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Staying competitive within the EU energy sector to realize energy transition and potential sustainable competitive advantage: A resource perspective

A case study based on two incumbent energy companies based in the EU

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Abstract

Our research has conducted a comparative cross-case analysis to assess how firm-specific resources can enable the energy transition within firms located in the EU. The multiple-case study was based on data collected from two incumbent energy companies that were founded and headquartered in an EU country (E.ON and Vattenfall). We have chosen a privately owned company and a state-owned company to create a more fruitful reflection on the energy transition from a resource perspective. For this study, we have focused on the resource-based view (RBV), dynamic capabilities, and resource leveraging within the theoretical framework of this research.

We analyzed how E.ON and Vattenfall can utilize their firm-specific resources and facilitate resource orchestration to gain a sustainable competitive advantage (SCA). The empirical data was based on 7 interviews where 8 interviewees (4 representatives from E.ON and 4 representatives from Vattenfall) participated and responded based on a semi-structured interview conducted by the researchers themselves. During our study, we were able to identify several firm-specific resources along with their impact from analyzing the empirical data through the RBV, dynamic capability, and leveraging theories. The analysis informed how resources and firms are reaching energy transition goals while maintaining competitive advantage (CA) or SCA in a transitioning market. Both E.ON and Vattenfall have similarities and also some differences stemming from their firm's resources and firm strategies. We have discussed our findings from a resource perspective to link RBV to dynamic capabilities and leveraging to inform how firms maintain SCA while progressively accomplishing energy transition.

Keywords: Resource-based view; dynamic capabilities; resource leveraging; energy transition; sustainable competitive advantage

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Table of Contents

List of Tables

List of Figures

Glossary

Competitive advantage (CA) - can be defined generally as firms who can or could potentially create maximum value surpluses.

Clean-Up Information (**CLU-IN)** - provides "information on innovation treatment, characterization, and monitoring technologies while acting as a forum for all waste remediation stakeholders" (CLU-IN, 2022).

Dynamic capability - "The firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments." (Teece, Pisano, & Shuen, 1997, p. 516).

Flex providers - Flex providers are the network owners and customers who are connected to "Switch" (Switch, 2022).

Resource-based view (RBV) - Under the RBV, firms need firm-specific resources that are valuable, rare, inimitable, and non-substitutable (VRIN), in addition to being heterogeneous and immobile to be competitive in the market (Barney, 1991).

Resource leveraging - Firm's actions to create superior performance through the utilization of firm resources (Bingham & Eisenhardt, 2008).

Prosumers- Consumers who produce their own electricity and their role in the electricity market (Diestelmeier, 2019).

Sustainable competitive advantage (**SCA)** - is the ability of a firm to continuously maintain their competitive advantage; sometimes SCA is referred to as sustained competitive advantage.

Smart cities accelerator - This creates flexible smart energy systems while promoting renewable energy (RE) sources (Smart cities accelerator, 2022).

Switch - A digital power marketplace that benefits both network owners and customers – an intuitive tool to take advantage of the benefits of flexibility in daily operations. Together it creates a smarter and flexible electricity grid and becomes an important part of the energy transition (Switch, 2022).

Sectorial coupling - A process that interconnects energy consuming sectors and power producing sectors (Appunn, 2018).

Taxonomy - The EU taxonomy classifies the green and sustainable economic activities which are executed by the EU which creates a clear framework for sustainability and environmental friendly practices (EU-taxonomy, 2022).

Tollgate - Critical activities needed for a project compilation associated with define, measure, analyze, improve, and control (DMAIC) methodology (Isixsigma, 2022).

Valuable, rare, inimitable, and non-substitutable (VRIN) resources (part of the resource-based view (RBV) theory) - firm-specific resources that are valuable, rare, inimitable, and non-substitutable. A firm's resources will be valuable if a resource can enhance efficiency and effectiveness. The rareness of a resource depends on the uniqueness of the resources. Inimitability is based on three main attributes: unique historical conditions, social complexity, and causal ambiguity (see Section 2.1). Non-substitutability occurs when a firm's resources can not be replaced by other firms' resources of offerings. (Barney, 1991)

1. Introduction

The fact is that the world is still not meeting Agenda 2030 targets (IPCC, 2022; IEA, 2018). The energy sector has a large role to play in achieving not only the targets set out in the Paris Agreement, but to reach a viable level of sustainability and regeneration from our global processes to mitigate and prevent further climate crises in the long term (IEA, 2018). Thus, the transition from fossil fuels to low-carbon energy sources is essential. While this energy transition is necessary, only limited progress has been made when it comes to achieving desired progress in reality (IEA, 2018; IPCC, 2022).

Nevertheless, change is being made, and institutions involved in the energy system regime are gradually implementing new energy technologies, while investors, governments, and other stakeholders around the world are making substantial investments into decarbonizing the energy system (World Economic Forum, 2020). There are many environmental, political, and industry factors that affect the ability of a business to transition to low-carbon energy, namely the prevalence of fossil fuels and continued fossil fuel subsidies (IPCC, 2022; Alfonso, Marques & Fuinhas, 2021). In recent years, energy efficiency and low-carbon energy have increasingly become a more pressing issue given the limited resource capacity of the earth (Kristoffersen et al. 2021). The appeal of renewable energy (RE) within the energy transition is that it does not drastically alter the earth's natural processes relative to fossil fuel energy production, nor does it significantly alter the functional structure of the biosphere (Bogdanov, Gulagi, Fasihi & Breyer, 2021).

According to Seles et al. (2021), it was identified that resources, capabilities, and dynamic capabilities embedded in organizational structure, products, and processes are enabling the energy transition, and therefore organizations need sustainable business models, performance measures, stakeholder relationships, governance, and communities to accelerate the transition from the energy landscape from a fossil one to a low-carbon one. Therefore, it is necessary for firms to build up specific skills, processes, and routines for the transition.

Firms need to understand which firm resources should be prioritized and leveraged in order to ascertain sustainable competitive advantage (SCA) in the energy transition. Since many energy companies are privatized and state-owned, we think it is important to understand how businesses operating within the energy system can accomplish energy transition within the competitive energy landscape. This topic is especially of interest given that the changes in the energy sector will put pressure on existing firm resources. In this period of dynamic change to meet climate goals, firms have to use their resources and adapt in response to the business environment in order to create or maintain competitive advantage (CA) or SCA.

1.1 Background and Problematization

This section will provide a brief overview of energy transition types and also some insights related to nuclear energy. This is followed by a discussion of the impact of the energy transition in relation to renewable energy. Subsequently, it will further discuss the current gap between the energy transition and a resource perspective, and then problematization is formed to understand how firm resources will use resources to drive energy transition within their firm in order to build a SCA.

1.1.1 Energy Transition

The energy transition has created a dynamic environment within the energy sector. According to the UNFCCC (2022), there is a strong call to action creating regulatory pressure toward achieving energy transition so that the energy sector is in alignment with 2030 goals. Energy transition has commonly been defined as the proportionate change of energy sources from fossil fuels to alternative sources of energy (Afonso, Marques & Fuinhas, 2021), and more specifically by IRENA (2022) as the transition from fossil fuels to zero carbon energy sources.

Energy transition can be accomplished through different ways. Afonso, Marques, and Fuinhas (2021) further defined and divided energy transition into these two definitions commonly accepted in the literature: low carbon energy transition (LCET) and the clean energy transition (CET), where LCET is defined by the transition from fossil fuels to lower carbon intensive fuel sources, including both renewables and nuclear energy sources, and CET is defined by the transition of energy sources from fossil fuels to "clean energy sources" which includes only renewable energy sources. However, for this paper, we think it is more important to include nuclear energy as a factor in the energy transition than to exclude it.

1.1.2 Nuclear Energy

Sometimes nuclear energy is considered renewable energy from a legislative and regulatory perspective (Fatima, Li, Ahmad, Jabeen, Li, 2021; Sulich & Soloducho-Pelc, 2021), but it is generally understood and defined as a non-renewable energy source, albeit that nuclear is another class of its own than other non-renewable energy sources when it comes to greenhouse gas (GHG) emissions and energy efficiency (Khan, Hou, Zakari, & Tawiah, 2021). Additionally, sometimes nuclear energy is considered, “clean energy,” versus “low-carbon energy,” (Sulich & Soloducho-Pelc, 2021), but for the purposes of this paper, nuclear energy will be defined within the term “low-carbon energy” (Afonso, Marques & Fuinhas, 2021). Some countries are phasing nuclear energy out (Fraser, 2019; Gao, Fan, & Liao, 2018), while other nations are beginning their nuclear energy development (Afonso, Marques & Fuinhas, 2021). Nuclear energy provides a stable and reliable source of energy compared to renewables which are often volatile (Afonso, Marques & Fuinhas, 2021).

Additionally, nuclear energy has an incredibly high energy efficiency that can achieve similar benefits as RE, in addition to providing stability to the power grid if the power plants are managed correctly (Afonso, Marques & Fuinhas, 2021). Although nuclear is advocated by some as unsafe and not viable as a part of the energy system (Sulich & Sołoducho-Pelc, 2021), in theory, this low-carbon energy supply of both RE and nuclear could help mitigate poverty and increase sustainable consumption of energy (IRENA, 2021; Afonso, Marques & Fuinhas, 2021; Anser, Ahmad, Khan, Nassani, Askar, Zaman, Abro, Kabbani, 2021).

1.1.3 Renewable Energy (RE) and its Impact

According to Marra and Colantonio (2021), fossil fuels are a non-renewable energy source that will be exhausted in the future at current usage rates. The demand and the supply for non-renewable energy have increased despite its negative impact on the environment (Marra & Colantonio, 2021). They further stated that this has prompted the EU to take action by renewing their renewable energy directives in line with the energy reduction target of the EU's 30 percent by 2030.

The term renewable energy (RE) covers all the natural energy types, such as solar, hydro, wind, ocean, bioenergy and geothermal that can be regenerated within our lifetimes, as opposed to non-renewable energy types such as fossil, gas, oil and coal which takes hundreds of years to form (Bele, 2021). According to the EU directive 2009/28/EC, article number 2 has defined renewable energy as, "energy from renewable non-fossil resources namely wind, solar, aerothermal, geothermal, hydrothermal and ocean energy, hydropower, biomass, landfill gas, sewage plant and biogases," (European parliament, 2009, p.2). By prioritizing energy transition, the EU has strengthened its renewable energy policies for the energy sector. Due to the development of long-term strategies in the EU renewable energy sector, there is a significant increase in renewable energy consumption and currently there is an emerging trend in the sector (Marinescu, 2019).

Bonciu (2021) stated that the transition to a more climate neutral economy is one of the most prominent priorities in the recent decades due to that new geological era of the Anthropocene, thus the earth has changed rapidly due to the negative human activities which caused the pollution of water, soil and air which has led to climate change. To avoid these negative ramifications many large economies have made changes to their current strategies for more climate resilient solutions to accelerate the United Nations 2030 agenda (Villavicencio & Mauger, 2017). For example, the EU is one of the examples of governmental institutions which are regulating and driving their RE transition within their influence (Bonciu, 2021).

RE sources are vital due to their contribution to the reduction of climate change and the delivery of energy services (Bele, 2021). According to Bele (2021), the development of RE should not only be looked at from the climate change perspective, but also the social, financial, and political perspectives. Modern civilization is based on energy, and the quality of life in a society is impacted

by its energy sector. The energy transition concept was established in 2015 through the Paris agreement which is an important document for sustainable development and climate action (Bele, 2021). SDG goal number 7 represents affordable and clean energy which is the main driver of sustainable development (United Nations, 2015). According to the U.S Department of energy, clean energy is defined as energy generated through renewable energy sources and nuclear (U.S Department of Energy, 2022).

On the other hand, according to Singh, Park, Tolmie, and Bartikowski (2014), the environmental investments and firms' returns should have a positive relationship in order to make such investments by a firm. According to them, to understand this phenomenon it is needed to understand the firm-specific resources which will take the lead on environmental friendly transition and there is a lack of literature that analyze the environmental friendly performance and firms' returns. Moreover, Ruggiero and Lehkonen (2017) stated that even though the transition to RE can improve the environmental performance, there is a question about the gains of the firm after such transition. However, according to their research, they pointed out that there is a negative relationship between the RE penetration and the long-term firm performance. Gamero, Azorin, and Cortes (2009) stated that there is a positive relationship between environmental performance and firms' performance if the firms adopt proactive environmental management and gain first mover advantage. The limited literature related to this area provides mixed results on how energy companies utilize their firm resources to make SCA and hence it is vital to understand how energy companies can leverage their resources in the energy transition in order to gain a SCA.

1.2 Aim and Objectives

Our main objective of this research paper is to identify how energy companies in the EU utilize their resources when transferring from non-renewable to renewable energy. Hence, we have chosen two main multinational energy companies for the research – the Swedish company, Vattenfall, and the German firm, E.ON. There are several reasons for choosing the energy sector for the research. The main reason is that according to the UN's 2030 agenda energy transition from non-renewable to renewable is crucial to fulfill the SDG goal 7 (United Nations, 2015). Secondly, a sustainable energy transition can mitigate the impact of climate change since it brings a reduction in pollution and sustainable economic growth (Marra & Colantonio, 2021). Moreover, EU member states are actively contributing to sustainable energy development by allocating public funds for the progress of this sector, and therefore it is vital to understand the opportunities and challenges faced by the energy companies during this transition (Bele, 2021). Furthermore, energy is not only a topic related to climate change but also has implications related to financial, technological, social, and political factors (Bele, 2021).

Our study considers three major areas of focus in regard to the research direction to attempt to

answer the research question: (1) the resource-based view (RBV), (2) environmental analysis (including political and legal environment, economic environment, technological environment, and social environment, and lastly, (3) resource leveraging and dynamic capabilities. Our analysis will mainly be based on both interviews and secondary data. We will conduct several interviews with managers and executives from each company and also use company websites, and annual and sustainability reports to back up our findings.

1.3 Research Question and Purpose

The whole purpose of this research is to fill the gap discussed in Section 1.1.3. In this paper, we will synthesize the connection between energy resources and how firm-specific resources can leverage the firm's position in order to gain a SCA through the energy transition to achieve the 2030 agenda. Therefore, we pose our research question:

> **"How do businesses operating within the EU energy sector use their resources to achieve energy transition and remain competitive in the market while doing so?"**

It is important to understand how businesses in the energy system change from fossil fuels to low-carbon energy sources to accomplish firm energy transition. We want to understand the resources that businesses in this system are deploying in order to stay competitive and undergo major changes in adopting new innovations to achieve the energy transition. We assume that the resources utilized to accomplish the energy transition efficiently and before other competitors will provide businesses a CA within the energy system in regards to price, performance, and compliance. Thus, recognizing key enablers of the energy transition in businesses can be paramount when making strategic investments in the resources of the company, as well as prioritizing projects. Additionally, it is important for businesses to achieve energy transition to reach Agenda 2030 targets to reduce GHG emissions, as well as ideally addressing other SDGs by lowering energy costs for future energy consumers for a fairer and greener energy system.

1.4 Delimitation

Due to the strict time limit it was important to limit the scope of our study. Therefore, we have limited our study to two multinational energy companies from the EU with only 7 interviews and 8 interviewees. Also, we have limited our study only to analyze the implications from a resource perspective with the usage of three theories: the resource-based view, dynamic capabilities, and resource leveraging. Some depth is lacking here due to a limited word count. Using other frameworks may provide a different perspective; however, this is beyond the scope of this paper. We have not analyzed the firm's financial performance.

1.5 Chapter Summary and Thesis Outline

The thesis is structured into 6 chapters. This chapter contains the background to define and contextualize the research problem and research question regarding how businesses transition from fossil fuels to low-carbon energy (including both renewable and nuclear energy). It also provides problematization, followed by the objectives and purposes, followed by delimitations. In Chapter 2, a thorough review of the existing literature is conducted, examining the different perspectives of resources and capabilities in the energy industry, and eventually formulating the theoretical framework. Chapter 3 presents and motivates the choice of research design and data collection and analysis method. Additionally, it addresses the validity and reliability, as well as limitations of the study. The empirical findings of the research from the multiple-case are presented in Chapter 4. Chapter 5 analyzes and discusses the empirical data with the theoretical framework created in Chapter 2. From this, firm resources under the RBV, dynamic capabilities, and leveraging topics were determined from the cross-case analysis. The findings are summarized and the research is concluded in Chapter 6. The discussion is followed by a call for future research.

2. Literature Review

2.1 Resource-Based View

According to Barney, Ketchen, and Wright (2011), identifying firm resources has become a major topic in the literature that drives strategic management research. It has been specifically of interest to look into the RBV to analyze the connection between a firm's resources and SCA. Additionally, the RBV integrates economics with the management perspective (Peteraf & Barney, 2003).

According to Barney (1991), the resource-based view (RBV) has two alternative assumptions. First, RBV assumes that resources within an industry can be heterogeneous based on how firms control their strategic resources. Secondly, it assumes that heterogeneity can be long-term since resources can not be perfectly mobile across firms (Barney, 1991).

