Investigating the quality and drivers of sustainability reporting in the electricity industry: A global context

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ABSTRACT

This research investigates the quality and determinants of sustainability reporting in the electricity industry, in particular the electricity generation sector. Electricity is a major driver of economic development and a major influence on climate change, hence an interesting setting for this study. Understanding the trends and determinants relating to the quality of sustainability reporting (QSR) may contribute to improved QSR and consequential improvements in transparency, accountability, and value creation. Part 1 of this study is qualitative and investigates the QSR of 100 electricity generators included in the S&P Platts Top 250 Global Energy Companies Rankings for 2021. The assessment of QSR is based on the qualitative characteristics of reporting, namely relevance (including materiality) and reliability. Content analysis of sustainability disclosures during 2018-2020 suggests the QSR of sample companies is relatively high and improving over time. Companies in countries with mandatory sustainability reporting regimes generally tend to achieve higher QSR. Part 2 of this study is quantitative and concerns testing selected determinants of QSR through regression analyses. Findings suggest that sustainability performance, use of the Global Reporting Initiative framework, and institutional shareholding have significant positive impacts on all QSR measures, while foreign shareholding has the same effect on relevance and overall QSR (contemporaneous as well as one-year lagged effects). Rule of law and carbon pricing policy have significant negative effects on relevance (contemporaneous as well as one-year lagged effects) while gender diversity shows the same effect on reliability (one-year lagged effect only). Rule of law also has a significant negative influence on overall QSR but only when testing for one-year lagged effects. Robustness and additional tests support these results. This study extends the existing literature on sustainability

reporting by providing a holistic longitudinal, global, as well as an environmental, social, and economic perspective on QSR in the electricity industry. It also covers a wider range of QSR determinants than most others and improves on the precision of QSR measurement. This study may be useful to regulators and standard setters in their efforts to harmonise sustainability reporting and provides useful insights to decision makers and practitioners on the need to link sustainability disclosures to sustainability performance, as well as stakeholder activities, assurance considerations, and materiality.

Keywords: quality of sustainability reporting (QSR), relevance including materiality, reliability, overall QSR, determinants, sustainability reporting

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LIST OF ABBREVIATIONS

CDP	Carbon Disclosure Project
CPP	Carbon pricing policy
CSR	Corporate Social Responsibility
EMEA	Europe, Middle East, and Africa
ESE	Environmental, Social, and Economic
ESG	Environmental, Social, and Governance
EU	European Union
GHG	Greenhouse Gas
GRI	Global Reporting Initiative
IFRS	International Financial Reporting Standards
IIRC	International Integrated Reporting Council
IRF	Integrated Reporting Framework
ISSB	International Sustainability Standards Board
QSR	Quality of Sustainability Reporting
QSRRM	Dependent variable/ QSR for relevance including materiality dimension
QSRR	Dependent variable/ QSR for reliability dimension
QSRTotal	Dependent variable for/ overall QSR
ROA	Return on assets
RQ	Research question
SASB	Sustainability Accounting Standards Board
SDG	Sustainable development goal
TCFD	Task Force on Climate-related Financial Disclosures

CHAPTER 1

INTRODUCTION

1.1 Study overview

This thesis investigates the quality and drivers of sustainability reporting in the electricity industry, in particular the electricity generation sector, covering the environmental, social, and economic (ESE) pillars of sustainability. These three pillars are referred to in Hansmann et al. (2012), Ismail et al. (2018), Purvis et al. (2019), and Ranjbari et al. (2021). Prior studies involving varied foci and settings have significantly contributed to the development of literature on sustainability reporting. However, while these studies have their own merits in achieving the intended purposes, issues on the applicability and comparability of results remain. Thus, this thesis attempts to look at a higher and wider perspective in evaluating the quality of sustainability reporting (QSR) in terms of focus areas (sustainability pillars, period covered, country setting), and considering a wider range of QSR determinants, but specific to one of the focal industries in every nation's economy.

Sustainability reporting,[1] albeit voluntary in most jurisdictions, has been largely practiced in the corporate sphere (Badia et al., 2020; Thijssens et al., 2016). Nowadays, many companies believe that sustainability reporting is an important part of their corporate performance (Hubbard, 2011), hence annual reporting, especially for listed companies. Such companies either issue a separate Sustainability Report or include their non-financial information in their Annual Report or

[1] Synonymous with non-financial reporting (NFR), corporate social responsibility (CSR) reporting, integrated reporting, environmental, social and governance (ESG) reporting, Triple Bottom Line reporting, and Sustainable Development Goal (SDG) reporting. Sustainability reporting also includes greenhouse gas (GHG) and carbon reporting (Turzo et al., 2022), and isolated environmental or social reporting (Hahn & Kühnen, 2013).

Integrated Report. The length, format, and scope of such reports vary for reasons that include the differing motives and target audiences of the reports (Carmo & Ribeiro, 2022; Roca & Searcy, 2012). We provide further background on sustainability reporting in Chapter 2.1.4.

As mentioned in Adams (2002), the main motivation for corporate reporting is to improve corporate image and credibility with stakeholders, and the primary reason for commencing the report is public pressure. Companies take accountability to their stakeholders and satisfy their diverse and, at times, conflicting interests through disclosure of their ESE activities. Sustainability reporting also helps companies pursue transparency (Hahn & Kühnen, 2013) and engagement such as interaction with the external environment and long-term value creation for their stakeholders (Badia et al., 2020). Moreover, it advances corporate reputation, greater engagement with investors, and trust relationship with stakeholders (Steyn, 2014). Considering the importance of sustainability reporting in making a difference to the business case of the company, a sustainability report should provide relevant, reliable, useful, and comparable information (Hubbard, 2011) about the firm's sustainability performance and its impacts, both internal and external. Accordingly, this thesis adopts the relevance and reliability dimensions to measure the electricity generators' QSR.

Researchers face issues in identifying and understanding the factors that influence manager's decision making on reporting (Ismail et al., 2018). According to Adams (2002), understanding the factors that affect disclosure is imperative to improve the quality and extensiveness of reporting by companies, hence improving accountability. This thesis adds to the sparse electricity industry related literature that focuses on the drivers of QSR.

This study employs mixed methods research (qualitative and quantitative) to assess the QSR in the electricity industry and identify the determinants of QSR. Determining the QSR necessitates analysis of the descriptive statistics by quality indicator, by region, by country, and for the companies. Quantitative methods are then used to investigate the determinants of QSR.

The remainder of this chapter proceeds as follows. Section 1.2 discusses the research questions while Section 1.3 discusses the motivation for the study. Section 1.4 presents the research findings, while Section 1.5 discusses the contributions of the study. Lastly, Section 1.6 discusses the structure of the thesis.

1.2 Research questions

This thesis sets out to investigate the QSR in the electricity industry. To better understand this research problem, two research questions are formed:

Research Question 1 (RQ1): What is the electricity generators' QSR?
Research Question 2 (RQ2): What are the determinants of the electricity generators' QSR?

The first research question is addressed by assessing the electricity generators' QSR using an assessment tool developed to provide a sharper measure than those of prior studies. This tool assists with the content analysis (Hooks & van Staden, 2011) of sustainability reports, annual reports, integrated reports, and other relevant reports linked in these documents. Scoring criteria for various quality dimensions and indicators identified by reference to prior literature are used to calculate scores for overall QSR and two QSR dimensions, namely relevance (including

materiality), and reliability. The QSR is then determined with reference to mean scores - those above (equal or below) the mean are deemed to provide high (low) QSR.

The second research question is addressed through interpreting the results of multivariate ordinary least squares (OLS) regression runs. Robustness and additional tests are also conducted to validate the main findings.

1.3 Motivations for the study

This thesis is motivated by the following intentions. First, to address a literature gap identified in the area of sustainability reporting, specifically in the electricity industry. Considering the diversity of ESE influences across the various industries, further studies focusing on "sector-specific analyses" are called for (Mans-Kemp & van der Lugt, 2020, p. 9) This will facilitate comparability among entities operating in a similar sector or industry (Ng & Nathwani, 2012), as well as with appropriate benchmarks (GSSB, 2016; Integrated Reporting, 2021; TCFD, 2017). Second, the electricity generation sector is an appropriate setting, given: (a) its impact on domestic and global economies; (b) the dominant role it plays in relation to the climate change crisis; and (c) the highly regulated environment (Parrot & Tierney, 2012), as well as the internal and external scrutiny and pressures that electricity generators are exposed to. Third, the time period selected (2018-2020) contributes to the relatively scarce literature updating us on the effects of the Task Force on Climate-Related Financial Disclosures (TCFD) recommendations in 2017 (Braasch & Velte, 2023; Principale & Pizzi, 2023), as well as the COVID19 pandemic (Phang et al., 2023; Praveena & Aris, 2021). Fourth, the literature on electricity generators' QSR appears highly fragmented (Leopizzi et al., 2023), so this thesis may contribute towards a more

coherent, inclusive, and wide ranging consideration of the various QSR determining factors in this industry sector.

1.4 Research findings

This study builds on the concept of high versus low sustainability reporting to assess electricity generators' QSR and finds a moderately high QSR, although there is still room for improvement. Findings also include some developing trends in reporting, which may facilitate achieving higher QSR e.g., (1) directly linking the relevant United Nations Sustainable Development Goals (SDGs) to the companies' overall plans and programmes and including concrete actions taken, as well as accounting and monitoring their impacts; (2) inclusion of methodologies for calculation of sustainability information to support more accurate reporting; (3) financial quantification of the effects of sustainability activities; (4) comparative reporting with respect to both actual performance and targets; and (5) consideration for more comprehensive assurance coverage of sustainability reports and information.

This thesis uses two main regression models, one for contemporaneous effect and the other for the one-year lagged effect to determine the factors that influence QSR, results of which are as follows. Sustainability performance, use of the Global Reporting Initiative (GRI) framework, rule of law, carbon pricing policy (CPP1), institutional shareholding, and foreign shareholding drive the QSR for the relevance, including materiality, dimension in both the contemporaneous and one-year lagged effects, with the rule of law and carbon pricing policy showing significantly negative impacts, while the rest show significantly positive effects. The reliability dimension of

QSR is driven by sustainability performance, use of GRI framework, and institutional shareholding, with board gender diversity (in one-year lagged effect only) showing a negative influence, while the rest show positive effects. For the overall QSR, sustainability performance, use of GRI framework, institutional shareholding, and foreign shareholding have a positive influence in both contemporaneous and one-year lagged effect while rule of law has a negative effect in the one-year lagged effect only. Robustness and additional tests conducted substantially validate these results.

1.5 Contributions of the study

This thesis extends existing literature on sustainability reporting in several ways. First, this study provides a longitudinal, global, and ESE perspective, In contrast, prior studies tend to focus on a single country and different industry (Khan et al., 2021), or on the environmental pillar and single-year analysis only (Alrazi et al., 2016b; Rahman et al., 2019). Second, this thesis covers a wider range of QSR determinants than has been attempted in prior studies (firm characteristics, institutional, and country level factors). Third, this study improves the precision of the QSR measurement as compared with prior studies. In summary, this thesis may be the first study on QSR specific to the electricity industry, which offers a global, longitudinal analysis incorporating TCFD and COVID19 effects, as well as considering a wide range of ESE factors. This resonates with observations that climate change and infrastructure remain under-researched areas (Slacik & Greiling, 2020). Moreover, it provides evidence that contributes to the debate related to "voluntary versus mandatory" sustainability reporting (Carmo & Ribeiro, 2022), which may be useful to standard setters and regulators in their efforts towards reporting harmonisation. Lastly,

this thesis provides better insights for decision makers and practitioners on the need to link sustainability disclosures (Ardiana, 2023) to sustainability performance and stakeholder engagement activities, contextualise materiality topics, and consider assurance of sustainability reports.

1.6 Structure of the thesis

The remainder of this thesis is structured as follows. Chapter 2 provides background information on sustainability reporting and the electricity industry. Chapter 3 presents the literature review, theoretical framework, development of research questions, and hypotheses. Chapter 4 discusses the research design and methodology for the assessment of QSR and for investigating the drivers of QSR. Chapter 5 discusses the results of the QSR assessments and tests of research questions and hypotheses, including descriptive statistics, correlation and regression analysis, main findings, and results of robustness and additional tests. Chapter 6 reports the summary of results, implications of the study, limitations, and suggestions for future research.

CHAPTER 2

BACKGROUND ON SUSTAINABILITY REPORTING AND THE ELECTRICITY INDUSTRY

2.1 Overview of sustainability reporting

2.1.1 Sustainability

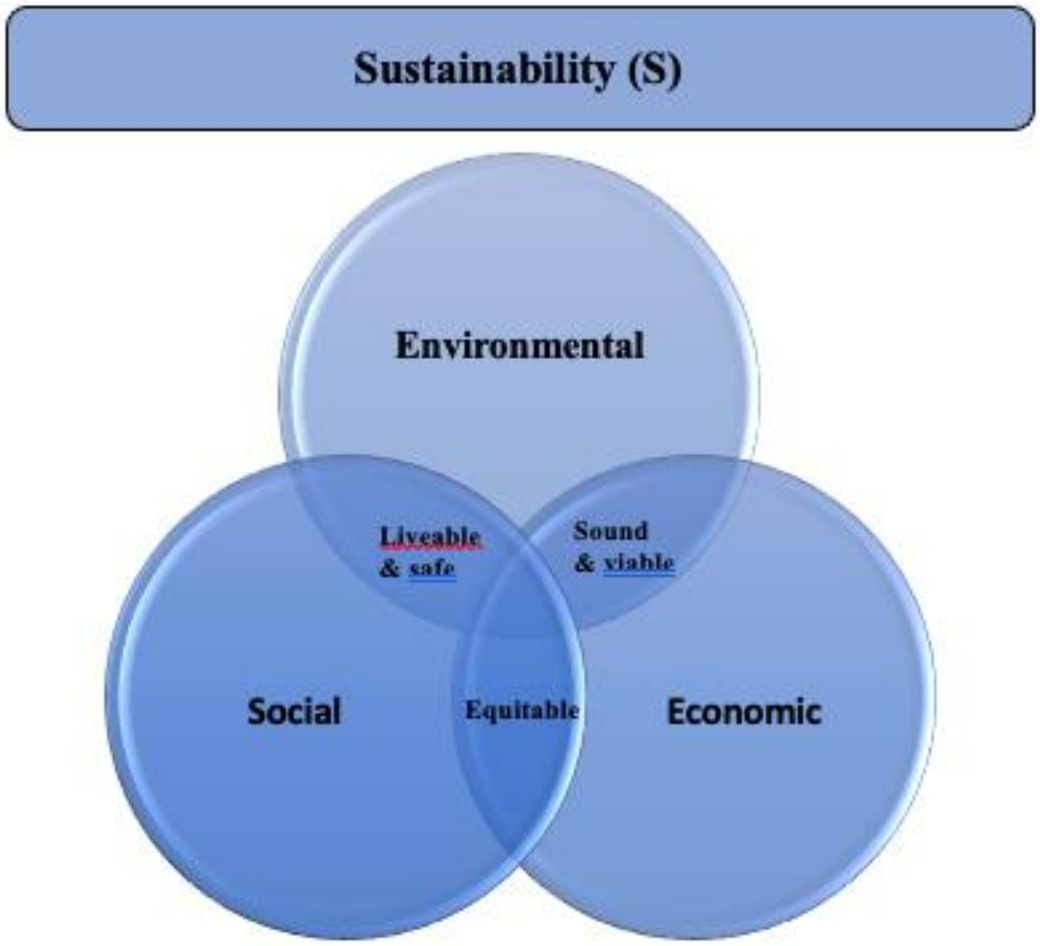
Sustainability has been defined in different ways over time, by many different parties but a useful and concise description is: “maintaining a balance of resources extracted and resources restored” (CDP, 2024a). Ben-Eli (2018) adds insight by suggesting that sustainability is the equilibrium during the process of interaction between people and the environment, such that people’s developmental initiatives do not adversely affect the environment upon which it depends.

Purvis et al. (2019) study the genesis of the three-pillar concept of sustainability (environment, social, and economic) through review and discussion of past literature on sustainability. They find that there is little theoretical foundation and no single point of origin, but that the concept gradually developed in early literature. Environmental, social, and economic perspectives began to incorporate the need to balance pursuit of economic growth against the social and ecological viability arguments highlighted by the United Nations. The three pillars are clearly mentioned by the United Nations (2012, p. 2), including their “interlinkages”.

A related concept is “triple bottom line” suggested by Elkington (1994) and promoted in his book “Enter the Triple Bottom Line” (Elkington, 2013). This concept is seen as being synonymous with sustainability (Purvis et al., 2019). In triple bottom line, a firm’s environmental, social, and economic performance may be measured using monetary units or a wide array of indicators, such as those provided in the GRI guidelines (Lamberton, 2005). Examples include emissions, manpower, health and safety, financial performance, and economic impact of projects. Triple bottom line is also referred to as the three P’s: people, planet, and profit. Elkington (2018) argues that triple bottom line’s default setting is to, at least, progress on two pillars without compromising the third. This view is consistent with the aim of the United Nations 2030 Agenda for sustainable development aimed at ending poverty and other deprivations while driving economic progress, but at the same time protecting the environment by tackling climate change (United Nations, n.d.). Elkington (2018, p. 5) suggests that companies need to be committed to be not just “best in the world,” but “best for the world”.

Figure 2.1 depicts the interaction among the three pillars of sustainability inspired by the “equilibrium” concept of sustainability (from Report of the World Commission on Environment and Development: Our Common Future)

Figure 2.1: Interaction between the three pillars of sustainability



(*Adapted from Purvis et al. (2019) and Zuraida (2016) to suit the purpose of this thesis*)

Economic and social sustainability relate to human and political development (Moldan et al., 2012). However, these pillars need to be sustainable environmentally (Moldan et al., 2012), so there has to be a balance between all three pillars to attain sustainable development (Ajmal et al., 2018). For example, while companies aim to profit out of a project affecting the environment, they should implement measures to mitigate environmental impact (e.g., waste disposal system) to protect the health of the community.

Environmental sustainability: Environmental sustainability was highlighted in the Rio declaration on environment and development in 1992, which called for environmental protection as an essential part of the development process (United Nations, 1992). This concept can be reflected by a firm's actions to reduce Greenhouse gas (GHG) emissions, and their transitioning to the use of renewable sources of energy. Such actions are particularly important for firms in environmentally sensitive industries (Bui et al., 2020) like electricity generation. Extant literature uses environmental information, as provided in terms of sustainability reporting pronouncements, like those of the Global Reporting Initiative (GRI) and Sustainability Accounting Standards Board (SASB), or as available from sustainability data providers (e.g., Bloomberg and Refinitiv) to assess a firm's environmental performance. Further examples of environmental indicators include measures relating to water consumption, biodiversity, environmental compliance, and climate policy.

Social sustainability: A firm's business decisions and policies affect social sustainability, as manifested by the interaction or exchange between the company and its stakeholders. Examples include companies that provide wages to their employees and in return receive labour, expertise, and skills; or between companies and suppliers, where basic exchanges are money for goods and services (Hutchins & Sutherland, 2008). The GRI 400 series covers such firm activities and their impacts on the social system within which they operate (GRI, n.d.). Activities contributing to a firm's social sustainability include those related to employment, labour relations, workforce health and safety, security practices, local communities, customer health and safety, and marketing and labeling (GRI, 2024; SASB, 2023).

Economic sustainability: This concept relates to the financial sustainability, long-term profitability, and continuing operational efficiency and productivity of a firm (Alsayegh et al., 2020; Giovannoni & Fabietti, 2013). It also extends to other economic areas like a firm's market presence and indirect economic impacts (e.g., infrastructure investments and essential services supported) for the well-being of its stakeholders and the community (GRI, 2016b, 2016c).

2.1.2 Sustainable development

Between late 1960 and early 1970, the melting pot of various ideas about sustainability, growth, progress, and development began taking a new direction, namely sustainable development (Du Pisani, 2006). The 1980 World Conservation Strategy is among the first to mention the term "sustainable development", and highlights that development and conservation are equally important for our survival and for discharging our responsibilities as stewards of limited resources for the future generations (International Union for Conservation of Nature and Nstrual Resources et al., 1980). In 1987, the United Nations Brundtland Commission defined sustainable development as "meeting the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987, p. 41). The 1992 United Nations Conference on Environment and Development, also known as the "Earth Summit", led to the creation of the Commission on Sustainable Development, and the Rio Declaration consisting of 27 universal principles on environment and development. It also led to the adoption of Agenda 21, the global consensus for development and environmental cooperation (United Nations, 2024b).

The year 2000 saw the establishment of eight millennium development goals, which were reviewed and monitored between 2005 and 2010. In 2013, a special event was held to promote a high-level summit in 2015 for adoption of a new set of goals built on the foundations of the millennium development goals. This led to the 2015 United Nations Summit on Sustainable Development and a new plan, "Transforming Our World: The 2030 Agenda for Sustainable Development", which included 17 sustainable development goals (SDGs) and 169 targets. It was also in 2015, at the Paris Conference on Climate Change (COP 21), that the Paris Agreement was signed and ratified. The latest (at time of writing) United Nations Climate Change Conference (COP 28) was held in Dubai in 2023, which calls on governments to accelerate the transition away from fossil fuels to renewables such as wind and solar power (United Nations, 2024a).

Sustainable development may be defined in different ways, but the primary purpose should be the reasonable and equitable distribution of economic well-being over many generations (Goodland & Ledec, 1987). Presently, there are around 140 developing countries worldwide striving to satisfy their development needs; urgent action is therefore required to make sure that today's development will not negatively impact future generations, especially the continuing threat of climate change (United Nations, 2024b).

In recent years, sustainable development has received increasing attention due to climate change, environmental crises, tensions due to social inequities, poverty, and the increasing gaps evident in social order (Giovannoni & Fabietti, 2013). Managing these issues requires innovation and the integrated efforts of all concerned, including international agencies and organisations e.g., the United Nations, Organisation for Economic Cooperation and Development, governments, non-

governmental organisations, and other civil society groups (Mensah, 2019; van Zanten & van Tulder, 2021).

2.1.3 Sustainable development goals (SDGs)

The SDGs are the product of decades of work by many nations and the United Nations, starting with the Earth Summit in 1992 through to the 2015 General Assembly, and culminating with the agenda on the adoption of the 2030 Agenda for Sustainable Development, and the 17 SDGs (United Nations, 2024b). These are summarised in Figure 2.2 below:

Figure 2.2: The 17 SDGs

Source: United Nations (https://www.un.org/sustainabledevelopment/news/communications-material/. Accessed 27 June 2024)

Among these, SDGs 7- Affordable and clean energy, 8- Decent work and economic growth, 9- Industry, innovation, and infrastructure, and 13- Climate action appear most relevant to electricity generators.

2.1.4 Sustainability reporting

Sustainability reporting has evolved over time, flowing from the need to address the issues relating to sustainable development (Section 2.1.2) and the SDGs (Section 2.1.3). The latter half of the twentieth century saw Western companies set up operations in less regulated jurisdictions, following globalisation trends. This stimulated an increasing demand for accountability for their environmental, social, and economic impacts (Adams et al., 2022). In response, the number of companies that report on environmental, social, and sustainability impacts or on sustainability policies have grown significantly since the publication in 1989 of the first environmental reports (Kolk, 2004). More recently, sustainability reporting has gained strong impetus in the United States of America and Europe, but also globally (Wagenhofer, 2024), fueling extensive research on sustainability accounting (Searcy & Elkhawas, 2012). Various (and often synonymous) terms emerged, such as Sustainability Reporting, Triple Bottom Line reporting, Environmental, Social, and Governance reporting (Stent, 2018), Economic, Environmental, and Social (Jiang et al., 2018), Social and Environmental reporting (Adams & Frost, 2008), Non-Financial Disclosure (Luque-Vílchez et al., 2023), and Non-Financial Reporting (Henriques et al., 2022). Turzo et al.

(2022) present a nomenclature of sustainability reports/reporting in their bibliometric analysis of non-financial reports from 2012 to 2020, which includes the terms mentioned above, as well as additional terms such as Corporate Social Responsibility (CSR) reporting, integrated reporting, SDG reporting, ESG reporting, corporate citizenship reporting, and GHG emission and carbon reporting.

For many large companies, sustainability reporting has been accepted as part of disclosure and transparency over the past three decades, with continued global uptake (KPMG, 2022). As the public becomes more concerned about sustainability reporting, companies see the increasing need to communicate to their stakeholders on their performance, especially in regard to environmental issues such as climate change (Ng & Nathwani, 2012). However, while sustainability reporting has become mandatory for European listed companies due to the (EU) Directive on Non-Financial Reporting (2014/95/EU), it remains voluntary in many other jurisdictions (Luque-Vílchez et al., 2023) around the globe.

2.1.5 Sustainability reporting pronouncements

Various sustainability reporting pronouncements have been introduced and implemented over time. Stent (2018) notes over 100 such pronouncements and describes what were considered to be some of the more important of these. This thesis focuses on seven major reporting pronouncements and bodies responsible prior to the formation of the International Sustainability Standards Board (ISSB). These are described briefly below (2.1.5.1 to 2.1.5.7).

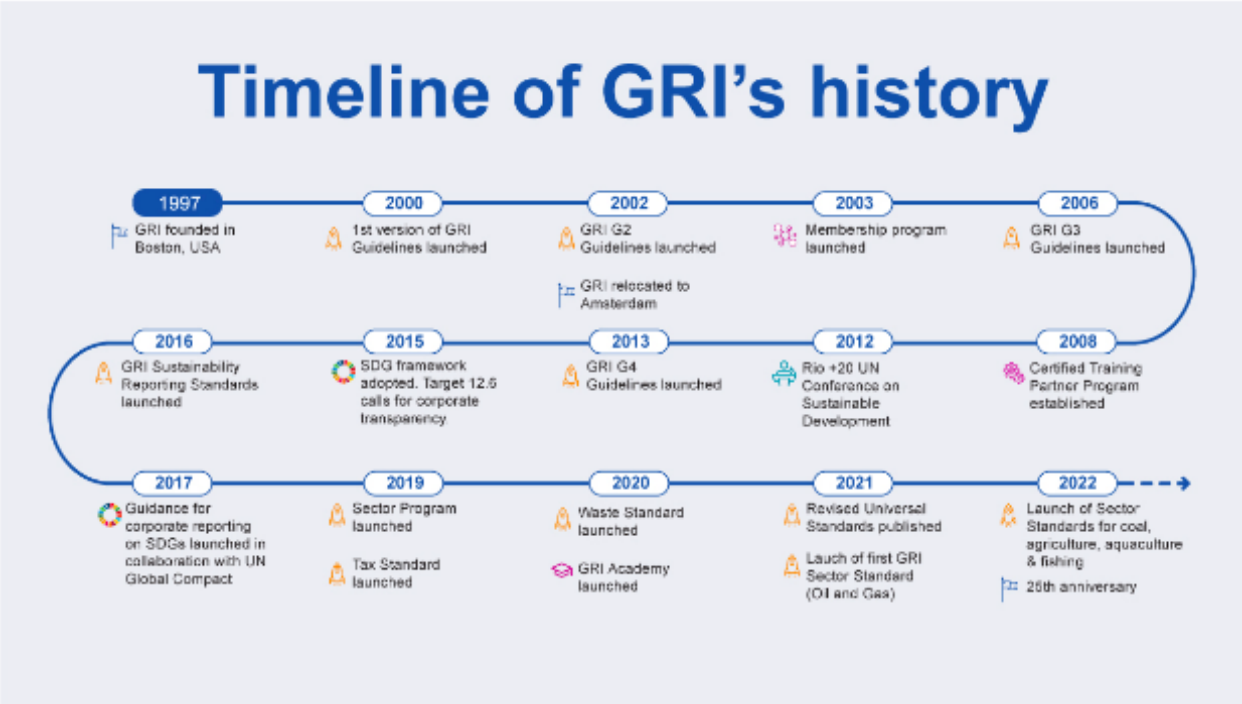
A. Before formation of the ISSB

2.1.5.1 GRI

Following public outcry over the environmental damage caused by the Exxon Valdez oil spill in 1989, the GRI was founded in 1997 in Boston, United States of America. Its roots can be traced back to non-profit organisations Tellus Institute and Coalition for Environmentally Responsible Economies, with the United Nations Environment Programme's participation (GRI, 2024a). Its purpose was to provide a generally accepted reporting framework on firm environmental, social, and economic performance (GRI, 2011).

The GRI Framework espouses reporting principles of reliability, comparability, timeliness, clarity, accuracy, and balance. It provided the first global framework for sustainability reporting with the publication of the first set of GRI guidelines (G1) in 2000. It was launched as an independent, non-profit organisation in 2001 (GRI, 2024a). Due to increased demand for GRI reporting and widespread participation in sustainability reporting globally, the GRI has continued to evolve, becoming a leader in the sustainability reporting arena (GRI, 2022). The GRI's multi-stakeholder strategy seeks to consider the opinions and needs of others (Adams, 2023) and to achieve consensus (Tschopp & Huefner, 2015). The timeline of GRI's history is shown in Figure 2.3.

Figure 2.3: History of GRI



Source: GRI, 2024a

Authors who have used GRI indicators to evaluate sustainability reporting include Alrazi et al. (2016b); Mamun (2023); Traxler and Greiling (2019); and Yadava and Sinha (2016).

2.1.5.2 SASB

SASB was created in 2011 as a non-profit and independent standards-setting organisation, with a mission to establish and maintain industry-specific standards to assist companies to disclose financially material sustainability information to the Securities and Exchange Commission that is decision-useful to investors (Bloomberg Law, 2024; SASB, 2024a). It transitioned to a two-tier governance structure in 2017, composed of the SASB Foundation Board, and a standards-setting board, the SASB Standards Board (SASB, 2024a). The SASB standards consist of industry-specific standards for each of 77 industries (SASB, 2024b).

2.1.5.3 International Integrated Reporting Council (IIRC)

The IIRC is a global coalition of investors, regulators, standard setters, companies, the accounting profession, non-governmental organisations, and academia. This coalition believes that the next step in the evolution of corporate reporting is to communicate about firm value creation, preservation, or erosion (Integrated Reporting, 2021). The IIRC is the organisation behind the development of the Integrated Reporting Framework (IRF), which was launched in 2013.

The IRF seeks to promote the IIRC's long-term vision for integrated thinking to be embedded within the normal business practice in both the public and private sectors (IIRC, 2013). The IRF utilises seven guiding principles, namely, strategic focus and future orientation, connectivity of information, stakeholder relationships, materiality, conciseness, reliability and completeness, and consistency and comparability (IIRC, 2013). It is also structured around eight content elements, namely, organisational overview and external environment, governance, business model, risks and opportunities, strategy and resource allocation, performance, outlook, and basis of preparation and presentation (IIRC, 2013).

In January 2021, the first revisions (since the 2013 launch) were published to provide for more decision-useful integrated reporting. These revisions were the outcomes of broad market consultation worldwide, which confirmed that the conceptual thinking and principles of the IRF remain fit for purpose and robust (Integrated Reporting, 2024). The IRF (January 2021)

supersedes the IRF (December 2013) and applies to reporting periods commencing 1 January 2022 (Integrated Reporting, 2021).

2.1.5.4 Task Force on Climate-related Financial Disclosures (TCFD)

The Task Force on Climate-related Financial Disclosures (TCFD) was created by the Financial Stability Board[2] in 2015 (TCFD, 2024a). The TCFD was tasked with developing recommendations as to the types of information that would be useful to investors, lenders, insurers, and other stakeholders in assessing climate related risks (Lombardi et al., 2021; TCFD, 2017). Its recommendations were issued on 15 June 2017. The core elements of the recommended climate-related financial disclosures are governance, strategy, risk management, and metrics and targets. TCFD recommendations incorporate seven principles for effective disclosure, i.e., relevant, complete, clarity, consistent, comparable, verifiable, and timely.

2.1.5.5 Carbon Disclosure Project (CDP)

CDP Global is a global non-profit organisation composed of CDP North America, CDP Worldwide Group, and CDP Europe AISBL (CDP, 2024b). It runs an environmental disclosure system for companies, governments, and investors facilitating assessment of impacts and actions towards a sustainable economy (CDP, 2024a). The CDP was created in 2000 and has expanded coverage of environmental disclosures to include water security and deforestation (CDP, 2024b). In 2021, a new strategy was launched further expanding its scope to cover all planetary boundaries (CDP, 2024b). The new 2021-25 strategy lays down how the CDP will respond to the

[2] Financial Stability Board is a global body that monitors and provides recommendations about the global financial system (https://www.fsb.org/about/. Accessed 03 May 2024).

need to achieve net zero emissions by 2050, and push for more profound action through tracking and analysis across a wide array of stakeholders, strengthening engagement, expanding scope for more coverage of environmental issues, and broadening its focus on tangible plans, targets, and performance (CDP, 2021).

2.1.5.6 United Nations Global Compact

The United Nations Global Compact was established in 2000 to accelerate and measure the global collective impact of business. It seeks to uphold ten principles[3] on human rights, labour, the environment, and anti-corruption and to promote the 17 SDGs through committed and accountable companies and fostering of ecosystems to enable change (UNGC, 2024a). The 17 SDGs are shown in Subsection 2.2.3

2.1.5.7 European Non-Financial Reporting Standards

Directive 2014/95/EU, known as the Non-Financial Reporting Directive was issued on 22 October 2014 and has been described as the most extensive development in mandatory sustainability reporting (Posadas & Tarquinio, 2021). European Union (EU) member countries were required to bring the Directive into force in their respective national laws by 6 December 2016. Affected organisations were required to publish their first non-financial statements for financial years beginning on or after 1 January 2017 (Carmo & Ribeiro, 2022). The Non-Financial Reporting Directive aims to ensure that investors and other stakeholders have adequate access to non-financial information from companies to be able to take account of sustainability-

[3] Details are available in: https://unglobalcompact.org/what-is-gc/mission/principles

related risks, opportunities, and impacts on society and environment (European Union, 2021). The GRI and SASB are both sustainability standards, the former being European based while the latter, American based. Moreover, the GRI is intended for a broad range of stakeholders while the SASB is industry focused and aimed at investors. The IRF is the most wide ranging framework and covers both the financial and non-financial aspects of the companies' operations. The CDP provides climate-related information that is aligned with the TCFD recommendations on climate-related risks and opportunities (CDP, 2019). On the other hand, the United Nations Global Compact is committed to the delivery of the SDGs (UNGC, 2024c). The European Non-Financial Reporting Standards is a mandatory sustainability reporting regulation covering companies in the European Union member countries.

In summary, these seven pronouncements contributed to confusion as to which of the pronouncements to use, leading to the initiatives by the ISSB, and European Financial Reporting Advisory Group.

B. After formation of the ISSB

2.1.5.8 Towards harmonising sustainability reporting

In June 2021, the IIRC and the SASB merged to form the Value Reporting Foundation, enabling organisations to use its three key resources (Integrated Thinking Principles, the IRF, and the SASB Standards), either separately or combined (Value Reporting Foundation, 2021). On 3 November 2021, as world leaders met for the COP26 United Nations global summit on climate change in Glasgow, the IFRS Foundation Trustees announced the creation of the ISSB, and the

consolidation of the Climate Disclosure Standards Board and Value Reporting Foundation into the IFRS Foundation, as well as the publication of prototype disclosure requirements developed by the Technical Readiness Working Group composed of representatives from Climate Disclosure Standards Board, International Accounting Standards Board, Financial Stability Board's TCFD, Value Reporting Foundation, and World Economic Forum (IFRS, 2021). The ISSB's four key objectives are as follows: (1) to develop standards for a global baseline of sustainability disclosures; (2) to meet the information needs of investors; (3) to enable companies to provide comprehensive sustainability information to global capital markets; and (4) to facilitate interoperability with disclosures that are jurisdiction-specific and/or aimed at broader stakeholder groups (IFRS, 2024).

