A Qualitative Study of Access to Capital for the Norwegian Offshore Wind Cluster

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Preface

This master thesis marks the completion of a two-year study journey at the master program Energy, Environment, and Society at the University of Stavanger. It has been challenging balancing work with master studies, but most of all, inspiring and enriching for my personal, academic and professional growth.

In April 2019, I attended the *Science meets Industry* conference hosted by the Norwegian Offshore Wind Cluster. This conference is what sparked my interest and confirmed my belief for floating offshore wind. I am honored to contribute to a potential renewable energy adventure for Norway. It is with both excitement and wistfulness I deliver this thesis. I hope to seek as stimulating encounters for the future.

I would like to express my appreciation to my academic supervisor Dr. Gorm Kipperberg, for precise feedback and guidance. I would also like to thank Cluster Manager and professional supervisor Arvid Nesse, for introducing me to his network, expanding my understanding of offshore wind and professional support. I wish to thank the informants for allowing me their time and contributing to my master thesis with enthusiasm and professionality. Finally, I wish to express my gratitude to Christian, Ingrid, Anette, and, Josefine for revisions and encouragement throughout the final semester.

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Abstract

The objective of this thesis is to understand the demand for capital in the Norwegian Offshore Wind Cluster (NOWC) and suggest how the cluster management can facilitate access to capital for member companies to accelerate growth. This thesis aims to organize knowledge and lay a foundation for a joint capital strategy for the NOWC.

This thesis investigates access to capital in the Norwegian Offshore Wind Cluster through semi-structured interviews with ten companies. To offer the opposing perspective, four semi-structed interviews were also conducted with investors and capital actors to broaden the understanding of the investor and capital actor mindset and preferences.

This study finds that the Norwegian Offshore Wind Cluster may be significantly capital intensive, especially for technology companies. Particularly, the young companies seem to struggle to access capital for further growth. The demand for capital appears to be so substantial that venture capital investors may not be a sufficient source to capital. These findings indicate a gap between governmental funding agencies and venture capital. Young companies should focus on attaining capital from policy instruments and target capital actors with longer time-horizon. Furthermore, this thesis argues that current valuation methods may fail to take into account the risk of climate change.

The main limitation to this thesis are the limited data samples, and hence the findings may not be representative for the Norwegian Offshore Wind Cluster, nor the offshore wind industry. Thus, further research is encouraged to focus on larger data sets that allow for a broader quantitative analysis for investments in floating offshore wind.

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Chapter 1: Introduction

Far from the shore, and on the surface of the deep sea, harsh wind reigns. This decade, we are witnessing a remarkable accomplishment. Built on 5000-years-old methods, modern technology and human ingenuity has successfully raised steel constructions twice the size of the Statue of Liberty, floating at sea with massive rotating shafts. Harvesting renewable energy using floating wind turbines is now a real possibility.

The urgent challenge of global warming calls for humanity to foster innovation and new technologies to meet the clean energy demands of the future. Consequently, floating offshore wind emerges as a solution for Norwegian companies to embark on a renewable energy adventure and to combat climate change, concurrently. Indeed, offshore wind is predicted to become a 1 trillion-dollar industry by 2040 (IEA, 2019a). According to Menon Economics (2019), floating offshore wind may bring value creation up to 117 billion Norwegian Krone (NOK) towards 2050 and Norway alone holds the potential to capture up to 20% of the emerging market world-wide. However, many of the Norwegian offshore wind companies are considered to be in the early phases in a particularly capital-intensive industry. To ensure that Norwegian companies take part in this value creation, the Norwegian Offshore Wind Cluster (NOWC) seek to facilitate their member companies to accelerate growth. Alas, the offshore wind industry encounters possible threats. Among them, political barriers to help establish a domestic market in Norway. Investors considering entering an emerging market with high uncertainty are likely to be cautious and risk averse. Additionally, as the COVID-19 pandemic in unfolding its impact on the global economy, the risk appetite of investors may plunge to new lows. Nonetheless, in the coming years, investments in offshore wind is paramount to achieve economies of scale and to reap the benefits of the first mover advantage in this emerging industry.

This thesis has two academic objectives; first, to map out the need for capital for the young member companies of Norwegian Offshore Wind Cluster, and second, to understand the investor mindset. Specifically, this thesis aims to answer the following research question:

> *How should the Norwegian Offshore Wind Cluster facilitate its member companies' access to capital to accelerate growth?*

To support the research question, the following secondary research questions are asked:

- *Is the access to capital the main barrier for growth in the NOWC?*
- *What do investors and capital actors emphasize when considering offshore wind investments?*
- *How does the current COVID-19 situation impact the emerging market for floating offshore wind?*

Through a qualitative study conducting semi-structured interviews with 14 highly qualified informants with excellent knowledge about the Norwegian offshore wind industry and the Norwegian capital market. The thesis has organized the insights from the informants to expand the understanding on how the NOWC should work to facilitate their member companies. The practical business objective of this thesis is to synthesize information into practical knowledge for the Norwegian Offshore Wind Cluster. The findings intend to provide a foundation for a joint capital strategy for the NOWC to further support and serve its member companies.

This introduction serves as the first chapter of eight chapters in total, which forms this master thesis. The second chapter presents a historical, technical, economic and political background of offshore wind. The third chapter examines previous literature related to the research question. Chapter four explains relevant theory. Chapter number five address the methodology. The sixth chapter elaborates on the analysis. Chapter seven discusses the findings and presents the conclusion alongside recommendations for the NOWC and suggestions for further research. Finally, references are listed in chapter eight.

Chapter 2: Background

This chapter consists of three parts. The first section introduces the history of human wind utilization, then presents a few selected highlights from recent Norwegian wind history. The second section briefly presents the need for green investments to combat climate change. The third section explains the technical fundamentals of wind power.

2.1 A Brief Introduction to the History of Wind Energy, from Ancient Times to the 21st Century

2.1.1 Human Utilization of Wind Energy

Humankind has harvested the energy from the wind for several thousands of years. Egyptians presumably used wind energy for propel boats in the Nile river as early as 5000 BC (EIA, 2020). According to Sorensen (1995) the first evidence of active human utilization of wind has been documented through ancient sailboats in the Mediterranean Sea from 3500 BC. Earlier sources indicate that human wind utilization was passive, such as the ancient Persian evaporative cooling structures using airflow as air-conditioning (1995). By 250 BC, there have been found multiple designs of vertical axis machines with rotating shaft across Asia (Coley, 2013). These machines were used to convert the motion of air into mechanical energy for grinding corn and pumping water. In 947 AD, Al-Masudi, a Muslim traveler in Seistan (modern day Iran), has written what is considered to be the first reliable literary reference to windmills (Smil, 2019). He describes simple vertical shafts using wind flows to drive water streams to irrigate gardens (2019).

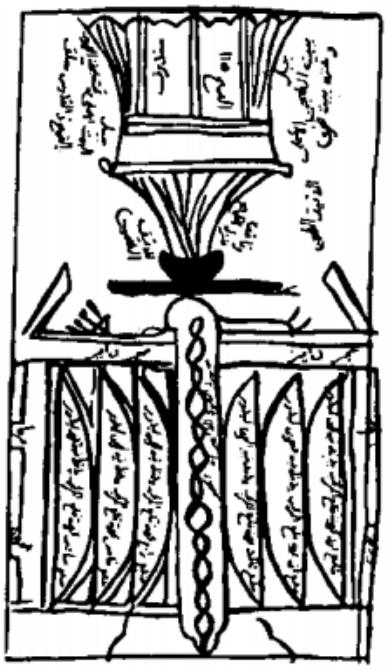

Figure 1: Earliest Persian Design of Windmill ca. 1300 AD (Sorensen, 1995).

By the eighteenth century, there were already about 100 000 windmills in Europe (Coley, 2013; Smil, 2019). The average power generation of windmills at this time was below 5kW (Smil, 2019). The first windmill for electricity generation was assumingly designed in 1888 by Charles F Brush (Coley, 2013). About a century later, in 1991, the world's first offshore wind park was built in Vindeby, Denmark. *Vindeby,* or 'town of winds' was installed with eleven

turbines generating 450 kW each (WindEurope, 2020a). In comparison, turbines installed today typically generate twenty times more power (see Figure 2).

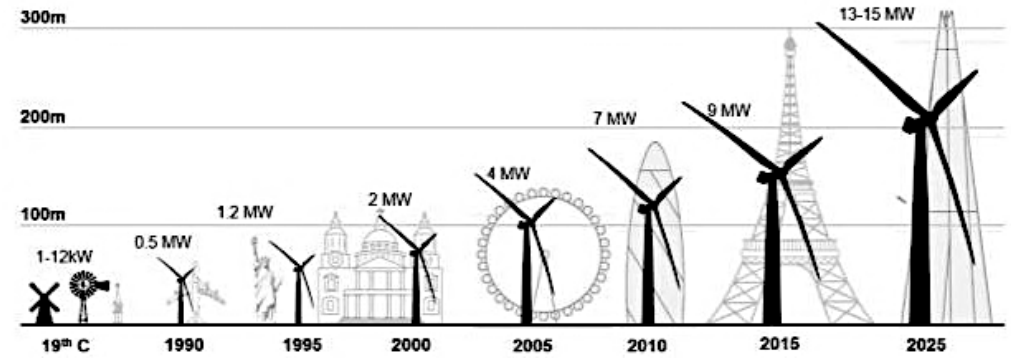

Figure 2: Evolution of Wind Power (Liebreich, 2017).

Faith Birol, the Executive Director or International Energy Agency (IEA), stated, "some may question why I decided to devote so much of the IEA's time and effort to this report on offshore wind, a technology that today supplies just 0.3% of global power generation. The reason is that its potential is near limitless" (IEA, 2019a). However, when we consider electricity generation in isolation, on- and offshore wind energy combined is predicted to increase its share in the next few decades (2019a). Figure 3 illustrates the historical and projected global net electricity generation by energy source, where wind is projected to increase substantially for the next thirty years (EIA, 2019; IEA, 2019c).

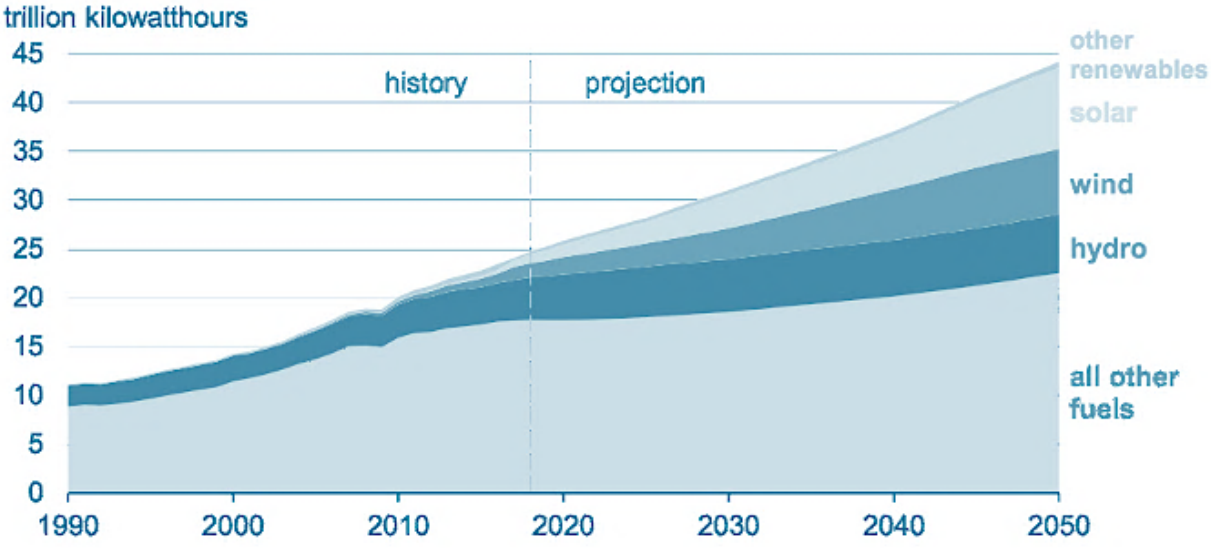

Figure 3: Global Net Electricity Generation by Source (EIA,2019; IEA, 2019c).

Figure 4 displays historic and projected global net wind generation. Currently, Europe accounts for about 85% of the global offshore wind capacity (IRENA, 2018). The figure does not differentiate between offshore and onshore wind; however, it provides an indication for the future.

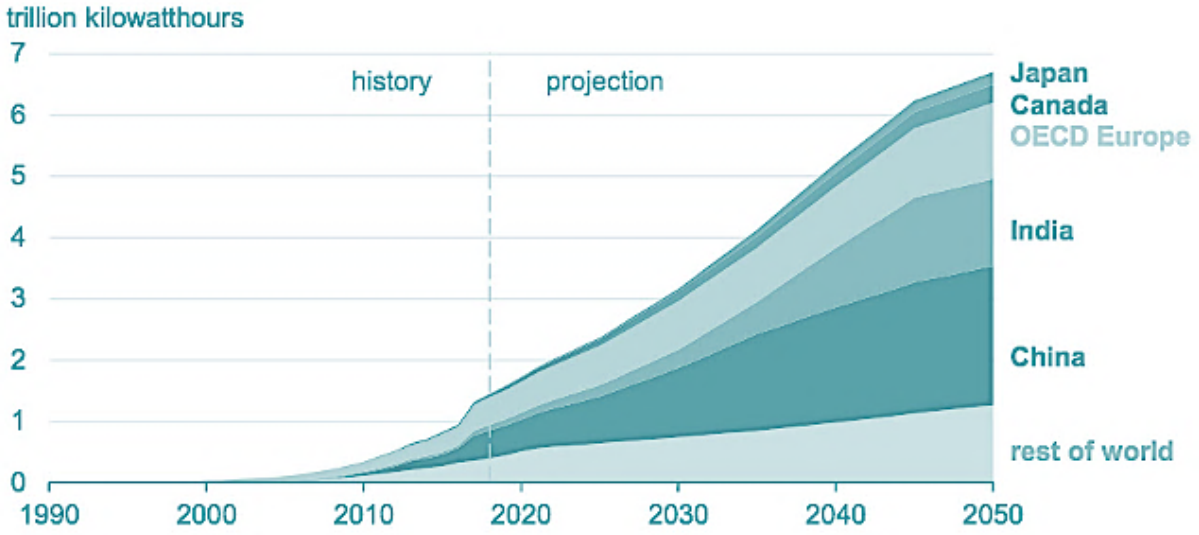

Figure 4: Global Net Wind Generation (IEA, 2019c).

