

A sustainable future: How firm diversification is a
possible answer

*A qualitative study of Norwegian oil and gas supply
firms*

Natalie Johnsen



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Abstract

This thesis explores firm diversification from the oil and gas (O&G) sector to the renewable sector, among Norwegian O&G service and supply firms. The purpose is to contribute to the debate of sustainability transitions from a firm oriented point of view and to inform policy makers on barriers to diversification. Global warming and a changing climate, due to factors like high CO₂ emissions, highlight the urgency to transform the fossil dependent energy sector. The thesis draws on strategic management literature to account for firm behaviour, studying system change at the micro-level.

The study is conducted by a qualitative approach. Data is gathered predominantly by the use of in-depth interviews with supply firms in O&G, but also observation and content analysis of relevant documents serve as complementary data. The purpose is to understand why and how these firms diversify from O&G and to investigate barriers associated with such a process. By understanding firm motivation, processes, and barriers to diversification, this study informs policy makers on actions that can lower entry barriers and facilitate firm diversification.

The findings suggest that firm resources are essential for understanding the type of target industry, transition processes and experienced barriers. Smaller firms experience more barriers to diversification due to less available resources, compared to larger firms. Firms predominantly diversify for firm survival and growth, and they diversify by redeploying existing resources and by developing new ones. Barriers to diversification mainly relate to the market dimension and not the technological dimension. However, a significant barrier affecting all supply firms diversifying is the lack of a clear renewable strategy for the sustainability transition needed for the fossil-dependent energy sector. Thus, there is a need for governmental declared long-term goals and commitment. This thesis, therefore, suggests activities and policy instruments needed to facilitate firm diversification and lower entry barriers to renewable industries. These are a clear renewable strategy, a domestic offshore wind power market, learning arenas, research and development policy instruments, policies targeting the market dimension, and large firm-small firm collaborations.

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Oslo, June 1st, 2020

Natalie Johnsen

Abbreviations

DCs – Dynamic Capabilities

FWP – Floating Wind Power

MLP – Multi-level Perspective

NOK – Norwegian Kroner

O&G – Oil and Gas

OWP – Offshore Wind Power

RBV – Resource-based View of the Firm

RCN – The Research Council of Norway

R&D – Research and Development

SDGs – Sustainable Development Goals

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1 Introduction

Global warming due to factors like high CO₂ emissions from sectors such as oil and gas (O&G), is one of the grand challenges of our time. A changing climate and the urgency of sustainability transitions across the political, social and industrial sector have resulted in a need to transform the fossil dependent energy sector. A step towards this transformation, that has been met with great interest in Norway, is diversification from the O&G sector to the renewable sector – a process that has been studied by several researchers (Andersen & Gulbrandsen, 2020; Mäkitie, Andersen, Hanson, Normann, & Thune, 2018; Steen & Hansen, 2018; Steen & Weaver, 2017).

There are various agreements set in motion in an attempt to combat climate change. The Paris Agreement brings all nations together through agreed upon common goals in addition to nation-specific goals (United Nations, n.d.-b). All member states of the United Nations have adopted the Sustainable Development Goals (SDGs) to tackle grand challenges. An essential step highlighted is climate action (United Nations, n.d.-a). Norway has pledged itself both to the Paris Agreement and the SDGs, while still being a critical O&G supplier for the world market, e.g. 25 per cent of the EU gas demand is supplied by Norway (Norwegian Petroleum, 2019a). Export of O&G represented almost 47 per cent of Norway's total export in 2019 (Statistics Norway, 2019); this sector is hence essential for the Norwegian economy. Emissions of greenhouse gases like CO₂ needs to reduce, but Norway still requires an industry with stable jobs, continued export of merchandise, and a constant flow of income to the state. The government, therefore, has stated that resources from the O&G sector, e.g. managerial resources and technological resources, must be redeployed to other sectors and industries (Ministry of Finance, 2017, p. 115). As such, they also establish a requirement for firm diversification to other industries.

All industries are unique in their way, and diversifying to new markets is not without challenges. To lower the entry barriers, most firms diversify to a related industry, meaning an industry they share common factors with (Anand, Kim, & Lu, 2016; Helfat & Lieberman, 2002). However, even related diversification is not an effortless process.

1.1 Research area and topic

The research area in this thesis lies within the sustainability transitions field. The focus in sustainability transitions is on the transformation of established sectors such as energy, the food system, water supply or transportation (Geels & Schot, 2007; Markard, 2017). Such sectors are conceptualized as socio-technical systems, consisting of actors, institutions, and material artefacts and knowledge (Geels & Schot, 2007; Markard, Raven, & Truffer, 2012; Verbong & Geels, 2010). Problems within a socio-technical system, therefore have far-reaching effects and transformation of the system is a challenging and long-term process. Hence, incremental rather than radical change is common (Dosi, 1982; Geels & Schot, 2007; Markard, 2011). There is an understanding among scholars in the transition field that established sectors need to transform to become sustainable in the long run (Markard, 2017). A change of the system requires change on several dimensions, including the individual firm level.

Transitions are often studied from a system point of view to investigate the layers of the socio-technical system (Farla, Markard, Raven, & Coenen, 2012). However, the systems perspective comes at the expense of the understanding of the role of individual actors and agency (Farla et al., 2012; van Mossel, van Rijnsoever, & Hekkert, 2018). Insight into the systemic nature of socio-technical transitions is essential. However, to facilitate long-term change that not only transforms the fossil dependency of the energy sector but also maintains the competence and jobs existing in the O&G sector today, understanding of firm behaviour is vital. This thesis will therefore study system change at the micro-level, from an actor point of view, by drawing on strategic management literature to account for firm behaviour. The resource-based view of the firm and dynamic capabilities approach, stemming from strategic management theory, serve as a basis for my analytical framework. The actor is here understood as the firm.

The research topic is firm diversification from O&G to the renewable sector, two sectors within the energy system. O&G constitute together over 50 per cent of the world's energy supply (IEA, 2019a), and while electricity generation from O&G is falling, oil is still the most important source of energy in transportation worldwide (EIA, 2016; IEA, 2019b). The global electricity demand is rising annually, and the need for renewable energy with it (IEA, 2019c).

Hence, moving from fossil dependency to renewable sources is vital to achieving a sustainable future.

This thesis studies how established firms in the supply industry diversify from O&G to renewables. Established firms often are conceptualized as inert and locked-in to their current path, where arguments are made that growth of renewable industries usually is driven by niche-actors (Hockerts & Wüstenhagen, 2010; van Mossel et al., 2018). Due to this, scholars within transition studies often study emerging innovations, instead of innovations ongoing in established actors (Geels, 2014b). Nevertheless, there is a growing understanding that established firms play different and vital roles in sustainability transitions (Hockerts & Wüstenhagen, 2010; Wesseling, Niesten, Faber, & Hekkert, 2015). Still, this is an understudied topic in sustainability transition research, and this thesis aspires to contribute to this gap.

1.2 Research questions and methods

This study is not the first to research firm diversification in a sustainability context. However, earlier studies in Norway have primarily focused on O&G-related firms diversifying into offshore wind power (OWP) (Andersen & Gulbrandsen, 2020; Mäkitie et al., 2018; Steen & Hansen, 2018; Steen & Weaver, 2017). Most research focuses on the transition from O&G to OWP or maritime-based industries (Thune & Mäkitie, 2019). However, there is still limited knowledge about how firm resources and competences are redeployed and what barriers diversifying from O&G encompasses. Further, few inquire about why such processes come about (Mäkitie, 2019). These are central questions and topics to investigate, not only to gain a greater understanding of the O&G and renewable sector, but also to understand the challenges firms meet when diversifying away from O&G. Such knowledge is important to inform policy makers seeking to promote a transformation of the O&G sector. This thesis will therefore study the following research questions:

***RQ1:** Why and how do established supply firms in the oil and gas sector diversify to the renewable energy sector?*

***RQ2:** What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms?*

Research on technology end-users dominates the field of sustainability transitions, with limited focus on the upstream firms (Andersen et al., 2020). These are the service and supply firms producing various components and services. However, the energy system in general and the O&G system, in particular, encompasses a broader range of actors relevant to research in a transition perspective (Engen, Simensen, & Thune, 2018; Thune, Engen, & Wicken, 2018). The O&G supply chain consists of both product and service suppliers essential for innovation and technological development in the sector. The operators are the technology users. As limited attention has been granted firms in the supply chain, the proposed research questions will guide a study of supply firms diversifying from O&G to renewables. The research questions will also guide the study of established firms entering renewables, in contrast to newcomers, thereby broadening the limited literature that exists today. By deepening the understanding of firm motivation, processes, and barriers to diversification, this study has societal relevance by informing policy makers on actions that may lower entry barriers and facilitate firm diversification from O&G. Thereby, it will contribute to the understanding of the diversification process and resource transfer from O&G, a goal stated by the Norwegian government (Ministry of Finance, 2017, p. 115). As highlighted, most have studied the transition to OWP only, as this empirical focus represents possibilities for resource redeployment between two industries perceived as technologically related (Hansen & Steen, 2015). This study therefore aspires to research the transition to renewables in general in a Norwegian context. This, to investigate general barriers to diversification from O&G, and what motivations and processes take place when firms enter different industries within the renewable sector.

To answer the research questions, I have conducted a qualitative study. I have collected data predominantly by interviews with O&G supply firms diversifying to a renewable industry, in addition to content analysis of relevant documents and reports.

1.3 Firm diversification from O&G

Through the Paris Agreement and the SDGs, Norway has, among other significant goals, committed itself to cut greenhouse gas emissions, like CO₂. An important step is, therefore, to substitute the fossil-based energy sources with renewable ones. This sustainability transition is, however, a complex systemic process where both the supply and demand must change in

order to achieve success. The focus on the contribution of individual actors, like supply firms, to such a transition, is lacking in management research and the sustainability transition literature (George, Howard-Grenville, Joshi, & Tihanyi, 2016).

The O&G sector in Norway encompasses a high level of capital, technologies, and skills (Engen, 2009; Engen et al., 2018). These resources can be utilized in related industries when there is a good match between the firm's resources in one market and the resources needed to succeed in a new market (Helfat & Lieberman, 2002). The exploitation of related industries to leverage the utilization of existing firm resources is not equal to radical innovation, but rather an incremental customization to existing technology and services (Schumpeter, 1934). Certain firms in O&G also have a history of diversifying, especially large supply firms. These have their roots from other sectors, e.g. shipping and maritime industries, and came rather late in their history to oil (Engen, 2009; Ryggvik, 2010).

98 per cent of the current electricity supply in Norway can be credited to renewable sources: hydropower, wind power from land, and thermal power (Ministry of Petroleum and Energy, 2016). Hence, there is no critical need for renewable energy. However, the diversification of firms from O&G to renewables is not only about the sustainable aspect of the transition, but also about securing the Norwegian economy through stable jobs and a continuation of the country's export connected to energy – broadly defined.

1.4 The Norwegian oil and gas sector and the supply firms

The O&G sector in Norway is the largest in terms of turnover, with the supply industry being the second largest (Norwegian Petroleum, 2019b). Hence, both O&G as a sector and the suppliers are essential for the country's economy. The term "sector" is in this thesis used to describe the larger segment of industries. The term "industry" is used to describe the specific business areas, such as the supply industry of the O&G sector and the hydropower industry in the renewable sector.

The supply industry in Norway mostly consists of small and medium-sized firms (Iversen, 2003). The interviews conducted for this thesis are with both small, medium, and large firms in terms of the Norwegian definition of firm size. Small firms have 1-20 employees, medium-sized firms have 21-100 employees, and large firms have over 100 employees (NHO, 2018).

However, the international definition of firm size regards everything below 250 employees as small and medium-sized firms (OECD, 2018). I will in the discussion chapter distinguish between small and large firms by the international definition in line with other research. However, I will in the empirical chapter, highlight firm size by Norwegian standards in the informants quotes to let the reader in on the nuances of the empirical findings.

The O&G sector is vital to the Norwegian economy, in terms of turnover and the high number of people directly or indirectly employed there. Also essential is the resources, capital, and competences the sector holds. These resources and competences are built up through years of research and development (R&D) and experience (Engen, 2009; Engen et al., 2018; Thune, Engen, & Wicken, 2018). Even though the export of O&G is essential to the Norwegian economy, the sector has experienced stagnation phases. After these downturns that started in 2008 and again in 2014, there was a surge of investments in OWP. However, firms quickly returned to the O&G sector once it recovered (Mäkitie, Normann, Thune, & Sraml Gonzalez, 2019). A characteristic of a relatively new market like OWP, is the lack of competitiveness to related industries, due to its limited scale. This enhances the pull towards the capital-intensive O&G sector, once it recovers from the decline.

The O&G sector is subsidised both directly through R&D subsidies, and indirectly through the lack of internalization of negative external economies associated with its production and use, e.g. emissions of CO₂ and NO_x, air pollution and aerosols, and environmental degradation (Jacobsson & Bergek, 2004). Established firms in O&G have therefore been operating under favourable conditions, facing few incentives and demands, e.g. regulations, to diversify to more sustainable sectors. O&G supply firms inhabit vast resources to leverage in the renewable sector. It is therefore essential to understand what initiate firms to diversify and what is needed to secure long-term commitment in renewable industries.

1.5 Perspectives and contributions

Research on firm diversification, part of the sustainability transition, often focus on mechanisms by which transition takes place (Andersen & Gulbrandsen, 2020; Markard et al., 2012). Other research topics include how established sectors influence renewable industries (Mäkitie et al., 2018), mechanisms for path creation (Steen & Hansen, 2018), and O&G incumbents' responses to changing conditions because of transition processes (Steen &

Weaver, 2017). With a growing amount of research on established firms in transition research, a more in-depth understanding is being built on how sustainability transitions can benefit from established sectors. Still, there is a lack of insight into why and how established firms seek out more sustainable industries, and what type of resources are mobilized (Farla et al., 2012; Mäkitie, 2019; Strøm-Andersen, 2019). The theoretical contribution of this thesis is, therefore, to advance the literature on sustainability transitions from a firm oriented point of view. The empirical contribution is a deeper understanding of how individual actors, i.e. established firms in the O&G sector, respond to the sustainability transition, in addition to suggestions on how to facilitate firm diversification from O&G better.

In this study, I investigate firm diversification from O&G but frame it in a sustainability transition context. I use theoretical frameworks from management studies, but also draw inspiration from innovation studies and transition research.

1.6 Thesis outline

This thesis is divided into seven parts. In this first chapter, I have introduced my research topic and the research area it is situated in. I have also briefly introduced perspectives and contributions on the topic, thus also elaborated on the background of my research questions.

In chapter 2, I will elaborate on the research field my thesis is located in. This serves as a relevant backdrop and greater context for my research topic. I will also present theoretical gaps in the sustainability transition literature today, which leads me to the analytical framework constructed in this thesis.

In chapter 3, I will elaborate on theory relevant for my analytical framework, rooted in the resource-based view and dynamic capabilities. I will present my analytical framework, a combination of the two theoretical perspectives. My analytical framework allows me to research areas not that prominent in the general field of sustainability transitions.

In chapter 4, I will present and elaborate on my methodological approach and choices. I will discuss why I chose a qualitative approach and what data collection techniques I used. I will also discuss the quality and rigour of this study.

In chapter 5, I will present my empirical findings based on the analysis of my data material.

In chapter 6, I will discuss my empirical findings in light of my analytical framework and previous research to answer my research questions.

In chapter 7, I conclude this thesis by an overall discussion of my research topic in a sustainability transition perspective and highlight my main findings. Additionally, I have crafted a framework of actions needed to facilitate firm diversification from O&G to accelerate the sustainability transition. I will also briefly discuss implications of my findings on policy and theory, limitations of the thesis, and propose further research.

2 Literature review and research gaps in sustainability transitions

The field of transition studies will serve as a backdrop for discussing my research topic from a broader perspective. Criticism of the system approach, highlight the need to draw on inspiration from management studies to understand individual firm responses to transitions (Farla et al., 2012; Shove & Walker, 2007; van Mossel et al., 2018).

2.1 Sustainability transitions

Sustainability transition studies is an interdisciplinary field of research, often conceived as open and pragmatic, frequently applying different approaches and theoretical frameworks (Markard, 2017, pp. 8–9; Shove & Walker, 2007, p. 2). Therefore, there is some agreement about conducting various approaches to the field and acknowledging the limitations of one's study (Shove & Walker, 2007, p. 2). Being an interdisciplinary field, it draws on perspectives and key concepts from different disciplines and fields, e.g. innovation studies, science and technology studies, political science, management studies and the natural and engineering sciences (Geels, 2010; Markard, 2017; Smith, Voß, & Grin, 2010). Sustainability transition studies are highly normative, in that a focal point is on transformations and how to facilitate change leading to the desired outcome (Markard, 2017; Markard et al., 2012). These studies also draw on historical case studies of transitions to provide insight into how change comes about (Geels, 2005; Turnheim & Geels, 2013).

Transitions are long-term changes at the societal level and are therefore extensive and affect multiple actors and areas. Examples of such sectors are water supply, transportation, and energy supply. These sectors are also examples of systems with a critical function in society, as they deliver vital products. In the tradition of transition studies, are sectors often conceptualized as socio-technical systems (Geels, 2004; Markard et al., 2012). The transition of established systems affects its constituents of actors, meaning firms, users, public actors and other organizations, institutions, meaning regulations, laws, norms and routines, and technologies, meaning material artefacts and knowledge (Geels, 2004; Markard, 2011). Changes in a socio-technical system, therefore also encompass major institutional and organizational shifts as the different components of the system are interrelated and dependent on each other (Hughes, 1987; Markard, 2011).

Many established sectors today face major sustainability issues where problems have far-reaching effects (Geels & Schot, 2007, p. 406). Most scholars in the field, therefore share an understanding that established sectors need to undergo a fundamental change to become more sustainable in the long run (Markard, 2017). Markard et al. (2012, p. 956) define sustainability transitions as “long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption”. Smith et al. (2005) emphasize that “guidance and governance” are closely correlated with sustainability transitions. Long-term processes are therefore often supported and endorsed through political goals that direct transition.

Sustainability transitions, however, encounter resistance and are challenging to accomplish due to several reasons. First of all, they are complex and intertwined processes that are hard to approach and have no “quick fix”. Different stakeholders view and define problems differently, resulting in issues with establishing social legitimacy (Markard, 2017). Accompanying the goal of zero emissions from the creation and use of energy is the aspect of stable jobs and value creation. A difference between environmental and socio-economic goals can result in social legitimacy problems (Busch, Foxon, & Taylor, 2018; Lütkenhorst, Altenburg, Pegels, & Vidican, 2014). The scale of the problems, both regarding the number of different sectors involved, but also the temporal scope of several generations, makes it challenging to address (Markard, 2017). It is both a costly and conflicting topic as different stakeholders in politics will have different goals, and the lack of an ideal policy instrument leave both the public and authorities feeling powerless (Avelino, 2017; Markard, 2017). Tackling sustainability transitions, therefore, require knowledge on all aspects of the transition process, ranging from individual firm responses to systemic transformations of entire sectors, i.e. socio-technical transitions.

The most prominent theoretical frameworks within the field are the multi-level perspective (MLP), technological innovation systems, transition management, and strategic niche management (Markard et al., 2012). The different approaches have different areas in focus, but they all emphasize the systemic nature of sustainability transitions. I will only present the MLP with its transition pathways (Geels, 2002; Geels & Schot, 2007). The MLP is not part of my analytical framework but instead provides me with analytical concepts valuable for discussing my research topic from a broader perspective. As transitions are changes from one

regime to another (Geels & Schot, 2007), the niche and regime concept from the MLP contributes to the discussion of the dynamics between these two levels.

2.2 Socio-technical transitions

The socio-technical system is made up of actors, institutions and material artefacts and knowledge. The system serves a purpose in society and is thereby linked with different parts of society and sometimes also other systems, like the transportation sector, which is dependent on the energy supply sector. A shift in a socio-technical system is a socio-technical transition (Geels, 2018; Markard et al., 2012). Transition studies of socio-technical systems encompass user practices, institutional structures, and the study of technological change. Such studies, therefore, differ from the study of only technological transitions, which lack the systemic focus (Markard et al., 2012). Socio-technical transitions unfold over a substantial amount of time, from five decades and more, as they involve multiple actors and numerous elements of society play a part of the transition (Geels, 2002; Markard et al., 2012). During a socio-technical transition both services, business models, new products, institutions, and organizations emerge and evolve, some surpassing existing structures and organizations, others complementing the existing (Verbong & Geels, 2010). Two prominent examples of historical studies of a socio-technical transition are Geels' (2002) study of the transition from sailing ships to steamships, 1780–1900, and Geels' (2005) case study of the shift from horse-drawn carriages to automobiles in the USA, 1860-1930.

Socio-technical systems are closely interlinked with different parts of society. Problems within systems are deep-rooted and complicated, especially as systems in modern society also face major structural problems, e.g. greenhouse gas emissions (Geels, Elzen, & Green, 2004, p. 1). Transition scholars, therefore, call for structural change (Farla et al., 2012; Geels et al., 2004; Markard et al., 2012; Verbong & Geels, 2010). Scholars within the tradition seek to understand change within regimes, with all its interrelated elements of actors, institutions and material artefacts and knowledge (Geels, 2002, 2005; Markard et al., 2012; Smith et al., 2010). Change is often difficult as regimes are path-dependent and locked-in to specific systems and technological trajectories (Fagerberg, 2005; Unruh, 2000). However, a socio-technical system can still transform, but with some level of intervention like long-term goals, incentives, governance and guidance (Markard et al., 2012; Smith, Stirling, & Berkhout, 2005).

I will now present MLP as this approach provides me with analytical concepts to frame and discuss my research topic and focus in a broader context.

2.3 The multi-level perspective

The MLP sees socio-technical transitions as a product of alignments between three levels, the macro, meso and micro-level (Geels, 2002). The macro-level corresponds to the socio-technical landscape, the meso-level to the socio-technical regime, and the micro-level to the socio-technical niche (Geels, 2004; Geels & Schot, 2007). When studying and applying the MLP framework, it is important to understand that the three levels of the framework are not ontological descriptions of the real world, but rather heuristic levels. A socio-technical transition is a complex process, requiring analytical and heuristic concepts to study (Geels, 2002).

The socio-technical regime is inspired by Nelson & Winter's (1982) concept “technological regime”, used to explain a common development path for an engineering community along “technological trajectories”. Later it was argued by sociologists of technology that also other interest groups play a part when technological development follows a specific path (Bijker, 1995). The term technological regime was redefined to capture the broader meaning of the regime, described as “the rule-set or grammar embedded in a complex of engineering practices, production process technologies, product characteristics, skills and procedures, ways of handling relevant artefacts and persons, ways of defining problems—all of them embedded in institutions and infrastructures” (Rip & Kemp, 1998, p. 338). Today, the concept of the socio-technical regime is rooted in the notion that change happens incrementally and has a direction set by the established regime, where it follows established pathways of development (Geels, 2002). The regime itself is a stable configuration of practices, institutions, knowledge, processes, and networks, that influence both the use and development of technology within the socio-technical system (Geels & Schot, 2007). Lock-ins and path dependencies restrain radical novelties, locking the socio-technical regime to the same path and logic. In consequence, this results in stability of the socio-technical system and for change to take decades (Geels, 2002; Unruh, 2000). The regime concept today encompasses not only the engineers directly connected to the technology but also policy makers, users, different interest groups, and the supply chain, amongst other actors (Geels, 2002).

The socio-technical niche corresponds to the micro-level in the socio-technical system. Whereas incremental innovations and change happen at the regime level, radical innovations emerge in niches (Geels, 2002). Radical innovations are protected from market dynamics happening at the regime level, with the niches acting as “incubation rooms” (Kemp, Schot, & Hoogma, 1998; Schot, 1998). These protected spaces are necessary for the novelties to gain momentum, as they initially are expensive and unstable, and have what is called “low technological performance” (Geels, 2002, p. 1261; Geels & Schot, 2007, p. 400). Commonly, niche-innovations are carried out by different actors than those dominating the regime-level. As these innovations are radical and outside the patterned development path, often dedicated actors or others outside the regime carry out the niche-innovations (Geels, 2002). However, an important distinction is that a niche technology need not be new; it can exist in a constant niche environment (Markard & Truffer, 2008b, p. 605). The regime and niches can seem similar, but the former is large and stable, and the latter small and unstable. They both have communities of linked groups through selected rules. For the regimes “these rules are stable and well-articulated; for niche-innovations, they are unstable and ‘in the making’” (Geels & Schot, 2007, p. 402).

Two different types of niches can be classified based on how their selection environment transpire: market niches and technological niches (Markard & Truffer, 2008a, 2008b). Renewable energies can function as both. A market niche can evolve around hydropower, where an application context can be a remote cabin without connection to the electricity grid. Parallel, hydropower can be supported by government programs, subsidies and incentives to create a new energy source for a national context, and not just for private consume. The success of a niche is correlated with its compatibility with the regime. Niches that in some way conflict with the established socio-technical regime, are thought to be less successful (Markard & Truffer, 2008b, p. 606).

The landscape makes out the macro-level of the socio-technical system. The landscape represents the exogenous environment outside of and not in direct influence by the dynamic interconnection between the regime and niches (Geels & Schot, 2007). The landscape is described as “a set of heterogeneous factors, such as oil prices, economic growth, wars, emigration, broad political coalitions, cultural and normative values, and environmental

problems” (Geels, 2002, p. 1260). Whereas institutions, in the form of rules within the regime, both restrict and enable its activities, the landscapes external factors can put pressure on current regimes and open “windows of opportunities” (Markard et al., 2012, p. 958). When these windows occur, niches can emerge from the niche-level and contribute to shifts in existing regimes (Geels, 2002, p. 1261). As with regimes, landscape changes do occur but happen even more slowly than with regimes (Geels, 2002, p. 1260).