In order to analyze the RBV, it is important to define some valuable concepts such as CA, resources, and SCA. Barney (1991) stated that the firm's resources can be defined as both tangible and intangible resources (e.g., physical wind farms, research and development capabilities, organizational processes, patented technology, etc.). These firm resources can be used strategically to enhance the effectiveness and efficiency of the firm's overall performance.

Barney (1991) classified these resources into human capital, physical capital, and organizational capital resources. According to him, physical capital resources can include plant, equipment, raw material access, geographical location, as well as physical technology used by the firm. Individual managers, intelligence, workers, experience and training, and building relationships are examples of human capital resources (Zahra, 2021). Barney (1991) also provided examples for organizational capital resources which can refer to formal and informal planning, reporting structure, informal relationships, and other control systems within the firm and the environment in which the firm operates.

CA has many definitions in the literature. It can be defined as when a firm implements a strategy to create value before its rivals in the industry who do not implement the strategy at the same time (Barney, 1991). Porter (1999) defined CA as the ability of the firm to create a higher value for buyers than what it costs the firm. Peteraf and Barney (2003) built upon these definitions to define CA as the firm’s ability to create more economic value than its competitors. Overall, it can be generalized that the firms who can create maximum value surpluses will arguably have a CA of some kind. It is important to acknowledge that the CA may also have the potential to realize this comparative value creation in the future (Grant, 2016). This is especially relevant to the energy sector considering their work often involves long-term strategies and projects. To gain CAs, the firm can produce greater net benefits through either a low cost or differentiation strategies within

business units (Porter, 1999; Peteraf & Barney, 2003). Peteraf and Barney (2003) explained that firms with superior resources can obtain and deliver greater value to their consumers with a lower cost due to the efficiency of the resources.

Based on Barney and Porter's work, Hoffman has defined SCA as the, "prolonged benefits of implementing some unique value-creating strategy not simultaneously being implemented by any current or potential competitors along with the inability to duplicate the benefits of this strategy" (2000, p.1). If an industry has resource homogeneity and resource mobility, then firms can replicate the strategies of their rivals and implement the same strategies which will not lead to SCA (Barney, 1991). However, if firms have heterogeneous and immobile resources, the firm can obtain a CA, such as a "first mover advantage" (Ghemawat, 1991; Barney, 1991). To gain a first mover advantage, firms need to identify the opportunity in the industry before its competitors (Barney, 1991).

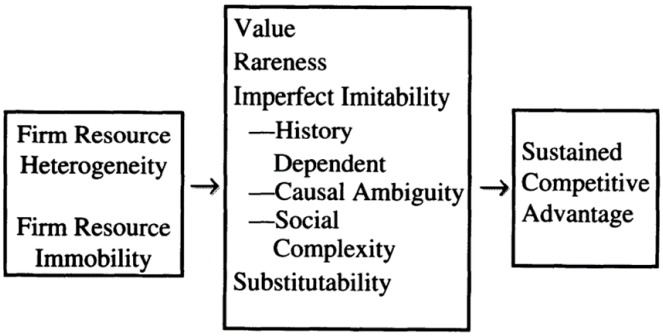
To reiterate, SCA is derived from the firm's resources under the RBV. However, in order to achieve SCA, the resources of the firm that provide CA opportunities should be or potentially become heterogeneous and immobile to some extent. Seddon (2014) added emphasis on the organizational component of the firm in orchestrating VRIN resources and strategically applying them to obtain SCA. However, such organizational capabilities are defined as resources under Barney's (1991) RBV theory, as well as under the work of Ghemawat (1986) on SCA. According to Barney (1991), the firm must have resources valuable, rare, inimitable, and non-substitutable (VRIN) in order to have a SCA:

- Valuable: A firm's resources will be valuable if a resource can enhance the efficiency and effectiveness.
- Rare: The rareness of a resource depends on the uniqueness of the resources.
- Inimitable: Inimitability is based on three main attributes: unique historical conditions, social complexity, and causal ambiguity. If a firm has a unique history, the firm may be able to make value creating strategies which can not be replicated by the rivals. The firm's unique location, unique individual human capital and unique organizational cultures can contribute to inimitability. Causal ambiguity occurs when rivals are unable to understand the link between how firms control its resources and gain CA.
- Non-substitutable: Non-substitutability occurs when a firm's resources can not be replaced by other firms' resources of offerings.

Thus, Barney (1991) stated that to have a SCA or a potential SCA, a firm's resource or resources should possess all of the aforementioned resource attributes. The connection between

heterogeneity, immobility, VRIN and SCA can be summarized in Figure 1.

Figure 1: Connection between heterogeneity, immobility, VRIN and SCA (Barney, 1991)



2.2 Dynamic Capabilities

RBV is a reflection of how some firms outperform their rivals based on VRIN resources which leads to a CA (Combs, Ketchen, Jr, Ireland & Webb, 2011). According to Combs et al. (2011), there are critics who argue that the RBV approach is problematic because it lacks an explanation about how these resources should be managed to gain a CA. Combs et al. (2011) and Eisenhardt and Martin (2000) argued that firms need to understand how rapid and unpredictable changes affect the performance of their strategic resources, in addition explaining why and how other firms have CA in dynamic markets with such changes. Moreover, Kristoffersen et al. (2021) have criticized the RBV by stating that it is lacking in explaining how firms can transform the VRIN resources into capabilities needed to adapt to changing market environments. Another limitation of RBV, according to Sirmon, Barney, Ketchen, Wright, Hitt, Ireland and Gilbert (2010) is that processing resources alone will not lead to CA. They proposed that resources need to be accumulated, bundled and leveraged, and therefore there should be more focus on managers' decisions when it comes to strategy and using resources. Partially in response to the shortcomings of the RBV, Teece, Pisano, and Shuen (1997) have developed a dynamic capabilities framework.

Dynamic capabilities are a way to understand how companies adapt in rapidly changing environments and continue to deliver value and remain competitive in the market (Teece, Pisano & Shuen, 1997). Dynamic capabilities emphasize the importance of both internal and external factors when it comes to the firm and the environment in which it exists (Teece, Pisano & Shuen, 1997). Teece, Pisano, and Shuen (1997, p. 516) define dynamic capabilities as, "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments.". Eisenhardt and Martin (2000, p.1107) have defined dynamic capabilities as,

“antecedent organizational and strategic routines by which managers alter their resource base, acquire and shed resources, integrate them together, and recombine them to degenerate new value creating strategies".

Adding new knowledge contributes to dynamic capabilities which supports agility and the development of new oppertunities (Sirmon et al. 2010). Dynamic capabilities include strategic and organizational processes, alliance, best practices, efficient processes and routines (Eisenhardt & Martin, 2000). Dynamic capabilities help organizations to overcome challenges arising from the changing environment by renewing existing resources and capabilities and also exploiting new resources (Kaur & Mehta, 2017).

2.3 Leveraging

According to Bingham and Eisenhardt (2008), resource leveraging is an important concept in the strategic management literature. They defined leveraging as the firm's actions to create superior performance through the utilization of firm resources. It is closely associated with the RBV perspective with VRIN resources, as they stressed that the ownership of particular, firm-specific resources can be used to obtain CA (Bingham & Eisenhardt, 2008). According to Carnes, Hitt, Sirmon, Chirico and Huh (2021), firms' strategic choices on how to operate in a market is based on how they can leverage their resources and dynamic capabilities, as well as how these resources and capabilities should be managed to support innovation and value creation. Leveraging can be seen in different forms such as mobilizing, coordination, and the deployment of firm-specific strategies (Asiaei, Rezaee, Bontis, Barani, & Sapiei, 2021).

Liao and Duy (2017) explained that the concept of resource leverage can be also achieved by creating more value through using under-utilized resources. For example, firm technological capabilities can be leveraged to build new firm competencies through product development and innovations (Danneels, 2002). Moreover, Bingham and Eisenhardt (2008) stressed that when a firm amalgamates their core resources with the complementary resources, they can develop products more cost effectively, promptly, and can also move to new markets; hence, leveraging can facilitate market diversification and firm differentiation.

According to Mouzas and Ford (2012), managers are also a key driver of resource leveraging processes since managerial key tasks include managing resource interdependence, tension and uncertainty. They further stated that these key tasks include orchestration of both physical and knowledge base resources and therefore firms need to leverage their resources and capabilities to gain a CA over the rivals. According to them, the managers should leverage these resources in the form of know-how, expertise and intellectual assets. Bingham and Eisenhardt (2008) stated that resource leverage is very effective when the firm can use their knowledge based resources as core

resources and it is an assumption related to moderately dynamic markets. But if the firm has core and complementary resources, they can leverage them in multiple and changing markets (Bingham & Eisenhardt, 2008).

2.4 Firm Environment Analysis - Political & Legal Environment

2.4.1 Governance and Policy

RE supply is one of the main features for the road to net zero emissions target. According to Verbruggen and Lauber (2009), this is in line with reducing the global temperature increase beyond 2 °C. To provide a central role for market forces, it is vital to design a regulatory framework (Verbruggen & Lauber, 2009). According to Diestelmeier (2019), one main challenge of the energy transition is to integrate “prosumers" into the renewable electricity market. The author stated that prosumers are the consumers who produce their own electricity and their role in the electricity market is partially or fully limited due to the regulated remuneration schemes. According to research done in the Netherlands, they state that this can be fulfilled through enabling blockchain technologies since it allows organizations to have a more decentralized person without the need of maintaining a centrally connecting entity but this implies legal and policy ramifications (Diestelmeier, 2019).

The EU Commission is accelerating the energy transition through a more consumer-centered approach which will be further discussed in Section 2.7.1. According to Diestelmeier (2019), the implementation of blockchain will introduce more peer-to-peer (P2P) transactions which will be challenged by the existing governance structure of the EU electricity law and the actors which were defined previously by the EU electricity law will be cut by enabling the blockchain technologies. They also stressed that currently the EU electricity law is mainly based on the “silo thinking” approach where the sustainability, market regulations, and security in the energy sector follow a parallel path rather than a close relation, and with the emergence of blockchain, the silo thinking should be changed into a more holistic approach.

According to Diestelmeier (2019), the EU energy sector is moving towards more liberalization and consists of supply chain actors such as consumers, suppliers, producers, transmission system operators and distribution system operators and one important policy development is to enable more secure actions to protect the consumers in the electricity markets such as legalizing an incentive system. They further stressed that within the liberalized setting, the consumers are not bound to local utility companies and can choose different energy suppliers. Consumers can also produce electricity and they are receiving location-independent tariffs and obtaining the supply and distribution of electricity at a flat rate (Diestelmeier, 2019). According to Wangs and Su (2020), peer-to-peer (P2P) technology can be identified as one of the main applications of

blockchain. Blockchain technologies can provide more real-time information for the consumers and thus enhance the direct involvement of consumers (Diestelmeier, 2019). Blockchain technology is based on the trust of the users which can accommodate to create smart contracts (Wangs & Su, 2020).On the other hand, since the RE transition is also based on the trust between the firm and consumer if there is any excess capacity in housing the consumers can share the excess capacity within the community at a suitable price which is called a sharing economy and the policymakers should not define one and only correct blockchain design to the sector but instead strengthen the governance structure due to the complexity of the blockchain. (Diestelmeier, 2019).

Jankiewicz and Gradzik (2017) explained that it is important to expand the electric grid with the energy transition. They further stated that the current challenge is that the electric infrastructure in most EU countries are obsolete more than 30-40 years and therefore it is hard to adapt this infrastructure for the requirements of RE needs. They elaborated there is a need to have more strengthened policies for faster development of grid infrastructures, and that more financial support to extend the grids with the rise of wind and photovoltaic source is also necessary.

2.5 Economic Environment

2.5.1 Funding for Low-Carbon Energy

Unsurprisingly, it is an important factor of the development of low-carbon energy due to the efficiency of energy resources and energy efficiency is based on cost efficiency (Verbruggen & Lauber, 2009). Bele (2021) stated that energy efficiency is based on the energy duties and taxes hence, energy tax is an indicator of low-carbon energy resources. The author also stated that dynamics of the energy taxes are influenced by the environmental taxation of the country. To build affordable sustainable energy transitions, it is vital to invest in sustainable, equitable, and energy efficient forms of low-carbon energy and divest from fossil fuels altogether (Verbruggen & Lauber, 2009).

Bele (2021) stated that public funds were allocated under different support schemes for the development of the energy sector in EU countries and especially towards the acceleration of RE. The author also stated that technological developments are a key feature of reducing costs of green energy procurement which will affect economic development and this should be done based on a specific funding mechanism such as investments for RE. Private funding for RE holds the largest share and public funding holds a smaller proportion (Bele, 2021). Moreover, financial circumstances also reflect strategic importance when developing RE capacities which depend on strategies and capital markets, and the increase of the domestic capital share will generate ownership capacities and will continue to improve the financial elements of the RE business models (Cosmin, 2014).

2.5.2 Business Model of the Energy Sector

Verbeke, Coeurderoy, and Matt (2018) posited that business models could be a firm specific competitive advantage. Cosmin (2014) has identified two pillars of a renewable business model which provides CA to energy companies to capitalize within regional and national energy markets. The increased energy volume of such companies is driven by entrepreneurs and the scope of the company which tries new markets and thus, the small projects related to the energy industry don't create high value for the entrepreneurs, since the energy production business model is supported by partnerships and network relationships (Cosmin, 2014).

According to Cosmin (2014), for a large energy firm, one most important factor is to attract investors through clean energy technologies, and on the other hand, a small-scale energy firm can build their business model to attract investments through alliances and joint ventures. They also stated that the advantages of such joint venture's relationship are to acquire relevant expertise, resources and other assets which would be hard to acquire otherwise by these small firms.

According to Cuenca, Jamil, and Hayes (2021), there were only few participants involved and energy needs to transport from the main center to consumers in the traditional energy sector which is a long-distance process associated with generation, transmission, distribution, and supply. They further state that with the rise of primarily resources such as solar, wind, hydro, etc, the electricity industry has shifted to a more decentralized approach which reduced the distance. Thus, this transition has also led to generating and consuming electricity with a reasonable investment (Cuenca, Jamil, & Hayes, 2021).

Cuenca, Jamil, and Hayes (2021) also stated that it is important to find out technical and economical friendly new business models within the energy sector where the users can aggregate their resources. As per them, one main concept is sharing economy and energy communities. Sharing economy is defined as where individuals can define bottom-up institutions to increase the social benefit, governance of communities and individuals and environmentalism using shared resources for long-term sustainability (Cuenca, Jamil & Hayes, 2021).

2.5.3 Energy Communities

Energy community can be defined as a "form of a community driven institution taking social control of shared energetic resources through decentralization" (Cuenca, Jamil & Hayes, 2021, p.5738). According to Cuenca, Jamil and Hayes (2021), the government is committed to setting renewable energy resource targets; these energy communities can develop their own goals through aggregation of resources and the users within that community can enjoy the benefits arising from this energy transition by accepting responsibilities which are more beyond the economic perspective. On the other hand, energy communities aggregate the energy resources which

contrasts with microgrids and also the resources within the renewable energy communities can be managed and owned by the community or owned individually and managed by the community based on the agreed rules (Cuenca, Jamil & Hayes, 2021).

The revised new EU directives have led to open new possibilities for microgrids (Martirano, Rotondo, Kermani, Massarella & Gravina, 2021). A study done by Martirano et al. (2021) stated that one main challenge for the electrical grid operation is combining renewable resources for the electric grid. They also state that traditionally the electricity production was a one-way process and due to the network community effect now it has become a two-way process. Moreover, they further stressed that energy communities are associated with more regulatory problems and barriers which delays the energy transition in the EU. Thus, in today's world, smart grids are born and growing and it is essential to boost the energy transition which manages RE sources (Martirano et al. 2021). In addition, Cuenca, Jamil and Hayes (2021) states that an element which controls the in and out of the power flow to the community is called "resources" such as renewable energy resources, energy storage, demand response and energy management systems. They further stressed that the renewable resources are energetic resources such as wind, waves, tides, solar, geothermal, etc which can be renewed within the lifespan of humans.

2.6 Technological Environment

2.6.1 Technological Improvements

According to Dogl and Holtbrugge's (2010) study of German RE companies, it was revealed that environmentally friendly energy technologies have a higher impact when it comes to gaining CA. They also stated that these firms have a high number of patents for innovative solutions and make substantial capital investments in research and development which creates technological leadership within these firms and thus, high quality RE technological energy solutions and know-how can be profited on and exported to other countries.

Cosmin (2014) states that the technological pillar of renewable energy is based on innovation and capability of upgrading primary energy resources into electricity, hence, these business models are the driver of competitiveness since it transforms technological heritage (e.g., manager's expectation of the business) into the value proposition for both customers and markets.

Moreover, with the requirements of decentralized energy systems and RE resources, it was needed to have a more reliable, secure, scalable, trading model for the energy sector to manage communication, distribution, transmission and independent management of actors within the energy network (Miglani, Kumar, Chamola & Zeadally, 2020). According to Diestelmeier (2019), the main solution for such integration is the new disruptive technology of blockchain in the energy

sector which enables consumers to engage in market transactions. He further states that blockchain works as a ledger technology which records the ownership status of a specific asset and prosumers. Moreover, blockchains are used to create green energy certificates for the prosumers and thus, this certificate is a proof of showing that the energy is generated through the renewable resources without sending manual records for the centralized agency (Miglani et al. 2020).