2.1.2 Norwegian Development in Offshore Wind

Norwegian Government First Signaled Focus on Wind Energy

In 1997, only a few years after the opening of the offshore windfarm in Denmark, the Norwegian Government signaled enthusiasm for producing Norwegian wind power. A governmental white paper stated that Norway should increase the focus on renewable energy sources in general, and specifically wind power (Normann, 2015; Ministry of Climate and Environment, 1997).

Havgul, a Missed Bottom-Fixed Opportunity

In 2005, a company called Havgul announced their plans about a bottom-fixed wind farm named Havsul in the Møre region, off the coast in Norway. The wind farm was supposed to be installed to electrify oil rigs. Alas, due to a lack of legal documents governing this part of the North Sea (Normann, 2015), the authorities were unable to grant a license. Consequently, Havsul was moved 10 km off the shore and missed the opportunity for "niche protection" in Norway's first opportunity in offshore wind (Normann, 2015). With the ongoing development in floating wind turbines, Norway is now facing a "second opportunity wave" (CenSES, 2019).

Hywind Demo, the World's First Full-Scale Floating Wind Turbine

Statoil's (now Equinor) *Hywind Demo* started operating off the coast in Karmøy in 2009, as the world's first full-scale floating wind turbine with 2,3 MW (Equinor, 2020). An increase in governmental press releases and white papers focusing on offshore wind from 2009-2013

(Ministry of Petroleum and Energy, 2009; 2010a; 2010b, 2011, 2013) reflects the national enthusiasm after *Hywind Demo* started operating. *Hywind Demo* was granted MNOK 59 from Enova, a Norwegian governmental enterprise which has been a driving force for wind power projects in Norway (Enova, 2014).

Hywind Tampen – The World's First Full-Scale Floating Wind Farm

In April 2020, the Norwegian government approved to open the world's first full-scale floating wind farm, Equinor's *Hywind Tampen* (Ministry of Petroleum and Energy, 2020). Eleven 190-meter-tall floating wind turbines will be installed on the Norwegian Continental Shelf with 8MW each, as illustrated in Figure 5. The floating wind park will be connected to the existing oil fields Snorre and Gullfaks, about 140 kilometers off the shore. *Hywind Tampen* is estimated to reduce 200 000 tons of CO_2 emissions and accounts for about 35% of the energy to the oil fields (Equinor, 2020). Norwegian Authorities granted NOK 2,3 billion to this project through Evona (2020).

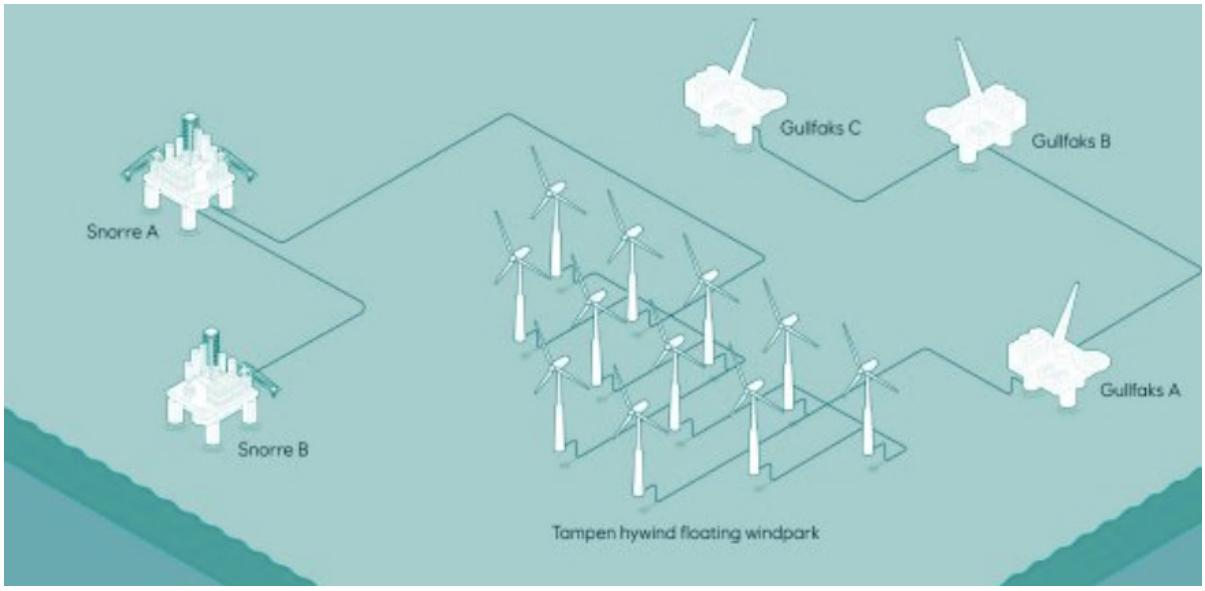

Figure 5: Illustration of Hywind Tampen Interconnected to Snorre and Gullfaks on the Norwegian Continental Shelf (Equinor, 2020).

OO-STAR demonstration

The EU's *Horizon2020* granted MEUR 25 to the *OO-Star Flagship* project (NOWC, 2020c). This is a result of several Norwegian member companies of the Norwegian Offshore Wind Cluster working together; Kværner, Dr.Techn Olav Olsen, Unitech, and DNV GL. The aim of *OO-Star Flagship* is to demonstrate a 10MW floating concrete wind turbine where costs are reduced to 40-60 EUR per MWh by 2030 (2020c).

2.1.3 The Norwegian Offshore Wind Cluster

The Norwegian Offshore Wind Cluster (NOWC) is a business cluster consisting of more than 100 companies and organizations "aiming to be the strongest supply chain for floating offshore wind worldwide" (NOWC, 2019). NOWC (2020a) organizes conferences, workshops, seminars, webinars, and meetings on a national and international level for their member companies. NOWC shares up-to-date information about the recent development in the offshore wind industry, nationally and globally. The NOWC management operates actively politically, evidently by sending an open letter to the prime minister recently to ask for licensing to open two full-scale floating wind farms on the Norwegian Continental shelf (NOWC, 2020b), in light of the economic crisis of COVID-19 (WHO, 2020). In an emerging international market with immense potential where the actors are not set, the Norwegian Offshore Wind Cluster joins the race to win a quintile of the future global market shares in floating offshore wind.

2.2 Green Investments as a Part of the Global Solution

The European Union (EU) (European Commission, 2012; 2014) has stated the goal to reduce greenhouse gas (GHG) emissions with 40% by 2030, compared to pre-industrial levels. To reach the goals set by Paris Agreement in 2015 (Rogelj et al., 2016), aiming to sustain global warming to 2°C and aspiring for 1,5°C compared to pre-industrial levels, the EU aims towards zero GHG emissions by 2050. Hence, green investments need to ramp up to accelerate the transition to a low-carbon society (IEA, 2019b; WindEurope, 2019a; 2019b). A report from the International Renewable Energy Agency (IRENA, 2019) estimates that investments in renewable energy should be USD 27 trillion from 2016 to 2050 to meet the goals set by the Paris Agreement. United Nations Environment Programme (UN EP) Finance initiative (2020) acknowledges the urgent challenges of climate change humanity now is facing by stressing the significance of "the active involvement of investment institutions" to accelerate the transition to a "resource-efficient, low-carbon and inclusive economy" (UN EP Finance Initiative, 2020).

2.3 Understanding Wind Power

Wind is an unlimited energy resource that can be captured and converted to energy by utilizing technology (Coley, 2008). It is considered a renewable energy source as the wind never can be depleted. Wind occurs as a reaction to the sun, causing differential heating on the surface of the earth both regionally, locally and globally. This motion of airflow can be converted to kinetic energy (2008).

2.3.1 How to Capture Energy from the Wind

Equation 1 explains power obtained from wind energy and can be expressed as follows:

$$P_{kinetic} = \frac{1}{2} A \rho v^3$$

Equation 1: Power Obtained from Wind (Coley, 2008).

Whereas $P_{kinetic}$ is power, A denotes the swept area, ρ density of air, v is the wind mass (Coley, 2008). As the equation displays, there are two ways to increase the power obtained from the wind. Imagine a disk sweeping a diameter of airflow. By doubling the swept area, the power obtained doubles (2008). However, by doubling the wind speed, the power increases eightfold (Coley, 2008). Thus, to harvest double wind power, the swept area must be increased, either by a larger rotor blade diameter or by adding additional wind turbines. If the wind turbine is placed at a location with double the wind speed, such as at a site off the shore with double wind speed, the power obtained is eightfold. Hence, small variances in wind speed will have a significant economic impact (Coley, 2008). Wind speeds tends to increase by distance above the ground and distance from the shore where the winds are more consistent and stronger (Coley, 2008; Equinor, 2020). Theoretically, large wind farms in the windiest sights allow for higher power obtained. However, larger constructions also require the rotor blades to be more robust, and thus more costly. With grand constructions follows increasing costs associated to production, installation, maintenance, operations and transportation (Coley, 2008). In the past thirty years, two trends have been ruling in wind power; larger wind turbines and placing them offshore (2008). Placing wind turbines offshore allows for harsher winds to be captured, and at the same time reducing noise and visual pollution (Coley, 2008).

2.3.2 Bottom-Fixed and Floating Foundations

Wind turbines can come in different shapes and sizes. They can be installed onshore or offshore; fixed to the bottom of the seabed or they may afloat. Indeed, floating offshore wind alone holds the potential to meet the total global electricity demand more than eleven times over by 2040 (IEA, 2019a). Table 1 below provides a simple comparison of bottom-fixed and floating wind turbines:

	BOTTOM-FIXED	FLOATING FOUNDATIONS
Suitable location	Shallow waters	Deep waters
Distance from shore	20-60km	60-300km
Water depth	<60 m	60-2000m
Estimated technical potential per year	>87 000 TWh	>330 000 TWh
Global geospatial potential	30%	70%

Table 1: Original table illustrating differences between Bottom-Fixed and Floating Foundations (IEA, 2019a).

Although floating offshore wind is not yet competitive, great advancements has been made in recent years (IEA, 2019a). Figure 6 below illustrates the cost development in floating (red) and bottom-fixed (blue):

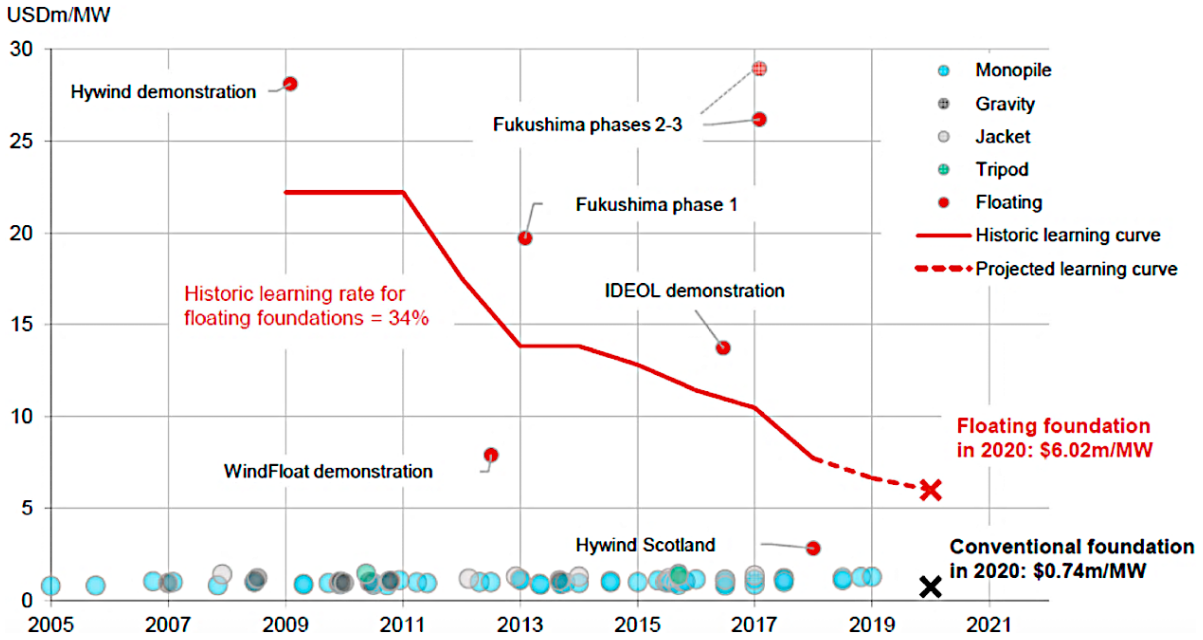

Figure 6: Cost Development in Floating Offshore Wind. (Kausche, Adam, Dahlhaus and Großmann, 2018).

As the figure illustrates, floating offshore wind is currently more costly than bottom-fixed. However, future technology advancement aims to reduce the cost (IEA, 2019a).

Chapter 3: Literature Review

This chapter reviews relevant past and current research on the thesis topic. It has five sections. First, 3.1 provides an overview of relevant literature reviewed for this thesis (summarized in tabular form in appendix 3). Subsequently, sections 3.2-3.4 present literature and themes corresponding to the secondary research questions. Section 3.5 will briefly explain limitations to previous research and how this thesis aims to expand current knowledge.