The whole concept of the MLP as a way to study sustainability transitions is based upon the interplay between the three different levels: landscapes, regimes and niches (Geels, 2002). A sustainability transition transpires when niches break through and replace the existing regime (Geels & Schot, 2007). This view has received criticism of being too much in favour of niches being the force driving transitions. As a response, Geels and Schot (2007) have further developed the MLP into four different transition pathways based on the timing and nature of the interactions of the three levels.

The four transition pathways are the transformation path, the de-alignment and re-alignment path, technological substitution, and the reconfiguration pathway. They all accentuate that change can happen for several reasons and not only because niche technologies break free. However, there are still limitations of the MLP framework as it underestimates the role of agency and individual actors in transition processes (Geels, 2011, p. 29). Genus and Coles (2008, p. 1442) advocate for incorporating other approaches to better “show a concern for actors and alternative representations that could otherwise remain silent”. Other types of criticism concern the concept of the regime and the lack of a clear definition of its meaning. Berkhout, Smith, and Stirling (2004, p. 54) state that “it is unclear how these conceptual levels should be applied empirically. By this, we mean that a sociotechnical regime could be defined at one of several empirical levels”. Hence, when applying the MLP framework to sustainability transitions, the definition of what the regime level is is unclear, making findings less transferable. Further, what one may find and define as regime change and a transition at one level, might be viewed as an incremental change for someone studying the same topic but with a wider definition of the regime. The landscape level has also been criticized for being an analytical concept that can incorporate almost any kind of external influences (Geels, 2011, p. 36).

2.4 Criticism and theoretical gaps

The MLP has become a popular theoretical framework for studying transitions. Despite this, it has received criticism that ranges from a bottom-up focus to unclear definitions of the socio-technical levels. The field is usually studied from a system point of view, as Farla et al. (2012, p. 1) put it: “The emerging field is characterized by a wide variety of topics, approaches and methodologies, but a general feature is that transitions towards sustainability are framed from a systems perspective.” This is in line with how transitions are understood and most often researched, as socio-technical systems with transformations at multiple layers of society, both organizational, institutional and technological (Geels, 2002). There are also other prominent frameworks with a system approach, but they all study the transition at the macro or the system level. This is important to understand the broader context, which is an essential aspect of system transitions but comes at the expense of agency and the role of actors (Farla et al., 2012; van Mossel et al., 2018). Shove and Walker (2007, p. 2) argues that studies of transitions from a systems point of view commonly are distanced and even voyeuristic, meaning they study the transition from a vantage point and too far away. This leaves little room for agency and assertions about individual established firms and organizations, and how they can be part of shaping trajectories and contribute to transitions, based upon already set and defined normative goals (Farla et al., 2012; Shove & Walker, 2007).

Criticism against the system perspective, highlight why it is essential to study not only the system but also actors and how resources within firms (and other organizations) can play a part in transition processes. This is especially important for sustainability transitions, which are transitions not only for convenience sake but most necessary for sustainable continued survival. Ideally, one combines both the macro and micro perspective when studying transitions to involve multiple actors and perspectives. This also limits the inherent uncertainties and weaknesses with all methods and approaches (Shove & Walker, 2007, p. 2). A combination of the macro- and micro perspective would provide an understanding of how something at the micro-level affects the macro-level and vice-versa, in a way a one-sided focus rarely captures. Especially important is this for sustainability transitions that are long-term visions set at the macro-level to guide the transition and affect agents at the micro-level (Berkhout, 2006).

Research within sustainability transitions have tended to portray established actors as rigid and resistant to change (Geels, 2014b), and have focused mainly on niches as a means to change (Geels, 2002). However, this understanding of established firms is criticized for focusing too much on how niches work as bottom-up agents for change, with little attention to agents at the regime-level or actors actively operating from the landscape-level (Berkhout et al., 2004, p. 62). Recent studies have contributed to this notion, studying established firms in the energy sector diversifying from O&G to renewable energies (Bergek, Berggren, Magnusson, & Hobday, 2013; Mäkitie et al., 2018; Pinkse & van den Buuse, 2012; Steen & Weaver, 2017). These studies challenge the notion of established firms' aversion to change and invites further research into firm characteristics and behaviour through a transition. Thus, management studies can contribute with invaluable insight into micro-level transition behaviour.

The use of different approaches to investigate complex topics is the optimal way to address such topics, but a too broad scope for this master thesis. My contribution is only a snapshot of how the firms I interviewed experience and feel about the transition they are part of, diversifying as a supplier from O&G to the renewable energy sector. This contribution will not give an absolute answer to how best govern a transition to help firms make this shift, but it is a small contribution with certain recommendations. The limitations of the socio-technical systems perspective and the MLP specifically, have served as essential inputs when formulating my research questions and establishing an analytical framework that encompasses and make up for the aforementioned shortcomings. Therefore, based on criticism of the systems perspective, I will study the sustainability transitions from O&G to renewables from a micro-perspective.

3 Firm diversification as part of the sustainability transition

The objective of this thesis is to study firm diversification as part of the sustainability transition. As such, it is also a contribution to the field of sustainability studies, where the system approach has dominated. This study also informs policy makers on barriers to diversification. In this chapter, I will introduce theory and concepts from management studies, which I will use for my analytical framework, the perspective from which I examine and analyse my data. Hence, this chapter contributes to achieving the objective of this thesis by presenting theory relevant to study firm diversification, an aspect partly lacking in the sustainability transition literature today. I have chosen to separate this section from the previous chapter as that serves as a backdrop and review of the field sustainability transitions. My analytical framework, presented later on, enables me to take into account aspects the systems perspective is lacking, and also allows me to employ frameworks and perspectives not that frequently applied to study sustainability transitions (Farla et al., 2012).

3.1 Management studies and sustainability transitions

Management studies have investigated firm behaviour concerning sustainability transitions in numerous ways, but rarely with a direct link to the sustainability transitions literature (van Mossel et al., 2018). The focus has instead been part of a broader theoretical and empirical discussion about management, entrepreneurship, and strategy (Hahn, Kolk, & Winn, 2010). Theories have evolved around how established firms behave during transitions, with the firm in focus and not its part in the transition (van Mossel et al., 2018, p. 46). A review on sustainability research and management theories revealed that the environmental dimension is treated as an attachment to mainstream management research, despite a growing number of research linking these two research traditions (Kallio & Nordberg, 2006). Markard's (2017) review of management studies and its work with sustainability challenges found that management studies generally have a limited focus that misses out on the broader context of sustainability issues. He also found that topics related to sustainability transitions still are lacking from top journals within the management field, and established approaches restrict management researchers. There is also a debate whether or not today's research strand within management studies contributes to the sustainability issue at all, considering its focus often being on the firm and wealth creation (Markard, 2017). This criticism covers both management studies more generally and a substantial body of literature within its field that is

corporate sustainability literature (Markard, 2017). Amongst other things, corporate sustainability encompasses a focus on how firms react to sustainability challenges (Aragón-Correa & Sharma, 2003; Bansal & Roth, 2000) and how firms respond to climate change (Buhr, 2012; Wittneben, Okereke, Banerjee, & Levy, 2012).

Within the field of management studies there exist several theories on established firms and their behaviour (van Mossel et al., 2018). The theories have different understandings of “the firm”, how it behaves during transitions, and how and what factors regulate its behaviour (van Mossel et al., 2018, p. 46). Today, different theories draw upon inspiration from a wide range of disciplines, such as sociology, economics, management, psychology, and biology (Baum & Rowley, 2017). Theories conceptualize firms differently, e.g. the resource-based view of the firm (RBV), which views the firm as a collection of resources (van Mossel et al., 2018, p. 46). What they all share is a firm-oriented focus on firm characteristics and behaviour. This is a perspective partly lacking in the MLP, the prominent approach when studying sustainability transitions. Still, studies that link management studies and the sustainability transition today are not without flaws. Bansal and Song (2017, p. 131) argue that researchers in the field should be fearless and “expose new forms of knowledge at the frontiers of and bridges between normative and systems logic”. I, therefore, frame my study of firm diversification from O&G in the broader sustainability transitions context. I highlight that firm diversification is only one type of response to transitions. Geels and Schot’s (2007) four transition pathways is another example, where the timing and nature of interaction between the three levels niche, regime and landscape, result in various responses by the different actors. For example, in the transformation path, the regime experiences moderate pressure from the landscape while the niche-level is not yet fully developed. Regime actors, i.e. established firms, respond by re-orienting themselves and their technological development through incremental change (Geels & Schot, 2007).

3.2 Firm diversification

Multiple theoretical frameworks have investigated firm behaviour and characteristics of firms that diversify from one market to another (van Mossel et al., 2018). A central theory to explain diversification at the firm level is the RBV. A core element of this theory is that firm competitiveness is based on the resources the individual firm possesses (Penrose, 1959; Wernerfelt, 1984). The theory is often used in a context to investigate firms diversification,

meaning to enter a new market, usually through internal growth, mergers or acquisitions (Helfat & Lieberman, 2002). Diversification can either be related or unrelated, respectively depending on if entry of the new market is based on existing resources or not (Anand et al., 2016; Helfat & Lieberman, 2002). A good match between a firm's resources in one market and the resources needed to succeed in a new market, the higher the chance of that firm's survival and success in the new market (Helfat & Lieberman, 2002). The use of existing resources to succeed in a new market is corresponding to Schumpeter's notion of the use of existing resources in new combinations to "create" innovations (Schumpeter, 1934).

Relatedness is about common factors between sectors (Lemelin, 1982; Rumelt, 1982). Hence, related diversification allows firms to exploit existing resources and is less demanding compared to unrelated diversification (Anand et al., 2016). The use of resources from one market in a new one, might not only result in replication but recombination with other resources (Helfat & Peteraf, 2003). This can create synergies back to the original market resulting in resource renewal in the current market. The idea of resource combination makes use of the notion of knowledge recombination in innovation (Kogut & Zander, 1992). In the case of unrelated diversification, firms are lacking the right resources to enter the new market and need to acquire new and different resources, in addition to integrating and making them compatible with their existing ones (Helfat & Lieberman, 2002; Helfat & Peteraf, 2003). Hence, unrelated diversification is atypical, demanding more effort compared to related diversification, and therefore considered comparable to radical innovation. Related diversification has more in common with incremental innovation and is more of a continuum from existing markets to new markets (Helfat & Lieberman, 2002).

A diversification process has many aspects and takes place along multiple dimensions: knowledge concerning technology, market properties, innovation management and production (Anand et al., 2016; Helfat & Peteraf, 2003). It is, therefore, a complex process that may transpire for several reasons. Firms diversify either because they can, meaning they have excessive or available resources, or because they have to for continued survival, simply put (Anand et al., 2016). Mäkitie (2019) found that firms within the O&G sector diversifying to floating wind power (FWP), pursued this line primarily because of the perceived effects of resource redeployment, in addition to an understanding of the energy transition transpiring in their sector. Hansen and Steen (2015) support the notion of exploiting a firm's existing

resources in a new market, expected to continue growing. They also found that some firms might use the prospects of the OWP industry to attract new human resources to deploy back into the O&G market. The expectation of market opportunities and possibilities to leverage existing resources in other markets may motivate to diversify as part of the sustainability transition (van Mossel et al., 2018; Wesseling et al., 2015). Generally, the motivation to diversify is complex, and not just a one-factor cause. Examples of typical motivations are the opportunity of redeploying existing resources, to build a broader resource base to create a more rigid organization, to achieve growth in term of revenues, and to meet customer demands (Reed & Luffman, 1986).

Part of related diversification is to redeploy resources from one area to another. Penrose (1959) defined the capacity to redeploy resources as necessary for the continued growth of the firm. Anand et al. (2016) have categorized diversification and resource redeployment into two groups: intra-temporal redeployment and inter-temporal redeployment. The first one refers to cases where resources are shared between markets, and the latter one to cases where resources are withdrawn from one market completely, meaning a firm exits a market, to redeploy them into another market (Anand et al., 2016; Helfat & Peteraf, 2003). Intra-temporal redeployment can often be related diversification, and inter-temporal redeployment is often as a result of declining markets and can constitute both related and unrelated diversification (Helfat & Eisenhardt, 2004). Both intra- and inter-temporal redeployment fall under the concept of internal resource redeployment as they compromise the movement of internal resources inside the firm. External resource redeployment happens via open markets, e.g. asset divestiture and outside contracting (Anand & Singh, 1997; Teece, 1982). Sudden loss of market is an essential cause for inter-temporal resource redeployment, but firms may also choose to leave a market “voluntary” as a result of shrinking demand and output (Anand & Singh, 1997; Helfat & Eisenhardt, 2004). Firms may choose to diversify to improve their performance in changing external conditions (Zahra & Covin, 1995), to secure future revenue streams (Mcgrath, Venkataraman, & Macmillan, 1994), to achieve strategic renewal (Guth & Ginsberg, 1990; Mäkitie, 2019), or to realise excess resources (Barney, 1991; Penrose, 1959). Firms making a strategic decision to diversify raises issues of managerial dimensions on whether to focus on short-term revenues or invest in future business opportunities. Managerial decisions are part of the internal selection environment. The external selection environment encompasses changes in demand, policies, access to raw material, and science, amongst others (Helfat & 20

Peteraf, 2003, p. 1004). The drivers and motives for firm diversification in the diversification literature and the RBV are first and foremost about making use of relatedness, and exploiting existing firm resources (Barney, 1991; Penrose, 1959; Wernerfelt, 1984).

3.3 The resource-based view of the firm

The RBV is a theoretical approach for investigating firms diversifying from one market to another and firm potential for developing sustained competitive advantage (Barney, 1991; Wernerfelt, 1984). According to the theory, the competitiveness of a firm is based on the resources the firm holds (Penrose, 1959; Wernerfelt, 1984). The term “resources” is defined and understood differently within the RBV community, but I will return to this shortly after presenting the context and development of the RBV. The theory is often used in a context to research firm diversification, but also firm development and survival are essential focal points (Anand et al., 2016). Penrose’s work with her book “The Theory of the Growth of the Firm” was the first to put a focus on firms as a more comprehensive collection of resources (Penrose, 1959). Penrose noted that firms attain knowledge and learn over time and that they over time also start using their resources more efficiently. The theory of the RBV was not accentuated until Wernerferlt’s seminal article “A Resource-based View of the Firm”, and have since then been a prominent theoretical contribution (Wernerfelt, 1984).

3.3.1 Firm resources

Previous models, e.g. models with an external point of view, have focused little on the idiosyncratic features of firm resources (Barney, 1991). As a result, environmental models have made two assumptions that simplify the understanding of firm competitiveness. The first assumption is that firms within an industry or a strategic group are homogenous, i.e. that they possess the same resources and hence also can make the same strategic decisions (Porter, 1981; Scherer, 1980). Next, scholars within the environmental model's tradition assumed that should heterogeneity occur it would not be sustained, as a result of high resource mobility soon returning firms to homogenous entities (Barney, 1986; Porter, 1980). These assumption does not suffice for the RBV that links firm resources, i.e. internal characteristics, with competitiveness. The RBV relies on opposite assumptions of environmental models: firms resources are heterogeneous and immobile (Barney, 1991).

Up until now, I have used the term “resources” when discussing the internal characteristics of firms. Resources are termed differently within the RBV community. Relevant for the RBV is not only resources but also capabilities. Amit and Schoemaker (1993, p. 35) define resources and capabilities as two separate entities, resources being “stocks of available factors that are owned or controlled by the firm”, and capabilities as “a firm’s capacity to deploy resources, usually in combination, using organizational processes to effect a desired end”. Here, covering both resources and capabilities are “assets”. Barney (1991, p. 101) define resources, the overarching concept, as all “assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness”. This definition covers almost everything that is strategically useful to the firm. Wernerfelt (1984, p. 172) is even more inclusive in his definition of resources, as they can be “anything which could be thought of as strength or weakness of a given firm. More formally, a firm’s resources at a given time could be defined as those (tangible and intangible) assets which are tied semi-permanently to the firm”. Firm resources can be both tangible, such as technological artefacts, facilities, and financial capital, or intangible, such as intellectual property, reputation, managerial know-how and other knowledge related capabilities closely interlinked with the firm’s technical- and managerial systems, skill sets and routines (Barney, 1991). Intangible resources are hard to imitate and thus often the source of sustained competitive advantage. The difference in definitions has generated some criticism because of the lack of distinction between input resources and the factors that enable the deployment of the resources, in addition to criticism against the lack of distinction between resources and how they contribute to a firm’s sustained competitive advantage (Kraaijenbrink, Spender, & Groen, 2010). Therefore, I will now continue my typology of firm resources to create a framework applicable to this study. I will use Barney’s umbrella term for the understanding of resources.

Firm resources are categorized differently by various authors (Amit & Schoemaker, 1993; Barney, 1991; Helfat & Eisenhardt, 2004; Tanriverdi & Venkatraman, 2005). Barney (1991) separates firm resources into three categories: physical capital resources, human capital resources, and organizational capital resources. Others view human assets as part of organizational resources (Chatterjee & Wernerfelt, 1991; Farjoun, 1994). Either way, to separate resources into categories is to simplify reality as it can exclude the results of the interaction between the resources. However, I find it necessary for the analysis. Henceforth, I

will use the division of physical and organizational resources. Physical resources encompass the technology used, facilities, geographic location, and raw materials accessible.

Organizational resources are both planning processes, managerial capabilities, human and financial assets, identities of a company, systems of control and coordination, informal relations amid groups, and technology design and manufacturing capabilities (Barney, 1991; Helfat & Peteraf, 2003).

An alternative typology of resources that is complementary to the division between physical and organizational resources is Helfat and Lieberman's (2002) division of specialised and generalised resources (Teece, 1982). Specialised resources are particular to a specific setting, hence only functional in a limited number of businesses. These resources are closely interlinked with a specific technology, production process and operations related to a specific business. Specialised resources are deemed a source of competitive advantage (Pisano, 2017). Functional area resources, such as marketing and R&D, often fall into the category of specialised resources. One type of resource can be both specialised and general per definition, it may depend on context. Organizational knowledge can be specialised to a specific industry or technology, or general like the ability to manage large projects. Other resources, like patents and brand names, are always specialised. Generalised resources have a wider application field, e.g. organizational capabilities used for organizing a firm's day to day activities. Functional area resources are not always specialised resources, e.g. financial capital which is an example of a generalised functional are resource (Helfat & Lieberman, 2002). Generalised resources are as valuable as specialised resources as they are part of the resource base and therefore shape a firm's potential of acquiring specialised resources for a specific market. Generalised resources can thus serve as a foundation for the development of specialised resources (Pisano, 2017).

Key to diversification and redeployment of resources in the RBV is that generalised resources and capabilities have a higher application range and degree of transferability, compared to specialised resources (Chatterjee & Wernerfelt, 1991; Helfat & Lieberman, 2002; Pisano, 2017). This is sometimes referred to as the fungibility of resources, meaning that some resources, specifically generalised resources, are not locked to their current use, but can be redeployed (Anand et al., 2016; Teece, 1982). Specialised resources are to a higher degree

confined to their current use, and firms, therefore, tend to focus on exploiting these in the business context they are set (Teece, Pisano, & Shuen, 1997).

Another critical characteristic of resources is having a scale-free property (Anand et al., 2016; Levinthal & Wu, 2010). This happens when “the value of resources is assumed to not be reduced as a result of the sheer magnitude of firm operations over which they are applied” (Levinthal & Wu, 2010, p. 781). Resources have a scale-free property when simultaneously used in different markets without them losing any value or opportunity, in other words, without them having opportunity costs. Intangible assets like knowledge, patents, brand names and relationships with customers are typical scale-free resources (Anand et al., 2016; Helfat & Lieberman, 2002; Levinthal & Wu, 2010). This is not to be mistaken for generalised resources which can be applied more broadly, but still can have an opportunity cost by doing so, e.g. capital and financial skills, which can be considered non-scale-free resources (Helfat & Lieberman, 2002; Levinthal & Wu, 2010). Typical examples of non-scale free resources are a management team and manufacturing facilities (Anand et al., 2016; Levinthal & Wu, 2010). Use of a non-scale-free resource precludes its use in any other market at the same time.

Firm resources play a part in diversification processes through both economies of scale and scope. Firms that possess excess resources can realise these through diversification. Through economies of scale, firms can utilize a resource like brand name, a typical scale-free resource, in multiple markets and achieve a competitive advantage through reduced production cost. Through economies of scope, firms can deploy resources into different markets, creating synergies through low marginal cost. According to the RBV are firms with an abundance of resources, including generalised resources, more likely to diversify (Penrose, 1959; Pisano, 2017; Teece, 1982). Abundance here meaning in both quantity and variety. Thus, large firms are through economies of scale and scope better equipped to diversify. I will from here on refer to a more abundant resource base as a broader resources base. Firms with a broad resource base are in a better position to diversify into new markets, relative to firms with a smaller resource base. Firms with a broad resource base perform better both in original markets and markets entered through diversification (Miller, 2006). Quintana-García and Benavides-Velasco (2008) found that an advanced technological resource base and a high degree of innovation experience are essential factors of indicating a firm’s explorative and diversifying abilities. Not only the extent of available resources is of consequence for

indicating diversification, but also what type of resources present. Related diversification is more common as firms can utilize already possessed resources (Helfat & Lieberman, 2002). Numerous studies have identified the upsides of related resources, e.g. for strategic management (Farjoun, 1994; Markides & Williamson, 1996), products (Tanriverdi & Venkatraman, 2005), and technology (Breschi, Lissoni, & Malerba, 2003; Silverman, 1999).

Diversification can be seen as a balance between exploiting existing resources and pursuing incremental innovations in a firm's current market, and exploring new markets, resources and pursuing radical innovations (Pisano, 2017; van Mossel et al., 2018; Wernerfelt, 1984). The ability of a firm to both explore and exploit is termed organizational ambidexterity and is essential for the long-term survival of the firm (Tushman & O'Reilly, 1996). To be ambidextrous is to exploit the present and explore the future, i.e. firm diversification is to be ambidextrous. Nonetheless, ambidexterity is not only about the exploitation of the existing and exploration of the new, but also about being able to survive in the face of transitions, through having and developing the required resources and capabilities (O'Reilly & Tushman, 2008). The ability of a firm to continuously evolve its resource base is the possession of dynamic capabilities (DCs) (Teece et al., 1997). I will present this in greater detail later on.

Size of firms

The breadth of a firm's resource base can be a determinant for chances of firm diversification (Miller, 2006). Larger firms may more easily diversify from one sector to another as a broad resource base may be correlated with also having both generalised and specialised resources, where fungible resources are easier redeployed. Contrary to this, Thune and Mäkitie (2018) found that large and technologically specific and advanced firms were not that diversified compared to smaller firms with a less specific resource base. They also found that firms with extensive and broad competence bases were not more diversified than companies with narrower and more specific competences. This is in contrast to the common understanding of a positive correlation between firm size and diversification (Gourlay & Seaton, 2004; Grossmann, 2007). This understanding is rooted in the notion that large firms have broader resource bases, i.e. easier access to more resources and a better chance of excess resources, to make strategic decisions upon to pursue diversification (Penrose, 1959; Teece, 1982). The understanding of firm size can, amongst other things, relate to both the number of employees, the measure of total sales, and total revenues. Still, larger firms, no matter what definition

used, tend to have a broader resource base, enabling them to easier diversify to other sectors. The smaller resource base of smaller firms does, however, not have to be a drawback. They might not have the same opportunities in utilizing an abundance of resource for related diversification. However, as they are smaller, they are usually more responsive to market changes and more willing to act on the external changes and accept the risk that comes with it (Dass, 2000; King, Covin, & Hegarty, 2003; Rothwell & Dodgson, 1991). Larger firms can, to a better extent, absorb external shocks as they typically have a broader resource base and more products to build on after a crash in a market (Albers, 2019). The firms I study have already diversified from O&G to renewables, but it differs how far they have come in their diversification process.

Heterogenous and immobile resources

A firm can gain a “first-mover advantage” as resources are heterogeneous and immobile. A firm that gains insight or information that makes them pursue a new strategic decision that other firms do not may gain a first-mover advantage (Lieberman & Montgomery, 1988, 1998). Lieberman and Montgomery’s seminal work on first-mover advantage (Lieberman & Montgomery, 1988), was later further developed and connected with the RBV (Lieberman & Montgomery, 1998). As my focal point is not on the timing of entry for firms in a new industry and sector, I will not linger on the timing aspect. Worth mentioning, however, is that a firm might gain a resource position barrier as a result of first-mover advantage if the industry has heterogeneity and immobility of resources. When a firm attains a resource, that affects the cost for others to gain the same resource, putting them in a position of disadvantage (Wernerfelt, 1984). Barriers to entering a market can exist, but only if resources are heterogeneously distributed and the resources are immobile (Barney, 1991).

3.4 Dynamic capabilities

The RBV understands sustained competitive advantage and diversification from one market to another as a result of the characteristics of a firm’s possessed resources (Barney, 1991; Penrose, 1959; Wernerfelt, 1984). Even though this is a widely used framework in management studies, it criticized for lacking perspectives on why and how some firms have a competitive advantage in high-velocity markets compared to others, and how capabilities and resources are created (Eisenhardt & Martin, 2000; Pisano, 2017). The DCs framework has emerged from the RBV as a response to this criticism. DCs was first defined as “the firm’s

ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997, p. 516). A capability, understood as a collection of routines together with resources, enable a firm to carry out activities repeatedly (Winter, 2003). The DCs approach considers the RBVs focus on possessed resources as insufficient at explicating how a firm makes use of its resources to diversify (Pisano, 2017). Another definition incorporates this aspect to a greater extent by defining DCs as:

The firm’s processes that use resources—specifically the processes to integrate, reconfigure, gain and release resources—to match and even create market change. Dynamic capabilities thus are the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die. (Eisenhardt & Martin, 2000, p. 1107)

I will continue to use the term DCs when referring to this phenomenon, and not dynamic resources, even though I have already stated that all capabilities and assets are resources. DCs are not resources and capabilities in the RBV understanding. DCs are more in line with processes that can have an impact on resources. A firm can either have and utilize DCs or develop them through specific processes. The RBV has a focus on resources and the possibility of using existing resources to diversify. However, to utilize a firm’s resource, to be able to sense the possibility to utilize them and to succeed in such a process is to possess DCs (Ambrosini & Bowman, 2009). Hence, DCs can be considered the strategic “tool” needed to be able to realise a firm’s static resources.