2.7 Social Environment

2.7.1 Consumer Centered Energy Transition

With the transition of the RE, it was identified that the consumer role in the energy sector should be changed and there should be a consumer centered energy system, but the question arises on integrating the consumers and new actors (Miglani et al. 2020). According to EU policy, it has acknowledged that this energy transition should be consumer centered (Diestelmeier, 2019). Therefore, it should be integrated with "prosumers" or "aggregators" and this enables consumers to benefit from the price fluctuations in the electricity market and gain compensation for their participation in the market and avoid main costs associated with backup generation (Diestelmeier, 2019). As discussed in the Sections 2.4.1 and 2.6.1, blockchain technologies are a key application for a consumer centered energy generation society. Wang and Su (2020) show that blockchain technology helps to promote renewable energy and reduce the negative environmental impact since this technology which is coupled with P2P helps customers to buy and sell RE with each other. They further stated that blockchain technology is associated with many nodes which are connected to a network and thus it can connect different energy customers who need to trade their energy within the network. This is an emerging technology in the RE industry which provides solutions for the bottlenecks and helps to replace fossil energy (Wang & Su, 2020).

2.8 Firm-Specific Resources Towards Energy Transition

According to Singh et al. (2014), the firm's motivation towards investments in higher environmental performance is based on the economic return of such investment. However, many firms do not see the value of investing in renewable resources (Singh et al. 2014). On the contrary, Gamero, Azorin, and Cortes (2009) stated that environmental management can enhance the competitiveness of a firm hence, it is important to outline specific resources and capabilities needed to implement effective environmentally friendly strategies. They also stress that if the firm has a higher capacity for change then its environmental performance will also be increased. Moreover, they also state that the firms who are early adopters of environmentally friendly technologies will also increase their performance and long-term sustainability. Therefore they stated that it is important to have proactive environmental management skills.

According to Gamero, Azorin, and Cortes (2009), a firm which has high intensity in environmental issues and early investment timing tend to reach first mover advantages than its rivals since they adopt proactive environmental practices. Potrich, Cortimiglia and Medeiros (2019), stated that proactive environmental management is based on costs and differentiation where the cost advantage arises from the production process efficiencies, reduction of waste disposal costs. To gain the cost efficiency firms need to establish new green technologies, greener distribution and transportation systems where the higher firms level innovation capabilities in pollution proactive technologies will lead to higher cost benefits and differentiation is based on how the firm increases the value for their customers and thus RE firms need to market the environmental friendly characteristics of its product and services (Gamero, Azorin, & Cortes 2009). Differentiation capabilities will help a firm to market their green packaging, products and other initiatives while obtaining a premium positioning in the market (Singh et al. 2014).

According to Singh et al. (2014), to allocate environmental responsibilities and achieve environmental objectives firms need to develop firm environmental procedures and policies which involve sustainable thinking and internalization of ecosystem services which further reduce the firm's costs. Gamero, Azorin, and Cortes (2009) further stressed that it is vital to develop superior firm resources to gain SCA where the firm's reputation towards environmental friendly practices is a crucial factor that increases the market value. Singh et al. (2014) stated that to enable environmental communication practices firms need green reputations and eco networking resources and capabilities. They also state that green reputation capabilities will increase the firm credibility, reduce risk and create differentiation which leads to enhanced financial performance and sustainable reputation among suppliers, customers, investors, employees, and government. Moreover, they state that by enhancing environmental marketing management capabilities will lead to increased corporate environmental marketing efforts through managing external relationships. Also, the eco networking capabilities can be developed through collaborative alliances, transfers, acquisitions, and joint ventures where the firm can gain diverse resources to generate rents and also to overcome high capital investment issues facing due to high cost of enabling environment-friendly technologies (Singh et al. 2014).

Gamero, Azorin, and Cortes (2009) also stated that changes in operations and routines are a valuable organizational competency which enhance the social reputation and legitimization of a firm which needs to orchestrate the technical and human skills. Singh et al. (2014) further stated that sustainable thinking will incorporate sustainability in the firm strategies thus leading to leverage firm's capabilities in terms of shared vision, knowledge sharing, resource orchestration. According to them, this firm can acquire, develop and create environmentally friendly capabilities where they can acquire human talent who have specialized skills towards environmental management. Furthermore, they also show that sustainable thinking will be further embedded in

the organizational operating procedures which integrate sustainable organizational mechanisms and lead to higher economic and environmental performances.

Gamero, Azorin, and Cortes (2009) further stressed that environmental performance also enhances the development of new firm resources through tangible and intangible assets. According to them, new firm resources increase the firm's capabilities through learning about environmental issues. Singh et al. (2014) stated that it is important to build capabilities towards environmental operational practices such as production and operating systems. To adopt these practices they need to develop cradle-to-cradle and eco-efficiency approaches (Singh et al. 2014).

Singh et al. (2014) also showed that the cradle to cradle approach is based on mitigating waste and increasing efficiency which is also known as closed-loop production. Material substitution capabilities are embedded in the cradle-to-cradle approach and it leads firms to acquire and design high quality organic resources and also to develop capabilities related to closed-loop supply chain management by creating efficient reverse logistics, product simplification and eliminating waste according to them. On the other hand, the eco-efficiency approach helps firms to reduce the use of green (natural) resources through enhanced resource productivity and thus leads to economies of scope through user-centric design capability and leveraging high quality materials (Singh et al. 2014). They stated that it is also important to develop eco-innovation capabilities to reduce environmental risk, negative impact on resource use and pollution since these innovative solutions will lead to climate-induced technological change. According to them, these innovations lead to building or leveraging completely new capabilities or reconfiguring firms' capabilities.

2.9 Chapter Summary and Theoretical Framework

After an extensive literature review that considered dominant business theories pertaining to firm resources and CA, we have created a theoretical framework to summarize the important concepts that relate to firm competitiveness and remaining competitive under transition.

The theoretical framework is broken into two parts to incorporate three dominant theories in the literature when it comes to identifying why firms are competitive in the market under a resource perspective, in addition to how they remain competitive under dynamic conditions, such as the energy transition. Furthermore, some propositions about the firm environment are also mentioned as summarizing points that are connected to the RBV theoretical section, as well as points connected to the dynamic capabilities and leveraging theoretical section.

1. *RBV*: Firms need VRIN resources that are heterogeneous and immobile for firms to be competitive in the market.

a. Resources and capabilities related to differentiation, cost reduction efforts, green reputation, eco networking, innovation, environmental marketing management, environmental operational practices, servicing and commercialization will lead to gain early mover advantages, increase firm value through reputation, enhance economies of scope and develop new business models which will lead to SCA.

b. To generate affordable sustainable energy, firms need to have technological competencies, innovation capabilities (eg., innovative material processing, blockchain technologies, etc.), and value-creating business models.

c. Resources enabling energy communities may be the future of energy distribution, and thus may be a source for capturing VRIN benefits to create a CA in a consumer-centered energy transition. Prosumers and energy networks are currently more important components of energy transition.

d. Firms need to manage their VRIN resources through proper management systems.

e. Funding for low-carbon energy is necessary to achieve energy transition.

The energy transition is an example of a drastic change within the market that has implications for all stakeholders involved. Since the RBV has been critiqued for having limitations when it comes to explaining how firms can use resources to create CA and SCA in rapidly changing and dynamic environments, the dynamic capability and leveraging theories are utilized to explain how resources are adapted to survive a market change such as the energy transition.

2. *Dynamic capabilities and leveraging***:** In order to survive and be competitive in a post-energy transition market, firms need to adapt and change their existing resources and capabilities in response to the changing market. Firms need to utilize their resources effectively in order to ascertain superior performance to sustain CA. This is based on their dynamic capabilities and how they will leverage their resources and capabilities in a way where they can mobilize, coordinate and deploy firms' specific resources.

    a. Dynamic capabilities are critical for firms to adapt to changes in governance and policy, societal pressures, technology, and other external factors.

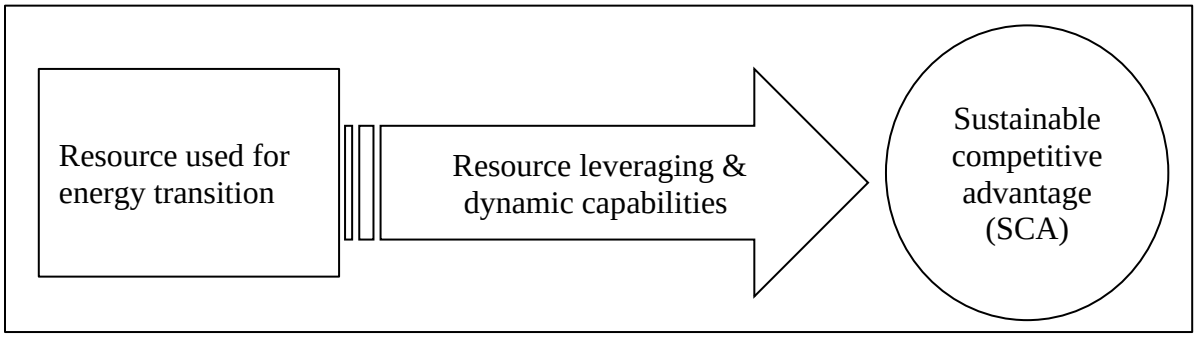
    b. The firms that adopt proactive environmental strategies can leverage their resources to achieve energy transition towards long-term environmental benefits, which may also lead to early mover advantages and SCA.

    c. Firms can strengthen their strategic position via corporate strategy choices such as, entry modes like alliances, partnerships, joint ventures, etc.

d. Firms need to leverage their firm-specific resources such as VRIN to ascertain a CA in dynamic or new markets.

e. Firms need to accomplish energy transition and they may potentially gain SCA by doing so.

Figure 2: Framework of energy transition



3. Methodology

The methodology chapter introduces and explains the steps, approaches, and considerations taken to collect and analyze the data required to answer the research question. Firstly, we introduce our usage of an abductive research approach. Secondly, the usage of qualitative multi-case study research approach is introduced and presented. Thereafter, the data collection methods of purposeful sampling and semi-structured interviews with open-ended questions are discussed. The empirical data is organized into themes determined by the interviews themselves for convenience of presenting the data. The empirical data Chapter was further supported by secondary data in the form of company information, annual reports, etc. An analysis of the empirical data is done with cross reference to the theoretical framework in Section 2.9 as a part of the qualitative multi-case study approach. The chapter concludes with a discussion of the validity and limitations of the research methodology and design.

3.1 Research Approach

Research strategy refers to the general direction in which business research is conducted (Bryman & Bell, 2011). In order to explore how energy companies in the EU transition from fossil fuels to low-energy energy from a resource-based perspective, an abductive reasoning approach was used to inform and conduct a qualitative multi-case study. The link between theoretical and empirical data can be explained by the research approach.

The most commonly used research methods can usually be divided into deductive and inductive reasoning (Bryman & Bell, 2011). Bryman and Bell (2011) explained that the deductive approach is based on known information and theories related to a particular field, starting with hypotheses or predictions to test theoretical consistency. In contrast, they explained the inductive approach starts from observations and/or specific data collected, which is then generalized through observational patterns to put forth a general conclusion that creates theory as part of the research contribution. Abductive reasoning is somewhat of a combination between the two deductive and inductive research approaches; it is used to overcome limitations associated in both (deductive and inductive) approaches (Dubois & Gadde, 2002). The abductive approach has been defined as a process that allows for iterative modification of the underlying framework through a combination of established models and new empirical research, and is suitable for making new discoveries from pre-existing theories (Dubois & Gadde, 2002).

The starting point for this study served as the known theory (i.e., the RBV, dynamic capabilities, and leveraging), and in addition to some theoretical deductions, the inclusion of inductive elements are necessary to supplement the study considering the current lack of research on energy transition processes in the energy sector within the EU region. The inductive elements allow general

conclusions specific to EU energy companies to be drawn from the observation of interview data and other academic literature. The aim is to utilize a resource-based perspective traditionally used to explain CA and SCA to shed light on the interplay of dynamic market environments and the ability for firms to achieve energy transition. Therefore, the deductive or inductive approach was not chosen to be used in isolation, but a more suitable abductive reasoning approach was chosen to incorporate both theoretical perspectives and new perspectives observed and analyzed from the empirical data.

In terms of choosing qualitative research, it usually emphasizes textual and interpretive social approaches when collecting and analyzing data (Bryman & Bell, 2011). Qualitative research also has a strong applicability to capture processes, changes, and events that unfold over time (Birkinshaw, Brannen & Tung, 2011). A qualitative research method was chosen since this study aims to describe and explain the energy transition process in order to gain insight into how the resource-based view theory can explain SCA and transition efforts. Secondly, Birkinshaw, Brannen and Tung (2011) stated that the qualitative study focused more on the participants' perspectives rather than the researcher's. The interviewees are the focus of this research, and their position within the selected energy companies makes their testimonies and perspectives related to energy transition relevant and important. This remains highly consistent with the qualitative analysis.

3.2 Research Design

Research design represents a structure that serves as a facilitator to guide the execution of the research methods and subsequent analysis of the data (Bryman & Bell, 2011). The motivations and reasons for the research design are discussed in the following sections to explain the usage of the qualitative multi-case study approach.

3.2.1 Case Study

Knights and McCabe (1997) suggest that a case study provides a vehicle designed to combine several qualitative methods, thus avoiding an over-reliance on a single method. Since this study used qualitative methods, such as participant observation and interviews, that facilitated an in-depth and detailed exploration of a case. Case studies are very popular and widely used research designs in business-related research (Eisenhardt & Graebner, 2007). According to Bryman and Bell (2011), the focus of a case study is to intensively examine phenomena on a detailed, micro level. In other words, the complexity and specificity of the case in a particular setting or context is able to be considered and incorporated into the research analysis through that research design (Stake, 1995). The researcher is also able to grasp some broader information and perspectives

specific to that context through the case study and to gain a more comprehensive understanding of the interconnections between variables.

3.2.2 Multiple Case Study

As described in the previous section, case studies enable in-depth study and theoretical analysis. However, case studies can also use multiple cases. In a single-case design, a detailed and in-depth analysis is required through data collection for a single case (Bryman & Bell, 2011). However, in a multi-case design, data collection and analysis of multiple or collective cases need to be jointly conducted and theoretically analyzed. In general, a single case emphasizes the uniqueness and criticality of a specific case, while multiple cases disclose the empirical phenomenon from a more holistic dimension.

The multiple case study design fitted well with the aims and objectives of this study, which was to understand the processes and impacts of energy transitions in the specific geographical and industry context of energy companies in the EU energy sector. In addition, case studies are best suited to the "why" and "how" types of research questions, as they involve not only incidence but also the need for business linkages that change over time (Yin, 2003). Clearly, the case study design is the best for this study because the research questions focus on exploring how energy sectors can use their own resources to make a more interpretive shift to low-carbon energy sources.

Yin (2003) suggested the creation of propositions for the theoretical foundation, and then in the analysis to analyze the observed data, the empirical evidence, in regard to the propositions. The cross-case analysis from a multi-case study compares two independent cases with the same propositions to compare the findings against the propositions that may be explained by the theoretical component. In this research we use a theoretical framework instead of propositions to analyze each case. From the empirical data, we cross-reference it to the theoretical framework and use an abductive approach to both test theoretical compliance while also suggesting areas of particular importance when it comes to firms achieving energy transition from a resource based perspective.

There are several reasons that motivated the choice of a comparative multiple-case study design using two case companies. Firstly, based on the limited scope of this study, only two firm cases were chosen to increase the depth and quality of the report. It is valuable and beneficial to select multiple cases to establish the connections to theory. The use and selection of two different energy company cases allows a more holistic analysis that increases the reliability and veracity of this study because it provides more consistency between the results and the theories on a more macro level. Secondly, by considering the unique and similar perspectives on the energy transition process in these cases, it can facilitate a more coherent theoretical reflection while potentially

building or validating the theories put forth in the theoretical framework (see Section 2.9). And lastly, this study aims to create new insights concerning a resource-based perspective and energy transition within the energy sector.

3.3 Data Collection Method

After determining the research strategy and design, the next step is to decide how to collect the research data. Data collection method refers to a technique for actually obtaining the data to be analyzed in a study (Johnson & Christensen, 2020). The aim is to employ a range of feasible strategies for collecting relevant empirical data to address the research question (Creswell, 2014). Therefore, the decision of the data collection method is crucial. The following sections outline the sampling strategy, the selection of cases, the sources of primary and secondary data, and the interview design. The reasons for adopting these collection methods are addressed.

3.3.1 Purposive Sampling

According to Bryman and Bell (2011), purposive sampling is the most common type of sampling in qualitative research. The authors define it as a non-probability form and argue that it is not permissible for the researcher to generalize the sample population. Therefore, the sampling process is not random, but rather a purposive choosing of people from a research population that is relevant based on taking account of the research question and objectives (Bryman & Bell, 2011). By sampling in a strategic manner, the high relevance of the sample to the study was satisfied.