3.1 Overall Literature Findings

Although there are numerous sources about the Norwegian offshore wind power industry, there is limited academic literature on the topic. My working hypothesis when writing the literature review was that searching for words such as *offshore, floating, Norwegian, capital, wind, venture, growth* in both English and Norwegian, would be a relevant place to start to understand the capital need in the NOWC. Alas, I found a limited journal articles highly pertinent to my area of research. Due to the unique characteristics of floating offshore wind, it is challenging to find articles conveyable to the nation-specific nature of the research question. Moreover, there is vast literature available on, for example, economic feasibility, the technical potential of floating wind, venture capital, and cleantech (clean technology). Corresponding to secondary research questions two and three, which are less country-specific, it was easier to find suitable sources. After gaining an extensive overview of existing research on the Norwegian offshore wind industry, I came to the understanding that my area of research is a niche area in an emerging academic field.

In total, 37 sources form this literature review (see table in appendix 3). The purpose of presenting the sources sorted and categorized in tabular form to provide a comprehensible overview of reviewed academic and non-academic sources.

3.2 Barriers to Growth in Norwegian Offshore Wind Industry

The selected sources from Category 1 (Barriers to growth in the Norwegian offshore wind industry) are published between 2011 and 2019, with an increasing number of articles is published between 2017 and 2019. This indicates that offshore wind has gained an increasing academic attention in the past few years in line with the emerging offshore wind industry. Especially three sources (Centre for Sustainable Energy Studies, CenSES; Menon, 2019;

Normann and Hanson, 2017) have direct transfer value to answer the research question. The two reports (CenSES; Menon, 2019) written about the offshore wind industry in Norway have homogenous findings. The report *Value Creation in the Norwegian Floating Offshore Wind Power Industry* was written on behalf of "Norwegian Offshore Wind Cluster, in collaboration with Export Credit Norway, Norwegian Shipowners' Association, GCE NODE, Haugaland Vekst and Greater Stavanger" (Menon, 2019). The other report, *Conditions for Growth in Norwegian Offshore Wind,* is written on behalf of The Research Council of Norway (Norges Forskningsråd, CenSES, 2019). The authors of the CenSES report (2019) have also been contributing to the majority of journal articles used for this review. This may imply a small academic cluster with interest in renewable energy, especially from the University of Oslo. However, the Menon-report has similar findings and written by other authors, which increases the reliability of the reports. Nevertheless, because these sources (CenSES; Menon, 2019) are reports and not journal articles, the method is not fully disclosed, which makes it hard to judge. However, both reports are written by professionals that have surveyed and interviewed around 100 companies in the Norwegian offshore wind value chain. Together they serve as a starting point for answering whether the main barrier in the Norwegian Offshore Wind Cluster is access to capital.

According to past research, about 150-200 Norwegian companies engage in offshore wind activities abroad (Mäkitie, Andersen, Hanson, Normann, and Thune, 2018; Steen and Hansen, 2014; Normann and Hanson, 2015). The majority of the offshore wind industry in Norway has roots from the oil and gas (O&G) industry, where several O&G companies have diversified their business activities into offshore wind. Domestically, the Norwegian floating offshore wind power industry has completed the pilot stage and is now entering a commercial phase (IRENA, 2019; Menon 2019). In sum, the Norwegian offshore wind industry consists of a series of small and medium-sized enterprises (SME) (Normann and Hanson, 2015; 2017; CenSES, 2019), whereas many are in the pilot stage. This stage is capital intensive, especially for technology companies. Particularly smaller firms are struggling to get public support and have a lack of financial muscle (CenSES, 2019; Normann and Hanson, 2017). Norwegian companies develop central concepts in offshore wind technology and have a vast potential to capture global market shares in the floating wind, specifically because of Norwegian competence from the O&G industry (Menon, 2019; Mäkitie et al. 2018). Based on the literature review, I have identified four themes in the literature that I might expect to see occurring in my data. The following subsections present the themes, in no particular order:

3.2.1 Oil and Gas Engagement in Offshore Wind Power

Past research uncovers that actors with competence from the oil and gas (O&G) industry have a competitive edge in developing offshore wind, and especially floating foundations (Normann, 2015; Menon; Mäkitie et al., 2018). For example, floating oil rigs are secured to the seabed in similar terms as floating wind turbines (Equinor, 2020). Engagement in offshore wind power fluctuates. Scholars find that market changes in the oil and gas industry have resulted in the development of offshore wind (Hansen and Steen, 2015; Mäkitie, Normann, Thune, Gonzalez, 2019; Steen and Hansen 2014). Specifically, diversifying into offshore wind activities increases when the O&G market is in decline (Mäkitie et al., 2019; Hansen and Steen, 2015). For suppliers, diversifying can be rewardable (BVG Associates, 2019). On the other side, offshore wind business activities evolving from O&G companies represents a possible barrier. Several of the firms consider the offshore wind as an emerging side business, instead of the main business activity (Mäkitie et al., 2018; Normann and Hanson, 2017). Regrettably, a majority of the companies employ strategies suitable for oil and gas, which may not be beneficial to foster the growth of the offshore wind industry (Hansen and Steen, 2015). In sum, however, the research supports that technology overlaps have a positive impact (Mäkitie et al., 2018).

3.2.2 Lack of a Domestic Market

A study (Normann and Hanson, 2017) surveying 102 companies in the offshore wind power industry in Norway concluded that the lack of a domestic market was a barrier. The study found that this barrier was less evident in large firms. A home market is crucial for a domestic ecosystem for increased competition, both offshore and floating, Menon (2019) argues. It provides Norwegian companies with a track record reference when seeking venture capital from future investors and winning contracts. While writing this thesis, the opening of *Hywind Tampen* was approved (Ministry of Petroleum and Energy, 2020). However, several scholars found that *Hywind Tampen* alone is not sufficient to reap the benefits of becoming the first-mover in a global emerging market (Nielsen and Frøysa, 2019; Menon, 2019; CenSES, 2019).

3.2.3 Lack of Capital

CenSES (2019) reports that several of the companies in their study are SMEs that lack internal resources, including access to capital. Some companies “struggle with getting public support

for financing because they lack private investments and links to commercial partners that are able to provide additional investments to fulfill the criteria for public funding" (CenSES, 2019, p. 35). The companies have also reported the lack of long-term financial support to marketing activities, value chain coupling, in addition to research and development (R&D) (Menon; CenSES; 2019).

3.2.4 The Importance of Policy Instruments to Support the Energy Transition

In Norway, politics in offshore wind seems to have attracted interest in academia. Several scholars urge the Norwegian government to set a direction to stimulate economic activity (CecSES, 2019; Fagerberg, 2018). Previous research (Söderholm and Pettersson 2011; Normann, 2017; CenSES, 2019; Menon, 2019, Mäktie et al., 2019) found that public support such as policies and governmental financial incentives was essential to ensure the emergence of the domestic offshore wind industry. The term "policy instruments" will be used throughout this thesis to refer to any political incentives created to realize future political goals. The companies in the Norwegian offshore wind power industry state that support from Enova alone is not sufficient for full-scale wind farms. The public sector enterprises *GIEK* and *Eksportkreditt* are accentuated as actors that may help finance offshore wind parks through credit guarantees (Menon, CenSES; 2019). Although Menon forecasts the possibility of great potential with up to 20% of global market shares, it also states that Norway must capture 11% to ensure the industry to become socially economically feasible *if* subsidy measures are introduced to investments. A majority of the academic research calls for policies to foster scale-ups in offshore wind (Mäkitie et al., 2019; Mäkitie et al., 2018; IRENA, 2019). For example, Mäkitie et al. (2019) argue "…policy measures addressing the economic environment, and the economic situation of incumbent energy industries can have an effective and swift impact in causing a reorientation towards renewable energy markets". Subsequently, policy measures should support investments in new emerging technologies to create competitiveness (Mäkitie, Thune, and, Gonzalez, 2018). To support SMEs, Normann and Hanson (2017) suggested that policies should focus on increasing the interaction between large companies and smaller suppliers, to create the possibility to penetrate international markets. Conversely, some scholars argue that policies must be employed as cross-border cooperation to accelerate the energy transition (Jacobsson and Karltorp, 2013).

3.3 The Investor Mindset

To understand the investor mindset could be a thesis on its own. This section is an attempt to provide a brief overview to broaden the understanding of the main elements of the investor and capital actor mindset.

3.3.1 How Investors Think

Chen (2020) defines an investor as "any person or other entity (such as a firm or mutual fund) who commits capital with the expectation of receiving financial returns". Not all investors think alike. "They have varying risk tolerances capital, styles, preferences, and time frames" (Chen, 2020). Investor and author Kender (2014) has identified some key elements of the investor mindset, among them, are high returns, time perspective, and valuation. According to Kender (2014), investors typically want returns of 6-10 times their investments. Previous studies indicate that venture capitalists, especially, demand high returns from high-risk investment opportunities (Moore and Wüstenhagen, 2004). New emerging, high-growth markets or products with the potential of scalability is attractive for investors (Kender, 2014; Gaddy, Sivaram, Jones and Wayman, 2017). Investors have different time perspectives but usually want the option to attain the return within 3-10 years (Moore and Wüstenhagen, 2004; Gaddy et al., 2017; Kender, 2014). While there is no universal valuation equation to evaluate a company or project (Kozlova, 2017; Kitzing, Juul, Drud, and Boomsma, 2017; Santos et al., 2014), it is evident that investors employ "…different financial instruments to earn a rate of return" (Chen, 2020). Subsequently, investment theory has given decision-makers tools to better manage prospect investments (Chong, 2004). When considering an option to invest, paying attention to risk is crucial to avoid severe consequences and investment loss (Baker and Filbeck, 2014).

3.3.2 The Renewable Energy Megatrend

Globally, in 2018, investments in renewable energy were close to 2,5 times more frequent than investments in hydrocarbon-based energy (Statkraft, 2019). In total, EUR 4,2 billion invested in European wind in 2019, came from capital markets (WindEurope, 2020b). Investments in renewable energy technologies are often referred to the generic term *cleantech* (clean technology). Cleantech may be defined as "commercializing clean energy technologies or business models, including those developing, integrating, deploying, or financing new materials, hardware, or software focused on energy generation, storage, distribution, and

efficiency" (Gaddy et al., 2017). A study (Gaddy et al., 2017) comparing investments in cleantech, soft-ware, and medical industries finds that deep technology required the most capital and offered the lowest returns. The lengthy time for hardware, materials, and chemicals to develop was stated as the reason for the poor performance. The researchers (Gaddy et al., 2017) conclude that venture capital is not preferable to finance cleantech. It is essential to note that renewable energy technologies have developed substantially and falling in costs the past years (IRENA, 2019), and the data analyzed by Gaddy et al. (2017) is dated between 2006-2011. However, to understand the investor mindset, this article has offered valuable perspectives.

3.3.3 Venture Capital for Growth

Although there is a broad consensus that venture capital is valuable for growth in start-up innovation (Berk et al., 2013; Faria and Barbosa, 2014; Hellmann and Puri; 2000; Moore and Wüstenhagen, 2004); opinions about when venture capital should be injected into a company is polarized. It has also been questioned if venture capital is the best solution for renewable energy growth (Gaddy et al., 2017). A study (Faria and Barbosa, 2014) found a stronger correlation of venture capital at a later stage of the financing cycle (see Figure 7). When it comes to renewable energy technology companies, Gaddy et al. (2017) argues that venture capital should be injected at the maturation stage. Another scholar (Stadheim, 2010), finds that venture capital is not critical for growth the majority of start-ups. On the other side, private sector investment is urged to be the leader in renewable energy investments (Waissbein, Glemarec, Bayraktar, and Schmidt, 2013).

3.3.4 Suggestions to Mobilize Capital into Renewable Energy Markets

Past research (IRENA, 2016; Waissbein et al. 2013) highlights the importance of policies coupled with financial instruments to de-risk renewable investments to mobilize private capital. Waissbein et al. (2013) argues that financial de-risking instruments alongside policy instruments "can reduce the financing costs of renewable energy investment and help attract capital at scale". Characteristics of energy investments are especially the requirement for high upfront capital (IRENA, 2016). According to Gatzert and Kosub (2016), from an investors perspective, policy and regulatory risks are considered among the most substantial risks. Gaddy et al. (2017) suggest the increased use of policy support to fill the "valley of death" gap between venture capital and research and development (R&D) phase from governmental funding.

Gaddy et al. propose investors with longer time horizons such as “pension funds, sovereign wealth funds, family offices, and other institutional investors, as well as philanthropies, foundations, and other charitable organizations” are suitable for clean tech investments (2017).

3.4 The COVID-19 Impact on Renewable Energy

This section is included to recognize the current COVID-19 pandemic (WHO, 2020). The outcome of the current precautious situation is critical for the field of research for this thesis. While it is still too early to review past research academic literature, this section aims to present what recognized energy agencies (IEA; Rystad Energy; WindEurope, 2020) currently predicts on growth in renewable energy under the uncertain times of COVID-19.

Historically, humanity has observed a growing interest in renewable energy after the “oil price shocks of the 1970s” (Bhattacharya, 2011). After the World Health Organization (WHO) declared a pandemic in March (WHO, 2020), the global economy has been severely impacted. The IEA (2020) now predicts a historic low in energy investments and a global recession. This means postponing the energy supply of tomorrow (2020). A recent report from WindEurope explains interest rates are likely to be low throughout 2020. In normal market conditions, this could indicate an opportunity for long-term investments. However, the global economy is expected to be weak due to the uncertainties related to the COVID-19 pandemic (WindEurope, 2020b). Subsequently, investments in energy are expected to be reduced by one fifth in 2020, compared to investment activity in 2019, where investments in O&G will fall the most (IEA, 2020). Investments of renewable energy, however, is expected to fall by 10%. “The crisis underlines the strategic rationale for oil and gas companies to diversify investments, but also cuts their means to do so” (IEA, 2020, p. 36). On a positive note, the IEA points out offshore wind as still standing a chance, in contradiction to Solar PV and onshore wind. Although there are risks for delays, “investment in longer-lead time technologies, offshore wind, and hydropower, is set to rise supported by ongoing projects around the world” (IEA, 2020, p. 71). In the Norwegian newspaper, E24, sustainable financial analyst Tina Saltvedt stated that the return on renewable investments looks more promising compared to the oil crisis in 2014 (Fjellberg, 2020). However, in March 2020, Rystad, an energy intelligence agency, published an analysis with a rather pessimistic view (Rystad Energy, 2020), stating that growth in renewables would be “wiped out” by COVID-19. Late May, the Norwegian government suggested a “green crisis package” of NOK 3,6 billion primarily targeted towards offshore

wind, battery technology, hydrogen, and emission reductions in shipping (Hovland, 2020). In the current economic crisis, it is evident that predictions are polarized, and it is still too early to conclude what the future will look like after COVID-19.