Teece (2007) extended the DCs framework and classified them into three capabilities, that can also be understood as processes (Strøm-Andersen, 2019): sensing capability, seizing capability, and reconfiguring capability. The sensing capability is about learning and identifying both opportunities and threats based on possessed resources and the business ecosystem, meaning the community of organizations a firm resides in and the institutions that follow. To “sense”, firms must search and explore technologies and markets. If they can conduct both R&D or make use of others research, while also learning and understanding customer needs, they have a foundation for a strong sensing capability. A firm must be able to seize an opportunity after is it identified. This means to exploit it through new products, processes, or services. To move from sensed opportunity to new product requires a focus on

R&D-processes and commercialization activities. A firm is not always able to sense or even seize a sensed opportunity as especially established firms can be “held back” by path-dependency concerning organizational resources, strategies they choose and their understanding of a sensed opportunity. This can lead to biased decision making and limit established firms’ investments in radical innovation and their ability to pursue trajectories outside their business-market. Therefore, firms need to be able to reconfigure their resources, both tangible and intangible, and organizational structure, to be able to grow and diversify (Teece, 2007).

Managerial decision-making, an organizational resource, is essential to sense, seize, and transform a firm’s resource-base to address potential opportunities. Management is also shaped by previous trajectories and decisions made. The learning capability of a firm is thus, fundamental to its survival (Eisenhardt & Martin, 2000; Levitt & March, 1988). Even if a firm can sense an opportunity, it might not be able to act on it. As a consequence, firms may resolve to hire additional personnel to act as gatekeepers to be able to exploit these opportunities (Cohen & Levinthal, 1990). Prior knowledge and experiences restrict a firm’s ability to recognize, adapt, and act upon useful information and potential opportunities due to path-dependency. The capability assisting firms to overcome this is termed a firm’s absorptive capacity. A firm at a disadvantage not able to exploit potential opportunities might assign certain positions within a firm the job of gatekeeping. A gatekeeper will both search for opportunities, but also translates information from the external environment into information the firm can utilize and act upon (Cohen & Levinthal, 1990). Hence, a gatekeeper can serve as a link between a firm’s old market and already possessed resources and the new market.

3.5 Challenges when diversifying

Excess and available resources enable firms to diversify from one industry to another related industry (Teece, 1982; Wernerfelt, 1984). The same way resources can serve as an advantage, they can also limit a firm’s strategic options and possibilities to diversify. Already mentioned is the resource position barrier a firm might gain through the first-mover advantage in a new industry, making it more challenging for others to attain the same resource (Barney, 1991).

The RBV relies upon the assumption that firm resources are heterogeneously distributed and immobile (Barney, 1991). There thus exists a scarcity of resources both within individual

firms and in the external market. The balance between exploration, e.g. by diversification, and exploitation of resources in the existing market, can be a source of conflict and competition between resources. Not all resources are scale-free and without opportunity cost when redeployed to other markets (Andriopoulos & Lewis, 2009; Tushman & O'Reilly, 1996). Mäkitie (2019) found that firms redeploying resources from the O&G sector to FWP technologies experienced a conflict between using the resources in the new market instead of in the O&G sector. The deployment of resources between two markets can serve as a challenge when firms diversify. However, DCs can also function as tools for the exploitation of the existing and exploration of the new. Liu, Yu, and Wu (2019) found that exploitative DCs and explorative DCs enhance each other.

I have already elaborated on the fungibility of resources, and that generalised resources have a wider application range and are easier redeployed compared to specialised resources (Helfat & Lieberman, 2002; Teece, 1982). Specialised resources are necessary to have and acquire in any sector but are not that easy redeployed. Obtaining specialised resources when diversifying to a new sector may hence prove a challenge. Firms with a broader resource base, i.e. large firms, can easier diversify compared to smaller firms. Larger firms also perform better in both the new sector and the original sector (Miller, 2006). This can mean that smaller firms lacking a broader resource base, can experience it more challenging obtaining specialised resources needed in the new sector. Specialised resources are expensive and challenging to acquire, and can serve as a challenge and entry barrier to new sectors for smaller firms compared to larger firms (Sandvig & Coakley, 1998). On the other hand, lacking generalised resources to redeploy can also prove as a challenge and barrier when diversifying. Thune and Mäkitie (2018) found that firms within the O&G sector with highly specialised resources were less likely to diversify.

I investigate firms diversifying from the O&G sector to renewables energies in general, and not to one specific type of industry, e.g. OWP. Still, offshore wind is not part of the Norwegian market, as such, can a lack of a home market prove to be a barrier for firms diversifying into this industry (Normann & Hanson, 2017). Additionally, differences between the O&G industry a firm operates in and the renewable industry entered, can pose as barriers to diversification. Andersen and Gulbrandsen (2018, 2020) have identified several such

differences that require the development of new firm resources and targeted policies to lower the entry barriers.

3.6 Limitations

The RBV and DCs take an internal outlook, linking reasons to diversify and to which markets a firm diversify to, to what type of and the extent of resources a firm possesses. In general, are most theories often simplifications of reality, but necessary to understand complex situations. By conducting such a simplification, some aspect will, by definition, be omitted. The RBV lacks perspectives on how the social and institutional context of the firm affects the organizational analysis. The RBV postulates that a firm's resources are the primary source of decided strategies, decisions made, and competitive advantage. The external environment, constituting of both other firms and organizations, laws, social values, and traditions do not affect the firm. Hence, agents within firms always act rational and are economically motivated (Oliver, 1997). However, this is not the case. The RBV "has not looked beyond the properties of resources and resource markets to explain enduring firm heterogeneity. (...) it has not examined the social context within which resource selection decision are embedded" (Oliver, 1997, p. 697). The social context referred to can be regulatory pressures or incentives through policies, which also can affect a firm's direction and diversification strategy.

Still, I have chosen to not take an outside-looking-in view as the core assumption for the RBV is that firm performance is rooted in firm resources, and other theoretical frameworks with an external point of view root firm performance in the external environments (El Shafeey & Trott, 2014). This is a contrasting view not compatible with the scope of this thesis. The RBV has been criticised for being a static theory, failing to capture the dynamic features of resource utilization and creation like learning, knowledge creation, and innovation (El Shafeey & Trott, 2014; Priem & Butler, 2001). Additionally, the RBV is criticised for not having a clear distinction between input firm resources and resources that enable an organization to seize opportunities (Priem & Butler, 2001). Therefore, I incorporate the DCs approach with the RBV as DCs make up for the aforementioned limitations of the RBV (Pisano, 2017).

3.7 Analytical framework for studying related firm diversification

Based on the above theoretical contributions, I present my analytical framework for related diversification in Figure 1. The framework is based on a firm's possessed resources as a basis

for firm diversification. Motivation based on excess and available resources coupled with external pressure can lead firms to utilize their resources and DCs through sensing, seizing, and reconfiguration processes. Hence, a firm can redeploy resources from fossil fuels in the O&G sector to the renewable energy market. The analytical framework, therefore, integrates the RBV and DCs approach, as complex topics are best studied by using different paradigms (Teece et al., 1997).

To investigate why firms diversify, I am interested in their motivations and possessed resources as a guide to why they chose the renewable market. To investigate how firms diversify it is relevant to investigate the resources a firm might redeploy in the context of diversification from O&G to renewables. As firms are redeploying a technology, a service, or a degree of technological competence, a focus is on technological and organizational resources. I will also look for generalised and specialised resources to investigate the theory of fungibility of resources (Anand et al., 2016; Teece, 1982).

The sensing processes of DCs utilize firm resources to align the business with firm motivation and reactions to external pressure. The sensings processes also investigate the renewable market and discover gaps in the resources needed to take a position in the new market (Teece, 2007). A crucial part of the sensing process is, therefore, the learning capabilities and a firm's absorptive capacity (Cohen & Levinthal, 1990; Levitt & March, 1988). The seizing processes are about addressing opportunities through mobilizing resources. As firms are diversifying, they might need to improve their resource bases and gain new knowledge and resources, both technological and organizational (Teece, 2007). This can involve investments in technology and human resource to absorb new knowledge and apply it for commercial ends (Cohen & Levinthal, 1990). By seizing sensed opportunities, firms are being ambidextrous (O'Reilly & Tushman, 2008; Tushman & O'Reilly, 1996).

The reconfiguring process of DCs serves as a theoretical foundation for analysing how and if the firms had to restructure their organizations. An essential part of reconfiguring is the rearrangement of resources and organizational structures through the expansion of human capital (Liao, Kickul, & Ma, 2009; Teece, 2007). The resources a firm possesses allows it to take a position within a sector and DCs allows it to update and alter its resource base to address new sectors (Ambrosini & Bowman, 2009; Eisenhardt & Martin, 2000). To research

what barriers are associated with diversifying from O&G to renewable energies for established supply firms, I will investigate how possessed and not possessed resources can pose as challenges with a basis in the RBV and DCs.

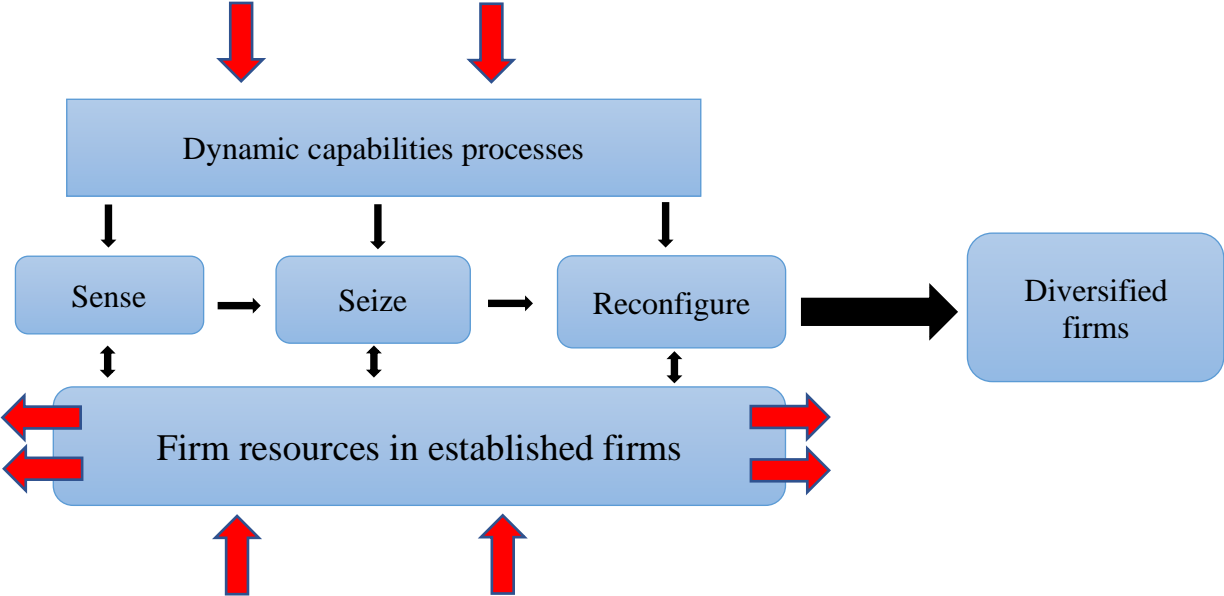


Figure 1: Analytical framework for studying related firm diversification. Red arrows represent barriers firms experience when diversifying, both from within the firm and from the external environment.

4 Methodological approach

In this chapter, I will present my methodological choices for conducting this study. I have taken a qualitative approach and will discuss the reasoning behind this choice, what data collecting techniques I used, and how the data was analysed. I will also elaborate on rigour in qualitative research, ethical concerns, and possible limitations of my study.

4.1 Qualitative research

My topic of study, firm diversification from O&G to renewables, can be investigated by different approaches. Whether a researcher opts for qualitative or quantitative methods has to do with the type of research questions one wants to study and not only what topics but also what aspects of those topics are under scrutiny. My type of research questions requires answers that have to do with subjective perception and experiences regarding the transition from being an O&G supplier to diversifying to the renewable energy sector. A qualitative approach is suitable for researching this, as it is well suited for studying social structures or investigating individual experiences (Winchester & Rofe, 2016). Qualitative research answers questions like “why” and “how”. In contrast, a quantitative researcher would ask “how many” and focus on quantification and establishing statistical relationships about differences and similarities between objects of study (Stratford & Bradshaw, 2016). Qualitative research is therefore also named intensive research or idiographic research as it seeks detailed knowledge through conducting in-depth studies, usually with a limited number of units of observation (Stratford & Bradshaw, 2016; Yin, 2011). Quantitative research on the other hand usually has large data sets with the purpose to identify patterns and regularities, to be able to generalize about a population, based on for example questionnaires executed within a part of the population in focus (Stratford & Bradshaw, 2016). Quantitative research is, therefore, also known as extensive research or nomothetic research and differs on many levels from qualitative research (Baxter, 2016, p. 134).

When conducting a thorough study, not only what to investigate, but also how to research the topic is fundamental to research design and formulation of research questions. Both approaches, quantitative and qualitative, have advantages and disadvantages. The myth about qualitative research to be inferior to quantitative, as the latter is said to be “focused, objective and generalizable”, no longer has any hold. Today, they are both considered equal and

complementary, as they can study the same topic, but in different ways (Winchester & Rofe, 2016, p. 18).

Transition research is usually conducted by a qualitative approach with the use of case studies (Markard et al., 2012, p. 964). I have also chosen this approach as I aim to gain insight into how firms reflect on and have experienced the process of diversifying to renewables. Hence, I will be able to elaborate on social, economic and political structures that characterize firms diversifying from O&G to the renewable sector.

4.1.1 Case study research

The case study approach is well suited for studying a social phenomenon and groups of individual actors to establish a picture of a complex process through the use of a “case” (Yin, 2009, p. 4). A “case” is an empirical investigation of a contemporary phenomenon, where the purpose is to gain an understanding of similar or larger classes of that phenomenon (Baxter, 2016, p. 130; Yin, 2009, p. 18). The case study approach is, therefore, suitable for researching questions on “why” and “how” a phenomenon takes place (Yin, 2009, p. 13). The data collection methods used in this thesis: interviews, observation, and content analysis of documents are methods that go well with the case study approach (Yin, 2009, p. 101). Case studies can provide information that calls attention to the limitations of the theoretical concepts used to study the case (Baxter, 2016, p. 131). Findings from my case study can serve as a basis for a broader understanding of firm diversification and sustainability transition research by identifying characteristics of diversification processes and barriers.

Although the case study approach investigates a specific phenomenon, the findings are rarely limited to only that specific case and a researcher will look for similarities among related cases (Baxter, 2016, p. 134). Generalizability is, therefore, achievable in qualitative research. Quantitative research with large probability samples achieves statistical generalizability. Using findings from case studies to say something about similar cases is known as an analytical generalization (Baxter, 2016, pp. 142–143). Such generalization is accomplished by selecting suitable cases and by seeking to create theory on a phenomenon (Yin, 2009, p. 43, 2011, p. 100). The generalizability of a case study is closely connected to the quality and rigour of the study. I will return to this in a later section.

There is no explicit guide on how to conduct rigorous qualitative research. Therefore, it is essential to pay attention to the design of the case study (Yin, 2009, p. 26). This chapter is a response to this in order to ensure rigour and transparency of my research. The case, firm diversification from O&G to renewables, is investigated by collecting data through interviews, content analysis, and observation and informal conversations. Interviews are my primary data source as only this method provides in-depth knowledge into how individual firms diversify (Dunn, 2016). The case is, to some degree, theory-generating in that it uses inductive logic to move from empirical findings and analysis to concepts and theory (Baxter, 2016, pp. 136–139). Still, the analysis of the empirical findings is conducted based on my analytical framework and previous research.

There are limitations of the case study approach. Although one strives for analytical generalization, it is not always achievable. There are possibilities to draw conclusions from this case study that can apply to a larger population of general firm diversification from O&G, as relatively similar case studies have been conducted previously on firm diversification from O&G to OWP (Andersen & Gulbrandsen, 2020; Mäkitie et al., 2018; Steen & Hansen, 2018; Steen & Weaver, 2017).

4.1.2 Choice of case

A case study can be highly concrete, e.g. a specific small group of people, or less concrete by studying a specific community, decisions or a phenomenon (Yin, 2009, pp. 32–33). Firm diversification alone is not a case study, but the study of diversification among supply firms from O&G to renewables, inhabit possibilities to generate valuable data. The case has value on its own, as it generates information about firms transitioning to more sustainable industries. Additionally, it can enhance knowledge to the general understanding of firm diversification from O&G. As such, the case can prove to be valuable to the understanding of sustainability transitions by generating knowledge about firm processes and barriers (Baxter, 2016, p. 131). I use the term “case”, even though my topic of study does not fall under the definition of the typical single-case design with a single-unit of analysis. My study is a type of an embedded single-case design, meaning multiple units of analysis for a single case (Yin, 2009, p. 46). My case is not a study of a single firm diversifying, but rather several firms as units of analysis. This creates a case bounded by theory, rather than the empirical context surrounding one firm. My units of analysis together, i.e. the firms, are part of an overarching

case. This contributes to a holistic understanding of Norwegian supply firms diversifying. For simplicity reasons, I will continue the use of the phrase “case” to my topic of study.

In this case study, I have conducted interviews with several firms, usually with one informant from each. Another approach common for case studies is to investigate a specific technology by undertaking interviews with several informants from the same firm and other actors with a link to the technology in question (Yin, 2009, pp. 116–117). I have, regardless of technology, interviewed different firms diversifying to investigate experiences related to the whole process of transition from a firm’s perspective. I have not interviewed other actors in the energy system, as the purpose of this study is the firm perspective and not a systemic understanding of sustainability transitions. I chose the case from a personal point of interest in the topic of sustainability and the limited research present on individual actors in such processes.

4.2 Data collection

It is essential to gather data from different sources by data triangulation to ensure rigour in qualitative research (Stratford & Bradshaw, 2016, p. 127; Yin, 2009, p. 116). I have collected data from in-depth interviews, scoping interviews, content analysis of documents, observation and informal conversations, and to some extent from the use of questionnaires. I have also triangulated my data through the use of different perspectives from my informants.

Triangulation ensures rigour by avoiding the pitfalls of relying too much on a single source (Stratford & Bradshaw, 2016, p. 127).

4.2.1 Sampling

To answer the research questions, I have conducted interviews with firms diversifying from O&G, as my primary data source. The selection and recruitment of informants can impact the information collected and the findings of the study (Stratford & Bradshaw, 2016, p. 123). In qualitative research, the rigour of a study is not measured in the number of informants, as representativeness is not the intention. Instead, the organization of the research is important, but also that recruited informants are relevant and that researchers themselves evaluate when to stop gathering data (Stratford & Bradshaw, 2016).

I was fortunate early on in this thesis to come in contact with the coordinator of the Energy Valley cluster, a collaboration of firms where they focus on technology for the energy future. They were conducting inquiries into member firms by sending out a questionnaire. I developed questions regarding firm presence in different markets, to identify possible firms relevant for my case study. From the data collected, I located candidates and initiated contact through e-mail with all the firms that met my criteria. All the informants are selected through criterion sampling, a form of purposive sampling (Stratford & Bradshaw, 2016, p. 124). The criterion the informants had to meet was to be a supply firm operating in O&G that also have diversified to a renewable industry. The firms differ in how far they have gotten in that process.

Table 1 shows a list of firms and informants, both anonymised. Initially, I asked to interview with one informant in each firm, but two firms wanted two people present in order to enlighten the topic better. In addition to firms, I have highlighted firm size as this through analysis manifested as an essential parameter. Size is by the Norwegian scale (NHO, 2018).

Table 1: An anonymised overview of informants, the corresponding size of the firm and interview setting. * transcripts from previous interviews conducted by academic staff on a similar topic, ** supply firm only operating in O&G (scoping interview).

Firm	Informant	Size	Interview setting
1	F.1	Large	Physical meeting
2	F.2	Medium	Physical meeting
3	F.3	Small	Digital
4	F.4	Medium	Physical meeting
5	F.5	Small	Digital
6	F.6	Small	Digital
7	F.7A and F.7B	Medium	Physical meeting
8	F.8A and F.8B	Large	Physical meeting
9*	F.9	Medium	Phone
10*	F.10	Medium	Phone
11**	F.11	Large	Physical meeting

I have had to discard data from one interview as it through the interview, became apparent that the firm, after all, did not meet my criterion for the case. This firm is therefore omitted from the table and is not part of my data set. By that time, I had not conducted all of my interviews and identified a need to gather more informants. This is a time-consuming process, and I had already spent quite some time arranging and setting up the other interviews.

Through my supervisor, I, therefore, got access to transcripts from previous interviews conducted by academic staff on a similar topic and in similar types of firms as this thesis. Firm 9 and 10 in Table 1 represent data from such transcripts.

Questionnaire

I briefly want to present the technique of questionnaires as I used this initially to gain access to possible informants. Questionnaires are well suited for asking standardized questions to a specific group (Mcguirk & O'Neill, 2016, p. 246). I did not use this technique to gather data used in the analysis, but to gather information about possible informants. From data from the questionnaire, I got an insight into what firms were operational in both O&G and renewables. The cluster, with member firms rooted in O&G, have recently broadened their scope into general energy production and it was therefore particularly relevant for me to initially cooperate with them. I did not take part in sending out the questionnaire or analyse the data in any way, except for gaining access to the datasheet to obtain information regarding the questions I had formulated. The cluster has used data from the questionnaire, together with data from a few in-depth interviews, to develop a report of the state of their member firms. This report is not publicly available and is not part of this thesis.

4.2.2 Conducting interviews

Qualitative interviewing is a renowned technique for data collection (Patton, 2002, p. 340). It is different from the regular conversation, in that there is a clear purpose of the interview situation. An interview takes place to gather information about a non-observable phenomenon to investigate complex behaviour, motivation, or experiences. The gathering of such data is a strength of the interview technique and is difficult to acquire from quantitative data or through observation alone (Dunn, 2016, pp. 149–150). Interviews usually follow an already prepared structure and thus require skills, preparation and rehearsal (Patton, 2002, p. 340).

Scoping interviews

As the cluster coordinator in Energy Valley was conducting in-depth interviews with individual firms that had answered their questionnaire, I joined in on some of the interviews. This gave me insight into the topic I was studying and a chance to develop my research questions. Thus, I got to refine the wording and identify any misplaced use of technical terms that were unfamiliar to the informant, and hence needed removing. As the interview situation

demands preparation and skills, the scoping interviews provided me with an opportunity to get comfortable with the setting, essential to achieve rapport, a productive interpersonal climate between researcher and informant (Dunn, 2016, p. 160). Yin (2009) highlights the significance of a pilot study, both to prepare the researcher, but most importantly, to increase the reliability of the study. I will return to the topic of reliability.

Interviews

Transcripts from interviews are the primary data source in this thesis. All the interviews I conducted took place in January 2020 and early February 2020 and lasted between 45 and 70 minutes. Some of the firms interviewed are located outside of Oslo and I, therefore, conducted these interviews digitally. There are drawbacks of conducting interviews digitally, as it can be challenging to achieve rapport and understand visual cues. The challenges of recognizing paralinguistic clues when conducting digital interviews, meaning tacit signs mostly only visible in face-to-face interviewing, can pose a barrier to understanding the informants' level of comfort about the topics discussed (Dunn, 2016, p. 181). However, both the topic and questions asked for this thesis do not inquire into personal experiences as I have researched the firms' processes, not the informants themselves. I had also conducted and taken part in four physical interviews, where two were the scoping interviews, before having a digital interview. Therefore, it does not appear that the digital format has posed any barriers to the truthfulness or the degree of information the informants shared. The advantage of digital interviewing is a reduced interviewer effect, meaning a less formal setting, as opposed to meeting face-to-face in a meeting room. The formality of the interview situation can affect what and how an informant conveys information (Dunn, 2016, p. 179). The interviews conducted face-to-face was in a meeting room at the informants' workplace after their choosing. Still, I had presented the opportunity to meet on "neutral" ground, e.g. a café.

All interviews started with me presenting the project, going through the consent form and them agreeing to audio recording of the interview. The interviews follow a pyramid structure, meaning I started with easy questions about the informant's position and responsibilities, before proceeding into questions that demands reflection and thought (Dunn, 2016, p. 156). This facilitates a comfortable setting for both informant and researcher. I found this particularly helpful as I am relatively inexperienced with the interview situation. The

interviews finished off by allowing the informant to add additional information that had not come up during the conversation.

I developed a semi-structured interview guide for my in-depth interviews (see Appendix A). This means I developed certain questions and topics to be discussed beforehand but still left room for flexibility to investigate topics that came up (Dunn, 2016, p. 158; Patton, 2002). Some questions matured as I conducted the interviews and became aware of what manifested as essential themes. The interview guide was purely a guide and not followed strictly. The conversation developed differently from interview to interview, and thus not every question was necessary to ask in every setting explicitly. Some of my follow up questions functioned as a checklist, securing essential topics got covered. A limitation of a semi-structured interview guide is that the wording of not prepared questions might affect the answer (Patton, 2002, p. 349). For all interviews, I used both primary questions meant to initiate a new topic, and secondary questions to encourage the informants to expand on already discussed topics (Dunn, 2016, p. 154). Thereby also facilitating a more dynamic conversation. I also used secondary questions to follow up on what the informants said, to make sure I did not misinterpret the meaning of what they conveyed. I based the interview guide on topics I deemed of interest to answer my research questions. We talked about development processes in O&G versus renewables, motivation for pursuing renewables, the process of diversifying, barriers experienced, and thoughts about their future in renewables. I want to highlight that the interviews were conducted in Norwegian and have therefore translated the quotes to English personally. Any misinterpretation stemming from this endeavour is solely my responsibility, including any information lost in translation or misunderstood intentions. The analysis was, however, done in Norwegian to minimize such a risk.