The study chose purposive sampling for several reasons. First, a purposive sampling strategy was considered most appropriate to find a reasonable number of qualified respondents as the primary sources of data. Secondly, due to the limited time frame of the study, purposive sampling can more effectively drive the quality of data used to explore the research question. People that did meet the objectives or had little information, weak relevance, or redundancy were not consulted to inform the data to answer the research questions and were excluded in advance.

The specific subjects of this study were individuals working in energy-related positions at energy sectors. That is, the respondents were generated from relevant individuals based on company sampling. In order to make the sample representative, four criteria were selected for this study: (1) energy companies that have operations within the EU geographical area and have high visibility and influence; (2) companies that work towards achieving energy transition; (3) one state-owned and one privately owned company; and (4) individuals with current energy or sustainability-related expertise and experience in middle or high-level positions. The first three criteria are for companies sampling, designed to ensure the relevance of this study, as well as the reliability of the results.

The last criteria is a respondent-specific sample designed to ensure that respondents can provide valid expertise and insights.

3.3.2 Case Firms and Interviewee Selection

At the end of the previous section, the criteria for case companies selection were identified (see Section 3.3.1). Based on these criteria, the most relevant case companies were determined. Based on the revenue data report of energy companies in Sweden in 2021 compiled by Statista (2021), the top ten companies were considered. From this list, each company was examined and evaluated for ownership and being in the process of energy transition by visiting its official website, with the aim of evaluating compliance with identified criteria. The results are shown in Table 1. After evaluating the companies against our criteria, we choose a privately owned company, E.ON (Germany), and a state-owned company, Vattenfall (Sweden), as the two case companies for this study.

Table 1: Energy Companies in Sweden

#	Company Name	Established Year	Ownership	Geographical area	Revenue in billion SEK (2021)
1	Vattenfall AB	1937	Swedish State-Owned multinational	Europe/EU Head office in Sweden	158.8
2	Sidensjö Vindkraft AB	2010	German stated-owned multinational (subsidiary of Stadtwerke Munchen)	Europe/EU Head office in Germany	13.9
3	E.ON Energilösningar AB	1917	German Limited liability multinational company (Private company)	Europe / EU Head office in Germany	10.7
4	E.ON Energidistribution AB	1959			10.1
5	E.ON Sverige AB	1906			9.4
6	Fortum Sverige AB	1906	Finish state-owned multinational company	Europe / EU Head office in Finland	8.4
7	Stockholm Exergi AB	1919	State-private owned company (50/50 ownership)	Europe/EU/USA Head office in Sweden	7.2
8	Peas Industries AB	2010	Private company	Europe/EU/USA Head office in Sweden	5.5
9	Sydkraft Nuclear Power AB	1970	Private company	Europe/EU/ UAE/USA Head office in Germany	4.9
10	Modity Energy Trading AB	2010	Independent electricity retailer Subsidiary of Öresundskraft	Sweden	4.4

Data has been sourced from the websites owned by the companies in the table, compiled and organized by the authors (Vattenfall, 2022; Sidensjö Vindkraft, 2022; E.ON, 2022; Fortum Sverige, 2022; Stockholm Energi, 2021; Peas Industries, 2022; Uniper, 2022; Modity Energy Trading, 2022)

Based on the company selection and the publicly available information, representatives of these companies were contacted by e-mail and asked if they could either be interviewed for this research, or if they could recommend suitable candidates. After identifying possible interviewees, they were contacted via email and LinkedIn, and informed about the purpose of this study, the basic content of the interview, and how the interview information would be used. At the end of the email, the intention of being able to participate in the interview in person or via video call was inquired. The

snowball approach, as a non-probability sampling, refers to the researcher making initial contact through a small group of people related to the research topic and later using them to obtain more respondents (Bryman & Bell, 2011). Therefore, after making contact with the interviewees, we asked for information about other potential respondents and established contact with them. To reduce the influence of personal opinion bias on the study, we identified a total of 8 respondents from the two case companies, of which 4 interviewees from each company. The detailed information about the interviewees is presented in Section 3.3.4. To ensure we protect the respondent's privacy rights, we included the possibility of remaining anonymous in the interview upon request. This has been stated to each interviewee as a part of the interview declaration (see Appendix A).

3.3.3 Primary and Secondary Data Sources

The data set for this study includes both primary and secondary data to ensure that the data is comprehensive and complete. Primary data was collected through interviews with representatives of respondents from each case company. The interviews were recorded with the permission of the interviewees, and the interview data was transcribed and organized into themes in Chapter 4. The interview data is the primary data source for this study. The secondary data for the empirical section of this study included a series of articles related to the case companies and energy types collected from company websites and publicly published corporate materials. The purpose of this data was to supplement the primary data and to add more insight into the research questions.

3.3.4 Interview Design

Interviews are the most widely used method in qualitative research, and there are two main types of qualitative interviews: unstructured and semi-structured (Bryman & Bell, 2011). Whereas unstructured interviews allow respondents to answer freely, like a conversation, semi-structured interviews are usually conducted according to an interview guide developed by the researcher (Bryman & Bell, 2011). This research utilized an interview script to ask questions that allowed respondents to respond freely which allowed some exploration of the interviewee's unique experience and insights (to see the interview guide, see Appendix A). Using a semi-structured interview is more flexible as it allowed us as the researchers to go off-script with unwritten follow-up questions where the responses of the interviewees led to other unique insights and understandings.

The semi-structured interview was chosen for this study in order to keep a specific direction and focus related to the topic during the interview, while also encouraging minor deviations from the interview guide to potentially inform the study results with more depth than only a structured interview can provide. Furthermore, due to its flexible characteristics, we were able to use the

interview time efficiently and extract more valid information from the interviewees for our empirical data collection. According to Bryman and Bell (2011), taking semi-structured interviews allows for more specific questions to be addressed when the researcher has a fairly clear focus rather than exploring generalized concepts. They also mentioned that for the sake of comparability of case and interview data, the choice of semi-structured interviews is appropriate if the study is based on multiple respondents and/or multiple cases. Clearly, semi-structured interviews were the most relevant method considering our research approach, as this study used a qualitative, multi-case study research design.

We first designed the interview questionnaire around the relevant literature and conducted a face-to-face pilot interview. Due to the limited time available to the interviewee, we restructured the interview questions. The final company interview questions consisted of a total of 25 open-ended questions designed to provide detailed answers on topics related to the firm and the firm's transition to sustainable, low-carbon energy. These questions consisted of five main topics, including: 1) energy transition, 2) nuclear energy, 3) renewable energy, 4) firm-specific resources, and 5) environmental analysis. Within the topic of environmental analysis, the questions are subdivided into four sections: 1) political and legal environment, 2) economic environment, 3) technological environment, and 4) social environment. The correspondence between questions and categories is shown in Table 2.

Table 2: Categories connection to interview questions

Topics	Interview Questions
Energy Transition	**1-3**
Nuclear Energy	**4-5**
Renewable Energy	**6**
Firm-specific Resources	**7-14**
Environmental Analysis	
*Political & legal environment	**15-17**
*Economic environment	**18-21**
*Technological environment	**22-24**
*Social environment	**25**

After reconstructing our interview guide, we continued conducting interviews with the renewed questionnaire. The rest of the interviews were conducted online with video conferencing through Microsoft Teams software. Prior to each interview, interviewees were informed that the interview would be recorded and they were also given the option to remain anonymous and receive the interview transcripts (see Appendix A for interview declaration). For those interviewees who requested anonymity, we used the interviewee number within the text instead of a name. We sent transcripts to interviewees who requested them, as well as allowing interviewees to confirm their

responses and to address any misunderstandings. After each interview, we sent a follow-up email to interview participants thanking them for their participation and left an open channel for them to communicate with us if they had any thoughts, questions, or concerns relating to the interview and usage of interview content for the research afterwards. The complete list of interview questions is provided in Appendix A - Interview Questions. A complete list of interview participants and their additional information is listed in Table 3 below.

Table 3: Interview participants' information of Vattenfall and E.ON

#	Interview conducted date	Name of the interviewee	Company	Designation	No. of years in the energy sector	Interview Duration
1	28/4/2022	Peder Berne	E.ON	Driving energy transition, Sustainability Coordinator	15	55 minutes
2	29/4/2022	Azra Sapcanin	E.ON	Head of Energy Solutions på E.ON & CGO Airson	13	1 hour
3	29/4/2022	Lana Nore	Vattenfall	Innovation Leader in the Energy Sector	3	1 hr and 8 minutes
4	2/5/2022	Helene Biström	Vattenfall	Head of Business Area Wind	30	42 minutes
5	5/5/2022	Representative from E.ON	E.ON	Associate	3	1 hr and 13 minutes
6	5/5/2022	Representative from E.ON	E.ON	Department Manager	19	1 hr and 13 minutes
7	9/5/2022	Gustav frid	Vattenfall	Senior Environment & Sustainability specialist	6	1 hour
8	13/5/2022	Representative from Vattenfall	Vattenfall	Director sustainable business performance & transparency	Approximately 10 years	1 hour

3.4 Empirical Data and Data Analysis

Large and cumbersome qualitative databases resulting from unstructured text material such as interview transcripts or documents can pose challenges for data analysis in qualitative research (Bryman & Bell, 2011). Thus, in order to simplify the analysis in Chapter 5, the empirical data from the interviewees was organized in categories in Chapter 4 to increase readability and understanding amongst the readers. The data analysis for this study was then conducted using the theoretical framework (see Section 2.9) based on the dominant theory in resource-based literature to analyze the empirical data in regards to the research question. A cross-case analysis was used to discuss the similarities and differences and to both test theoretical alignment and compliance, as well as to lend insights into particularly useful resources used to enable energy transition amongst firms in the EU on a general level. This was done using a theoretical framework to do a cross-reference of the empirical data.

3.5 Validity and Reliability

There are three criteria that are important in evaluating business and management research: reliability, replicability, and validity (Bryman & Bell, 2011). When conducting this study, several steps were taken to enhance the replicability and reliability of this study. First, the research design, the process, and the selection of the explanatory components were described and justified in detail.

Thus, this informed how the content and design of the research were created which made it replicable by others to a reasonable extent, while its transparency increased reliability. Regarding internal reliability, the consistency of the observers' views was ensured by summarizing data from the transcripts into categories to explain the phenomena of the cases by compiling individual observations and then comparing and contrasting the observed data within and between cases. The interviews were conducted with a semi-structured format to allow flexibility with follow-up questions based on the interviewees' responses for more depth on relevant topics to the research question. Authoritative data sources were relied upon during the theoretical review and analytical discussions, i.e., relevant research articles published in reputable journals (all including the peer review process), official company websites, etc. Such information was considered to be reliable. In addition, the quality of this study was ensured through a purposeful sampling method in which case companies and respondents with expertise and experience were selected and interviewed.

In terms of the validity, the interview questions in this study were mainly developed based on the definition of theories and related concepts, and were not guided towards the answers, so that the measurement and the research were unassuming and relatively open for new insights. Moreover, in order to avoid misunderstanding of the questions during the interview process, some information was clarified in advance, as well as during the interviews if there was any confusion amongst the interviewees. Therefore, the interview data collected was sufficiently accurate to ensure the validity of the study. We also used secondary data to supplement the empirical data and data analysis to address the research problem.

3.6 Limitations

There are still several methodological limitations in this study. First is the language aspect. Since this study was led by international students, any sources referenced, as well as the language of the interview process, were in English. However, for the interviewees, English was not their first language, so there may be a possibility of misinterpretation. Although some countermeasures have been taken to improve the validity and reliability of the study, this still constitutes a limitation of this study.

Secondly, since our interviews are conducted with respondents currently employed by the firms in this study, they may not speak the full truth about how the company actually operates. There is always bias and here the bias can surface as a result of the firm, respondents, or both. For example, there may be incentive to embellish claims and actions of the company since the employees may have incentive to do so based on unwritten corporate cultural pressure. Additionally, although the interviewees are professionals in their field, they may have limited knowledge about the company’s energy transition overall and how the company is working on shifting their energy mix

as a whole; in other words, bounded rationality is a limitation here, as with any study. However, this limitation has been addressed to some extent by supplementing the interview data with secondary data.

Despite the purposive sampling approach chosen, we were influenced by the limited time. The data may be biased due to limitations in the number of case companies and the number of interviewees. The selection of interviewees was based on who we were able to contact and receive a response from. Moreover, although we had some criteria to identify suitable interviewees, the final interviewees were selected based on our subjective judgment to some extent.

4. Empirical Data

In this section, our interview data is presented, analyzed, and discussed. The data was collected through primary data sources from interviews with the interviewees, while secondary data informed the semi-structured interview questionnaire. The observed data related to both E.ON and Vattenfall's cases are used to identify themes within the company, and then the topics were cross-referenced to ensure the categories are relevant to both cases. A multi-case approach is used to analyze each case independently according to themes identified. The observed data has been organized according to these six categories: 1) the company, 2) competencies, 3) main processes and practices, 4) environmental policy, and 5) company strategy. Each category is discussed in terms of the E.ON and Vattenfall cases, followed by an overall discussion. This approach has been chosen to organize the data to increase readability, as well as provide a more proper view of the cases and a feel for the companies. All the interviewee discussions and quotes presented in this section have used their last name excluding those interviewees who requested to remain anonymous.

4.1 The Companies

This section provides a brief overview of E.ON and Vattenfall's history based on secondary data. Some key interview findings about brand and culture are also described, focusing on aspects of the company that are relevant to the energy transition.

4.1.1 E.ON

E.ON is a listed multinational energy company with its headquarters in Germany. It was founded in 2000 and is a privately owned company (see Table 1). The company currently employs around 70,000 people in 15 European countries (E.ON, 2022a). As an energy company, E.ON provides individuals and companies with the energy and electricity they need to make everyday life run smoothly (E.ON, 2022b). Their business comprises two main areas: intelligent distribution networks and innovative energy solutions for customers (E.ON, 2022a). Currently, E.ON is helping to drive the transition to a sustainable society by focusing on power grid expansion and electrifying transportation (E.ON, 2022b). They are shifting from fossil fuels as an energy source to renewable electricity and low-carbon energy solutions to achieve its goal of becoming carbon neutral by 2050 (E.ON, 2022c).

According to Sapcanin, E.ON can make differences in the industry while being a game changer. She stated that:

''I often meet people that will be interested in and willing to come to you. Because they see the important game changer on the course of the energy transition…when you are that big player, you can really make a difference.''

Moreover, E.ON has the advantage of being in the industry for many years where they have much knowledge and experience as stated by interviewee 6. Therefore, he stated that:

"We have an advantage … We have been in the market for many years. So there is much experience that we have both knowledge on how to build, maintain grids, how energy flows are to be valued, and what could contribute to our customers in order to save energy or install other sources."

4.1.2 Vattenfall

As of today, Vattenfall is a leading energy company and one of the largest producers and retailers of electricity and heat in the EU (Vattenfall, 2022a). Originally founded in Sweden in 1909, Vattenfall was mostly focused on energy production from hydro and nuclear power energy sources (Vattenfall, 2022b). Vattenfall eventually grew into an energy service company in 1985 and started to move into the European market in 1991 (Vattenfall, 2022b). Today, the company operates in several European countries (Vattenfall, 2022a). The transition from fossil-based energy sources to renewable, low-carbon energy sources has been a more pressing issue brought up with the Paris Agreement and Agenda 2030 made in 2015 (UNFCCC, 2022), yet Vattenfall has had the energy transition on its agenda since the early 2000s (Vattenfall, 2022c).

According to Biström, the company has a history of working with the industry closely where she stated,

"We can see that the industry wants to work with us. And when we partnered up with the ASF in the Netherlands, they own half our farm that we built there now. All of our competitors were asking, how did you get them on board? … it's something here which I would call history and brand maybe, and that is good.''

Vattenfall is committed to acting on a broader scale to improve energy efficiency. The company also offers real solutions for Climate Smarter Living (Vattenfall, 2022a). Since Vattenfall has a strong brand, people are interested to work with them. As Frid mentioned:

"Since we are a big player with a strong brand, it might also be of interest for technology owners or innovators to connect to us and try out things together."

Vattenfall is driving the transition to a sustainable energy system and is committed to living fossil-free within a generation (Vattenfall, 2022a). In addition, culture and ambitions for a fossil-free future partly contribute to the competitive ability of Vattenfall. Biström stated that:

> *''I also think that the culture, including a very honest ambition to enable fossil-free living, is also our purpose and target is maybe also a competitive advantage we have.''*

Moreover, Vattenfall is focused on proving things rather than just stating things and they create things today even though it can't be proven today stated by Biström. During the interview, Biström explained this by stating:

> *"You cannot always count and show a number on why we want to go and be the front runner in sustainability, for instance, we would say that we go first when it comes to recycling problems or whatever it is…but we know that it is. So that's why we connect it. We just program our brains to know that it will always be the right way to go, even if I cannot prove it today…We never promised anything without doing it. Before we say anything like that, we are really sure we can make it, even though we don't know exactly how, but we will make it."*

4.1.3 The Companies Overall

Overall, E.ON and Vattenfall are two companies that have built strong brands and cultures in the EU market based on their different historical trajectories and cultures. Both companies are making efforts to transition to more sustainable energy sources, i.e. a fossil-free future.