3.5 Limitations to Research

There are some limitations to this literature review. First, the time frame of this thesis limits the complex research question, which involves three themes. Specifically, sections 3.3 and 3.4 must be understood as a general overview rather than a detailed review. Some of the research is done in other countries, which may operate under very different political and legislative conditions. In addition to external conditions, there might be some topics that could have been included with some relevance, although not directly transferrable. Some of the sources are not from recognized journals, which is clarified in the table in appendix 3.

From creating this literature review, my understanding is that my thesis is contributing to an emerging field of research. Academically, there is a lack of focus from a corporate angle, and most research is either technical, political, economic, or environmental. There is limited academic research on offshore wind investments, specifically with a Norwegian perspective. My thesis aims to expand the existing literature on the Norwegian offshore wind on a company level focusing on access to capital for further growth.

Chapter 4: Conceptual Foundations

This chapter consists of three sections. First, The Phases of the Financing Cycle are introduced as a tool to categorize companies. Second, an introduction to Real Options Analysis may indicate why investments in floating offshore wind are continuously delayed. Third, to acknowledge the unexpected economic situation due to the COVID-19 pandemic, the Multi-Level Perspective will be briefly explained. Together these theories and concepts form a theoretical paradigm that reflects the present time of the research question.

4.1 The Phases of the Financing Cycle

Cardullo's (1999) phases of the financing cycle (see Figure 7), and other models similar to it, are ubiquitous in corporate investment environments and related academic articles.

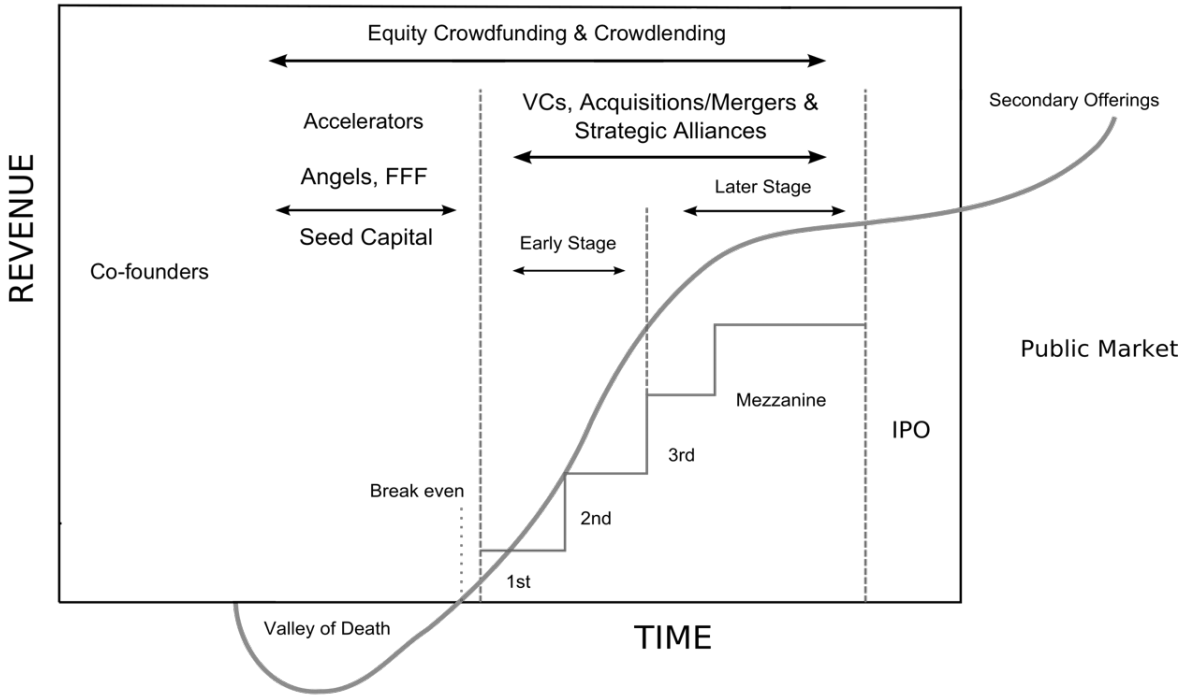

Figure 7: The Phases of the Financing Cycle (Cardullo, 1999).

The model illustrates the financing phases a company goes through in evolutionary terms. For this thesis, the model serves as a theoretical tool to categorize companies. The different phases of the model are associated with specific business activities and capital requirements. Investors often focus on different stages of the financing cycle. Thus, to attract capital, the Cluster Manager of the NOWC needs to understand the phases that the member companies currently

resides in. According to Berk et al., "access to external capital is almost always required for growth" (2013, p. 421). There are five sources of external capital; angel investors, venture capital, private equity, corporate investors, and institutional investors (Berk and DeMarzo, 2014). These sources to capital can fuel a company's acceleration evolving through the phases.

There seems to be no consensus on the terminology of the phases of the financing cycle. Therefore, I have divided Cardullo's model (1999) into five phases, corresponding to the five stages of venture capital funding (Goldstein, 2020). To prevent confusion, the following terms of the phases will be applied throughout this thesis as Figure 8 illustrates: seed, start-up, scale-up, venture, and IPO.

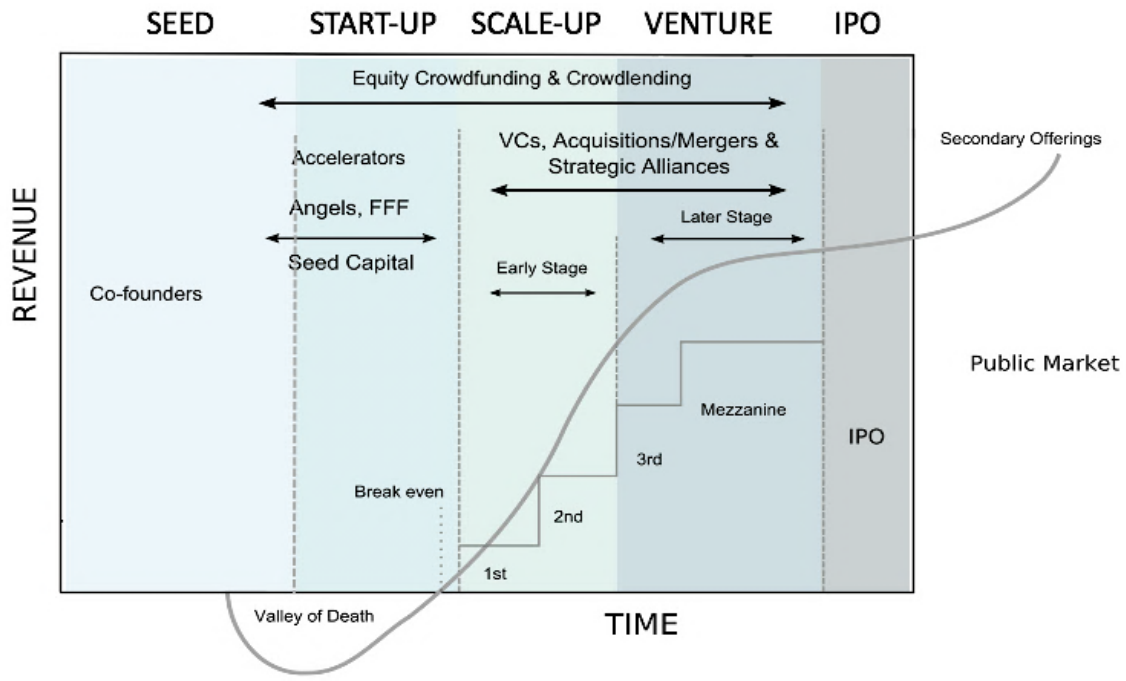

Figure 8: Cardullo's Model (1999) Original Edit, Divided into Five Phases.

4.1.1 Seed and Start-up

The birth of a company is often referred to as a seed (sometimes pre-seed), whereas a start-up commonly refers to a newly established business. Common for the early phases is the lack of capital. These companies tend to access capital from accelerators; typically, from "friends, fools, and family" (FFF) or angel investors (Berk and DeMarzo, 2014). The "valley of death" area in Cardullo's model (1999) represents a crucial phase for company survival before the young companies meet the break-even point and start generating revenue streams.

4.1.2 Scale-up and Venture

The third and fourth phases refer to an expansion phase where the company is growing in organizational size or revenue streams. Sometimes the scale-up phase is referred to as 'early-stage,' 'series A,' or 'early venture' (Goldstein, 2020). The fourth phase, Venture, is sometimes referred to as 'expansion stage,' 'later stage,' 'series B,' or 'mezzanine' (2020). These phases typically attract venture capital, and business activities may include mergers and acquisitions or strategic alliances (Berk and DeMarzo, 2014).

4.1.3 IPO

The fifth stage of the Financing Cycle is termed Initial Public Offering (IPO) (Berk and DeMarzo, 2014). When this phase is reached, the company will be listed on the stock market, available for the public to trade. At this stage, the company will have greater access to capital and increased liquidity (2014). As Cardullo's model displays (Figure 7), the company's revenue is higher, and thus, the need for external capital is not always crucial.

4.2 Real Options

An investment is "the action or process of investing money for profit or material result" (Investment, 2020). There are several methods to evaluate an investment in a renewable power generating energy, such as floating offshore wind. Instead of traditional methods, such as Internal Rate of Return (IRR), Return on Investment (ROI), or Net Present Value (NPV), a Real Options (RO) approach has been selected. Real Options builds on Net Present Value but incorporates uncertainty and management flexibility (Berk and DeMarzo, 2014). Consequently, to understand Real Options, Net Present Value will first be introduced. Then, Real Options is explained.

4.2.1 Net Present Value

Net present value (NPV) is vastly used to support decision making before an investing in energy projects (Bhattacharyya, 2011). NPV is an analytical decision-making tool that converts future cash inflows and outflows to present value and thus accounts for the time value of money. Net present value then aggregates the net value, the difference between cost streams, and benefit streams of the project over a given period in time (Bhattacharyya, 2011). A higher NPV is desirable; however, a project with a positive NPV can generally be invested in.

In economics, Net Present Value (NPV) can be expressed as follows:

$$NPV = \sum_{t=1}^{N} \frac{(R_t - C_t)}{(1+i)^t} - I_0$$

Equation 2: Equation for Net Present Value (Bhattacharyya, 2011).

where R_t is denoted revenue in year t; Ct is denoted costs in year t; i is denoted the discount rate, and I_0 is denoted the initial investment in Equation 2 (Bhattacharyya, 2011).

However, since uncertainty and risk are hard to quantify and insert into the equation, the NPV alone is not suitable for uncertain market situations (Bhattacharyya, 2011), such as the emerging floating offshore wind market.

4.2.2 Real Options Analysis

The Real Options (RO) is selected as the analytical framework for this thesis because it is often applied in investment decisions for renewable energy and power generating, such as offshore wind projects (Kitzing et al., 2017). RO is commonly applied in uncertain markets with underlying tangible physical assets rather than financial assets and includes management flexibility (Berk and DeMarzo, 2014) , and is often not traded in the competitive markets. Applying RO gives the decision-maker the option to delay, grow, or abandon an investment opportunity. The option flexibility available is of value for a decision-maker, and investment with correct timing can add value. According to Berk and DeMarzo, "to make the most accurate investment decisions, the value of these options must be included in the decision-making process" (2014, p. 774). Hence, Real Options can be mathematically expressed as follows:

$$NPV_{expanded} = \begin{matrix} NPV_{traditional\ or\ static} \\ + Value_{management\ flexibility} \end{matrix}$$

Equation 3: Expression for Real Options Analysis (Santos et al., 2014).

Real Options are often graphically illustrated using a decision tree analysis, which will be elaborated in the following section.

4.2.3 Decision Tree Analysis

According to Berk and DeMarzo, most investment decisions are so "investment-specific it is impossible to present a general theory of the Real Options" (2014, p. 777). However, to visually illustrate the management flexibility of Real Options, a graphical tree represents the options and potential outcomes. The branches of the tree illustrate future decisions, illustrated by decision nodes, and uncertainty resolutions, illustrated by information nodes. The tree presents the choices available to the decision-maker as most investments "allow for the possibility of reevaluating the decision to invest at a later point in time" (Berk and DeMarzo, 2014, p. 775).

From Berk and DeMarzo's (2014) model, I have elaborated a decision tree based illustrating a simplified possible decision tree for an offshore wind project (see Figure 9). The circles represent information nodes, while squares illustrate decision nodes. In a real investment decision, this model would be further advanced with additional information nodes and decision nodes. For example, it could include information nodes about the future; higher or lower interest rate, changes in CO_2 tax, or technological development of wind turbines.

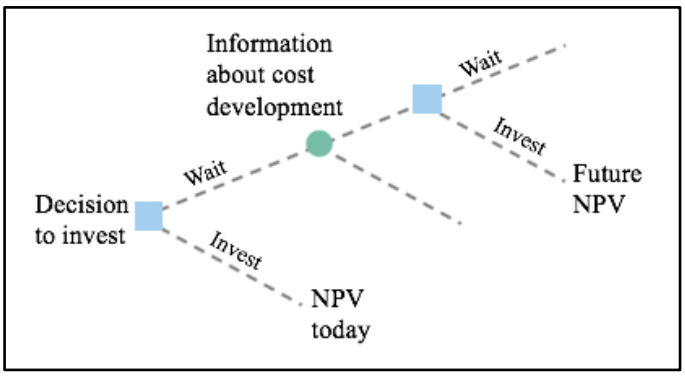

Figure 9: Original Decision Tree for Theoretical Investment in Floating Offshore Wind

Generally, there are three types of real options frequently used; delay, grow or abandon the investment opportunity (Berk and DeMarzo, 2014).