There are several challenges in conducting interviews. Through my study, I interviewed both managers and CEOs. These are part of the internal selection environment making strategic decisions about where to focus a firm's resources. Such interviewing is a type of elite interview, where the power balance might shift from researcher to informant. For a researcher, this is important to be aware of, as it can affect how the researcher perceives the answers (Smith, 2006). I did not experience elite interview as a barrier, instead, I felt welcome at all the firms I visited and talked to online, and they were all forthcoming, contributing to a rich data set. Further, since the quality of the interviews is reliant on me as a researcher, I

conducted scoping interviews and thoroughly crafted the semi-structured interview guide. I was watchful of not asking dichotomous questions, poorly worded questions or leading questions that can lead to biased answers and a lack of data on essential topics (Patton, 2002).

4.2.3 Observation and informal conversations

I have used observation and informal conversations to complement my data set (Yin, 2009, p. 110). Observation has typically three functions: to count a phenomenon, to contribute with complementary evidence, and to present a contextual understanding of a phenomenon (Kearns, 2016, pp. 314–315). I attended three seminars, one physical and two through streaming. The streaming seminars: “Does the electricity grid have capacity for the green shift?” and “How to realize the world’s largest floating wind farm?”, only served as background information to gain a deeper understanding of the topic. I want to highlight the physical seminar I attended. This was also a workshop about the offshore wind market: “Energy Valley’s Offshore Wind Workshop”. There I gained a preliminary understanding of challenges in the OWP supply chain from operators and the supply firms’ perspective. I also conducted informal conversations and established contact with potential informants. The seminars attended, and informal conversations conducted have first and foremost served as background information, to get a better grasp of my case. This data material is not used directly in the analysis, but rather as a supplement. A proper understanding of the case to be studied is vital to develop a rigorous and suitable interview guide (Emerson, Fretz, & Shaw, 2011).

When I participated in seminars, I did it as observer-as-participant (Gold, 1958, p. 221; Kearns, 2016, p. 319). This means I attended by a single visit in a relatively formal setting and was part of the crowd, only letting my purpose be known to people I talked to face-to-face. As it is challenging gaining access to seminars and other observational sites, I used my time at the workshop carefully. I was wary not to transfer my interpretations of the topic to the “informants” I conducted informal conversations with (Kearns, 2016, pp. 314–315).

4.2.4 Content analysis of relevant documents

I have analysed white papers and other relevant reports for the energy transition, to look for statements that corroborate, contradicts, or elaborates on different dimensions of the process of firm diversification to the renewables sector. These documents have served as

complementary data in addition to observation and informal conversations. I have also conducted a content analysis of interview transcripts. However, in white papers and reports, I looked specifically for information about transition targets, diversification strategies, and policies aimed at facilitating the transition. When undertaking a content analysis, it is common to search for pre-decided topics (Dunn, 2016, p. 173). By doing manifest content analysis, I looked for visible information about sustainability-related goals. Secondly, I conducted a latent content analysis, meaning I searched for themes and the deeper meaning of the content (Dunn, 2016, p. 175). I looked for stated goals that were in contradiction with policies, but also what the documents did not say. As will be evident in my empirical findings chapter and discussion chapter, the lack of stated goals is a challenge.

4.3 Data analysis

After conducting each interview, I wrote down immediate thoughts there had not been time to scribble down during the interview, referred to as field notes or memos (Cope, 2016, p. 374). The memos proved essential for writing down personal reflections, meaning aspects of how I conducted the interview and what I could have done differently. Secondly, they were necessary for analytical reflections, meaning I identified a preliminary theme or highlighted information I considered to be important. Memos can complement audio recordings, as they supplement what the spoken word cannot (Dunn, 2016, pp. 169–170). I transcribed the interviews shortly after they were conducted, where I also noted memos of recurring statements by the informants or thoughts I had during the transcribing process. Transcribing is time-consuming, but still vital as the researcher can familiarize themselves with the data once again (Dunn, 2016, p. 170). I gave all my informants the choice of seeing the quotes used in this thesis to ensure they could speak freely, which a few requested. Additionally, both firms and informants are anonymised.

I used NVivo to code and analyse my interviews. The software allows the researcher to organize and analyse data in a way that ensures rigour, but also transparency of the analysis (Cope, 2016, pp. 388–389). When coding, the purpose is to search for patterns or regularities in behaviour or processes, documented in the data. A passage of text is decoded when the researcher attempts to understand its core meaning, and coded when it is decided what “label” to give the text (Saldaña, 2009, pp. 4–5). I conducted both manifest and latent content analysis in NVivo. I first looked for surface themes and repetition of words, according to manifest

content analysis, before looking deeper into the meaning of the data set, according to latent content analysis (Dunn, 2016, pp. 173–175). After the manifest content analysis, I had five broad themes (in random order): motivation, firm resources, learning, internal barriers, and external barriers. After the latent content analysis and having searched for themes not only recurring in that they were spoken, but the deeper meaning and connection between the spoken word and what it meant, I ended up with several important themes presented in my empirical findings chapter.

As I have used a qualitative approach for this study, the analysis and interpretation of data have taken place continuously along the process and not only during the use of NVivo (Cope, 2016). Coding is an iterative process and has no distinct finish line. Therefore, also, memos were used as a coding instrument to secure an initial analysis and rigour of the research (Bailey, White, & Pain, 1999, p. 172). The themes presented in this thesis are based on what appeared as crucial to the informants, but also on findings from the content analysis of documents. The themes became apparent through the analysis. However, I crafted some of the initial codes beforehand based on my research questions.

4.4 Quality and rigour

Qualitative research delves into emotions and experiences (Winchester & Rofe, 2016, p. 5). Therefore, a researcher needs to be reflexive about one's research, through constant self-scrutiny of themselves and the research process (Dowling, 2016, p. 34). A reflexive approach is vital to ensure reliable and rigorous qualitative research (Stratford & Bradshaw, 2016). I will now briefly discuss four parameters that expand on the rigour of my research: Validity, reliability, reflexivity, and positionality.

4.4.1 Validity and reliability

Validity refers to whether or not the parameters can measure what meant to measure, said differently, if the findings correctly reflect the data (Hay, 2016, p. 457; Noble & Smith, 2015). Reliability refers to the rigour and consistency of the research process, ensuring that the data collection is not biased (Hay, 2016, p. 453; Noble & Smith, 2015). These are terms used initially in quantitative research and are not used consistently in qualitative research as researchers have not agreed upon their role in qualitative research (Noble & Smith, 2015). Further, objectivity is not as crucial in qualitative approaches compared to quantitative, as

social interactions and the researchers own personal assessment are essential parts of the approach (Dowling, 2016, p. 39). Therefore, what I have brought with me from these concepts is to strive for trustworthiness and neutrality of me as a researcher and the research itself, by transparency and reflexivity of my positionality. As far as it is possible, the findings of this study are verifiable.

4.4.2 Reflexivity and positionality

By maintaining constant critical reflexivity through the study, I have been self-critical of my own biases, the wording of my questions, and expectations of what the informants were going to share with me. In qualitative research, one is never truly objective, but by being aware of this throughout the research process ensures rigour and quality of the analysis and findings. The use of memos has helped to ensure transparency and facilitated critical thinking (Dowling, 2016, pp. 34–35). By being reflexive about my positionality, I believe my thoughts on the topic of sustainability transitions have not affected my analysis nor findings. However, by researching a topic related to climate concerns, it was challenging not letting the informants know my thoughts on the topic. This can have affected the answers I got as they could have shared information that I “wanted” to hear. Still, I am not under the impression that this happened to a great extent, as I was understanding and agreeing with the informants in that a firm cannot alone be responsible for securing the renewable energy future, a concept brought up by several informants.

4.5 Ethical concerns

As a researcher, there are several ethical concerns to take into account. This research project has been notified and approved by NSD – The Norwegian Centre for Research Data, as I have handled personal information and recorded audio (see Appendix C). When conducting this research project, I have had obligations to the firms and informants involved, and also to the general public (Dowling, 2016, pp. 30–31). In this study, I have not handled particularly sensitive information or had any informant belonging to a vulnerable group, but still chose to anonymize the interviews to facilitate an interview situation where the informants could speak freely. Some of the interviewed firms are quite small. There is, therefore, an increased chance of recognition from either work title or what product or service they deliver. I have therefore anonymized both names of firms and informants. I have not highlighted to what renewable industry the firms have diversified to. Through the empirical findings chapter, specific

industries are mentioned through the informants' quotes, as these do not pose any risk of exposing the firms. However, specific renewable industries are relatively new to Norway. Because of the nature of the technology the informant firms deliver, I have therefore anonymised these industries. Specific industries are not the focal point of study in this thesis; instead, it seeks answers concerning the link from O&G to renewables in general.

All informants signed a consent form where I had presented the research project, both purpose, process, time frame, the informants right to withdraw from the study, and the opportunity to be anonymous (see Appendix B). This consent form is developed by a template from NSD – The Norwegian Centre for Research Data. The consent form ensures informed consent, meaning the informants knew precisely what they were consenting to (Dowling, 2016, p. 32). Before the interviews, I also sent out the overall themes to be discussed and some of the questions. I did not wish for rehearsed answers but instead hear the informants' reflections in the interview, and therefore did not send out the complete interview guide beforehand.

4.6 Limitations and weaknesses

There are limitations and weaknesses of the data gathering techniques chosen and qualitative approach taken. That this is a research project and that I have interviewed informants in different positions can have affected the answers I have received, as they can have their agendas. A manager might want to present the firm as more devoted to sustainability than it is. Still, I do not experience this as a barrier present in my data set, as all informants reflected around their answers and were very forthcoming. A limitation is that I have only talked to supply firms, and not operators or policy makers. Additionally, interviewing supply firms that have not diversified to renewables would have increased the quality of the research. However, one of the firms in the scoping interview was such a firm, which provided me with some valuable insight. Given the scope of this thesis, adding further interviews would have been too ambitious and time-consuming to embark on. Lastly, I want to draw attention to that I along the research process have changed my research questions somewhat. I do not necessarily consider this a weakness, rather a strength. More profound knowledge and understanding of the topic I have studied have made me aware of what questions are fruitful to ask and research.

5 Empirical findings

In the following section, I will present my empirical findings related to answering my two research questions. The findings are based on transcripts from interviews with managers at different levels within the interviewed firms, reports relevant for the energy transition, and observations and informal conversations. The data is presented through three sections, where an overview of the findings concludes each section. In the quotes from the informants, I highlight the size of the firm they belong to by the Norwegian definition of firm size. This to nuance the empirical findings for the reader.

5.1 Why established firms diversify

Here I will present empirical findings related to answering the first part of my first research question, why established firms in the O&G sector diversify to renewables. Through the coding, three themes emerged: the decline in the O&G sector, the search for new opportunities to broaden and create a more robust firm, and lastly the opportunity to redeploy firm resources through entering a related market.

5.1.1 Decline in the O&G sector

The decline in O&G, experienced both after 2008 and after 2014, served as a motivator and push for firms to explore the renewable energy sector.

“In 2015/2016, the market fell, and we needed to act. Before, we had many orders, and at that time we used to say that “we do not actively try to sell and promote our self, and we only pick up the phone if we recognize the number”. That stopped around 2015/2016 when the oil market crashed, we had to become more proactive and look for other opportunities” (informant F.4, medium).

“We felt the crash in the oil business as well and have had to significantly reduce both operations and the organization over the last three years. A good thing with the renewable market is that it is at odds with the O&G sector, meaning that when things go badly in one place, hopefully, things will go well in the other” (informant F.3, small).

“When the dip came to most firms in 2014, we did not notice anything about it. We first felt it in 2016, primarily because the customers had a hard time paying even though we had a lot to deliver. Since we had a lot to supply, it was difficult for us to turn around and find alternative markets. Had to stick with it and do what was necessary. In 2017/2018, we tried to look at how we can do better. That is when we really began to think about the renewable market” (informant F.6, small).

This means the supply firms in the O&G sector felt the decline in the sector by losing customers and orders. Later on also experiencing operators struggling to pay for already set orders, as expressed by informant F.6. Several firms expressed the decline in the O&G sector as a significant reason and motivator for diversifying into other sectors. However, they had previously been aware of other opportunities but had ignored these because of prospering times in O&G.

“When the crisis started, we were forced to do what we could have done right from the start, enter different industries. Now it was both logical and necessary to do. It was uncomfortable having to lay off employees. We had to let them go, not exclusively, but to a great extent, because we had only focused on one thing. However, you learn that you cannot go on like that” (informant F.2, medium).

“There were various issues in hydropower that had possibilities for us, and we saw that there were opportunities that we have not followed up on previously in hydropower. Whether it was completely direct or indirect, it certainly gave us a strong incentive to look for other opportunities as O&G declined” (informant F.7A, medium).

Not only was the O&G sector in a time of stagnation, but the renewable energy sector was prospering making it easier to make the transition as access to information and arenas to meet people with the same interests were increasing. One informant brought to my attention that gaining access to funds was easier than before, even for smaller firms.

“We were given a green technology project by Innovation Norway in 2015. At that time, there were downturns in the oil industry. We were lucky to get our innovation project fully covered, with only ourselves as participants. Often there is a requirement

for collaboration on such projects. (...) Lately, it has become easier to get into the renewable sector” (informant F.6, small).

Another firm put it like this, highlighting that the rebranding of clusters and large firms is an adaptation to the decline in O&G and the prospering times in renewables:

“We see now that the focus the entire the industry and business in Norway have on renewables after the crisis (...) is much more visible. We often receive invitations to seminars which we attend to learn about new industries. Innovation Norway and others also push Norway in new directions. The possibility of such seminars was not present before. It was challenging to get an introduction to that industry and meet others interested in renewables. At least that is our experience. It may be that we were not looking for it. For example, we notice that Energy Valley changed its name from Subsea Valley to Energy Valley, and Equinor is no longer Statoil. There is now a better climate for establishing Energy Valley and working in those lines” (informant F.2, medium).

Many of the firms diversified because of the decline in O&G, and thus did it because it was necessary for survival. However, some left their renewable projects when the O&G sector again was prospering.

“We made investments into renewables after the first downturn, but in 2012/2013 the prices went straight up again in O&G, and it was then more attractive to go back to O&G where we had lots of projects” (informant F.1, large).

Still, it is now considered a long-term investment:

“We are in a phase of investments; we want to reach 30 per cent turnover from renewables. The plan is to get there within 4-5 years” (informant F.1, large).

“It was and is a long-term investment. Also, if you want to attract people applying for jobs today, then you have a greater choice of applicants if you can promote renewable

projects. It is much easier to find someone who wants to work in wind power than someone who wants to work in O&G” (F.8B, large).

In addition to being a long-term investment, firms also experience that the decline in O&G and their entrance in the renewable sector makes it easier to attract new people to the firm, as stated by informant F.8B. Even though the investments are now long-term, they are in addition to the investments in the O&G sector.

“Our investments in renewables is in addition to O&G, we have grown in general. It is not that one has gone down and the other up, both go up. We have the profit to continue with offshore wind. Over time, we will probably reduce O&G, but at this time, that is not possible” (informant F.4, medium).

“Renewable is in addition to our O&G investments. Our turnover from O&G vs renewables is 70/30, where O&G have gone down a little. It is not a cut we wanted, but more a natural development as a result of fewer large discoveries in the Norwegian Sea” (informant F.1, large).

As stated by informant F.1, a large firm, diversifying to renewables because of the decline in O&G is not because they wanted to, but because they had to. However, the smaller firms appear to have been affected harder by the decline in O&G, as they to a higher degree diversified because of the decline. I remind that both small and medium-sized firms are understood as small, compared to the large firms.

5.1.2 A search for new opportunities

A motivation for diversifying to renewables is the perceived transition from O&G and possible opportunities in a new industry to broaden the firms’ resource bases. For some, this is coupled with the decline in O&G, for others not. Not to be dependent on only one sector is identified as a reason for why the firms diversified.

“As a business one needs more than one cornerstone. Having several business areas drawing synergies from each other is just good business. You are then not dependent on the oil price in the same way” (informant F.8B, large).

“We started the development of the product we are entering the renewable market with now, back in 2009. The intention was to not rely on only one sector. At that time, it was not necessarily aimed at the renewable market” (informant F.3, small).

“We started the process (of diversifying) as early as 2013, but we did not see the downturn in O&G coming so fast. At that time, it was more that we understood we needed more to rely on” (informant F.9, medium).

A search for new opportunities may not lead supply firms in the O&G sector to renewables. There are other related industries, and for some, a transition is a natural step in their firm’s history.

“We are an old company that has changed several times. (...) When Norway entered the oil age, we took a position there. However, we have been through many phases. 20 years ago, we were 100,000 employees internationally, now just under 3000. There have been sales and mergers. Now the next change is on its way, and that is towards renewables” (informant F.1, large).

The transition from O&G to renewables (and other sectors) is also considered as necessary and a natural step by the Norwegian government to preserve the resources and competences developed in the O&G sector. They have a stated goal to transfer competence:

“The expertise that the Norwegian oil and gas industry has developed through its 50 years of operations must be transferred to other industries. The individual employee must adjust their skills, and the companies must use experience and technology in new areas” (Ministry of Finance, 2017, p. 115 - Perspektivmeldingen).

The fact that the firms ended up in renewables and not another sector or industry, is for certain firms important. This is an industry “for the future”, and thus they have opportunities to grow there.

“We wanted to expand, and renewable industries have the energy form of the future. Engineering wise, the concepts we are inventing and developing, is also industrial development. It is the right form of energy production for the climate. It is also an interesting but tough market” (informant F.4, medium).

“These are only my rough estimates, but when I started in 2013, there was 4 GW offshore wind out there. Now we have rounded 24 in 6-7 years. I expect it to grow exponentially. In 2040, at least \$ 1,000 billion will be traded in this market. It is a market that can provide safe jobs” (informant F.1, large).

The Norwegian government has also stated that they want to fund and continue to focus on R&D, contributing to meeting the green shift and climate goals. The following quotation is from the white paper “Long-term plan for research and higher education 2019–2028” where the government states they want to:

“invest in education, research and technology development that helps reach the climate and environmental targets and promotes the shift to a greener society” (Ministry of Education and Research, 2018, p. 25).

The choice of diversifying to the renewable sector is for some also about new visions and values.

“We do not pursue this project because we believe this is where we will earn the most, but because we think it is right to look at alternative solutions where we can use our expertise” (informant F.6, small).

“To come home and say that you are working on this, it gives you pride, and at the same time you are working for a greener globe, it is very important. (...) For many, it is value-driven to be able to contribute in that way. Then you go the extra mile, and you are passionate about what you do” (informant F.1, large).

Having a greener profile after diversifying is also an advantage when recruiting new people.

“If you look at those searching for jobs and higher degrees today, people go towards positions regarding the climate and environment. There are significantly stronger and more applicants in that domain. I think we would become a company full of old men if we just invested unilaterally on oil” (informant F.1, large).

From my scoping interviews, I talked to a firm only vested in O&G and not in renewables. They experience losing access to arenas for recruitment they previously had and struggle to recruit. This is opposed to diversifying firms attracting more people because of their sustainable profile.

“The green shift is a threat. We have our market and our customers in O&G, but much of what we are good at can also be used elsewhere. Lund University once denied us visiting, saying they would not cooperate with those who do business with non-renewable resources. We find it challenging to recruit as we only deal with O&G” (informant F.11, large, only in O&G, not diversified).

Firms having diversified to seek new opportunities in addition to their operations in O&G, have experienced the diversifying as positive. Some expressed thoughts on continued expansion.

“There may be multiple industries we can explore, but within ocean space somehow. We could have pursued wind on land or aquaculture, but we are trying to keep a strategic focus. For the time being, we are focusing on O&G and offshore wind. There are several areas that we can enter where there are the same types of challenges, e.g. cargo problems, waves, wind, and bad weather” (informant F.4, medium).

Both small and large firms diversified to search for new opportunities, either because it is a natural development, they see it as a strategic decision, or for some, to a certain degree, it is also value-driven.

5.1.3 Opportunity for resource redeployment

Why firms diversify may not only be contributed to a single reason but is rather multifaceted. However, many saw an opportunity to redeploy already possessed firm resources through

related diversification. That is also why they diversified from O&G to renewables. Some describe the context for their business in O&G, as the same as in renewables. Thus, this step is utilizing already possessed resources in a relatively similar context.

“The complexity is very much the same, operating a processing plant is very similar to an oil refinery and an oil platform. We did not operate on land before, but it is the same systems and the same work processes. The crossover between those industries is almost 1” (informant F.5, small).

A reason why many diversified from O&G and to the renewable sector specifically was the opportunity to redeploy already possessed resources. One firm stated that their resources made them partner up with someone else, and together they had a product for OWP.

“They needed someone to build platforms to put inverter equipment in, and we knew how to do that. We made a partnership in 2009/2010 and started with offshore wind. It was simply business to explore an interesting, new market that was coming, and one where we could use our core competences from O&G” (informant F.8A, large).

Another one pointed out that the similarities between O&G and renewables made it less risky to diversify into this industry.

“There are not really any big differences, and that is what is interesting for us about being able to enter that market. It is a lot of the same mechanisms and methodology. The risk of entering that market is hence much lower than if we, for example, were to explore the automotive industry” (informant F.3, small).

A third one saw a wider application range and need for their product in the renewable sector, even though they had started in O&G.

“We saw that our products had obvious applications in offshore wind. We have been in O&G for quite some time, but because the need for our product was a bit limited, we saw a wider use for it in offshore wind” (informant F.10, medium).

Some did not just redeploy part of their existing resources to another sector but experienced that their technology in renewables is practically the same.

“Essentially, it is one type of thing we deliver, and that is critical decision support that you need here and now to do a specific thing. That is what we are taking with us to offshore wind. It is really the same product” (informant F.4, medium).

5.1.4 Overview of findings for why firms diversify

In Table 2, I present an overview of the findings related to why firms diversify from O&G to renewables.

Table 2: Overview of why firms diversify from O&G to the renewable sector.

Why firms diversify	Summary
Decline in the O&G sector	<p>Firms did not get enough orders and were not being paid for deliveries, causing them to seek out other opportunities for firm survival. Some sought out opportunities they knew had existed before but had left alone because of the upturn in the O&G sector. A greater focus on renewables by the industry made it easier for firms to gain access to information they previously had been lacking. Even though the reason to diversify is not willingly because of the decline in the O&G sector, it is now considered a long-term investment. Still, they try to prosper in the O&G sector, where the investments in renewables come as an addition to the ones in O&G. Compared to larger firms, more smaller firms diversified because of the decline in O&G.</p>
A search for new opportunities	<p>Some survived the downturn in O&G well but sought renewables to broaden the firm and seek new opportunities. They have a positive outlook on renewables, and it is also a priority in national plans. The sustainable aspect of renewables has significance for some, and it also helps attract new employees. Firms only in O&G experience the opposite. Firms that have chosen to diversify are generally more positive to diversify further.</p>
Opportunity for resource redeployment	<p>An important reason why firms diversified and a key factor for why they diversified to renewables is the opportunity of resource redeployment. Some consider the transition as a natural development as the context is still the same, some have almost the same product in both O&G and renewables, and a final key factor is that resources can be redeployed and used in a different sector through related diversification.</p>

5.2 How established firms diversify

In this section, I will present my findings related to how the firms diversified from O&G to the renewable sector. During my analysis, five themes became apparent: addressing knowledge gaps through learning, funding, resource redeployment, development of new firm resources, and organizational restructuring.

5.2.1 Addressing knowledge gaps through learning

When the firms started to explore renewables, it became apparent they had knowledge gaps concerning the new sector. These manifested as barriers they had to address. I will return to the topic of barriers in section 5.3. The firms took different steps to address their knowledge gaps, e.g. by attending seminars, enter into R&D collaborations with academia, enter into partnerships with other firms, hire additional staff, use their network of suppliers and operators that had already diversified, and by using consultants to understand the new sector. Following are some examples:

“It all started when we partnered up with NTNU. We had the same thoughts and started a seminar where we invited the whole industry. From there, we formed a research project together. (...) Statkraft also later joined” (informant F.7A, medium).

“We employed people with higher education and skills to strengthen our new strategy towards renewables. We employed one with a doctorate in physics chemistry, we built our expertise” (informant F.9, medium).

“What we did was that we hired someone who was given key responsibilities. And that means that we to a much greater extent had time to understand how they (the renewable sector) work and what they want. We also attended seminars” (informant F.2, medium).

“At the time, we did not know the market or the customers, and OWP was relatively immature, making it difficult to obtain the necessary information about the industry. As a consequence, we had to make contact with actors we already knew were in the industry, building projects and delivering components” (informant F.10, medium).

The firms took different steps to deal with their knowledge gaps at the beginning of the process of diversifying. They attended seminars and entered into partnerships with other firms and universities both to learn and get access to tangible and intangible knowledge. By hiring new staff already familiar with the renewable sector, they secured even to greater extent access to intangible knowledge one cannot get without experience. During my interviews, several informants highlighted the fact that being able to attend seminars to both learn about the new sector, but also to meet like-minded people was essential to get a foothold in renewables. This was also an opinion several brought to my attention during my informal talks at the seminar I attended. It was pointed out that it is more usual with such seminars nowadays, and that everybody wants to learn. A lack of such opportunities in the past has acted as a barrier to diversification. The firms took steps to learn, however, this was not considered an easy and quick process.

“Turnover from O&G is 100 per cent, and renewable is still 0. The projects we are working on now, being in discussions and dialogue with customers, will not turn into products, we are only in the design and engineering phase. We are developing solutions and how to do things. Hence, there are no profits before we get a specific order for production and delivery. From the time we begin a preliminary talk with a customer, a process can take another 4-5 years before something concrete happens” (informant F.3, small).

Even though firms are in a phase of R&D to learn and develop new technology, the process is time-consuming and not one where they are guaranteed orders for production.

5.2.2 Funding

Funding proved to be an essential parameter that came up several times during my interviews. Some funded their exploration of the renewable sector within the firm, while many also got funding through different governmental schemes. Also, a combination of the two took place. Firms funding the diversification into renewables partly or on their own, did it with funds from their businesses in the O&G sector.