4.2 Competencies

This section provides a brief overview of the existing infrastructure and competencies of both E.ON and Vattenfall based on the interview findings.

4.2.1 Competencies at E.ON

E.ON has leading industry knowledge and expertise when it comes to infrastructure. The company's main existing infrastructures are the power grid, district heating, district cooling, and on-site generation. E.ON attempts to make these facilities as energy efficient as possible by exploiting system linkages while attempting to transition the sources of the energy used in their systems in a step towards energy transition overall. Berne stated that:

> *"It's also infrastructure such as district heating, onsite generation, power grid, district cooling. It can also shake up the hecto grid solution to the first one deployed in Lund in the world … That is something we see as a real competitive advantage having*

alternatives to provide. Also looking at the energy transition from our European perspective with a new infrastructure solution that provides a sustainable supply of energy and a way to recycle energy in different ways."

In addition, he stated that electric vehicles, charging infrastructure, and the e-mobility business, which are now key competencies of E.ON, are also important in the energy transition. Therefore, According to Berne:

"That's a huge portfolio of different parts of that e-mobility business. Of course, charging infrastructure, and also our competence base."

Ensuring more efficient use of resources is the mission of E.ON so that the company can create the infrastructure for waste management. As Azra Sapcanin stated in the interview:

"Our first and foremost goal is to be more efficient when it comes to using energy and then we have a great product that really uses low value energy and then makes it possible for us to heat up houses and the cities. So we can create an energy infrastructure for that with low energy and waste."

For E.ON, achieving the energy transition requires the flexible use of its internal competencies, such as bringing together different experts and content owners through many different approaches, as can be supported by Berne's statement:

"I think what is very critical for E.ON moving forward is, of course, the competence we have within the company and also how we utilize that competence in as good a way as possible … We have many different approaches looking at different parts and how we do on our energy infrastructure solution. We have one example which we call the Academies, the pool of different experts and content owners which could be activated in different projects on an international basis."

Moreover, according to interviewees 5 and 6 from E.ON, building and maintaining grids efficiently is also their knowledge and competencies. The company has installation capabilities and knowledge on how the entire system works. According to the statement from interviewee 6:

"...We all have our competencies. The core competency is building and maintaining grids efficiently. So we have it from a system perspective, not only by installing a cable here and there and just leaving it as it is, we have a knowledge of how the entire system goes together."

The company also has some hard assets as interviewee 5 stated in the interview:

"There is a lot of knowledge about hard assets. The asset base and the systems that we use to operate the grid, but also the knowledge and the competence and management finance are a lot of our company revolves through everything around them…So we have to make big procurement deals."

4.2.2 Competencies at Vattenfall

In Vattenfall, the existing infrastructure is mainly based on production, grid, digital, and charging infrastructures. In 2020, Vattenfall becomes a member of the Alliance for Sustainable Digital Infrastructure to effectively integrate as part of the energy system of the future (Vattenfall, 2022d). From the interview, we learned that Vattenfall's current innovative ideas include infrastructure for electric vehicles. Referring to Biström:

"We started building the infrastructure for charging electrical cars because no one else did."

Vattenfall has experts in many areas, and also experience of being the frontrunner in the wind industry in Europe. Such expertise and experience are competencies of Vattenfall. According to Biström:

"We sit on all the competencies in terms of how to integrate the renewable farm into the system, how to write the long power purchase agreements with the industry to make them comfortable. So we have expertise in many different areas. That said, we have the distribution. We're sitting on that. So what we do here with the experience we have, we have been one of the frontrunners in developing the wind industry, for instance, in Europe."

4.2.3 Competencies Overall

Overall both E.ON and Vattenfall currently have some significant infrastructure and competencies. E.ON's infrastructure is mainly focused on the grid and district heating, while Vattenfall is mainly focused on energy production and digital infrastructures.

4.3 Main Processes and Practices

This theme will discuss how E.ON and Vattenfall's main processes and practices help them in their journey towards energy transition.

4.3.1 Main Processes and Practices at E.ON

According to all of the E.ON's representatives that were interviewed, skills, processes and routines have played a vital role in their energy transition. E.ON's top management is focusing more on

three areas such as decentralization, decarbonization, and digitalization as stated by all the E.ON's representatives. In 2015, E.ON took an important step where they chose to sell out all their nuclear assets. However, due to that decision, they were able to focus more on their decentralization strategy. Therefore, Sapcanin stated that:

> *"I'm kind of mature and in making bold decisions that are at an early stage. So it puts us in front of our competitors...E.ON to take up an important step this was in 2007 or something. E.ON sold all nuclear energy...do not operate nuclear power plants anymore. The main focus is the more decentralized solutions, more solutions that are based on the actual digital technology and more reasonable on climate positive technology"*

E.ON's CEO has three main areas on their renewable transition journey, and digitalization innovation is one of them where they provide resources as stated by Sapcanin. She further stated that they are converting fossil to biofuel when she explained:

> *"We do have renewable biomass and we have solar. Of course, we have a lot of fossils right now, but they are on the way of being convertible to biofuel.…we do have management that in a sense of the positive and innovation and the pushes the innovation, the front and making it possible… Leo Bamberger, our chief executive, has three focus areas and one of them is digitalization innovation. That's kind of where we are coming from. The top down, that this isn't the area that we focus on. They also give us the resources to do that"*

Also, looking at different alternatives for reinvestment can further strengthen the decentralization, decarbonization, and digitalization possible for E.ON as stated by Berne.

E.ON, being an energy distribution company and also a customer solution company, was able to provide an opportunity where each and everyone is able to participate differently in their energy business as stated by interviewee 5 and 6. Being in the industry for many years they have experience and knowledge which is stated by interviewee 5:

> *"Very many years, so there is much experience that we have both knowledge on how to build, maintain grids on how energy flows are to be valued, to what could contribute to our customers in order to save energy or install other sources."*

According to interviewee 6, when one subsidiary has poor performance opposed to another subsidiary which has strong performance, they will share the relevant financial resources.

> *"So we have diversification in our portfolio. If anything happens to customer solutions, if they have a bad year, energy networks could have a strong year, for example. So we can diversify in that sense. "*

Interviewee 6 also stated that E.ON has correctly understood the two-way link of the energy transition while also being able to predict the future in a different way: thus, they were able to drive their business from being solely a distribution network operator to a distribution system operator where he stated:

> *"We have our plans of producing a regional grid that takes the power to the cities. And then we have the locals taking it to the households because in the future there will be more prosumers where the people have solar cells on their roof and small maybe wind farms in the city or just outside the city. So as a whole we're going from a distribution network operator to a distribution system operator. It's a more complex system. It's not that one way link anymore. It's totally different and in different ways."*

Moreover, slight changes in their business model strengthened E.ON´s position and its growth as stated by interviewee 6:

> *"The whole group is in Europe. So we have to tweak and change the business models for every country because it's not the same everywhere. But basically, the basis is similar. A bit similar business model, but to change it a bit to fit in different countries, maybe that's the one thing that made us grow."*

E.ON is scaling up the best practices where the top management takes some hard decisions to shape the company's structure and the operation as stated by interviewee 6.

> *"We actively try to find best practices in lessons learned across departments across units. So it's part of how we work…That's definitely a big thing like top management like decisions and things. So those are like those skills, those hard decisions that shape the structure and operations."*

Furthermore, E.ON is a very process-driven company with structured and holistic day-to-day processes and they work in projects where the working environment is more agile which gives them the flexibility to roll out their solutions fast as stated by both Sapcanin and interviewee 6. E.ON also has a lot of research projects connected with housing associations and developers such as smart cities accelerator and clean up information (CLU-IN), as stated by Berne. Berne further stated that the processes are linked where possible, e.g., the usage of sectoral coupling, which enhances the energy efficiency of the processes and overall energy systems. According to Berne:

> *"We can work with sectoral coupling. So connecting different energy infrastructure, such as the heating sector, where we in Sweden have a very well established district heating grid where you have a connection because the district heating grid supplies hot water in pipes, which is heated through assets that could consume electricity or produce electricity. At the same time, it produces heat. So there is a clear linkage to the power*

system and can then be planned in order to really optimize between these different sectors."

E.ON has processes to measure performance. E.ON manages their waste through recycling processes and also considers the safety of the workers as stated by interviewee 6:

"We also look at our processes and try to work according to those procedures…try to measure the performance of our processes…change over time…we are privately owned and there is an expectation on us as a privately owned company to generate a profit and then that we have to supply. But what we have to do as management is also balance out those expectations to the market developments. So just driving for profit does not make us successful in the long run."

As per all the representatives, E.ON has a very broad national and international network which enhances the knowledge sharing of the company. Sapcanin explained her experience by stating that:

"The global stage, as a global company, there are a lot of opportunities for myself. I'm a part of social networks and I talk to my colleagues in Poland and Germany, Netherlands, France and Britain exchanging things. If they have a solution in France that is really good, then you can take it to Sweden."

Moreover, Berne explains that the company also builds the knowledge through their "Academy" which has different experts and content owners.

"We have one example which we call the Academy, the academies, the pool of different experts and content owners which could be activated in different projects on an international basis. And that is of course to be able to get the resources needed in order to deliver on profile projects or a complicated project."

Knowledge sharing within the company facilitates the opportunity to find the best practices and lessons learned across the departments as mentioned by interviewee 6. Moreover, while some company employees were given freedom to work independently and flexibly with partners and prosumers, there were some jobs that operate under strict processes and rules as stated by interviewee 6. He further stated about partners and collaborations:

"We have to cooperate with other partners such as Google. I don't know what their capabilities and analytics of all of these large data streams that are connected to all…our customers we collaborate in developing what is called H2 network that is built up in the European Union."

Berne also stated that:

> *"…drive those development topics and we need to be engaged with the research sector and that partnership with the Research Institute."*

E.ON also has processes related to recruitments, employee development, training and job rotations which were revealed based on all the interviewee statements. During their recruitment process they acquire different talents which are coming from different backgrounds and different age groups according to Sapcanin:

> *"But the key factor is, there is the gathered knowledge and gathering competence. That's how we do our teams. One of the goals that the union has is to have teams with different backgrounds, different ages, different looks. And it is because we believe in equality and inclusion."*

Both Sapcanin and Berne stressed that E.ON has diversified teams where they are capable of finding new solutions and enhancing innovation and productivity. They also do their recruitments through internal sources to acquire relevant competence and skills which would otherwise be acquired through the labor market directly where interviewee 6 stated that:

> *"And now I'm talking in general and there is education done. What is needed if you're an engineer, for instance? We are also like those who are working in our operation center, we have something that is called the School for Operation Technicians so there we may not have found the competence right away from problems on the market."*

E.ON has different industries, different building owners, and residential owners which enable the energy transition as stated by Berne. They also have a broader portfolio which provides different solutions for different levels where these processes are linking the company and the customers together and also energy communities when Berne stated that:

> *"We have a broad portfolio of different solutions on different levels and a quite broad knowledge base also linking energy efficiency metering and building coupled solutions such as the energy supply…we have energy communities, One in Italy and one in Spain."*

E.ON's employees have experience in building and maintaining their grids effectively when interviewee 5 stated that:

> *" So there is much experience that we have both knowledge on how to build, maintain grids on how energy flows are to be valued, to what could contribute to our customers in order to save energy or install other sources."*

E.ON facilitates minimizing the outages of their consumers through enhancing the service quality when interviewee 6 stated that:

> *"We have to be proud of what we basically do every day and we are proud of our role and the society. You see that every time there is a storm or there's outages, there is no question for our employees to really help out independently of where they are situated…customers are relying on us in relation to that. They use electricity in their systems and they need a quality in these electricity… Our customer solution guys are really good with the energy distribution when transforming that knowledge."*

E.ON processes towards digitalization have also enhanced integrating buildings and consumers in an efficient way to provide flexible services and these are linked through automated building and systems as stated by Berne. They link capacities together where Sapcanin stated that:

> *"We also have again activated those kinds of activities where the whole idea of activity is to ease the sharing and to connect different, different sized, different communities, different buildings, and that what we bring is the technology that enables us to share energy."*

E.ON links their local storage capacities to more flex providers using the local market which is called a "switch" according to Berne. Furthermore, in accordance with digitalization, Berne stated that:

> *"We have those sorts of solutions where we can integrate to building automated buildings, automation systems and through that interact and thus we could create flexibility saving both on the heating side and power side."*

Additionally, both interviewee 5 and 6 stated that they have used laser scanning which was also a first mover advantage to the company many years ago by stating that:

> *"I'm not quite sure how we compare to others here and if it's a really early move on all aspects. But we are moving very fast when it comes to digitization and digital tools that we use examples for us in energy distribution as we have many years ago already had like laser scanning of our long lines here in Sweden when there's a helicopter flying, scouting the airlines and all of the trees and looks for trees that have to be cut before they fall onto the lines, for instance, to prevent outages this is now done with drones."*

Moreover, with regard to linking company and prosumers in the energy transition, interviewee 6 from E.ON also stated that:

"...There is a large transformation ongoing. Once we build the entire structure from a production facility, we transport energy to a consumer. We are in a significant change where there's new sources coming in, renewable sources with much fluctuation in their production, but also that these parts can be popping up within our electricity grid on different spots, different sites."

They have a separate team to manage the waste management process and material recycling process and they are taking proactive measures to handle waste by coordinating with waste management companies where Berne stated that:

"That is something we tap into and use the waste energy that is generated from the management and handling of the waste which is incineration. If we come further down on the waste hierarchy, I mean we team up with the waste companies also and really try to drive proactive material recycling."

4.3.2 Main Processes and Practices at Vattenfall

By being a state-owned company for well over a century, Vattenfall's operational landscape has shifted based on their management focus towards fossil-free living. Biström further elaborated that Vattenfall has experience and resources which comes from being connected to the industry throughout its history. Biström further stated that:

"...I think Vattenfall is the first mover in many areas. We have a clear target to enable fossil-free living within one generation. So I would say that…Vattenfall is a fully integrated company with a very, very long experience in the energy industry…we sit on a lot of resources."

Vattenfall is engaging with new things on a daily basis. They need to build partnerships for producing more electricity since they can find innovative solutions together and do different things as stated by Biström. Vattenfall is collaborating with strategic alliances, industry partners and investors and also gaining the first mover advantage due to its vision towards fossil free future. For instance Biström stated that:

"...As I said when we work here, for instance, I think that this will be a very common way in the future that we connect, specifically strategic alliances heavy with the industrial partners. It can be with the investors."

She further stated that:

" I would say the whole industry, how to connect and work together, some of our competitors need strategic partners to balance risks…A lot of capital is needed and to get

that capital in, we connect with the industry. We make the industry invest in our farms and we need to integrate it into the system. because we are more or less doing new things every day…I think the first mover in many areas. We are having the clear target to enable fossil-free living within one generation."

Moreover, Frid also added more insights stating that:

"Our partnerships are very important in order to build our argument about developing and producing even more electricity because we can find the solutions together and apply electricity as the energy source instead of coal."

Furthermore, collaborations also helped to achieve great efforts at Vattenfall where evidenced when interviewee 8 stated that:

"In the UK we had put up the largest offshore wind turbine in the world at that time. And that was kind of a collaboration that we had done with the wind developer."

Moreover, Frid additionally stated that:

"We are highly involved in technical development together with the manufacturers of technology and we have close collaboration with the bigger and wind turbine manufacturers in order to develop together."

Biström stated that due to having expertise in different areas, Vattenfall integrates a lot of resources together and manages their projects in a fast and efficient way. She further explained about their buying and selling nature of their wind and solar farms which helps them to accelerate their projects faster and create value. She further elaborated by stating:

"…we do that in a quite swift way and we can see when it comes to creating value…But usually we build the farm and then we can sell our even more money…We usually build them and sell them because others can take care of them."

Vattenfall's clear leadership ambitions also build future leaders since they test their leaders before they become leaders as stated by Biström during the discussion. Furthermore, they are also connecting their employees for the firm's common target through the steering processes as stated by interviewee 8.

"And I think our steering processes, business scorecards and KPIs reflect our long-term strategic ambitions and targets. So we essentially know that we're steering adequately on these, that the future that our businesses are being held accountable of course, in the supply chain, there are impacts on the supply chain as well."

Interviewee 8 also stated that Vattenfall's CEO has always emphasized the importance of being at the forefront of transition where he stated that:

> *"If you listen to our CEO speak, she'll say that, you know, being at the forefront of the transition and being among the most sustainable is a competitive advantage."*

Interviewee 8 further stressed that their projects ensure that all the relevant elements are covered and thus looking at a more holistic view than only looking at it through the financial perspective. Thus, a project considers both financial and non-financial KPIs. He also, explained how tollgate process enhances the robust decision making in their projects by stating:

> *"...I think the way our project goes through their sort of their process is called a toll gate process..that is a part of it being a process that helps us facilitate the best decisions, the best investments and we have essentially ongoing strategic reviews of our entire portfolio. We look at sort of, you know, investment impact versus investment cost through the portfolio evaluation process."*

He further explained that:

> *"But it ensures that all elements of a project and the whole portfolio are considered when making decisions so that you're not just looking at a project in isolation and you're not just looking at that project's financial indicators. ROI or IRR, that PV or whatever it happens to be, but you're looking at a whole suite of both financial and non-financial KPIs, and you're also looking at it in the broader context of the whole portfolio."*

Vattenfall understands the requirements of their consumers such as consumption patterns and their decarbonizing plans according to interviewee 8. This helps them to deliver more value for their consumers where Vattenfall was able to produce fossil-free steel as stated by interviewee 8.