2.1.5.9 ISSB's sustainability disclosure standards

In August 2022, the Value Reporting Foundation was consolidated with the IFRS Foundation following the commitment made at COP26 to work together in developing a comprehensive set of global standards for sustainability reporting for capital markets (IFRS, 2022). Accordingly, the ISSB anchors on and consolidates the work of investor-focused market-led reporting standards, including the SASB, TCFD, IRF, and Climate Disclosure Standards Board (IFRS Foundation, 2024).

On 26 June 2023, the ISSB released IFRS S1 and S2, the first two international sustainability disclosure standards (Grant Thornton, 2023). IFRS S1 sets out the general requirements for disclosure of sustainability-related financial information, while IFRS S2 focuses on the

disclosure of specific climate-related information (Grant Thornton, 2023). IFRS S1 and S2 took effect on January 2024 (IFRS, 2023).

2.1.5.10 European Sustainability Reporting Standards

On April 21, 2021, the proposal for a Corporate Sustainability Reporting Directive was adopted by the European Union Commission to expand the Non-Financial Reporting Directive in the EU. In December 2022, the co-legislators in the Corporate Sustainability Reporting Directive - Directive (EU) 2022/2464 mandated the adoption of the European Sustainability Reporting Standards by Delegated Act[4] (EFRAG, 2024). In July 2023, the European Union Commission adopted the first set of European Sustainability Reporting Standards for use by all companies subject to the Corporate Sustainability Reporting Directive. The European Financial Reporting Advisory Group released three implementation guidelines for the European Sustainability Reporting Standards in December 2023 (EFRAG, 2024). The Corporate Sustainability Reporting Directive broadens the scope for companies covered by the mandatory non-financial reporting, implements mandatory limited assurance, and introduces more detailed reporting requirements in the European Sustainability Reporting Standards (KPMG, 2022).

2.1.5.11 Other relevant developments

On SASB - The ISSB assumed responsibility for the SASB Standards as of August 2022. Moreover, it has committed to maintain, enhance, and evolve these standards as important to

[4] The delegated acts specify the complementary information that undertakings (companies) are to report regarding sustainability matters and reporting areas, and those specific to the sector where they operate (Chapter 6a Sustainability Reporting Standards, Article 29b, Directive (EU) 2022/2464)

fulfilment of the requirements of their IFRS Sustainability Disclosure Standards. Moreover, the ISSB promotes the continued use of the SASB standards (SASB, 2024b).

In June 2023, the climate-related content in the SASB Standards was amended to align with the industry-based guidance accompanying IFRS S2 Climate-related Disclosures. Furthermore, in December 2023, the non-climate-related content in the SASB Standards was amended by the ISSB in relation to the International Applicability of the SASB Standards project (SASB, 2024b). The amendments aim to assist preparers apply the SASB standards regardless of the type of generally accepted accounting principles they adopt without substantially changing SASB Standards' intent or structure, or the jurisdiction in which the companies operate (SASB, 2024c)

On TCFD - Following the TCFD's remit of the 2023 status report in October 2023, it disbanded (TCFD, 2024a). Accordingly, the Financial Stability Board asked the IFRS Foundation to take over the monitoring of companies' progress with climate-related disclosures (TCFD, 2024b).

On GRI - In March 2022,, the Global Sustainability Standards Board[5] worked with the ISSB through the GRI-IFRS Memorandum of Understanding to promote the inclusion of impacts, risks, and opportunities in reported sustainability information (Adams, 2023). It also collaborated with the European Financial Reporting Advisory Group, providing input for the development of their European Sustainability Reporting Standards (Adams, 2023). The GRI issued detailed Frequently Asked Questions guidance in December 2022 to explain to reporting entities the

[5] The Global Sustainability Standards Board is an independent operating entity under the umbrella of GRI that has sole responsibility for setting globally accepted sustainability reporting standards (https://www.globalreporting.org/media/fk1lyhvp/gssb-terms-of-reference-2018.pdf. Accessed 27 June 2024).

interconnection between GRI standards and European Sustainability Reporting Standards (GRI, 2023).

2.1.5.12 Battle of sustainability reporting frameworks

In summary, some momentous developments occurred after 2021 in the world of sustainability reporting i.e., the amalgamation of various sustainability reporting pronouncements and the transition of Non-Financial Reporting Directive to Corporate Sustainability Reporting Directive through adoption of mandatory European Sustainability Reporting Standards. At the time of writing, this resulted in the emergence of three major sustainability reporting bodies, namely, the ISSB for the IFRS Sustainability Standards (IFRS S series), European Financial Reporting Advisory Group for European Sustainability Reporting Standards, and Global Sustainability Standards Board for GRI. As mentioned in GRI (2022), the impact disclosure requirements in the European Sustainability Reporting Standards are fully or closely aligned with GRI standards. On the other hand, the IFRS sustainability disclosure standards and GRI can be viewed as complementary and interrelated standards serving distinct purposes, the former being investor-oriented while the latter are multi-stakeholder oriented (GRI, 2022).

KPMG (2022) indicate that GRI remains the most widely used set of sustainability reporting standards globally, while the SASB standards dominate in the US, Canada, and Brazil with the IRF showing strength in the Middle East and Asia Pacific. While the European Sustainability Reporting Standards (based on GRI standards) is now mandatory for EU member countries, it remains to be seen whether the IFRS S series will dominate to the same extent as IFRS accounting standards have done.

2.1.5.13 Views on the impact of ISSB standards on GRI

de Villiers et al. (2022) provide a critical analysis and reflection on the GRI's achievements, its current initiatives, and the likely impact of the IFRS Foundation's actions to move towards a single set of unified global sustainability reporting standards. The authors opine that the IFRS is unlikely to negatively affect the GRI's global status as a multi-stakeholder-oriented setter of sustainability reporting standards. The IFRS Foundation leverages its structural legitimacy for sustainability reporting standard-setting from its financial reporting standard-setting status, but its founding principles relate to investors' needs, making it implausible for it to properly address the information needs of other stakeholders (de Villiers et al., 2022).

Adams and Mueller (2022) investigate the nature of academic engagement and policy makers' lack of responsiveness to the scientific community, as relates to the Consultation Paper on Sustainability Reporting (developed by the IFRS Foundation Trustees). They find that most academic submissions have divergent views/oppose the IFRS Foundation's Consultation Paper. They conclude that the academics' opposition to the IFRS Foundation's proposals is credible as it is supported by research evidence. The IFRS Foundation/supportive academic submissions, however do not give evidence and analysis to support their proposals (Adams & Mueller, 2022). Reasons put forward by those opposing the proposals include their focus on financial materiality, investor-focus when a multi- stakeholder approach is necessary for sustainability development, and the IFRS Foundation's lack of expertise and legitimacy with regard to setting sustainability reporting standards (Adams & Mueller, 2022). Ali et al. (2023) also argue that with its economic focus, the ISSB will unavoidably centre on market participants and investors.

Afolabi et al. (2023) examine the influence and behaviour of the new standard setters (IFRS Foundation/ISSB and European Financial Reporting Advisory Group/ European Commission) in the sustainability reporting arena and implications for the GRI's current position. These authors argue that the ISSB's agenda is not about sustainable development, citing as an example that the ISSB exposure draft on identifying risks and opportunities of climate related events ignores the environmental impacts of firms' operations and focuses on the users of financial reporting, so will not satisfy the needs of other stakeholders (Afolabi et al., 2023). In contrast, the GRI revised standards continue to encapsulate financial, as well as ecological and social aspects defining sustainable development (Afolabi et al., 2023).

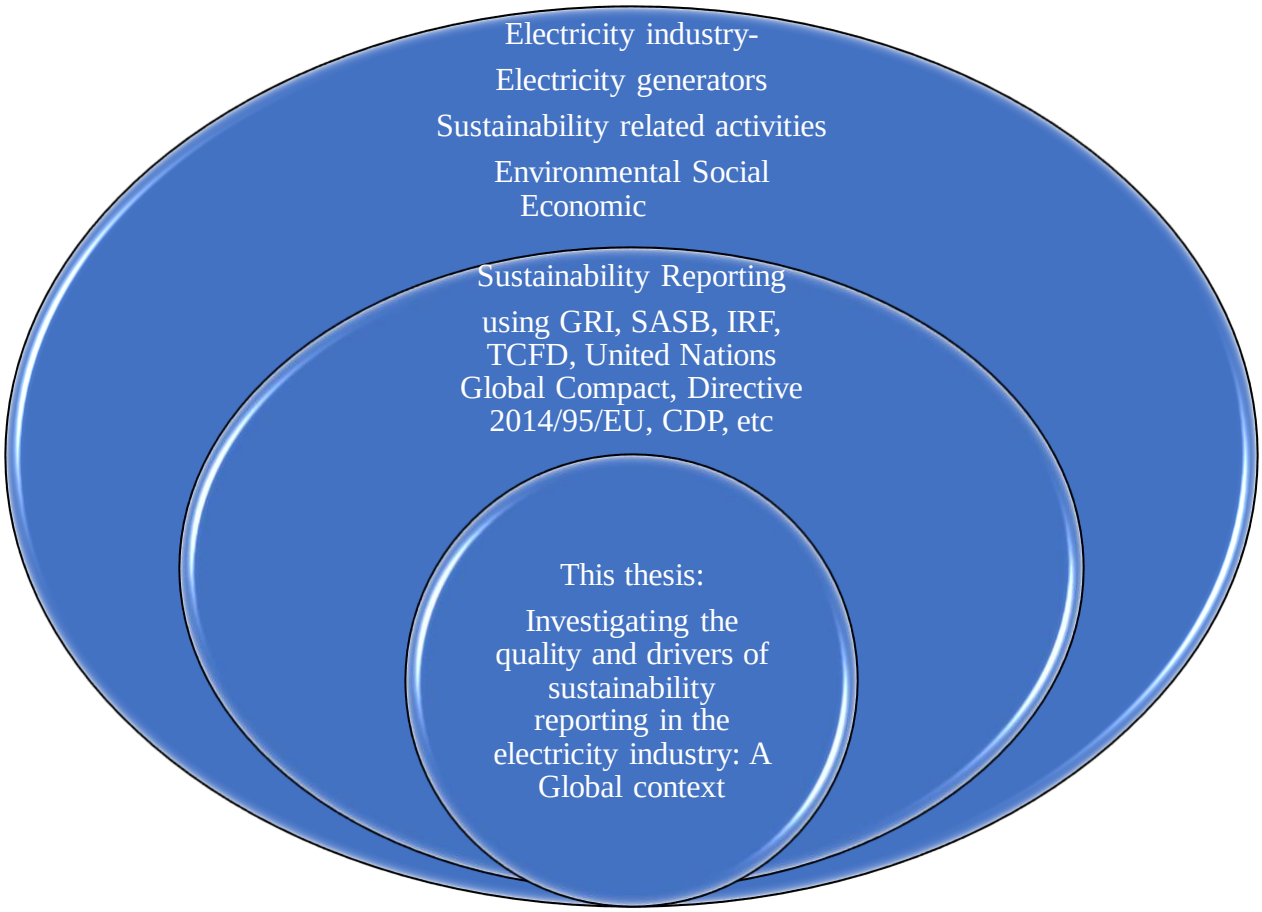
In summary, these studies reflect the view that sustainability reporting standards should aim at addressing the information needs of a broad array of stakeholders. Sustainability issues faced by humanity are of the utmost priority and related disclosures should be *sans* power dynamics rather than based on the interests of the most powerful/dominant stakeholders (Ali et al., 2023).

It will take some time to evaluate the impact of the ISSB and the European Financial Reporting Advisory Group led new sustainability initiatives in terms of their contribution towards companies' sustainability reporting practices.

2.2 Overview of the global electricity industry

Figure 2.4 below highlights the links between the electricity industry and sustainability reporting that are explained in Chapter 1.

Figure 2.4: The study context



Burke et al. (2018) argue that electricity use and access are strongly linked to economic development. In support, Sanau Villarroya et al. (2021) provide evidence that electricity generation stimulates economic growth. Moreover, electricity offers advantages over other energy sources, allowing for more productive manufacturing, as well as more efficient lighting, communication, and information technologies (Burke et al., 2018). The electricity industry,

therefore, affects sustainable development in terms of its environmental, social, and economic impacts.

The electricity industry is composed of four major sectors: generation, transmission, distribution, and retail (Electricity Authority, 2018). The electricity generation sector produces electricity and sells it to electricity consumers. The sale of electricity may take place through wholesale and retail electricity markets or directly to contracted consumers. Electricity produced is transferred from the generators through high voltage lines, power stations, and transformers (Argento et al., 2019) by the transmission sector. This sector serves as the electricity highway, which connects generators to the distribution network. The distribution sector then distributes electricity to end users/ consumers. The electricity retail sector serves as a 'middleman' between the generators and the consumers.

Electricity companies are obliged to perform their role of providing reliable services at a reasonable cost (Parrot & Tierney, 2012). Moseñe et al. (2013) contend that the political and economic influence, as well as the impacts and global activities of electricity companies, are scrutinised by multiple stakeholders (i.e., politicians, regulators, media, citizens, social and environmental organisations, non-governmental organisations, labour unions, and employees). Most electricity companies operate in a highly regulated environment and so stakeholder engagement is important (Parrot & Tierney, 2012). As the business environment has evolved with speed and complexity, so has the degree of stakeholder power and influence, thus increasing demands on electricity companies for improved social and environmental performance and transparency (Parrot & Tierney, 2012).

A discussion of the electricity industry is not complete without considering climate change, as they are closely connected. According to the United Nations Secretary General, the world is in a climate emergency - “a code of red for humanity” (UNEP, 2021). Achieving the promise undertaken in the Paris Agreement of limiting the global temperature rise to 2^{o}C above pre-industrial levels is a significant challenge, and GHG emissions in the atmosphere continue to wreak havoc worldwide, endangering economies, lives, food, and health (UNEP, 2021).

The electricity generation sector is a major contributor to GHG emissions, accounting for 25% of global GHG emissions in 2010, mainly from the burning of coal, natural gas, and oil (United States Environmental Protection Agency [EPA], 2024a). Over 10 years later this is still reflected in the United States of America, where electricity production again accounted for 25% of their total GHG emissions in 2021, mainly from burning coal and natural gas (EPA, 2024b). The world’s top three GHG emitters in 2019 and 2020 were China, the United States of America, and India, accounting for 42.6% of total global emissions (ClimateWatch, 2024; Friedrich et al., 2023). This thesis covers eight countries out of the 10 top emitters.

In 2023, global emissions increased by 1.1%, which is significantly slower than global Gross Domestic Product (GDP) growth of 3% (IEA, 2023). The apparent ‘disconnect’ between the two measures can be traced to the weather effects of climate change; continued COVID19 effects; and strong global GDP growth (IEA, 2024a).

The EU saw a historic milestone in 2023 for energy transition in the region, as renewable wind power bested both natural gas and coal in electricity generation for the first time, a major driver for their 9% decline in CO2 emissions (IEA, 2023). In the United States of America, renewables also contributed to reduced emissions in the electricity industry, where total CO2 emissions decreased by 4.1% compared to the economy's growth of 2.5%. On the other hand, while China experienced a 4.7% rise in CO2 emissions, it has contributed approximately 60% of global additions to wind power, electric vehicles, and solar photovoltaic (PV) technology (IEA, 2023). In India, the 7% increase in emissions is attributed to its rapid economic growth (6.7%) and resultant high electricity demand. By 2035, it is imperative that emissions decline from 2022 levels, by 80% and 60% in advanced economies and in emerging/developing economies, respectively (IEA, 2024b).

Rovere et al. (2010) avers that energy is a vital element for a nation's economic and social development and aside from reliability and availability of electricity supply, efficient use of natural resources and affordable electricity access for the people should be present to ensure sustainable economic growth. The electricity industry's initiatives towards use of renewable energy will therefore contribute to achieving the SDGs. While emissions continue to rise, clean energy is helping to limit this rise (IEA, 2023).

Achieving the goal of net zero emissions by 2050 will likely require extensive use of low-emissions fuel; bigger, smarter, and repurposed electricity networks; and possibly more use of nuclear power (IEA, 2024b) - significant implications for the electricity industry.

2.3 Chapter summary

This chapter provides important context for this thesis by presenting some background on sustainability reporting, especially in the light of the rapid changes since 2021. Moreover, it discusses the overview of this thesis' perfect setting, namely the electricity industry, which is affected by these reporting developments due to its crucial role in climate change and global sustainability. We are now moving from an era of unsustainable use of energy towards safe and sustainable energy future. A sustainable energy future impacts on the economic, social, and environmental sustainability of companies.

CHAPTER 3

LITERATURE REVIEW, THEORY, RESEARCH QUESTIONS, AND HYPOTHESES

3.1 Introduction

The literature on sustainability reporting is diverse. Much of it includes a focus on the relationship of sustainability disclosures with variables such as financial performance, governance, use of reporting frameworks, regulations, country level factors, and ownership structure. Very few of these studies deal with all three of the pillars of sustainability reporting: ESE, discussed in the previous chapter. This chapter reviews extant literature and related theory to develop research questions and hypotheses considered most pertinent to the assessment of QSR and the factors influencing the QSR of electricity generators.

This chapter is structured as follows: Section 3.2 focuses on studies related to measurement of QSR, while Section 3.3 discusses the literature related to QSR constructs. Section 3.4 relates to studies involving the electricity industry, while Section 3.5 discusses the theoretical foundation for this study. Section 3.6 discusses literature on QSR descriptors as a basis for the development of RQ1, while Section 3.7 discusses literature that relates to the determinants of QSR and leads to RQ2. Section 3.8 discusses the identified determinants of QSR in more detail and explains the development of the relevant hypotheses. Section 3.9 closes the chapter with a brief summary of all sections.

3.2 Measurement of QSR

Companies are answerable to their stakeholders and should report how they address the impact of their ESE activities (De La Cuesta & Valor, 2013). As a consequence of multiple demands for information from various stakeholders, there has been an increase in the amount and extent of non-financial reporting by firms to signal their commitment to sustainable development. Accordingly, topics on non-financial reporting (also known as sustainability reporting, corporate social responsibility (CSR) reporting, or environmental, social, and governance (ESG) reporting) have attracted much attention (De La Cuesta & Valor, 2013) from researchers. The last two decades have witnessed exponential growth in related research, which has "moved from a 'paucity' stage in 2000 to a 'saturation' stage in 2022 and is still ongoing" (Benameur et al., 2023, p. 37).

Literature about sustainability reporting may concern extent/quantity (Bahari et al., 2016; Slacik & Greiling, 2020; Traxler & Greiling, 2019), quality (Al-Shaer & Zaman, 2016; Khan et al., 2021; Khan et al., 2023) or both quality and quantity (Rahman et al., 2019) of disclosures. Sustainability reports also vary in terms of focus area within sustainability pillars, country setting, and industries. For example, Kraft (2018) and Khan et al. (2021) both focus on a single industry (electricity and banking respectively) and a single country setting (United States of America and Bangladesh respectively), while Eng et al. (2022) and Imperiale et al. (2023) conduct a single country (United States of America) but multi-industry study.

The Conceptual Framework for Financial Reporting describes relevance and faithful representation as fundamental qualitative characteristics of useful financial information, while comparability, verifiability, timeliness, and understandability are described as enhancing

characteristics (International Accounting Standards Board, 2018). Sustainability reporting frameworks, such as the GRI, IRF, and TCFD, also describe their respective reporting principles, as mentioned in Chapter 2. While these reporting principles may vary from one framework to another, the qualitative characteristics of relevance and reliability in reporting are common to both financial and sustainability reporting guidelines.

The QSR has been measured in various ways, including: comprehensiveness of disclosures (Alrazi et al., 2016b; van Staden & Hooks, 2007), disclosure dimensions (Comyns & Figge, 2015; Gao et al., 2016; Hąbek & Wolniak, 2016; Helfaya et al., 2019; Khan et al., 2021; Michelon et al., 2015; Mion & Adaui, 2019), governance and assurance attributes (Al-Shaer & Zaman, 2016; Singhania et al., 2023), reporting framework requirements (e.g., GRI, SASB, TCFD) (Alrazi et al., 2016b; Badia et al., 2020; Ching et al., 2017; De La Cuesta & Valor, 2013; Demaria & Rigot, 2021; Eng et al., 2022; Slacik & Greiling, 2019), European Union Directive, 2015/95/EU requirements (Gerwing et al., 2022; Lombardi et al., 2021), third party ratings, like Bloomberg and Refinitiv (Apergis et al., 2022; Ruiz-Blanco et al., 2022), and keyword analysis to classify the rhetoric of companies' sustainability reports (Al-Shaer & Hussainey, 2022). These studies use rating scales to assess the quality of disclosures of each item included in the sustainability themes or indices identified.

The constructs used in evaluating the QSR vary. For example, van Staden and Hooks (2007) and Hooks and van Staden (2011) develop an index to assess environmental disclosure quality of 32 New Zealand companies. The index comprises 32 environmental disclosures under six categories: the entity, management policy and systems, environmental impacts, stakeholders, financial impacts, and general. Bouten et al. (2011) develop a content analysis framework to

assess the comprehensiveness of CSR reporting in terms of three information types, namely, vision and goals, management approach, and performance indicators. More recently, Singhania et al. (2023) construct a quality index with a scale of 0 to 4 covering parameters starting with the existence of a sustainability report, a sustainability committee, internal audit, to external audit of sustainability activities.

Hąbek and Wolniak (2016) employ relevance and credibility themes using a sample of CSR reporting for companies in selected EU member states. Michelon et al. (2015) focus on four disclosure factors, namely quantity, density, accuracy, and managerial orientation for CSR reports of 114 firms in the London Stock Exchange. Helfaya et al. (2019) introduce a multi-dimensional quality model composed of three Cs (content, credibility, and communication) to assess the quality of corporate environmental reporting incorporating the views of both preparers and users of environmental reports. Al-Shaer and Zaman (2016) measure QSR using a 0 to 4 coding scale covering factors from the presence of a sustainability reports, a sustainability committee, to assurance providers for sustainability reports (non-audit firm or Big 4). Building on the work of Al-Shaer and Zaman (2016), Al-Shaer (2020) uses a scale of 0 to 5 to determine the scores for QSR with an additional attribute concerning the linkage of executive remuneration for CSR or sustainability targets.

3.3 The QSR constructs adopted for this thesis

In Solomon (2000), findings suggest similarities between financial reporting and corporate environmental reporting, in terms of users, qualitative characteristics, and the need for verification. Furthermore, the qualitative characteristics required for financial reporting are likely

generally applicable to non-financial reporting (Khan et al., 2021; Solomon, 2000). This thesis considers relevance (including materiality) and reliability in assessing the QSR of electricity generators, drawing mainly on Khan et al. (2021), but also with reference to Alrazi et al. (2016b), Al-Shaer and Zaman (2016), Hąbek and Wolniak (2016), Helfaya et al. (2019), and Rahman et al. (2019).

3.3.1 Relevance (including materiality)

The relevance quality dimension is employed in Chauvey et al. (2015), Hąbek and Wolniak (2016), Khan et al. (2021), and Rahman et al. (2019). It is one of the fundamental qualitative characteristics of the Conceptual Framework for Financial Reporting. The IASB (2018, p. A25) defines relevant information as "capable of making a difference in the decision made by users". The relevance dimension is one of the TCFD's principles for effective disclosure (TCFD, 2017), and SASB's principles for topic selection and elements of standardised presentation (SASB, 2017). The IASB further explains the relevance qualitative characteristic by describing the materiality concept as an entity-specific feature of relevance. For information to be relevant, it needs to be material. Materiality is associated with relevance: "Information is material if omitting, misstating or obscuring it could influence the decision making of primary users of financial reports" (IASB, 2018, p. A26). Both the SASB and GRI frameworks refer to materiality maps/matrices to provide guidance in identifying sustainability issues that are likely to affect the companies' operating and actual performance, as well as influence stakeholders' assessments and decisions (GSSB, 2016; SASB, 2018a). The IRF also describes a four-step process on the determination of materiality. Likewise, Corporate Sustainability Reporting Directive and European Sustainability Reporting Standards introduce the double materiality concept

comprising financial materiality and impact materiality as a key step in determining required disclosures for sustainability reporting (Deloitte, 2024). The materiality assessment process is a way to determine ESE issues that are most relevant and significant to the firm and its stakeholders (Calabrese et al., 2017) and that need to be disclosed in the SRs. Few prior studies incorporate materiality analysis in sustainability reporting (e.g., Cerbone and Maroun (2020); Farooq and de Villiers (2019); Ruiz-Lozano et al. (2022)), so this thesis contributes towards filling this gap in the literature.

3.3.2 Reliability

According to Badia et al. (2020), reliability refers to the ways of gathering, recording, compiling, analysing, and disclosing information and the process of preparing sustainability reports so that they can be examined, and so the quality and materiality of information can be ascertained. The GRI framework describes a reliable report as one which gives confidence to stakeholders that it can be checked or examined as to veracity of the report content (GSSB, 2016). Such checking can be done through assurance processes. Assurance enhances the credibility of sustainability reports and improves corporate reputation (Boiral et al., 2019b; Helfaya et al., 2019; Moroney et al., 2012; Simnett et al., 2009). Badia et al. (2020) and Khan et al. (2021) use the reliability dimension to measure QSR. Khan et al. (2021) find improvement in reliability sub-indicators, like report accuracy and readability, the other aspects of reliability (e.g. ongoing feedback and external verification have marginal improvement over the 13-year study period). Bangladesh banks do not depend on external assurance prior to communicating sustainability information to external stakeholders (Khan et al., 2021). On the other hand, Badia et al. (2020) show that only 28.57% of Italian public utility companies' reports are submitted for external verification.

Sustainability reporting, which is relevant and reliable, provides stakeholders with information that enhances decision making. Prior literature reveals different ways of defining quality constructs depending, *inter alia*, on the theoretical frameworks used by the researchers. As noted above, this thesis follows prior literature as well as considering qualitative characteristics espoused in the Conceptual Frameork for Financial Reporting, GRI principles, IIRC principles, and TCFD principles for effective disclosures. The details of these quality dimensions are discussed in Chapter 4.

3.4 Studies related to the electricity industry

Leopizzi et al. (2023) notes that studies in the electricity industry are considered emerging research topics with literature pertaining to sustainability reporting by electric utilities beginning around 1974, growing at just 1.42% annually, and showing a high degree of diversity. Similarly, Slacik and Greiling (2019) argue that the electricity industry remains under-researched in terms of sustainability reporting quantity and quality as a tool of stakeholder accountability. Most publications concern the power generation sub-sector (Akrofi et al., 2022), probably because it is one of the largest GHG emitters, hence a major contributor to climate change, and so has an important role to play in addressing the climate emergency.

There are 38 prior studies identified related to the electricity industry between 2001 to 2023. Around 50% of studies tend to mainly focus on environmental or climate related disclosures. Only seven studies focus on ESE while 13 articles focus on sustainability reporting using the GRI framework. Twenty seven studies focus on a single country or regional setting, covering many countries in Europe and the Asia/Pacific Rim region. There are nine prior studies that encompass the global setting, five of which are related to QSR.

The determinants of QSR have been identified in studies such as Alrazi et al. (2010), Alrazi et al. (2016b), Imperiale et al. (2023), and Rahman et al. (2019). Among such determinants are sustainability performance, use of GRI, International Organisation for Standardisation, CPP1, legal system, rule of law, financial measures (e.g., total assets, leverage, return on assets [ROA]), and governance factors (e.g., board size, gender diversity, Chief Executive Officer duality). Testing of most of these determinants are included in this thesis as they have been established in prior studies.

The literature review for this study suggests that there is a literature gap in terms of holistically assessing QSR i.e., covering the ESE pillars from a global perspective, over an extended period. While the works of Alrazi et al. (2010), Alrazi et al. (2016b), and Rahman et al. (2019) do offer a global perspective, they are limited to only the environmental dimension and single-period analyses. Anwar et al. (2021) focuses also only on the environmental area, although in a global setting and over multiple periods. Similarly, Traxler and Greiling (2019) focus on ESE, measuring extent or quantity of disclosures (absence or presence of disclosures based on the GRI G4 indicators), in a global setting, but with a single-year analysis only. Slacik and Greiling (2019) conduct a qualitative multi-year analysis of sustainability reports in a global setting, but this is limited to investigation of compliance with the materiality principle of GRI. While Slacik and Greiling (2020) then go on to determine the disclosure or non-disclosure (quantity or extent) of sustainability information, they do not consider the quality of disclosed information. This thesis, therefore, seeks to address these gaps by assessing the QSR of the top global S&P ranked

electricity generators from 2018–2020, which covers all three ESE pillars of sustainability. It also further contributes to literature on the determinants for QSR.

Table 3.1 builds on a summary of the literature by Slacik and Greiling (2020) by adding clusters for the focus area (in italics) and updating the references.

Table 3.1: Summary of studies in the electricity industry

Cluster (for Focus area)	Theories	References
Environmental	Agency theory, Stewardship theory, Legitimacy theory, Voluntary disclosure theory, Signaling theory, and Impression Management.	Alrazi (2014); Alrazi et al. (2010); Alrazi et al. (2016a); Alrazi et al. (2016b); Alrazi et al. (2018); Anwar et al. (2021); Bae (2014); Bahari et al. (2016); Camargos et al. (2014); Chang (2013); Freedman and Stagliano (2008); Kim and Lyon (2011; 2015); Kraft (2018); Meyer and Pac (2013); Moseñe et al. (2013); Rahman et al. (2019); Silva-Gao (2012); Talbot and Boiral (2018); van Staden and Hooks (2007)
Two pillars (Environmental and social)	Legitimacy theory; Stakeholder theory	Cormier and Gordon (2001); Eng and Fikru (2022)
Three pillars - Triple bottom line / ESE (Environmental, social, and Economic)	Agency theory, Strategic Stakeholder theory, Legitimacy theory, Ownership theory	Ait Sidhoum and Serra (2017); Gallego (2006); Mamun (2023); Ng and Nathwani (2012); Sartori et al. (2017); Slacik and Greiling (2020); Traxler and Greiling (2019)
Sustainability reports based on GRI Framework	Legitimacy theory, (Strategic) Stakeholder theory, Contingency theory, Neo-institutional theory, Signaling theory, Agency theory	Alrazi (2014); Alrazi et al. (2010); Alrazi et al. (2016b); Bakhtina and Goudriaan (2011); Camargos et al. (2014); Gallego (2006); Garcia et al. (2016); Moseñe et al. (2013); Roca and Searcy (2012); Sartori et al. (2017); Slacik and Greiling (2019); Traxler and Greiling (2019)
Other sustainability topics (e.g. CSR performance; tax related)	Agency theory, Institutional theory, Stakeholder theory	Branco et al. (2023); Shahbaz et al. (2020); Valor (2012)
Includes determinant(s) of sustainability reporting/ QSR	Agency theory, Legitimacy theory, Neo-institutional theory, Stakeholder theory	Alrazi et al. (2010); Alrazi et al. (2016b); Alrazi et al. (2018); Anwar et al. (2021); Chang (2013); Cormier and

		Gordon (2001); Imperiale et al. (2023); Kraft (2018); Rahman et al. (2019); Slacik and Greiling (2020); Traxler and Greiling (2019); van der Laan Smith et al. (2005)
Single country/regional setting on sustainability reporting	Legitimacy theory, Stakeholder theory, Contingency theory, Neo-institutional theory	Ait Sidhoum & Serra (2017); Alrazi et al. (2016a); Alrazi et al. (2018); Bae (2014); Bahari et al. (2016); Bakhtina and Goudriaan (2011); Camargos et al. (2014); Chang (2013); Cormier and Gordon (2001); Eng and Fikru (2022); Freedman and Stagliano (2008); Gallego (2006); Garcia et al.(2016); Imperiale et al. (2023); Kim & Lyon (2011; 2015); Kraft (2018); Lu et al. (2019); Mamun (2023); Meyer & Pac (2013); Moseñe et al. (2013); Ng & Nathwani (2012); Roca & Searcy (2012); Sartori et al. (2017); Sharratt et al. (2007); Silva-Gao (2012); Van der Laan Smith et al. (2005)
Global setting but one year period analysis on sustainability reporting	Legitimacy theory, Neo-institutional theory, Stakeholder theory	Alrazi et al. (2010); Alrazi et al. (2016b); Branco et al. (2023); Rahman et al. (2019); Traxler and Greiling (2019)
Global setting and multi-year analysis on sustainability reporting	Neo-institutional theory, Stakeholder theory, Logic, and Conversation theory	Anwar et al. (2021); Slacik and Greiling (2019, 2020); Talbot and Boiral (2018)

Note: Adapted from Slacik and Greiling (2020) but with updated list of prior literature and modified clusters for the focus area

3.5 Theoretical foundation

Three theories appear relevant to this thesis as explained below.

3.5.1 Stakeholder theory

As mentioned in Parmar et al. (2010), the word "stakeholder" first appeared in 1963 in a Stanford Research Institute (now SRI International, Inc.) internal memorandum challenging the perception that shareholders are the only group to whom management need to respond to. Freeman defines a stakeholder as "any group or individual who can affect or is affected by the achievement of the organization's objectives" (2010, p. 46). While there are many such stakeholder groups, shareholders have traditionally been regarded as the primary stakeholder group.

The stakeholder concept focuses on "developing and evaluating the approval of corporate strategic decisions" by stakeholders whose support is essential for the continued existence of the firm (Roberts, 1992, p. 597). There could be conflicting demands between and among stakeholders (Roberts, 1992), which the firm has to balance or align to. Thus, stakeholder theory suggests that for an organisation to be successful it must cater to the needs and interests of a broad range of stakeholders (Jadoon et al., 2021). Moreover, stakeholder theory focuses on the importance of good relationships between an organisation and its stakeholders for the firm's success (Traxler & Greiling, 2019). Donaldson and Preston (1995) discuss three distinct parts of stakeholder theory: descriptive, instrumental, and normative. The descriptive and instrumental components involve matters of fact and are part of social sciences (e.g., research about what companies and managers actually do, and research on the results of specific behaviour of

management, respectively). The normative strand is the domain of ethicists and represents the moral element and is the central core of stakeholder theory while the other two play a subordinate role (Donaldson & Preston, 1995).

Moreover, disclosing sustainability activities to communicate matters like favourable environmental performance, if perceived as credible by investors, may increase firm value (Eng et al., 2022). Stakeholder groups exert varying degrees of power on the organisation, depending on their classifications, such as low-proximity or high-proximity, active or passive (Schons & Steinmeier, 2016; Traxler & Greiling, 2019), and primary or secondary stakeholders (D'Souza et al., 2022). Getting the support of stakeholders, particularly those that influence the achievement of company goals, incentivises managers to report social and environmental issues (Bebbington et al., 2014). Increasing pressure from stakeholders has driven organisations towards embedding social and environmental considerations into their business strategies and operations and engaging a variety of stakeholders (Le Roux & Pretorius, 2019).