4.2.4 Delay the Investment Opportunity

When there is great uncertainty related to the investment opportunity, the option to wait is considered highly valuable, unless there is a cost to waiting (Berk and DeMarzo, 2014). The Real Options approach allows the investor to weigh the benefits of delaying the investment opportunity against the cost of waiting for more information. Postponing an investment opportunity to a time with more available information may represent a cost. The decision-maker might miss out on profits generated interims when choosing to delay the investment. Or, a competing firm may have reached development in the meantime (2014). However, when an

investor has the option to delay an investment, the investor should only invest if the NPV is signifyingly greater than 0. Waiting for the right timing of an investment can be valuable because it allows the investor to decide at a point in time when uncertainty has resolved, and thus committing capital only when the situation is well contemplated and hence a better decision.

4.2.5 Option to Grow

By investing in a project, the investor may get an opportunity in the future to make further investments because of the early involvement in the project. Thus, the investor has an option to grow the investment, which has a value today (Berk and DeMarzo, 2014).

4.2.6 Option to Abandon

Real Options also include the option to abandon an investment opportunity. For example, if the investment is not generating cash flow and or have promising future revenue streams. RO accounts for the flexibility to walk away from the opportunity (Berk and DeMarzo, 2014). Additionally, the investor may invest a small amount in a project associated with risk while gathering more information. Later, the investor may have the option to invest more, or the option to abandon at a much lower cost, considering the smaller investment.

In sum, when an investor has the management flexibility of Real Options, waiting is valuable. Applying the fundamentals of Real Analysis, the investor should make an effort to delay investment expenses whenever it is suitable and aim to "create value by exploiting real options (Berk and DeMarzo, 2014, p.800)".

4.3 The Multi-Level Perspective

The multi-level perspective (MLP) aims to explain how an economic crisis, theoretically, may create a window of opportunity for the floating offshore wind industry to accelerate. This theory was included after interviewing the member companies, as market acceleration caused by COVID-19 was an emerging theme. The MLP is a middle-range analytical framework that should be presented alongside another theory (Geels and Schot, 2010). It is commonly used to explain the long-term socio-technical change, such as the shift from one energy technology to another. The MLP bridges Science and Technological studies (STS) with evolutionary economics (2010). The multi-level perspective is commonly presented with three levels

decreasing in structure, stability, and size; a. The socio-technical landscape, b. The socio-technical regime, and, c. the niches (see Figure 10).

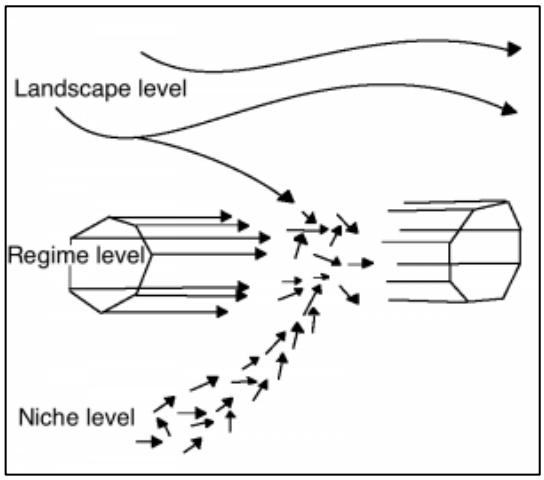

Figure 10: The Multi-Level Perspective (Geels, 2011).

The socio-technical landscape is described as a broad stable background structure that influences the lower levels in the model, the regime, and the niches. The landscape level consists of three types of factors (Geels and Schot, 2010) 1. Factors that don't change, or slightly change, such as climate. 2. Long term changes, such as industrialization, and 3. Rapid external shocks, such as wars and fluctuations in oil-price. At the landscape level, the structure is usually stable but can impact the lower levels. Below the landscape level in the model, stays the socio-technical regime. The regime is considered how we know our "dynamically-stable" reality of the world; our values and norms, culture, standard technology, industry, and institutions. The lowest level recognized as highly unstable, where changes can occur quickly. Here, the niches represent new and radical technologies and innovations that aim to attract funding to sprout through the surface, a so-called "a window of opportunity" (Geels, 2011) to become a part of the accepted regime. A company working with solutions for floating offshore wind can be considered a niche.

According to Karl Popper's falsification criteria, the well-known hypothesis *all swans are white* can be disproven by observing only *one* black swan (Catton and Macdonald, 2012). COVID-19 may be an example of a rare and unpredictable event with severe impact (Taleb, 2009). Alas, a global pandemic, has been both predicted and warned by experts. Conversely, a global economic crisis caused by COVID-19 and a substantial drop in the oil-price simultaneously represents major external shocks in the landscape level (Geels and Schot, 2010) that may lead to an unstable regime, people losing their jobs, change in politics, habits of energy use, and so on. Theoretically, COVID-19 may hold the potential to create the external shock that creates a window of opportunity for the floating offshore wind niches to emerge into the socio-technical regime.

Chapter 5: Methodology

This chapter has three objectives. First, it briefly introduces what method is. It will state why a qualitative research design has been selected for this master thesis and detail using interviews as a research method. Second, this chapter will elaborate on the research process for this master thesis. Third, the validity and reliability of the interviews conducted will be examined.

5.1 Method and Research Design

5.1.1 What is Method?

Methodology is defined as "a set of methods and principals used to perform a particular activity" ("Methodology," n.d.). There are two types of methods to generate data; qualitative and quantitative. Qualitative data form evidence from visual images, words, or sounds, whereas quantitative data derive evidence from numbers (Neuman, 2014).

5.1.2 Selection of Research Design

A descriptive, qualitative method using semi-structured interviews was selected for this thesis. Applied social research (Neuman, 2013) can be a powerful tool to improve decision-making in NOWC and form the foundation of a capital strategy for the cluster. Applying a qualitative approach rather than a quantitative approach enabled me to interview target member companies that obtained valuable information relevant to the research question. The research followed an inductive logic of inquiry (Blaikie and Priest, 2019), which starts with collecting data through interviews before proceeding to derive generalizations.

5.1.3 Interviews as a Research Method

The data generated for this master thesis is fourteen individual semi-structured interviews of twenty-five minutes. Semi-structural interviews differ from lengthy, in-depth interviews, and quantitative surveys (Ghauri, Grønhaug, and Strange, 2020). Selected this method of research enabled me to interview a larger sample of informants than using in-depth interviews. During the semi-structured interview, new themes might emerge for further exploration. This method allows asking questions outside the interview guide and enriches the data collected with follow-up questions (Ghauri et al., 2020). It is structured more like a conversation, which makes the informants relaxed to provide answers, but the interviewer still steers the conversation and goes through the interview guide that allows for data to be analyzed and compared later.

5.2 Research and Methodological Process

The research process for this thesis started with my attendance at the WindEurope Conference in Copenhagen in November 2019. Here, I got an overall impression of the European offshore wind industry, and I also talked to many of the member companies of the NOWC. In February 2020, I attended a capital seminar in Stavanger and was further inspired to answer the research questions. Figure 11 below is an original flow chart model, illustrating the methodological process for this thesis.

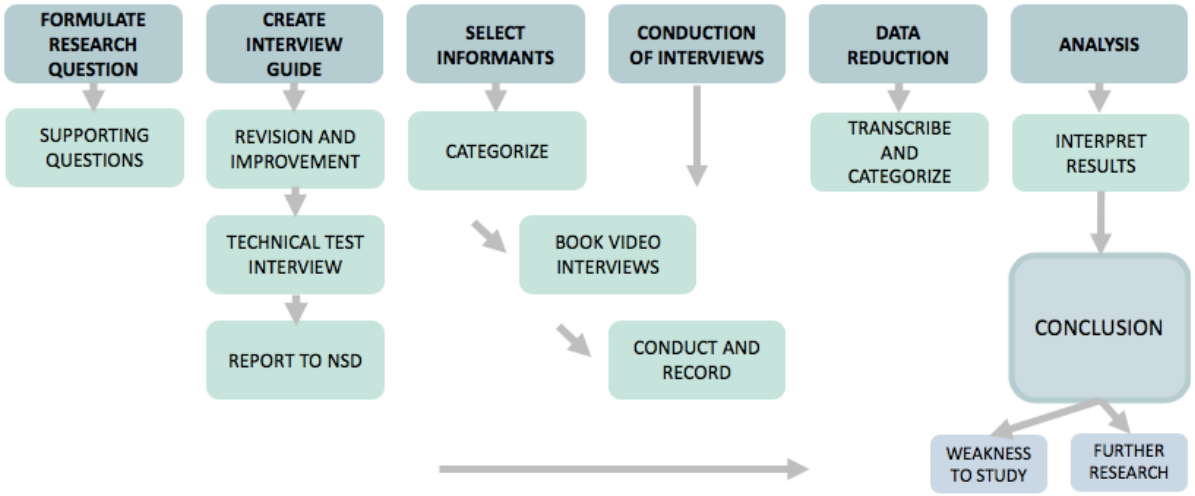

Figure 11: Original Flowchart illustrating Methodological Process

5.2.1 Interview Guide

Two interview guides were created to interview the two samples; member companies of the Norwegian Offshore Wind Cluster and investors and capital actors that typically engage in the early phases of the financing cycle.

With the research question in mind, it was apparent to interview the member companies about their need for capital, the greatest barriers in offshore wind, and what they thought could help them facilitate their growth. To get the opposing perspective, we decided to extend our research also to include investors and capital actors. Thus, the second interview guide was created to understand the investor mindset. It consisted of questions on investment preferences and floating offshore wind. Including investors and capital actors as informants in the thesis will add another dimension to answer the research question.

The interview guides have many similar questions and followed the same structure. Before the interview, all informants received an information letter with the consent statement. The entry questions were designed to make the informants comfortable and asked about the company they worked for. In the very last question, I included a question about how COVID-19 might have influenced their answers. This question was designed as a control question to isolate the problem statement from the current COVID-19 situation. The interview guide was created in Norwegian, and all interviews were conducted in Norwegian. For this thesis, the interview guide has been translated into English. The full interview guides are attached in appendix 2.

Revision, Improvements and Technical Test Interview

After creating the interview guides, I invited my supervisor and the cluster manager to a meeting where we went through all the questions together and discussed possible improvements. From this feedback, some items were deleted, reconstructed, and made more explicit. The structure of the interview guide was also slightly changed. Before conducting my first interview, I asked an acquaintance for a technical test interview. After the interview, I made my introduction more concise. In the concern that the non-personal presence would affect the responses or lead to misunderstandings, the interview guide was converted to a PowerPoint. In the virtual conference room, I shared my screen with the informant, showing them one question at the time. I also made a progress bar in the PowerPoint, clearly showing how far into the conversation we were. The technical aspects went well, and the audio recording was clear and easily transferred to my computer.

Data Privacy

To ensure the proper storage of privacy, this research project was reported to and approved by The Norwegian Centre for Research Data (Norsk Senter for Forskningsdata, NSD). The information letter with the consent slip is attached in appendix 1.

5.2.2 Selection of Interview Informants

The Norwegian Offshore Wind Cluster consists of more than 100 member companies (Norwegian Offshore Wind Cluster, 2020), which will be referred to as *the population*. For this thesis, a sample size of ten member companies was selected from the population. The member companies were categorized in collaboration with the cluster manager though reviewing publicly available information about the companies. The population was then divided into two

sets of categories; the anticipated phase of financing cycle and type of business activities. Stratified sampling (Blaikie and Priest, 2019) was applied to ensure that the sample informants represented the target population. The cluster manager was curious about the need for capital of the member companies in the early phases of the financing cycle; seed, start-up, and scale-up. Selecting the right informants was crucial for a reliable data foundation in qualitative research (Ghauri et al., 2020). Four informants representing sources of capital were selected through the professional network of the cluster manager that was assumed to focus on the early phases of the financing cycle. The term "investors and capital actors" will be used throughout this master thesis to refer to this sample of informants, including investors, governmental funding agencies, and investment bankers.

5.2.3 Conduction of Interviews

In total, I conducted fourteen interviews for this master thesis. Due to the COVID-19 situation, the interviews could not be conducted in person and thus was conducted through video interviews. Three interviews were done by phone, due to informants with busy time schedules or locations with a poor internet connection.

5.2.4 Data Reduction and Analysis

The findings from the audio recordings were categorized using Excel, where I created two tables (one for each sample) with the rows reflecting each question in the interview guide, and additional rows for emerging themes and attitudes (see appendix 4). Their responses were translated to nominal (barriers to capital), ordinal (optimist, neutral, pessimist), and interval levels (MNOK) (Neuman, 2014). Using these tables, I was quickly able to identify if the tech companies typically had a higher capital need or were more optimistic about floating offshore wind by examining correlations between the categories. The tables are attached in appendix 4. For the analysis, see chapter 6.

5.3 Validity and Reliability

According to Neuman (2014), perfect reliability and validity can never be achieved. However, to get precise measures, the researcher will strive to get the best possible data. Validity refers to "the concept of interest closely matches the method used to measure it" (Neuman, 2014), while reliability refers to if the method of measuring is "consistent and dependable" (2014).

5.3.1 Reliability

The interview guide was followed, so all informants responded to the same core questions. I was able to follow-up with questions if it seemed that the informant would talk off the topic and steer the conversation. The semi-structured format also allowed me to monitor their understanding of the questions, help define and introduce themes, if necessary. However, because of the qualitative nature of the data, it is not possible categorize the answers perfectly objectively. Due to the COVID-19 situation, most of the informants were at the location of their own home. I could assume that it would make them comfortable, however, it is hard to ensure a sterile environment as a remote interviewer. After the first interviews went well, I decided to add a few informants. Hence, the sample size was doubled, which helps decrease sampling errors and increase sample reliability (Blaikie and Priest, 2019).