> *"…understanding our consumers and their consumption patterns, their decarbonization plans, you know, that's how we were able to create this…partnership to produce fossil-free steel right if we didn't have that knowledge of those customers and their plans and their desires and the idea that the drive that they have to decarbonize, we wouldn't have been invited to the to the table."*

For instance, if a customer needs to have a solar farm Vattenfall will provide them a free ticket for a long period of time through their contracting process which uses the knowledge of their expertise as stated by Biström:

> *"So that if a customer says I want to sell electricity from a solar farm, we have free tickets that are usually like 50 years. So then you just make the contract. Then we have*

expertise in our market. So they know how to be included in that kind of contract. So the customer gets a contract for 15 years."

Also, processes related to automation, machine learning, and artificial intelligence (AI) play a critical role in the transition by making the grid more efficient and providing support for agreements as stated by interviewee 8. He also stressed that technologies such as blockchain are still at the pilot level and not implemented into their processes. Moreover, peer-to-peer technologies are used when helping customers to set up solar panels in the roof tops in the Netherlands and this provides Vattenfall to connect the consumer's RE production into the smart grids as stated by interviewee 8.

"I mean we've got a product in the Netherlands which is sort of exactly that concept where you can essentially access a sort of neighborhood electricity. So you help people put solar panels on their roofs and that it's kind of almost a peer-to-peer marketplace for people who have their own production of renewable electricity and locals who want to have that."

Vattenfall looks at the lessons learned from different processes and they are collaborating with their peers through cross-border knowledge sharing while breaking organization silos and conducting more knowledge sharing sessions as stated by Frid.

"I focused on lessons learned from different processes…I would say that we built up a lot of support functions that I have the core knowledge about. So we work across borders and cross markets and so it's not like we're trying our best not to work in silos and yeah, I mean, that is just like the organizational setup is built on trying to share lessons learned."

The R&D process also plays an important role when transferring technological know-how between departments as mentioned by Frid. By being an incumbent of the industry they can use their R&D capacities which will further attract partners to explore these technologies together. Frid stated that:

"I think that our early mover advantage is that we can have quite a strong effect since we are a big factor. We can also have the flexibility of trying certain things in research projects, but we have a much bigger R&D organization than other smaller actors. So we can try out certain technologies, engage and resources for that, definitely…I mean, our partnerships are very important in order to build our argument about developing and producing even more electricity because we can find the solutions together. "

Their intellectual property (IP) tools and innovation processes also help the sustainable energy transition at Vattenfall, as stated by Frid,

> *"We have all the different IP tools and systems that are opposing quite a very rapid change from time to time. So that is very good. Also innovation like seeing things, finding opportunities, and that can put us in a stronger position as a developer. That's also very important."*

Vattenfall's processes are aligned to ensure that their processes will minimize or zero the environmental impact as stated by both Biström and interviewee 8. For instance before constructing wind farms, building distribution systems and transmission they analyze the impact. For instance, Vattenfall uses AI technology to analyze the fish movements when building up hydropower stations and ensure the safety of the marine ecosystem where interviewee 8 stated that:

> *"...In our hydropower dams or hydropower stations, using artificial intelligence to recognize fish and understand fish movements and all of this so that we can actually essentially limit or completely eliminate the number of fish that's going through the turbines and can steer them around that."*

Also, for instance, when building wind farms they always consider the impact of the surrounding landscape which removes the negative environmental impact as stated by Biström:

> *"For example, does it have an impact on the surrounding landscape? Are there chemicals or other things?"*

Vattenfall develops employee capabilities through giving them the opportunity to analyze their new ideas towards sustainability as stated by Biström:

> *"because someone comes up with their idea that we say, analyze it. I want because I want to see the costs, even if we cannot prove profitability I just if the cost just seemed to me it would."*

The company is relying on their loyal staff members and thus gives opportunities for the employees to develop their skills within the company and also provides the opportunity to opt out from the company and come back with new ideas as stated by Frid. Vattenfall also uses their expert knowledge and best practices among cross-functional team collaborations and provides training through internal leadership programs and health and safety programs. Frid explained this by stating:

"*I feel I get all the opportunities I need for training and we have a very high focus on health and safety…always ensures that we get the training. Some external actors would definitely say that we have a very high focus on health and safety…there are leadership programs internally."*

He further stated that:

"...I think we're also investing in different training academies. We are very engaged in our work fairs and networking with students…Our former CEO always said that it's good that you work for Vattenfall, but it's also good that you leave and then you can come back with some other perspectives… of course, a very open mind about welcoming back former colleagues…there is a culture in Vattenfall that is that people feel very satisfied with."

Vattenfall has an efficient waste management and recycling system which is a focus area of the supply chain management where Frid stated that:

"We're engaging a lot with different recycling actors in this and tried it out in the pilot project as well in the Netherlands where we use different types of recycling technologies and so at large the and there is a focus on waste and circularity and also in our procurement work where we are targeting on trying to find products that are easier to recycle and so on."

4.3.3 Main processes and practices overall

Both E.ON and Vattenfall have well-defined processes and routines in their business with some similarities and also differences.

4.4 Environmental Policy

Policy related to RE transition helps companies to stick into the rules which will drive the RE transition on the correct path. This shows a transparent and responsible management path for the companies and in most cases EU's energy compliances are driven by the EU directive and Paris agreement discussed in Section 1.1.3.

4.4.1 Environmental Policy at E.ON

E.ON's environmental performance declarations provide solutions that enable customers to take an active role by deciding on which assets they are investing in their buildings and how they could support them in optimizing that investment as stated by Berne. According to him, E.ON has three main targets which govern their business such as clean 2025 which commits only to distribute a

mix of renewable and recycled energy. Secondly, net zero targets are included in E.ON's scope 1 and 2 emissions until 2030 and scope 3 net zero emissions in 2035. Berne further stated that there are a lot of changes happening on the policy side related to energy communities.

> *"There's a lot of things on the policy side that are changing on different levels. One is, for example, the EU directive linking to energy communities, which is something that isn't deployed in Sweden yet, but a clear regulation on how we could come together from a local perspective to create these resource efficient energy solutions."*

However, Berne further stressed that even though there are a lot of changes happening at the policy level, some challenges arise since some aspects are not yet deployed under the EU directive. For instance, he stated that it is not clear whether the companies need to set up either RE communities or local energy communities according to the EU directive. According to the EU taxonomy, it is required to report on sustainability parameters as explained by Berne:

> *"The EU taxonomy is an EU requirement on reporting on sustainability parameters … we need to report on all these sustainability parameters and we need to do that reporting on an EU level."*

Furthermore, Sapcanin from E.ON further stated that RE permit processing time should be shorter and faster in order to accelerate the RE transition.

> *"If you take some of a permit term it could take several years to tell you to get and you want to make changes today so that the regulatory limit I-pass needs to be more clear and more and more fast and also to give initiatives to the industry to move even faster to commit as we do today."*

Also, from the legislative perspective, the company should reduce the waste and find ways of minimizing the financials. The interviewee 5 from E.ON further stated that:

> *"We are not allowed to, for instance, use batteries or production ourselves in our grid areas, it would be possible to reduce, for instance, to change how we build our grid maybe with less money, less stable, so to say, if you have some supportive energy in the system at different places that plays out, we are not allowed to do so."*

4.4.2 Environmental Policy at Vattenfall

It is important to comply with the Paris agreement, and therefore Vattenfall has signed up on the climate disclosure protocol (CDP) where the action plan is to reduce the emissions below 1.5 degrees which lead them to net zero emissions by 2030, as stated by Frid. He also explained that Vattenfall has also complied with their governance structure in accordance with the EU directives.

For instance, waste is associated with a lot of regulations and legislation and a lot of bureaucracy is involved with recycling or disposing of hazardous waste. Frid continued by stating that:

> *"When something is categorized as waste, it comes with a lot of legislation and especially if it's a hazardous waste so if you want to recycle the hazardous waste, there is a lot of bureaucracy in that…if we want to have a circular economy must be smoother to work with recycling and also permitting."*

Permitting processes are a very challenging area in the transition process since it takes a lot of time for obtaining approvals from the national level as stated by Frid. He further stated that:

> *"There is ongoing work trying to reduce the time for permitting. Now talking about the Swedish perspective. And that is, of course, a challenge, it takes more than ten years to get a permit."*

According to the Vattenfall's environmental policy, they are facing a challenge when disposing of the end of life wind turbines since Vattenfall has banned contaminating the blades to landfills as stated by Frid:

> *"So there is a lot of ongoing work within the business on this because when you say sustainable or renewable energy, it's these it's the wind turbine you normally put as an icon. So that comes with so many responsibilities I would say. But definitely one of our main focuses is going on. There is also some legislation on the EU level towards a more circular economy and so on."*

Biström further stressed that:

> *"So even though a turbine can be recycled up to 90%, there was still the issue with the composite materials and so on. But now we have announced a strategy on that. So by today, there is a ban on putting anything from the blades in landfills and by 2050 we have 20, 25, we have a 50% recycling target in 2013, and for what you have towards 100%."*

Moreover, the company's compliance is in accordance with the national laws in different countries they operate as stated by interviewee 8:

> *"...So customers in the Netherlands have been focused on child labor because the Dutch have a child labor law. Customers in the UK are focused on modern slavery because of the UK Modern Slavery Act. "*

4.4.3 Environmental Policy Overall

Overall, both E.ON and Vattenfall have challenges with the RE permitting process due to its time frame. Both companies are working towards the EU directives and Paris agreement and thus aligning the companies' overall environmental policy in accordance with the EU directives and other national policies.

4.5 Company Strategy

Representatives from E.ON and Vattenfall have explained the importance of their firm strategies when it came to realizing energy transition.

4.5.1 E.ON: Decentralization, Decarbonization, and Digitalization

In 2015, E.ON took an important step where they chose to sell out all their nuclear assets which happened very early. Due to that decision, they were able to focus and narrow down their business portfolio as a part of their corporate strategy. Sapcanin stated that:

> *"I'm kind of mature and in making bold decisions that are at an early stage. So it puts us in front of our competitors...E.ON to take up an important step. This was in 2015. E.ON sold all nuclear energy...do not operate nuclear power plants anymore. The main focus is there is the more decentralized solutions, more solutions that are based on the actual digital technology and more reasonable on climate positive technology"*

E.ON thinks from a system perspective when it comes to their offerings as a firm. Berne explained this by stating:

> *"And in that perspective, we think it's important to emphasize that not only including one energy vector, but rather looking on a system perspective and looking on how could we be an enabler for resource efficient flows within our cities and within our regions that we're active and linking those different resource flows together, such as how can we utilize energy that is already available in our cities, for example, and use that once more, which is all over the place."*

Linkages in the energy system are a critical consideration when it comes to infrastructure development. Additionally, collaborations between local and national governments are essential to facilitating energy transition investments into different business areas. From a corporate level, there have been major changes in the company's core business focus areas. Aging assets and reinvestment opportunities have allowed the company to realign their focus areas to develop deeper competences in their company. According to Berne:

"For example, looking at our district heating grid, we have quite many aging assets, so [sic] we're looking into many different alternatives for reinvestment, and that's also part of the decarbonization strategy to really drive [sic] while looking on all of these focus areas: decentralization, decarbonization, and digitalization."

As an example of decentralization, the flexible services that E.ON offers for electricity and heating systems are an important part of what drives many of E.ONs business areas. The ownership and development of certain assets including the distribution networks and automated flexible decentralized energy systems and solutions seem to be the strategic focuses that E.ON has chosen to prioritize. E.ON has decoupled entirely from their nuclear operations and a portion of their fossil fuel operations when the company split beginning in 2015. As a result, the company Uniper was created, and is currently owned mostly by the Finnish company, Fortum. Today E.ON has a neutral view towards nuclear power when it comes to being a viable energy source in the energy transition, although the company has no nuclear assets or plans to obtain such. As Berne stated:

"So we are really focusing on distribution … for the energy transition, but also on more decentralized distribution and the assets. So it's much clearer for us now where our business focus lies."

Energy transition at E.ON has a specific focus on renewables when it comes to low carbon energy transition. The company has set several targets progressively throughout this decade that comply with and go beyond meeting the Paris agreement goals. As stated before, decentralization, decarbonization, and digitalization are the drivers of E.ON's corporate strategy and enablers of E.ON's energy transition. In order to be carbon negative, the company is investigating decarbonization projects in addition to their core business areas, but there is nothing publicly operational as far as carbon sinks nor carbon market trading goes at this moment in time.

Digitization is a key enabler of energy transition, and according to interviewee 5 and interviewee 6, the technological knowledge and intellectual property assets of the company are a major factor of their success and how they steer their company overall. Sapcanin also explained that the strategy pillars are created on the top leadership level and are communicated with a top-bottom approach, and there are mechanisms to help implementation, in addition to facilitating suggestions between the corporate and business function areas.

According to Berne, investing in "future-proof" projects is ensured with evaluations of projects on timelines that usually range from 10 to 25 years, depending on the investment. At the same time, it is also important for E.ON to continuously develop technologies and methods to increase energy efficiency and energy transition from fossil fuels to renewable energy sources. According to Azra:

"Our main focus is, of course, to be sustainable and it is also to use digital technology in order to, as I said before, use our resources and use our energy in a more efficient way."

Furthermore, Berne stated that:

"We have quite an extensive business development agenda linking to that also, but looking at decarbonization, one part is of course to really explore and try new solutions. And I think we do that on the asset base such as real exploring the potential in deep geothermal energy… but this is very, very immature technology and we want to be there and drive those development topics…"

Berne continued with elaborating the usefulness of collaborations and partnerships of future business developments to hone in on the strengths of E.ON to compete with a specialized, differentiated market niche.

" … we need to be engaged with the research sector and that partnership with research institutions, but also looking at future policy perspectives and so forth that could adjust or be affected. What I also want to say is that it's also about things in the building and that environment and what we offer our customers tomorrow."

4.5.2 Vattenfall: From a Swedish Energy Producer to Fossil-free Future Enabler

As with the E.ON interviewees, there was consensus amongst all Vattenfall interviewees about their strategy on the corporate level that transitioning to low carbon energy is of utmost importance in the firm. According to Biström:

"Yes, I think the most important is, of course, [sic] that we have with this strategy or target is [sic] to enable fossil free living within one generation. It is our business strategy. We are convinced this is the right way to go for a successful business."

Interviewee 8 further stated that:

"We're getting consumers onto the other renewables, enabling them to do their part. And the fossil assets that we have, we have a plan to [sic] decarbonize. So I mean, our corporate strategy philosophy is fundamentally based on being a leader in the transition."

Additionally, Nore emphasized that the focus on quality is prevalent in their current and future energy mix. Vattenfall's energy mix includes hydro, nuclear, district heating, offshore and onshore wind power, in addition to their nuclear production. Vattenfall currently has two nuclear reactors, but they are not investing more into increasing their nuclear capacity at this point in time. The

influence of politics affects the overarching strategy of Vattenfall, but the firm's environmental responsibility ambitions have led to proactive investments in the firm which keeps them relatively future-proof amidst potential increases in regulation in this area, according to Frid:

> *"It is accepted to bring on additional costs in different phases. They're focusing on certain environmental sustainability issues in order to reduce the impact … beyond legislation."*

Vattenfall has been in the industry since 1909, and their success throughout the century can be attributed to their collaborations and accumulated resources and competences throughout the decades. The company was started with Sweden's need to produce electricity, and they were historically dependent on state funding for providing their services. Nowadays, the state investments have seemingly paid off as Vattenfall is operating independently from the state subsidies and support for the most part. They have expanded in Europe and have many collaborations on a multinational level. According to Biström, they leverage their resources to amass the capital from industry players through their energy system projects and competences in system integration to incorporate renewables into the energy mix.

In the wind and solar segments of Vattenfall, they sometimes use a business strategy of building and selling infrastructure projects. In this way, they utilize their technical competences of constructing solar or wind farms and can detail the operational aspect to the client organization who purchases the energy farms. Usually, this is more typical of solar farms because those farms are more simple to operate and maintain relative to larger, more complex wind farms. As Biström stated:

> *"So we build and sell. And when we do that, we can put that money into the next farm much faster. So that's really our strategy for wind and solar, but also for onshore solar. We do that sometimes that we build the farm, we sell it, we release the capital, and we build the next project faster."*

Value creation is a core to any business strategy, and the added value of planning projects and building projects is something that puts Vattenfall in a unique position. In addition to their solar and wind segments, they have been extremely innovative with, for example, the creation of the world's first fossil-free steel. According to interviewee 8, they have formed many partnerships that aim to produce innovative developments that position Vattenfall and their partners to mutually benefit from one another.