Stakeholder theory, therefore, appears an appropriate lens for this thesis, considering that an important reason for many firms' non-financial disclosures is to satisfy the information requirements of their stakeholders. This connection deepens in that this thesis draws items for the quality assessment instrument from GRI. Stakeholder engagement (inclusiveness) is a basic element of this instrument, as it is seen as a contributor to non-financial reporting quality (Badia et al., 2020). Moreover, policies to adopt external assurance and increased involvement of stakeholders could help improve QSR (Badia et al., 2020).

On the determinants of QSR, stakeholder theory can also help explain the relationship between sustainable boards (which includes gender diversity, sustainability experts, and sustainability-related executive compensation) and CSR (sustainability) reporting. Consistent with stakeholder theory's assumption that organisations must satisfy the needs of stakeholders (Freeman, 2010), boards of directors should identify the legitimate concerns of various stakeholder groups regarding sustainability related activities of the company and report on these (Velte, 2023).

Moreover, consistent with stakeholder theory, firms should consider the interests of all stakeholders who can affect or be affected by the firm (Pucheta-Martínez & Chiva-Ortells, 2018). Accordingly, boards increasingly make sustainability related decisions (Pucheta-Martínez & Chiva-Ortells, 2018). Institutional board members are expected to encourage sustainability practices that focus on ESE issues, which can enhance firm value.

3.5.2 Legitimacy theory

Legitimacy theory has been defined by many (Deegan, 2002; Di Tullio et al., 2019; Dowling & Pfeffer, 1975; Guthrie et al., 2007; Suchman, 1995). Suchman (1995, p. 574) defines legitimacy as: "… a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions." Being part of a broader social system, organisations exist to the extent that the particular society considers that they are legitimate, and as such, society "confers" upon the organisation the "state" of legitimacy (Deegan, 2002, p. 292). Legitimacy theory suggests that organisations desire to be recognised as legitimate by their stakeholders (Moloi & Marwala, 2020). The scope of legitimacy theory is expanded in Archel et al. (2009) to consider the state's

role in social and environmental disclosures of companies for legitimation purposes in terms of inhibiting or assisting interventions (e.g. regulations) to achieve business legitimation strategies (Archel et al., 2009).

A number of prior studies on sustainability reporting in the electricity industry have built on legitimacy theory (Alrazi et al., 2010, 2016b; Kraft, 2018; Traxler & Greiling, 2019). From a legitimacy theory standpoint, companies with poor CSR performance and disclosure will be perceived as "poor corporate citizens" (Freedman & Stagliano, 2008, p. 479). Thus, the company should report its ESE performance to demonstrate fulfillment of, and compliance with, the value systems of the society of which it is a part. Moreover, firms employ disclosures to guarantee continued access to capital and to emphasise activities aimed at bringing the firm's performance in accordance with society's expectations, or to justify any gap or underperformance (Alrazi et al., 2016b). This is consistent with the implied contract between the firm and the society assumed in legitimacy theory (Nobanee & Ellili, 2016) in which disclosures play a part in legitimising firms (Alrazi et al., 2016b). In line with the firm's social contract with its stakeholders and wider society, it has to gain social acceptance by complying with social norms and expectations (Bui et al., 2020). An example of promoting socially acceptable goals is the inclusion in the company's governance policy of requirements to hire a certain number of women or people from an ethnic minority, as a means of complying with universal inclusivity or gender diversity goals. The organisation may also opt to deny or refrain from disclosing activities or results which may undermine its legitimacy (Ashforth & Gibbs, 1990).

For environmentally sensitive industries like the electricity industry, Manes-Rossi and Nicolo (2022) argue that the critical employment of legitimacy theory can help explain how the

disclosures of sustainability-related actions and strategies can be carried out. Sustainability reporting is an instrument of firms to assist them to adapt to stakeholder expectations and external pressures, and to increase transparency and accountability (Badia et al., 2020). This, in turn, enhances firm legitimacy and facilitates management of firm reputation, as well as demonstrating conformity with social norms (Alrazi et al., 2016b).

Legitimacy theory is, therefore, also useful in this thesis in helping to explain contributory factors relating to results of QSR assessments. For example, legitimacy theory can explain the relevance of sustainable board governance (which includes board gender diversity) and CSR outputs (Velte, 2023). One of the determinants of QSR identified in prior literature is board gender diversity, specifically inclusion of women on corporate boards, as part of sustainable board governance. According to Velte (2023), the presence of women on a board, along with the existence of a sustainability committee, a Chief Sustainability Officer, and sustainability related compensation, will change a board's direction and monitoring efforts, leading to full CSR reporting in accordance with international guidelines like GRI. Moreover, the firms' CSR performance may improve, thereby boosting corporate reputation and attraction among stakeholders (Velte, 2023). According to legitimacy theory, good (poor) sustainable board governance will likely impact positively (negatively) on CSR reporting performance (Velte, 2023).

3.5.3 Institutional theory

Institutional theory suggests that firms have a tendency to act in socially responsible ways in environments with rigorous government regulations, industrial self-regulation, independent,

private monitoring organisations, and in "normative institutional environments" promoting socially responsible behaviour (Campbell, 2007, p. 962). The above are all forms of external pressure, which trigger the institutionalisation of certain practices and lead to firms' isomorphism (Zharfpeykan & Ng, 2021). DiMaggio and Powell (1983) describe three isomorphic pressures - coercive, mimetic, and normative. To elaborate, the process of institutionalisation may stem from coercion (e.g. government regulations, laws, or market changes); or mimetic pressures, where firms model or imitate other (successful) firms' behaviour; or norms (shared values through professionalisation or formal education) (DiMaggio & Powell, 1983; Gray et al., 2009). For example, a leading company, in terms of compliance with mandatory sustainability reporting regulation, may put pressure on other companies within the same industry to take initiatives to meet reporting requirements. Institutional theory also suggests that "self-regulatory structures" can be institutionalised enabling the development of a set of practices to generate real commitment to regulatory compliance (Short & Toffel, 2010, p. 363).

Institutional influences, such as society's expectation for transparency in corporate behaviour, may be achieved through regulatory and legislative action (Bebbington & Dillard, 2009). Institutional theory has been applied to examine diverse social and environmental reporting practices, non-disclosure, and symbolic versus substantive behaviour (Bouten et al., 2011), as well as to evaluate the impact of regulatory guidelines on QSR (Khan et al., 2021). Likewise, it has been adopted to assist in understanding the influence of institutional factors, as well as internal and external stakeholder pressures (Hyatt & Berente, 2017; Uyar et al., 2021) on QSR across nations, or across different domains (Geerts et al., 2021). Gray et al. (2009) highlight the

close relationship that institutional theory has with both stakeholder theory and legitimacy theory further justifying the inclusion of these three theories for purposes of this thesis.

Application of this theory to studies on the QSR in the electricity industry has been somewhat limited. However, Anwar et al. (2021) and Rahman et al. (2019) provide evidence in support of coercive isomorphism with studies showing a positive relationship between carbon pricing policies and voluntary environmental disclosure quality.[6] Moseñe et al. (2013) find that institutional pressures for reporting have been replaced by mimetic isomorphism resulting in a decrease in the differences between disclosure practices of Spanish companies.

This thesis is, therefore, informed by a multi-theoretical framework (Cormier et al., 2005), mindful that sustainability reporting is too complex to be building on a single theory (Garde Sánchez et al., 2017; Larrán Jorge et al., 2019). Specifically, this thesis considers stakeholder, legitimacy, and institutional theories to assist in understanding and explaining how some variables can influence (Larrán Jorge et al., 2019) the QSR of electricity generators. The combination of these three theories provides a richer theoretical framework within which to assess the QSR and its determinants.

3.6 Describing QSR

Authors have used several terms to describe the QSR of companies. Examples of these terms are "symbolic or substantive" (Ahmed Haji & Anifowose, 2016; Khan et al., 2021; Manes-Rossi & Nicolo, 2022; Nor Ahmad et al., 2022), "decoupling" (García-Sánchez et al., 2021; Tang et al., 2023; Tashman et al., 2019), which is the difference between sustainability disclosure and

[6] Carbon pricing policies are examples of pressure of government or regulatory policy.

sustainability performance (García-Sánchez et al., 2021); “cosmetic or organic” (Khan et al., 2023), “greenwashing” (Delmas & Burbano, 2011; Kim & Lyon, 2015; Walker & Wan, 2012), a more negative form of the symbolic approach (Bowen & Aragon-Correa, 2014), and “high” and “low” quality disclosures (Alrazi et al., 2016a; Alrazi et al., 2010; Hooks & van Staden, 2011). Sebrina et al. (2023, p. 25) also uses “low disclosure” to describe the QSR of Indonesian companies, as well as “acceptable”, “satisfying”, and “less acceptable” as QSR descriptors. Amran et al. (2014a, p. 226) describe the QSR of companies in the Asia-Pacific region as “generally above average” with a mean value of 0.577. Likewise, Obeng et al. (2021) classify integrated report scores from the ASSET4 database as high (low) if the score is above (below) the yearly median of the integrated report score in their sample. Other words used in electricity related studies that are consistent with the high or low QSR nature include “overall level of EID … lower” and “EID of few firms are bigger than 0.5” (Chang, 2013, p. 644) [EID referring to environmental information disclosures], “highest compliance rate” (Mamun, 2023, p. 482), or “poor quality” and “high quality” (Imperiale et al., 2023, p. 4).

Deeper analysis of the above terms reveals that “symbolic” QSR is related to low scores, while “substantive” QSR is associated with high scores (Ahmed Haji & Anifowose, 2016; Khan et al., 2021; Manes-Rossi & Nicolo, 2022). This relationship holds for “cosmetic” and “organic” QSR (Khan et al., 2023) and in general for the other descriptors noted above. The point of differentiation for binary descriptors is the mean values of the QSR scores measured. This study therefore simply adopts “high” or “low” as descriptors based on mean scores for each QSR measure where scores above the mean are considered high QSR, otherwise low QSR.

Moreover, the quality of disclosures is assessed normally using an assessment tool that integrates the scoring criteria (Hooks & van Staden, 2011). In most prior studies, the disclosure indices or assessment tools employed to assess QSR vary. Some are purpose built by the researchers, while others are based on indicators provided in sustainability reporting frameworks e.g., GRI, SASB, IRF, TCFD, or European Union Directive 2015/95/EU. Other researchers make use of available databases like ASSET4 for integrated report scores and Bloomberg for sustainability disclosure scores. Likewise, the scoring scale, which is embedded in the assessment tool, also varies. This disparateness in assessment tools used, and scoring criteria may lead to conflicting results among studies.

Achieving high sustainability performance involves genuine organisational change(s) through the development and execution of business strategies that take into account the interests of the firm's stakeholders. However, firms' responses to stakeholder pressures tend to vary and, hence too, the strategies they adopt/ actions they prioritise under given circumstances (García-Sánchez et al., 2021). Such responses carry over to sustainability reporting. For example, reporting on engagement with stakeholders in the mining industry may reflect (1) a one-directional and corporate driven attitude, rather than (2) two-way communication/ genuine discussion with critical stakeholders as to how to achieve sustainable mining (Böhling et al., 2019). Alternative (1) simply aims to achieve reputational capital (feigning a desire to learning about community concerns or boasting knowledge about sustainable mining); while alternative (2) is concerned with agreeing on concrete actions with timelines to resolve issues identified. In exploring the SDG reporting practices of 15 European energy sector companies, Manes-Rossi and Nicolo (2022) find that only a handful of energy companies demonstrate practical and long-term strategies and objectives to incorporate the most relevant SDGs to their operations. The authors

argue that a top-down approach starting with a willingness to contribute to the achievement of SDGs by embracing and operationalising these SDGs in core business operations is needed. Moreover, Khatri and Kjærland (2023) assume that companies engage in high quality-enhancing practices where sustainability reporting is incentivised by more than just a desire for legitimacy. However, as long as there are discrepancies between reporting (corporate talk) and actual practice (corporate walk), especially in policy implementation (Nor Ahmad et al., 2022), a genuine approach to sustainability cannot be achieved.

The discussion above highlights why this thesis is concerned with investigating whether the QSR of electricity generators is high or low. Consistent with Khan et al. (2021), the following research question is proposed:

RQ1: What is the electricity generators' QSR?

3.7 Determinants of QSR

Many studies focusing on varied areas of sustainability and involving many different industries and country settings have identified a large number of factors affecting QSR. These influencers include financial measures, governance characteristics, ownership structures, country level factors, institutional factors, and various other internal and external determinants. Examples include: reporting regulations (Khan et al., 2021; Kraft, 2018), reporting frameworks used e.g., GRI (Khan et al., 2021; Rahman et al., 2019; Sreepriya et al., 2023), sustainability performance (Eng & Fikru, 2022; Imperiale et al., 2023; Khan et al., 2021), legal system (Alrazi et al., 2010, 2016b), governance (Al-Shaer & Zaman, 2016; Marquis & Qian, 2014; Shahbaz et al., 2020; Singhania et al., 2023), gender diversity (Al-Shaer & Zaman, 2016; Gerwing et al., 2022; Moses

et al., 2020; Singhania et al., 2023), rule of law (Alrazi et al., 2016b), carbon pricing policy (Rahman et al., 2019), institutional shareholding (Khan et al., 2021; Shafai et al., 2024; Shahab & Ye, 2018), foreign shareholding (Correa-Garcia et al., 2020; Ismail et al., 2018; Khan et al., 2021), external financing required (Gao et al., 2016), and financial measures/ performance (Dong et al., 2023; Eng et al., 2022; Lee et al., 2023; Mion & Adaui, 2019; Rukmiyati et al., 2023). Chang et al. (2019) also identify institutional, cultural, and corporate factors that affect QSR (e.g., country of origin, Islamic and non-Islamic, territorial extent of the company, government ownership, and vision and mission).

This thesis focuses on the relationships between QSR and determinants flowing from the above studies (Alrazi et al., 2016b; Ismael et al., 2018; Khan et al., 2021; Rahman et al., 2019) to answer the following research question:

RQ2: What are the determinants of the electricity generators' QSR?

3.8 Hypothesis development

Seven determinants of QSR are selected as they have been argued and examined in various previous studies, across single and multiple industries, and across different country settings. These are sustainability performance, use of the GRI framework, gender diversity, rule of law, carbon pricing policy, institutional shareholding, and foreign shareholding. Most of the studies mentioned in Section 3.7 do not deal with the electricity industry except for a few (e.g., Alrazi et al. (2016b) and Rahman et al. (2019), hence this thesis investigates if these drivers do hold for

the electricity industry. These variables are also selected as they can be objectively measured or captured (Breakwell & Tytherleigh, 2010; Elmagrhi & Ntim, 2022).

3.8.1 Sustainability performance

The relationship between QSR and sustainability performance may be explained through institutional theory and legitimacy theory. Shabana and Ravlin (2016) argue that substantive CSR reporting enables an organisation to build its reputation and improve legitimacy. This, in turn, promotes corporate social performance. For example, companies' compliance with best practice in sustainability reporting reduces information asymmetry and improves transparency (Nobanee & Ellili, 2016). This enables investors to make more informed decisions through better comparison and evaluation of investment risks and opportunities (Girón et al., 2020). Moreover, according to Khan et al. (2021), social performance contributes to improving the company's market reputation and enjoying competitive advantage, while also benefiting society as a whole. Conversely, poor corporate social performance may negatively impact on firm reputation and legitimacy (Shabana & Ravlin, 2016).

Sustainability disclosures refer to information provided by companies in their sustainability reports or annual reports. On the other hand, sustainability performance is the actual result of companies' sustainability related efforts. The question arises as to whether sustainability reports present valuable information on the firms' actual sustainability performance (Papoutsi & Sodhi, 2020). Companies may either provide useful information through sustainability reports indicating their actual performance, or use these reports (Papoutsi & Sodhi, 2020) to achieve legitimacy.

Legitimacy theory warns, however, that a firm's voluntary disclosures do not necessarily signify its desire for transparency and accountability in its performance and climate commitment but may rather be a response to external pressures (Talbot & Boiral, 2018). In the same vein, Alrazi et al. (2016b) find that the level of overall environmental disclosure is not influenced by environmental performance (measured as CO_2 emissions). The authors suggest this is an industry specific finding as electricity generators are considered to be amongst the largest contributors to climate change, and hence subject to increased scrutiny and external pressures (Alrazi et al., 2016b). The authors find that level of disclosure is influenced more by the variation in differing countries' social norms/beliefs than by their environmental performance. Similarly, Wiseman (1982) finds no association between the quality of environmental disclosures in annual reports of companies and their actual environmental performance using an index of disclosures.

Imperiale et al. (2023) study 146 US Utilities during the period 2017 to 2021 to explore the association between sustainability reporting and ESG performance (total ESG, environmental, social, and governance). Their analysis shows that environmental and social performance, as well as total ESG performance have positive and significant relationships with sustainability reporting while governance performance is positive but not significantly associated with sustainability reporting (Imperiale et al., 2023). On the other hand, in their study of 47 investor-owned electric utilities in the United States of America, Eng and Fikru (2022) find no strong association between QSR and sustainability performance. Sustainability performance is described in more detail in Section 4.3.1.2.

To conclude, there are mixed results in the literature about the association between environmental performance and environmental disclosures, so this thesis proposes the following null hypothesis:

Hypothesis 1 (H1)- There is no relationship between sustainability performance and the QSR of electricity generators.

3.8.2 Use of the GRI framework

The GRI framework is the most widely used sustainability reporting framework applied by companies to provide stakeholders with sustainability information (Nobanee & Ellili, 2016). This is supported by a more recent survey's finding that 78% and 68% of the G250 and N100 companies respectively, adopt the GRI Standards (KPMG, 2022). Graafland and Smid (2019) note that the GRI framework provides guidelines and indicators for CSR reporting developed to address material matters identified by the firm and its stakeholders (Tarquinio et al., 2018). However, firms show reluctance to engage in substantive adoption of the GRI guidelines, due to costs involved in implementation and verification. This may explain why some studies find no association between use of GRI guidelines and higher quality disclosure (e.g., Bromley and Powell (2012) and Michelon et al. (2015)).

Chelli et al. (2018), however, report positive results between use of GRI guidelines by Canadian firms and additional environmental disclosures that support legitimacy. Similarly, Khan et al. (2021) find that companies adopting GRI guidelines have higher QSR. This may mean that companies apply GRI guidelines to appear to improve sustainability performance by merely

"ticking more GRI boxes" (Khan et al., 2021, p. 346). Rahman et al. (2019) also note the significance of the use of GRI guidelines for the quality of voluntary environmental disclosures, which results in normative pressure in an isomorphic manner. One issue observed in the application of GRI guidelines by electric utilities in Brazil is the mention of indicators in the GRI content index, which were not supported by any detail in the report text or were not in compliance with the GRI proposed protocols (Camargos et al., 2014), thus affecting the credibility/quality of affected sustainability reports.

A more recent study by Henriques et al. (2022) explores the relationship between QSR and use of the materiality principle/reporting frameworks such as those of the GRI and IIRC. Their sample of 31 companies operating in the Iberian Peninsula (133 company-year observations) suggests that there is a positive and significant relationship between disclosure quality when applying the materiality principle and GRI, suggesting a better application of this principle by using the GRI framework.

The mixed findings regarding associations between use of the GRI framework and QSR lead to the following proposed hypothesis:

Hypothesis 2(H2) - There is no relationship between the use of the GRI framework and the QSR of electricity generators.

3.8.3 Board gender diversity

An innate responsibility of corporate boards is to represent and defend stakeholders' interests (Gerwing et al., 2022) through corporate governance mechanisms, which include gender

diversity. The presence of more women on a board promotes a wider perspective and may play a critical role in terms of sustainability reporting compared to boards comprised of men only (Gerwing et al., 2022). Gender is, therefore, one differentiating trait of board members frequently considered in research, along with nationality (Prado-Lorenzo & Garcia-Sanchez, 2010).

Prior studies provide evidence on the positive impact of governance gender diversity on QSR. For example, Al-Shaer and Zaman (2016) find an overall positive significant association between board gender diversity and QSR in the United Kingdom context. Moreover, Moses et al. (2020) conduct a literature review on sustainability reporting practices and QSR in relation to corporate governance in studies involving Malaysian companies. The authors establish a positive relationship between QSR and various board governance aspects, such as gender diversity, communication, integrity, political connection, and external assurance. Likewise, García-Sánchez et al. (2019), in an international setting, find a positive association between female directors and reliable, comparable, and balanced sustainability information thus reducing the risk of impression management schemes. Shahbaz et al. (2020) provide evidence that companies in the electricity/ energy sector are likely to be more committed to CSR when they have a more gender-diverse board. More recent studies also confirm a positive relationship between QSR and gender diversity (Gerwing et al., 2022; Singhania et al., 2023).

Singhania et al. (2023) also find the presence of women directors and the number of independent female directors are positively and significantly associated with QSR. They argue that it is highly likely that the QSR improves (in terms of having committees responsible for sustainability practices, publishing sustainability reports, and having an internal audit to evaluate the cost-

benefit of sustainability practices) as the percentage of women directors increases (Singhania et al., 2023). Gerwing et al. (2022) investigate sustainability reporting quality for 220 German firms in accordance with the European CSR Directive (2014/95/EU) and find a positive association with gender diversity at the supervisory board level, sustainable remuneration[7] of the executive board, engagement in CSR, existence of a CSR committee, and external assurance. Other authors that find positive association between gender diversity are Erin et al. (2022) and Abdul Latif et al. (2023).

On the other hand, prior literature also includes findings suggesting there is no association between gender diversity and QSR. For instance, in the case of Indonesian and Malaysian oil and gas companies, Burhany et al. (2024) find that the presence of women as board members does not have an impact on QSR. Similarly, Yusoff et al. (2015) find no association between the proportion of female board directors and environmental reporting quality of publicly listed Malaysian companies.

In summary, the positive and significant findings overshadow the other findings. It can be argued that female directors can foster participative decision making and bring diverse values and opinions to the boardroom (Abdul Latif et al., 2023), which may result in improvement of corporate sustainability activities and reporting. Thus, from the preceding discussion and based on the impact and relevance of women directors from legitimacy theory's perspective (Erin et al., 2022), this thesis posits the following hypothesis:

[7] "Relevant corporate mechanism linking management remuneration with sustainability components" (Gerwing et al., 2022, p.525)

Hypothesis 3 (H3) - There is a positive relationship between board gender diversity and the QSR of electricity generators.

3.8.4 Rule of law

As defined in Kaufmann et al. (2011, p. 223), the rule of law means "capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence." The advantages of strong rule of law enforcement cascades from the government level to the lowest level of society, including the corporate level. At the corporate level, this may lead to exercise of transparency and accountability in terms of providing high quality sustainability disclosures to the company's stakeholders.

In a study of the environmental disclosures of the electricity industry in a global setting, Alrazi et al. (2010) and Alrazi et al. (2016b) show a positive association between the country's rule of law and the overall emissions disclosures by electricity generators. Similarly, Alrazi et al. (2018) find that the most important institutional factors influencing carbon emissions disclosures are the country's rule of law, compliance with GRI guidelines, and commitment towards the environment. Likewise, Frías-Aceituno et al. (2013) find that companies domiciled in countries with a stakeholder-orientation and with strong legal enforcement are more likely to provide extensive integrated reports. This is consistent with legitimacy theory and institutional theory where companies disclosure sustainability information to enhance legitimacy and comply with social norms (Alrazi et al., 2016b), and to act in a socially responsible way (Campbell, 2007), respectively. Contrarily, Alrazi et al. (2010) and Alrazi et al. (2016b) find a positive (negative)

and insignificant association between rule of law and overall environmental disclosures. Based on the literature review, more authors find a positive relationship between rule of law and QSR, as such, the relevant hypothesis is:

Hypothesis 4 (H4)- There is a positive relationship between the country's rule of law and the QSR of electricity generators.

3.8.5 Carbon pricing policy

Carbon pricing is a key element of multilateral initiatives (e.g., 2015 Paris Agreement) to address climate change (Green, 2021). Carbon pricing mechanisms for government can be in the form of an emissions trading scheme or carbon taxes (Rahman et al., 2019). The emissions trading scheme has a cap (Ko & Lee, 2022) on the allowable amount of emissions (Rogge et al., 2011) and the cost of emissions will vary depending on the supply (scarcity or over supply) of allowances to emit or tradable emission units. There is a platform for distribution and/or auction of allowances, and also to track, trade, and retire these allowances. In addition, the platform may allow for an offset mechanism enabling emitters to pay for "decarbonising activities" (Green, 2021, p. 2). Heavy polluters can simply buy from the market allowances at a lower cost, whereas other firms can offset their environmental innovation cost to reduce GHG emissions from the funds paid to them by heavy polluting firms (Ko & Lee, 2022).

By contrast, with a carbon taxes scheme, there is no limit on emissions, as long as the regulated firm is able to pay the tax (price) set by the government, hence it is comparatively easier to administer than an emissions trading scheme (Green, 2021). Carbon taxes also aim at reducing GHG emissions or use of taxed fossil fuels through tax rate increases to entice economic actors

to invest in clean power that will save them the cost of carbon taxes (Ko & Lee, 2022). These economic actors have to weigh the costs and benefits of investing in GHG reduction efforts or cleaner production versus paying taxes.

Consistent with global initiatives to address climate change, countries have enacted environmental regulations aimed at protecting the environment. Such regulations are likely to affect environmental sustainability disclosures (Hrasky, 2012). For example, it will be necessary to provide non-financial information about the impact and risks associated (Bebbington & Larrinaga-González, 2008) with the adoption of the emissions trading scheme. This is important because stakeholders, such as investors, the general public, and policy makers, expect relevant information to help them assess carbon intensity, as well the regulatory and competitive risks that the firm may likely encounter (Bebbington & Larrinaga-González, 2008). Moreover, many countries have launched a carbon pricing policy, especially in areas with high environmental issues (Rahman et al., 2019). High demand for environmental information is expected by companies' stakeholders (Rahman et al., 2019), thus affecting sustainability reporting. Cowan and Deegan (2011) see that disclosures are reactive to the implementation of Australia's first national emissions reporting scheme. Companies may also become selective in their disclosures highlighting only the positive environmental results, but concealing information on negative results (Kim & Lyon, 2011), adversely impacting the QSR.

Studies on carbon pricing deal with carbon pricing and decoupling between GHG emissions and economic growth (Ko & Lee, 2022), internal carbon pricing and financial performance (Ma & Kuo, 2021), and carbon policy to decrease carbon dioxide emissions (Szasz, 2023). No study

has, as yet, been identified concerning the impact of carbon pricing policy on the QSR beyond just environmental disclosures. A national carbon pricing policy has been found to improve the quality of voluntary environmental disclosures (Rahman et al., 2019). Also, Anwar et al. (2021) indicate that when a country implements an emissions trading scheme or carbon tax, electricity generators respond proactively with increased voluntary environmental disclosures, even including aspects not yet covered by regulation to avoid stricter government regulations. Government influence, by way of an indirect isomorphic pressure, is recommended in order to improve the quality of environmental disclosures and promote transparency on the part of companies (Rahman et al., 2019). Institutional theory helps explain the formal or informal pressure of institutional arrangements on the firms' sustainability reporting practices (Rahman et al., 2019). Similar arguments are likely to hold for CSR reporting in the broader sense. Alrazi et al. (2016b) also show a positive and significant relationship between the emissions trading scheme and environmental disclosures quality. These findings in prior literature lead to the following hypothesis:

Hypothesis 5 (H5) - There is a positive relationship between carbon pricing policy and the QSR of electricity generators.

3.8.6 Institutional shareholding

Kaminker and Stewart (2012) contend that the decarbonisation of the world's energy system requires gigantic investments in green infrastructure of between USD 36-42 trillion between 2012 and 2030 or approximately USD 2 trillion per year. They note that with an investment of only USD 1 trillion annually, there is an annual USD 1 trillion investment gap, which needs to be

addressed. While governments recognise the huge amount required to decarbonise their economies, many acknowledge the need for recourse to private capital - institutional investors who may potentially assist in the financing clean energy projects (Kaminker & Stewart, 2012). With bigger voting rights, institutional shareholders become more powerful as they want to report more ESE disclosures to increase the firm's "competitive advantage in the market" and "investment opportunities" (Bae et al., 2018, p. 4).

There are a few studies on the relationship between sustainability reporting and institutional shareholding, but none found that focus on the electricity industry. However, prior literature suggests interesting possibilities relating to sustainability disclosures and institutional ownership (Shahab & Ye, 2018). For example, Shahab and Ye (2018) investigate the CSR disclosures of Chinese listed companies. They find that institutional shareholding has a positive and significant association with QSR. In a study examining the quantitative impact of mandatory integrated reporting on listed South African companies, Conway (2019) finds that higher report quality is associated with higher levels of institutional investors' stockholding. Through increased voting rights, institutional owners are empowered to direct the disclosure of more environmental, economic, and social information thus enhancing the QSR practices, and expanding their investee company's investment prospects in the market (Das et al., 2023). Shafai et al. (2024) also document significant relationships between QSR and institutional shareholding. Following stakeholder theory, companies will respond to the expectations of powerful stakeholders, like institutional investors; one such response will be in terms of disclosure (Dibia & Onwuchekwa, 2015) of sustainability information.

On the other hand, Khan et al. (2021) find no significant relationships between the percentage of institutional investors' ownership and QSR by Bangladesh banks. Ismail et al. (2018) also prove that institutional shareholding has no significant influence on the corporate environmental disclosure (CED) quality in their study of companies in the oil and gas industry in developing countries. This could be due to lower percentages of institutional ownership, which means limited bargaining power on the boards to compel the disclosure of more voluntary sustainability information (Masum et al., 2020). In the light of these conflicting findings in prior literature, the relevant hypothesis is:

Hypothesis 6 (H6) - There is no relationship between institutional shareholding and the QSR of electricity generators.

3.8.7 Foreign shareholding

Foreign shareholders are equipped with experience, expertise, different cultures, and values that they can share with other shareholders. According to Aksan and Gantyowati (2020), foreign investors will invest in firms that implement good governance, have excellent protection, and disclose valuable information. These foreign shareholders play an important role in the company as they are likely to require disclosure of sustainability issues (Bae et al., 2018) consistent with the stakeholder theory view related to the primary stakeholder pressure for sustainability responsibility and operations (D'Souza et al., 2022). Thus, firms need to continuously improve reporting of sustainability information in communicating with external foreign stakeholders and counterparties (Dong et al., 2023).

Ismail et al. (2018) validate the positive and significant relationship between CED quality and foreign shareholding. The finding of this study suggests the importance of stakeholders in the advancement of sustainability reporting (Wang, 2017). Likewise, Correa-Garcia et al. (2020) show that foreign ownership improves QSR in Latin American business groups. This suggests that due to the presence of a greater number of economic, cultural, and strategic visions, business groups with broadened foreign ownership portfolios are more committed to improving sustainability practices (Correa-Garcia et al., 2020), and also their QSR. Al Amosh and Khatib (2022) also argue that foreign ownership can help maximise stakeholders' value and improve corporate governance by way of urging corporate administrations to respond to their needs and wants, including reporting of sustainability information. Ananzeh et al. (2023) also find a positive significant association between foreign ownership and environmental disclosure quality.

However, prior literature does show somewhat mixed results on the association between foreign shareholding and sustainability reporting (Al Amosh & Khatib, 2022). Contrary to the findings mentioned above, Abdul Latif et al. (2023) find that foreign ownership is negatively and significantly associated with QSR. Khan et al. (2021) find no significant relationship between the percentage of foreign investor ownership and QSR by Bangladesh banks.

In view of the mixed findings in prior literature, the hypothesis developed is:

Hypothesis 7 (H7) - There is a positive relationship between foreign shareholding and the QSR of electricity generators.

3.9 Chapter summary

This chapter reviews the literature on sustainability reporting and reporting quality constructs as the basis for developing research questions and hypotheses. The research questions developed relate to assessing the nature of QSR (high or low), and the determinants of QSR. Hypotheses are also developed to test selected determinants of QSR, based on findings in prior literature.

CHAPTER 4

RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

The aim of this thesis is to investigate the quality and drivers of electricity generators' sustainability reporting. To seek a better understanding of this research problem, two research questions are formed to assess the QSR and to investigate the determinants of the QSR.

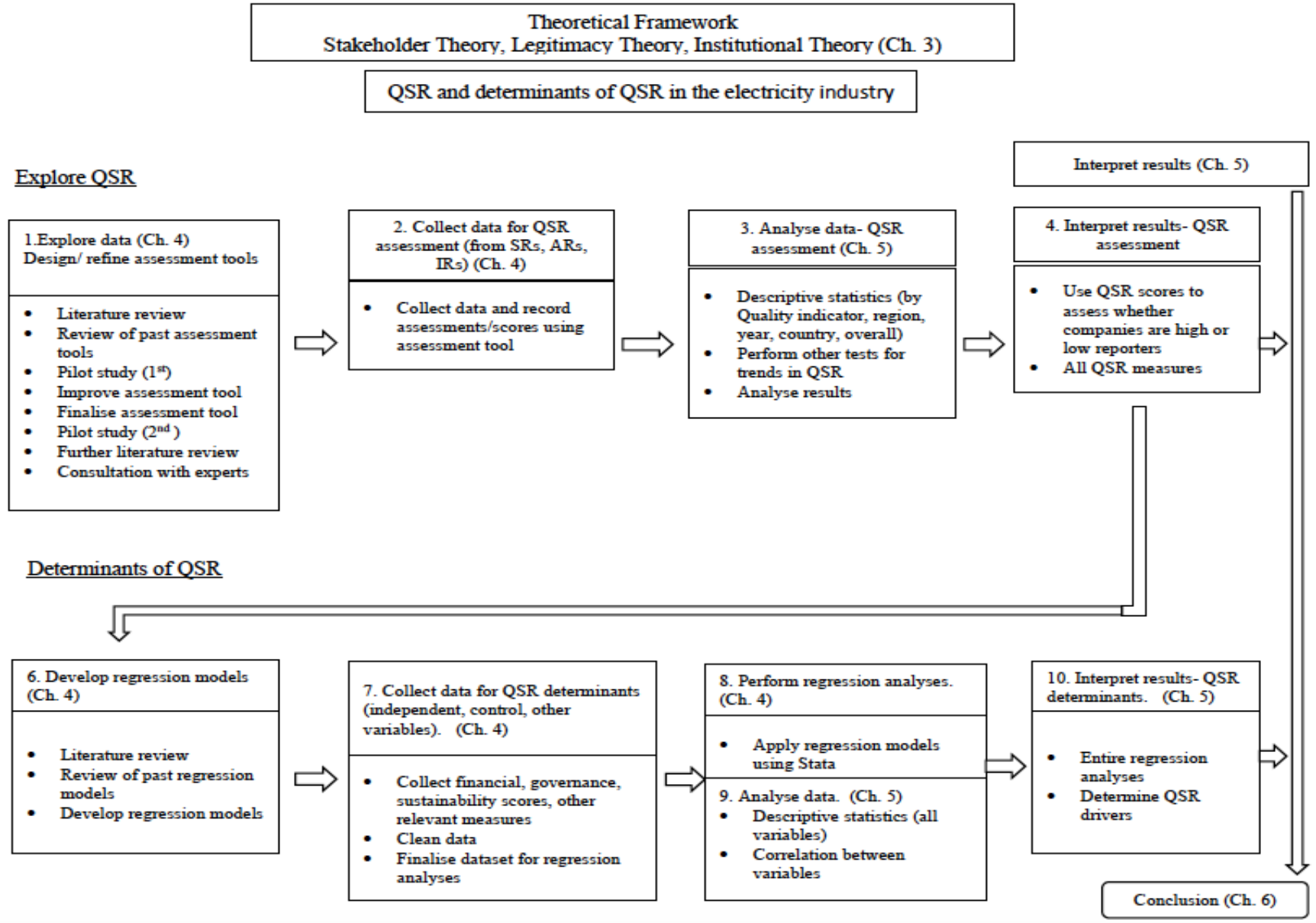
This thesis employs the mixed methods research approach involving both qualitative and quantitative research methods (Creswell, 2015). According to Creswell (2015), the employment of mixed methods is useful to gain a fuller understanding of the problem than is possible through the use of a qualitative or quantitative approach alone, due to the inherent weaknesses in each method. In this thesis, for example, collection and analysis of qualitative data is most useful in promoting an understanding of the nature of electricity generators' QSR. However, to better understand the factors influencing QSR requires use of quantitative data and research methods.