“You need to have some quick wins, to be noticed, get hired, get good partners, and positive feedback from customers. We have won orders, but also lost some, where we still got far in the process. Therefore, we still need O&G” (informant F.1, large).

“You can say that O&G at that time helped to finance what became our renewal initiative. After all, what we earned in O&G was used to invest in renewables. We used, to put it cautiously, tens of millions (NOKs) on renewables for a while” (informant F.8A, large).

For those using governmental schemes, this type of funding is conceived of as a necessary means to be able to diversify. Brought up by many of my informants is the importance of the tax incentive scheme SkatteFUNN. This is a governmental program meant to stimulate R&D in Norwegian firms.

"We have used SkatteFUNN, a pretty good and robust scheme" (informant F.5, small).

Also, Innovation Norway and The Research Council of Norway (RCN) is highlighted as essential funding institutions.

“SkatteFUNN is important, and we have been part of various programs through the Research Council of Norway. We also get funding from Horizon 2020, where the university, our collaboration partner, is the owner of the project” (informant F.7A, medium).

Firms that have collaborated with universities in developing new technology have also received funding for their technology through international grants like Horizon 2020. The Norwegian government also has a focus on greener initiatives like technological development in the renewable sector, by devoting funds through the R&D-demonstration budget.

“In the period 2015–2018, around half of Norway's total R&D-demonstration budget went to renewable energy and energy efficiency” (RCN, 2019, p. 104 - ‘The Indicator Report’).

“Energy research is particularly relevant to achieving sustainability goals 12 and 13. Research in this area constitutes 15 per cent of Norwegian R&D activity, and the business sector accounts for the largest part of the effort (65.4 per cent). Research on renewable energy, energy efficiency and transition has grown in recent years, while petroleum research has declined somewhat” (RCN, 2019, p. 343 - ‘The Indicator Report’).

Funding is not only critical in the aspect of money for development, but also for testing and demonstration of developed technology. Some received funding through a program for demonstration through the RCN.

“We had a demonstration program through a scheme in the Research Council of Norway called DEMO 2000. If an industrial product is to be a success, you have to demonstrate it on a larger scale, to check and prove that it works” (informant F.3, small).

5.2.3 Resource redeployment

Redeployment of already possessed resource is a vital part of explaining how the firms did their diversification process. It happened through both redeployment of specialised and generalised resources. In the following, I will present these findings.

Specialised resources

As previously mentioned, the focus will be on technological and organizational resources.

Technological resources

Firms moving from O&G to offshore wind could redeploy their knowledge about offshore structures.

“We can build structures of concrete. Much of our design expertise and engineering expertise has built many of the platforms in Norway. When you look at these substations and offshore installations that collect electricity from wind turbines before sending them ashore, it is a simple platform, something we know how to build” (informant F.1, large).

“It is the same mechanisms, whether there are floating or bottom structures. Our engineers need to do the same calculations. It is our special expertise. (...) We intend to use the same sensors and more or less the same calculation models for wind power” (informant F.4, medium).

Companies with specialised technological resources found these applicable in OWP as well, as many of the same components were necessary, e.g. anchorage, insulation of cables, and an understanding of what type of materials best suitable for offshore use. The firms did, however, not only diversify to OWP, but some also moved into hydropower.

“We are well familiar with turbine regulators. They control the speed of water entering the turbine but need to be frequently changed. The turbine control is hydraulic, just like we used hydraulics in O&G” (informant F.2, medium).

Even though the firms have diversified to different industries within the renewable sector, they can still bring specialised technological resources from O&G. They all supply different components and systems to the O&G sector but can still redeploy specialised resources relevant to the new industry.

Organizational resources

Even though my informants do not directly express it, I have identified specialised organizational resources redeployed. The firms have developed an identity within the O&G industry that both affect how they define themselves based on what they deliver to the O&G sector, but also their relationship with the actors in the sector. It is this identity they have redeployed and had use of in the renewable sector. Some firms' identity is ocean space, others' offshore, or process industry.

“We often use references, such as Johan Sverdrup and other fields we have delivered to. There we have supplied several different regulators. Most suppliers have delivered to Johan Sverdrup and thus understand where we come from” (informant F.6, small).

“We have the big energy operators as customers, that is our market. You could also say that the ocean space is our natural market. (...) We are entering (the renewable industry) with the contacts we have from O&G and are therefore recognized for what we have been supplying for years. We already have a relationship with the O&G operators that now also work in wind. However, we are not yet in contact with those who started out in wind or come from elsewhere than O&G” (informant F.4, medium).

“Our market is really all process industries, and renewable is part of the process industry. We want to be part of a technology that supports that industry, whether you call it energy or a process, it is the same. We want to be part of the energy equation” (informant F.5, small).

It is clear they have developed an identity and reputation for what they have supplied to the O&G sector. Some benefit from this identity when diversifying to renewables.

Generalised resources

Through coding and analysis, I have identified generalised resources firms redeployed when diversifying from O&G to renewables. These resources are not connected to the O&G sector specifically, even though they were utilized there. They are broader resources, e.g. generalised technical and organizational resources and capabilities.

Technological resources

The firms redeployed generalised technological resources, e.g. knowledge regarding offshore structures and how they are affected by environmental conditions like wind and ocean currents, but also expertise on technologies and how to integrate them into a functional system.

“Our job is to get the interface and everything around to work, and that has not changed. We buy technology, integrate everything, and make it work in a context” (informant F.8B, large).

“Whether it is a floating wind turbine or a floating O&G platform, it is the same requirements; it is waves, wind, and ocean currents. It is factors that create challenges

and stress on the structures and affects their lifetime. We use our knowledge from O&G to understand how to get to the components and take them in for maintenance” (informant F.3, small).

“We use our AI competence on wind turbines to identify when to do maintenance based on when there is no/little wind. It is also important to identify what the expected electricity price during the maintenance period is to be, to optimize and make sure they produce optimally when the electricity price is high. Wind is also a factor for an O&G platform” (informant F.5, small).

O&G platforms are complex constructions, and wind turbines and their platforms are simpler in many ways. The knowledge of how to integrate all the components and understand how the structures are affected by environmental conditions is still knowledge the firms have from experience in O&G.

Some firms have a specific type of knowledge that can be utilized in different sectors when adjusted and coupled with specialised resources. Their core resources and knowledge can thus be considered generalised resources.

“For us, an electromagnetic physics process that you use in a generator is the same as you use in a motor, only the other way around. There is the electricity that pushes something, while in the generator, there is something that is pushed by wind power, and that generates power” (informant F.7B, medium).

Organizational resources

The firms are to different degrees used to custom-made deliveries in O&G and are therefore used to developing new technology and adapting existing technology to new contexts. The step towards renewables, specifically offshore wind, is thus, for some, considered a natural development as it is just another project.

“We do not focus on delivering anything to the turbines, cables etc. We only focus on what is custom made, which means heavy engineering. That is similar to what we have

done before and have had as business areas. We can draw on our strengths from O&G” (informant F.8B, large).

Those with experience with managing large projects from O&G find this resource and competence easily redeployable and also useful when it comes to the renewable sector.

“This is a market in which we have much expertise, we know project management and contract structure, we can understand the risk and also take the risk.” (informant F.1, large).

“The common factor for O&G and renewables is an efficient operation, i.e. operational efficiency and competence to make sure the production system produces optimally. You want to avoid unplanned downtime, meaning sudden production stops. You have to have an overview of all the elements that play into that equation, there are many common factors in logistics, conditions, and need for work permits etc.” (informant F.5, small).

The firms have different resources and competences from the O&G sector, e.g. managing large projects. Also redeployed is the ability to understand complex situations and unique cases. This has equipped the firms to address the uniqueness of the renewable sector quickly.

“The fact that we are used to working with very high standards make it easier to turn to another industry and quickly address their complicated situations” (informant F.7B, medium).

Already presented in section 5.2.2 is the topic of funding and how the firms redeployed financial capital. Also significant is the redeployed human capital.

“People move back and forth between O&G and renewable projects. It is about being able to provide enough opportunities and projects to have ready human resources when renewable projects arrive” (informant F.1, large).

It seems as though the larger firms can more easily redeploy generalised organizational resources and have a more extensive resource base to base their diversification process on. Typical redeployed generalised organizational resources for larger firms are project management capabilities and financial capital.

5.2.4 Development of new firm resources

When the firms diversified from O&G to renewables, they had to adjust their technologies to the new sector and context. Thus, they have developed new firm resources, both technological and organizational. Some of the firms are still developing these resources as they are trying to find their place in the sector.

Technological resources

Many firms were in a position to redeploy their existing technology from O&G, almost as it was. However, it still needed adjustments to make it compatible with the new context, e.g. of materials and conditions.

“It is a kind of tape that is to be wrapped around something, rather than pipes as in O&G. I, therefore, had to establish some material properties and understand how I could customize my product” (informant F.3, small).

Firms do not only need to adapt their technology but acquire new knowledge about a sector they are not familiar with.

“O&G has been concerned about one thing, while the hydropower industry has been concerned about something else. You must understand the problem in order to use the methods. (...) Things become more complex, and to help our customers in the best possible way, we not only have to be experts in simulation software, but we also have to understand the industry and understand the customer's problems in a larger perspective” (informant F.7A, medium).

“Batteries and cooling systems are not new to us, but this use is new, so we have to spend some time understanding it” (informant F.2, medium).

“It has not been a big transition for us to enter this new industry. The product and services we provide are the same. We have had to learn and understand a new value chain with a slightly different focus” (informant F.5, medium).

It seems like the smaller firms to a higher degree have had to develop new technological resources to adjust their already existing product. Hence, the larger firms with a broader resource base, have not had to develop such new resources to the same extent. The larger firms are also service suppliers and therefore develop less specific technological resources.

“We are not a product supplier; we are more of a project supplier. We do not own any technology but buy what we need. One of the things we are good at is, for example, working with concrete, building these structures. There are some new elements, but a lot of the basic principles are the same: design, engineering and how to make it work” (informant F.1, large).

Organizational resources

By diversifying to the renewable sector, many of the firms experience they have to build new networks of suppliers and make new contacts with buyers.

“We need expertise in business development, i.e. sales. We need someone who knows the industry and who knows the needs better and who simply has a network. We need someone from wind to strengthen our commercial side” (informant F.4, medium).

The firms do not only develop new resources and competences concerning making new contacts with potential buyers, but some also leapt to the academic sector, establishing research coalitions with universities.

“The most important consequence for us regarding the oil decline was the ability to go out to academia and take a position there. That strengthens us as a supplier. We have learned a lot and are still learning a great deal from working this way” (informant F.7B, medium).

The O&G sector has, for a long time, been a sector with a high turnover of money. The supply chain has thus gotten used to a high demand for its products. Turning to another sector, the firms experienced having to learn how to address the market, as they had gotten used to the customer approaching them.

“We do not have complete control of the market, because mostly it is not we who have reached out to the market, it is the market that has come to us. That is one of the things we need to change, we want to work with a website to show that our products can be used elsewhere” (informant F.6, small).

By building new networks, also new knowledge about value chains and strategies was necessary.

“We have had to build up knowledge about the value chain and purchasing strategies in all the projects we have been working on” (informant F.10, medium).

For firms entering the offshore wind industry, the diversification from O&G to renewables also means a move from a Norwegian industry to an international one. Thus, the firms have had to develop new organizational competences related to different norms and rules in other cultures, e.g. how contracts and negotiations take place.

“The one thing I would like to point out is that we have gone from a Norwegian industry and a lot of Norwegian projects to the export industry. Moreover, that leads to new contract types, unknown customers, and we need training in fundamentals stuff like how to behave as an individual engineer, as a manager, and how to behave in contractual relations/negotiations” (informant F.8B, large).

Not only has the international market forced firms to develop new organizational resources, but there have also been new contract types in domestic renewable industries. Some firms have adopted new ways to work, where the lean methodology was mentioned by multiple. This is an approach that enables businesses to streamline and optimize across their value streams. Several informant firms have had to adopt skills and restructure for mass manufacturing.

“We have built a new production line, and we have worked a lot with lean thinking. It is important to reduce the cost of the products and work on improvements. It is about thinking correctly, both organizationally and in terms of production” (informant F.9, medium).

“A big change is to go from developing something unique to making fifty of the same products. The design must be incredibly good right away unless you repeat the mistake fifty times, and it becomes costly. Stopping and adjusting along the way will also be very expensive. The mass manufacturing expertise, it will only become more and more important to us” (informant F.1, large).

By adopting new skills and getting a foothold in the sector, individual firms that have come longer in their process of diversification experience they have developed a new identity.

“We have gotten a name in OWP. We get contacted by customers abroad because they now have heard of us” (informant F.8A, large).

Like stated, it seems like smaller firms redeploy their existing technology with adjustments to make it compatible with the new sector, to a higher degree than larger firms. Thus, smaller firms develop more new technological resources. The larger firms develop less new technological resources and competences as they have a more extensive resource base to start with. The larger firms also develop new organizational resources.

5.2.5 Organizational restructuring

An identified theme during my analysis is the need for organizational restructuring. This is needed both when firms are diversifying, and after they have gotten a foothold in the sector, to plan ahead. Several express a need for employing more people, either to broaden their resource base with knowledge from the renewable sector or simply because they need more hands as they are expanding.

“We will need some technical expertise, but first and foremost, we need commercial expertise in the form of sales and network expertise” (informant F.4, medium).

While some see a need to employ more people, others have changed the composition of their work stock to accompany the different needs they face in the renewables sector. As deliveries to the O&G sector is mainly unique deliveries, many engineers are needed. The renewable sector is more about mass production and cutting costs, and hence the need for an abundance of engineers to customize solutions is lessened.

“Before offshore wind power, the firm was 50 per cent engineering and 50 per cent production. Now it is more like 20-80 per cent. We have gone from being a project-oriented firm to a production-based firm. We, therefore, adopted lean principles early on. This was necessary when changing from serving a market where our deliveries were 2-5 specially made systems, to delivering hundreds or thousands of standardized components” (informant F.10, medium).

Following the change from unique production to mass production, there has also been a need to change the use of outside hire. One firm is also looking into additional renewable projects in another industry than what they first diversified to.

“Since we need fewer people per project in renewables compared to O&G, over time, it will require more renewable projects to keep us going if O&G is to decline. Right now, we experience that we do not need to hire as many external people in some of the departments. We are also looking at the possibility of a larger biofuel plant. And that is a type of facility that almost fits even better with our O&G background” (informant F.8A, large).

By planning ahead, some have as mentioned, invested time and resources in research projects with the academic sector. To be able to invest in more future projects, the firms have employed more personnel and started additional research projects.

“After the first research project, we have started other projects and have employed several. Both competence gained through these projects on hydropower, and the human resources, can be used back to O&G” (informant F.7A, medium).

When diversifying, some have made strategic decisions when employing new personnel, highlighting that building competence for the future is vital by adding personnel with higher education to their working stock.

“We employed one with a doctorate in physics chemistry to build our expertise. To upgrade, we have prioritized expertise in physics, chemistry, production management, and employed a chief financial officer. This was a significant upgrade, important to build a robust firm for the future” (informant F.9, medium).

The organizational restructuring may take different forms, and for some, it meant giving someone new tasks, like one firm who dedicated one person to the job of trying to understand and learn about the new sector.

“It is important to have this one dedicated person with us who can go in and meet with new customers. However, first, we must convince them even to bother to spend time talking to us. Devoting one person to this job is, therefore, necessary” (informant F.2, medium).

5.2.6 Overview of findings for how firms diversify

In Table 3, I present an overview of the findings related to how firms diversify from O&G to renewables.

Table 3: Overview of how firms diversify from O&G to the renewable sector.

How firms diversify	Summary
Addressing knowledge gaps through learning	When diversifying, the firms had to address knowledge gaps when diversifying to the new sector. It was done by entering into R&D collaborations, attending seminars, forming partnerships, and employing additional personnel to access intangible knowledge about the renewable sector.
Funding	Funding is essential for the development of new technology and when firms diversify. The firms funded their exploration of the new sector through their O&G activities, governmental schemes, and through research projects with the academic sector. Funding for renewable technologies and the transition from O&G is also on the state’s agenda, supporting the firms’ diversification.
Resource redeployment	All the firms were able to redeploy and utilize already possessed resources in the new sector, both technological and organizational, and specialised and generalised resources. The larger firms could leverage a broader generalised resource base.
Development of new firm resources	The firms could not only rely on their possessed resources and had to develop new ones. The smaller firms did, to a higher degree, develop new technological resources. Both large and small firms developed new organizational resources, including amongst others, knowledge about new contracts, value chains, and the lean work methodology.
Organizational restructuring	By employing additional personnel, many firms restructured their organization to be able to get a foothold in the new industry. By expanding their organization, they were able to explore more opportunities.

5.3 Barriers associated with diversifying from O&G to renewables

In this section, I will present my findings related to answering my second research question: What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms? During coding and analysis in NVivo, six barriers became apparent: differences between sectors, funding schemes, lack of contacts, lack of resources, lack of a domestic market, and no clear renewable strategy. During the interviews, the informants were explicitly asked about barriers. However, in some of the interviews, this came up naturally, as it presented itself as an important topic to the informant.

5.3.1 Differences between the sectors

As there are many differences between the O&G sector and the renewable sector that act as barriers to diversification, I have chosen to visualize my findings through Table 4 before presenting empirical findings from my interviews to support the table. The differences to some degree overlap, but I will still present them under separate headings.

Table 4: Overview of perceived differences between the O&G and the renewable sector, inspired by (Andersen & Gulbrandsen, 2018, 2020).

O&G	Renewables
Maximize quality	Minimize prices
Unique design	Standardised design
Development of technology within projects (together with contractor)	Development of technology before projects are set
Fewer, longer contracts	More, smaller contracts
Need for more personnel and more hours	Less personnel and fewer hours needed
Technically complex issues	Logistically complex issues

Prices under pressure

All of my informants brought up the challenge of going from a sector with a surplus of money to a sector where prices are a lot more under pressure. For some, this meant they had to develop what they perceived to be a more effective way to run their business.

“I believe land-based industries are more focused on efficient operations because their margins are so much more under pressure than what the oil industry is. In my eyes, they earn far too much money, so they focus little on efficiency” (informant F.5, small).

Others brought up that the harsh environment for small operators in renewables is challenging, and this only proves the need for substantial investments for the sector to stabilize.

“It is brutal for many. There is a great deal of pressure on us in the supplier industry, where it is challenging to be a small provider. But also, it is not easy being a large energy production company, where there is strong competition to get sea acreage in OWP. Only large companies can succeed in wind power, and that says a little about the need for investments. It is tough for everyone, we need to make it profitable soon” (informant F.4, medium).

Because of a surplus of money and high technological standards in the O&G sector, quality has been in focus and price have come second. If something should fail when operating an O&G platform, the consequences can be extreme.

“Price is secondary in O&G, while safety and product quality are primary. On the other hand, offshore wind power is only focused on cost – price per MW. As price is not the main issue in O&G, the time suppliers need to deliver is not that important. If you deliver a good quality product within a reasonable time, you can almost name your price. In offshore wind power, time is money” (informant F.10, medium).

Both time pressure and tight margins in the renewable sector create a new environment for the firms to operate in, forcing them to acquire new resources and capabilities. As one informant expressed, OWP is more comparable to land-based industries than O&G, if one leaves the technological side out of the equation.

“O&G have challenging technical projects where most things are unique, with a potential for great profits. Hence, the most important driver is to get started quickly. If

it costs a little more is no problem. See Sverdrup, for example, they produce for let us say 200 million NOK a day. So, if you give them a week's earlier delivery by spending an extra 30 million, there is no discussion. You do not have that at all in offshore wind power. Offshore wind is similar to land-based industries with normal returns. And thus, you have mass production and low costs” (informant F.1, large).

An additional barrier, coming from a high-priced sector like O&G, some suppliers experience they have to prove they are competitive and able to supply to reasonable prices. This means adopting new working methods like the lean methodology.

“A challenge for us coming from O&G to renewables is that people think everything we have is crazy expensive, so we have to show that we are competitive. We have worked a lot with lean” (informant F.1, large).

Standardized design

Because of the nature of the O&G sector, unique design is almost always necessary, as no well, sea bottom structure or ocean current connected to a specific spot, is equal to another. The supply firms have thus gotten used to developing unique technologies for each project. Diversifying to renewables, this is opposite. Here standardized design is the norm, where prices under pressure are closely linked to standardization.

“Each oil well is unique, and no reservoirs are the same. In floating wind, on the other hand, there is more standardization. There is no room to develop in the same way here as we have done in O&G. The price is set and the time from order to when it is expected to be ready and assembled at sea is very short” (informant F.3, small).

Going from unique design to mass production does not only mean making more units but also making them perfect right away, as there is less money in the development process and mistakes are expensive. The step towards mass production requires new resources and competences. Some have also adapted the lean methodology to handle this change and have transitioned from a production-oriented firm to a more project-oriented firm.

“We have started with lean and have become a technology company that is much more project-driven. This requires a different approach from being only a production-oriented company” (informant F.9, medium).

Technological development and contracts

Prices under pressure and standardized design are closely linked with the change of how technological development takes place in the two sectors. Coming from O&G, the firms are used to cooperate with the customer when conducting R&D on specific orders. In renewables, suppliers are expected to have a ready product before approaching customers. This means the suppliers have to develop, test and pay for the whole process themselves, also with all the risk it holds.

“You have to give a price very early on. It requires a lot of new skills and new ways of working for us” (informant F.1, large).

As the firms have to do the development process themselves, this also encompasses setting a price for the expected expenses early on. Hence, the renewables projects require a higher level of maturity much earlier on in the process.

“In wind we have entered into fixed-price contracts, meaning you take a risk and expect a higher margin than you expect in an O&G contract where you have less risk and therefore accept to earn less. Thus, in the long term, we should earn more from renewables than in O&G. However, it is demanding as there is a fixed price and therefore risks in those contracts. (...) After the contract has been set, it is almost impossible to get any more money to make changes. Everything is at our own risk, and we have to deliver. It is a tougher regime than we are used to from the last 10-15 years in Norway with O&G contracts” (informant F.8B, large).

Concerning the offshore wind industry, this industry is “new”, especially for Norwegian suppliers. It is an international industry as there is no domestic market, I will return to this in section 5.3.5. There are shorter and fewer contracts in offshore wind, and the suppliers do not know when these are expected. In O&G, they know what is expected to come five years beforehand, and when you first get a contract it lasts for quite some time, securing work. This

adds another dimension to the uncertainty and risk that it is being a supplier in this industry compared to the relatively stable O&G.

Execution of projects

The firms do not redeploy all their resources to the renewable sector, and for larger firms, this also means that not all personnel are needed when they diversify.

“These converter platforms do not require the same type of personnel that we require a lot of in O&G. For example, process engineers and those who design piping systems, not much need for them in wind. So, you do not use all of the expertise that you have in O&G in offshore wind, you only use part of it. Therefore, there are also fewer design man-hours. You use as much structural and steel engineers as you do on an O&G project, and you use some electrical and ventilation engineers. But you do not need the large departments or piping design and hydrocarbon processing that we otherwise use. (...) If we were only to be in wind, we would have to have more projects if we were to retain the same number of employees compared to O&G” (informant F.8A, large).

Another informant reflected upon the documentation and paperwork demand in O&G for security reasons. This means fewer people are needed when this requirement falls away. In renewables, there are standard requirements for components of wind turbines and water turbines. This poses a challenge for a firm entering renewables and requires adaptation and more projects.

“A major difference between O&G and renewables is that there are extra expenses for us to have employees to handle all this documentation. But they are needed for our business in O&G. Some will have to go if we are to grow within renewables” (informant F.2, medium).

Complexity

The O&G sector has technically complex issues, and therefore also requires unique projects and components for each well. The renewable sector, specifically the offshore wind industry, has more difficulties with logistically complex issues.

“Where you may have technically very complex issues in O&G, there are logistically very complex issues in renewables. The blades for an Airbus are maybe made in England and then sent over the canal. The engine might come from another place, and so on. Everything should also come in at the same time, so you do not get a stock that builds up. We have to build fifty wind turbines, and everything has to fit. This requires a massive logistical control, even though each component in themselves are not that advanced” (informant F.1, large).

This holds different challenges for a firm compared to what they do in O&G. They must acquire these resources and knowledge when diversifying to renewables. This can pose as a barrier, especially for smaller firms.

5.3.2 Funding schemes

To be able to diversify from one sector to another, firms need enough funds. As previously described, the firms funded and are funding their diversification process in different manners, some within the firm, some with applying for governmental funds through, e.g. RCN, by using tax schemes, and with combinations of the ones mentioned. The public funding agencies and instrument apparatus is a complex jungle. The informants brought up that applying for funds is both time-consuming and expensive. Some even have employees devoted to precisely this. Some experience that much of the funding is for start-ups and not operational firms, and this poses as a barrier when trying to get funds to be able to diversify.

“A bit of the problem for many Norwegian companies is that there is a lack of funding opportunities. A lot of funds are spent on start-ups, and we have been there ourselves, but the good healthy companies, that is where the jobs are. There is a need for a little more management in that direction. (...) No need to develop for the sake of development, it is about getting the product ready for market and commercialization” (informant F.9, medium).

For those getting public funding, they experience a barrier when it comes to testing their product. As already addressed, the renewable sector demands ready products, meaning the

supplier must develop and test their product before sealing a deal with a customer. To test a product requires testing facilities that test the correct parameters, and this is expensive.

“You need to make a lifelike test that shows a complete on-shore retraction and installation. This is expensive and difficult. For this, it would have been nice to be able to apply for support” (informant F.10, medium).

Further, the smaller firms find it difficult to get funds that help them to get a foothold in the market. Some bring up the fact that Equinor, one of the largest operators, got 2,3 billion NOK to build Hywind Tampen, and they are not even obliged to support and buy from Norwegian suppliers.

“(…) If Equinor had spent 50 million of the 2.3 billion NOK to get us up and running, then we would have been able to cross that critical point and get the first contract, started building the first factory and hired more people. It breaks people’s motivation” (informant F.3, small).