According to Biström, Vattenfall also encourages employees to ideate and put forth suggestions. She elaborated that Vattenfall supports ideas and proposals that employees bring to the table, given that they prove it is viable through costing and analysis of relevant elements. Sourcing innovation

from employees is one way that Vattenfall aims to improve their business areas. Another way they do so, according to interviewee 8, is through knowledge sharing processes, such as the usage of excellence centers that have specialized experts and operational worker participation to establish best-practices within and between business areas and departments. Interviewee 8 put it simply as, "… the centers of excellence are designed such that the experts can share the theory, the best practice and then the … other contributors can share what they're doing, how it works, what challenges they face," which in turn, "...creates a virtuous cycle of being able to do more and quicker because we share learnings throughout the various businesses…".

4.5.3 Company Strategy Overall

E.ON and Vattenfall are both focused on moving towards carbon-neutrality as a part of multilateral treaties pushing for climate action. The energy transition at each company is driven forward by each company's strategy. The companies have unique competencies and resources, and both companies use these resources in a strategic way to position themselves in the market using more of a differentiation strategy versus a solely cost reduction strategy. Both companies focus on a long-term sustainability perspective, and although they have different ways of accomplishing the energy transition, they share the same overarching goal.

4.6 Chapter Summary

Table 4 provides the overall insights of both E.ON and Vattenfall.

Table 4: Summary of E.ON and Vattenfall empirical data

E.ON	Vattenfall
The company	
History -A private owned German company -Many years in the industry, a lot of knowledge and experience	**History** -A 100% stated owned Swedish company -A history of close collaboration with the industry
Brand - An important game changer in the energy transition	**Brand** - A big player with a strong brand - Attract technology owners or innovators to connect with and try out things together
Competencies	
Infrastructure -Infrastructure, such as district heating, on-site power generation, power grids, district cooling	**Infrastructure** -Extensive energy production infrastructure such as wind, solar, hydro power, etc.
Main processes and practices	
CEO's focus area focus areas such as decentralization, decarbonization, and digitalization	**Forefront of transition** - Being at the forefront of the transition and being among the most sustainable is a competitive advantage -Never promised anything without doing it.
Digitalization innovation -solutions which integrate to building automated buildings, automation systems -One main focus area is digitalization innovation.	**Technology and R&D** -Highly involved in technical development together through close collaboration. -Peer-to-peer marketplace -Different IP tools and systems -Using artificial intelligence to recognize fish and understand fish movements. - Bigger R&D organization and can try out certain technologies
Diversification on portfolio -We have diversification in our portfolio.	**Working close with the industry** -Working really close with the industry
Business models -Change the business models for every country	**Targets and creating value** -First mover in many areas. -Clear target to enable fossil-free living within one generation. -Build solar and wind farms and sell them to create value.
Lessons learned -Find best practices in lessons learned across departments and across Units.	**Lessons learned** -Work across borders and cross markets and try to share lessons learned.

Working according to procedures -Look at processes and try to work according to those procedures.	**Analyzing ideas** -Analyze ideas to see the costs.
Measuring performance -Measure the performance of our processes.	**Steering, tollgate, and portfolio evaluation process** -Steering processes. (Business scorecards and KPIs) -Looking at a whole suite of both financial and non-financial KPIs. -Projects go through a sort of process called a toll gate process to facilitate the best decisions. -Analyzing investment impact versus investment cost via portfolio evaluation process.
Strict and flexible rules -Give the freedom to make decisions.	**Consumer-centered idea generation process** -Understanding the consumers and their consumption patterns, and their decarbonization plans.
Teams -The union has to have teams with different backgrounds, different ages, and different looks for equality and inclusion.	**Training academies** -Investing in different training academies and networking with students.
Exchanging things -Social networks to exchange things.	**Work across borders** -Built up a lot of support functions that have the core knowledge about. work across borders and cross markets
Academy and operation center -Academy (the pool of different experts and content owners). -School for Operation Technicians.	**checking leaders and training** -Checking the leaders before they become leaders - Get all the opportunities for training. -Very high focus on health and safety.
	National -Focused on various national acts like child labor act in Netherlands and modern slavery act in the UK.
Company strategy	
Business strategy -Decentralization, decarbonization, and digitalization	**Business strategy** -Enable fossil-free living within one generation

5. Analysis and Discussion

5.1 Analysis of Themes in Relation to Theoretical Framework

The theoretical framework from Section 2.9 is used as a basis for analysis of the observed data from Chapter 4. The data collected from E.ON and Vattenfall are analyzed with reference to the theoretical framework. This will help to determine the extent that the theoretical framework is applicable to the case and the extent that resources are used to leverage energy transition at E.ON and Vattenfall overall, as well as on a more general level given the multi-case research approach. In addition to analyzing each case against the theoretical framework, the analysis evaluates the theoretical applicability on a holistic level.

The energy transition is an example of a drastic change within the market that has implications for all stakeholders involved. The analysis of the multiple case data is organized as follows in compliance with the theoretical framework for analyzing the competitiveness and transition using: 1) RBV theory (see Section 2.1) and 2) dynamic capabilities and leveraging theories (see Section 2.2). Since the RBV has been critiqued for having limitations when it comes to explaining how firms can use resources to create CA and SCA in rapidly changing and dynamic environments (e.g., the energy transition), the theories of dynamic capabilities and leveraging were incorporated to provide additional insights.

5.2 Analysis and Discussion of E.ON and Vattenfall

5.2.1 RBV: Resources that Enable E.ON and Vattenfall to Compete in a Transitioning Market Today

Firms need VRIN resources that are heterogeneous and immobile for firms to be competitive in the market.

The RBV is useful when it comes to the identification of strategic resources, but it is not the most explanatory tool when it comes to explaining a firm's overall strategy (Combs et al. 2011). This is partly because the RBV is an internally focused theory of the firm that does not consider external factors to the same extent. The lack of external considerations is brought up by Kristoffersen et al. (2021), Eisenhardt and Martin (2000), and Sirmon et al. (2010). Nonetheless, the VRIN assets of both E.ON and Vattenfall have strategic value and are incorporated into their corporate and business strategies, so it is still worth discussing with those critiques in mind.

History, Culture, and Brand as VRIN resources

According to Barney (1991), a company is able to develop value creation strategies that cannot be replicated by its competitors based on its unique history. He also stated that the company's corporate culture and brand reputation can play an important role in the inimitability of resources in order to make the company competitive in the market. Furthermore, Gamero, Azorin, and Cortes (2009) also emphasize that superior firms' resources (e.g., reputation for environmentally friendly practices) are essential for obtaining SCA and increasing market value. Singh et al. (2014) further stated that green reputation capabilities will enhance a company's credibility which enable to gain a sustainable reputation in society. Looking at the history and culture, E.ON, a privately owned German company founded in 2000, has been in the energy market for many years. In addition, the brand, one of its intangible assets in the field of sustainable energy, is also an important resource for the company. E.ON's strong brand and green reputation enhance their perceived value and increase credibility and trust.

On the other hand, Vattenfall has been working within the energy sector since its foundation in 1909. Compared to E.ON, Vattenfall has been in the energy market, especially in Europe, for a longer period of time, as the company has been in the European market since 1991, achieving the transformation from a Swedish energy producer to a European energy producer and service provider. In terms of its culture and brand, Vattenfall places unique importance on proving their goals and ambitions through action instead of simply stating things. Their history and strong brand recognition give Vattenfall the credibility and trust that is necessary to compete with its rivals.

Firm-Specific Resources: Infrastructure

The existing infrastructure is one of the key tangible assets for both E.ON and Vattenfall's RE transition. The main physical assets within infrastructure at E.ON are their systems for waste management, power grids, district heating, charging infrastructure, etc. However, it is not enough to achieve carbon neutrality by solely expanding the grid and other infrastructures; new infrastructure needs to be created by using a system- and long-term approach that works together with existing infrastructure and factors in the need for maintenance and enhancement throughout its life cycle. Jankiewicz and Gradzik (2017) stated that the current electricity infrastructure in most EU countries is obsolete and cannot adapt to meet RE needs. Therefore, to be able to continue to increase CA in the future, both E.ON and Vattenfall need to consider the adaptability of their infrastructures, and both companies do actively incorporate full life-cycle thinking into their current infrastructure projects according to interviewees from both companies.

Looking at the energy transition from an EU perspective, E.ON and Vattenfall are able to use their existing competencies to offer new infrastructure solutions that recover energy in different ways

to maintain their competitiveness. In contrast to E.ON, Vattenfall has extensive energy production infrastructure.

Firm-Specific Resources: Technical and Environmental Knowledge, Competencies, and Knowledge Sharing

According to Danneels (2002), the technological competencies of a firm can increase competitiveness in the market through development and innovation. Cosmin (2014) also stated that RE transition can be done successfully through enhancing the technological pillar (e.g., innovation) which leads to enhancement of the value creation. Unsurprisingly, both E.ON and Vattenfall place a high value on technological resources.

Diestelmeier (2019) stated that technologies can enable energy firms to create greater cost efficiency and differentiation through innovation and technological capabilities. For instance, E.ON has used technological development such as laser scanning and drones to navigate the helicopter flying, and scouting in order to cut the trees which otherwise will fall into the electricity lines. In addition, this can be seen through E.ON's ability to attract more flex providers using the local market known as "switch" due to their unique digitalization and decentralized competencies. Technologies also enable waste management through efficient recycling processes, while they also partner with waste management companies to efficiently manage their waste.

Vattenfall uses AI technology to improve the process efficiency and reduce negative environmental impact when building their wind farms, P2P technology when helping customers to set up their solar panels, and they are also in the pilot phase of deploying blockchain technologies. They are also a member of the Alliance for Sustainable Digital Infrastructure. Vattenfall also manages their waste and recycling using efficient technologies and partnerships. For instance, they stated that they use waste management technologies in the Netherlands for the process efficiency of waste.

Singh et al. (2014) further stated that firms can build environmentally friendly capabilities when they can acquire human talent who have specialized knowledge on sustainability. Innovation and technological capabilities are also acquired through E.ON's "Academies". Utilizing internal organizational capital resources helps E.ON and Vattenfall to connect knowledge across the company on a global scale and facilitates its transition to renewable energy. Vattenfall has a similar knowledge-sharing practice through what they termed, "excellence centers," where experts and stakeholders in specific areas collaborate towards best practices and lessons learned. Vattenfall's cross-border collaborations facilitate knowledge sharing while breaking organizational silos.

Management's Strategic Goals and Business Models as a VRIN resource: Capitalizing on Differences to Stand Out Amongst Competitors

With consideration of strategy under the RBV perspective, it is worth pointing out again that business models can be considered a firm-specific resource (Verbeke, Coeurderoy, & Matt, 2018). Under this perspective, the business strategy element can especially be considered when it comes to the business models of both E.ON and Vattenfall's unique business areas. The business models can be considered as VRIN resources, which in turn could provide CA or SCA. Vattenfall and E.ON interviewees say that their respective company has CA in the market, and this can be evidenced by the ability of both companies to win tenders by sourcing and offering energy that is relatively more sustainable on the market or by the creation of customized offerings to meet specific customer needs. E.ON and Vattenfall employees have underlined that differentiation is a key driver for their firm's strategy, but they also maintained that cost efficiency is always an important consideration. In grid business areas, both E.ON and Vattenfall are subjected to heavy legal regulations that make differentiation strategies more challenging, albeit not impossible.

As a part of their differentiation strategies, E.ON and Vattenfall have specialized their corporate strategy to align their business strategy and models towards their overarching goals of energy transition; for example, E.ON has decoupled from their nuclear operations when the company began its spit in 2015 and focused on renewable energy production (primarily solar and biomass) and flexible grid and decentralized energy solutions instead, while Vattenfall has focused on a wide range of energy production (primarily nuclear, solar, wind, hydro) and renewable energy production assets (competencies with the creation and selling of wind and solar farms).

Prosumers and energy communities are a prevalent part of change in the energy transition (Miglani et al. 2020) and EU directives (Diestelmeier, 2019), and as such, both E.ON and Vattenfall seek to stay on top of regulatory demands while also being efficient in incorporating these demands into their business models as well.

E.ON's representatives have stated that since prosumers are providing electricity to the energy grid, RE production is not a one-way link anymore. E.ON's broader energy portfolio links individual consumers, building owners, industries, municipalities, etc., into the energy grid. They have an expert customer support segment that shares information and offerings about grids and energy solutions to their customer base that they can further customize depending on their client. Furthermore, even though energy communities are still an emerging concept, E.ON has energy community business models operating in both Italy and Spain. Their digitalization strategy also combines customers and building owners by connecting different sizes, different communities and different buildings to the grid to share energy.

While Vattenfall also works on various levels and can provide prosumers options to be connected to the grid like E.ON, they are mostly concerned with larger scale energy production and integration. Vattenfall has identified the consumption patterns of their consumers by working with them together through a more consumer-centered approach and that is how they come up with fossil-free steel production. If a consumer is interested in making a solar farm, Vattenfall will provide them a free ticket through their contracting process for a longer period which is also an example of how Vattenfall drives their consumer-centered approach.

The business models within these business areas, along with the corporate model that determines which businesses the firm engages in, i.e. which business models, can be viewed as VRIN resources for both E.ON and Vattenfall under the RBV. The especially important resources within E.ON and Vattenfall when it comes to the corporate and business strategies can fit best into the human capital and organizational capital resource categories as defined by Barney (1991).

Top-Down Leadership

Both E.ON and Vattenfall have a top-down business approach that is communicated by top managers leading the strategy of company or business areas, i.e. human capital resources, while the information systems, routines, processes, networks, organizational structure, etc., i.e. organizational capital resources, are utilized to communicate the strategy and the actual ability of translating strategic ambitions into action.

Vattenfall has a clear process of testing leaders before they become leaders and connecting their employees to the common goal through the steering process which consists of KPIs and business scorecards. Vattenfall has an efficient employee development process. They develop employees through providing them the facility to analyze their ideas and provide opportunities within the company to develop their skills. They also facilitate employees to opt out from the company and re-join with new perspectives and ideas. Gamero, Azorin, and Cortes (2009) stated that it is necessary to have production process efficiencies and waste management in place to increase cost advantages. Furthermore, it is essential to have a cradle-to-cradle approach and closed loop production practices to reduce waste and increase efficiency (Singh et al. 2014).

5.2.2 Dynamic Capabilities and Leveraging: How E.ON and Vattenfall Position Themselves in a Dynamic Market to Remain Competitive

In order to survive and be competitive in a post-energy transition market, firms need to adapt and change their existing resources and capabilities in response to the changing market. Firms need to utilize their resources effectively in order to ascertain superior performance to sustainable CA. This is based on their dynamic capabilities and how they will leverage their resources and capabilities in a way where they can mobilize, coordinate and deploy firm-specific resources.

An Overview About Strategy and its Link to Dynamic Capabilities

Corporate strategy is about the overall decisions a firm makes regarding the choices of which business areas to compete within, as well as the choice regarding which markets to compete in (Porter, 1999). This strategic distinction differs from traditional competitive strategy, which refers to business strategy. Business strategy is concerned with how a firm does business and decisions made pertaining to that area. Corporate and business strategy were key themes in all of the interviews, and that makes sense considering the magnitude that corporate and business strategic decisions have on the success or failure of a firm (Grant, 2016). Dynamic capabilities are essential for businesses that hope to maintain a CA in a rapidly changing business environment (Teece, Pisano & Shuen, 1997).

Proactiveness for the Environment: Managing with Consideration of External Factors

According to Singh et al. (2014), sustainable thinking and actions will eventually result in lowering the firm's cost. Gamero, Azorin, and Cortes (2009) further stated that firms need to have proactive environmental management skills for a greener economy. Eisenhardt and Martin (2000) argued that firms need to understand the dynamic market changes in order to react in an agile way (i.e., dynamic capabilities). These concepts aligned with E.ON and Vattenfall's top management decision-making skills since they have a unique set of management skills where they took proactive steps to leverage resources. Resource leveraging is defined as the ability to create superior performance by utilizing the firm resources (Bingham & Eisenhardt, 2008).

Section 4.4 addresses the role of environmental policy for both E.ON and Vattenfall, and it is clearly a major driver from a corporate strategic perspective to act proactively when it comes to positioning the firms in a desirable position given different future scenarios caused by changes in external factors within political, social, and environmental areas. These external factors within the energy sector are changing in a drastic and significant way due to the energy transition, and such a transition puts pressure on existing firms and resources within those firms.

Since external factors relating to the energy transition potentially have impacts for E.ON and Vattenfall on a corporate and business level, most of the interviewees have stressed how their company sets ambitious internal goals and are actively engaging in discussions with policymakers in order to mitigate and prevent environmental impacts. The ability to internalize external knowledge while also seeking to influence external factors that affect them is a dynamic capability that enables E.ON and Vattenfall to continue working towards their energy transition goals while maintaining a competitive position within a transitioning, dynamic market.