5.3.2 Validity

Given the time frame for this master thesis, semi-structures interviews was regarded as the method which would gather the most valid data. The collected data holds high face validity (Neuman, 2014, p. 133), as the member companies answer questions about how much capital they need, and the projects they want to realize. The informants hold higher positions as either Chief Execution Officers, Managing Directors, or Project Managers. The informants shared openly, professionally, with well-articulated responses. Some of the informants may not disclose all relevant information or may want to overemphasize something perceived as important to them. The phrasing of some of the interview questions was slightly improved between the interviews, to avoid confusion and save time explaining. As a result, it was easier to steer the conversation and ask better follow-up questions. The sample of ten member companies will not perfectly represent the whole cluster. Some of the member companies' categories are unidentified, and the distribution of the cluster is also unknown. Furthermore, it is incorrect to assume that the categories are evenly distributed in the cluster.

The investor and capital actor sample is too small to draw confident conclusions; however, the informants are considered key actors in their field and hold positions as CEOs or have excellent knowledge. Essentially, their responses gave a flavor on how investors think.

Chapter 6: Analysis

This chapter will present, analyze, and discuss my interpterion of the data collected. It aims to triangulate findings from literature, theory and interview data, for a more confident recommendation. The chapter consists of three sections that are organized to correspond to the three secondary research questions. The extensive data tables used to categorize the informant's answers are attached in appendix 4. Some quotations from the interviews are highlighted in this analysis. Selected quotations from the interviews are attached in appendix 5.

6.1 Barriers to Growth for the NOWC Member Companies

This subchapter corresponds to the secondary research question *Is the access to capital the main barrier for growth in the NOWC?* Thus, this section briefly reviews the member company data sample, then provides an overall impression after conducting the interviews. Section 6.1.3 presents an overview of the reported barriers to growth, and then sections 6.1.4-6.1.7 analyzes the findings from each barrier.

6.1.1 Overview of the NOWC Member Company Data Sample

While the ten member companies' informants are kept anonymous, Table 2 below provides an overview of the sample of informants; their job title and the type of company they represent.

JOB TITLE OF INFORMANT	TYPE OF BUSINESS ACTIVITY	REPORTED PHASE OF THE FINANCING CYCLE
Project Manager	Tech	Seed
Cheif Executive Officer	Tech	Seed/Start-up
Cheif Executive Officer	Service	Start-up
Cheif Executive Officer	Tech	Start-up
Cheif Executive Officer	Tech	Start-up/Scale-up
Cheif Executive Officer	Tech	Scale-up
Cheif Executive Officer	Service	Scale-up
Managing Director	Service	Scale-up
Managing Director	Tech/Service	Scale-up/Venture
Managing Director	Tech/Service	IPO

Table 2 Overview of Member Companies' Informants

To categorize the informants correctly, I created an original simplified financing cycle (see Figure 12), which was used during the all 14 interviews. Company logos from a random sample

of member companies and capital actors were placed in the model for reference. Informants from expressed that they had previous knowledge of the model, or a model similar to it, and seemed comfortable using it as a frame of reference.

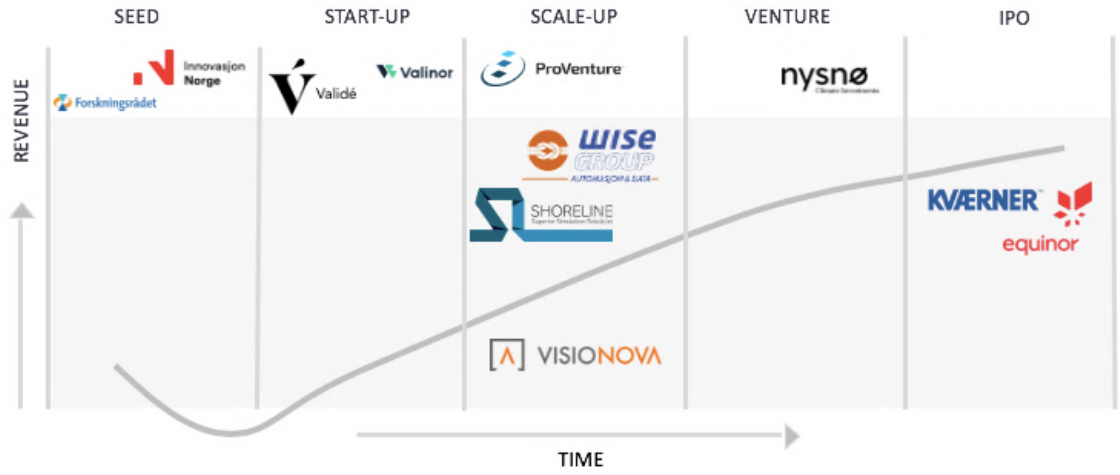

Figure 12: Original Financing Cycle with a Random Sample of Reference Companies.

My experience was that the informants felt comfortable, and there were very few misunderstandings. I also got feedback from several of the informants, stating that the interview was easy to follow. Figure 13 below illustrates how the sample was distributed in the financing cycle after the informants placed their company in the phase they identified with:

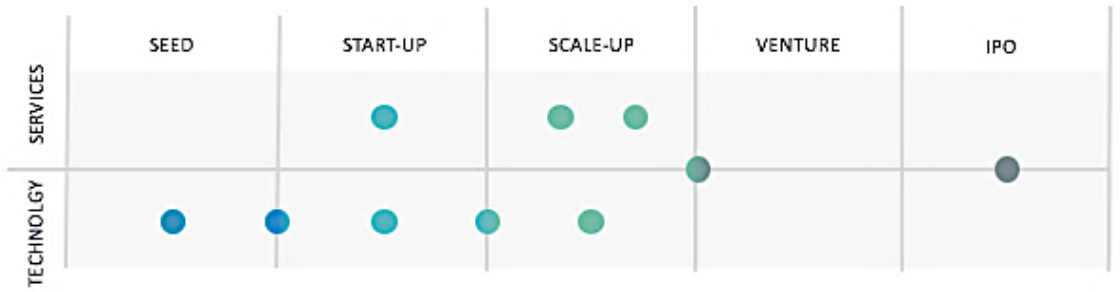

Figure 13: Data Sample Member Company Informants, Categorized by Phases of Financing Cycle and Type of Business Activity.

As Figure 13 displays one of the member companies interviewed was unknowingly listed through another company. Although companies in the IPO phase were not a targeted through stratified sampling, the informant representing an IPO company proved to bring valuable knowledge about the offshore wind industry and was thus included in the analysis.

6.1.2 Overall Impression of the NOWC Data Sample Interviews

Overall, the informants appeared as highly qualified, with years of relevant experience and great interest in Norwegian offshore wind. Early on in conducting the interviews with the

member companies, several patterns and themes emerged from interview number three and four. Many arguments repeated, especially on access to capital and policy measures. This might indicate a common belief in offshore wind or a homogenous sample. Additionally, the member companies tended to express great enthusiasm towards offshore wind. An interesting find is that 8 out of 10 member companies express optimism to a green shift to offshore wind, the remaining 2 is neutral. Two informants also expressed no belief in floating offshore wind; however, they believed in bottom-fixed foundations. Two examples of optimism follow:

> *Great opportunities. We have focused a lot on floating wind. But I probably believe that Norway can be the production hub for the whole of Europe when it comes to floating wind. So, I envision a ten billion industry for Norway.* (CEO, Tech Scale-up Company).

> *If we get it* [floating offshore wind] *here in Norway, we can export this technology to the whole world - and that is what is the great opportunity.* (Managing Director, IPO Tech/Service Company).

The optimism might be an indicator that the informants willing to participate in a master thesis, are more enthusiastic about offshore wind in general. It may also be "social desirability bias", meaning that the informants may tend to give answers they think the interviewer want to hear. The optimism may either be an indicator of overconfidence or might be an indicator that floating offshore wind may be a great emerging opportunity.

6.1.3 Overview of Reported Barriers to Growth

The NOWC member companies' informants were asked about barriers to growth, on company-level and industry-level. Lack of policy instruments was reported as the main financial barriers for the Norwegian offshore wind value chain, followed by access to risk capital (see Figure 14).

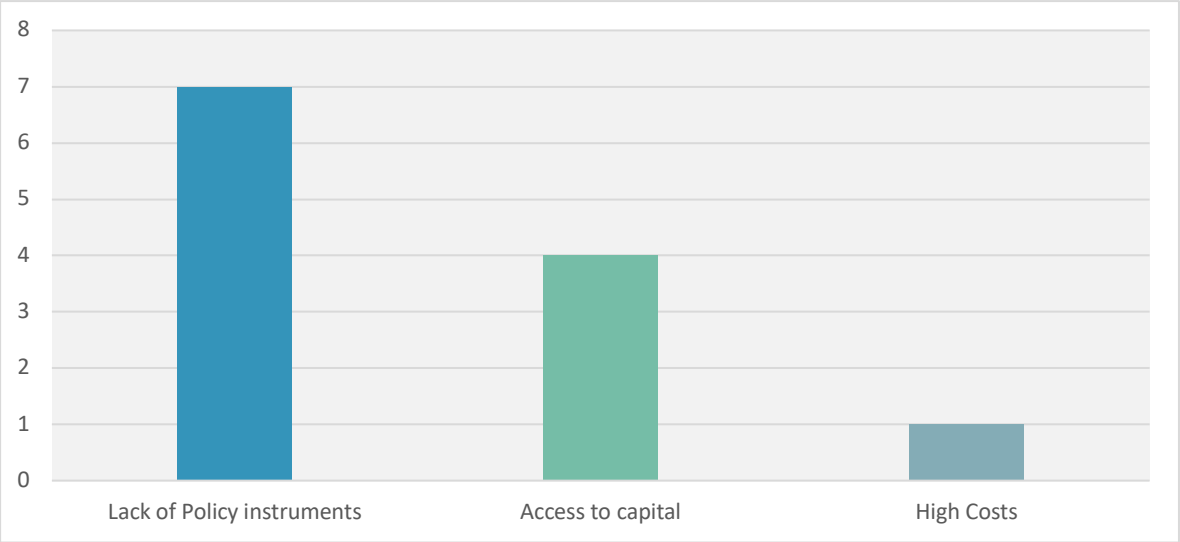

Figure 14: Reported Financial Barriers in the Norwegians Offshore Wind Value Chain.

The quantity of reported barriers will exceed the number of informants, because some of the informants listed more than one financial barrier during the semi-structured interviews. When the informants were asked about the barriers for their own company growth, the main reported barrier was access to capital, followed by access to competent capital; people and collaboration partners, as illustrated in Figure 15. High costs, lack of policy instruments and the business model was also emphasized as barriers on company-level.

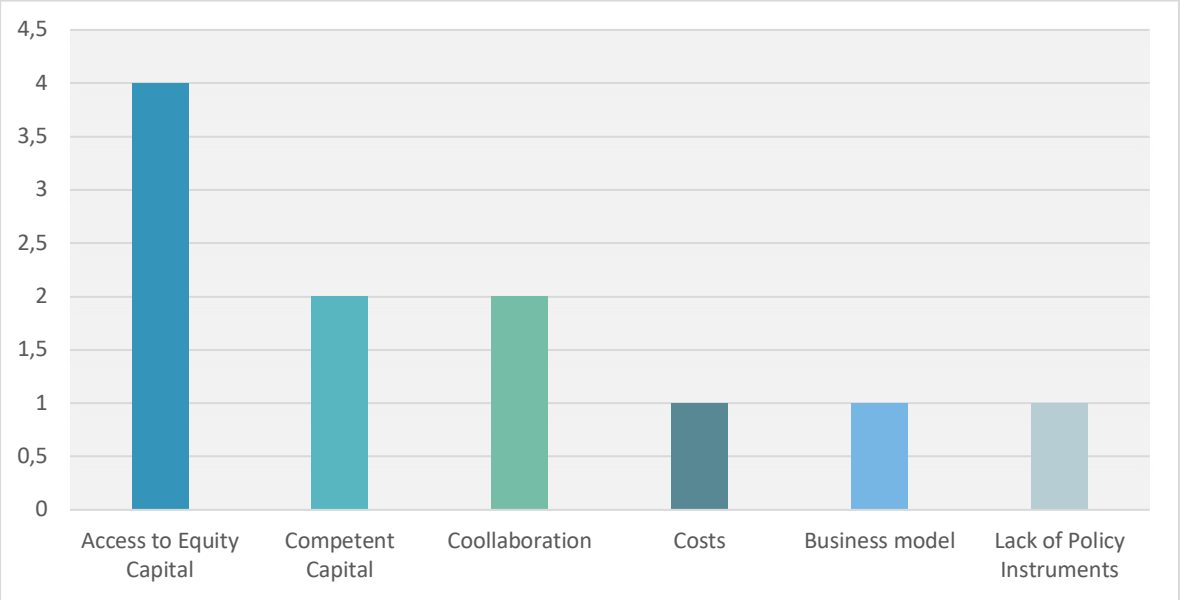

Figure 15: Reported Company Level Barriers.

The data reveals informants' reports policy instruments to be a greater barrier for growth on industry level, and access to equity capital to be the greatest reported barrier on company-level.

The next sections will analyze the some of the reported barriers revealed from the interviews with the member companies of the NOWC.

6.1.4 Competence from the Oil and Gas Industry

Although previous scientific research pays attention to O&G knowledge as a foundation for the offshore wind industry, my data found little focus on this theme. 9 out of 10 of the member companies interviewed built their products and services based on their strong background in O&G, however the informants did not seem preoccupied by barriers related to oil and gas activities in particular. Two of the informants pointed to the O&G spending mindset to be a barrier, however no one highlighted this as the main barrier during the semi-structured interviews. One informant explains that it might be hard to leave the O&G mindset behind;

> *They* [O&G firms] *pour money on all kinds of nonsense, a totally careless way to spend money compared to offshore wind.* (Managing Director, Tech/Service IPO Company).

The finding that 90% of the companies has evolved from competence from the oil and gas industry confirms the conclusions of the literature (Mäkitie et al., 2018; Steen and Hansen, 2014; Normann and Hanson, 2015). Thus, as my results are on accord with the literature, it is fair to assume that the majority of the NOWC come from O&G. However, as indicated by (Hansen and Steen, 2015), it may represent a barrier to employ O&G strategies to foster offshore wind. Thus, there might exist an O&G culture in the Norwegian Offshore Wind Cluster that represent a barrier for development in offshore wind. However, previous research suggests that competence from O&G in sum has a positive impact on offshore wind, (Mäkitie et al., 2018) and especially floating (Normann, 2015; Menon; Mäkitie et al., 2018). Even though all informants were especially enthusiastic about offshore wind, I might have gotten different answers if I interviewed employees in different department, or especially larger oil firms instead of smaller companies.