It is challenging and perceived as a barrier, getting the “right” funding. The supply firms are at different stages in their diversification process and need different levels and types of funding instruments. Some also brought up that as an established, but small firm, what they struggled with was not their product, but being able to pay wages. Trying to enter a new industry is time-consuming, and the opportunity to be able to apply for funds to keep the business afloat while diversifying, might for some be necessary.

5.3.3 Lack of contacts

Coming from O&G, many firms experience a lack of contacts as a challenge when trying to enter the renewable sector. They have only or mostly operated in O&G, having no references to any projects in renewables of any kind. Some have the advantage of a link to a diversified O&G operator they can benefit from. However, they still struggle to get a foot inside with the big established operators in OWP. Lack of experience makes it challenging getting the first contract in renewables.

“We have experienced some challenges with “cross-over firms”, meaning they operate in both O&G and OWP, and one company actually tried to exclude us from contracts because we did not have a proven track record in OWP. But the biggest challenge was the first reference and contract” (informant F.10, medium).

The fact that operators from O&G also have ventured into renewables pose as a barrier for some firms. The O&G sector and the large operators are conceived of as conservative and rigid, and they mostly want to meet with suppliers they had previously used in O&G concerning projects in renewables. Smaller suppliers that have not had a relation with the large operators in O&G struggle to get accepted when diversifying to O&G.

“We experience that they use suppliers they know from O&G without actually taking the time to look into what we can offer. Most of it goes to companies they know well from before. They are not interested in anything new” (informant F.3, small).

Lacking contacts in renewables poses as a barrier for small and larger firms. Larger firms not supplying a specific component, but that instead are service providers, experience the market as set, where large renewable operators have taken their place. This leaves little room for newcomers, no matter their size. This is especially relevant for OWP, which is also an international market. Some informants highlighted that larger supply firms themselves also act as barriers for smaller firms trying to initiate collaboration on renewable projects. The larger firms are only willing to collaborate if someone else is paying, making it challenging to be a small supplier.

5.3.4 Lack of resources

A distinct barrier for all of the firms is the lack of resources when entering a new sector. As previously explained, all of them had to develop new resources and capabilities, and then both time and money are redeployed to this at the expense of other activities. Learning and adapting new resources is, therefore, not without conflict.

“Understanding how production in a processing plant is different from an O&G platform is the biggest challenge. Technologically they are very similar, but the issue is more concerned with understanding what their challenges are, and the differences in

the challenges. In many ways are a processing plant and an O&G platform very similar, but they use a slightly different language. So, it is about understanding the domain, and it has taken time to get into it” (informant F.5, small).

Not having resources needed to get a foothold in an industry can be a barrier, but also the redeployment of resources from one industry to another. This can serve as a conflict as to where to concentrate the resources.

“If you are fighting over key people and key heads, and where to prioritize them, that is a tough discussion. We probably would not have dropped wind if suddenly quantities of O&G were found, but it would have been a tough discussion” (informant F.1, large).

5.3.5 Lack of a domestic market

An essential barrier for entering the renewable sector, specifically OWP, which today is a prospering industry in terms of revenue, dimension, and potential projects, is the lack of a domestic market in Norway. The Hywind Tampen project is the first commercial floating wind project in Norway, but its electricity generated is to serve an O&G platform, not the general public. Most OWP farms in the world today are bottom-fixed, whereas Hywind Tampen is a floating OWP project. This is relatively new, even internationally, raising the bar to join in on such projects. The supply firms in Norway delivering to OWP, participate in an international market, where some previously only had O&G projects within Norwegian borders. One informant brought up the challenges of a lack of domestic market for OWP by also addressing the barrier of “local content”.

“Norway is our market, but offshore wind is even more international than O&G. The authorities in Norway must ensure good regulations for this industry because what happens to a greater extent than in O&G is that each country wants to build up something of their own, i.e. what is called "local content". This means that we, as a Norwegian firm, may not be allowed to deliver to the US because they want it to be a US supplier. (...) Norwegian small and medium-sized firms are not in a position to have firms in all countries. This is also a requirement in O&G, but even more so in offshore wind, as all countries want to build this industry internally, creating their own

domestic jobs. If Norway does not, we lose an advantage. Norway must therefore not shrink its offshore wind efforts but be proactive and support the supply industry. The demand for local content and the lack of a domestic market in renewables is a threat” (informant F.4, medium).

The lack of a domestic market for OWP makes it even more challenging to enter this industry of renewables. With international markets follow different cultures, ways to negotiate, norms, and the demand for local content. That OWP is an established international industry, makes it more challenging for outsiders like Norwegian supply firms to enter this industry.

“Some customers are starting to get very comfortable going to China and buying from there. And then you suddenly have competitors in the market that you could have been ahead of if we had been five to ten years earlier. The Dutch and Benelux countries have large shipping companies that work with everything related to transport and installation. There are four to five Belgian and Dutch companies doing all that, and they went in early even though The Netherlands or Belgium did not have wind farms themselves at that time. The Norwegian industry has, unfortunately, thrived in oil and gas, and are now a little late for offshore wind. Meanwhile, Asian competitors have emerged. The Dutch now have a track record, have established relationships and have built trust with customers. Norwegian suppliers are new and in a difficult situation” (informant F.1, large).

5.3.6 No clear renewable strategy

An essential barrier for making the decision as a supply firm in O&G to diversify to renewables is the lack of a clear renewable strategy from the government. This is closely linked with the lack of a domestic market for OWP. Also, generally, there is no clear strategy for Norwegian renewables to replace and substitute the need for O&G. Not only is there a need for power and energy but also stable jobs, as many have their income from work in this sector. Most of the electricity consumed in Norway comes from renewable sources. However, there is still a need for a Norwegian industrial development and security of the jobs currently in the O&G supply chain.

Many of the firms express a concern for the lack of a clear strategy of what the government want the supply industry to do, feeling that it is up to them putting the country on a more sustainable path. As a result, few go all in and the developments taking place, e.g. in FWP, are not guided or coordinated by a common strategy.

“In floating wind power, there are completely different concepts competing to be the leading ones, and it is costly for the industry to have too many concepts to develop. There are questions concerning what the standard will be, will it be good enough for energy production to become cheap enough to compete with other forms of energy, and so on. The potential for floating wind power is enormous, there are so many more ocean areas you can use. Another challenge, of course, but also an opportunity is how to get the power to land. There are so many unanswered questions, we in the industry are left with alone” (informant F.4, medium).

Because there is no leading debate about OWP, there is no one to challenge the lobby organizations, e.g. the fish and climate lobby organizations. One informant said:

“There must be strong governance so that this becomes a positive industrial development, not one filled with conflict” (informant F.4, medium).

Norway’s next industrial adventure must have a strategic plan and needs governance and governmental legitimacy.

“If we want Norway to play a role, it will not be for free. It is an investment, just as we invested in O&G. O&G was not making profits before somewhere in the 90s, I think. At least it was a long investment phase before they started making money. It is the same here with renewables and wind power. We need some kind of support, but we need a plan first and foremost. What do we want?” (informant F.1, large).

O&G is still highly prioritized, both when it comes to funding and the lack of a clear plan for where this sector and the suppliers go next. “The Indicator Report” from 2019, published yearly by RCN about the Norwegian research and innovation system, highlights that petroleum is still the most researched energy type in Norway.

“Norway has a high proportion of renewable energy of total energy consumption, 50 per cent, most of which is hydropower. A little over 30 per cent of the energy consumption is covered by petroleum. However, when petroleum is the energy form most researched in Norway, it is related to this industry’s important position in the Norwegian economy. Less than 20 per cent of Norway's R&D and demonstration is on renewable sources” (RCN, 2019, p. 105 - ‘The Indicator Report’).

5.3.8 Overview of barriers identified

In Table 5, I present an overview of the findings related to barriers associated with firms diversifying from O&G to renewables.

Table 5: Overview of barriers associated with firms diversifying from O&G to the renewable sector.

Barriers for firms diversifying	Summary
Differences between the sectors	Prices under pressure, standardized design, new ways of conducting technological development and different contract structures, new ways of executing projects, and different complexities. This required firms to develop new resources and change their business to accommodate the new environment.
Funding schemes	Applying for funds is identified as a barrier to diversification. It is a time-consuming process, that is not always successful. There is an experienced lack of funding for operational funds without an innovative product. The renewable sector requires developed and tested products, resulting in challenges for firms lacking such facilities.
Lack of contacts	Not having contacts in the renewables sector is a barrier to enter the sector. A lack of track-record in renewables excludes firms coming from O&G. Larger operators also diversifying tend to use suppliers they already know from O&G.
Lack of resources	Lacking resources to enter a new sector means having to invest time and money to develop said resources. The firms also experience conflict as to where to concentrate the resource between the two sectors.
Lack of a domestic market	Local content is especially relevant in OWP, raising the bar for Norwegian firms.
No clear renewable strategy	Norway has no clear renewable strategy. Thus, there are few incentives to leave O&G, and none of the firms are willing to leave O&G altogether as their revenues come from that sector. There is no governance or strategy for industrial development from the government.

6 Discussion

In this chapter, I will discuss my empirical findings in light of my analytical framework and previous research to answer my research questions.

6.1 RQ1: Why and how established firms diversify

Why and how do established supply firms in the oil and gas sector diversify to the renewable energy sector?

6.2 Why established firms diversify

In this section, I will discuss the first part of my first research question: *Why* do established supply firms in the oil and gas sector diversify to the renewable energy sector? There is much research on what is called sustainability innovations or ecopreneurship, research about how businesses can take part in solving environmental problems or how they can operate more sustainably (Bansal & Roth, 2000; Lober, 1998). However, there are fewer research efforts into understanding why and how established firms diversify in a sustainability context (Hansen & Steen, 2015; Mäkitie, 2019). Understanding the motivation and reasoning behind firm diversification, aids in identifying the appropriate and correct instruments better to facilitate firm diversification as part of the sustainability transition. To discuss why the firms diversified, I will base my discussion of the empirical findings on mainly the theory of the RBV and previous research. I have identified three themes as to why diversification took place: a decline in the O&G sector, a search for new opportunities, and an opportunity for resource redeployment. During the analysis, it also became clear that some of my findings differed concerning firm size. This aspect will also be discussed in light of the RBV, as large firms have broader resource bases compared to smaller firms, and thus have more resources they can leverage to be realised by diversifying (Penrose, 1959; Teece, 1982).

As presented, I have identified three themes as to why the firms diversified. I will discuss these separately, but they are to some degree connected, as the motivation for diversification rarely can be traced back to a single source. For some, the decline in O&G initiated a search process within the firms, i.e. they started investigating other markets and from there saw a potential to redeploy resources. I will discuss this in further detail under the specific sections.

6.2.1 Decline in the O&G sector

The experienced decline in the O&G sector is an essential reason as to why the firms started to diversify. A decline in a sector is an exogenous pressure that can serve as an incentive to diversify from fossil-based industries to more sustainable industries like the renewables sector and also more radical technologies like OWP (Karlton & Sandén, 2012; Penna & Geels, 2015). The O&G sector experienced declines in both 2008 and 2014 (Ministry of Finance, 2017). The reason for the declines is out of scope for this thesis. However, several stated that the decline they experienced through fewer orders and projects, and the O&G sectors weakened ability to pay for already set production orders, forced the firms to search for opportunities in other markets. Certain firms had been aware of such opportunities but had not pursued them due to the prospering times in O&G. Because of the decline, however, they now both had an incentive and a need to diversify. The push of the decline together with a certain level of access to funding schemes and learning arenas about the renewable sector made the initial steps towards renewables more effortless compared to the situation only ten years ago, as perceived by the informants. Both incentives and opportunities were essential for the firms to diversify to renewables. This is in line with other findings on firm motives and incentives needed to respond to transitions (van Mossel et al., 2018; Wesseling et al., 2015).

According to the RBV, larger firms have a broader resource base compared to smaller firms (Penrose, 1959; Teece, 1982). This means larger firms have more resources and thus a higher chance of excess and available resources that can be realised by diversifying. The smaller firms have to a greater degree diversified because of the decline in the O&G, compared to the larger firms. As the firms have diversified to renewables, they still operate in the O&G sector, from where they all have their primary income. One informant from a large firm brought up the temporality of their renewable projects, as they quickly fully returned to O&G when the sector once again was prospering. However, they are now back on track with their renewable projects as the second decline in O&G is more prolonged and they have invested a substantial amount of money in the industry (Mäkitie et al., 2019).

The broader resource base of large firms also includes more generalised resources (Helfat & Lieberman, 2002). Generalised resources are fungible, i.e. not locked to their current use (Anand et al., 2016; Teece, 1982). As larger firms have more fungible resources than smaller

firms, the former is expected to better thrive in a new sector. As the large firms returned to O&G when the opportunity presented itself, this is contrary to theory. Supporting this with a similar finding is Thune and Mäkitie (2018). They found that large and technologically advanced firms were not that diversified compared to smaller firms. Larger firms are commonly older, with a strong position in a market and thus with fewer incentives to diversify and radically innovate (Chandy & Tellis, 2000; Wesseling et al., 2015). Larger firms can also, to a greater extent, absorb external shocks as they typically have broader resource bases (Albers, 2019). Spending time trying to get a foothold in a new sector is expensive. When the O&G sector had an upturn again, the smaller firms could therefore not discard their already started renewable projects to the same degree the large firms could. Large firms have more of the resources identified as necessary to succeed in a new sector: industrial knowledge, marketing, international contacts, established brand name, amongst others. However, they have taken time to fully commit to their renewable projects, awaiting an upturn in the O&& sector. Hence, this challenges the link between large firms, breadth of resource base and fungibility of resources.

All the supply firms in my study have most of their revenues from O&G, some still 100 per cent. Still, they all have diversified to renewables, but some have not landed their first contract and are still exploring possibilities. The O&G declines that have transpired are just economic declines and not regime destabilisations (Turnheim & Geels, 2013). The sector is still thriving; however, there have been fewer investments and tighter budgets after the more prolonged decline in O&G after 2014, making O&G a riskier market to operate in compared to before (Mäkitie et al., 2019). The ongoing Covid-19 outbreak is prolonging this situation, with potential long-term outcomes still unknown.

6.2.2 A search for new opportunities

An important reason why many of the firms chose to diversify was to broaden their resource bases and limit the dependence on only one sector. Several of the firms only felt the need to engage in other sectors after they experienced a decline in O&G. Almost all the firms have or are in a process to enter the OWP industry. The firms expect this industry to grow in the coming years, and the industry is perceived as part of the coming and on-going transition of the energy sector. Mäkitie (2019) argues that firms diversify from O&G to FWP partly because of the growth the industry has seen in Europe in recent decades, but also due to

public ambitions for firms to transition. The Norwegian government does not have explicit goals for the transition from O&G to renewables but want to continue to support renewables through R&D and have a goal of transferring competence built in O&G to other sectors (Ministry of Finance, 2017, p. 115; Normann, 2017; Normann & Hanson, 2017).

Expectations of market opportunities generally and governmental support for radical and new sectors are identified to serve as an incentive and attraction for established firms from other sectors (Budde, Alkemade, & Weber, 2012). Early work on the RBV also highlights the role of expectations (Wernerfelt, 1984). Barney (1986) also discuss how firms generate expectations and implement different strategies. According to theory, firm resources are heterogeneous distributed and immobile between firms (Barney, 1986). Hence, a firm with specific resources can implement a strategy and gain a first-mover advantage firms without those resources cannot (Lieberman & Montgomery, 1988, 1998). In the case under study in this thesis, several of the firms were able to implement the same strategy, i.e. to diversify to renewables. They have under different conditions implemented the same strategy as a result of the decline in O&G and the perceived opportunities in renewables. All of the firms have different products and services and have entered the renewable sector and the different industries within renewables at different entry points in times. They all possessed different resources entering renewables, and thus implemented different strategies concerning timing, how they did it, and to which industry they diversified.

Large firms, to a greater degree, consider the step towards renewables as a natural part of their firms' development. As these firms are larger, they have grown their resource base through many expansions. Smaller firms, with smaller resource bases, experience the step as risky but necessary. This is in line with theory on firm resources, the extent of available firm resources is correlated with how likely and how easy a firm can diversify (Helfat & Lieberman, 2002; Penrose, 1959; Wernerfelt, 1984). The fact that smaller firms also stated that they diversify because it is an opportunity, and not only because of the decline in O&G is not contradictory to theory but challenges the general conception that breadth of firm resources serve as a marker for degree and ease of diversification. It is out of the scope of this thesis to investigate and compare precisely why, when, how, and how far the individual firms have come in their diversification processes. Instead, this thesis investigates the general case of firm diversification from O&G to renewables. This, I must leave for future research. However,

larger firms do appear to have come further in their process, where certain smaller firms still are trying to land their first contract and still have zero revenues from renewable projects.

Through the analysis, it became evident that entering renewables also meant getting an opportunity to front a greener profile towards potential employees. Several firms had employed additional human resources following the diversification, but few devoted these solely to work on renewable projects. The human resources and their competences are shifted back and forth between O&G and renewables. Hansen and Steen (2015) found that O&G firms involved in OWP pursued certain investments in OWP to attract human resources to also use in O&G. My findings do not support this completely, but rather that the renewable projects provide a bonus for firms to exploit to attract additional human resources.

A broader resource base is connected to how likely and how easy firms diversify (Helfat & Lieberman, 2002; Penrose, 1959; Wernerfelt, 1984). By easy, here meaning they have more resources to leverage, they are in a position where they might not need to develop and acquire as many new resources as smaller firms. Developing and acquiring new resources is time-consuming and expensive. Smaller firms expressed that having diversified to renewables have enabled them to investigate additional new sectors and industries. By diversifying to renewables, they have broadened their resource bases and are, therefore, now in a better position to diversify further (Penrose, 1959; Pisano, 2017).

6.2.3 Opportunity for resource redeployment

A third identified reason and motivation for why the firms diversified from O&G to renewables is the opportunity of resource redeployment. According to the theory of the RBV, the potential and opportunity to redeploy existing firm resources to other sectors is an important reason as to why firms diversify (Helfat & Lieberman, 2002; Penrose, 1959; Wernerfelt, 1984). The firms redeployed resources to different degrees. Some describe their technology as the same in both sectors and some highlight they have been able to bring competences from O&G with them to their renewable projects. Others found their product had a better application range in renewables compared to how they operate in O&G. The technological relatedness between O&G and renewable industries makes entering these industries less risky than if the firms were to diversify to an unrelated industry. The firms diversified to an industry in a sector where they can redeploy part of their existing firm

resources, hence this is an example of related diversification (Helfat & Lieberman, 2002). As the firms described, they redeployed firm resources, and it happened through internal resource redeployment by the movement of internal firm resources (Anand et al., 2016; Helfat & Peteraf, 2003). As the firms have shared resources between markets, this is also inter-temporal resources redeployment (Anand et al., 2016). The expected opportunity to redeploy already possessed resources is a central element in explaining why the firms diversified from O&G to renewables (Helfat & Lieberman, 2002). Mäkitie (2019) have a similar finding after investigating established firms in the O&G redeploying resources to FWP.

Related diversification, the opportunity to redeploy existing firm resources, served as a motivation and reason as to why the firms diversified. Additionally, important is the experienced decline in O&G and the search and expectations of new opportunities. A relevant discussion in this context is how the firms describe and experience this “relatedness”, and also how they describe their original sector, O&G. How something is related is relative, but in the context of this thesis, understood as the opportunity to utilize already possessed resources in a different context (Anand et al., 2016; Helfat & Lieberman, 2002). All the informants got asked directly to describe their primary market and sector. I got varying answers, but typical for all was O&G as their primary market. Some explicitly described O&G as their main market, others the process industry, some ocean space, and a few also pointed to customers in the energy business. This has affected to what industries they diversified to in renewables. However, it also affects how they consider their opportunities to diversify further. Those that answered ocean space and energy customers generally, typical broad terms, perceive few limitations to where they can expand as long as it is within the definition of their sector and market. This resonates well with another finding that especially larger firms have broad resource bases of generalised resources to utilize in a more diverse selection of sectors. They have strong competences in organizing and carrying out complicated technical operations and logistics.

6.3 How established firms diversify

I will in this section discuss the second part of research question one: *How* do established supply firms in the oil and gas sector diversify to the renewable energy sector? Established firms are typically viewed as rigid and resistant to change (Geels, 2014b). This is a changing view, and such firms may shift their attention over time, both exploiting their existing

business sector and diversifying into a new one (Smink, Hekkert, & Negro, 2015). There has been increasing attention on established firms in the energy sector diversifying from O&G towards renewable energies (Bergek et al., 2013; Pinkse & van den Buuse, 2012; Steen & Weaver, 2017). However, there is still limited knowledge about sustainability transitions and how individual firms react to and address such processes. Hence there is a need to understand firm strategies and characteristics concerning sustainability transitions (Geels, 2014a). Studying how established firms diversify from O&G to renewables, attains a greater understanding of the dynamics between the sectors and how established firms play a part in the transition (Hansen & Steen, 2015). Thus, the right support schemes and tools can be identified to accelerate the sustainability transition and the diversification from O&G (Farla et al., 2012).

I will discuss how the firms diversified by applying my analytical framework that integrate the RBV and DCs approach and in light of previous research. By doing so, I will identify how the firms utilized their resources, and how they through sensing, seizing, and reconfiguring have been able to diversify from O&G to renewables.

6.3.1 Addressing knowledge gaps through learning

In response to external pressure like the experienced decline in the O&G sector and the firms' own internal motivation to search for additional opportunities as well as utilize already possessed resources, the firms looked towards the renewable sector. The firms had limited knowledge about the field and had to gain new knowledge by learning, an essential part of the sensing process of DCs (Teece, 2007). Learning was done by conducting R&D, attending seminars, and entering into partnerships with other firms. Some firms thought renewables was compatible with their resources but knew very little about how the sector and the specific industry they were interested in actually worked. This led them to employ additional human resources with experience and knowledge from the field. These human resources thus serve as gatekeepers between the firm and the renewables sector, strengthening the firms absorptive capacity (Cohen & Levinthal, 1990). Human resources can learn, improve, transfer knowledge from one sector to another, and can combine resources, separating them from other types of resources (Penrose, 1959). It is the tacit dimension of human resources, the intangible resources they possess, that makes them invaluable as gatekeepers (Barney, 1991; Cohen & Levinthal, 1990; Farjoun, 1994).

One firm neither attended seminars nor employed new human resources. Taking on new people is expensive, and for smaller firms, the cost-benefit assessment is even more critical and challenging than for larger firms with more funds. One small firm dealt with this by hiring consultants to act as gatekeepers by translating the firm's technology to the new context, i.e. the new industry. A consultant will also act as a gatekeeper by translating information about the new sector to the diversifying firm. Skill acquisition and gaining new knowledge and intangible resources are essential parts of the learning and sensing process (Hayes, Wheelwright, & Clark, 1988). Learning processes have also proven to be vital when firms diversify (Strøm-Andersen, 2019; Tallott & Hilliard, 2016).

An essential part of the sensing process is the ability to identify, act upon and choose where to go next (Teece, 2007). The firms interviewed for this thesis had already started diversifying to a renewable industry. Therefore, I will not discuss the firms' abilities to choose where to diversify after they have sensed external pressures or internal motivation. This is partly covered in the previous section, 6.2, and is also a premise for the study I have conducted. The study of how firms choose the target sector is out of scope for this thesis, and more in line with so-called phase-out literature (Kivimaa & Kern, 2016).

My findings show how learning plays a crucial role when firms address knowledge gaps during early diversification (Strøm-Andersen, 2019; Tallott & Hilliard, 2016; Teece, 2007). Certain firms employed additional human resources, while others hired temporary consultants to serve as gatekeepers when the firms could not utilize their resources directly or could use their human resources to learn about the new industry. A gatekeeper translates the new industry into a language the firm understands and also translating the firm's technology to a compatible form for the specific renewable context (Cohen & Levinthal, 1990). It is costly to employ new personnel, but it is a long-term investment. Hiring consultants is cheaper in the long run, as they are only employed temporarily. However, the function as gatekeepers and the knowledge they translate and transfer is thus also temporary, putting pressure on the firm to quickly acquire the resources needed from the consultant.

6.3.2 Funding

Funding is an essential part of diversifying and identified as a crucial part of the seizing process of DCs (Strøm-Andersen, 2019; Tallott & Hilliard, 2016; Teece, 2007). After the firms had sensed the opportunities in the renewable sector and acted upon their knowledge gaps, they had to exploit the possibility through diversifying to the renewable sector. The financial resources are thus, essential to facilitate this process. Many of the firms in this study are small by definition, and the medium-sized firms are also small in an international context, few of them have more than fifty employees. Funding the diversification process, especially if the decline in O&G initiates it, can be challenging. Strøm-Andersen (2019) found that established firms in the process of expanding their business ended up diversifying to the options where they received funding from Innovation Norway or where they knew development would be less costly, and they could take it on themselves. The opportunity to apply for financial support through public funding institutions was essential to many of the firms in my study.

Financial support is vital for niche technologies and renewable energy infrastructures, as such innovations involve high risk and are costly as the established firms are moving away from their primary area in O&G (Loorbach & Kemp, 2008; Yildiz, 2014). The firms in this study got financial support from Innovation Norway and RCN and also used tax incentive schemes like SkatteFUNN. Certain firms also got financial support to test and demonstrate their prototypes, essential to their commercialization process. Lack of such funding is as a barrier to diversifying, a topic I will return to in section 6.4. Financial support only partly covers the process of diversifying, e.g. R&D of new technology. Diversifying to renewables, therefore also means the firm are dependent on their O&G projects to fund this process. Firms that have operated in O&G for a more extended period can suffer under so-called carbon lock-in, meaning their financing, as well as operations, are to a high degree locked to their current path in O&G, resulting in high switching costs (Unruh, 2000; Yildiz, 2014). The Norwegian government are, therefore, funding projects in renewable energy and energy efficiency to accelerate and help firms diversify (RCN, 2019). Governmental funding schemes are hence essential to accelerate the sustainability transition.