According to Creswell (2015), there are three basic mixed methods designs, namely convergent design, explanatory sequential design, and exploratory sequential design, as well as three advanced designs where additional features are included in the basic design. These are intervention design, social justice or transformative design, and multistage evaluation design.

Exploratory sequential design most closely describes the approach taken for this thesis. This starts with qualitative data collection and analysis and is followed by quantitative data collection and analysis. The first phase builds on the literature review to explore the problem and past assessment tools used, then an instrument (assessment tool) for collection of qualitative data relating to the nature of QSR is designed. The assessment tool is then used to assist with the content analysis of sustainability related disclosures, resulting in scores per company and per year. The main outcomes of this first phase are the three dependent variables (QSRRM, QSRR, QSRTotal). We use some descriptive statistics to better understand these variables, as they form the basis of the models used for the second (quantitative) phase. The next step in sequential design is to then perform the quantitative work of collecting data for independent and control variables to be used in regression analysis. Descriptive statistics are generated again to better understand the independent and control variables. Correlation analysis between variables is then conducted, followed by multivariate regressions to test the hypotheses. Analysis and interpretation of regression results lead to uncovering QSR determinants.

Data collection is a lengthy process as the researcher has had to hand collect data from the reports of the 100 sample companies for three years (2018-2020). Most companies issue separate sustainability reports, and at the same time include sustainability information in their Annual Reports. Figure 4.1 shows the study framework, adapted from Creswell (2015), illustrating the application of exploratory sequential design in this thesis.

Figure 4.1: Thesis framework: Exploratory sequential design used for mixed methods approach



Note: Process flow adapted from Stent (2011) but modified to suit this thesis' processes.

The chapter proceeds as follows: Section 4.2 (Assessment of QSR) comprises the qualitative portion or Part 1 of the thesis with eight subsections, which cover the "quality construct", assessment tool, background for Bloomberg's and Refinitiv's measures of sustainability, data collection and analysis of QSR, scoring principles applied in the assessment tool, scoring reliability and internal consistency, and analysis of trends in QSR. Section 4.3 covers Part 2, the quantitative phase of this thesis. Section 4.3.1 discusses the variables, i.e., dependent variables (Subsection 4.3.1.1); independent variables (Subsection 4.3.1.2); control variables (Subsection 4.3.1.3); and other control variables for additional tests (Subsection 4.3.1.4). Section 4.3.2 discusses the correlation analysis, including measures employed to address multicollinearity concerns, while Section 4.3.3 presents the main regression models. Section 4.3.4 discusses robustness tests for endogeneity, while Section 4.3.5 discusses additional analyses. Lastly, Section 4.4 concludes the chapter.

4.2 Part 1- Assessment of QSR

4.2.1 Quality construct

The quality construct is composed of two dimensions, i.e. relevance (including materiality) and reliability, mainly referenced from Khan et al. (2021). The relevance (including materiality) dimension has the following quality indicators: RM1-Sustainability strategies, RM2-Stakeholder inclusiveness, RM3-Environmental and social disclosures from Bloomberg, RM4-Economic disclosures, and RM5-Materiality determination process. The reliability dimension comprises the following quality indicators: R1 - Trends over time, R2 - Readability, R3 - Verifiability, R4 -

Accuracy, and R5 -Value and timeliness of data. Scoring for these quality indicators is adopted from Ahmed Haji and Anifowose (2016), Al-Shaer and Zaman (2016), Hąbek and Wolniak (2016), Khan et al. (2021), and Yadava and Sinha (2016).

4.2.2 Assessment tool

This subsection describes the quality indicators in the assessment tool used to determine the electricity generators' QSR. The assessment tool builds on Khan et al. (2021), using the quality dimensions of relevance (including materiality) and reliability referred to earlier. However, major enhancements include consideration of materiality as part of assessing relevance and replacing binary scores (0 and 1) with expanded and more informative scoring ranges (e.g., 0 to 3 or 0 to 5), which may be more appropriate in assessing reporting quality. The adapted scoring criteria draw on previous studies on sustainability (e.g., Ahmed Haji & Anifowose, 2016; Al-Shaer & Zaman, 2016; Yadava & Sinha, 2016) and global databases (e.g., Bloomberg, Refinitiv-DataStream), and have been further refined as a result of conducting pilot studies. An overview of the scoring for the quality indicators is presented in subsection 4.2.6. Appendix 1 presents the assessment tool for this thesis.

4.2.2.1 Quality dimension A: Relevance (including materiality)

The quality indicators for relevance (including materiality) are adapted from Khan et al. (2021) and Yadava and Sinha (2016) with modifications in terms of coverage, scoring, and data source.

RM1- Sustainability strategies linked with business strategy/objectives: RM1 determines the consistency of each electricity generator's sustainable strategies with its business objectives. Electricity generators may or may not mention specific SDGs as long as they clearly disclose their strategies and link them to the entity goals. Institutionalising CSR in this way indicates that companies appreciate the importance of sustainability strategies and reporting, and are motivated to implement systems to measure and disclose their strategic sustainability goals and performance publicly with the aim of addressing stakeholders' concerns (Amran et al., 2014a).

RM2- Stakeholder inclusiveness: RM2 considers how each entity relates to or communicates with its stakeholders. This can include disclosures such as describing stakeholders, stakeholder concerns, expectations or interests, the process of stakeholder engagement, and the impact of this engagement. Bellucci (2019) believes that devoting a specific section of the sustainability report to stakeholder engagement satisfies the demand for accountability and transparency of stakeholder involvement.

RM3- Environmental and social disclosures from Bloomberg: RM3 covers the electricity generator's environmental pillar, and social pillar disclosure scores from Bloomberg (Ioannou & Serafeim, 2017; Papoutsi & Sodhi, 2020; Zuraida, 2016). Refinitiv score ranges (0 to 1)/ letter grades (D- to A+) are modified to arrive at a '0 to 6' range. Table 4.1 provides further detail.

At 30 March 2022, there were a total of 3,239 ESG data fields in Bloomberg, of which 2,210 were Bloomberg proprietary fields and 1,029 were third party fields (e.g., MSCI, CDP, Sustainalytics, ISS, S&P Global). The environmental pillar had 974 fields while the social pillar

had 576 fields. Extracts from these lists of environmental and social fields are presented in Appendices 2 and 3.

Table 4.1: RM 3 scoring conversion

Refinitiv		This thesis		
Score ranges	Letter Grade	Score ranges converted	Score ranges aligned to Bloomberg disclosure scores	Score
		0= no disclosure	0= no disclosure	0
0.0 <= score <= 0.083333	D-	>0 to 0.083	>0 to 8.33.	.5
0.083333 < score <= 0.166666	D	>0.083. to 0.16.	>8.33. to 16.66.	1
0.166666 < score <= 0.250000	D+	>0.16. to 0.25	>16.66. to 25.0	1.5
0.250000 < score <= 0.333333	C-	>0.25 to 0.33.	>25.0 to 33.33.	2
0.333333 < score <= 0.416666	C	> 0.33. to 0.416.	> 33.33. to 41.66.	2.5
0.416666 < score <= 0.500000	C+	> 0. 416. to 0.50	> 41.66. to 50.0	3
0.500000 < score <= 0.583333	B-	> 0.50 to 0.583.	> 50.0 to 58.33.	3.5
0.5333 < score <= 0.666666	B	>0. 583. to 0.66.	>58.33. to 66.66.	4
0.666666 < score <= 0.750000	B+	> 0. 66. to 0.75	> 66.66. to 75.0	4.5
0.750000 < score <= 0.833333	A-	>0.75 to 0.83.	>75.0 to 83.33.	5
0.833333 < score <= 0.916666	A	> 0.83. to 0.916.	> 83.33. to 91.66.	5.5
0.916666 < score <= 1	A+	> 0. 916. to 1	> 91.66. to 1.0	6

The environmental or social disclosure score of 0.5 to 1.5 denotes poor disclosure (D- to D+), 2 to 3 (C- to C+) indicates satisfactory disclosure, 3.5 to 4.5 (B- to B+) indicates good disclosure, and 5 to 6 (A- to A+) denotes excellent disclosure and is consistent with the Refinitiv letter grades (D- to A+). The 0.50 intervals used align the weighting of these scores with others in the overall assessment tool. Moreover, the Risk Atlas[8] has a similar scoring scale of 1 to 6 for environmental and social risk exposure, where a score of 1 indicates low exposure to risk while 6 means high exposure (S&P Global, 2019).

[8] Refers to the relative ranking of industries in terms of exposure to environmental and social risks (and opportunities).

RM3a- Environmental disclosures: Bloomberg considers a comprehensive list of environmental metrics covering themes for climate change, energy, GHG emissions management, natural capital, and value chain. According to Bloomberg (2023), they continue to strengthen access to climate-related information through application of the TCFD recommended disclosures.

RM3b- Social disclosures: Bloomberg considers a comprehensive list of social metrics with themes including business practices, community and customers, human capital, supply chain, and value chain. There are 472 social fields in Bloomberg (portion of which is shown in Appendix 3). The list does not include third party fields.

RM4- Economic disclosures: RM4 includes disclosures relating to economic performance, market presence, and indirect economic impact. The main reference for these quality indicators is Yadava and Sinha (2016), who use the 2011 version of the GRI guidelines. Other papers use the 2000 and 2002 versions of the GRI frameworks to assess companies' sustainability disclosures (Morhardt et al., 2002; Skouloudis et al., 2009). This thesis uses the more recent 2016 version of the GRI 200 standards. Searching for economic disclosures includes going through both the GRI content index (if available) and companies' disclosures within the relevant report(s).

RM4a- Economic performance: "GRI 201 addresses the topic of economic performance. This includes the economic value generated and distributed by an organization; its defined benefit plan obligations; the financial assistance it receives from any government; and the

financial implications of climate change." (GRI, 2016a, p. 4). Accordingly, RM4a covers each of the above aspects of economic performance, except for GRI 201-2 (Financial implications and other risks and opportunities due to climate change), since this is already captured in the environmental disclosures per the Bloomberg sustainability field list.

GRI 201-1 concerns direct economic value generated (revenues), economic value distributed such as operating expenses, employee wages and benefits, payments to capital providers (shareholders and lenders), payments to government (taxes), community investments, and earnings.

GRI 201-3 relates to IAS 19- Employee benefits, which requires an entity to recognise: (1) a liability, when an employee has provided a service in exchange for employee benefits to be paid in the future; and (2) an expense, when the entity consumes the economic benefit arising from the service provided by an employee in exchange for employee benefits (GRI, 2016a). Employee benefit plans can be in the form of defined benefit plans, defined contribution plans, and other types of retirement benefits. The disclosure of pension plans (e.g., estimated value of pension liabilities, strategy and timetable to fully recover pension liabilities, level of employee participation etc.) is a useful indicator of the company's level of commitment to the welfare of its employees. This, in turn, promotes sustainability through retention of employees as it provides them with a safety net against poverty upon retirement.

GRI 201-4 relates to IAS 20 - Accounting for Government Grants and Disclosure of Government Assistance. Disclosures include the monetary value of the financial assistance received by the

electricity generator from the government (e.g., tax relief and tax credits, subsidies, grants, awards, royalty holidays, or other financial benefits), or whether any government is present in the shareholding structure. This disclosure provides a measure of governments' contributions to an organisation. Significant financial assistance received from a government, in comparison with taxes paid, can be useful for developing a balanced picture of the transactions between the organisation and government (GRI, 2016a).

Economic performance disclosures within the Financial Statements or Notes to Financial Statements are only considered for content analysis if referred to in the broader annual report, sustainability report or integrated report.

RM4b- Market presence: RM4b pertains to GRI 202-1 (Ratios of standard entry level wage by gender compared to local minimum wage) and GRI 202-2 (Proportion of senior management hired from the local community).

GRI 202-1 requires the reporting entity to disclose employee wages or compensation in comparison with the minimum wage, as well as the entry level by gender. This is applicable to organisations in which substantial portions of their workers' compensation are linked to minimum wage rules and regulations. Wage levels may have direct impacts on individuals, companies, countries, or economies (GRI, 2016b). Disclosure of such compensation related information can assist decision makers to narrow wage gaps between men and women or between organisations.

GRI 202-2 requires the reporting entity to disclose the percentage of senior management hired from the local community. Location of power plants within a particular country is likely to have important implications for the local communities concerned. Hiring senior management from such local communities may be an indicator of a company's positive market presence, enhanced understanding of local needs, and intent to bolster economic benefits to community (GRI, 2016b).

RM4c- Indirect economic impact: RM4c includes GRI 203-1- Infrastructure investments and services supported, as well as their expected impacts on communities and local economies; and GRI 203-2- Significant indirect economic impacts in the context of external benchmarks and stakeholder priorities (e.g., national and international protocols, standards, and policy agendas).

GRI 203-1 requires the reporting organisation to disclose the significant infrastructure investment and services supported, positive or negative impacts to the communities and local economies, as well as the nature of these investments and services (commercial, pro-bono, or in-kind). Infrastructure investments can extend beyond the company's own operations and may include community social facilities, sports centres, transport links, or health and welfare centres. To help in the economic activities of host communities (area where the power plants are located), electricity generation projects include community infrastructure and support programs like school buildings, training programs, etc.

GRI 203-2 requires the reporting entity to disclose significant indirect economic impacts, whether positive or negative. This may include among others, economic impacts of improving or

deteriorating social or environmental conditions, enhanced skills and knowledge in a professional community or in a geographic location, number of jobs supported in the supply or distribution chain, and economic impact from changes in operation or activity location (GRI, 2016c).

RM5- Materiality determination process: RM5 considers the manner or the process by which the electricity generators determine the material topics to be disclosed in the sustainability report. Materiality determination is important in both financial and sustainability reporting. In financial reporting, materiality is the threshold for influencing economic decisions of users of financial reports e.g., investors (GRI, 2016d). In sustainability reporting, materiality defines which topics are essential to report on (GRI, 2016d). Material information can enable the board and managers to influence actions and direct business strategy (Steenkamp, 2018), and thus company sustainability performance. The GRI, IRF, and SASB reporting frameworks provide guidance and processes for determining materiality. The IRF requires disclosure and a description of the materiality determination process, along with reporting boundaries, and significant frameworks and methods used (Stent & Dowler, 2015).

4.2.2.2 Quality dimension B: Reliability

The quality indicators for the reliability dimension are adopted from Khan et al. (2021) but with enhanced scoring from Ahmed Haji and Anifowose (2016), Al-Shaer and Zaman (2016), Hąbek and Wolniak (2016), and Yadava and Sinha (2016).

R1- Trends over time: This quality indicator seeks to ensure comparability and consistency of sustainability information reported by the company. For example, comparative quantitative information can be achieved by presenting more than two years information, indicating the trend or direction of change in sustainability performance.

R2- Readability: This quality indicator aims to facilitate the user's understanding of the company's sustainability reports or sustainability disclosures. Examples of effective reporting techniques include use of tables, graphs, maps, linkages, process flows, or other presentation forms, which help users appreciate what the company would like to convey to its stakeholders.

R3- Verifiability: External assurance is an indicator of the reliability of sustainability reports. There are recent developments on the assurance of SRs and SIs. The International Audit and Assurance Standards Board has proposed the International Standard on Sustainability Assurance 5000, a principles-based standard to serve as standalone comprehensive standard applicable for any sustainability assurance engagements set to be issued before the end of 2024 (IAASB, 2024). In New Zealand, the assurance of GHG emissions will be required for fiscal year ending on or after 27 October 2024 (External Reporting Board, 2023). Moreover, the EU's Corporate Sustainability Reporting Directive has mandated independent assurance of NFR's, starting in 2023 initially with limited assurance and extending to reasonable assurance later (PricewaterhouseCoopers, 2023). As such, external assurance of sustainability reports was not mandatory during the sample period, but rather a matter of company policy.

R4- Accuracy: Accuracy can be enhanced by quantifying, in financial terms, the sustainability related activity supported with some form of reference to the basis or method of calculation of the sustainability information.

R5- Value and timeliness of data: This quality indicator is also important because timely issuance of sustainability reports or sustainability information provides stakeholders with useful tools to aid in making timely decisions. Disclosures for this indicator are usually found in the "About this report" or "Report overview" portion of the sustainability report, integrated report, or annual report.

Appendix 4 provides examples of sustainability disclosures found and how they were assessed/scored for the relevance (including materiality) and reliability categories described above.

4.2.3 Bloomberg's measures of sustainability

Bloomberg's sustainability data covers more than 13,000 companies, more than 100 countries, 88% of global market cap,[9] 474,000 plus active securities, and 3,300 plus sustainability fields (including third party data). As mentioned in Section 4.2.2, the environmental data fields cover themes such as climate change, natural capital, and value chain, while the social data fields comprise human capital, product responsibility, business practices, value chain, supply chain,

[9] https://www.bloomberg.com/professional/product/esg-data/?utm_medium=Adwords_SEM&utm_source=pdsrch&utm_content=APAC_ESGdata_2023&utm_campaign=728003&tactic=728003&gclid=CjwKCAjwscGjBhAXEiwAswQqNLA8NONo74f52LraPQGckCHQ9ED15O7tFqV4eK2xpHjA6ZqHzsyciRoCKzkQAvD_BwE Accessed 27.05.2023

and community and customers. The governance data fields consist of board composition, shareholder rights, compensation, executive structure, and audit and oversight. Bloomberg collects data directly from publicly available reports and information e.g. annual reports, sustainability reports, proxy statements and corporate governance reports (governance data only), company websites, and CDP data to ensure accuracy and consistency of data capture.[10] Moreover, Bloomberg's sustainability data supports both traditional and quantitative research with companies' data available up to 10 years, as well as risk assessment and portfolio allocation.[11] Although a Bloomberg sustainability score, like a Dow Jones Sustainability Index, is technically a measure of disclosure of sustainability performance rather than sustainability performance itself, data gathered are subject to high levels of verification, hence implying veracity of information (Papoutsi & Sodhi, 2020). The Bloomberg database covers wide ranging concepts representing companies' sustainability behaviour, thus is extensively used by researchers, e.g., Appiagyei et al. (2023), Eng et al. (2022), and Ruiz-Blanco et al. (2022), financial analysts, and investors (Eng et al., 2022).

Bloomberg sustainability scores are available for individual pillars (environmental, social, and governance), environmental and social combined scores, as well as in aggregate, with scales of 0 to 100. Specifically, companies with minimal levels of disclosure receive a score of 0.10 while those that provide disclosures for all the data points receive a score of 100 (Qasem et al., 2022; Zuraida, 2016). The scores indicate the level of sustainability disclosure by companies and facilitate comparability across firms and industries. Papoutsi and Sodhi (2020) posit that there is a significant positive relationship between sustainability disclosure and third party rating i.e.

[10] https://data.bloomberglp.com/professional/sites/10/1148330431.pdf Accessed 27.05.2023
[11] https://data.bloomberglp.com/professional/sites/10/1148330431.pdf Accessed 27.05.2023

Bloomberg ESG scores, and Dow Jones Sustainability Index as proxies for sustainability performance. Thus, disclosures in sustainability reports indicate actual performance (Papoutsi & Sodhi, 2020), and companies with higher levels of disclosure have better sustainability performance.

4.2.4 Refinitiv's measures of sustainability

Refinitiv[12] is a London Stock Exchange Group business that has one of the most comprehensive ESG databases with more than 630 sustainability metrics, covering more than 85% of global market capitalisation (about 12,500 public and private companies globally), and with history as early as 2002 (Refinitiv, 2022). Refinitiv's sustainability scores are designed for transparent measure of a company's relative sustainability performance, effectiveness, and commitment based on the company's disclosures (Refinitiv, 2022)**,** and are used widely by researchers and companies (Alkayed et al., 2023; Aluchna et al., 2022; Khatri & Kjærland, 2023; Sahin et al., 2023). Ratings are available in both percentages from 0 to 100, with a higher score indicating better sustainability performance (Khatri & Kjærland, 2023), as well as in letter grades from D- to A+ (see first two columns of Table 4.1). There are a total of 10 categories, and 25 themes under the environmental, social, and governance pillars as shown in Table 4.2. There are five sustainability scores available in Refinitiv, namely environmental, social, governance, ESG, ESG controversies, and ESG combined score. ESG score is the aggregate of environmental, social and governance scores. Refinitiv provides more detail on its scoring methodology for sustainability in its annual environmental, social and governance scores issuance[13] (LSEG, 2023). The ESG controversies score covers controversies across 10 categories and 25 topics.

[12] Although now named London Stock Exchange Group, this thesis adopts Refinitiv to be consistent with the term used in prior literature.
[13] Pillar scores show the category scores, formula for the sum of category weights, and formula for pillar scores.

Companies with no controversies get a score of 100. The ESG combined score refers to the average of the ESG score and ESG controversies score per fiscal period. The ESG combined score presents a thorough evaluation of a company's ESG performance from the information reported in the ESG aspects, as well as ESG controversies taken from global media sources (Apergis et al., 2022).

Table 4.2: Refinitiv ESG categories and themes

Pillars	Categories	Themes
Environmental	Emission	Emissions
		Waste
		Biodiversity*
		Environmental management systems*
	Innovation	Product innovation
		Green revenues, research and development, and capital expenditures
	Resource use	Water
		Energy
		Sustainable packaging*
		Environmental supply chain*
Governance	CSR Strategy	CSR strategy
		ESG reporting and transparency
	Management	Structure (independence, diversity, committees)
		Compensation
	Shareholders	Shareholder rights
		Takeover defenses
Social	Community	Equally important to all industry groups, hence a median weight of five is assigned to all
	Product responsibility	Responsible marketing
		Product quality
		Data privacy
	Workforce	Diversity and inclusion
		Career development and training
		Working conditions
		Health and safety
	Human rights	Human rights

*No data points available that may be used as a proxy for ESG magnitude/materiality

Source: Environmental, Social and Governance Scores from Refinitiv, May 2022

4.2.5 Data collection and analysis - QSR

Following are the details of data collection and analysis of results related to the assessment of QSR.

(1) Data from various reports were hand-collected and content analysis performed to "search these data sources for evidence relating to the items" (Stent & Downer, 2015, p. 108). Specifically, these reports include sustainability reports, integrated reports, and annual reports with sustainability information. Sustainability data collected and content analysed (Alrazi et al., 2018; Alrazi et al., 2016b; Demaria & Rigot, 2021; Khan et al., 2021; Rahman et al., 2019) from these reports include information from web links provided within these reports of the sample electricity generators. Such evidence, if found, was then recorded in an Excel file mirroring the assessment tool but in an expanded version in support of the validity and reliability of the analysis (Stent & Dowler, 2015). The Excel file is provided per company. A second pass analysis was also performed to test check the initial analysis and ensure consistency and accuracy of scoring.

(2) Analysis of results. The analysis of results started with the creation of a summary of results in the Excel file for each company (copied to an overall summary file). Inputs were checked as to the accuracy of data copied. Formulas were also checked to make sure that outputs are correct. The analysis of results considers individual company performance (Stent & Dowler, 2015), as well as summaries per year and per region, and overall performance.

Descriptive statistics (e.g., mean, median, maximum, minimum) are generated using Stata. Specifically, this thesis provides descriptive statistics for the quality indicators, per region, and summary of companies' performance, which are then analysed. The results of analysis determine the QSR for all QSR measures, as well as QSR performance by quality indicator, by region, and by country. Additional tests are also employed to prove improvement in QSR. Consequently, the outcomes of all these activities address RQ1: What is the electricity generators' QSR?

This thesis builds on Alrazi et al. (2016b) to establish a rationale for assessing the entity's QSR. Mean scores are used to differentiate "high" from "low" performing entities. Specifically, high QSR connotes an above the mean score while low QSR signifies a score equal to or below the mean. Amran et al. (2014a) also refer to the mean scores to measure QSR.

4.2.6 Overview of scoring principles in assessment tool

Where appropriate, a simple scheme is preferred using a range of 0 to 3. When the item is not disclosed, 0 is assigned, then 1 for general disclosure of item, 2 for specific disclosure of item, and 3 for detailed and substantive disclosure of sustainability item (Ahmed Haji & Anifowose, 2016). Ismail et al. (2018) and Shahab and Ye (2018) also employ the 0-3 scoring system. However, a 0 to 5 scheme is used for R3 (Verifiability), to cover a broader range of possibilities compared to prior literature e.g., Al-Shaer and Zaman (2016). The details of scoring for each quality indicator is specified in Appendix 1. For the environmental and social disclosures, which come from the Bloomberg ESG dataset, the scoring is adapted from the Refinitiv letter scoring method and transformed to a 0-6 scheme. Moreover, in assessing the electricity generator's

disclosures, the 'substance over form'[14] (Meyer, 1976) principle is applied on the 0-3 scoring scheme. The grand total, as well as separate totals, are calculated for the relevance (including materiality) dimension (TotalRM) i.e., sum of the scores for RM1 to RM5 quality indicators, and for the reliability dimension (TotalR) i.e., the sum of R1 to R5:

QSRTotal = GrandTotal score / Maximum score (59)

QSRRM = TotalRM score / Maximum score (42)

QSRR = TotalR score / Maximum score (17)

similar to the formula used by Amran et al. (2014a), Appiagyei et al. (2023), Alrazi et al. (2016b), and Rahman et al. (2019).

4.2.7 Coding/scoring reliability and internal consistency

To ensure reliability in the data collection and coding, three coders were involved in the content analysis of the annual reports/sustainability reports. The first coder performed the coding for the initial pilot study. The second and third coders compared and verified the coded data for the selected pilot firms. All disagreements between coders were addressed through consultation, and by revisiting the reports when required (Bose et al., 2018). Krippendorff (2018, p. 128) notes that "content analysts should not underestimate the importance of the coders' familiarity with the phenomena under consideration". Coders should interpret the instructions alike, and so coders should be familiar with the field of research (Krippendorff, 2018). In this case such potentially

[14] A basic feature of financial accounting is to maintain that economic substance should prevail over legal form (Meyer, 1976)

problematic issues are avoided as all three coders are experienced in conducting research in this field.

Cronbach's alpha coefficient provides a measure of the internal consistency of the QSR index (Khan et al., 2021; Pistoni et al., 2018) – the value of 0.8747 indicates the assessment tool is satisfactory in this regard.

The first pilot study includes the five major electricity generators of New Zealand and companies domiciled in Australia (2), China (1), Japan (1), the Philippines (2), Spain (1), South Africa (1), and the United States of America (1). These companies produce either annual reports with sustainability content, stand-alone sustainability reports, or both annual reports and stand-alone sustainability reports. Fifty percent of the companies included in the first pilot study are part of the final sample of companies. The first pilot study assisted in assessing the quality and availability of sustainability disclosures by electricity generators, defining quality measures clearly (Adaui, 2020), and making appropriate changes to the quality indicators (Alrazi et al., 2016b) in the assessment tool.

A second pilot study was then conducted, further promoting scoring reliability and internal consistency. The second pilot study includes 10 companies [10% of the final sample (Alrazi et al., 2016b)] selected, based on ranking i.e. top three, four mid-ranked, and bottom three companies, from eight countries (Finland, Spain, the United States of America, Russia, Brazil, Japan, Thailand, the Philippines (two companies each from Spain and the United States of America). In terms of region, there are three countries each from the Americas and Asia/Pacific

Rim, and four companies from Europe, Middle East, and Africa (EMEA). This pilot study helped to enhance the assessment tool by ensuring completeness/appropriateness of quality indicators, consistency and reliability of coding and adequacy of coding protocols. The same three coders were involved in this pilot study. The first coder coded the sustainability disclosures against the quality indicators in the assessment tool and this was checked by the other two coders to ensure consistency in coding (Alrazi et al., 2016b; Stent et al., 2013). The results of the second pilot study are broadly consistent with the main study's overall results for QSR as shown in Appendix 5.

4.2.8 Analysis of trends in QSR

This thesis includes parametric and non-parametric tests to assess whether QSR improves during the sample period. The tests conducted are listed in Appendix 6.

4.3 Part 2- Investigating the determinants of QSR

4.3.1 Variables

4.3.1.1 Dependent variables

There are three dependent variables, namely, QSRTotal, QSRRM, and QSRR. QSRTotal refers to the overall rating based on the scores for the relevance (including materiality) and reliability quality dimensions. It is calculated as the total score for relevance (including materiality) and reliability variables scaled by the maximum score. Similarly, variables QSRRM and QSRR are

computed by dividing the actual score by the maximum score for each dimension (Alrazi et al., 2016b; Rahman et al., 2019). Please refer to Appendix 1 for the details relating to the calculation of these variables.

4.3.1.2 Independent variables

Data are collected from various sources (Alrazi et al., 2018) to test the impact of the following influences or predictors of QSR:

Sustainability performance (SUSPER): To measure the variable sustainability performance, this thesis relies on the Refinitiv's ESG rating from DataStream, in each year, for each company, specifically code TRESG. This represents the aggregate score for environmental, social, and governance pillars. The scores range from 0 to 100. Higher scores represent higher sustainability performance and vice versa. This approach to calculating sustainability performance is widely used in the literature (e.g., Engelhardt et al., 2021).

Use of the GRI framework (GRI): The GRI reporting format is measured as a dummy variable that equals 1 if a firm follows the GRI reporting framework as a standardised template for non-financial and sustainability information, and 0 otherwise (Khan et al., 2021; Rahman et al., 2019).

Board gender diversity (GENDIV): This variable is measured as the percentage of female members to total members of the Board of Directors (Al-Shaer & Zaman, 2016). The board diversity data is sourced from Bloomberg. For this thesis, the variant variable GENDIV is used

in the regressions, which refers to a dummy variable coded as 1 for ratio greater than the GENDIV mean and 0 otherwise (Bui et al., 2020). Other studies that used a dummy variable for gender diversity are Fernandez-Feijoo et al. (2014), Liu (2018), and Nekhili et al. (2017).

Rule of law (LAW): This variable also refers to rule of law. Companies domiciled in countries with strong law enforcement are expected to disclose more sustainability information. Similar to Alrazi et al. (2016b), data from the World Bank rule of law is used. The scores range from -2.5 to 2.5. A higher score means the country has a strong law enforcement environment and vice versa (Alrazi et al., 2016b).

Carbon pricing policy (CPP1): This is also a dummy variable indicating whether the company is from a carbon pricing country or not. Companies domiciled in countries with carbon pricing have a code of 1, and 0 otherwise (Anwar et al., 2021; Rahman et al., 2019). Data for this variable are collected from the World Bank State and Trends of Carbon Pricing for 2018, 2019, and 2020. The World Bank State and Trends of Carbon Pricing is an annual report published by the World Bank with the support of the Guidehouse,[15] Carbon Disclosure Project, International Carbon Action Partnership, and the Institute for Climate Economics (World Bank, 2020). Out of the 27 countries involved, 16 countries have carbon pricing in 2018, and 17 countries in 2019 and 2020, at the national level (Table 4.3). The rest of the countries have either carbon pricing at the subnational level or initiatives under consideration. Moreover, there are 15 countries covered in this study that are in the top 20 emitters, making up 72% of the total carbon emissions

[15] Guidehouse, a leading global provider of consulting services helps the World Bank track the development of carbon pricing globally: https://guidehouse.com/case-studies/energy/2018/state-and-trends-of-carbon-pricing Accessed 28 May 2024.

worldwide based on data from BP, Statistical Review of World Energy, 2020.[16] For the CPP1 variable, this thesis considers those countries with carbon pricing policy at the national level, and those areas/states in Canada and the United States of America with sub-national implementation of carbon pricing policy. According to the Center for Climate and Energy Solutions, there are 12 States in the United States of America implementing carbon pricing, namely California, and the 11 northern states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia.[17] In Canada, carbon pricing is implemented in Ontario, Quebec, Alberta, and British Columbia (World Bank, 2018).

Table 4.3: Carbon pricing and non-carbon pricing countries with carbon pricing policy

Status	List of Countries
Carbon pricing countries	Australia, Austria, Canada*, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Japan, Poland, Portugal, South Korea, Spain, the United Kingdom
Non-carbon pricing	Brazil***, Hong Kong, India, Malaysia, the Philippines, Russia, Saudi Arabia, Thailand***, United Arab Emirates, United States of America**

Sources: World Bank State and Trends of Carbon Pricing 2018, 2019, 2020

*started implementation on a national level in 2019

** with sub-national level implementation of carbon pricing policy

*** under consideration

Institutional shareholding (INSTSHARE): This variable pertains to the percent of shareholdings owned by institutional investors in the generation company. Data for this variable is collected

[16] https://www.carbontax.org/wp-content/uploads/2021/03/The-s-20-Largest-Carbon-Emitting-Countries-_-piechart-_-19-Mar-2021.png. Accessed 30.05.2023

[17] 10 https://www.c2es.org/document/us-state-carbon-pricing-policies/#:~:text=Those%20states%20are%20California%20and,Greenhouse%20Gas%20Initiative%20(RGGI). Accessed 14.04.2023

from Bloomberg. For companies exceeding 100% shareholding in the Bloomberg database, this thesis considers them to be 100% shareholdings as ownership of more than 100% is logically inconsistent.

Foreign shareholding (FOREIGNOWN): This variable refers to the percent of shareholding owned by foreign investors in the generation company. Data of this variable is collected from Bloomberg. The percentage of foreign ownership is derived by deducting the percent ownership at the home country (geographic ownership) from 100. For example, in the case of A2A S.p.A, in 2018, percent foreign ownership is 27.4% (100 - 72.6 as appearing in the Bloomberg database).

For ease of reference, the summary of the independent variables is presented in Table 4.4.

Table 4.4: Summary of independent variables

Variable		Measurement	Data Source
Label	**Name**		
SUSPER	Sustainability performance	Total score for environmental, social and governance, with code TRESG in Refinitiv	Refinitiv
GRI	Use of GRI reporting framework	Coded as 1 if the company uses GRI framework, and 0 otherwise	Annual Report
GENDIV	Gender diversity	Coded as 1 if the percent of women on the Board is above the mean for the total population, and 0 otherwise	Bloomberg
LAW	Rule of law	Company's score for rule of law ranging from -2.5 to 2.5.	World Bank rule of law
CPP1	Country's carbon pricing policy	Coded as 1 if the company is domiciled in a country or state with carbon pricing policy, and 0 otherwise.	World Bank State and Trends of Carbon Policy
INSTSHARE	Institutional shareholding	Percent held by institutional investors	Bloomberg
FOREIGNOWN	Foreign shareholding	Percent held by foreign investors	Bloomberg

4.3.1.3 Control variables

The choice of control variables is guided by prior studies on sustainability reporting. This thesis includes financial measures such as LnTA, TOBINSQ, ROA (Alrazi et al., 2016b; Bui et al., 2020; Khan et al., 2021), SALESTA (Hapsoro & Husain, 2019; Serhii et al., 2023), and LTDTA (Alkayed et al., 2023; Bose et al., 2018) as control variables, as shown in Table 4.5. Alrazi et al. (2016b) and Khan et al. (2021) find the positive significant relationship of firm size to QSR, while Singhania et al. (2023) show the positive significant association between TOBINSQ and QSR. On the other hand, ROA has insignificant association with QSR (Alrazi et al., 2016b; Khan et al., 2021; Serhii et al., 2023). Hapsoro and Husain (2019) show that SALESTA affects QSR while Serhii et al., 2023 find otherwise. Alrazi et al. (2016b), and Khan et al. (2021) prove that LTDTA does not affect QSR while Alkayed et al. (2023) find otherwise.