6.1.5 Cooperation for a Domestic Market

The data reveals that the member companies confirm the importance of a home market; 6 of 10 informants mentioned the need for a domestic market on their initiative. Since the interviews were semi-structured, not everyone expressed their opinion about this, so the number might be

even greater. From my impression with the member companies, there is a strong consensus in the cluster for a domestic market to develop:

> *It is clear that we must have a domestic market ... it lacks financial instruments and incentives to start a domestic market, first and foremost. If we had that, it is not difficult to obtain capital. But a home market is important.* (CEO, Tech Scale-up Company).

> *The operators and contractors must use the suppliers. That should almost be a requirement.* (Managing Director, Service/Tech Scale-up/Venture Company).

As emphasized in previous reports (Menon 2019; CenSES, 2019), the member companies were eager for a home market to develop. Normann and Hanson (2017) suggested policies to increase interaction between smaller and larger companies to support young companies. (Normann and Hanson, 2017) found that the lack of a home market represents a barrier. Although this is an important argument and an acknowledged barrier to growth, my data does not confirm that it is the *main* barrier to growth.

6.1.6 Access to Capital

A Capital-Intensive Cluster

The Norwegian Offshore Wind Cluster is capital-intensive, and several companies struggle with to access capital. 9 out of 10 member companies in the sample reported they needed external capital to realize future projects, with the exception being the IPO company, graphically illustrated in Figure 16:

Figure 16: 9 out of 10 Member Companies Reported Need for External Capital

The companies reported a capital need ranging from MNOK 1 to 300, where the average reported need for capital was 58,18 MNOK. However, technology companies proved to be notably capital intensive. In the technology companies, the average reported need for capital was MNOK 87,9 MNOK, whereas service companies reported average was MNOK 26,7. When asked about how much capital they needed, some companies reported a scale. For this

analysis, the reported scales were converted to the average of the reported range, which is illustrated in Figure 17. The line marking *AVERAGE TECH AND SERVICE* provides the average capital need for all the ten member companies interviewed.

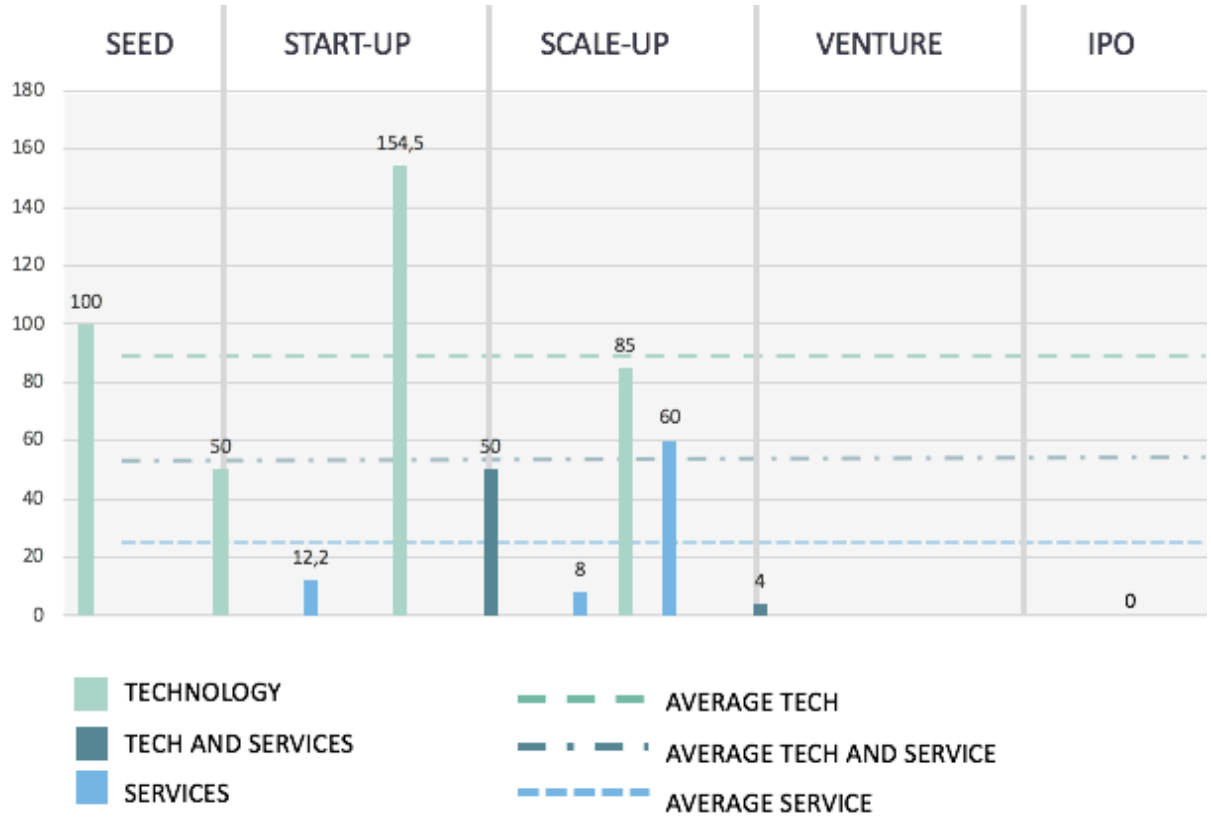

Figure 17: Member Companies' Average Reported Capital Need

The NOWC informants explained the demand for external capital to commercialization activities, such as software development, branding, sales, or construction of full-scale pilot or production facilities. Three companies expressed need for capital to get through the pilot stage, and six companies reported need for capital for commercialization. Thus, the data supports that Norwegian Offshore Wind is completing the pilot stage and entering a commercial phase, as stated in the literature (IRENA, 2019; Menon, 2019).

Access to Capital is Polarized

Another interesting find was that the companies had a different perspective on how easily accessible capital was to them. When asked, 5 out of 9 informants described it was complex to access capital. It was evident that companies in the earlier phases of Cardullo's (1999) model (Figure 7) tended to express a struggle to access capital. On the other side, companies that believe capital is easily accessible tended to belong in the middle phases of the financing cycle.

My impression after interviewing the member companies is that companies in the middle phases tend to preoccupy with internal resources such as the competent people and right investment partner. In contrast, the earlier phases tend to focus on external factors. This might be explained by that the successful companies already are attractive investments and thus capital flows easily to them. To exemplify, two CEOs describe capital as following:

> *When it comes to capital, there is really no shortage of funds for good projects. (*CEO, Tech Scale-up Company).

> *There is plenty of capital, and it is accessible if you succeed.* (CEO, Service Scale-up Company).

Contrastingly, 4 out of 8 informants expressed that investors don't have an interest in them. Although the sample is too small to present firm conclusions, my data indicate trends for each phase of the financing cycle. Using the Gardullo's (1999) model has helped categorize and understand the needs of the member companies. As expected, companies in the earlier phases, also reported a lack of projects and typically expressed capital as difficult to access. A Project Manager explains:

> *In our view, there are few financial solutions. Nysnø* [a state-owned venture fund] *is too far to the right* [in Cardullo's financing cycle]. *There are really no special solutions that we can see for offshore wind in Norway. Then you have to do everything through venture capital...* (Project Manager, Seed Tech Company).

This Informant is stating that there are too few policy instruments solutions for offshore wind in Norway, which forces them to look into venture capital, already at the seed stage. Another informant further explains:

> *It is very easy to get money to develop things, or not very easy - but it is relatively easy. Innovation Norway has a bunch of solutions, and if you apply and are good at applying, then you get it* [funds]. *But when you have developed it* [your product] *until it is almost complete, then the flow of capital stops completely. There is almost no money for such commercialization, the industrialization of what you have developed. And almost impossible to get money for marketing, internationalization in that context. So, there is*

> *a lack of funding on the way up to get things done.* (Managing Director, Scale-up Service Company).

As this Managing Director touches on, there seems to be a gap between government support for research and development and venture capital. Another CEO supports this by stating;

> *There are no equity companies in Norway who are interested in financing a prototype.* (CEO, Tech Start-up Company).

Especially the early-phase companies seem to struggle. 3 out of 4 companies in the seed and start-up phases expressed that it was complex to access capital. They communicate a dependence on external capital to survive. A CEO explains:

> *The technology has matured as far as we can carry on our own back.* (CEO, Tech Start-up Company).

The CEO further explains that the Norwegian offshore wind industry cannot mature further without external capital. Another informant explains that a small company does not have time resources available to apply to different governmental funding agencies;

> *Everyone* [governmental funding agencies] *has their requirements for reporting, administration - it almost takes up a position just that.* (Managing Director Scale-up/Venture Service Company).

This is especially crucial in a developing capital-intensive industry, such as floating offshore wind. These findings reinforce existing literature where Gaddy et al. (2017) describes a "valley of death," a gap between government funding agencies and venture capital. Their answers reveal that there seems to be a lack of long-term financing for commercial business activities in addition to R&D, as found in previous studies (Menon CenSES; 2019). My findings indicate that for a capital-intensive industry such as floating offshore wind, this gap may be comprehensive. The data supports that the complexity of accessing capital represents a barrier, as described CenSES (2019) in the literature review. In the literature review of this thesis, several scholars (Faria and Barbosa, 2014; Gaddy et al., 2017) states venture capital should be

injected into middle and later phases. From analyzing a small sample of data, I support this may be the case.

6.1.7 Policy Instruments

The informants were asked what they perceived as sufficient efforts for the NOWC to succeed. As illustrated in Figure 13, 7 of 10 informants pointed to the lack of policy instruments. The companies demanded stronger direction setting, suitable policy measures and financial incentives to make investments in floating offshore wind more attractive before it is too late.

> *Maybe we* [Norway] *are a little too democratic.* (CEO, Tech Start-up Company).

A CEO contemplates. The CEO further urges the Norwegian government to act *now*;

> [About the Norwegian Authorities]: *It is useless to fall asleep and wake up to miss the train. And I think that train is going to leave incredibly fast*. (CEO, Tech Start-up Company).

The member companies call for urgent policy measures to facilitate access to capital. These findings fit with the existing literature (Normann, 2017; CenSES, 2019; Menon, 2019, Mäktie et al., 2019 Mäkitie et al., 2018; IRENA, 2019), where it is vastly suggested that policy instruments must de-risk the floating offshore wind industry. Potential ripple effects of suitable policy measures for offshore wind includes investments and the emergence of a domestic market (Menon, 2019).

6.2 The Investors and Capital Actors Mindset

This subchapter relates to the secondary research question *What do investors emphasize when considering offshore wind investments*? It starts presents an overview of the sample, then the overall impression from interviewing the investors and capital actors. Then, sections 6.2.2-6.2.4 will analyze the data to explore the investor mindset.

6.2.1 Overview of the Investors and Capital Actors Data Sample

Table 3 (on the following page) gives an overview of the informants' job title and the type of capital environment they are representing.

INFORMANT JOB TITLE	TYPE OF BUSINESS
Renewable Energy Investment Banker	Investment Banking
Financial Advisor	Governmental Fundig Agency
Cheif Executive Officer	Investor Company
Director of Funds	Investor Company

Table 3: Overview of Investors and Capital Actors Informants.

The interviews with investors and capital actors provided valuable insight to the investor mindset. Four informants proved to form a heterogenous data sample. Consequently, the informants had different positions and worked with capital from distinctive perspectives. At first, no obvious trends or patterns occurred, and the overall impression was complex. Although these informants had belief in offshore wind, their preferences would vary. Thus, the analysis, aims to organize overarching themes to explore investors and capital actor's preference and gain a better understanding of the investor mindset. After the informants reviewed Figure 12 with reference investment companies as well as offshore wind companies mapped onto the financing cycle, Figure 18 explains where the informants reported to be focusing in the financing cycle:

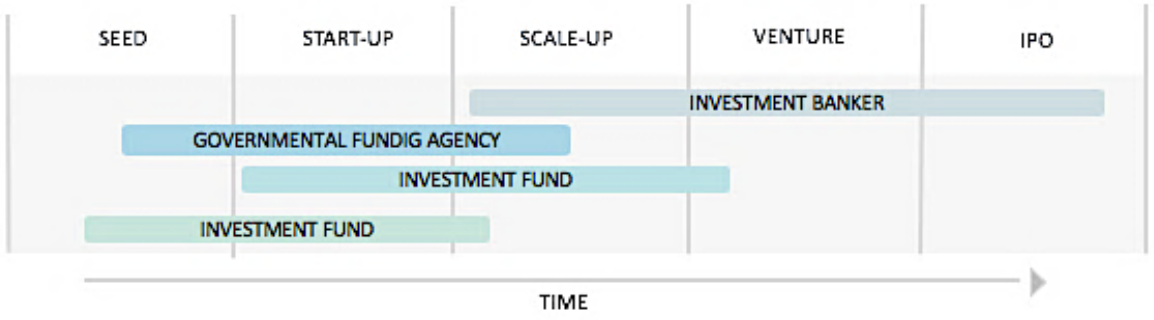

Figure 18: Data Sample Investors and Capital Actors, Categorized by Focus in the Financing Cycle.

6.2.2 Overall Impression of the Investors and Capital Actors Sample

Overall, the informants expressed a positive attitude towards development in offshore wind. Although the investors and capital actors had no official requirement for a greener portfolio, 4 out of 4 explained they would invest in, fund or render services to offshore wind within the next five years. The investment banker sums up the opportunities in offshore wind:

> *I see many opportunities. It is very attractive, long cash flows, political support, secure capital flow, which makes it attractive for institutional capital.* (Renewable Energy Investment Banker).

When the investors and capital actors were asked if they thought if capital markets were influenced by ongoing trends, such as resistance against onshore wind power and Greta Thunberg's climate strike, some answered as follows:

> *Investors are looking at megatrends in markets and the world. Climate is an important megatrend that affects companies' earnings - then it also affects the investor environment.* (Renewable Energy Investment Banker).