When the firms both receive financial support and fund their process of diversifying, they are ambidextrous (O'Reilly & Tushman, 2008; Tushman & O'Reilly, 1996). They are both exploring a new industry within renewables and at the same time exploiting their existing business in O&G. My findings show how firms seizing such opportunities are being ambidextrous and thus have DCs (O'Reilly & Tushman, 2008; Teece, 2007). Exploring a new industry also facilitate new resource development, and this broadens a firm's resources base, strengthening their chances of surviving and thriving in renewables (Eisenhardt & Martin, 2000).

6.3.3 Resource redeployment

Resource redeployment is an essential part of related diversification and is identified as a DC, specifically part of the seizing process (Tallott & Hilliard, 2016; Teece, 2007). My study of firms diversifying from O&G to renewables is an example of related diversification as they can share resources between the sectors (Anand et al., 2016; Helfat & Lieberman, 2002). The firms redeployed both specialised and generalised resources, and also both technological and organizational resources, with the same level of ease. These findings challenge the theory of fungibility of resources (Anand et al., 2016; Teece, 1982). Firm resources that are fungible are easier to redeploy from one sector to another, compared to specialised resources that, to a higher degree are confined to their current use (Teece et al., 1997). Still, specialised resources are considered a source of competitive advantage (Pisano, 2017). A similar finding corroborates the redeployment of both specialised and generalised resources. Mäkitie (2019) found the same classes of resources redeployed when firms diversified from O&G to the renewable industry FWP.

As the firms in my study diversify to a related sector and industry, they can draw on both their specialised and generalised resources (Pisano, 2017). Generalised resources can also be redeployed in unrelated diversification, whereas specialised resources are mostly restricted to their current use (Chatterjee & Wernerfelt, 1988). However, this study indicates that specialised resources also are redeployed in related diversification. The firms did not diversify to renewables because they knew beforehand precisely which resources they could leverage. Instead, they saw similarities between the industries, and thus this corroborates the theory of the RBV that firms possess resources they can leverage to gain a competitive advantage by for example diversifying (Barney, 1991; Penrose, 1959; Wernerfelt, 1984).

In the analysis, it became apparent that there are differences between small and large firms concerning type and degree of redeployed resources. The smaller firms redeployed to a greater degree more specialised technological resources, i.e. they found they could utilize their existing technology used in O&G also in renewables, after some adjustments. Examples are suppliers providing insulation of cables and sensor systems. The large firms leveraged more generalised resources, like project management capabilities and financial strength. The large firms studied supply specific products but are also project and service providers where generalised resources are their core strengths. They have gotten a foothold in their renewable industry and have started building a name for themselves. The RBV predicates that firms with a broad resource base, i.e. large firms, and generalised resources, have a higher chance of diversifying and succeeding when diversified (Penrose, 1959; Pisano, 2017; Teece, 1982). I have not conducted a quantitative study and can thus say little about whether large firms indeed have a higher chance of diversifying, as both small and large firms have diversified. The larger firms do seem to have gotten further in their process, but I have not investigated the time of entry and can draw no conclusions based on this finding. I can, therefore, draw few precise conclusions on the relationship between firm size and extent of redeployed resources. Hence, more research is needed. Still, it appears that the larger firms could more easily redeploy generalised organizational resources and had a broader resource base to diversify on. Thus, they also have more to build on for developing additional resources. I will return to this in section 6.3.4 “Development of new firm resources”.

I now want to highlight some of the specific findings from my analysis related to the firms’ resource redeployment. Both small and large firms redeployed specialised organizational resources through an identity they have developed while operating in the O&G sector, which made the transition to renewables easier. A similar finding corroborates this, where Mäkitie (2019) noted an offshore identity as necessary for motivation and dedication of firms diversifying. The identity identified in this thesis affects how firms define their business market, e.g. ocean space, energy operators, or process industry. However, all firms operate within O&G and supply products and services to O&G platforms. This identity has affected where they have diversified, where some have stayed in ocean space. Others using the wording “process industry”, also envisage opportunities in land-based industries. By having an identity that defines their course of action, certain firms have been able to leverage this by

referencing previous work in O&G that complement their identity and business profile to further their agenda and chances of new projects in renewables. The identity both opens but may also limit future opportunities as it can restrict the firms' vision about where they can diversify, utilize and redeploy resources.

I also want to highlight that the larger firms considered the process of diversifying to renewables as a natural development to a higher degree than the smaller firms. Again, the larger firms can draw on their strengths of having a broad resource base, which means easier access to available and excess resources (Penrose, 1959; Teece, 1982). The large firms have diversified several times through history and can, therefore, make use of resources and capabilities acquired through such processes when diversifying to renewables.

6.3.4 Development of new firm resources

The firms have diversified through internal resource redeployment, meaning they have “moved” internal resources from one sector to another, rather than through acquisition (Anand et al., 2016; Helfat & Peteraf, 2003). As they diversified from O&G to renewables, they were able to utilize already possessed resources to a certain degree, but still needed to develop new firm resources (O'Reilly & Tushman, 2008). The firms developed new resources, including new competences and capabilities. As discussed in the previous section, the smaller firms redeployed specialised technological resources to a greater degree than the larger firms, which in turn redeployed more generalised organizational resources. This also seems to have a consequence for the need to develop new firm resources. Even though the smaller firms redeployed more technological resources, they were also the ones in most need of developing new technological resources related to the renewable industry they had entered. Their technology still needed adjustments to become compatible with the new context. Examples are new knowledge about material properties that was needed even though the product in question had been used under water in O&G and was still going to in the renewable industry. The larger firms felt less of a need to develop new technological resources as they had a more diverse product base and had operated in different segments of the O&G industry before, making the step towards renewables easier. An important distinction worth highlighting is that the larger firms also are service firms, not only product suppliers, whereas most of the smaller firms are more product based. The larger firms thus have resources and competences from different knowledge fields they can leverage when diversifying, resulting in a lesser need to

develop new firm resources. As will be highlighted later in section 6.4 about barriers, this is a strength when diversifying to renewables.

As already mentioned, the larger firms redeployed more generalised organizational resources. This can prove to be a strength concerning developing new firm resources. According to the theory on the RBV and DCs can generalised resources serve as a foundation for the development of specialised resources (Pisano, 2017, p. 754). Having redeployed generalised resources, larger firms are thus in an advantageous position. However, both small and large firms developed new organizational resources. The ambidextrous nature of exploring a new industry and developing new firm resources and at the same time operating in and exploiting an old industry strengthens a firm's DCs (O'Reilly & Tushman, 2008; Tallott & Hilliard, 2016; Teece, 2007). Through seizing the opportunities in a renewable industry, firms enhance their resource bases, building a more robust firm.

All of the firms experienced challenges with different contract types in renewables compared to O&G. All had to develop new resources related to large batch production compared to the unique technological developments more common in O&G, and several firms have adopted the lean methodology as a consequence of diversifying. All of these findings confirm that even though firms diversify to a related sector, they have to develop new resources (O'Reilly & Tushman, 2008). Mäkitie (2019) found that firms diversifying from O&G to FWP needed to develop new supplier relationships and new technological resources about how to assemble wind turbines. However, firms leveraged their resource bases and knowledge from O&G to develop these new resources. Andersen and Gulbrandsen (2020) found several differences between the O&G sector and other sectors diversified to in their study. These differences pose as barriers, meaning firms have to develop new resources to overcome them, thereby confirming the findings in this thesis.

Before returning to the discussion about the development of new firm resources regarding firm size, I want to highlight that the step from operating in a domestic market in O&G, more typically for the smaller firms, to an international market in OWP, is not straightforward. This encompasses developing new resources not only related to the new industry and sector but also about how cultural differences affect contract negotiations, norms and general behaviour.

Large firms have a more extensive resource base they can leverage not only to redeploy resources but also in developing new firm resources (Penrose, 1959; Teece, 1982). Thus, they do not have to develop as many or as extensively new resources, as they initially have a broader resource base. It seems like the development of new firm resources is built on firms' existing resources, both concerning small and large firms. There was only a need for minor adjustments to the technologies, and this process utilizes the existing resources. This is in line with the theory of the RBV and DCs that firms can develop new resources, and these will be based on and in close relation to a firm's existing resources (Pisano, 2017, p. 756). Also, previous research on resource redeployment and resource acquisition has found the development of new resources to be based on already possessed resources (Kaul, 2012; Mäkitie, 2019). Firms have a "learning range" that limits or hampers the development of new firm resources if the new resources stray too far away from the already possessed resource base (Teece, Rumelt, Dosi, & Winter, 1994, p. 17). Thus, this strengthens my finding that the development of new firm resources is to some degree based on existing resources.

6.3.5 Organizational restructuring

Organizational restructuring is essential for the process of firm diversification. Through the process, all the firms needed to employ new human resources, reassign new tasks to existing personnel or limit the use of outside hired personnel for projects. Organizational restructuring is in line with theory on DCs and reconfiguring processes (Teece, 2007). Expansion of human capital is identified as an essential part of the reconfiguring process by rearrangement of a firm's resources and organizational structure (Liao et al., 2009; Teece, 2007). The firms in this study have, by rearranging their organizational structure and adding additional human resources, been able to recombine new resources and align their business with a changing external and internal environment. A similar finding by Strøm-Andersen (2019) corroborates this, where an incumbent firm diversifying its product base had to reconfigure its firm units by employing new human resources to align the business with changing environmental conditions.

Another essential dimension of the reconfiguring process is the long-term perspective, creating and restructuring a firm for the future (Lieberherr & Truffer, 2015; Teece, 2007). The firms diversifying from O&G to renewables are preparing for future change and requirements by looking at other projects and industries within the renewables sector. Also, they enter into

several research projects and collaborations with the academic sector and prioritize high competence in recruitment processes to build a robust organization. The step to renewables is for certain firms value-driven by working for a more sustainable future. None of the firms diversified purely because of this. However, by continuing to explore renewables and changing their firm to adapt to the new external environment, the firms are part of the sustainability transition. Strategic planning for the future while also being aware and willing to take the risk that accompanies change and new technologies is to possess DCs through reconfiguring processes for sustainability transitions (Lieberherr & Truffer, 2015; Truffer, Störmer, Maurer, & Rued, 2010). Sustainability transitions are “long-term, multi-dimensional, and fundamental transformation processes” that thus requires long-term goals and commitment (Markard et al., 2012, p. 956).

I have also here, under the theme organizational restructuring, identified firm size differences. Firm size is decisive to what degree firms have to employ new personnel. The smaller firms have compared to the larger firms had a greater need to recruit more human resources to adapt to the changing environment. The theory of the RBV can explain this, that larger firms have broader resource bases and thus more resources to base their diversification on and less of a need to recruit new personnel (Penrose, 1959; Teece, 1982). Certain smaller firms highlighted that they want to build a diverse human resource base with employees also with higher education. Employees with doctorate degrees have both very specialised and generalised competences. They have specialised knowledge about specific topics within certain fields. However, they have also built a broad resource base through their education and research, e.g. the ability to quickly acquire new knowledge, strategic planning, and project execution. Thus, the firms restructuring such human resources are reconfiguring their resources base and building an organization able to adapt to future and ongoing environmental changes (Lieberherr & Truffer, 2015; Teece, 2007).

6.4 RQ2: Barriers associated with diversifying from O&G to renewables

RQ2: What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms?

Some of the barriers identified relate to challenges in the external environment. These are outside of my analytical framework, and I will therefore mainly discuss these barriers in basis of the empirical findings and previous research.

6.4.1 Differences between sectors

The analysis revealed several differences between the O&G and the renewable sector that act as barriers to diversification. An essential finding is that most of these barriers are of a non-technological degree. All of the firms, especially the smaller ones, experienced the change from unique development processes and deliveries to the requirement of ready-to-go, standardised and mass-produced products in addition to a new cost-efficiency mindset in renewables, as a barrier. Similar findings in previous research corroborate these findings (Andersen & Gulbrandsen, 2019, 2020; Mäkitie, 2019).

The different ways of doing business in O&G and renewables makes these two sectors almost unrelated when taking the technical part out of the equation. As discussed in previous sections, there are clear opportunities for resource redeployment for firms in O&G, but there are also apparent barriers to diversification. O&G appears to be a unique sector, where even OWP is more like a land-based industry when looking at the non-technological parts of the business. I have already stated that firms with broad resource bases, i.e. large firms, have advantages when diversifying, as they have more resources to leverage. Not investigated in this study is where those resources originate. For future research, it would be interesting to investigate if firms that have operated both in O&G and other land-based industry have an advantage when entering OWP, compared to large firms that have only operated in O&G.

The established firms investigated in this study experience barriers when diversifying, even though they have diversified to a related industry. There has been discussion about whether established firms or start-ups are better suited for niche industries like OWP (Hockerts & Wüstenhagen, 2010). Established firms have advantages over smaller start-ups, due to their

existing resource base, no matter the size (Snyder & Kaiser, 2009). There is research suggesting that both established firms and start-ups are essential for sustainable transition, and the growth of niche-industries (Hockerts & Wüstenhagen, 2010). However, because of my findings suggesting that both small and large firms experience barriers when diversifying, I suggest more research is needed on established firms, start-ups, and firms with experience from both O&G and land-based industries, diversifying to renewables. This is necessary to challenge and investigate my claims that the O&G sector appears to be unique, the barriers experienced by firms diversifying from O&G are a result of them coming from O&G, and that those with a more diverse background experience these barriers to a lesser degree. This type of knowledge could assist the development of correct instruments needed to assist the transition.

Andersen and Gulbrandsen (2018) studied challenges and opportunities for firms diversifying from O&G to other industries. They found that most barriers are connected to non-technological dimensions. Also, firms diversify to industries they perceive as related, based on how they view their technology. This is also the case for my study, even though I have investigated firms where all have diversified to the same renewable energy sector. Thus, this substantiates the argument that the O&G sector is unique. Policy measures to target and lower the non-technological related barriers must, therefore, aim at this dimension. For example, through funding and support schemes to restructure the business, but also for resources and competences needed to accommodate the renewable sector. Still, R&D policy instruments are vital in the diversification process, as presented in the empirical section and discussed previously concerning how public funding schemes are essential for firm diversification. This study, therefore, contradicts with Andersen and Gulbrandsen (2018) on their assumption that R&D policy instruments are not tools necessary to support firm diversification.

I want to highlight the differences identified relating to firm size and barriers to diversification through the differences between the two sectors. Although both small and large firms experienced challenges, the larger firms could more easily overcome them. Larger firms generally have broader resource bases they can leverage, explaining this trend (Penrose, 1959; Teece, 1982). The larger firms in this study also have a previous history of diversifying, thus have experience with adapting to new industries and have built a broad resource base through the use of DCs (Teece, 2007; Teece et al., 1997). A broad resource base also points to more

generalised resources that serve as a foundation for the development of specialised resources required in the new sector (Pisano, 2017, p. 754). The smaller firms experienced the differences between the two sectors as barriers that required additional efforts to overcome, which, to some degree, can be explained by their smaller resource bases.

6.4.2 Funding schemes

I have previously highlighted public funding as an essential tool for firms to be able to diversify. In this section, I draw attention to the fact that it also functions as a perceived barrier. A prevalent experience for all the smaller firms is that they are not getting the right funding and not at the right time. The findings suggest that smaller firms are more dependent on public funding to diversify as they have limited and less financial resources compared to larger firms. Larger firms are more able to finance their expansion and are also better equipped to handle the expanding workload and the increasingly complex organizational structure that follows (Rothwell, 1989).

Even though established supply firms struggle with getting funding for their R&D, expressing start-ups are prioritized, a tougher challenge is the lack of funding for industrialisation and commercialisation of technology. Several small firms struggled with the requirement of the OWP industry to have a complete product, as a full-scale demonstration was needed beforehand. This testing was in the O&G sector done iteratively in collaboration with the customer, both financially and through the equipment and context needed for testing. Smaller firms have more limited resources (Penrose, 1959; Teece, 1982), and perceive this step as a barrier to entry to the OWP industry. Previous research corroborates this, e.g. Mäkitie (2019) found that smaller firms struggle more with the financing of the demonstration phase than the two larger firms in his study.

I also want to highlight that the public funding of large incumbent energy operators comes with few obligations to use Norwegian suppliers, e.g. Equinor that received 2,3 billion NOKs to develop Hywind Tampen. This acts as a barrier for smaller firms trying to enter the OWP industry. A similar finding corroborates this, where Normann and Hanson (2017) found in their study that smaller firms struggled to enter the OWP industry as Statoil (now Equinor) and Statkraft's only interest is a qualified supplier, where the country of origin comes second.

I have mainly argued that the current types of policy instruments are inadequate, but also highlighted by my informants is that the application process for funding is time-consuming and expensive. Even if you get funding, it is often too late. Thus, even though the firms need R&D related funding, my findings suggest that additional types of funding instruments are needed. Andersen and Gulbrandsen (2018) also make a call for this. The uniqueness of the O&G sector warrants a more customised support system to address the barriers experienced by the firms in this study. As it is an established goal of the government to transfer resources and competences from the O&G sector to other sectors (Ministry of Finance, 2017, p. 115), the funding and policy instruments should follow suit.

6.4.3 Lack of contacts

The industries within the renewable sector exist as niches, where the O&G sector can be considered a stable regime (Geels, 2004; Geels & Schot, 2007). Nevertheless, the industries in renewables diversified to in this study are established industries, meaning there are already actors with a proven track record and somewhat established technologies present. For OWP, the established industry is in the international market. Emerging industries might have advantages over established ones, as there are opportunities to take part in defining the industry, establishing dominant technologies, and taking a leading position (Smith & Cooper, 1988). The opposite is true for established industries, as dominant actors already have taken a position.

Because of a lack of contacts and network in the renewable industry, a central challenge is getting the first contract. Some small suppliers benefit from a link to a larger operator that also have diversified. This is specifically relevant for firms diversifying to OWP. However, those without such strong confidential bonds struggle to get a foothold in the industry. Without any reference to previous work in the industry, it is challenging landing the first contract. It seems like the renewable sector, especially the OWP industry has strong positive feedback loops, meaning that when a firm gets its first contract, they can use this as reference for future projects.

I also want to highlight that the larger supply firms diversifying also act as barriers themselves towards smaller firms, by mainly using smaller suppliers they have a track record with from O&G. The finding discussed briefly in the previous section related to large diversified

incumbent energy operators acting as barriers. Here I highlight that also large supply firms using smaller suppliers as part of their deliveries, act as barriers. Larger firms also state that entering the industry and landing the first contract is a challenge. However, these have broader resource bases and thus better positioned to succeed compared to smaller firms with limited capital and resources. To address this barrier, large firms, both supply and incumbent energy operators, should act as a link between the small supply firms and the international OWP industry to assist their entry. This is also highlighted by Normann and Hanson (2017) that point to the fact that larger firms can partly make up for the lack of a domestic market for OWP.

6.4.4 Lack of resources

Related diversification allows firms to exploit existing resources in another sector and industry and thus requires less development of new resources, compared to unrelated diversification (Anand et al., 2016; Helfat & Lieberman, 2002). Still, the development of new resources is also necessary when firms diversify to a related industry, and this is both time-consuming and expensive. One informant highlighted that understanding the new domain and the specific features of the new industry has taken time and money. This is per theory, as specialised resources are expensive and challenging to acquire (Sandvig & Coakley, 1998). Thus, this serves as a more significant barrier for smaller firms than large firms with broader resource bases to leverage (Penrose, 1959; Teece, 1982).

The lack of specialised resources, but also generalised ones, are perceived as a barrier because firms already present in the renewable industries enjoys the presence of a resource position barrier (Wernerfelt, 1984). The firms present have acquired specific resources and assets, like established customer relations and contracts. This raises the cost for others to gain the same resources, putting the diversifying firms in a position of disadvantage. I stress that the resources in question must be non-scale-free resources for a resource position barrier to exist, or else any given firm can acquire them without any opportunity cost (Anand et al., 2016; Levinthal & Wu, 2010). The term “resources” is here used in a broad sense, like Barney’s (1991) definition that encompasses all capabilities, information, knowledge available, and specialised and generalised resources.

A large firm size does not equal an abundance of resources. One firm highlighted that deciding where to concentrate vital human resources was experienced as a challenge. This is in line with theory on resources and their degree of applicability. Resources that have an opportunity cost when utilized is a non-scale-free resource, meaning its use precludes use in any other market at the same time (Anand et al., 2016; Levinthal & Wu, 2010). Thus, a lack of “enough” resources is a barrier to diversification that smaller firms might struggle with more than larger firms because of their smaller resource bases. The barrier of where to concentrate resources is a finding also corroborated by previous research (Andriopoulos & Lewis, 2009; Mäkitie, 2019). The tools for lowering this barrier is, therefore not R&D policy instruments, but instead, I suggest instruments directed at strengthening the firms' resource bases, especially targeted at smaller firms.

6.4.5 Lack of a domestic market

A critical barrier for all firms studied is the lack of a domestic market for OWP. OWP is a particularly important industry within the renewable sector, as it has great potential for growth, especially with the emergence of FWP (Walsh, 2020). However, the sustainability transition from O&G to renewables is not only about cleaner energy but also about building a new export industry and securing Norwegian jobs. Hywind Tampen is Norway's first commercial floating wind project, and this represents an important step for Norwegian OWP developments.

The lack of a domestic market identified means that firms struggle with testing their technology before going international, having to turn to international markets straight away without any references (Normann & Hanson, 2017). There is also a requirement of local content that raises the entry barrier further. As discussed previously, the international OWP industry is an established industry, meaning established actors dominate the market. Smaller firms do not have the financial resources, R&D capacity, or other resources needed to access the international OWP market, to the same extent as larger firms. To meet the requirement of local content, a firm must set up a separate firm in the country in question. This is becoming more of a standard, especially in the UK (Kern, Smith, Shaw, Raven, & Verhees, 2014). The demand for local content raises the bar for Norwegian firms to enter the industry (Reichardt, Negro, Rogge, & Hekkert, 2016). Thus, my findings that smaller firms struggle to enter the OWP is per previous research. The larger firms also struggled, but to a lesser degree. Previous

research corroborates this finding, where a lack of a domestic market is found to present a barrier, especially for smaller firms (Mäkitie et al., 2018; Normann & Hanson, 2017).

The absence of a home market, where supply firms can have an opportunity to leverage market connections from O&G, means they have to demonstrate their technology through internal financial resources or internationally through a first contract. I have previously discussed that lack of contacts presents itself as a barrier to diversification, as getting the first contract is challenging without previous contacts. The international market has even more competitors, and thus, the competition is even harder. One informant stated that the chances of small supply firms from Norway accessing OWP internationally are close to zero. That is if not the Norwegian government takes measures. I will return to this topic in the next section.

There is a call for establishing OWP projects in Norway by The Federation of Norwegian Industries (Norsk Industri, 2020). They deem this is necessary if supply firms operating in O&G today are to have any chance in this industry. Thus, both my findings, previous research and the industry itself find that the lack of a domestic market for OWP acts as a barrier to entry for supply firms coming from O&G. Based on the findings discussed in this section and previous barriers, I suggest that the market relatedness between O&G and renewables is lower than the technological relatedness. This barrier must, therefore, be met with the appropriate instruments to stimulate the sustainability transition. As this is not the case today, the OWP industry in Norway can be said to struggle with legitimacy issues amongst actors like politicians and policy makers that could enhance its growth (Mäkitie et al., 2018). Such issues are common for sustainability transitions, stemming from stakeholders viewing and defining problems differently (Markard, 2017), and a difference between environmental and socio-economic goals (Busch et al., 2018; Lütkenhorst et al., 2014).

6.4.6 No clear renewable strategy

No firms highlighted strong governmental incentives or a contribution to the sustainability transition as reasons for their motivation to diversify. However, a few informants had an interest in the value of pursuing more sustainable sectors. All three themes identified as to why firms diversified relate to firm survival and firm growth, which also explains why some left their renewable projects returning all their focus to O&G when oil prices went up after 2011 (Mäkitie et al., 2019). These firms returned to renewables after 2014 when the O&G

prices again declined and are still there as they now have made investments in renewables and the O&G sector also implemented cost-saving measures after the second downturn. I, therefore, suggest that the similarities between O&G and the renewable sector, that enables related diversification, both act as an advantage but also poses as a barrier for the sustainability transition, as it allows firms to return to O&G easily. Thus, there is a need for clearly stated political goals and long-term commitment (Hanson et al., 2019).

While I write this thesis, the Covid-19 outbreak is ongoing, causing severe consequences because of society lock-down, resulting in a declining economy, with oil prices plummeting once again. This presents a possibility and “window of opportunity” for the government to leverage this opportunity and state clear goals for the sustainability transition needed. However, this appears not to be the case as they pursue tax changes to incentivise continued investments in O&G (Andersen & Gilbrant, 2020). Steen and Hansen (2018) call out for correct policy instruments to establish a path creation that gains substantial momentum. There are few incentives for supply firms in the O&G sector to diversify more than just for the projects needed to stay afloat while the O&G sector is in a phase of stagnation. I, therefore, suggest that there is a discrepancy between what the supply firms in O&G need to diversify long-term, and the policy instruments available and the governmental strategy present. This, therefore, serves as a barrier not only to firm diversification but also to the sustainability transition. In this thesis, I investigate firm diversification from an inside-looking out point of view, rather than the systems perspective. Still, the O&G sector is the dominant regime. Change within regimes often follow specific technological trajectories and are thus path-dependent and locked-in to the system (Fagerberg, 2005; Unruh, 2000). However, a socio-technical system can still transform, but with some level of intervention like long-term goals, incentives, governance and guidance (Markard et al., 2012; Smith et al., 2005). From my analysis, it appears that this is not evident today, thus inhibiting the sustainability transition.

The Norwegian government have stated they want to transfer resources and competences generated in the O&G sector to other sectors (Ministry of Finance, 2017, p. 115), but the policy instrument needed to assist this transfer is lacking. There is no clear strategy as to when and how supply firms are to leave O&G, as of now, the sector enjoys continued support. Equinor themselves rebranded from Statoil, and the Energy Valley cluster rebranded from Subsea Valley of their own accord. The analysis shows that firms experience little support in

building a new industry adventure to replace O&G. OWP is not just about clean energy, as Norway has hydropower and wind power from land, but also about securing jobs. The O&G sector enjoyed support in its early days through tax incentives, national governance and control, and support by the state to build the O&G adventure (Norsk olje og gass, 2017). This is not the experienced situation for the renewable sector today.