Table 4.5: List of control variables, measurement and data source

Variable		Measurement	Data Source
Label	**Name**		
LnTA	Firm size	The natural logarithm of the firm's total assets	Annual Report/ Compustat/ Eikon/Bloomberg
TOBINSQ	Firm's worth	Total assets less book value of equity plus market value of equity/market capitalisation divided by total assets	Bloomberg/Annual Report
ROA	Return on Assets	Net Profit/ divided by Ave. Total Assets	Bloomberg
SALESTA	Sales to total assets	Sales divided by total assets	Bloomberg
LTDTA	Ratio of long-term debt to total assets	Long-term debt divided by total assets	Bloomberg

Discussed below are further details about the control variables.

LnTA: The data for the SIZE variable is collected from Bloomberg and validated from annual reports. For the purpose of uniformity and consistency of application to the regression model, the amounts are converted to USD. The companies prepare their financial statements using the currencies of their respective countries (and for most members of the European Union, amounts are presented in Euro currency), thus the need to convert the total assets to USD. Historical exchange rate data from XE.com and x-rates.com for 31 December 2018, 2019, and 2020 (last working day of the year) are used, which have the same results. The only difference is that the exchange rates under XE.com are presented in four decimal places while those in x-rates.com are up to six decimal places. The historical rates for these two exchange rates sources are complete compared to the data in the Federal Reserve system (which lacks data for the Czech Republic, the Philippines, Russia, Saudi Arabia, and United Arab Emirates). There are negligible differences between the rates in the Federal Reserve system and XE.com and x-rates.com. The Oanda website gives graphical presentation of historical rates, hence, not considered. Appendix 7 presents the comparative historical rates for 1 USD per unit from the Federal Reserve, XE.com and x-rates.com.

TOBINSQ: The formula used for this variable is (Total Assets -book value of equity + market value of equity) divided by Total Assets. Market value of equity (or market capitalisation) are gathered from Bloomberg under FA/Key Stats/BBG Adj Highlight. Total Assets and book value of the equity are collected from Bloomberg and validated with companies' annual report - financial statements section. For United States of America companies, it has been observed that total capitalisation is reflected in FA/Key Stats/GAAP instead of total equity. As such total

equity is taken from companies' annual reports. Figures collected from Bloomberg are validated from those reflected in the annual reports.

ROA: The ROA variable shows the percentage of return on assets used in operation, which is computed by dividing net profit by the average total assets. The data are collected from Bloomberg. ROA is one of the primary profitability ratios employed by electricity generators and included as one of the loan covenants.

SALESTA: The SALESTA variable is a measure of how well the company uses its assets to generate more income. Electricity generators invest a lot in infrastructures for the construction of plants, thus the utilisation of these investments should be maximised.

LTDTA: The LTDTA variable measures and shows if the company is highly leveraged to finance its operations. According to Bui et al. (2020), environmentally sensitive, large, and highly leveraged firms are likely to provide more extensive disclosures to manage legitimacy and reputation risks as these firms are subject to increased stakeholder and public pressures.

4.3.1.4 Other control variables for additional tests

Additional tests using selected corporate governance variables related to the size of the board, board independence, and audit committee are conducted to validate the robustness of the main findings. These variables are presented in the following table.

Table 4.6: List of corporate governance variables

Variable		Measurement (References)	Data Source
Label	**Name**		
LnBOD	Number of directors on the Board	Logarithm of the number of BOD (Alrazi et al., 2016; Khan et al., 2021)	Bloomberg
BIND	Ratio of independent directors on the Board to the total number of Directors on the Board	Coded as 1 if the ratio is more than the mean of BIND and 0 otherwise.	Bloomberg
AUDCOM	Number of Audit Committee members	Coded as 1 if the ratio is more than the AUDCOM mean and 0 otherwise	Bloomberg

4.3.2 Correlation analysis

Multicollinearity is caused by a "combination of high correlations" between explanatory variables and "one or more of the other factors being unhelpful" (Dougherty, 2016, p. 171). According to Dougherty (2016), multicollinearity is a common issue in time series regressions, which deals with a series of data or observations on variables over time. This thesis performs correlation tests e.g., Pearson's correlation and determines variance inflation factors of variables to address multicollinearity concerns.

4.3.3 Regression models

The determinants of QSR are discussed in Chapter 3 Section 3.7, above, wherein various hypotheses have been developed. These hypotheses are tested to provide empirical evidence on the impact of various influences on the QSR of electricity generators, following Khan et al. (2021) through regression analysis. The main model presented below, refers to the baseline

models, which are used to generate the contemporaneous effects and one-year lagged effects, respectively for the hypotheses testing.

$$QSRRM_{i,t} = \beta_0 + \beta_1 SUSPER_{i,t} + \beta_2 GRI_{i,t} + \beta_3 GENDIV_{i,t} + \beta_4 LAW_{i,t} + \beta_5 CPP1_{i,t} + \beta_6 INSTSHARE_{i,t} + \beta_7 FOREIGNOWN_{i,t} + \beta_8 LnTA_{i,t} + \beta_9 TOBINSQ_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11} SALESTA_{i,t} + \beta_{12} LTDTA_{i,t} + \sum YEAR_{i,t} + Country\_DV_{i,t} + \varepsilon \quad (1)$$

$$QSRR_{i,t} = \beta_0 + \beta_1 SUSPER_{i,t} + \beta_2 GRI_{i,t} + \beta_3 GENDIV_{i,t} + \beta_4 LAW_{i,t} + \beta_5 CPP1_{i,t} + \beta_6 INSTSHARE_{i,t} + \beta_7 FOREIGNOWN_{i,t} + \beta_8 LnTA_{i,t} + \beta_9 TOBINSQ_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11} SALESTA_{i,t} + \beta_{12} LTDTA_{i,t} + \sum YEAR_{i,t} + Country\_DV_{i,t} + \varepsilon \quad (2)$$

$$QSRTotal_{i,t} = \beta_0 + \beta_1 SUSPER_{i,t} + \beta_2 GRI_{i,t} + \beta_3 GENDIV_{i,t} + \beta_4 LAW_{i,t} + \beta_5 CPP1_{i,t} + \beta_6 INSTSHARE_{i,t} + \beta_7 FOREIGNOWN_{i,t} + \beta_8 LnTA_{i,t} + \beta_9 TOBINSQ_{i,t} + \beta_{10} ROA_{i,t} + \beta_{11} SALESTA_{i,t} + \beta_{12} LTDTA_{i,t} + \sum YEAR_{i,t} + Country\_DV_{i,t} + \varepsilon \quad (3)$$

Where: QSRRM is the QSR for relevance (including materiality dimension, QSRR is the QSR for the reliability dimension, QSRTotal is the overall quality of sustainability reporting; SUSPER, the sustainability performance; GRI, the use of GRI reporting framework; GENDIV, the gender diversity which relates to percentage of women on the Board; LAW, the countries' rule of law; CPP1, the countries' carbon pricing policy; INSTSHARE, the percentage of institutional shareholding; FOREIGNOWN, the percentage of foreign shareholding; LnTA, log of total assets; TOBINSQ, the firm's worth; ROA, the firm's return on assets; SALESTA, the ratio of sales to total assets; LTDTA, the ratio of long term debt scaled by total assets; YEAR,

the year dummy; Country_DV, the country dummy; and ε, the error term. Details of variables are presented in Section 4.3.1

This thesis uses a one-year lag of independent and control variables to examine the robustness of our results with lagged variables. The use of this lag also helps to address the issue of reverse causality. This is also consistent with prior studies such as Bose et al. (2018), Khan et al. (2021), and Safiullah et al. (2021).

The results of the regression analyses address question 2, by testing if hypotheses developed are supported or not, hence identifying the determinants of QSR.

4.3.4 Robustness tests for endogeneity

Endogeneity is expressed from measurement error, omitted variables or simultaneity (Li, 2013). The thesis uses firm fixed effects, change analysis, and instrumental variable analysis to address possible endogeneity concerns.

4.3.5 Additional analyses

Additional analyses are conducted by adding governance attributes and using raw scores of QSR. These tests aim to confirm validity of the main results.

4.4 Chapter summary

This chapter sets out the research design and methods used in this study and explains details relating to the assessment tool and how the QSR of companies is assessed. It also explains the regression models used for empirical testing of hypotheses, as well as the variables used, robustness, and additional tests.

The research design/methods described above are applied to a total sample of 100 companies included in the S&P 250 energy companies in 2021, from a total of 138 companies classified under electric utilities, independent power producers and energy traders, and multi-utilities.

The research findings are presented in the next chapter, after covering the sample selection and data sources.

CHAPTER 5

RESULTS

5.1 Introduction

This chapter discusses the sample selection, data sources, and research findings for the investigation of the two research questions and the testing of hypotheses developed for this thesis. Section 5.2 presents the sample selection section, followed by Section 5.3, which discusses the results of assessing the electricity generators' QSR and addresses RQ1. It presents the descriptive statistics for the quality indicators by region and for companies' performance. It explains the trends of sustainability reporting using parametric and non-parametric tests, discusses the electricity generators' QSR, and covers the developing trends towards high QSR.

Section 5.4 deals with the discussion of results leading to the identification of the QSR determinants. It covers the descriptive statistics for all variables, the correlation analysis, and the main results, specifically the tests for hypotheses, which address RQ2. The section also discusses the results of the robustness checks, specifically measures to address endogeneity, as well as additional analyses to validate the main results. Finally, Section 5.5 discusses the chapter summary.

5.2 Sample selection

The sample consists of electricity generation firms across the globe as listed in the S&P Platts Top 250 Global Energy Companies Rankings for 2021. Being included in the Top 250 Rankings is a feat of honor and prestige in the energy industry. The rankings are based on four key metrics, i.e., asset, profits, revenues, and return on invested capital (S&P Global, 2021). There are ten industries in the S&P classification: Coal and consumable fuels, electric utilities, gas utilities, independent power producers and energy traders, integrated oil and gas, multi-utilities, oil and gas exploration and production, oil and gas refining and marketing, oil and gas storage and transportation, and renewable electricity. For the thesis, electric utilities, independent power producers and energy traders, and multi-utilities companies are considered, as these industries comprise the electricity generators. The renewable energy category had no data available at the time of sample selection.

The companies listed in the S&P Top 250 Energy Companies for 2021 are selected as subjects for examination in this thesis, as they represent the leading electricity generators in the world. They tend to disclose voluntary sustainability information beyond regulatory requirements due to pressure from stakeholders e.g., non-governmental organisations, the general public, analysts, etc. (Demaria & Rigot, 2021). Moreover, larger companies are likely to quickly respond to, and address, regulatory changes or issues to avert any negative regulatory and even media attention (Ahmed Haji & Anifowose, 2016). Lastly, cross-national comparability, as well as cross-regional comparability, can be provided. The 100 sample companies span 27 countries across multiple regions and continents, with internationalisation experience, and covering a broad range of

institutional contexts (Tashman et al., 2019), hence the results of this thesis have global relevance.

The research period for this thesis is appropriate for examining developments in sustainability reporting practices (Al-Shaer, 2020) considering the implementation of the TCFD disclosure recommendations and the COVID19 pandemic.

There are 73 companies listed under Electric Utilities, 35 companies under Independent Power Producers and Energy Traders, and 30 companies under Multi-Utilities categories. The total list of 138 electricity companies is reduced to 100 after deducting those companies solely involved in electricity transmission and/distribution or infrastructure, with reports not in English, companies' websites unable to be accessed, or reports not accessible in companies' websites or other relevant websites (e.g., annualreports.com, responsbilityreports.com, corporateregister.com). Thus, the sample companies considered are publishing both annual reports (covering financial information) and stand-alone SRs, or those publishing annual reports/ integrated reports/ annual integrated reports with both financial and sustainability contents. Table 5.1 shows the summary of sample selection.

Table 5.1: Sample selection

Industries/Categories	#firms
Electric Utilities	73
Independent Power Producers and Energy Traders	35
Multi-Utilities	30
Excluding:	
No electricity generation business	(17)
Annual Reports/ Sustainability Reports not in English	(9)
Websites not accessible	(8)

No reports available on corporate websites	(4)
Final Sample	**100**

Note(s): This table reports the summary of sample selection of electricity generators from S&P Platts Top 250 Companies Rankings 2021.

Appendix 8 shows the list of the 100 sample companies.

The S&P classifies the regions into three, namely: Americas, Asia/Pacific Rim, and EMEA. The Americas region includes the United States of America, Canada, and Brazil, Asia/Pacific Rim covers Australia, China, Hong Kong, India, Japan, Malaysia, the Philippines, South Korea, and Thailand, while EMEA includes Austria, Czech Republic, Denmark, Finland, France, Germany, Greece, Italy, Poland, Portugal, Russia, Saudi Arabia, Spain, the United Arab Emirates, and the United Kingdom. Table 5.2 presents the regional composition in terms of the number of companies and country.

Table 5.2: Regional composition

Region	Companies	Country
Americas	38	3
Asia/Pacific Rim	36	9
EMEA	26	15
	100	27

There are 27 countries involved in this study, the details of which are shown in Table 5.3. There are 15 countries that are Organisation for Economic Cooperation and Development members, seven of which belong to the G7 group. Other countries are either developing or emerging economies.

Table 5.3: Country composition

SL. No.	Country	2018	2019	2020
1	United States of America	28	28	28
2	Japan	10	10	10
3	China	7	7	7
4	Brazil	5	5	5
5	Canada	5	5	5
6	Hong Kong	5	5	5
7	Italy	5	5	5
8	Philippines	4	4	4
9	Germany	3	3	3
10	India	3	3	3
11	Australia	2	2	2
12	Austria	2	2	2
13	France	2	2	2
14	Malaysia	2	2	2
15	Russia	2	2	2
16	Spain	2	2	2
17	Thailand	2	2	2
18	United Kingdom	2	2	2
19	Czech Republic	1	1	1
20	Denmark	1	1	1
21	Finland	1	1	1
22	Greece	1	1	1
23	Poland	1	1	1
24	Portugal	1	1	1
25	Saudi Arabia	1	1	1
26	South Korea	1	1	1
27	United Arab Emirates	1	1	1
Total		100	100	100

5.3 Assessment of QSR

This section of the chapter addresses RQ1. It covers the analysis of results of the QSR assessment, discussion on the nature of QSR, and developing trends for higher QSR in the electricity industry.

5.3.1 Descriptive statistics - QSR

5.3.1.1 Descriptive statistics for quality indicators

Table 5.4 presents the descriptive statistics for QSR assessment per year and across three years. The purpose of this table is to see the trend in the QSR during 2018 to 2020, which addresses RQ1.

Relevance (including materiality) dimension: For the quality dimension of relevance (including materiality), all quality sub-indicators from RM1 to RM5 register increasing means from 2018 to 2019, with RM4b (market presence) showing the biggest increase of 53.13%, followed by RM5 (materiality determination process) at 17.88%. The increasing trend continues from 2019 to 2020, although at lower percentages, except for RM3b and RM4b, indicating decreases of 2.41%, and 4.08%, respectively. No perfect scores are reported for either RM3 or RM4, although perfect scores are achieved by some companies for other relevance (including materiality) dimension quality indicators (i.e. RM4a and RM4c). The mean for TotalRM increases 8% and 3%, from 2018 to 2019 and from 2019 to 2020, respectively. Higher means than medians for TotalRM during the periods under review suggest a normal distribution of scores. For example, in 2018 the TotalRM mean is 48%, which is slightly higher than the median of 46%.

Furthermore, this thesis discusses the results for the quality indicators under relevance (including materiality) dimension for the three-year analysis period. RM1 achieves the highest performance with a mean of 84% and perfect median score of 100%, indicating that the electricity generators

present their sustainability strategies linked to their business goals in a specific or detailed manner. There are 285 company observations with scores of 2 and 3 implying that around 95% of companies clearly disclose their sustainability strategies. The most disclosed SDGs are those related to the three pillars of sustainability (SDG 13 Climate action; SDG7 Affordable and clean energy; SDG9 Industry, innovation, and infrastructure; SDG 8 Decent work and economic growth; and SDG 12 Responsible consumption and production) (Manes-Rossi & Nicolo, 2022). SDGs 2 7, 9, and 13 are directly linked to the electricity generators' core operations, hence the results are not surprising (Manes-Rossi & Nicolo, 2022). RM2 ranks second with a mean of 76% and median 67%. There are 278 company observations with scores of 2 and 3 suggesting that around 93% of companies disclose matters such as making clear who their stakeholders are, how they deal with them, as well as their programs to address stakeholder concerns.

Companies vary in the reporting of stakeholder engagement in their SRs, from general disclosure to elaborate discussion or even providing for a separate section on stakeholder relations. Essential to improving the credibility and reliability of disclosures is the correct understanding of stakeholders' needs (Calabrese et al., 2015; Henriques et al., 2022; Torelli et al., 2020). In the case of RM3, the mean and median scores are 48% and 50%, respectively. The mean for the environmental pillar is 53%, which is higher than the social pillar mean of 44%. Actual scores range from 0 to 5. RM4 has a mean and median of 42% and 38%, respectively. RM4a, RM4b, and RM4c have disclosure quality of 43%, 7%, and 77%, respectively. Mamun (2023) also finds RM4b as the least commonly disclosed quality indicator that requires disclosure of ratios for standard entry level wage by gender compared to local community minimum wage. Alternatively, Yadava and Sinha (2016) see that disclosure of environmental and social

information is less comprehensive than reporting of economic information. Lastly, RM5 has mean and median scores of 69% and 100%, respectively, representing 65% disclosure quality. Ruiz-Lozano et al. (2022) however, show the low level of disclosures of materiality determination process by Spanish state-owned enterprises (SOEs). This can be attributed to SOE's ceremonial compliance with mandatory regulation to prepare sustainability reports (Ruiz-Lozano et al., 2022), while most large electricity generators have already embedded the materiality determination process in their sustainability reporting. RM5 is the third highly disclosed quality indicator while RM3 and RM4 have the lowest level of disclosures. The mean for QSRRM (relevance (including materiality) dimension) is 51%.

Reliability dimension: For the reliability dimension, all quality sub-indicators from R1 to R5 register increasing means scores from 2018 to 2019 with the increase ranging from 7% to 9%. The increasing trend continues from 2019 to 2020 although at lower percentages, except for R3, which shows a bigger increase of 9% from 2019 to 2020. There has been a gradual rise in the assurance or verification of companies' sustainability reports from 2018 (43) to 2020 (46). This suggests that more than 50% of the electricity generators did not rely on external assurance prior to communicating sustainability information to stakeholders (Khan et al., 2021). This may also be due to the absence of mandatory regulation for external audit of sustainability reports or information (Khan et al., 2021) and content-wise external assurance on NFIs remains voluntary (Gerwing et al., 2022). The QSRR mean increased 7.34% and 4.77%, from 2018 to 2019 and from 2019 to 2020, respectively. Similar to QSRRM, QSRR shows higher means than medians.

Still on the reliability dimension, the ratings range from 42% (R3) to 85% (R1). R2, R3, and R4 have means of 77%, 71%, and 65%, respectively over the three-year period. R1 achieves the highest rank at 85%, which can be attributed to the companies' inclination to provide comparative sustainability information to their stakeholders. There are 269 company observations that provide at least 2-year comparative sustainability information with comprehensive details. R2 ranks second at 77%, representing 288 company observations that use adequate graphics and best practices in reporting to facilitate understanding of sustainability disclosures. R3 has a 42% score (the lowest), which can be due to the non-mandatory nature of assurance for sustainability information. The International Audit and Assurance Standards Board is working to develop a specialist sustainability reporting assurance standard (Farooq et al., 2024). R4 gets 71% as 262 company observations provide quantitative data up to financial quantification of, as well as basis or reference for calculating sustainability information. Lastly, for R5 (which scores 65%), 228 company observations give specific detailed disclosures for the reporting process and timely reporting, including framework used. The mean for QSRR (reliability dimension) is 65%.

Consequently, QSRTotal also shows an increasing trend from 52% in 2018 to 58% in 2020, denoting improvement in the QSR during the periods examined, and translating to a mean of 55%. QSRRM, QSRR, and QSRTotal are the dependent variables used in the regression analyses. The descriptive statistics for these variables are explained in Subsection 5.4.1.

Table 5.4: Assessment of QSR: Descriptive statistics for quality indicators

Indicator/ Variable(s)	2018					2019					2020					3 years				
	Mean	Med	SD.	Min	Max	Mean	Med	SD	Min	Max	Mean	Med	SD	Min	Max	Mean	Med	SD	Min	Max
A. Relevance (including materiality)																				
RM1	79%	67%	0.66	33%	100%	86%	100%	0.56	33%	100%	87%	100%	0.53	33%	100%	84%	100%	0.59	33%	100%
RM2	73%	67%	0.68	0%	100%	75%	67%	0.61	33%	100%	79%	67%	0.53	33%	100%	76%	67%	0.61	0%	100%
RM3	47%	46%	1.64	13%	79%	49%	50%	1.65	17%	79%	49%	50%	1.61	17%	79%	48%	50%	1.63	13%	79%
RM3a	50%	50%	1.06	8%	83%	53%	58%	0.99	8%	83%	55%	58%	0.97	8%	83%	53%	58%	1.01	8%	83%
RM3b	44%	42%	0.95	17%	83%	45%	42%	0.98	17%	83%	44%	42%	0.85	17%	83%	44%	42%	0.93	17%	83%
RM4	40%	38%	3.35	5%	76%	43%	43%	3.21	14%	76%	44%	43%	3.32	14%	86%	42%	38%	3.31	5%	86%
RM4a	39%	33%	2.32	0%	100%	43%	44%	2.26	11%	100%	45%	44%	2.31	0%	100%	43%	33%	2.3	0%	100%
RM4b	5%	0%	0.89	0%	67%	8%	0%	1.09	0%	83%	8%	0%	1.11	0%	67%	7%	0%	1.03	0%	83%
RM4c	74%	67%	1.15	0%	100%	77%	75%	1.02	17%	100%	79%	83%	0.87	17%	100%	77%	83%	1.02	0%	100%
RM5	60%	67%	1.23	0%	100%	70%	100%	1.08	0%	100%	76%	100%	1.00	0%	100%	69%	100%	1.12	0%	100%
QSRRM	48%	46%	5.78	20%	82%	52%	51%	5.45	29%	80%	53%	51%	5.04	32%	86%	51%	50%	5.49	20%	86%
B. Reliability																				
R1	80%	100%	0.79	0%	100%	87%	100%	0.65	33%	100%	89%	100%	0.57	33%	100%	85%	100%	0.68	0%	100%
R2	73%	67%	0.58	33%	100%	77%	67%	0.53	33%	100%	81%	67%	0.50	67%	100%	77%	67%	0.54	33%	100%
R3	39%	20%	1.92	0%	100%	41%	20%	1.88	0%	100%	45%	30%	1.81	0%	100%	42%	20%	1.83	0%	100%
R4	68%	67%	0.72	0%	100%	72%	67%	0.71	0%	100%	74%	67%	0.60	0%	100%	71%	67%	0.68	0%	100%
R5	61%	67%	0.83	0%	100%	66%	67%	0.75	0%	100%	69%	67%	0.73	0%	100%	65%	67%	0.77	0%	100%
QSRR	61%	59%	3.30	18%	100%	65%	65%	3.01	18%	94%	69%	65%	2.59	24%	100%	65%	65%	3.00	18%	100%
QSRTotal	52%	51%	8.47	22%	84%	56%	56%	7.84	29%	84%	58%	56%	6.93	31%	88%	55%	54%	7.89	22%	88%

Note(s): This table reports the results of QSR assessment by quality indicator, by year and for 3 years. The mean, median, minimum, and maximum values are expressed in percentage while the standard deviations are in absolute values. All variable definitions are in Chapter 4, Subsection 4.3.1.

5.3.1.2 Descriptive statistics for QSR by region

Table 5.5 shows the QSR scores by region. Under the S&P classification, there are three main regions: Americas, Asia/Pacific Rim, and EMEA. Based on the results of the QSR assessment, EMEA is the best performing region in sustainability reporting on all fronts, with average scores of 0.608, 0.796, and 0.776 in QSRRM, QSRR, and QSRTotal, respectively. The Americas region follows with average scores of 0.493 and 0.524 in QSRRM and QSRTotal, respectively. In QSRR, though, Asia/Pacific Rim is the second performing region for QSRR with an average score of 0.603. Only EMEA has average scores above the mean scores for the three dependent variables. Further analysis by year reveals that the Americas and Asia/Pacific Rim regions have their means falling below the means for the three dependent variables except in 2020 for the Americas' QSRRM mean. On a positive note, the EMEA region average is significantly higher the means in all measures with QSRR falling above the 75th percentile. Companies from the EMEA region account for 75% of the top ten ranked companies (including ties in scores) in terms of QSR scores. Dilling (2010) also finds that companies located in Europe and/or being involved in the energy sector are more likely to issue sustainability reports of higher quality. About 36%, 30%, and 84% of company observations for Americas, Asia/Pacific Rim, and EMEA regions, respectively have high QSR (untabulated).

Moreover, results by region and by quality indicator (untabulated) show that the EMEA region outperforms the Americas and Asia/Pacific Rim regions in all areas of the relevance (including materiality) dimension. All regions though have minimal quality disclosures for RM4b. In the reliability dimension, the Americas region slightly edges EMEA in R2 and R4. For R3, which

has the lowest overall score in the reliability dimension, 85% of companies in the EMEA region have their sustainability reports assured.

Table 5.5: QSR scores by region (n=300)

Region	Obs.	QSRRM Mean	QSRR Mean	QSRTotal Mean
Americas	114	0.493	0.600	0.524
Asia/Pacific Rim	108	0.463	0.603	0.503
EMEA	78	0.608	0.796	0.662

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1.

In terms of country performance, the untabulated results reveal that 16 (11) countries have means above (below) the means for QSRRM, QSRR, and QSRTotal. Spain is the best performing country in all QSR measures consistent with the finding of Ruiz et al. (2021) that Spain is leading the sustainability rankings.

5.3.1.3 Descriptive statistics for companies' performance

Table 5.6 presents the companies' three-year performance (Panel A), and annual performance (Panel B). Panel A shows the average performance for QSRRM, QSRR, and QSRTotal at 0.51, 0.65, and 0.55, respectively. The highest score received by the sample companies for QSRRM, QSRR, and QSRTotal are 86%, 100%, and 88%, respectively. Moreover, Panel A indicates that in terms of percentage score, company observations with high QSR performance are less than those with low performance for QSRRM, QSRR, and QSRTotal (47%, 44%, and 48%, respectively, with high performance, and 53%, 56%, and 52%, respectively with low performance). Panel B demonstrates increasing mean year-on-year in all QSR measures,

suggesting improvement in QSR. The percentage increase from 2019 to 2020 is lower than that from 2018 to 2019. For example, QSRRM increases 8% from 2018 to 2019 and only 2%, from 2019 to 2020. QSRR and QSRTotal follows the same trend. Moreover, Panel B indicates that the number of companies whose performance is above the mean is lower than those falling below the mean in all QSR measures, except in 2020 for QSRR where the statistics are equal (50%:50%). Annual difference ranges between 4% and 27%. QSRR 2019 claims the biggest gap (27%), which may be correlated to the 8% variance observed in Panel A for QSRR, compared with the lower variances for QSRRM and QSRTotal (6% and 4%, respectively).

Table 5.6: Companies' performance (n=300)

Panel A: Companies' overall (3-year) performance

Variable(s)	Mean	High QSR	%	Low QSR	%
QSRRM	0.51	141	47%	159	53%
QSRR	0.65	131	44%	169	56%
QSRTotal	0.55	144	48%	156	52%

Panel B: Companies' performance by year

		2018			2019			2020	
Variable(s)	Mean	High QSR	Low QSR	Mean	High QSR	Low QSR	Mean	High QSR	Low QSR
QSRRM	0.48	46%	54%	0.52	47%	53%	0.53	46%	54%
QSRR	0.61	48%	52%	0.66	44%	56%	0.69	50%	50%
QSRTotal	0.52	48%	52%	0.56	49%	51%	0.58	48%	52%

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1.

5.3.2 Trends in QSR

This subsection discusses the additional tests, such as paired t-test, two-sample t-test, Anova two-factor without replication test, and Wilcoxon tests, which are conducted to validate improving trends in QSR and whether these increases are statistically significant.

5.3.2.1 Paired t-test and Anova two-factor without replication test

Paired t-test is performed for the difference in QSR means between any two years (Ahmed Haji & Anifowose, 2016), which is presented in Table 5.7. To perform this test, new variables are created for each of the dependent variables per year (e.g., QSRTotal_2018, QSRRM_2019, QSRR_2020). This test aims to show the increases between any two years (Ahmed Haji & Anifowose, 2016). Significant increases between years are shown for the three dependent variables, on top of the overall increasing trend, suggesting that electricity generators are showing progress towards improving their QSR. This "improving trend" in sustainability reporting practices is consistent with that of Ahmed Haji and Anifowose (2016) following the adoption of the integrated reporting practice, and that of Khan et al. (2021) after the implementation of the reporting regulation in the banking industry.

Table 5.7: Paired t-test for the differences in QSR means between any two years

Years	Diff. in mean	t-value	Significance
Panel B: QSRRM			
2019 and 2018	0.0371	5.194	0.000***
2020 and 2019	0.0150	2.962	0.003***
2020 and 2018	0.0521	6.870	0.000***
Panel C: QSRR			
2019 and 2018	0.0447	4.321	0.000***
2020 and 2019	0.0318	3.683	0.000***
2020 and 2018	0.0765	6.038	0.000***
Panel A- QSRTotal			
2019 and 2018	0.0392	5.645	0.000***
2020 and 2019	0.0198	4.064	0.000***
2020 and 2018	0.0592	7.620	0.000***

Note(s): ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively. All variable definitions are in Chapter 4, Subsection 4.3.1.

Moreover, the outcomes of the Anova two-factor without replication test based on the mean scores of all quality indicators supports the significant findings of the paired t-test. The F test-statistic is 7.961 and the corresponding p-value is 0.002. Since this p-value is less than 0.05, it can be concluded that there is a statistically significant difference in mean scores over time (untabulated).

Additional two sample t-tests (Phang et al., 2023) are conducted for high and low dependent variables to establish the mean difference in QSR scores between companies with high QSR and those with low QSR. To perform this test, new variables are created (i.e., QSRTotal_Ave, QSRRM_Ave, and QSRR_Ave) for each of the dependent variables. This thesis uses the mean of the dependent variables (which are above the median scores) to decide whether the score is high or low. A score of 1 is allocated for score above the mean, and 0 otherwise (Phang et al., 2023). Results of this test are presented in Table 5.8. Panel A shows higher means for QSRR and QSRTotal for companies with high QSRRM, and with the differences in means significant at 1% level. Likewise, Panel B indicates higher means for QSRRM and QSRTotal for companies with high QSRR, and with the differences in means significant at 1% level. The same findings also hold in Panel C where QSRRM and QSRR signify higher means for companies with high QSRTotal, and with mean differences at 1% significance level. The results of the two-sample t-test validate the statistically significant correlation between the dependent variables shown in the correlation matrix (Subsection 5.4.2).

Table 5.8: Two sample t-test for high and low QSR [below (<) and above (>) mean] n=300

Variable(s)	≤ Mean	> Mean	Diff. in mean	t- statistics
Panel A- QSRRM ≤ and > mean				
	n = 159	n =141		
QSRR	0.550	0.767	(0.218)***	-13.484
QSRTotal	0.449	0.669	(0.220)***	-25.150
Panel B- QSRR ≤ and > mean				
	n = 169	n =131		
QSRRM	0.444	0.599	(0.155)***	-12.578
QSRTotal	0.468	0.662	(0.194)***	-17.998
Panel C- QSRTotal ≤ and > mean				
	n = 156	n =144		
QSRRM	0.409	0.624	(0.215)***	-25.191
QSRR	0.531	0.783	(0.252)***	-17.754

Note(s): ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively. All variable definitions are in Chapter 4, Subsection 4.3.1.

5.3.2 2 Wilcoxon tests for high and low QSR

To assess the significance of the differences in QSR between high and low QSR performance, the Wilcoxon signed-rank test (Mion & Adaui, 2019) and Mann-Whitney test (Alkayed et al., 2023; Slacik & Greiling, 2020) are performed. These tests, shown in Table 5.9, demonstrate significant p-values for all QSR measures, suggesting improvement in QSR. The results corroborate with the findings for paired t tests in Table 5.7. These appear to be good results considering that the majority of the sample companies adopt voluntary disclosures of sustainability information (74% from Americas and Asia/Pacific Rim), except for companies in the EU coverage areas.

Table 5.9: Wilcoxon tests for high and low QSR

Variable(s)	Wilcoxon signed-rank test		Wilcoxon rank sum (Mann-Whitney) test	
	z-value	p-value	z-value	p-value
QSRRM	3.221***	0.001	-14.947***	0.000
QSRR	8.963***	0.000	-14.912***	0.000
QSRTotal	6.236***	0.000	-14.965***	0.000

Note(s): ***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively. All variable definitions are in Chapter 4, Subsection 4.3.1.

5.3.3 Discussion of the electricity generators' QSR

In investigating the electricity generators' QSR, this thesis has undergone processes starting from data collection, content analysis, scoring of sustainability disclosures, to coming up with the scores per company by quality indicator, and by QSR measure. Descriptive statistics are analysed to verify QSR performance by quality indicator, by region, by country, and overall performance of companies. Additional tests as also employed to evaluate the trends in QSR. All these lead to addressing RQ1: What is the electricity generators' QSR?

As mentioned in Chapter 4, Subsection 4.2.5, this thesis rationalises that high QSR is associated with scores above the mean while low QSR is linked to scores equal to or below the mean. Accordingly, the results of the QSR assessment indicate an overall high QSR for the electricity generators as their mean scores breach the 50% level in all QSR measures (QSRRM – 0.51; QSRR – 0.65; QSRTotal – 0.55). Moreover, the descriptive statistics show an increasing trajectory year-on-year manifesting improvement in QSR. These findings on the increasing trend

are similar to those of Khan et al. (2021) and Mion and Adaui (2019). Legitimacy theory may play a part in this case, where companies voluntarily report sustainability information to legitimise their operation and show that they act in accordance with society's expectations (Khan et al., 2023). At the same time, companies are cognisant of stakeholders' increasing awareness (Khan et al., 2023) of sustainability issues, which may influence firms to disclose more sustainability related matters. The results may also be driven by the country's or region's mandatory reporting legislations, where the coercive isomorphism of institutional theory may come into play. Carungu et al. (2021) show preparers' view of mandatory NFR as being a comprehensive best practice to sufficiently report the companies' environmental, social, and economic performance.