Internalizing External and Dispersed Knowledge: Knowledge Sharing as Resource Leveraging and a Dynamic Capability

Sirmon et al. (2010) stated that new knowledge is contributing to dynamic capabilities by supporting agility. Resource leveraging is effective when a firm can use their knowledge-based resources in dynamic markets (Bingham & Eisenhardt, 2008). Knowledge sharing facilitates best practices and lessons learned at both E.ON and Vattenfall. Diversified teams facilitate new solutions and strengthen the firms' innovation, which is then shared through the knowledge-sharing centers.

E.ON works with agile projects in collaboration with housing associations and developers, which enhances the efficiency of their projects. E.ON has a broad national and international network for knowledge sharing where they integrate new market knowledge from different countries from either subsidiaries or external sources, where they can develop new solutions and continuously improve their offerings to different customer segments.

Vattenfall's IP tools and R&D process also help them to transfer the know-how between departments and enhance innovation. Vattenfall also has a more extensive tollgate process when carrying out their projects which attempts to deliver higher quality decisions on a corporate level. They also review their entire portfolio through an evaluation process. The review process is a form of a dynamic capability that both E.ON and Vattenfall practice to incorporate external knowledge and factors into their firm's decision-making processes, which in turn enables the firms to adapt to dynamic changes in the market.

Different Resources, Different Competencies: Corporate Strategies Playing on Business Strengths and Moving Towards Attractive Market Positions

Firms' strategies on how to operate in the competitive market are based on resources and their dynamic capabilities and how they can leverage these resources to support value creation and innovation (Carnes et al. 2021). As discussed in the RBV section, both E.ON and Vattenfall focus on differentiation strategies. Their differentiation stems from their different corporate strategies, which entails that they each focus on different business areas and different markets. The choice of their business areas highlights their company's core competencies that they achieve through leveraging their firm's resources.

The management at E.ON has made decisions that have narrowed down their business areas to utilize their resources in a strategic way. The most substantial example is when they split into E.ON and Uniper. This action enabled E.ON to release fossil and nuclear energy production assets from their financial statements. The capital raised from this split was used to finance and reinvest

in renewables and optimized distribution systems which are in alignment with their revised strategy aiming for cleaner, greener, and fairer energy offerings. E.ON's CEO has established their strategy based on these three main areas: decentralization, digitalization, and decarbonization.

Vattenfall's strategy statement has promised fossil-free living within one generation. The representatives at Vattenfall stated that their CEO's leadership style also encourages them to develop sustainable ideas and make suggestions towards energy transition, which helps them to be at the forefront of the transition. Dynamic capabilities, as defined and discussed in the framework of Teece, Pisano, and Shuen (1997), have only been confined to defining cases of private companies. However, Vattenfall is a unique, state-owned company that also demonstrates dynamic capabilities. The fact that Vattenfall is 100% state-owned has granted Vattenfall a unique opportunity to fund projects with state-sponsored subsidies when compared to E.ON, but the focus of Vattenfall has changed to not rely on subsidies for their activities and to act as a typical private company with profit motive and reinvestments of raised capital. This is currently being demonstrated by their first wind project that is not funded by subsidies in the Netherlands.

Partnerships, Collaborations, and Business Relationships

Cosmin (2014) stated that RE business models are facilitated by partnerships and network relationships. According to Singh et al. (2014), eco-networking capabilities can be developed through collaborative alliances, transfers, acquisitions, and joint ventures enabling environment-friendly technologies. E.ON has partnerships and collaborations with IT solution providers, research institutions, and waste management companies as stated earlier. Vattenfall also has a broad set of partnerships. Both E.ON and Vattenfall are developing innovative solutions through these partnerships and collaborations with industry partners, investors, and other stakeholders to potentially realize first mover advantages. Vattenfall's collaborations have helped them achieve massive targets such as building the largest offshore wind turbine in the world. Vattenfall integrated technical developments in collaboration with their partners prevalent in the manufacturing segment to deliver on large industrial requirements.

Additionally, the resources of E.ON and Vattenfall are used to leverage their businesses and create partnerships where they can drive innovative projects that they can potentially capitalize on to possibly achieve first-mover advantages and create SCA, while the partnerships can produce more sustainable and efficient outputs.

Business strategy, business models, and achieving SCA

Business models can be considered a firm-specific resource from the RBV perspective as previously discussed, but it can also be a dynamic capability and it can leverage resources. Both E.ON and Vattenfall have business models that offer prosumer services, yet E.ON is seemingly

more advanced when it comes to offering and developing energy community networks on a more decentralized basis when compared to Vattenfall. Since prosumers are the main feature of a consumer-centered energy transition (Miglani et al. 2020) and network-community effects are arising with this development (Martirano et al. 2021), sharing economy and energy communities are emerging as business models in the energy transition (Cuenca, Jamil, and Hayes, 2021). Both E.ON and Vattenfall have business models that incorporate prosumers, but E.ON also has two functional energy community business models as discussed in Section 5.2.1. The creation of these business models demonstrates the dynamic capability for both firms to integrate external factors into their firm and decisively make a viable solution that supports value creation in a changed business environment.

E.ON also has slightly different business models in every country they operate and they believe it is a significant factor that facilitates their growth. Additionally, on each project, they work with the client to link different processes and facilitate sectorial coupling to reach higher efficiency and optimize renewable energy usage when possible. E.ON can provide quality, decentralized solutions to companies and individuals alike, and they are actively enabling energy communities and optimizing system linkages on a project basis. They are continuously trying to lead on the frontier of innovation within technology and renewable energy with e.g., the usage of drones to prevent power outages and damage under storm threats, the hecto-grid in Lund, as well as developing deep geothermal energy from bedrock.

Since Vattenfall has started as a public company owned and controlled by Sweden, they have benefited from many first mover advantages due to the historic lack of competition in the Swedish market. Yet, Vattenfall has changed since that point in time with their limited liability company status, and nowadays they are actively participating in differentiating themselves with ambitious goals to become carbon neutral and circular in different business areas by leveraging the resources that they acquired overtime. Their strategy has shifted their business models to offerings to increase renewable energy production with partners, while also working to develop new low-carbon processes to replace fossil fuel dependence in different industrial settings (i.e., fossil-free steel and fossil-free jet fuel developments). Vattenfall uses their unique corporate portfolio to leverage agile projects, such as building and selling wind and solar farms, across Europe which helps the company have quicker turnovers and release capital to continuously deliver to existing and new customers in different markets and industries. This provides Vattenfall a CA when it comes to planning and realizing construction of renewable energy production systems and new business opportunities that can provide SCA in new markets and industries going forward.

All in all, the corporate and business strategies at E.ON and Vattenfall use dynamic capabilities and leverage their resources in an efficient manner. The companies have specific business focus

areas that they try to develop where they have or can potentially gain a strong presence. Both companies engage in research and development of immature technologies in search of new potential capabilities. Both companies use project funding to finance innovative pioneer projects which have not yet been developed to any point of maturity. Both companies' proactive approach to furthered development and advancement of technology and system solutions puts them in a unique position where they can potentially continue creating first-mover advantages and SCA.

6. Conclusion

6.1 Research Aims and Objectives

The purpose of this research was to fill the gap discussed in Section 1.1.3 concerning the lack of literature discussing how energy companies utilize their firm resources to make SCA in a dynamic environment such as the energy transition; hence, was important to understand how energy companies can use their resources in the energy transition in order to gain SCA. To do so, we have extended the literature in the area by conducting a multi-case analysis approach on two energy companies based in the EU: E.ON and Vattenfall. We wrote about how our objectives and aims were resolved in hindsight of the multi-case analysis.

E.ON and Vattenfall utilize their resources when transferring from non-renewable to renewable energy through mechanisms such as altering corporate strategy when it comes to investing in different business areas, as well as experimenting with renewable or fossil-free energy production or processes.

EU member states are actively contributing to sustainable energy development by allocating public funds: there are not many opportunities for subsidies from the EU for either E.ON nor Vattenfall unless the project is of a more innovative nature and an EU organization approves and finances the project. There are several concerns over the vagueness of EU directives, and representatives have advocated for homogenizing the regulation for creating European energy standards.

Our study considered three major areas of focus in regard to the research direction to attempt to answer the research question: (1) the resource-based view (RBV), (2) dynamic capabilities and leveraging, (3) environmental analysis (including political and legal environment, economic environment, technological environment, and social environment). The empirical data was sourced from interviewees with representatives from E.ON and Vattenfall. The analysis was based on the empirical and secondary data with cross-reference to the theoretical framework (i.e., RBV, dynamic capabilities, and resource leveraging). The theoretical perspectives informed us how E.ON and Vattenfall use unique resources and competencies to position themselves as a unique energy company in a changing market.

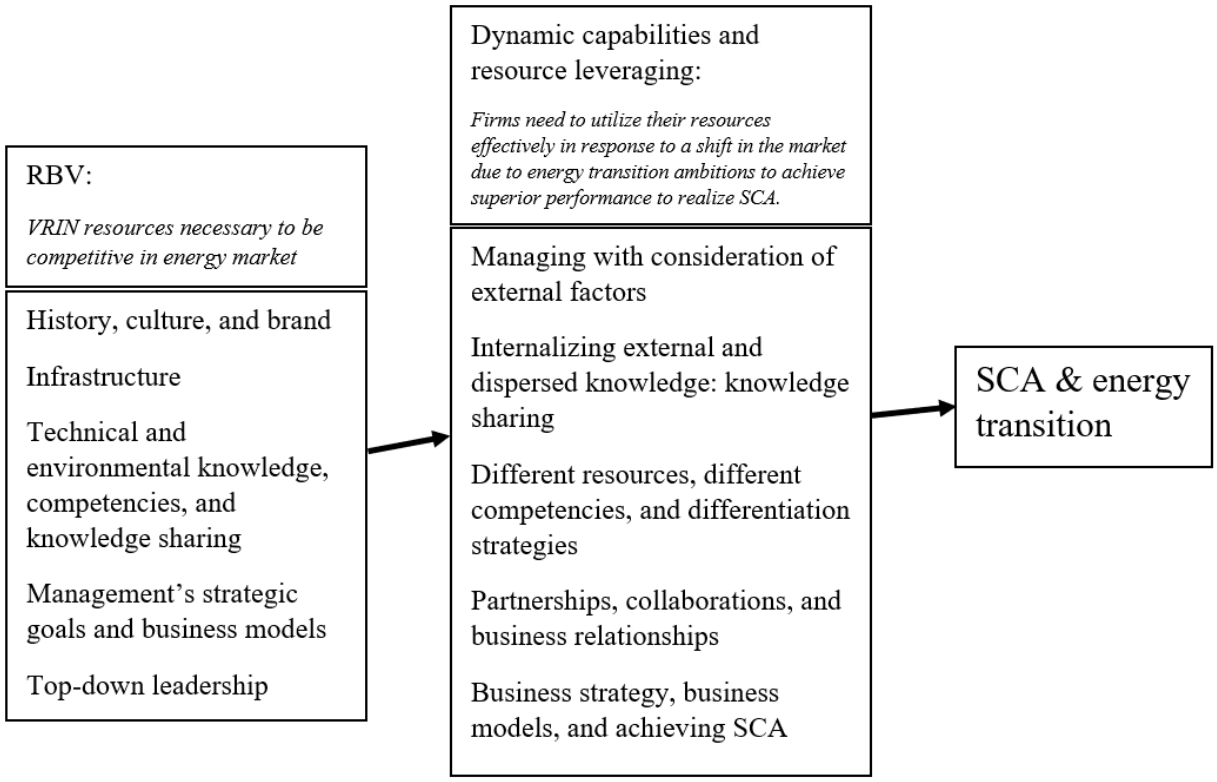
6.2 Key Findings and Practical Implications

In this paper, we synthesized the connection between resources within E.ON and Vattenfall and how they used their firm-specific resources from an RBV perspective to have a CA, in addition to how each company has used dynamic capabilities and resource leveraging to maintain or achieve SCA through the energy transition process. It was important to understand how businesses in the

energy system change from fossil fuels to low-carbon energy sources to accomplish firm energy transition. We wanted to understand the resources that businesses in this system have deployed in order to stay competitive and undergo major changes in adopting new innovations to achieve the energy transition.

Therefore, we answered our research question: *"How do businesses operating within the EU energy sector use their resources to achieve energy transition and remain competitive in the market while doing so?"* Both E.ON and Vattenfall utilized firm-specific resources that were strategically orchestrated to play on their firms' key strengths and optimize their key competencies. Consequently, that loops back into each company's differentiation strategy. Our main findings have been summarized in Figure 3.

Figure 3: Framework of energy transition and SCA from a resource perspective



Our assumption that the resources utilized to accomplish the energy transition efficiently and before other competitors will provide businesses a CA within the energy system in regards to price, performance, and compliance seemed to be in alignment with the thinking of managers at both case companies. This was evidenced by the management practices at both E.ON and Vattenfall. Both companies consider energy transition in their business areas and firm resources, as well as for investments and project selection. E.ON and Vattenfall have proven that they are proactive in

adopting environmentally proactive strategies, and thus they seem to agree that reaching Agenda 2030 targets to reduce GHG emissions, as well as lowering energy costs and externalized costs for future energy consumers is a viable and strategic direction.

6.3 Future Research

The delimitations and limitations of this paper present possibilities for future research. Firstly, only two case companies in this study were analyzed due to the limited time available and thus the general conclusions drawn might be incomplete. Therefore, to further investigate the findings of this research, case studies of other energy companies (e.g., small, medium-sized and start-up companies) would be very useful. Moreover, since this research is based within the EU, it would be relevant to conduct a similar study using companies from other parts of the world to discover whether the impacts of resources in energy transition are consistent in other regions (e.g., Asia). Secondly, there is a lack of the impact of firms' financial situation on the energy transition since we only focused on RBV and dynamic capabilities and leveraging in our study. Therefore, future research could examine the impact of firms' financial performance on the energy transition process. Also, we have not done an in-depth analysis for nuclear energy in this research. Thus, future research can be conducted on analyzing the contribution of nuclear energy as a solution for the energy transition since different companies will have different views on considering nuclear energy for their energy mix.

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Appendix A - Semi-Structured Interview Questionnaire

INTERVIEW DECLARATION

By participating in the interview you consent to being recorded and having the data collected used for the purpose of answering the research question at hand. One month after the thesis is submitted on June 1st, recordings will be deleted permanently on the condition that the thesis earns passing marks. Otherwise, the thesis recording may be deleted at a later date once the thesis is deemed completed. We will notify you upon deletion. Moreover, upon request, we can provide you a copy of the transcripts until June 1st. And lastly, you may choose to keep your name and other details anonymous if you choose.

Due to the short time frame and amount of questions we would like to ask, we request that you keep answers as precise and short as possible.

General information

1. Name
1. Position
2. Company
3. Role and responsibilities
4. Number of experience in the energy sector
5. Number of experience in this company

Topic I: Energy transition

1. How would you define energy transition?
2. When it comes to energy transition in the industry, does your company have a sustainable competitive advantage?
3. Briefly tell us some factors, such as political, environmental, and societal factors, that are shaping the industry landscape in regard to energy transition.

Topic II: Nuclear Energy

4. What is your perspective and strategy as a representative of [COMPANY NAME] on nuclear energy in the energy transition?

5. Do you have assets invested in nuclear energy?

Topic III: Renewable Energy

6. What are [COMPANY NAME]'s goals, vision regarding the role of renewable energy in the energy transition?
    - Which goals are prioritized?

Topic IV: Firm specific resources

Resource-based view: Company resources that potentially provide a competitive advantage are VRIN: valuable, rare, inimitable, and non-substitutable. These VRIN resources can be divided into two categories: tangible and intangible assets. We want to know which VRIN resources at your company enable energy transition.

7. Can you tell us which tangible resources are VRIN and facilitate energy transition at your company?
8. Considering intangible resources, Which firm management skills would you consider VRIN and facilitate the energy transition at your company?
9. Which organizational processes and routines are VRIN that facilitate the energy transition at your company?
10. What information and knowledge are VRIN resources that facilitate the energy transition at your company?
11. Which strategy does your company focus on, cost efficiency or differentiation? Which VRIN assets enable your company to do so?
12. Does your company have any early mover advantages compared to competitors?
13. How does your company develop and retain talent?
14. How does your company build capabilities related to, for example: decreasing waste and increasing energy efficiency?

Topic V: Environmental Analysis - Political & Legal Environment

Governance and policy (internal and external)

15. Are there any barriers and/or opportunities caused by EU directives?
16. Does the company work on energy communities? If YES can you briefly explain how it works?
17. How do you enable and protect consumers who create and supply energy?

Topic VI: Economic environment

Funding for low-carbon energy

18. Have you received any tax cuts or other subsidies that are supporting the energy transition at your company? Yes or no?
19. Do you feel like raising capital is a barrier for energy transition at your company? Yes or no?

Business model of the energy sector

20. How does your company's business model enable energy transition?
21. Do entry modes like strategic alliances, partnerships, and joint ventures facilitate energy transition at your company? Yes or no?

Topic VII: Technological environment

Technological improvements

22. To what extent have the company's technological developments enabled energy transition?
23. Do you have any technologies related to blockchain and peer-to-peer transactions (P2P)?
24. How do you transfer the technological know-how between departments?

Topic VIII: Social Environment

Consumer centered energy transition

25. Does your company have a decentralized and consumer-centered approach?
