Do electric and gas utilities use regulatory information for decision-making and control? An exploratory study from Italy

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Abstract

The aim of this paper is two-fold. First, it examines whether electric and gas utilities use regulatory information for internal decision-making and control. Second, 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 the management control systems (MCS) of electric and gas utilities.
Based on data from 33 questionnaires and eight complementary interviews with Italian electric and gas utilities, findings reveal different behaviors according to the size and operating activity of the firms. Large utilities and energy distributors use regulatory information for performance monitoring, benchmarking analysis, and investment prioritization strategies. On the contrary, small utilities and energy traders produce the information solely for regulatory compliance and do not use it in their day-to-day activities. Additionally, this study reveals that coercive pressure stemming from the regulatory environment affected the MCS of energy utilities either radically or incrementally. The findings underline the role of ARERA as a driver for controlling and improving performance.

Keywords: management accounting information, decision-making, control, MCS, institutional theory, energy industry

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1. Introduction

Management accounting systems (MAS) provide valuable accounting information that helps managers in the process of internal 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 generating knowledge within 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).

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 MCS of electric and gas utilities (*RQ2*).

The findings reveal different behaviors 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 to monitor their internal performance, conduct

benchmarking analysis and make investment decisions. By contrast, smaller utilities and energy traders adopt a passive compliance approach, indicating a divergence between formal structures and their actual behaviors. This difference in behaviour may be due to the lower managerial culture that characterize 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 external regulatory pressure has a radical or incremental influence on the MCS of electric and gas utilities. The findings highlight the regulator's role 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.

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). The existence of incumbent

companies resulted in inefficiencies, leading to a wave of privatization initiatives in the mid-1990s (Gilardoni, 2020).

The electricity and gas industry privatization began in 1999. Following the European directives (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 (Luciani and Mazzanti, 2006). 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. The same occurred in the gas sector, prompting the 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 the quality of the service, and ensure that the public interest was served. Thus, private operators are allowed to generate and sell energy in the free market, while local distributors and transmission companies are rate-regulated.

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 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 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. 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[1], as well as changes in tangible and intangible fixed assets. It is worth noting that ARERA may introduce changes in Accounting Unbundling reporting from year to year, requiring firms to disclose extra information. All this information and more serves to limit cross-subsidization between firms' divisions and check if there are any extra profits (TIUC, delibera 137/2016/R/com)

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 (delibera 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 ARG/com 151/11).

The need for information rises beyond financial accounting data. Electric and gas utilities must provide ample non-financial information concerning the quality of the service provided (punctuality of service, electrical outages, gas losses) as well as customer-oriented data (unpaid ratio, churn ratio, new customer acquisition rate, customer satisfaction). The above regulatory requirements are meant to foster transparency in public utility firms (documento per la consultazione pubblicato da ARERA il 16 marzo 2006, atto nr. 08/06).

[1] 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.

3. Literature and theoretical framework

3.1. Managerial uses of accounting information

MAS provide 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 use of management accounting information helps managers to make informed decisions and manage uncertainty and complexity of 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. When interpreted and used proactively and intentionally by decision-makers, information 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. Traditionally, MAS relied on historical internal data to monitor organisational performance. However, many organizations are adopting a more future-oriented approach that incorporate both internal and external information (Marchi, 2011).

MAS provide benchmarking and monitoring information to support managers in identifying industry changes and competitors' strategies and implementing 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 past trends and perform a thorough analysis of the causes and necessary interventions (Ezzamel and Robson, 1995; Marchi, 2003; Marchi *et al*., 2003). The use of benchmarking and monitoring information 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).

In addition to benchmarking and monitoring analysis, the information provided by MAS is used for performance evaluation, measurement, and target setting (Merchant and Van der Stede, 2017). Performance evaluation is particularly important for companies with a divisional organisational 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 relate 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).

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), and facilitate 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 privatised. Other studies have also shown that privatization has driven changes in 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 showing how public utilities achieve greater efficiency through the application of management accounting (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 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 they 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?

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 European and national level.

NIS view 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 centred 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 the 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?

4. Methodology

Data for this paper is gathered through an online survey and follow-up interviews. The survey method is particularly suitable for exploratory studies (Zikmund *et al*., 2013). Interviews were conducted to complement the survey and ensure 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 the 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 control is adopted rather than focusing on just one aspect (Malmi and Brown, 2008).

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)[2]. 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.

[2] 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.

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.[3] The final response rate compares well with those reported in previous studies (Robinson *et al*., 2010; Nowotny e*t al*., 2022).

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 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 - 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

[3] 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.

5. Results

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 2).

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 2 - 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

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%).

5.2. Influence of regulation on the MCS of electric and gas utilities

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 ap-

propriately 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 3). 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 3 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 3 - 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

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/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."

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 a 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).

From the overall findings, it emerges that ARERA requirements played a crucial role in motivating organizations to use regulatory information for internal management purposes. However, the formal requirements alone are not sufficient to ensure the adoption of institutional practices in daily routines (Collier, 2001). It is therefore fundamental to cultivate a managerial culture to facilitate the embracement of institutional practices into day-to-day activities.

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 the information 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, 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 capabili-

ties 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.

Future research could enrich the existing literature by examining the use of regulatory information in other regulated contexts, such as water utilities. Additionally, it could be interesting to explore whether and to what extent utility firms influence the regulatory process of ARERA by participating in consultations. Moreover, in addition to firm size and type of operating activity, future studies could focus on other specific firm characteristics, such as ownership. This would allow to examine the behaviour of private utilities, in comparison to their state-owned counterparts, in using regulated information to make decisions.

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Appendixes

Appendix A. Survey questionnaire[4]

Part 1 - General Information

Company name (optional):
Answer: ……

Operating activity:
Answer: Production/distribution/transport/sale; electricity/gas

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: ……

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

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?
   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 B. Interview topic list.

Use of ARERA regulatory requirements: 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.