However, while the QSR scores appear to be high, the electricity generators have disclosure deficiencies in RM3b, RM4a, and RM4b under the relevance (including materiality) dimension. The least frequently disclosed quality indicator is RM4b. Almost 50% of companies have minimal disclosure in RM4a, while 82% have no disclosure for RM4b, which suggests low QSR. There are companies that either have limited or no disclosure of economic performance in the sustainability reports as this is already part of the financial statements portion of the annual report. In these cases of reporting deficiencies, the electricity generators' sustainability reporting can be interpreted as a strategy to gain or improve social legitimacy (Bui et al., 2020; Imperiale et al., 2023; Michelon et al., 2015). More electricity generators provide detailed disclosures for RM1 and RM5, and specific disclosures for RM2. A few companies (between 5 and 15) practice what is called "SDG-washing", referring to superficial SDG engagement by companies (Heras-Saizarbitoria et al., 2022, p. 326) or mere listing down of material topics without action plans and

implementation strategies. For the reliability dimension, specific information dominates disclosures for R2, R4, and R5, with detailed reporting for R1. R3 should be given particular focus by the electricity generators.

Analysis of regional performance shows that EMEA appears to be the best performing region, which can be attributed to the mandatory regulation (Mion & Adaui, 2019) for sustainability reporting in the region. In terms of country performance, 59% of countries have means higher than the QSR means. On the other hand, there are more companies with means below the QSR means. These findings suggest that companies in the Americas and Asia/Pacific Rim regions need to improve their QSR by about 23% to 33% to be at par with EMEA companies' performance.

The results of the additional tests conducted, as mentioned in Subsection 5.3.2, demonstrate the improvement in QSR between any two years and over the 3-year period at 0.01 significance level in all QSR measures. Hence, with the exception of reporting deficiencies in a few indicators, the outcomes of all analysis and tests done for QSR assessment suggest that electricity generators are on the right track towards a higher QSR.

5.3.4 Developing trends towards further improvement of QSR in the electricity industry

There are certain emergent contentions to transform the present sustainability reporting (Ahmed Haji & Anifowose, 2016) to a more comprehensive QSR. From the results of QSR assessment, this thesis identifies some areas that would contribute to further improve QSR.

First is framing the SDGs to be directly linked to the companies' overall business strategies and objectives. Based on the data gathered from the electricity generators' sustainability disclosures over 2018-2020, around 60% to 65% made mention and/or discuss the SDGs, dominated by SDGs 7 and 13 followed by SDGs 8 and 9. This thesis observes that there are electricity generators that merely mention SDGs with some infographics, which aims to create the impression of gaining legitimacy and doing the right thing (Manes-Rossi & Nicolo, 2022). This supports the disappointing picture of companies' engagement with SDGs (Heras-Saizarbitoria et al., 2022), resorting to "cherry picking" the SDGs they feel comfortable with (Heras-Saizarbitoria et al., 2022; Kornieieva, 2020). van Zanten and van Tulder (2021) recommend the nexus approach to the SDGs (instead of treating SDGs as isolated silos) through managing the interactions between SDGs that would help companies improve their environmental and societal impacts. The following extract from sustainability report shows SDGs 7 and 13 are directly linked to the company's sustainability plan, indicating details of renewable investment, its impact on generation capacity, and emissions avoided.

"Energy produces and sells exclusively renewable energy, helping to displace fossil fuels in the national electricity mixes. As part of the 2020 Sustainability Master Plan, this division has committed to investing $2.5 billion over the period 2016-2020 in renewable generation to reach a total capacity of 10,500 MW. In 2019, ACCIONA reached 10,117 MW of installed capacity and avoided the emission into the atmosphere of a total of 13.1 million tonnes of CO2." (Sustainability Report, 2019, pp. 169-170, Acciona). It is also noted that there is a related table showing quantified avoided emissions by country of operation.

The second argument pertains to the inclusion of methodology or basis of calculation (e.g. GHG emissions), which enhance the reliability of sustainability reporting. The following quote shows a detailed basis for computing GHG emissions.

"Scope 1 and Scope 2 emissions of greenhouse gases from power stations, offices, and other facilities of Tohoku Electric Power and Tohoku Electric Power Network are calculated in accordance with Japan's Act on Rationalizing Energy Use and Act on Promotion of Global Warming Countermeasures. Scope 3 emissions are calculated by multiplying the electricity purchased from other companies by the alternative CO2 emission factor specified under the latter Act-specifically, 0.000488 t-CO2/kWh for FY2019 and 0.000470t-CO2/kWh for FY2020." (Sustainability Data Book, 2020, p. 8, Tohoku Electric Power).

Third is the reporting of sustainability activities with financial quantification of the impact of such an undertaking. For example, this extract discloses the monetary quantification of cost reduction measures.

"In 2017–2018, savings from initiatives aimed at cutting operating costs amounted to over RUB 12 bn, while total procurement savings across RusHydro Group came in at RUB 9.55 bn for 2018 alone. We intend to continue our cost reduction and efficiency improvement efforts to maximize savings. Example of financial quantification of sustainability information." (Annual Report, 2018, p. 8, PJSC RusHydro).

Fourth is the comparative reporting of sustainability performance with meaningful details. As noted above, about 65% of sample companies provide three or more years of comparative data for sustainability performance. Further reporting improvement on the trends over time quality dimension will be useful not only for internal comparison but external as well (e.g. within peers, country, or even regional comparison). This aspect can be associated with materiality content of the sustainability report. Better contextualisation of materiality aspect in sustainability reporting is viewed as vital for comparability (Luque-Vílchez et al., 2023). Henriques et al. (2022) show that companies that thoroughly follow the IIRC and/or GRI standards demonstrate higher levels of materiality as they pay more attention to stakeholder relationship, hence higher QSR.

Last is the assurance of sustainability reports or sustainability portion of the annual reports. During the period 2018-2020, more than 50% of the sample companies do not have external assurance of their sustainability report, which can be attributed to the absence of mandatory assurance regulations for sustainability reporting. Moreover, assurance of sustainability reports varies in terms of coverage area. For example, some companies have limited assurance covering only the emissions or environmental information only, while others have comprehensive coverage to include economic, social, environmental, and governance aspects. For other companies, the audit committee reviews the sustainability reports (Ahmed Haji & Anifowose, 2016). According to Boiral et al. (2019a), external assurance cultivates the integration of GRI guidelines, promotes self-regulation strategy, encourages stakeholder responsiveness, and can contribute to stakeholder accountability. Furthermore, firms are more inclined to consider sustainability reporting practices, including external assurance, as a substantive approach, particularly for those without environmental reputation or commitment (Khatri & Kjærland,

2023). Third party assurance also brings about stakeholder confidence in the usefulness and quality of sustainability reports and increases credibility of reports (Rezaee, 2017; Rezaee et al., 2023; Tuo et al., 2023), especially assurance with comprehensive coverage.

5.4 Determinants of QSR

This part of the chapter aims to address RQ2. It starts with a discussion of the descriptive statistics of all variables used in the regression analyses, followed by correlation analysis and measures to address multicollinearity, and the baseline regression results. Results of the robustness and additional tests are also discussed.

5.4.1 Descriptive statistics- Dependent, independent, and control variables

Table 5.10 presents the descriptive statistics across three years of all variables that are used in the regression model.

Dependent variables: The overall mean for QSRRM is 0.51 and the median is 0.50. This denotes that electricity generators disclosed 22 out of 42 maximum points, or 51% quality of reporting for the relevance (including materiality) dimension. On the other hand, the mean and median scores for QSRR are 0.65, implying that 11 out of 17 maximum points are achieved by the electricity generators, thus translating to 65% reporting quality for the reliability dimension. The mean and median scores for QSRTotal are 0.55 and 0.54, respectively. This suggests that 33 out of 59 maximum points are secured by the electricity generators, representing 55% quality of sustainability reporting as a whole.

Independent variables: SUSPER, GRI, GENDIV, CPP1, and INSTSHARE show increases between 2018 and 2020, while LAW shows a slight decrease. FOREIGNOWN, on the other hand, increases by 1% from 2018 to 2019 and is back to the 2018 level of 31% in 2020. Sustainability performance of electricity generators ranges from a low 0.17 in 2018 to a high 0.90 in 2020. The means increased by 3% and 4% between 2018 and 2019, and between 2019 and 2020, respectively. The GRI variable remains constant at 0.80 in 2018 and 2019, then shows a rise of 5% from 2019 to 2020. The GENDIV likewise posts positive increases of 11% and 8%, while CPP1 increases 4% and 5%, from 2018 to 2019 and 2019 to 2020, respectively. There is a decrease of 2% in the average rule of law rating of companies both from 2018 to 2019, and from 2019 to 2020. Moreover, there is a decrease in the percentage of institutional shareholding by 1% from 2018 to 2019, but an increase of 2% from 2019 to 2020. The lowest percentage of institutional shareholding is 3%, and the highest is 100%, while the percentage of foreign shareholding ranges from 0% to 100%.

Control variables: LnTA has a steady increase of 1% between 2018 and 2019, and between 2019 and 2020. TOBINSQ's mean increases by 3% from 2018 to 2019 but also decreases by 3% from 2019 to 2020. ROA remains static from 2018 to 2020. SALESTA also is constant from 2018 to 2019, and decreases by 9% from 2019 to 2020, while LDTDA remains static from 2018 to 2020.

This paragraph discusses the statistics for the independent and control variables across three years. The average sustainability performance of the electricity generators (SUSPER) is 58 based on the 0 to 100 scoring scale. There are 42 electricity generators that have achieved above the

58% mean scores throughout the three-year period of examination, while another 14 companies also have above average scores for one to two years (untabulated). There are 17 missing observations for the SUSPER variable. On a per region basis, 57%, 18%, and 71% of companies domiciled in the Americas, Asia/Pacific Rim, and EMEA, respectively, have ratings above the median score (untabulated). For the GRI variable, the mean and median scores are computed at 0.81 and 1, respectively. Eighty percent of the sample companies use GRI reporting frameworks in 2018 and 2019, and 84% in 2020 (untabulated). The rest of the companies use other reporting standards such as SASB, IIRF, United Nations Global Compact, International Organisation for Standardisation 26000, TCFD recommendations, or country's CSR reporting guidelines. There are a number of companies that use a combination of two or more reporting frameworks (e.g., GRI and SASB, GRI and IRF, GRI SASB, and TCFD, GRI and International Organisation for Standardisation 26000). On a per region basis, 90%, 84%, and 73% of companies located in EMEA, Asia/Pacific Rim, and the Americas, respectively, use the GRI standards (untabulated). The mean and median scores for GENDIV are .51 and 1, respectively. On the rule of law (LAW), the mean is 0.97 while the median is 1.43, with the lowest and highest score of -0.79 and 1.90, respectively. The average LAW in 2020 is negative but negligible.[18] On the other hand, the carbon pricing policy (CPP1) variable has a mean of 0.57, which suggests that about 57% of companies belong to carbon pricing countries (including the United States of America states with CPP), and a median score of 1. The institutional shareholding variable (INSTSHARE) has mean and median scores of 0.64 and 0.65, respectively, which signifies that institutional shareholders own an average of 64% in electricity generators' shares of stocks. Moreover, foreign shareholding variable (FOREIGNOWN) has mean and median scores of 0.31 and 0.20,

[18] The value of -1.43E-10 is computed based on rule of law data from https://databank.worldbank.org/source/ worldwide-governance-indicators/preview/on# Accessed 12 June 2024 for 211 countries

respectively, which suggests that foreign investors have an average share of 31% in electricity generators' shares of stocks.

We now turn to the statistics for the control variables across three years. LnTA has mean and median scores of 10.23 and 10.20 respectively. The average total assets of sample companies is USD43,915 million. The huge amount of assets may be due to the capital-intensive nature of the electricity generation sector. Andonov and Rauh (2024) argue that the electricity industry necessitates sizeable investment in its effort to further reduce carbon footprint. TOBINSQ's mean and median scores are 1.11 and 1.09, respectively, compared to the average for the energy industry for the three periods under study, which is 1.97[19]. ROA has mean and median scores of 0.03. The average industry benchmark for ROA under the Global industry classification standards utilities sector[20] is 0.08 from 2018-2020. The asset turnover variable, sales to total assets (SALESTA), has mean and median scores of 0.34 and 0.29. In the utility sector, 34% turnover ratio is above the industry average of 0.28 and 0.32 between 2018-2020 per Compustat database., while the average industry benchmark for under the Global industry classification standards [21] utilities sector1 for asset turnover ranges from 0.28 and 0.32 between 2018-2020. The variable for leverage ratio (LTDTA) has mean and median scores of 0.32 and 0.33, respectively, which suggest an average of 32% leverage ratio for the electricity generators. The average industry benchmark for under the Global industry classification standards utilities sector[22] for leverage ranges from 0.70 and 0.71 between 2018-2020.

[19] Calculated from Bloomberg data
[20] From Wharton Research Data Services
[21] From Wharton Research Data Services
[22] From Wharton Research Data Services

Table 5.10: Descriptive statistics for dependent, independent, and control variables

Variable(s)	N	2018					2019					2020					3 years				
		Mean	Med.	SD	Min	Max	Mean	Med.	SD.	Min	Max	Mean	Med.	SD	Min	Max	Mean	Med.	SD	Min	Max
QSRRM	300	0.48	0.46	0.14	0.20	0.82	0.52	0.51	0.13	0.29	0.80	0.53	0.51	0.12	0.32	0.86	0.51	0.50	0.13	0.20	0.86
QSRR	300	0.61	0.59	0.19	0.18	1.00	0.66	0.65	0.18	0.18	0.94	0.69	0.68	0.15	0.24	1.00	0.65	0.65	0.18	0.18	1.00
QSRTotal	300	0.52	0.51	0.14	0.22	0.84	0.56	0.56	0.13	0.29	0.84	0.58	0.56	0.12	0.31	0.88	0.55	0.54	0.13	0.22	0.88
SUSPER	283	0.56	0.59	0.17	0.17	0.90	0.58	0.59	0.16	0.17	0.89	0.60	0.62	0.16	0.26	0.90	0.58	0.59	0.16	0.13	0.90
GRI	300	0.80	1.00	0.40	0.00	1.00	0.80	1.00	0.40	0.00	1.00	0.84	1.00	0.37	0.00	1.00	0.81	1.00	0.39	0.00	1.00
GENDIV	300	0.46	0.00	0.50	0.00	1.00	0.51	1.00	0.50	0.00	1.00	0.55	1.00	0.50	0.00	1.00	0.51	1.00	0.50	0.00	1.00
LAW	300	1.00	1.51	0.82	-0.79	1.90	0.98	1.45	0.80	-0.75	1.90	0.94	1.36	0.76	-0.79	1.90	0.97	1.43	0.79	-0.79	1.90
CPP1	300	0.55	1.00	0.50	0.00	1.00	0.57	1.00	0.50	0.00	1.00	0.60	1.00	0.49	0.00	1.00	0.57	1.00	0.50	0.00	1.00
INSTSHARE	300	0.64	0.64	0.25	0.04	1.00	0.63	0.64	0.25	0.03	1.00	0.65	0.67	0.25	0.03	1.00	0.64	0.65	0.25	0.03	1.00
FOREIGNOWN	298	0.31	0.22	0.27	0.00	1.00	0.32	0.20	0.27	0.00	1.00	0.31	0.20	0.27	0.00	1.00	0.31	0.20	0.27	0.00	1.00
LnTA	300	10.17	10.17	0.91	8.65	12.21	10.23	10.19	0.90	8.65	12.21	10.30	10.31	0.91	8.65	12.21	10.23	10.20	0.91	8.65	12.21
TOBINSQ	300	1.09	1.08	0.25	0.62	2.04	1.13	1.14	0.28	0.62	2.04	1.09	1.08	0.27	0.62	2.04	1.11	1.09	0.27	0.62	2.04
ROA	300	0.03	0.03	0.03	-0.06	0.11	0.03	0.03	0.03	-0.06	0.11	0.03	0.02	0.02	-0.01	0.11	0.03	0.03	0.03	-0.06	0.11
SALESTA	300	0.35	0.32	0.23	0.08	1.32	0.35	0.29	0.22	0.08	1.32	0.32	0.27	0.20	0.08	1.27	0.34	0.29	0.22	0.08	1.32
LTDTA	300	0.32	0.32	0.14	0.02	0.61	0.32	0.33	0.13	0.02	0.61	0.32	0.33	0.13	0.02	0.61	0.32	0.33	0.13	0.02	0.61

Note: All variable definitions are in Chapter 4, Subsection 4.3.1.

5.4.2 Correlation matrix

The correlation analysis is done through Pearson's correlation for three significance levels (0.01, 0.05, and 0.10) as tests for multicollinearity. The results presented in Table 5.11 show that the correlation coefficients between dependent and independent variables and between independent variables fall below the 0.80 threshold (Gujarati & Porter, 2009) for multicollinearity. The highest significant correlation coefficient is 0.55 between QSRTotal and SUSPER, which suggests that the thesis model has no multicollinearity issues (Das et al., 2023; Dincer et al., 2023; Khan et al., 2021).

Table 5.12 shows an overall mean variance inflation factors of 1.58, which is far below the recommended limit of <10 (Gujarati & Porter, 2009; Khan et al., 2021). The highest individual variance inflation factors is 1.75 for GENDIV and TOBINSQ, and the lowest FOREIGNOWN at 1.25, suggesting that there is no multicollinearity problem since the VIFs are not unusually larger than 1 (Mansfield & Helms, 1982). Moreover, the tolerance or reciprocal of variance inflation factors (1/ variance inflation factors) are all above 0.5, implying that the assumption for non-multicollinearity in not breached (Menard, 2002; Zharfpeykan & Askarany, 2023).

Furthermore, the results of the untabulated Spearman's rho test show that multicollinearity is not an issue among the independent variables that may impact on the explanatory power of the models (Alrazi et al., 2018). The highest significant correlation is between QSRTotal and SUSPER, which is 0.56.

Table 5.11: Pearson's correlation

Variable(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
QSRRM (1)	1														
QSRR (2)	0.70***	1													
QSRTotal (3)	0.96***	0.86***	1												
SUSPER (4)	0.53***	0.46***	0.55***	1											
GRI (5)	0.41***	0.40***	0.44***	0.22***	1										
GENDIV (6)	0.20***	0.18***	0.20***	0.47***	-0.02	1									
LAW (7)	-0.10*	0.04	-0.05	0.18***	-0.11**	0.41***	1								
CPP1 (8)	-0.01	0.21***	0.07	0.07	0.12**	0.21***	0.26***	1							
INSTSHARE (9)	-0.03	-0.05	-0.03	0.11*	-0.14***	0.18***	0.22***	-0.01	1						
FOREIGNOWN (10)	0.23***	0.24***	0.25***	0.09	0.08	0.03	0.03	0.21***	-0.19***	1					
LnTA (11)	0.11*	0.10*	0.11**	0.26***	0.24***	0.18***	0.31***	0.24***	0.21***	0.04	1				
TOBINSQ (12)	0.10*	0.07	0.10*	0.27***	-0.17***	0.31***	0.24***	-0.20***	0.32**	-0.08	-0.12**	1			
ROA (13)	0.20***	0.09*	0.17***	0.11**	-0.06	0.00	-0.17***	-0.28***	-010*	0.33	-034***	0.37***	1		
SALESTA (14)	0.07	0.26***	0.15***	0.05	0.08	-0.05	-0.16***	0.18***	-0.14**	0.19***	-0.18***	-0.01	0.15***	1	
LTDTA (15)	-0.20***	-0.16***	-0.20***	-0.25***	0.06	-0.19***	0.07	0.04	0.06	-0.11*	-0.03	-0.02	-0.13**	-0.24***	1

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

Table 5.12: Variance inflation factors in regressions for the dependent variables

Variable(s)	DV=QSRRM	DV=QSRR	DV=QSRTotal
	Variance Inflation Factor (VIF)		
SUSPER	1.74	1.74	1.74
GRI	1.37	1.37	1.37
GENDIV	1.75	1.75	1.75
LAW	1.52	1.52	1.52
CPP1	1.67	1.67	1.67
INSTSHARE	1.48	1.48	1.48
FOREIGNOWN	1.25	1.25	1.25
LnTA	1.61	1.61	1.61
TOBINSQ	1.75	1.75	1.75
ROA	1.47	1.47	1.47
SALESTA	1.34	1.34	1.34
LTDTA	1.35	1.35	1.35
Mean VIF	1.58	1.58	1.58

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1.

5.4.3 Main empirical results

This subsection of the chapter presents the main results (Table 5.13) of the multivariate OLS regression analyses (Bui et al., 2020) that seek to test the seven hypotheses and address RQ2. Regression analyses are performed for contemporaneous effects and one year lagged effects. In performing regression analyses, independent and control variables, except for indicator variables, are winsorised at the 99th (0.01) percentile (Obeng et al., 2021) to limit the impact of outliers or extreme observations.

Table 5.13 consists of Panel A and Panel B showing the baseline results for contemporaneous effect and one-year lagged effect, respectively. The regression for the one-year lagged effect is considered to avoid potential endogeneity issues (Johnes & Virmani, 2020). There are three

columns under each panel representing the QSR dimensions, where Columns 1 and 2 present the results for the two QSR dimensions, relevance, including materiality (QSRRM), and reliability (QSRR), respectively, while Column 3 shows the findings for the overall QSR (QSRTotal) (Khan et al., 2021). All regression runs are performed considering the year and country effects. Total number of observations are 281 for the contemporaneous effect and 187 for the one-year lagged effect. The adjusted R^2s are 0.4885, 0.4125, and 0.5159, which indicates that the independent and control variables in contemporaneous effect explain a 48.85%, 41.25%, and 51.59% variation in the dependent variables QSRRM, QSRR, and QSRTotal, respectively. On the other hand, the adjusted R^2s are 0.4595, 0.3691, and 0.4761 for QSRRM, QSRR, and QSRTotal regression runs, respectively, for the one-year lagged effect, which indicate that the independent and control variables in the model explain a 45.95%, 39.61%, and 47.61% variation in the dependent variables QSRRM, QSRR, and QSRTotal, respectively. The F statistics suggest that the regression models statistically predict the three dependent variables or have high explanatory powers having p-values of less than 5% (Dincer et al., 2023).

5.4.3.1 Test for hypothesis one (H1): Sustainability performance

As mentioned in Chapter 4, this study posits that there is no relationship between sustainability performance and QSR. Table 5.13 shows the positive and significant relationship of sustainability performance with all QSR measures in both contemporaneous effect and one-year lagged effect at 1% significance level, which suggest rejection of H1. Specifically, under both the contemporaneous and one-year lagged effects (Table 5.13, Panel A and Panel B), the coefficients of SUSPER for QSRRM, QSRR, and QSRTotal are all positive (0.3749, t-statistic =

8.50, 0.4534, t-statistic = 7.44, and 0.3975, t-statistic = 9.20, respectively and 0.0039, t-statistic = 6.88, 0.0048, t-statistic = 6.88, and 0.0041, t-statistic = 7.46, respectively). Khan et al. (2021) and Mahmoudian et al. (2022) find a significantly positive association between sustainability performance and QSR. Additionally, Schreck and Raithel (2018) see the positive link between QSR and sustainability performance as a signal of high sustainability performance. However, sometimes, even companies with low sustainability performance publish extensive sustainability reports (Alrazi et al., 2018; Schreck & Raithel, 2018) as a strategy to legitimise their existence or gain legitimacy (Imperiale et al., 2023).

5.4.3.2 Test for hypothesis two (H2): Use of the GRI framework

The second hypothesis states that there is no relationship between the use of the GRI framework and QSR. Table 5.13 shows the positive and significant relationship of the use of GRI framework with QSRRM, QSRR, and QSRTotal in the contemporaneous effect at 1% level and in the one-year lagged effect at 5% level, which means the rejection of H2. Particularly, under both the contemporaneous and one-year lagged effects, the coefficients of GRI for QSRRM, QSRR, and QSRTotal are all positive (0.0775, t-statistic = 4.52, 0.0846, t-statistic = 3.57, and 0.0796, t-statistic = 4.74, respectively and 0.0535, t-statistic = 2.47, 0.0591, t-statistic = 1.97, and 0.0551, t-statistic = 2.58, respectively). The results imply that electricity generators using the GRI guidelines have higher overall QSR and confirm the findings in Alrazi et al. (2018) and Anwar et al. (2021). Moreover, the adoption of the GRI framework also increases the companies' relevance including materiality, and reliability (Khan et al., 2021).

The Global Sustainability Standards Board champions the GRI framework as being concerned with all stakeholders; as such, the use of GRI presupposes the stakeholder orientation of the companies that use this framework. Consistent with stakeholder theory, companies are managed in the "interest of its stakeholders, defined as employees, financiers, customers, and communities" (Freeman, 1994, p. 417). Sustainability reporting under the GRI standards would offer more reliable and relevant information due to the framework's coverage, clarity, and global reputation (Khan et al., 2021) as the most widely used sustainability reporting framework. Moreover, in line with the institutional theory, companies using the GRI guidelines provide more extensive (Alrazi et al., 2018) sustainability disclosures than their peers in the electricity industry.

5.4.3.3 Test for hypothesis three (H3): Board gender diversity

The third hypothesis tests the predicted positive relationship between board gender diversity and QSR. Table 5.13 shows the positive (negative) and insignificant relationship of board gender diversity with QSRRM (QSRTotal) in both the contemporaneous and one-year lagged effects (in the one-year lagged effect). There is a negatively significant association of GENDIV with QSRR only in the one-year lagged effect which supports the finding of Cucari et al. (2018). Particularly, Panel A and Panel B show the coefficients of GENDIV for QSRRM, QSRR, and QSRTotal (0.0109, t-statistic = 0.75, -0.0192, t-statistic = -0.95, and 0.0022, t-statistic = 0.16, respectively and 0.0175, t-statistic = 0.92, -0.0468, t-statistic = -1.77, and -0.0010, t-statistic = -0.06, respectively).

The negatively significant finding implies that a higher percentage of women on the board may lead to lower QSR. Accordingly, H3 is rejected for all QSR measures in both the contemporaneous and one-year lagged effects. Dragomir and Dumitru (2023) find a positive but insignificant impact of gender diversity with carbon disclosures and integrated reporting quality, respectively. On the other hand, Al-Shaer and Zaman (2016) and Mahmoudian et al. (2022) show a positively significant relationship between gender diversity and sustainability reporting. Al-Shaer and Zaman (2016) claim that a gender diverse board may influence QSR due to females' stakeholder orientation and higher involvement in social responsibility concerns.

For gender diversity, the unexpected result (Bae, 2014) of a negatively significant relationship with QSR in the reliability dimension (which includes R3- Verifiability or external assurance) may be caused by the effect of the low assurance rating under the reliability variable (QSRR) leading to the negative impact of gender diversity on QSR. Benjamin et al. (2024) demonstrate the negative and significant result of the interaction between the percent of women on the board and assurance on environmental and social disclosures.

Results from prior studies on the relationship between board gender diversity and QSR in emerging and developed countries differ in terms of power or impact of women on the board. For example, in Indian companies, the presence of women on the board can drive improvement in the QSR, although women directors lack the power to require external assurance (Singhania et al., 2023). Erin et al. (2022) also document the positive impact of board gender diversity in dealing with concerns on sustainability reporting practices by Nigerian companies. In the case of Amran et al. (2014a), the authors note that the low membership of women on Malaysian

companies' boards may restrict this minority group to significantly influence transparency in sustainability reporting. In the United Kingdom setting, Al-Shaer and Zaman (2016) find positive significant association between gender diversity and assurance as a measure of QSR. This suggests that women directors may influence the board to secure external audits of sustainability reports. Moreover, in a German setting, Gerwing et al. (2022) conclude that with a higher percentage of women on the supervisory board, the quality of mandatory sustainability reporting may ultimately improve. In the study involving French companies, results suggest that the presence of at least two or three female directors acts as an alternative for CSR assurance in assessing the credibility of CSR reporting (Nekhili et al., 2017).

5.4.3.4 Test for hypothesis four (H4): Rule of law

This thesis hypothesises that there is a positive relationship between the country's rule of law and QSR. Empirical results in Table 5.13 for both contemporaneous effect and one-year lagged effect reveal the negatively significant relationship between rule of law and QSRRM and with QSRTotal in the one-year lagged effect at 5% and 10% significance levels, respectively, hence do not support H4. However, rule of law has no relationship with QSRR and QSRTotal in both contemporaneous and one-year lagged effect and in the contemporaneous effect, respectively, thus rejecting H4 also. In particular, Panel A and Panel B report the coefficients of LAW for QSRRM, QSRR, and QSRTotal (-0.0204, t-statistic = -2.28, 0.0068, t-statistic = 0.55, and -0.0126, t-statistic = -1.43, respectively and -0.0268, t-statistic = -2.37, 0.0018, t-statistic = 0.12, and -0.0185, t-statistic = -1.66, respectively). The negatively significant results imply that there are more companies with lower QSR in countries with relatively strong law enforcement. These results run counter to the findings in Alrazi et al. (2018), where companies domiciled in stronger

law enforcement nations are likely to have greater sustainability disclosures. The statistically insignificant results for QSRTotal corroborate with Alrazi et al's (2016) finding of the negative and insignificant impact of rule of law on environmental related disclosures. There are companies in countries with weak rule of law that report high quality of sustainability disclosures aiming to gain social acceptance (Alrazi et al., 2016b) in line with legitimacy theory.

5.4.3.5 Test for hypothesis five (H5): Carbon pricing policy

H5 says that there is a positive relationship between carbon pricing policy and QSR. Table 5.13 indicates the negative and significant association of CPP1 with QSRRM in both contemporaneous and one-year lagged effects, which rejects H5. Moreover, CPP1 has a positive (negative) and insignificant relationship with QSRR (QSRTotal) in both contemporaneous and one-year lagged effects, which also rejects H5. Specifically, the coefficients of CPP1 for QSRR and QSRTotal are positive and negative for QSRRM (-0.0294, t-statistic = -2.03, 0.0217, t-statistic = 1.08, and -0.0147, t-statistic = -1.03, respectively and -0.0439, t-statistic = -2.44, 0.0109, t-statistic = 0.44, and -0.0281, t-statistic = -1.59, respectively). These findings suggest that when applying institutional theory, it appears no coercive pressure (Dong et al., 2023) is felt by those countries that do not have CPP to implement either emissions trading or carbon tax even if most developed countries are already adopting CPP. This may be due to the enormous investment in technology required to implement CPP (e.g. ETS) and impact the norms, expectations, and awareness of the public (Alrazi et al., 2016b). These findings contradict those of Rahman et al. (2019) and Anwar et al. (2021) who argue that the government's introduction of CPP affects the reporting practices of firms supporting the coercive isomorphic view of

institutional theory (Rahman et al., 2019). Moreover, carbon pricing policy may have a disciplinary effect where companies are likely to improve their disclosures to enhance their reputation (Bui et al., 2020).

5.4.3.6 Test for hypothesis six (H6): Institutional shareholding

The sixth hypothesis envisages that there is no relationship between the percentage of shares held by institutional investors and QSR. Table 5.13 presents the positively significant influence of institutional shareholding with QSRRM, QSRR, and QSRTotal in both the contemporaneous and one-year lagged effects at 1% and 5% significance levels, rejecting H6. Specifically, under both the contemporaneous and one-year lagged effects, the coefficients of INSTSHARE for QSRRM, QSRR, and QSRTotal are all positive (0.1000, t-statistic = 3.66, 0.1092, t-statistic = 2.89, and 0.1027, t-statistic = 3.83, respectively and 0.0011, t-statistic = 3.04, 0.0012, t-statistic = 2.46, and 0.0011, t-statistic = 3.19, respectively). This may be attributed to active participation by institutional shareholders, through their representative directors, in the board's decision-making process. Institutional investors usually own a big percentage of shares in the electricity industry (average of 64% for sample companies) thus making it complex and costly to dispose of their shares without negatively impacting share price, as well as difficulty finding alternative investments, hence they have incentives to be active in strategic corporate decisions, such as sustainability related decisions, and in monitoring undertakings (Pucheta-Martínez & Chiva-Ortells, 2018). Prior literature that documents the positive relationship between QSR and institutional shareholding, such as Shahab and Ye (2018) and Oh et al. (2011), is consistent with stakeholder-agency theory's view that to reduce information asymmetry between the firm and

the investors, more disclosures should be provided by the firms (Bose et al., 2018). These results contrast with those of Khan et al. (2021), Masum et al. (2020), Udin et al. (2017), and Ullah et al. (2019) who find no significant influence of institutional shareholding on QSR. The lack of relationship between QSR and institutional ownership implies that institutional shareholders may actually be less active in the board and in decisions about sustainability reporting, as opposed to what prior studies stated (e.g. Bose et al., 2018; Das et al., 2023) that institutional investors are actively participating in the board and would prefer more disclosures of sustainability information.

5.4.3.7 Test for hypothesis seven (H7): Foreign shareholding

The last hypothesis predicts the positive relationship between the percentage owned by foreign investors and QSR. The results in Table 5.13 display a consistent positively significant influence of foreign shareholding for QSRRM and QSRTotal at 5% and 10% significant levels in both contemporaneous and one-year lagged effects, supporting H7. FOREIGNOWN has positive but insignificant association with QSRR, rejecting H7. Particularly, under both the contemporaneous and one-year lagged effects, the coefficients of FOREIGNOWN for QSRRM, QSRR, and QSRTotal are all positive (0.0570, t-statistic = 2.50, 0.0495, t-statistic = 1.57, and 0.0549, t-statistic = 2.45, respectively and 0.0005, t-statistic = 1.69, 0.0004, t-statistic = 1.10, and 0.0005, t-statistic = 1.66, respectively). These positively significant findings confirm those of Injeni et al. (2022) and Ismail et al. (2018). From a political economy perspective, the firm should take into consideration the diverse norms, culture, laws, rules, and regulations for its foreign investors coming from various country (Ismail et al., 2018), which reinforce the view of stakeholder

theory suggesting that firms will act on powerful stakeholders' expectations and concerns, and part of the response will be by way of strategic sustainability disclosures (Dibia & Onwuchekwa, 2015). One reason for the positive coefficient for foreign shareholding is that foreign investors are more professional and put in place high-skilled, controlling and monitoring mechanisms, which encourages managers to improve the company's performance (Udin et al., 2017), as well as sustainability reporting practices to enhance QSR. Other contributing factors are the high quality of corporate governance and technology transfer by foreign investors (Udin et al., 2017), which could bring about positive changes in the quality of sustainability reports issued by companies. Khan et al. (2021) find a negative and insignificant impact of foreign shareholding on QSR.

In terms of control variables, this thesis discusses the results concerning these variables. ROA appears to have a significantly positive influence on QSRRM and QSRTotal in the contemporaneous effect, at 5% and 10% significance level, respectively, similar to Mahmoudian et al. (2022) and Mion and Adaui (2019). SALESTA has a negative effect on QSRRM in Panel A and Panel B at 5% and 1% significance levels, respectively. Serhii et al. (2023), however, find a positive but insignificant effect on sustainability reporting disclosure quality index.