Norway has great potential for OWP, and the experiences from Hywind Tampen can prove useful for building FWP parks in Norwegian waters. What is needed is a clear strategy. If O&G is where the government want the supply firms to stay the coming years, then the goals of transferring competence from O&G are redundant. The need for clean energy increases all over the world. Thus, there is an excellent opportunity for Norway to take a position as a sustainable energy supplier and maintain the country's export connected to energy – broadly defined.

7 Conclusion

7.1 Firm diversification: Overall discussion and main findings

The objective of this study has been to contribute to the debate of sustainability transitions with a firm oriented point of view, and hence contribute to the field of sustainability transitions with aspects partly lacking in the tradition today. The study also informs policy makers on barriers to diversification. In the basis of gaps in the research field today, the following research questions were developed:

***RQ1:** Why and how do established supply firms in the oil and gas sector diversify to the renewable energy sector?*

***RQ2:** What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms?*

I have investigated these research questions by mainly conducting in-depth interviews with supply firms in the O&G sector. A qualitative approach is well suited for answering questions that call for subjective perceptions and experiences (Winchester & Rofe, 2016). I have discussed the empirical findings in light of the developed analytical framework, which draws inspiration from management studies, and previous research to answer the research questions. However, management studies and its work with sustainability issues is criticised for a narrow focus that missed out the broader debate of sustainability transitions (Markard, 2017). In this thesis, I have, therefore, endeavoured to meet this criticism, discussing my findings in the broader context of sustainability transitions. I have discussed why and how established supply firms in the O&G sector diversify to the renewable sector and investigated what barriers they encounter, making the transition challenging. The knowledge generated by investigating and understanding why firms diversify can serve as a foundation for identifying the right incentives needed to accelerate the sustainability transition. By studying how, a greater understanding of the diversification process is established, in addition to pointing out what is perceived as important policy instruments. Investigating barriers to diversification has a twofold purpose, both to identify experienced barriers to diversification for the individual firms, but also to identify barriers that hamper the sustainability transition overall. As such, this thesis is a contribution to the research field of sustainability transitions.

The energy transition involves moving from a dependence on fossil fuels to renewable sources. Such a transformation involves multiple actors on different levels of the socio-technical system, extending over a longer period (Markard et al., 2012). The O&G sector and the position it has in the energy system translates to the regime level of the socio-technical system. The renewable sector and the industries within translate to niches and the landscape is the exogenous environment that cannot be directly influenced by the dynamics between the regime and niches (Geels, 2004; Geels & Schot, 2007; Markard et al., 2012; Rip & Kemp, 1998). Niches that conflict with the established regime, are thought to be less successful (Markard & Truffer, 2008b, p. 606). The renewable industries can be said to conflict with the O&G sector, as its growth represents a public desire to phase out the O&G sector. However, the Hywind Tampen project is more of a market niche complementing the O&G industries through the supply of OWP, and hence, not in conflict with the regime. Covid-19, an exogenous factor in the landscape level, could represent an opportunity to incentivise renewable initiatives. However, the established regime, the O&G sector, have continued support through governmental tax changes (Andersen & Gilbrant, 2020). My focus in this thesis has been on studying characteristics of diversification processes and firms' strategic choices when diversifying from O&G to renewables. Hence, the study has also partly inquired into the dynamics between regime and niches when firms diversify. However, I have not studied this from a systems perspective, analysed how other actors in the system are affected, or how the system contributes to or delays the sustainability transition.

The energy transition in Norway has a twofold purpose: The climate needs clean energy, and the economy needs secure jobs and a prospering export industry. My study and findings are, therefore, a contribution to this endeavour. I want to highlight my main findings that I deem essential to understanding firm decision making in diversification processes and the way forward to enhance the sustainability transition. These findings answer both my research questions. The main finding as to why firms diversify is highlighted in main finding 1, how firms diversify in main finding 2, and barriers to diversification in main finding 3 and 4. However, the following also highlights aspects that manifested through analysis and discussion that I initially did not intend to investigate or find:

1. Firms predominantly diversify for firm survival and firm growth. The sustainable aspects of the renewable sector do not affect firm motivation.

2. Firms diversify by redeploying existing and by developing new firm resources. This requires learning, decision making about finance, and organizational restructuring.
3. Firms experience several barriers to diversification, where most of them are related to the market dimension and not the technological dimension. However, financial support is identified as an essential instrument to help firms diversify as R&D and technological customization is needed when entering renewables. The technological barrier might have been more present without these funding instruments. Further, the differences experienced between O&G and renewables acting as barriers, appear to stem from the uniqueness the O&G sector holds compared to other sectors and industries.
4. The lack of a clearly stated renewable strategy by the Norwegian government for the sustainability transition is a central finding that permeates almost all the other barriers and affects how firms respond to challenges. Accompanying a clear strategy should be long-term goals and commitment from the state. Closely linked with the lack of a strategy is the lack of a domestic market for OWP.
5. Smaller firms experience more barriers and more severely than larger firms. They have smaller resource bases to leverage and are thus more prone to challenges and setbacks. I did not set out to investigate differences in firm size, but this is a finding that manifested itself through analysis.

7.2 Actions to facilitate diversification from O&G

During my analysis and discussion, I have identified several barriers to diversification. I have discovered findings that contrast with previous research, and I have identified themes not highlighted by others. I have found that supply firms mainly diversify to grow and survive, not because they are part of a broader sustainability transition. R&D policy instruments are still vital for smaller firms diversifying, and the O&G sector appears to be unique compared to other sectors and thus diversifying from O&G requires customized policy instruments. Lastly, the lack of a clear renewable strategy, or any strategy at all about leaving the O&G sector crafted by the Norwegian government, acts as a barrier for supply firms to fully commit to diversifying. Therefore, based on my findings and previous research, I have crafted a framework of activities and policy instruments needed to assist firms, particularly smaller firms, to diversify from O&G to renewables in order to facilitate the sustainability transition. Others have also called out for a need for policies aimed at the market dimension, as the

technological dimension do not pose as a barrier in the same degree (Hanson et al., 2019; Mäkitie et al., 2018; Normann & Hanson, 2017). There is also a need for clearly stated political goals (Hanson et al., 2019), and policy instruments that lower barriers to diversification (Steen & Hansen, 2018).

Figure 2 is a preliminary framework based on the work undertaken in this thesis, with some support in previous research. It might, therefore require more research and more data in order to function as a strategic instrument.

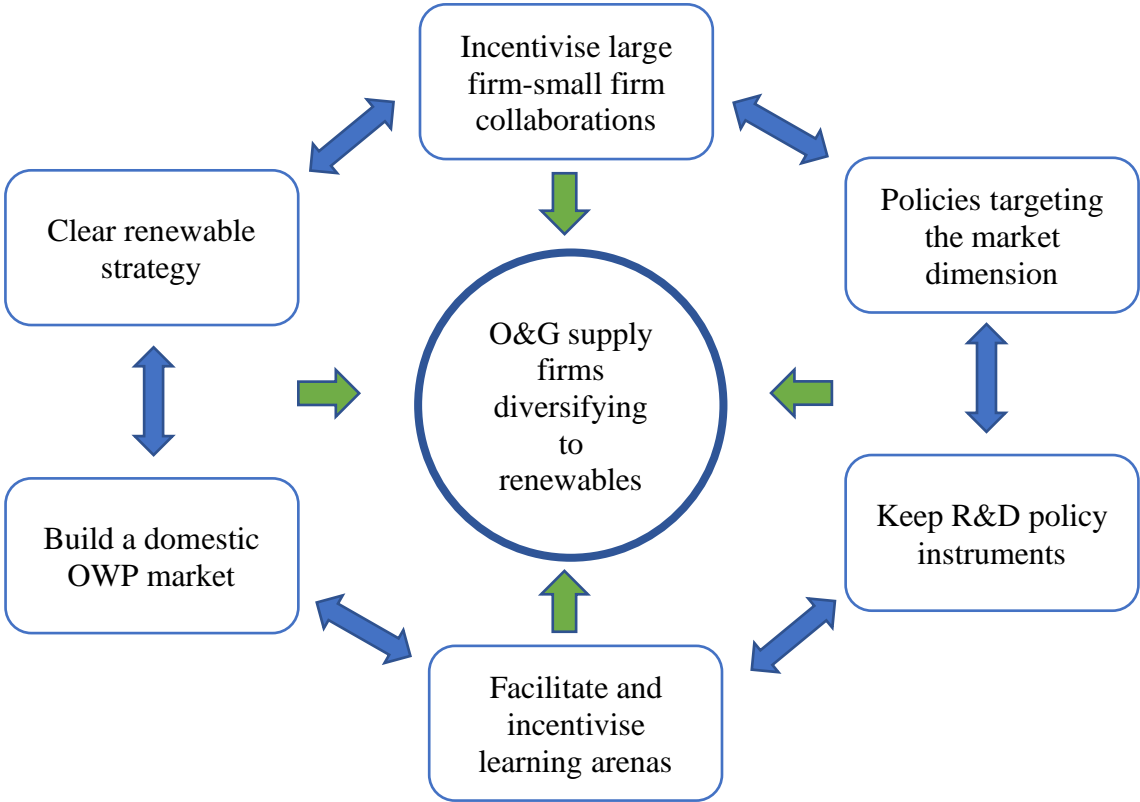


Figure 2: Framework of actions for supply firm diversification from O&G to the renewable sector.

This framework presents six actions necessary to enable firm diversification from O&G to renewables, an instrument for politicians and policy makers. There is a need for a clear renewable strategy, not only to ensure firm diversification to sustain jobs, but also to meet a growing energy and electricity demand, and at the same time uphold Norway’s position as an energy exporter. Per the Paris Agreement and SDGs, energy ought to come from renewable sources. A renewable strategy should also include plans for infrastructure, a mapping of

coming electricity demands, and possible grid developments. There is a need to build a domestic OWP market through pilots. Small supply firms will then have a chance to enter this market to test their technologies and gain contacts, references, and experience for future international projects. There is also a demand for regulatory frameworks when establishing a domestic OWP market.

There is a need for policies that target and lower the barriers to market access, and to incentivise diversification. As seen through analysis, firms easily return to the O&G sector. Thus, the incentives should be stronger than the pull towards O&G. Not only are new policies needed, but also to keep the existing R&D funding schemes as these have proven vital for the firms' diversification processes so far. Before the establishment of a domestic OWP market, there is a need for funding instruments that support demonstration projects. In addition to policies, I further highlight that learning arenas are essential. Several informants brought up that the growing number of arenas to meet like-minded suppliers the recent years have been necessary for accessing new information about relatively unknown industries. Lastly, there is a need to nurture policies to incentivise larger firms to enter into R&D collaborations with smaller firms. This can lower the entry barrier to the international OWP market for smaller firms.

7.3 Theoretical implications

This thesis has attempted to fill a gap in sustainability transitions literature regarding the lack of understanding of the role of individual actors and agency through transition processes. The case of firm diversification from O&G has illustrated the importance of firm resources to understand why, how, and what barriers firms experience. However, it has also demonstrated a need to understand the individual actor point of view together with system challenges, diversifying firms experience. My analytical framework, drawing inspiration from the RBV and DCs, do not wholly take this perspective into account. I, therefore, suggest that future studies on firm agency in sustainability transitions couple my framework with a systemic understanding, e.g. the technological innovation system, to have key concepts to discuss systemic challenges (Markard et al., 2012). However, my findings do show that the availability of firm resources are important indicators of diversification, and therefore vital to understand firm diversification. The study, therefore, provides valuable insight to research on firm diversification in three ways. First, firm resources do not entirely account for why firms

diversify. Second, the degree of available resources and breadth of resource base affect how easy firms redeploy resources and to which degree a firm must develop new resources. Lastly, the size of the resource base profoundly influences what and how strong barriers to diversification a firm experience while diversifying from O&G to renewables.

7.4 Limitations of this thesis

There are several limitations to this study. The identified uniqueness of the O&G sector lowers the generalizability of the case to other firm diversification contexts, both from varying sectors into renewables and in general. However, striving for generalizability is not the real objective in qualitative research. A case alone can serve a purpose and have implications without being generalizable.

The topic of firm size concerning firm diversification has proven to be an essential factor. I, therefore, need to highlight that only two large firms contributed to the data material for this thesis. Of course, this is not a high enough number to draw distinct conclusions. However, the two firms are central O&G suppliers, stable, and representative firms of their industry. Additionally, previous research corroborates my findings on firm size.

Another limitation is the one-sided perspective of my data set. Even though I included reports in my analysis, these have mostly served as complementary data to the transcribed interviews. A strength would have been to interview actors responsible for facilitating and incentivising transition and firm diversification, e.g. policy makers. This could have enlightened other aspects and balanced the one-sided perspective. However, this study's focal unit of analysis has been firm perspectives on diversification processes from O&G to renewables. This is by itself, an important research topic as experienced challenges and needs through such processes are real experiences that needs addressing.

In the methodological approach chapter, I addressed the limitations of my research design and chosen approach. I highlight that choice of informants, i.e. only O&G supply firms can have affected the truth or rigour of my findings. Incorporating O&G operators, or even supply firms not diversifying could have nuanced my findings. In hindsight, I could have opted for a more nuanced picture, by including either policy makers, O&G operators, or supply firms not diversifying.

7.5 Further research

This study has revealed a need for further research on more than one area. First off, the topic of barriers to diversification from O&G to renewables has opened up questions concerning entry into renewable industries. I have stated that the O&G sector appears to be somewhat unique and that this contributes to the many challenges supply firms experience. This is a statement that needs further research. Additionally, I state there is a need to investigate entry into renewable industries separating between established firms coming from different sectors. Findings from this would further challenge the claim of the O&G sector's uniqueness and thereby also contribute to the understanding of firm diversification characteristics.

Several have pointed to the lack of a domestic market for OWP as a key challenge (cf. Normann & Hanson, 2017; Steen & Hansen, 2018). Still, I believe there is a need for a deeper understanding of what the lack of such a market means for Norwegian O&G supply firms. The supply industry in Norway mostly consists of small and medium-sized firms. Hence, barriers to entry to international OWP can, therefore, have significant consequences for the supply industry when O&G stagnate.

Lastly, I want to draw attention to the somewhat limited or non-existing research on supply firms in O&G, not diversifying. Insights from such studies could provide invaluable knowledge into other perspectives of incentives and policy instrument needed to enhance the sustainability transition.

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Appendix

Appendix A – Interview guide

The interview guide is translated from Norwegian to English.

Introduction

Present myself, the topic and purpose of the thesis, and the research questions.

1. *Why and how do established supply firms in the oil and gas sector diversify to the renewable energy sector?*
2. *What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms?*

Confirm that both informant(s) and firm will be anonymized in the thesis. Ask if it is okay with audio recording and present the option to see the quotes I wish to use in thesis. Ask if they have any questions before we begin.

Background

1. Could you start by presenting yourself, name, title, and what you do in your position?

Main section

Oil and gas

2. Could you explain what briefly describe what the firm does?
 - a. Do you have a main product/service?
 - b. What is the firm's primary market?
3. In which market did the firm start?
4. What is the main product/service you supply the O&G sector?
 - a. Is it standardized or unique production?
 - b. Do you develop new technology together with the customer, based on a production order?

Their renewable industry

5. I already know you are active in a renewable industry in addition to O&G, but is there any other industries? And why these? What is the percentage turnover from your operations?
6. What product/service do you supply the renewable industry? How does it differ from what you deliver in O&G?
7. Why did you enter the renewable industry? When was this?
8. Can you take me through the process of moving from an O&G supplier to renewables, how did you do it?
 - a. Could you use some of the knowledge you have from O&G?
 - b. Was there a need to acquire new knowledge or people, and can you give me any examples of knowledge/resources you needed to acquire? How did you do this?
 - c. Has the shift led to any changes in product, routines, tasks, marketing?
9. Have you experienced any barriers entering the renewable industry?
Internally/externally?
10. Did you need and/or use public funding instruments moving into renewables?

Further inquiries

11. What are the main differences between O&G and your renewable industry?
12. Where is the firm in 1-10 years regarding O&G vs renewables? 10 years and further?
13. Any final thoughts or something you would like to add?

Appendix B – Information letter and consent form

The information letter and consent form are translated from Norwegian to English.

Research project: “Oil and gas supply firms expanding to renewable industries”?

This is an inquiry about participation in a research project where the primary purpose is to investigate how oil and gas supply firms transition to renewable energies. In this letter, I will give you information about the purpose of the project and what your participation involves.

Purpose of the project

The purpose is to investigate why and how oil and gas supply firms expand to renewable industries. My field of interest is the possibilities of a firm’s resources and expertise. This is a master thesis where I conduct interviews with oil and gas supply firms to collect data. The thesis is 60 credits, which means two semesters of work. The research questions are:

- Why and how do established supply firms in the oil and gas sector diversify to the renewable energy sector?
- What barriers are associated with diversifying from oil and gas to renewable energies for established supply firms?

Who is responsible for the research project?

The University of Oslo is the institution responsible for the project.

Why are you being asked to participate?

You and your company are asked to participate because you are active in the oil and gas industry and also in the renewable market. As a result of responding to a survey from Energy Valley in early fall 2019, you were identified as a potential informant for this master’s project. Among those meeting my criteria, have I contacted all of these, a total of 15 firms. I found your contact information on your firm’s website and hope it is okay that I contact you now.

What does participation involve for you?

If you choose to participate in the project, it means participating in an interview of about 60 minutes. I will not ask questions of a personal nature, but questions about the firm. I would like to inform you that it is possible to receive the questions in advance. During the interview,

I will take notes, as well as record audio. The questions will revolve around what you as a firm deliver to the oil and gas industry, what you think about the future of this industry, why and how you expanded into the renewable market, possible barriers you encountered/encounter along the way, and what you consider to be the most prominent differences between these two markets. I might also collect data about your business through reports published on your websites.

Participation is voluntary

Participation in the project is voluntary. If you chose to participate, you could withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how I will store and use your personal data

I will only use your personal data for the purposes specified in this information letter. I will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- Only I, and if necessary, my supervisor at the University of Oslo, will have access to transcripts and data collected.
- An audio recorder will record audio; the files will be transferred to my password-protected PC that only I have can access. While working on the collected data, I will replace your name and your company's name and contact information with a code stored on a list separate from the other data. This file will be stored in an encrypted folder. I will keep contact information and names separate from the data set throughout the work on this thesis. In my thesis, both firm and informant will be referred to with a number. It is therefore impossible to tract quotes I use in my thesis, based on the interview transcripts, back to neither you as informant nor the firm.

What will happen to your personal data at the end of the research project?

The project is scheduled to end May 5th 2020. All collected data in the form of audio recordings, notes from interviews and transcript will be deleted when the project is completed.

Your rights

So long as you can be identified in the collected data, you have the right to:

- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data.

What gives me the right to process your personal data?

I will process your personal data based on your consent. Based on an agreement, the University of Oslo, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project or want to exercise your rights, contact:

- The University of Oslo:
 - Supervisor: Taran Mari Thune
 - Student: Natalie Johnsen
- Our Data Protection Officer: Roger Markgraf-Bye, mail: personvernombud@uio.no
- NSD – The Norwegian Centre for Research Data AS, by email: personvertjenester@nsd.no or by telephone: +47 55 58 21 17.

I have received and understood information about the project “Oil and gas supply firms expanding to renewable industries” and have been given the opportunity to ask questions. I give consent:

- to participate in an interview

I give consent for my personal data to be processed until the end date of the project, approx. 05.05.2020.

(Signed by participant, date)

Appendix C – Notification form

This is the original version of the formal document, and therefore not translated to English.



Meldeskjema 786170 Sist oppdatert 05.05.2020

Hvilke personopplysninger skal du behandle?

- Navn (også ved signatur/samtykke)
- E-postadresse, IP-adresse eller annen nettidentifikator
- Lydopptak av personer

Type opplysninger

Skal du behandle særlige kategorier personopplysninger eller personopplysninger om straffedommer eller lovovertrедelser?

Nei

Prosjektinformasjon

Prosjektittel

Diversifisering fra olje og gass til fornybar energi for leverandørbedrifter.

Begrunn behovet for å behandle personopplysningene

Jeg skal gjennomføre intervjuer med ledere på ulike nivå i ulike leverandørbedrifter. Jeg skal kun stille spørsmål om bedriften og bedriftens oppfatning av grønn omstilling. Jeg skal ikke stille personlige spørsmål. Jeg må lagre mailadresse, navn og stillingstittel for å avtale intervju, i tillegg til å ta opp lyd under intervjuene som gjør at jeg nå må melde det inn. Det er nødvendig for meg å gjennomføre intervjuer slik at jeg får stilt de riktige spørsmålene og får innsikt i akkurat det jeg lurer på. Spørsmålene kan ha subjektive svar.

Alt av personopplysninger og innsamlede data lagres maskinvare tilhørende Universitetet i Oslo, og som jeg har tilgang til via min passordbeskyttede PC som kun jeg benytter. Informantene deltar via informert samtykke.

Type prosjekt

Studentprosjekt, masterstudium

Kontaktinformasjon, student

Natalie Johnsen, natalj@student.sv.uio.no, tlf: 48218678

Behandlingsansvar

Behandlingsansvarlig institusjon

Universitetet i Oslo / Det samfunnsvitenskapelige fakultet / Senter for teknologi, innovasjon og kultur

Prosjektansvarlig (vitenskapelig ansatt/veileder eller stipendiat)

Taran Mari Thune

Skal behandlingsansvaret deles med andre institusjoner (felles behandlingsansvarlige)?

Nei

Utvalg 1

Beskriv utvalget

Ledere i leverandørbedrifter til olje- og gassindustrien som også har utvidet til fornybar energi. Utvalget består av ledere på ulike nivå, i bedrifter av ulik størrelse. Det er informasjon de kan fortelle meg om bedriften som er av interesse.

Rekruttering eller trekking av utvalget

En klynge for medlemsbedrifter i energisektoren tok kontakt med mitt institutt på utkikk etter en masterstudent interessert i å skrive om noe relevant for de. Vi kom i kontakt og via data fra en spørreundersøkelse de hadde utført tidligere identifiserte vi en rekke ulike bedrifter operative i både olje- og gass og fornybar-sektoren. Jeg tok kontakt med et tilfeldig utvalg av disse via mail. Jeg fant kontaktinformasjon på bedriftenes nettsider. Jeg har siden selv hatt kontakt med mulige informanter via email. Denne klyngen får ikke innsyn i mine data eller

har noe som helst med prosessen å gjøre. De ønsker kun å lese sluttresultatet i form av masteroppgaven.

Alder

35 – 62

Inngår det voksne (18 år +) i utvalget som ikke kan samtykke selv?

Nei

Personopplysninger for utvalg 1

- Navn (også ved signatur/samtykke)
- E-postadresse, IP-adresse eller annen nettidentifikator
- Lydopptak av personer

Hvordan samler du inn data fra utvalg 1?

Personlig intervju

Grunnlag for å behandle alminnelige kategorier av personopplysninger

Samtykke (art. 6 nr. 1 bokstav a)

Informasjon for utvalg 1

Informerer du utvalget om behandlingen av opplysningene?

Ja

Hvordan?

Skriftlig informasjon (papir eller elektronisk)

Tredjepersoner

Skal du behandle personopplysninger om tredjepersoner?

Nei

Dokumentasjon

Hvordan dokumenteres samtykkene?

- Elektronisk (e-post, e-skjema, digital signatur)
- Manuelt (papir)

Hvordan kan samtykket trekkes tilbake?

De kan kontakte meg via mail, altså via mailadressen vi allerede har korrespondert, eller via mobil. Ønsker at et tilbaketrukket samtykke skjer skriftlig siden samtykket opprinnelig ble gitt skriftlig. Dette for å legge til rette for en mest mulig ryddig prosess for begge parter.

Hvordan kan de registrerte få innsyn, rettet eller slettet opplysninger om seg selv?

De kan kontakte meg om de ønsker innsyn, gjøre rettinger eller få slettet noe. Jeg kommer i tillegg til å tilby de å få lese gjennom transkriptet av intervjuet.

Totalt antall registrerte i prosjektet

1-99

Tillatelser

Skal du innhente følgende godkjenninger eller tillatelser for prosjektet?

Behandling

Hvor behandles opplysningene?

- Mobile enheter tilhørende behandlingsansvarlig institusjon
- Maskinvare tilhørende behandlingsansvarlig institusjon

Hvem behandler/har tilgang til opplysningene?

Student (studentprosjekt)

Tilgjengeliggjøres opplysningene utenfor EU/EØS til en tredjestat eller internasjonal organisasjon?

Nei

Sikkerhet

Oppbevares personopplysningene atskilt fra øvrige data (kodenøkkel)?

Ja

Hvilke tekniske og fysiske tiltak sikrer personopplysningene?

- Opplysningene anonymiseres
- Endringslogg
- Adgangslogg
- Andre sikkerhetstiltak

Hvilke

Hvis det blir behov for at noe personopplysninger ender opp på fysiske ark vil disse låses inn i skap med kodelås som kun jeg som student har tilgang til. Min PC som jeg bruker for å få tilgang til mine data på universitetets skyløsning, låses automatisk etter kort tid hvis jeg ikke bruker den aktivt. Jeg har også som vane og alltid låse den når jeg ikke sitter med den.

Varighet

Prosjektperiode

06.01.2020 - 30.09.2020

Skal data med personopplysninger oppbevares utover prosjektperioden?

Nei, alle data slettes innen prosjektslutt

Vil de registrerte kunne identifiseres (direkte eller indirekte) i oppgave/ fra prosjektet?

Nei

Tilleggsopplysninger

På grunn av korona har vi fått lenge tid på masteroppgaven og da rekker vi mest sannsynlig ikke å få gjennomført muntlig høring før sommeren, selv om jeg fysisk leverer innen semesterslutt vår 2020. Setter derfor god frist for prosjektslutt i høst.