted to contribute to the achievement of SDGs (Traxler *et al*., 2020).

The findings from this study have policy and practical implications. Given the hybrid nature of electric utilities, policymakers should be aware of the level of SDGs reporting and control. Policymakers should know that public-owned electric utilities and those operating in emerging markets need further guidance to direct their contributions to SDGs and develop targeted initiatives in this sense. Companies should learn from their peers when implementing MCS

package for SDGs. For society at large, this study presents a window into the public utility sector's current state of SDGs reporting and the ways in which MCS are used.

However, the study should be considered in light of certain limitations. One main limitation is the focus on data from one single year, which may not capture potential changes and trends over time. Another limitation is that this study does not explore differences in the use of MCS within specific country contexts. These aspects fall outside the scope of this study but can be promising avenues for future research. First and foremost, further studies on the use of MCS package for sustainable development are needed. Moreover, the potential for prospective longitudinal investigations holds promise for future studies. Finally, this paper focuses on electric utilities, but comparisons with other non-utility firms might provide additional insights.

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## Appendices

Appendix 3.1 - List and description of data collected from the content analysis.

| Variable label | Description |
|---|---|
| Planning controls | e.g., goals, target, objective, ambition |
| Cybernetic controls | e.g., financial and non-financial measures, KPIs, metrics, budget, Balanced Scorecard |
| Reward and compensation controls | e.g., reward, award, compensation, bonus, gift, benefit, incentive, premium |
| Administrative controls | e.g., policies and procedures, rules, governance, organisational design and structure |
| Cultural controls | e.g., vision, mission, beliefs, value, purpose, credos, symbol |

Appendix 3.2 – List of companies included in the study.

| NO. | COMPANY | COUNTRY |
|---|---|---|
| 1. | AB IGNITIS GRUPE | LITHUANIA |
| 2. | AMPRION | GERMANY |
| 3. | AS LATVENERGO | LATVIA |
| 4. | BULGARIAN ENERGY HOLDING | BULGARIA |
| 5. | CEZ | CZECH REPUBLIC |
| 6. | EDP - ENERGIAS DE PORTUGAL | PORTUGAL |
| 7. | ELECTRICITÉ DE FRANCE | FRANCE |
| 8. | ELEKTRO CELJE | SLOVENIA |
| 9. | ELEKTRO MARIBOR | SLOVENIA |
| 10. | ELEKTRO PRIMORSKA | SLOVENIA |
| 11. | ELERING | ESTONIA |
| 12. | ELIA GROUP | BELGIUM |
| 13. | ENBW | GERMANY |
| 14. | ENEA | POLAND |
| 15. | ENEL | ITALY |
| 16. | ENEXIS | NETHERLANDS |
| 17. | FINGRID | FINLAND |
| 18. | FLUVIUS SYSTEM OPERATOR | BELGIUM |
| 19. | FORTUM | FINLAND |
| 20. | HOLALUZ-CLIDOM | SPAIN |
| 21. | IBERDROLA | SPAIN |
| 22. | ØRSTED | DENMARK |
| 23. | PUBLIC POWER CORPORATION | GREECE |
| 24. | RED ELÉCTRICA CORPORACIÓN | SPAIN |
| 25. | TENNET | NETHERLANDS |
| 26. | TERNA | ITALY |
| 27. | VATTENFALL | SWEDEN |
| 28. | VERBUND | AUSTRIA |

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