Table 5.13: Determinants of QSR: Main results

Variable(s)	Panel A: Contemporaneous effect			Panel B: One-year Lagged effect		
	DV=QSRRM	DV=QSRR	DV=QSRTotal	DV=QSRRM	DV=QSRR	DV=QSRTotal
	1	2	3	4	5	6
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
SUSPER	0.3749***	0.4534***	0.3975***	0.0039***	0.0048***	0.0041***
	(8.50)	(7.44)	(9.20)	(6.88)	(6.88)	(7,46)
GRI	0.0775***	0.0846***	0.0796***	0.0535 **	0.0591**	0.0551**
	(4.52)	(3.57)	(4.74)	(2.47)	(1.97)	(2.58)
GENDIV	0.0109	-0.0192	0.0022	0.0175	-0.0468*	-0.0010
	(0.75)	(-0.95)	(0.16)	(0.92)	(-1.77)	(-0.06)
LAW	-0.0204**	0.0068	-0.0126	-0.0268**	0.0018	-0.0185*
	(-2.28)	(0.55)	(1.43)	(-2.37)	(0.12)	(-1.66)
CPP1	-0.0294**	0.0217	-0.0147	-0.0439**	0.0109	-0.0281
	(-2.03)	(1.08)	-1.03)	(-2.44)	(0.44)	(-1.59)
INSTSHARE	0.1000***	0.1092***	0.1027***	0.0011***	0.0012**	0.0011***
	(3.66)	(2.89)	(3.83)	(3.04)	(2.46)	(3.19)
FOREIGNOWN	0.0570**	0.0495	0.0549**	0.0005*	0.0004	0.0005*
	(2.50)	(1.57)	(2.45)	(1.69)	(1.10)	(1.66)
LnTA	-0.0014	-0.0165	-0058	0.0070	-0.051	0.0035
	(-0.18)	(-1.52)	(-0.74)	(0.73)	(-0.39)	(0.37)
TOBINSQ	0.0227	0.0323	0.0255	0.0320	0.0510	0.0375
	(0.82)	(0.84)	(0.94)	(1.14)	(1.31)	(1.35)
ROA	0.5271**	0.2329	0.4423*	-0.0146	0.3416	0.0880
	(2.06)	0.66)	(1.76)	(-0.07)	(1.21)	(0.44)
SALESTA	-0.0644**	0.0583	-0.0291	-0.0618*	0.0432	-0.0315
	(-2.23)	(1.46)	(-1.03)	(-1.80)	(0.91)	(-0.93)
LTDTA	-0.0711	-00744	-0.0721	-0.008	-0.0004	-0.0007
	(-1.50)	(-1.13)	(-1.55)	(1.41)	(-0.56)	(1.24)
_cons (intercept)	0.2058**	0.3659***	02519***	0.1492	0.2566*	0.1801*
	(2.31)	(2.98)	(2.89)	(1.40)	(1.74)	(1.71)
YearFE	Yes	Yes	Yes	Yes	Yes	Yes
CountryFE	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.4885	04125	0.5149	0.4595	0.3691	0.4761

F value	18.86	4.11	20.81	11.54	8.25	12.27
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000
Observations	281	281	281	187	187	187

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

Results from regression runs for the contemporaneous effect and one-year lagged effect report six factors that determine the QSR of electricity generators, namely sustainability performance (SUSPER), use of GRI (GRI), rule of law (LAW), carbon pricing policy (CPP1), institutional shareholding (INSTSHARE), and foreign shareholding (FOREIGNOWN) for the relevance including materiality dimension (QSRRM). For the reliability dimension (QSRR), QSR of electricity generators is influenced by SUSPER, GRI, and INSTSHARE in both the contemporaneous and one-year lagged effects, and by the presence of women on the board (GENDIV) in the one-year lagged effect. For the overall QSR (QSRTotal), QSR of electricity generators is driven by SUSPER, GRI, INSTSHARE, and FOREIGNOWN in both the contemporaneous and one-year lagged effects, and by LAW in the one-year lagged effect. The three common determinants of QSR from the results of the regression runs for the three dependent variables are SUSPER, GRI, and INSTSHARE. The outcomes of regression runs for the contemporaneous effect and one-year lagged effect address RQ2- "What are the determinants of the electricity generators' QSR?". Summarised in Table 5.14, below, are actions for hypotheses tests based on the main outcomes.

Table 5.14: Determinants of QSR: Summary of actions for hypotheses tests

Hypothesis: Relationship with QSR	Action based on regression analysis						Studies supporting findings
	Contemporaneous effect			One year lagged effect			
	QSRRM	QSRR	QSRTotal	QSRRM	QSRR	QSRTotal	
H1- SUSPER- No relationship	Reject + S	Reject + S	Reject + S.	Reject + S.	Reject + S	Reject + S	Henriques et al. (2022); Khan et al. (2021); Schreck & Raithel (2018)
H2- GRI- No relationship	Reject + S.	Reject + S.	Reject + S	Reject + S	Reject + S	Reject + S	Alrazi et al. (2018); Anwar et al. (2021); Rahman et al. (2019)
H3- GENDIV- positive relationship	Reject + NS	Reject - NS	Reject + NS	Reject + NS	Reject - S	Reject - NS	Bui et al. (2020); Cucari et al. (2018); Dragomir & Dumitru (2023)
H4- LAW- positive relationship	Reject - S	Reject + NS	Reject - NS	Reject - S	Reject + NS	Reject - S	Alrazi et al. (2016)
H5- CPP1- Positive relationship	Reject - S	Reject + NS	Reject - NS	Reject - S	Reject + NS	Reject - NS	Alrazi et al. (2016); Anwar et al. (2021); Rahman et al. (2019)
H6- INSTSHARE- No relationship	Reject + S	Reject + S	Reject + S	Reject + S	Reject + S	Reject + S	Bose et al. (2018); Shahab & Ye (2018)
H7- FOREIGNOWN- Positive relationship	Accept + S	Reject + NS	Accept + S	Accept + S	Reject + NS	Accept + S	Ananzeh et al. (2023); Bae et al. (2018); Das et al. (2023); Injeni (2022); Ismail et al. (2018)

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1.

S = significant

NS = not significant

5.4.4 Robustness tests

Measures to address endogeneity are performed, i.e., fixed effects for unobservable individual effects (Mundlak, 1978), change analysis, instrumental variable two-stage least squares for omitted variable(s) measurement error and reverse causality (Zahid et al., 2020), and other tests on the effect of companies operating in the United States of America, and address self-selection bias.

5.4.4.1 Firm fixed effects

Firm fixed effects technique is used to address the potential endogeneity caused by unobservable variables (Garcia-Castro et al., 2010). Numerous prior studies used firm fixed effects including Alkayed et al. (2023), Bui et al. (2020), Gerged et al. (2023), Khan et al. (2021), and Obeng et al. (2021). This thesis uses a panel dataset composed of data from the 100 sample companies for the period 2018 to 2020**,** with company and year as the panel variables. Table 5.15 presents the results from the firm fixed effects regressions. Results of the regression runs with firm fixed effects for company and year validate and support robustness of findings for the baseline regressions under the contemporaneous effect. Specifically, SUSPER, GRI, and FOREIGNOWN have positive and significant relationships with QSRTotal and QSRRM hold, while LAW's negative and significant association with the overall QSR and relevance including materiality dimension holds. The coefficients of SUSPER and GRI are significant at 1% level, LAW at 5% level, and foreign at 10% level. On the side of the reliability dimension of QSR, only the coefficients of SUSPER and GRI are positive and significantly associated with QSRR. The

control variable TOBINSQ is also positive and significant at the 5% level. Collectively, the results substantively reflect those of the main findings. The use of the fixed effects regression robust option also yields the same results (untabulated).

Table 5.15: Determinants of QSR: Firm fixed effects results.

Variable(s)	DV=QSRRM	DV=QSRR	DV=QSRTotal
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
SUSPER	0.1691***	0.1788*	0.1719***
	(2.69)	(1.73)	(2.84)
GRI	0.0559***	0.1492***	0.0828***
	(2.80)	(4.54)	(4.31)
GENDIV	-0.0202	-0.0057	-0.0161
	(-1.40)	(-0.24)	(-1.15)
LAW	-0.1226**	-0.1074	-0.1182**
	(-1.98)	(-1.05)	(-1.98)
CPP1	-0.0077	-0.0026	-0.0062
	(-0.32)	(-0.06)	(-0.27)
INSTSHARE	0.0036	0.0016	0.0030
	(0.07)	(0.02)	(0.06)
FOREIGNOWN	0.0991*	0.1250	0.1065*
	(1.74)	(-0.92)	(1.94)
LnTA	-0.0178	-0.0258	-0.0201
	(-0.50)	(-0.44)	(-0.58)
TOBINSQ	0.0777**	0.0534	0.0707**
	(2.22)	(0.93)	(2.10)
ROA	0.1887	-0.2031	0.0758
	(0.98)	(-0.64)	(0.41)
SALESTA	-0.0007	0.0988	0.0280
	(-0.01)	(1.05)	(0.51)
LTDTA	0.0988	-0.2427	0.0004
	(1.08)	(-1.62)	(0.00)
_cons (intercept)	0.5149	0.7316	0.5774
	(1.35)	(1.16)	(1.57)
YearFE	Yes	Yes	Yes
CompanyFE	Yes	Yes	Yes
Overall R^2	0.1471	0.1963	0.1878
Observations	281	281	281

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

5.4.4.2 Change analysis

This thesis also measures the relative change (Bui et al., 2020) in QSR in year t (vis-a-vis year t-1) to investigate the impact on the corresponding change in independent variables. Prior literature that employs change analysis include Bui et al. (2020), Maniora (2017), and Obeng et al. (2021). Table 5.16 reports the results of the change analysis performed to prove robustness of the main findings. Results for the change analysis indicate varied findings in terms of the association of the three dependent variables to independent variables. On the relevance including materiality dimension, the change in SUSPER, and LAW (with coefficients 0.0021 t-statistic= 3.15, and -0.1711 t-statistic= -2.68, respectively) have significant association with the change in QSRRM. On the reliability dimension, results imply that only the change in SUSPER, GRI, LAW, and FOREIGNOWN (with coefficients 0.0024, t- statistic= 2.16, 0.0441, t- statistic=1.98, -0.2382, t-statistic= -2.17, and .0018, t-statistic= 1.65, respectively) influences change in QSRR. The results also provide evidence that year-to-year change (Obeng et al., 2021) in QSRTotal is positively related to the change in sustainability performance, and negatively related to the rule of law, with coefficients 0.0022 t-statistic= 3.25, and -0.1904 t-statistic= -2.92, respectively. The change in LTDTA has a negative significant association with the change in QSRR.

Overall, the change analysis performed generate significant results for four independent variables, which appear consistent with those of the main findings (change in SUSPER, and LAW for all QSR measures, and GRI and FOREIGNOWN for QSRR).

Table 5.16: Determinants of QSR: Regression results using change analysis

Variable(s)	DV=ΔQSRRM	DV=ΔQSRR	DV=ΔQSRTotal
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
ΔSUSPER	0.0021***	0.0024**	0.0022***
	(3.15)	(2.16)	(3.25)
GRI	0.0097	0.0441**	0.0196
	(0.75)	(1.98)	(1.48)
GENDIV	-0.0052	-0.0202	-0.0095
	(-0.50)	(-1.13)	(-0.89)
ΔLAW	-0.1711***	-0.2382**	-0.1904***
	(-2.68)	(-2.17)	(-2.92)
CPP1	0.0085	0.0081	0.0084
	(0.81)	(0.45)	(0.79)
ΔINSTSHARE	0.0003	0.0008	0.0005
	(0.52)	(0.79)	(0.75)
ΔFOREIGNOWN	0.0007	0.0018*	0.0010
	(1.14)	(165)	(1.60)
ΔLnTA	0.0098	-0.0331	-0.0026
	(0.40)	(-0.78)	(-0.10)
ΔTOBINSQ	0.0184	0.0287	0.0214
	(0.72)	(0.65)	(0.82)
ΔROA	0.9304	0.0100	0.0691
	(0.85)	(0.05)	(0.62)
ΔSALESTA	0.0295	0.1415	0.0618
	(0.50)	(1.39)	(1.03)
ΔLTDTA	0.0013	-0.0030*	0.0001
	(1.31)	(-1.72)	(0.08)
_cons (intercept)	-0.0352**	-0.0792***	-0.0479***
	(-2.10)	(-2.74)	(-2.80)
Country_FE	Yes	Yes	Yes
Year_FE	Yes	Yes	Yes
Adjusted R^2	0.2116	0.1811	0.2585
Observations	186	186	186

Note(s). All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

5.4.4.3 Instrumental variable two-stage least squares

The instrumental variable two-stage least squares approach is used to address endogeneity issues, which can affect the relationship between QSR and the independent variables (Khan et al., 2021). The challenge for this thesis is to find the suitable instrumental variable for each of the seven independent variables, which is relevant and exclusive. This means that for an instrument to be considered valid, it has to have a strong correlation with the instrumented variable and no correlation with the error term (Liu et al., 2015). Ullah et al. (2021) argue that inappropriate/ improper use of instrumental variables may lead to problems of inconsistent coefficients and interpretation of results.

To address this potential issue of endogeneity and abate probable simultaneous causality, this thesis uses the instrumental variable two-stage least squares estimator (Al-Shaer & Zaman, 2019; Dilling & Caykoylu, 2019; Khan et al., 2023). The assumed endogenous variables are GRI and CPP1. The instrumental variables used are the average use of GRI and the average carbon pricing policy of countries across years. Following the mimetic isomorphism of institutional theory, the firms use of GRI is influenced by its peers in the same industry over time (Khan et al., 2023). For the carbon pricing policy, mimetic isomorphism and coercive isomorphism may also apply over time for companies in countries without CPP and with CPP, respectively. These instrumental variables are likely correlated with the company's use of GRI or CPP1 but not directly related to the dependent variables (QSRTotal, QSRRM, and QSRR). Other authors who employ instrumental variable two-stage least squares include Fonseka et al. (2019), Liu et al. (2015), and Obeng et al. (2021).

Table 5.17 shows the results of the manual two-stage regression for the 2SLS estimation with GRI and CPP1 as endogenous variables. The outcomes appear to be substantially consistent with the main results for contemporaneous effect for each measure of QSR. Likewise, results for the control variables also replicate the basic results. The results of the endogeneity test show that the p-value of the residual is not significant indicating that there is no endogeneity issue.

Moreover, the unreported results using ivregress 2SLS command in Stata (with GRI and CPP1 as endogenous regressors also) are very similar to those of the manual two-step process. Post-estimation tests are also employed (Dilling & Caykoylu, 2019). Durbin and Wu-Hausman scores are also not significant in all post estimation tests for endogeneity, thus GRI and CPP1 are exogenous variables. The minimum eignenvalue statistics is 27.0391, which is far higher than the values for 2sls and LIML size of nominal 5% Wald test, suggesting valid instruments used.

5.4.4.4 Other tests

The results using country dummy variable (1= United States of America companies, 0=otherwise) show the negative coefficient of country dummy variable suggesting that companies operating in the United States of America have lower QSR than non- United States of America companies (untabulated). Moreover, a Heckman test (untabulated) is also performed to address possible selection bias. The instrumental variable used is GRI_lag since the previous year's decision to use the GRI framework affects the current decision to adopt the said framework. GRI_lag has a significant association with GRI at the 1% significance level. The results of the second stage regressions for QSRRM, QSRR, and QSRtotal are largely similar to

the tenor of the main findings, except for GRI and CPP1 under the regression for QSRRM, which yield insignificant coefficients. For the control variables, ROA and SALESTA show significant coefficients under QSRRM, similar to the main findings. The Inverse Mills Ratio's (IMR) coefficient is not statistically significant, which implies that selection bias is not a cause of concern (Bose et al., 2017). In other words, the result of insignificant coefficients for IMR in all runs for dependent variables implies the absence of sample selection bias and appropriateness of OLS regression (Al-Shaer & Zaman, 2019).

Table 5.17: Determinants of QSR: Instrumental variable approach - GRI and CPP1 as endogenous variables

	Panel A- First stage regression	Panel B- Second stage regression		
Variable(s)	DV= GRI	DV= QSRRM	DV=QSRR	DV= QSRTotal
	Coefficient (z-value)	Coefficient (z-value)	Coefficient (z-value)	Coefficient (z-value)
MeanYearCountryGRI	0.8859*** (7,48)			
MeanYearCountryCPP1	-0.1569* (-1.76)			
Predictedvalue		0.0617 (1.50)	0.0911 (1.62)	0.0702* (1.74)
SUSPER	0.6547*** (4.73)	0.3878*** (7.08)	0.4481*** (6.00)	0.4052*** (7.54)
GENDIV	-0.0577 (-1.15)	0.0105 (0.69)	-0.0190 (-0.92)	0.0020 (0.13)
LAW	-0.0425 (-1.44)	-0.0218** (-2.22)	0.0074 (0.55)	-0.0134 (-1.39)
CPP1	0.0865 (1.27)	-0.0296** (-1.97)	0.0218 (1.07)	-0.0148 (-1.01)
INSTSHARE	0.0771 (0.84)	0.0989*** (3.48)	0.1097*** (2.83)	0.1020*** (3.66)
FOREIGNOWN	-0.0549 (-0.74)	0.0563** (2.37)	0.0498 (1.54)	0.0544** (2.34)
LnTA	0.1102*** 4.33	-0.0001 (0.01)	-0.0171 (-1.42)	-0.0049 (-0.56)
TOBINSQ	-0.0280 (-0.30)	0.0188 (0.62)	0.0339 (0.831)	0.0231 (0.78)
ROA	0.1271 (0.15)	0.5317** (2.01)	0.2310 (0.64)	0.4450* (1.71)
SALESTA	0.0821 (0.87)	-0.0638** (-2.13)	0.0580 (1.43)	-0.0287 (-0.98)
LTDTA	0.5385*** (3.56)	-0.0622 (-1.16)	-0.0781 (-1.07)	-0.0668 (-1.27)
_cons (intercept)	-1.4457*** (-4.46)	0.2011** (2.17)	0.3678*** (2.92)	0.2491*** (2.86)
YEAR FE	Yes	Yes	Yes	Yes
COUNTRY FE	Yes	Yes	Yes	Yes
Observations	281	281	281	281
R^2	0.3689	0.4536	0.3903	0.4796

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

5.4.5 Additional analyses

Additional analyses are also performed to confirm the validity of the main results. These analyses are: (1) addition of governance attributes variables to main regression model, and (2) using raw scores as dependent variables instead of the weighted average (Khan et al., 2021).

5.4.5.1 Including corporate governance variables

This thesis also performs regression runs replicating the main model but with added governance attributes variables to confirm consistency of findings. The findings (Table 5.18) show positive and significant coefficients of SUSPER, GRI, INSTSHARE, and FOREIGNOWN (0.3379, t-statistic= 7.56, 0.0753, t-statistic= 4.46, 0.0986, t-statistic= 3.64, and 0.0534, t-statistic= 2.35), and negatively significant coefficients of LAW and CPP1 (-0.0232, t-statistic= -2.60, and -0.0275, t-statistic= -1.91) for QSRRM. Moreover, a significantly positive coefficient is found in ROA (0.5394, t-statistic= 2.15), with negatively meaningful outcomes of SALESTA and LTDTA (-0.0755, t-statistic= -2.61, and -0.784, t-statistic= -1.67) for QSRRM. Likewise, on the reliability dimension, findings indicate positive and significant coefficients for SUSPER (0.4037, t-statistic=6.64), GRI (0.0757, t-statistic= 3.29), INSTSHARE (0.1180, t-statistic= 3.20), and FOREIGNOWN (0.0563, t-statistic= 1.80), confirming the main results. On the control variables, LnTA's coefficient (0.0264, t-statistic= -2.44) indicates a negative and significant association with QSRR. On the overall QSR, findings reveal the positive and significant coefficients for SUSPER (0.3568, t-statistic= 8.26), GRI (0.0754, t-statistic= 4.62), INSTSHARE (0.1042, t-statistic= 3.98), and FOREIGNOWN (0.0542, t-statistic= 2.47), while a negative and significant coefficient for LAW (-0.0167, t-statistic=-1.94), denoting a significant

relationship with QSRTotal, thus supports the main findings. On the control variables, ROA has positive and significant coefficient (0.4587, t-statistic= 1.90), while LTDTA has negatively significant coefficient (-0.0752, t-statistic= -1.65). The two governance variables, LnBOD (AUDCOM) show significantly positive (negative) association with all QSR measures.

Table 5.18: Determinants of QSR: Replicating main model with governance attributes

Variable(s)	DV=QSRRM	DV=QSRR	DV=QSRTotal
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
SUSPER	0.3379***	0.4037***	0.3568***
	(7.56)	(6.64)	(8.26)
GRI	0.0753***	0.0757***	0.0754***
	(4.46)	(3.29)	(4.62)
GENDIV	0.0112	-0.0109	0.0048
	(0.71)	(-0.51)	(0.31)
LAW	-0.0232***	-0.0006	-0.0167*
	(-2.60)	(-0.05)	(-1.94)
CPP1	-0.0275**	0.0212	-0.0135
	(-1.91)	(1.08)	(-0.97)
INSTSHARE	0.0986**	0.1180***	0.1042***
	(3.64)	(3.20)	(3.98)
FOREIGNOWN	0.0534**	0.0563*	0.0542**
	(2.35)	(1.82)	(2.47)
LnTA	-0.0042	-0.0264**	-0.0106
	(-0.53)	(-2.44)	(-1.38)
TOBINSQ	0.0240	0.0319	0.0263
	(0.88)	(0.86)	(1.00)
ROA	0.5394**	0.2594	0.4587*
	(2.15)	(0.76)	(1.90)
SALESTA	-0.0755***	0.0537	-0.0383
	(-2.61)	(1.37)	(-1.37)
LTDTA	-0.0784*	-0.0674	-0.0752*
	(-1.67)	(-1.05)	(-1.65)
BIND	0.0141	0.0103	0.0130
	(0.74)	(0.40)	0.70)
AUDCOM)	-0.0335***	-0.0283*	-0.0320***
	(-2.79)	(-1.73)	(-2.75)
LnBOD	0.0883***	0.1741***	0.1130***
	(3.27)	(4.75)	(4.34)
_cons (intercept)	0.0590	0.0796	0.0650
	(0.60)	(0.60)	(0.69)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adjusted R^2	0.5113	0.4562	0.5483
Observations	281	281	281

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

5.4.5.2 Using raw scores

Following Khan et al. (2021), this study reruns the baseline regression model by replacing QSRTotal, QSRRM, and QSRR with GrandTotal, TotalRM, and TotalR, respectively, as dependent variables. GrandTotal is the sum of TotalRM and TotalR, where TotalRM is the total score for relevance (including materiality) dimension while TotalR is the total score for reliability dimension. The results for the contemporaneous effect (Table 5.19) exactly mirror the main results in terms of significance levels. Results for the relevance including materiality dimension show a positive and significant relationship with SUSPER, GRI, INSTSHARE, and FOREIGNOWN, and a negative and significant association of LAW and CPP1 with TotalRM. Similarly, there is positive and significant association of SUSPER, GRI, and INSTSHARE with TotalR. Lastly, on the overall QSR, there also exists significantly positive relationship of SUSPER, GRI, INSTSHARE, and FOREIGNOWN with GrandTotal. On the control variables, ROA (SALESTA) has positive (negative) significant coefficient(s) for TotalRM and GrandTotal (TotalRM). The findings for all QSR measures perfectly confirm the main results.

Table 5.19: Determinants of QSR: Regression using raw scores instead of weighted scores

Variable(s)	DV=TotalRM	DV=TotalR	DV=GrandTotal
	Coefficient (t-value)	Coefficient (t-value)	Coefficient (t-value)
SUSPER	15.7456***	7.7074***	23.4530***
	(8.50)	(7.44)	(9.20)
GRI	3.2570***	1.4376***	4.6946***
	(5.52)	(3.57)	(4.74)
GENDIV	0.4590	-0.3263	0.1327
	(0.75)	(-0.95)	(0.16)
LAW	-0.8576**	-0.1158	-0.7418
	(2.23)	(-0.55)	(-1.43)
CPP1	-1.2339**	0.3691	-0.8648
	(-2.03)	(1.08)	(0.82)
INSTSHARE	4.2010***	1.8567****	6.0578***
	(3.66)	(2.89)	(3.83)
FOREIGNOWN	2.3955**	0.8418	3.2373**
	(2.50)	(1.57)	(2.45)
LnTA	-0.0585	-0.2811	-0.3396
	(-0.18)	(-1.52)	(-0.74)
TOBINSQ	0.9546	0.5487	1.5033
	(0.82)	(0.84)	(0.94)
ROA	22.1362**	3.9591	26.0952*
	(2.06)	(0.66)	(1.76)
SALESTA	-2.7061**	0.9912	-1.7149
	(-2.23)	(1.46)	(-1.03)
LTDTA	-2.9865	-1.2652	-4.2517
	(-1.50)	(-1.13)	(-1.55)
_cons (intercept)	8.6422**	6.2206***	14.8628***
	(2.31)	(2.98)	(2.89)
Country FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Adjusted R^2	0.4885	0.4125	0.5149
Observations	281	281	281

Note(s): All variable definitions are in Chapter 4, Subsection 4.3.1. ***, ** and * represent statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively (two-tailed tests).

5.5 Chapter summary

This chapter has reported and analysed the results of the study. Specifically, it discussed the findings from the QSR assessment, and the main empirical tests conducted on the two research questions and seven hypotheses set out in Chapter 3. It also discussed the descriptive statistics, correlation analysis, parametric and non-parametric tests, robustness tests, and additional analyses performed. The summary of findings is presented in the final chapter, Chapter 6.

CHAPTER 6

CONCLUSION

6.1 Introduction

This final chapter of the study is organised as follows: Section 6.2 discusses the overall summary of the results while Section 6.3 provides for the implications of the study for users, standard setters, and regulators. Section 6.4 discusses the limitations of the study, and in conclusion, Section 6.5 offers suggestions for future research.

6.2 Summary of research findings

This thesis, consisting of two parts, employs a mixed-method approach. Part 1 of this thesis uses content analysis to assess the QSR (Farooq et al., 2021; Henriques et al., 2022; Khan et al., 2021) in the electricity industry, in particular the electricity generation sector. Parametric and non-parametric tests are also conducted to support the results of QSR assessment. The evaluation considers the quality dimensions of relevance including materiality, and reliability, as well as the overall QSR. Part 2 of this study deals with the design of quantitative models and hypotheses testing to determine the drivers of QSR. Multivariate ordinary least squares (OLS) model is used to test the relationship between each QSR measure (QSRRM, QSRR, QSRTotal) (Bui et al., 2020; Donkor et al., 2021; Khan et al., 2021). Robustness and additional tests are also performed to validate the main findings.

The results of the QSR assessment indicate only a moderate overall level of QSR achieved by electricity generators (55%), but that it is improving over the 2018 – 2020 period examined (52% - 58%). The relevance including materiality dimension, which makes up around 70% (42/59) of total score shows slightly above average performance (51%), but likewise signify improvement from 2018-2020 (48% - 53%). The poor score is driven by the low quality (below average) disclosures for social (RM3b), economic performance (RM4a), and market presence (RM4b). On the other hand, the reliability dimension, which accounts for 30% (17/59) of the total score, attains a far better performance (65%) and upward trend from 2018-2020 (61% - 69%). Only the verifiability (R3) quality indicator falls below average. One big challenge faced by companies is to provide sustainability reporting both as a way to communicate the relevant sustainability information and to monitor management performance (Amran et al., 2014a). While the findings in this study imply increasing trends in all QSR measures, which suggest enhancement in sustainability reporting practices, the electricity generators' QSR still leaves room for further improvement (Amran et al., 2014a).

These findings and some deeper insights from this research appear to reinforce the need for mandatory sustainability reporting requirements. First, corporate sustainability plans and strategies may be lacking or deficient in companies under voluntary sustainability reporting regime as evidenced by the low QSR scores of the Americas and Asia/Pacific Rim regions. Second, the board or management of many companies are yet to benefit from the value of assurance for sustainability reports. Third, results indicate that companies still have particularly low disclosure quality on their economic and social activities. Lastly, on the positive side, the largest companies are more transparent and systematic (Donner et al., 2024) in their

sustainability reporting, most especially those under the mandatory reporting regime where the reporting requirements facilitate accountability to all strategic stakeholders and external assurance ensured (Vigneau & Adams, 2023), which contribute to high QSR.

Findings for the overall QSR reveal that sustainability performance, use of the GRI framework, institutional shareholding, and foreign shareholding with positive impact (both contemporaneous and one-year lagged effects), and rule of law with negative impact for the one-year lagged effect are the drivers of QSR. For the relevance (including materiality) dimension, positive influence are similar, while rule of law and carbon pricing policy have negative influence (both contemporaneous and one-year lagged effects). For the reliability dimension, sustainability performance, use of the GRI framework, and institutional shareholding have positive influences, but foreign shareholding is not significant (both contemporaneous and one-year lagged effects), while board gender diversity has a negative impact but only as a one-year lagged effect. For the control variables, ROA (SALESTA) influences QSRRM and QSRTotal (QSRRM) in the contemporaneous effect (both contemporaneous and one-year lagged effects).

Linking results to theories. This thesis uses a multi-theoretical approach (Fuhrmann, 2019) involving stakeholder, legitimacy, and institutional theories. To begin, the assessment tool takes into consideration quality indicators related to the concerns of a varied range of stakeholders consistent with stakeholder theory. Accordingly, the results of the QSR assessment reflects how companies report to their target stakeholder group(s), including their motivations for sustainability reporting. As regards hypothesis testing, all three theories are considered in the

interpretation of results. For example, companies in stakeholder-oriented countries that use GRI tend to have higher QSR. These companies disclose more comprehensive ESE information in response to their stakeholders' concerns and expectations, e.g. community projects and their social and environmental impacts. This observation aligns with the principle of inclusiveness of the stakeholder theory (Petruzzelli & Badia, 2024). On the other hand, those companies using the GRI framework that do have low QSR, are more likely to be using CSR reporting as a legitimating tool (Petruzzelli & Badia, 2024). In the case of carbon pricing policy (CPP), companies in countries with CPP are likely to disclose more comprehensive environmental information, either in compliance with the law (normative isomorphism) or to emulate their peers' actions (mimetic isomorphism) (DiMaggio & Powell, 1983). As regards ownership type (institutional and foreign ownership), this thesis takes the view of the "normative core" of stakeholder theory where companies should be governed and managers ought to act (Freeman, 1994, p. 413). Thus, representatives of institutional and foreign investors (holding significant interests averaging 64% and 31%, respectively in the sample used for this thesis) are likely to influence the board to establish through active participation in implementing corporate strategies to improve the quality of sustainability reporting practices (Das et al., 2023) and produce high quality SRs.

6.3 Implications of the study

This thesis reinforces prior literature in confirming that high quality sustainability reporting depends on sustainability performance, use of the GRI framework, and ownership structure. It also indicates the need for further research with regard to the contention that strong rule of law,

carbon pricing policy, and gender diversity will improve QSR, as results from this thesis show the opposite and results of past studies appear inconclusive.

This thesis offers practical implications for the electricity generators, government regulators, sustainability reporting standard setters, and other users. First, corporate boards that include strong institutional and foreign shareholder representation appear to be a key factor in achieving high QSR by driving incorporation of sustainability into the overall objectives and strategies (a top to bottom influence). This results in institutionalising corporate sustainability reporting practices (Farooq & de Villiers, 2019; Pizzi et al., 2023; Tarquinio & Xhindole, 2022). For example, by embedding stakeholder engagement in sustainability reporting, companies are held more accountable to their stakeholders and give more attention to their concerns (Ardiana, 2023). Second, the global evidence provided by this thesis promotes the need for governments to drive the value of high QSR into companies' culture. Similarly, regulators should consider requiring mandatory (Appiagyei & Donkor, 2024) assurance of SRs, initially for big companies to ensure reporting reliability in view of the costs involved. Third, the findings of this thesis provide insights for sustainability reporting standards setters in their efforts towards harmonising sustainability reporting and make pertinent decisions on the ESE information to be included in the reporting regulatory standards (Ismail et al., 2018). This study provides evidence that companies' compliance to either voluntary or mandatory reporting standards does not necessarily mean high QSR. Last, this thesis may assist users of SRs to better understand the status of sustainability reporting in the electricity industry and promote raised awareness of their sustainability performance which in turn should promote ingraining better sustainability reporting and performance into the firm's "organizational DNA" (Geerts et al., 2021, p. 8).

6.4 Limitations of the study

This thesis involves mixed methods using both qualitative and quantitative research approaches. Data collection and content analysis is therefore relatively arduous and time consuming so restricting this research to a relatively small sample size (Stent, 2011). In addition, the non-availability of sustainability reports and annual reports in English for some companies may detract from global representation of the sample.

The data for RM3- environmental and social disclosures are taken from Bloomberg's individual scores for environmental and social pillars. The scores for these quality indicators might be different if these areas have been subjected to the manual content analysis of sustainability data coming from annual reports,/sustainability reports/integrated reports. The choice of proxies and database is a common limitation (Houqe, 2010) for multi-country or global research. However, several authors have already used the Bloomberg ESG scores (Papoutsi & Sodhi, 2020; Qasem et al., 2022; Ruiz-Blanco et al., 2022), due to the extensive methods employed in Bloomberg's database in assessing the companies' ESG performance and activities (Marquis et al., 2011; Qasem et al., 2022).

This thesis is focused on a single industry and large companies (Al-Shaer, 2020) having drawn the sample from the S&P Top 250 Energy companies. This may limit or not permit generalisation of results (Ardiana, 2023; Henriques et al., 2022) as these could be industry specific. Finally, the three-year period of analysis also limits the extent to which it provides insights into future trends in QSR.

6.5 Suggestions for further research

The limitations and implications discussed above offer opportunities for future research. First, for further research on environmental and social disclosures, the use of other databases like Refinitiv ESG database, employed by various authors, such as Ottenstein et al. (2022), Sahin et al. (2023) and Zanin (2021) and recommended because of its transparency and breadth (Khatri & Kjærland, 2023) can be considered in future study.

Second, this thesis deals with only one sector of the electricity industry, the electricity generation sector. This study could therefore be usefully extended to the electricity transmission and distribution sectors to provide broader global insights regarding sustainability reporting in the electricity industry.

Other extensions, like company characteristics (e.g., type of plant, climate change policy) or industry characteristics (e.g. specific regulation) may also be considered. Furthermore, future studies may widen the sample to include smaller companies in the electricity industry. Future research could also be extended to other industries to test assess generalisability of this thesis' results beyond electricity generators. Also, future studies could extend to at least five-year horizons to provide a better long term view.

With respect to the empirical analysis results, this thesis proposes further study in two areas. The first relates to the values of Adjusted R Square (R^2) (Abdelrahman, 2018) of 41.25% to 51.49%, and 36.91% to 47.61% in the contemporaneous and one-year lagged effects, respectively. These

values suggest that the seven independent variables can explain from 37% to 51% of the change in QSR. While these are considered a significant proportion, a bigger percentage of 49% to 63% would provide a more desirable scientific explanation (Abdelrahman, 2018). Further research to include other variables may therefore be usefully considered to address this gap in explaining the variability in QSR (Abdelrahman, 2018). There could be other factors that may likely impact on the QSR, like scope and other sustainable corporate governance aspects (Pizzi et al., 2023), depending on the company's intended purpose of reporting and what group of stakeholders they give importance to. The second refers to the negatively significant relationship of LAW and CPP1 with QSR, suggesting that companies in countries with strong rule of law or with a carbon pricing policy produce low QSR and vice-versa, which is contrary to expectations and allows mixed results from prior literature to persist. Further investigation to garner more conclusive findings would be beneficial as there is a dearth of studies on the association between QSR and these two potential influences.

Finally, researchers may also contribute by conducting a literature review of QSR studies including clarifying the nomenclatures used in describing the QSR or nature of the QSR, and the rationale for the use of QSR descriptors.

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APPENDICES

Appendix 1: Assessment tool

Code/ Indicator	**Name**	**Description (Scoring references)**	**Max Score**
Dimension A: Relevance (including Materiality)			42
RM1	Sustainability strategies linked with business strategy/objectives	Sustainability strategies consistent with the United Nations SDGs are clearly linked with the business strategy/objectives of the electricity generator. 0= no disclosure; 1= general disclosure; 2= specific information; 3= detailed or elaborate discussion (Ahmed Haji & Anifowose, 2016)[23]	3
RM2	Stakeholder inclusiveness	The report contains identification of organisation's stakeholders, stakeholders' expectations, and stakeholder engagement process	3
RM3	ESG disclosure scores (from Bloomberg)	Bloomberg disclosure scores for the report for Environmental (E), and Social (S). Scores range from 0 to 6 for each of these two sustainability indicators (resembles Refinitiv ESG score range) 0= no disclosure; .5= >0 to 0.083 (-D); 1= >0.083· to 0.16. (D); 1.5= >0.16· to 0.25 (D+); 2= >0.25 to 0.33· (C-); 2.5= > 0.33· to 0.416· (D); 3= > 0. 416· to 0.50 (C+); 3.5= > 0.50 to 0.583· (B-); 4= >0. 583· to 0.66· (B); 4.5= > 0. 66· to 0.75 (B+); 5= >0.75 to 0.83· (A-); 5.5= > 0.83· to 0.916· (A); 6= > 0. 916· to 1(A+)	12

23 Applicable to RM1, RM2, RM4, RM5, R5.

RM3.a	Environmental disclosures	Bloomberg disclosure scores for the report's Environmental pillar disclosures.	6
RM3.b	Social disclosures	Bloomberg disclosure scores for the report's Social pillar disclosures.	6
RM4	Economic disclosures	The report presents the electricity generator's (1) infrastructure projects/investments and impact, and (2) climate related risks and opportunities. Scores range from 0-3 for each of the two sector-specific economic disclosures.	21
RM4.a	Economic performance	GRI 201-1 Direct economic value generated and distributed GRI 201-3 Defined benefit plan obligations and other retirement benefits GRI- 201-4 Financial assistance received from government	9
RM4.b	Market presence	GRI 202-1 Standard entry level wage GRI 202-2 Proportion of senior management hired from local communities	6
RM4.c	Indirect economic impact	GRI 203-1 1 Infrastructure investments and services supported GRI 203-2 Significant indirect economic impacts	6
RM5	Materiality determination process	The report contains the electricity generator's materiality determination process to determine what matters most to stakeholders.	3
Dimension B: Reliability			17
R1	Trends over time	Information is contained over several reporting periods, indicating the direction of change in sustainability performance information ensuring comparability and consistency. 0- no mention; 1- general statement; 2- extensive coverage (detailed information but did not cover more than 1 year data); and 3- coverage was full and	3

		systematic which covered more than 2-year data in comparable form (Yadava & Sinha, 2016).	
R2	Readability	The report has a logical structure, uses graphical presentation of the data, uses drawings, maps, links, data tables, and explanations where required, or uses other tools to help navigate through the document enabling understandability of sustainability report. 0= no graphics/effective reporting techniques used; 1= use of little graphics and data tables and other reporting techniques; 2= use of adequate graphics and data tables and other reporting techniques with explanation; 3= best practices and creative approach. (modified Habek & Wolniak, 2016)	3
R3	Verifiability	External verification is used for sustainability reporting. 0 = the company has not sustainability committee affiliated with the board of directors; 1 = the company has a sustainability committee affiliated with the board of directors; 2 = the assurance is provided on sustainability information by a non-audit firm; 3 = sustainability information is externally assured by a non-Big 4 audit firm; 4 = sustainability information is externally assured by one of the Big 4 audit firms with limited coverage; 5= sustainability information is externally assured by one of the Big 4 audit firms with comprehensive coverage (modified Al-Shaer & Zaman, 2016)	5
R4	Accuracy	The report contains unbiased reporting of sustainability information.	3

		0= no disclosure; 1= qualitative reporting; 2= quantitative but non-monetary reporting; 3= monetary reporting or financial quantification of sustainability information (Khan et al., 2021)	
R5	Value and timeliness of data	The report describes the processes and procedures of collection, aggregation and transformation of data into information objectively and with integrity. It also indicates the framework used in preparing the sustainability report and describes timely reporting of the sustainability performance information.	3
Total			**59**

Appendix 2: Bloomberg environmental fields

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Climate change		
ES036	EMISSION_REDUCTION	Emissions Reduction Initiatives
ES071	CLIMATE_CHG_POLICY	Climate Change Policy
ES105	CLIMATE_CHG_OPPORTUNITIES	Climate Change Opportunities Discussed
EG020	GHG_SCOPE_1_2_PER_SALES	Greenhouse Gas Scope 1 & 2 Waterfall Per Sales
EG022	GHG_SCOPE_1_2_PER_EVIC	Greenhouse Gas Scope 1 & 2 Waterfall Per EVIC
EG030	GHG_SCOPE_3_ESTIMATE_WATERFALL	Greenhouse Gas Scope 3 Estimate Waterfall

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Energy		
ES035	ENERGY_EFFIC_POLICY	Energy Efficiency Policy
ES038	GREEN_BUILDING	Green Building Policy
ES381	RENEWABLE_ELECTRICITY_TARGET_POL	Renewable Electricity Target Policy
SR592	TOTL_LNDFL_GAS_GNRTD_FLD_SCR	Total Landfill Gas Generated Field Score
SR225	DATA_CTR_ENV_SUSTAIN_FLD_SCR	BESG Data Centers Envrnmntl Sustnabilty Fld Scr
SR526	PCT_SUSTAIN_AVI_FL_USED_FLD_SCR	Percent Sustainable Aviation Fuel Used Field Score

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
GHG emissions management		
SR630	TEMP_SCORE_SCOPE_1_2_ST	Temperature Score Scope 1 and 2 Short Term
SR631	TEMP_SCORE_SCOPE_1_2_MT	Temperature Score Scope 1 and 2 Mid Term
SR632	TEMP_SCORE_SCOPE_1_2_LT	Temperature Score Scope 1 and 2 Long Term
SR636	TEMP_SCORE_SCOPE_3_ST	Temperature Score Scope 3 Short Term
SR637	TEMP_SCORE_SCOPE_3_MT	Temperature Score Scope 3 Mid Term
SR638	TEMP_SCORE_SCOPE_3_LT	Temperature Score Scope 3 Long Term

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Natural capital		
ES039	WASTE_REDUCTION	Waste Reduction Policy
ES247	WATER_POLICY	Water Policy
ES088	BIODIVERSITY_POLICY	Biodiversity Policy
SR642	PCT_MTRL_INCNRATD_HAZ_FLD_SCR	Pct of Matril Incinerated That is Haz Field Score
SR651	AMT_3RD_PRTY_WST_MAT_CMP_FLD_SCR	Amt of 3rd Party Waste Mtrl Composted Field Score
SR657	TOT_LEACHATE_TREATED_FLD_SCR	Total Leachate Treated Field Score

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Value Chain		
ES037	ENVIRON_SUPPLY_MGT	Environmental Supply Chain Management
ES040	SUSTAIN_PACKAGING	Sustainable Packaging
ES026	PCT_RECYCLED_MATERIALS	Pct Recycled Materials
SR524	PCT_RECYCL_MTRLS_RCVRD_FLD_SCR	Pct Recycled of Materials Recovered Field Score
SR575	NUM_COMM_PROJ_SUST_CERT_FLD_SCR	Num of Commissioned Proj with Sustain Cert Fld Scr
SR576	NUM_ACT_PROJ_SUSTAIN_CRT_FLD_SCR	Num of Actve Proj with Sustain Cert Field Score

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
N.A.		
ES041	ENVIRON_QUAL_MGT	Environmental Quality Management Policy
ES073	VERIFICATION_TYPE	Verification Type
F1641	INDEPENDENT_ASSESSMENT_CONDUCTED	Independent Assessment Conducted
SR267	ENVIRONMENTAL_PILLAR_DISCLOSURE	Environmental Pillar Disclosure
SR468	ENVIRONMENTAL_PILLAR_PERCENTILE	Environmental Pillar Percentile
SR709	APP_RES_SUBST_LIST_SUP_FLD_SCR	Applies Restrctd Substance List for Supplr Fld Scr

Appendix 3: Bloomberg social fields

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Business practices		
ES069	ETHICS_POLICY	Business Ethics Policy
ES197	ANTI-BRIBERY_ETHICS_POLICY	Anti-Bribery Ethics Policy
ES368	INTELLECTUAL_PPTY_RGHTS_PROT_POL	Intellectual Property Rights Protection Policy
SR910	ETH_AND_CMPL_ISS_SCORE_UPPR_TGT	Ethics and Compliance Issue Score Upper Target
SR912	MRKTNG_AND_LABLNG_ISS_SCR_UP_TGT	Marketing and Labeling Issue Score Upper Target
SR970	AI_ETH_PLCY_FLD_SCR	BESG Artificial Intllgnce Ethics Policy Fld Scr

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Community & Customers		
ES059	HUMAN_RIGHTS_POLICY	Human Rights Policy
ES370	CONSUMER_DATA_PROTECTION_POLICY	Consumer Data Protection Policy
ES369	QUALITY_ASSURANCE_AND_RECALL_POL	Quality Assurance and Recall Policy
SR708	NUM_AIRWRTHINSS_DIRCTVS_FLD_SCR	Number of Airworthiness Directives Field Score
SR805	COUNTRFT_PARTS_DETCTD_FLD_SCR	Counterfeit Parts Detected Field Score
SR942	PROD_TRC_COUNT_PREV_PLCY_FLD_SCR	Prod Traceability Countrft Preventn Plcy Fld Scr

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Human capital		
ES043	NUMBER_EMPLOYEES_CSR	Number of Employees - CSR
ES196	EMP_PROT_WHISTLE_BLOWER_POLICY	Employee Protection / Whistle Blower Policy
ES068	TRAINING_POLICY	Training Policy
SR950	RAILWAY_INTEGRITY_FLD_SCR	Railway Integrity Field Score
SR944	PCT_ENGNRNG_FEMALE_FLD_SCR	Percent Engineering Female Field Score
SR949	NUM_OF_REC_VILTN_DEFCTS_FLD_SCR	Number of Recommended Violtn Defects Field Score

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Supply chain		
ES118	SOCIAL_SUPPLY_CHAIN_MGMT	Social Supply Chain Management
ES116	SUPPLIERS_AUDITED	Number of Suppliers Audited
ES117	SUPPLIER_AUDITS_CONDUCTED	Number of Supplier Audits Conducted
SR746	SOC_SUPPLY_CHAIN_MGMT_DISC_FACTR	Social Supply Chain Management Disclosure Factor
SR927	SOC_SC_MGMT_ISSUE_SCORE_LOWR_TGT	Social SC Management Issue Score Lower Target
SR916	SOC_SC_MGMT_ISSUE_SCORE_UPPR_TGT	Social SC Management Issue Score Upper Target

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
Value chain		
SA414	ANML_WELFRE_POLICY	Animal Welfare Policy
SA416	OFFRS_GMO_FREE_ALT	Offers Genetically Modified Organism Free Altrntvs
SA417	PCT_EGGS_SOLD_CAGE_FREE_SRC	Percentage of Eggs Sold from Cage Free Sources
SA418	PCT_PORK_SLD_GESTTN_CRT_FREE	Pct of Pork Sold from Gestation Crate Free Sources

FIELD ID	FIELD MNEMONIC	FIELD DESCRIPTION
N.A.		
RX375	SOCIAL_DISCLOSURE_SCORE	Social Disclosure Score
SA329	NUM_OF_COMPNY_FACILTS_AUDTD	Number of Company Facilities Audited
SA330	PCT_OF_COMPNY_FACILTS_AUDTD	Percentage of Company Facilities Audited
F1655	EU_TAX_EST_MSS_OPTIONAL	EU Taxonomy Estimated MSS Optional
SR753	SOCIAL_PILLAR_DISCLOSURE	Social Pillar Disclosure
SR883	SOCIAL_PILLAR_PERCENTILE	Social Pillar Percentile

Appendix 4: Examples of sustainability disclosures for defined scale ranges

Scale range 0-3 (RM1, RM2, RM4, RM5, R1, R5	Description	Example	Source
0	no disclosure		
1	general disclosure	Example of RM2 "*We developed partnerships with our largest municipal customers. We are bringing new Electric Avenue charging stations to the region, while also strengthening our collaboration with mass transit. From transportation electrification to ambitious, industry-leading programs, we are bringing fresh energy and collaborating with stakeholders*."	2018 Annual Report Portland General Electric (p.3)
2	specific information	Example of RM1 "*Additionally, we are looking to reduce CO2 emissions produced as a result of generating electricity from lignite. On the basis of the lignite roadmap that has been pursued up to now, the emissions from lignite will have been reduced by approximately 15% by 2020 compared with 2015 as a result of transferring power plants to security standby. Emissions will continue to fall up to 2030 owing to the decline in the number of operational hours in the wake of*	2018 Corporate Responsibility Report RWE (p. 60)

		expanding renewable energy, efficiency enhancements, additional modernisation of our power plant portfolio and by discontinuation of the Inden opencast mine and the associated shutdown of the Weisweiler lignite-fired power plant. The resultant fall in emissions by 2030 will then be a total of up to 50%." Example of RM4b "*Average entry-level wages at RusHydro Group are three times higher than the statutory minimum monthly wage; in certain regions of operation, they are more than 13 times higher than the statutory minimum monthly wage.'* Example of RM4a Example of GRI 201-4 disclosure with specific information from IDACORP's 2020 ESG Report, p. 36 states: *'This sustained customer growth, along with prudent cost management, helped IDACORP achieve earnings growth while again preserving the full $45 million of accumulated deferred investment tax credits (ADITC) for future earnings support under its Idaho regulatory mechanism. Idaho Power did not use any additional ADITC amortization in 2020.*'	2020 Annual Report Public JSC RusHydro (p. 95) 2020 ESG Report IDACORP (p. 36)

3	detailed or elaborate discussion	Example of RM4b GRI 203-1 "*As a show of commitment to our hosts, First Gen prioritizes hiring the best talent from our local communities. We leverage on the leadership capabilities of our local hires. In fact, majority of our senior management are from the significant locations of operations, namely, the Head Office in Metro Manila, and our operating plants in Batangas, and Bukidnon. Local hires account for a majority of senior management (VP or higher): 82.35% of total senior management 90.00% of female senior managers 79.17% of male senior managers."* Example of RM4c 203-2 "*Our economic development efforts have brought an average of 21,000 new jobs and $7 billion in overall capital investment to the Southeastern United States for each of the past five years. At the Vogtle nuclear power plant in Georgia, the construction of two new units currently provides jobs for more than 7,000 people. When the new Vogtle units 3 & 4 are fully operational, 800 permanent jobs are expected to be created."* Example of RM5	2018 Annual Report FirstGen (p. 24) 2018 Annual Report The Southern Company (p. 48) 2019 Integrated

		"*As usual, the process of updating the A2A Group's materiality matrix is designed to identify the material issues for A2A and its stakeholders for 2019. The process allows stakeholders and top management to assess, on a scale from 1 to 5 (where 1 identifies a topic as irrelevant and 5 as strategic), 21 issues that embrace the 6 Capitals and the Group's governance system. To measure the importance for stakeholders, reference was made to the evaluations resulting from a survey conducted by the Ipsos Institute, involving citizens, customers, suppliers, institutions, media, political movements, environmental associations, trade associations and consumer associations, and the results of an online survey involving 500 employees in positions of responsibility. To measure the importance for A2A, an online questionnaire was sent to the first lines of the company. The results of the analysis were then presented to the Sustainability and Territory Committee and approved at the meeting of the A2A Board of Directors on January 20, 2020, which approved the following matrix."*The matrix includes the 21 material issues important to stakeholders shown on pages 56-57.	Report A2A (p. 56)
0-3 (R2, R4) 0			

1	Use of little graphics and data tables and other reporting techniques/ Qualitative reporting	Example of R2 Does not provide for go-to icon/link to navigate from the Table of Contents to other sections of the report; does not provide for go-to icon/link to navigate from the Section summary to a particular subsection. Made little use of graphics and other reporting tools	2018 Annual Report Saudi Electricity
2	Use of adequate graphics and data tables and other reporting techniques with explanation/ Quantitative but non-monetary reporting	Example of R2 "*This report has been published as an integrated report from this fiscal year to provide all stakeholders including shareholders and investors with a better understanding of the Shikoku Electric Power Group. We comprehensively organized the financial and non-financial information, which had been reported in the previous annual reports, presenting our Group's basic approach to creating sustainable corporate value as well as an overview of the status of actual initiatives and the outlook for the future.* *Further detailed content that was not published in this report is available on our website. We will continue to enhance the content of the report while reflecting the views of its readers. Reporting Period Fiscal 2018 (April 1, 2018 – March 31, 2019)* *However, when it is appropriate to show past historical data and recent cases, we report on matters that fall outside this period.*	2019 Integrated Report Shikoku Power (p. 1)

		Scope of Reporting *This report covers Shikoku Electric Power Co., Inc. and its subsidiaries and affiliated companies.* *Reference Guidelines for Presentation of Non-Financial Information* *Guidance for Integrated Corporate Disclosure and Company-Investor Dialogues for Collaborative Value Creation, Ministry of Economy, Trade and Industry* *International Integrated Reporting Framework, International Integrated Reporting Council (IIRC) Sustainability Reporting Standards, Global Reporting Initiative (GRI) Environmental Reporting Guidelines (2018 version), Ministry of the Environment* *Publication Date: Japanese version: Published August 2019; English version: Published September 2019"* Example of R4 *"The recent installation of efficient reciprocating internal combustion engine natural gas generators at TEP is expected to result in a 70% reduction in water consumption at the facility, a savings of more than 1.7 billion litres annually."* Northland Power, Inc. in its 2020 Sustainability Report, p. 10 provides quantitative reporting of GHG emissions, Scope 1 with a	2020 Sustainability Report Fortis, Inc. (p. 70) 2020 Sustainability

		note indicating that the reporting is based on GHG Protocol, hence a score of '2'. The Environmental Key Performance Indicators 1- 2017-2018 data for GHG emissions (Total direct GHG emissions, Total indirect GHG emissions, Total GHG emissions), among others with a note that the calculations of GHG emissions were set out based on the Guideline of the Greenhouse Gas Emissions Accounting and Reporting for the Chinese Power Generation Enterprise (Trial), hence a score of '2'.	Report Northland Power, Inc. (p. 10) 2018 ESG Report Huadian Power International Corp Ltd (p. 37)
3	Best practices and creative approach/ Financial quantification of sustainability information	Example of R2 The 2020 Sustainability Report and 2020 Annual Report provide for click icon/ pointer to navigate to sections within the report (Index page). Content Page 2020 Annual Report- To facilitate the navigation hypertext links have been included into the document (for Go to.., Income statement, Statement of financial position, Statement of cash flows, statement of changes in equity, Statement of Comprehensive Income	2020 Sustainability Report and Annual Report Enel Spa

		Overall, Enel Spa used best practice and creative approach in reporting for both the 2020 Sustainability Report and 2020 Annual Report. The reports have more than adequate graphics and other effective reporting tools all throughout the reports, including navigational hypertext. Example of R4 "*An unexpected rapid and exponential uptake of EVs in GB will have the potential to disrupt the electricity network and impact the reliability of the network assets. Additionally, there would likely be significant additional expenditure incurred due to the distressed nature of delivering capital investment as a result of a GB wide rapid uptake of EVs including the impact on the supply chain. The financial impact of rapid electrification cumulatively over the next five years on earnings could be between £50m to £100m.*"	2019 Sustainability Report SSE plc (p. 23)
0-5 (R3)			
0	No sustainability reporting committee		
1	With sustainability reporting committee or group/person responsible for sustainability	Example of R3 "Shanghai *Electric establishes an ESG governance structure led by the board of directors, which aims to implement the Company's concept of social responsibility through sound management. Our*	2019 ESG Report Shanghai Electric (p. 23)

	reporting	*ESG governance structure is composed of the Board of Directors, the ESG Management Committee and the ESG Working group from top to bottom*."	
2	Sustainability Report reviewed by non-audit firm	Assurance Statement - SGS (Thailand) Limited's Report on Sustainability Activities in the Global Power Synergy Public Company Limited's Integrated Sustainability Report for 2020 Statement of Independence and Competence *"On the basis of the methodology described and the verification work performed, we are satisfied that the information and data contained within Integrated Sustainability Report verified is accurate, reliable and provides a fair and balanced representation of GPSC Group sustainability activities from 1st January 2020 to 31st December 2020."*	2020 Integrated Sustainability Report Global Power Synergy Public Company (p. 40)
3	Sustainability Report assured by non-Big4 audit firm	*"The Consolidated non-financial reporting is subject to a limited audit ("limited assurance engagement" in accordance with the criteria indicated by the ISAE standard 3000, Revised version) by Audirevi Spa; these activities concluded with the issue of the "Independent auditors' report" presented at the end of this document.* *It should be noted that the quantitative information contained in the Non-Financial Reporting, which does not refer to the indicators reported in the "GRI Contents reference table", has not been*	2019 Non-Financial Reporting (Sustainability Reporting) Hera Spa (11-12)

		specifically examined by the independent auditing firm Audirevi Spa. This information has been presented voluntarily, also on the basis of the materiality analysis, to supplement that required by Italian Legislative Decree No. 254/16 and by the reporting standards adopted by the Hera Group."	
4	Sustainability Report assured by Big4 audit firm with limited coverage	*"Deloitte Oy has provided limited assurance in accordance with ISAE 3410 for the reporting period of 1 January 2019 to 31 December 2019 on GHG emissions calculations (Scope 1, 2 and 3) based on the Greenhouse Gas (GHG) Protocol."*	2019 Sustainability Report Fortum, Inc. (p. 78)
5	Sustainability Report assured by Big4 audit firm with comprehensive coverage	Assurance Report on the Statement of Non-Financial Information. Sustainability Report - KPMG Pursuant to article 49 of the Spanish Code of Commerce, we have performed a limited assurance review of the accompanying Statement of Non-Financial Information. Sustainability Report 2020, (hereinafter SNFI.SR) for the year ended 31 December 2020 of Iberdrola, S.A. (hereinafter the Parent or Iberdrola) and subsidiaries (hereinafter the Group), which forms part of the Group's consolidated directors' report. The SNFI.SR includes additional information beyond that required under the Sustainability Reporting Standards (GRI Standards): comprehensive option, the Electric Utilities Sector Supplement and	2020 Sustainability Report Iberdola (p. 1)

		prevailing mercantile legislation concerning non-financial information, which has not been subject to our assurance work. Our work was limited exclusively to providing assurance on the information identified in the “GRI Content Index” and “Disclosures from the Statement of Non-Financial Information” tables of the accompanying SNFI.SR. We also verified, with a “Moderate” level of assurance, the adherence to the principles of inclusivity, materiality, responsiveness and impact of the information included in the “Stakeholder Engagement” section of the accompanying SNFI.SR, prepared in accordance with the principles established in the AA1000AP (2018) AccountAbiility.	

Appendix 5: Comparative means: Pilot vs full sample companies

Panel A: Means per year								
	Pilot companies				Full sample companies			
	2018	2019	2020	3 years	2018	2019	2020	3 years
QSRRM	0.58	0.59	0.59	0.58	0.48	0.52	0.53	0.51
QSRR	0.73	0.69	0.76	0.73	0.61	0.66	0.69	0.65
QSRTotal	0.62	0.62	0.64	0.63	0.52	0.56	0.58	0.55
Panel B: Means per region								
	Pilot companies				Full sample companies			
	Americas	Asia/Pacific Rim	EMEA		Americas	Asia/Pacific Rim	EMEA	
QSRRM	0.49	0.46	0.75		0.49	0.46	0.61	
QSRR	0.60	0.61	0.92		0.60	0.60	0.80	
QSRTotal	0.52	0.51	0.80		0.52	0.50	0.66	

Appendix 6: List of tests to analyse trends in QSR

Test	Reference	Purpose
Paired t-test	Ahmed-Haji & Anifowose (2016)	Check improvement in QSR through the differences in QSR scored between any two years
One-way repeated ANOVA two-factor without replication	Ahmed-Haji & Anifowose (2016)	Verify improvements made on overall QSR and by quality indicator over time.
Two-sample t-test	Phang et al., 2023	Seeks to get a picture of how companies with high QSR perform compared to those with low QSR.
Wilcoxon tests (signed-rank test and Mann_Whitney test)	Mion & Adaui (2019) Alkayed et al. (2023) Slacik & Greiling, 2020	Evaluate the differences between high and low QSR

Appendix 7: Comparative historical rates: 1USD per unit

		Federal Reserve System*			XE.com			x-rates.com		
Country (A)	**Currency (B)**	**2018** (C)**	**2019 ** (D)**	**2020** (E)**	**2018 (F)**	**2019 (G)**	**2020 (H)**	**2018 (I)**	**2019 (J)**	**2020 (K)**
Australia	AUD	0.705	0.703	0.771	0.705	0.703	0.771	0.705	0.703	0.771
Austria	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Brazil	BRL	0.258	0.249	0.193	0.258	0.249	0.193	0.258	0.249	0.193
Canada	CAD	0.733	0.771	0.784	0.733	0.771	0.784	0.733	0.771	0.784
China	CNY	0.145	0.144	0.153	0.145	0.144	0.153	0.145	0.144	0.153
Czech Republic	CZK	-	-	-	0.045	0.044	0.047	0.045	0.044	0.047
Denmark	DKK	0.153	0.150	0.164	0.153	0.150	0.164	0.153	0.150	0.164
Finland	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
France	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Germany	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Greece	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Hong Kong	HKD	0.128	0.128	0.129	0.128	0.128	0.129	0.128	0.128	0.129

India	INR	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Italy	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Japan	JPY	0.009	0.009	0.010	0.009	0.009	0.010	0.009	0.009	0.010
Malaysia	MYR	0.242	0.244	0.249	0.242	0.244	0.249	0.242	0.244	0.249
Philippines	PHP	-	-	-	0.019	0.020	0.021	0.019	0.020	0.021
Poland	PLN	-	-	-	0.267	0.264	0.268	0.267	0.264	0.268
Portugal	EUR	0.873	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Russia	RUB	-	-	-	0.014	0.016	0.014	0.014	0.016	0.014
Saudi Arabia	SAR	-	-	-	0.267	0.267	0.267	0.267	0.267	0.267
South Korea	KRW	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Spain	EUR	1.146	1.123	1.223	1.146	1.123	1.223	1.146	1.123	1.223
Thailand	THB	0.031	0.034	0.033	0.031	0.034	0.033	0.031	0.034	0.033
United Arab Emirates	AED	-	-	-	0.272	0.272	0.272	0.272	0.272	0.272
United Kingdom	GBP	1.276	1.327	1.366	1.276	1.327	1.366	1.276	1.327	1.366
United States of America	USD	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix 8: List of sample companies

Count	Company	ISIN_CUSIP	Country	Region
1	A2A S.p.A.	IT0001233417	Italy	EMEA
2	Aboitiz Power Corp	PH0005M1090	Philippines	Asia/Pacific Rim
3	Abu Dhabi National Energy Co PJSC	AE002401015	United Arab Emirates	EMEA
4	Acciona, SA	ES0125220311	Spain	EMEA
5	ACEA S.p.A.	IT0001207098	Italy	EMEA
6	AGL Energy Ltd	AU000000AGL7	Australia	Asia/Pacific Rim
7	Algonquin Power & Utilities Corp	1585710	Canada	Americas
8	Alliant Energy Corp	1880210	United States of America	Americas
9	American Electric Power Co, Inc	2553710	United States of America	Americas
10	Beijing Jingneng Clean Energy Co, Ltd	CNE100001336	China	Asia/Pacific Rim
11	Brookfield Renewable Partners LP	BMG162581083	Canada	Americas
12	CenterPoint Energy, Inc	1518T10	United States of America	Americas
13	Centrais Elétricas Brasileiras SA - Eletrobrás	BRELETACNPB7	Brazil	Americas
14	Centrica plc	GB00B033F229	United Kingdom	EMEA
15	CEZ, a. s.	CZ0005112300	Czech Republic	EMEA
16	CGN Power Co, Ltd	CNE100001T80	China	Asia/Pacific Rim
17	China Longyuan Power Group Corp Ltd	CNE100000HD4	China	Asia/Pacific Rim
18	China National Nuclear Power Co, Ltd	CNE1000022N7	China	Asia/Pacific Rim
19	China Power International Development Ltd	HK2380027329	Hong Kong	Asia/Pacific Rim
20	China Resources Power Holdings Co Ltd	HK0836012952	Hong Kong	Asia/Pacific Rim

21	Chubu Electric Power Co, Incorporated	JP3526600006	Japan	Asia/Pacific Rim
22	CLP Holdings Ltd	HK0002007356	Hong Kong	Asia/Pacific Rim
23	CMS Energy Corp	12589610	United States of America	Americas
24	Companhia Energética de Minas Gerais	BRCMIGACNPR3	Brazil	Americas
25	Consolidated Edison, Inc	20911510	United States of America	Americas
26	CPFL Energia SA	BRCPFEACNOR0	Brazil	Americas
27	Datang International Power Generation Co, Ltd	CNE1000002Z3	China	Asia/Pacific Rim
28	Dominion Energy, Inc	25746U10	United States of America	Americas
29	DTE Energy Co	23333110	United States of America	Americas
30	Duke Energy Corp	26441C20	United States of America	Americas
31	Edison International	28102010	United States of America	Americas
32	EDP - Energias de Portugal, SA	PTEDP0AM009	Portugal	EMEA
33	Electric Power Development Co, Ltd	JP3551200003	Japan	Asia/Pacific Rim
34	Electricité de France SA	FR0010242511	France	EMEA
35	Electricity Generating Public Co Ltd	TH0465010005	Thailand	Asia/Pacific Rim
36	Emera Incorporated	29087610	Canada	Americas
37	EnBW Energie Baden-Württemberg AG	DE0005220008	Germany	EMEA
38	Enel SpA	IT0003128367	Italy	EMEA
39	Energisa SA	BRENGICDAM16	Brazil	Americas
40	ENGIE SA	FR0010208488	France	EMEA
41	Entergy Corp	29364G10	United States of America	Americas
42	Equatorial Energia SA	BREQTLACN0R0	Brazil	Americas
43	Evergy, Inc	30034W10	United States of America	Americas

44	EVN AG	AT0000741053	Austria	EMEA
45	Exelon Corp	30161N10	United States of America	Americas
46	First Gen Corp	PHY2518H1143	Philippines	Asia/Pacific Rim
47	First Philippine Holdings Corp	PHY255N1203	Philippines	Asia/Pacific Rim
48	FirstEnergy Corp	33793210	United States of America	Americas
49	Fortis Inc	34955310	Canada	Americas
50	Fortum Oyj	FI0009007132	Finland	EMEA
51	Global Power Synergy Public Co Ltd	TH6488010005	Thailand	Asia/Pacific Rim
52	Hawaiian Electric Industries, Inc	41987010	United States of America	Americas
53	Hera S.p.A.	IT0001250932	Italy	EMEA
54	HK Electric Investments & HK Electric Investments Ltd	HK0000179108	Hong Kong	Asia/Pacific Rim
55	Hokkaido Electric Power Co, Incorporated	JP3850200001	Japan	Asia/Pacific Rim
56	Hokuriku Electric Power Co	JP3845400005	Japan	Asia/Pacific Rim
57	Huadian Power International Corp Ltd	CNE000001LJ2	China	Asia/Pacific Rim
58	Iberdrola, SA	ES0144580Y14	Spain	EMEA
59	IDACORP, Inc	45110710	United States of America	Americas
60	Iren SpA	IT0003027817	Italy	EMEA
61	Korea Electric Power Corp	KR7015760002	South Korea	Asia/Pacific Rim
62	Kyushu Electric Power Co, Incorporated	JP3246400000	Japan	Asia/Pacific Rim
63	Manila Electric Co	PHY5764J1483	Philippines	Asia/Pacific Rim
64	NextEra Energy, Inc	65339F10	United States of America	Americas
65	NHPC Ltd	INE848E01016	India	Asia/Pacific Rim
66	NiSource Inc	65473P10	United States of America	Americas
67	Northland Power Inc	66651110	Canada	Americas

68	NRG Energy, Inc	62937750	United States of America	Americas
69	NTPC Ltd	INE733E01010	India	Asia/Pacific Rim
70	Origin Energy Ltd	AU0000000RG5	Australia	Asia/Pacific Rim
71	Ørsted A/S	DK0060094928	Denmark	EMEA
72	PG&E Corp	69331C10	United States of America	Americas
73	Pinnacle West Capital Corp	72348410	United States of America	Americas
74	Polska Grupa Energetyczna SA	PLPGER000010	Poland	EMEA
75	Portland General Electric Co	73650884	United States of America	Americas
76	Power Assets Holdings Ltd	HK0006000050	Hong Kong	Asia/Pacific Rim
77	PPL Corp	69351T10	United States of America	Americas
78	Public JSC Federal Hydro-Generating Co - RusHydro	RU000A0JPKH7	Russia	EMEA
79	Public JSC Inter RAO UES	RU000A0JPNM1	Russia	EMEA
80	Public Power Corp SA	GRS43400300	Greece	EMEA
81	RWE Aktiengesellschaft	DE0007037129	Germany	EMEA
82	Saudi Electricity Co	SA0007879550	Saudi Arabia	EMEA
83	Sempra Energy	81685110	United States of America	Americas
84	Shanghai Electric Power Co Ltd	CNE100000D55	China	Asia/Pacific Rim
85	Shikoku Electric Power Co, Incorporated	JP3350800003	Japan	Asia/Pacific Rim
86	SSE plc	GB0007908733	United Kingdom	EMEA
87	Tenaga Nasional Berhad	MYL534700009	Malaysia	Asia/Pacific Rim
88	The AES Corp	00130H10	United States of America	Americas
89	The Chugoku Electric Power Co, Inc	JP3522200009	Japan	Asia/Pacific Rim
90	The Kansai Electric Power Co, Incorporated	JP3228600007	Japan	Asia/Pacific Rim

91	The Southern Co	84258710	United States of America	Americas
92	The Tata Power Co Ltd	INE245A01021	India	Asia/Pacific Rim
93	Tohoku Electric Power Co, Incorporated	JP3605400005	Japan	Asia/Pacific Rim
94	Tokyo Electric Power Co Holdings, Incorporated	JP3585800000	Japan	Asia/Pacific Rim
95	Uniper SE	DE000UNSE018	Germany	EMEA
96	VERBUND AG	AT0000746409	Austria	EMEA
97	Vistra Corp	92840M10	United States of America	Americas
98	WEC Energy Group, Inc	92939U10	United States of America	Americas
99	Xcel Energy Inc	98389B10	United States of America	Americas
100	YTL Corp Berhad	MYL46770000	Malaysia	Asia/Pacific Rim