> *I think investors need to keep up with the trends. After all, it is the timing that is very important…It can be difficult to invest in something to do with hydrocarbons. If you get into the EU appliance, for example, financing something with hydrocarbons is almost impossible.* (Director of Funds, Investment Fund).

The informants' responses indicate the capital market is acknowledging climate change as a megatrend and is adapting their investments.

6.2.3 Investors and Capital Actors Preferences

Time Horizon and Size of Investments

Figure 19 (on the following page) illustrates average reported size of investment or grant. This thesis finds that the informants interviewed typically invest or grant sums varying from NOK 250 000 to MNOK 70, with the average being right over MNOK 13,62.

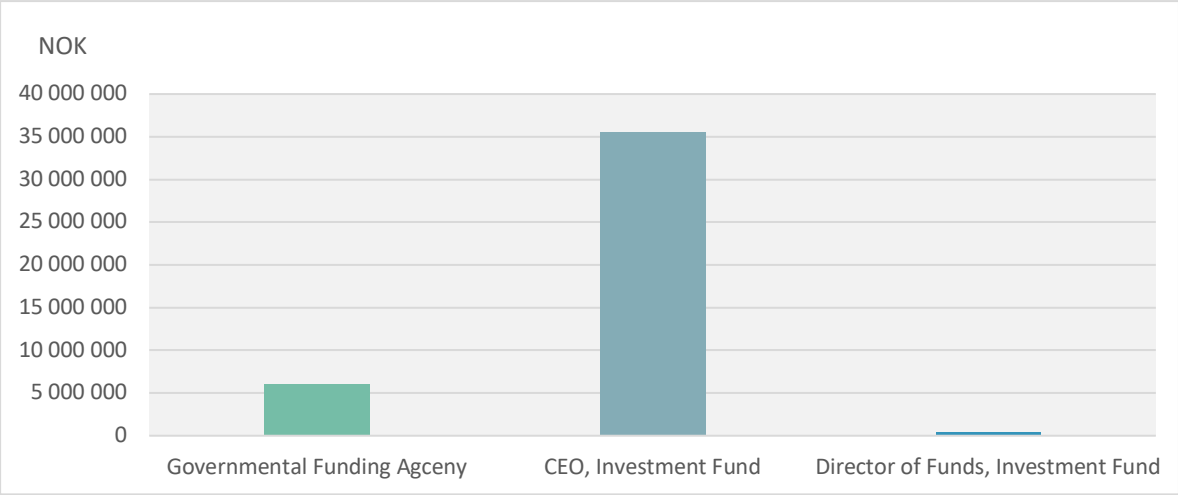

Figure 19: Average Reported Typical Size of Investment in NOK.

The informants further reported that they typically envisioned an exit between 3 to 10 years, which proves to be on accord with previous research (Moore and Wüstenhagen, 2004; Gaddy et al., 2017; Kender, 2014). The average reported demand from member companies are substantially higher than what the investors and capital actors typically invest. An Investment Banker explains:

> *You have to have a large balance, and preferably be a bigger player, that is something we see a trend towards - that it's* [the floating offshore wind industry] *is a big boy's game.* (Renewable Energy Investment Banker).

This indicates that capital in the offshore wind industry must possibly be accessed from larger investments funds or multiple sources.

Software or Hardware?

A theme that emerged during the member companies' interviews was that about 4 out of 10 member companies was under the assumption that investors favored technology over services. A member company informant explained:

> *My experience with offshore wind is that if you have something* [of dimension] *of length x height x width, people will understand what you are doing, and if you are doing that type of technology, people will almost look at it as rocket science.* (CEO, Start-up Service Company).

The cluster manager was also interested in finding out if investors had any clear preferences. Thus, the investors and capital actors were asked about their preferences. From the interviews conducted, it was apparent that investors and capital actors had no preference. All four informants agreed that technology and services in the capital market had an equal preference. The Investment Banker explains:

> *There are different environments that are interested in different exposures, both are equally interesting.* (Renewable Energy Investment Banker).

The results from the data sample, therefore, rejected the examined working hypothesis that investors and capital actors had a preference for hardware technologies. In contrast, previous research suggests investments in software provide higher returns than investments in deep technology (Gaddy et al., 2017). Hence, the literature suggest software should be preferred.

Returns or Climate?

The investors and capital actors were asked to select between two imaginary companies. Company A had higher expected returns and lower greenhouse gas (GHG) emissions. Company B had moderate expected returns and negative GHG emissions. Consequently, Company B had a *positive* impact for the climate by reducing GHG (see appendix 2). The informants' responses are illustrated in Figure 20:

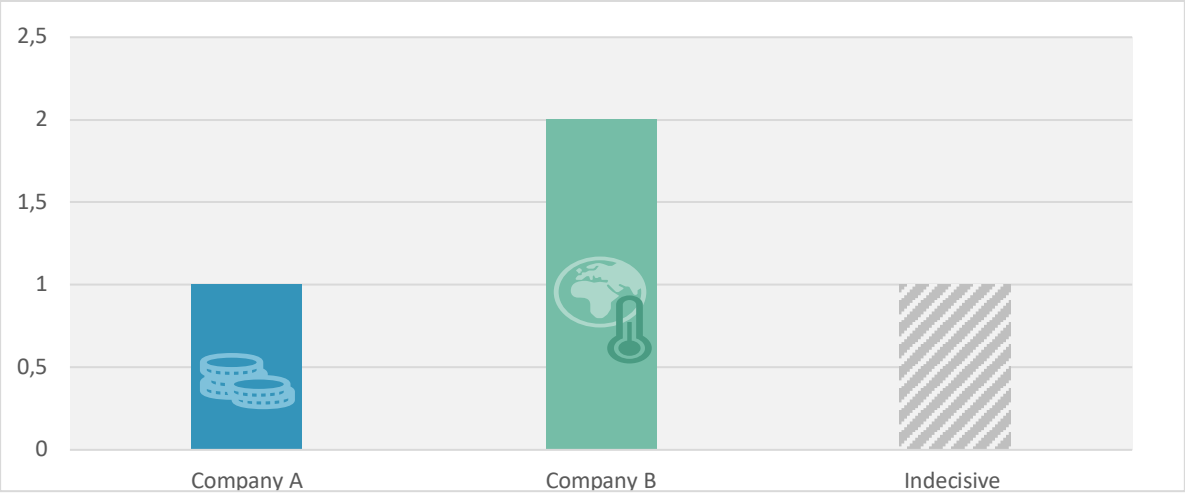

Figure 20: Investors and Capital Actors Preferences for Hypothetical Companies.

As the figure displays, one informant selected company A, two informants selected company B and the remaining informant was clearly indecisive. Some of their responses follow:

> *I understand that you should probably answer B, but I'll answer A for now.* (Renewable Energy Investment Banker).

> *I would have immediately said A, but with your voiceover so ...There is probably option A that reigns today, but if you want a change ...* (Director of Funds, Investment Fund).

Surprisingly, the results slightly favored lower GHG over returns. As the quotations read, there may be social desirability bias here. The informants may subjectively *want* to favor climate; however, when they invest, they might prioritize returns. On a positive note, during the interviews the UNs SDGs (United Nations Sustainable Development Goals) and ESG (Environment, Social, and Governance) was highlighted to be of increasing importance:

> *Investors who do* not *have ESG on the agenda, they are struggling a bit.* (Renewable Energy Investment Banker).

New or Tested Technology?

3 out of 4 informants responded that they would be interested in high risk and new technology. However, the Renewable Energy Investment Banker would advise towards tested technology:

> *After all, that's the problem with the early phase and new technologies; it's a lot of people who are a little cautious about it.* (Renewable Energy Investment Banker).

This high-risk appetite contradicts with the Real Options theory, which emphasizes getting track record and wait for more information when possible. (Berk and DeMarzo, 2014).

6.2.4 How Floating Offshore Wind Can Become Attractive Investments

In the conversation on opportunities and barriers in investing in floating offshore wind, the investors and capital actors' informants agreed on one thing: Track record is key. One investor emphasized that it was a lower risk in investing in Software as a Service (SaaS) companies or smaller components first, to build a track record. The informant further highlighted the need for success stories that serves as an eye-opener for the investor capital market. There is a high risk associated with the development of floating offshore wind industry and high costs:

> *After all, the floating wind has not hit through in the same way as bottom-fixed yet, and there is some risk associated with technology and how to get costs down fast enough.* (Renewable Energy Investment Banker).

> *There is greater uncertainty. When you invest in oil and gas, you have a longer track record.* (Governmental Funding Agency).

The responses above resonates with Real Options theory; waiting for track record is valuable for investors and capital actors. Here, Berk and DeMarzo's (2014) Real Options prove to be a relevant and valuable theory applied to floating offshore wind.

6.2.5 Responsibility and a Call for Policy Instruments

Previous literature tends to focus on the responsibility of either investors or governments to make green high-risk investments. In contrast, several of the investor and capital actors pointed to the responsibility of the companies and entrepreneurs:

> *Initially, in an immature or trending industry like this, you can get some help from the authorities … but in the long run, you have to stand on your own feet.* (Director of Funds, Investment Fund).

Another informant stresses the importance of not being overconfident and relying on governmental funds, but rather to perform better:

> *We must not believe that we are world champions, but rather deliver the world's best products.* (Financial Advisor, Governmental Funding Agency).

A CEO thinks that policy instruments are vital in a transition phase:

> [The Norwegian government] *must facilitate financial incentives in a transitional phase before it becomes financially sustainable in the same way as, for example, offshore taxation and or direct subsidies.* (CEO, Investment Fund).

6.3 COVID-19, An Opportunity or a Barrier to Floating Offshore Wind?

The third and final subchapter in the analysis briefly elaborates on the secondary research questions *How does the current COVID-19 situation impact the emerging market for floating offshore wind?* Thus, it will summarize and analyze both samples; 14 informants' responses regarding COVID-19.

As COVID-19 was declared a pandemic before conducting the interviews, understanding the crisis is valuable to answer the research question in the present time. 6 of 10 member companies informants suggested COVID-19 to be an opportunity to accelerate the green shift and for floating offshore wind to emerge. Some of the member companies' informants are even extremely optimistic:

> *It provides wonderful opportunities to get to this home market. That way, for the Norwegian venture for floating wind, COVID-19 helps.* (CEO, Tech Scale-up Company).

> *For floating winds, I never think the opportunity has been better - I am really very optimistic. Now is the time to forge - and then it happens… We cannot be waiting any longer, we must act* now (Managing Director, IPO Tech/Service Company).

The investors and capital actors seemed a bit more cautious, but two informants slightly indicated COVID-19 might be positive for the green transition, whereas two remain neutral;

> *That trend was probably evident before COVID-19, but it may have been further accelerated by COVID-19.* (Director of Funds, Investment Fund).

> *For the whole green shift - then it will be positive. Now, it has been proved that we can manage to stay that way in the water without emissions from fossil fuels.* (CEO, Investment Fund).

The member companies' informants describe a few challenges in relation to COVID-19 and some delays, however they express not being significantly affected by the pandemic as of April 2020. The investors and capital actors describe an increase in inquires. An Investment Banker excellently sums up the effects of the pandemic so far;

> *The transaction activity has slightly decreased. The stock market has fallen, and investors are a little more cautious. Generally speaking, in renewable energy and offshore wind, there is still surprisingly good momentum.* (Renewable Energy Investment Banker).

In sum, my data support what recent energy reports (IEA, WindEurope; 2020) found. However, it is too early to predict what the future may hold.

Chapter 7: Discussion and Conclusion

This thesis aims to discuss the findings and answer the research question; *How should the Norwegian Offshore Wind Cluster facilitate its members' companies access to capital to accelerate growth?* This primary research question is initially supported by three secondary research questions, corresponding to three themes which has shaped the structure throughout the thesis:

- *Is the access to capital the main barrier for growth in the NOWC?*
- *What do investors emphasize when considering offshore wind investments?*
- *How does the current COVID-19 situation impact the emerging market for floating offshore wind?*

Accordingly, this concluding chapter will first discuss the findings of the secondary research questions in sections one, two, and three. Section 7.4 summarizes the thesis and provides an answer the primary research question. Recommendations to the NOWC are provided in 7.5. Section 7.6 presents limitations and suggestions for further research. In section 7.7 my personal reflections are shared, and finally, 7.8 presents current affairs to the development in floating offshore wind.

7.1 The Barrier to Growth

Regardless of phase, 90 % of the companies reported that they needed external capital to realize future projects. This confirms that external capital is crucial for growth (Berk et al., 2013). This thesis finds that the Norwegian Offshore Wind Cluster is may be very capital intensive, as previous reports have found (CenSES, 2019; Normann and Hanson, 2017). Especially young companies and technology companies have a large demand for capital to evolve their businesses. Thus, my results support Gaddy et al. (2017) who found that technology companies in offshore wind proved to be particularly capital intensive, compared to other industries. This thesis found that particularly companies in the early phases tend to struggle to access capital and express that applying for funds are both complicated and time-consuming. Some of these early phase companies describe a lack of governmental instruments solutions and thus seem preoccupied by the assumption that they must target venture capital investment companies to grow. On the other side, some of the companies in the later stages describe capital as easily

accessible. They tend to focus on finding competent capital that align with their company goals. In sum, access to capital seems to be among the main barriers for growth in the Norwegian Offshore Wind Cluster however this thesis does not find that it represents the *main* barrier. The main barrier seems to be the lack of suitable policy instruments. Consequently, suitable policy measures may help de-risk equity capital, which can spark investments in offshore wind and help establish a domestic market. If the Norwegian government can help facilitate for this industry to evolve, global market shares up to 20% can be gained (Menon, 2019). These efforts might spark a new industry adventure.

7.2 Investor and Capital Actor Mindset

This thesis uncovers that investors and capital actors have a positive attitude towards floating offshore wind. However, the informants describe the emerging industry as uncertain and highlights track records to create attractive investments. The offshore wind industry seems so capital intensive that the amounts invested in early phases are not compatible with the amount demanded by the NOWC member companies. Here, Real Options (Berk and DeMarzo, 2014) proves to be a suitable framework to explain investments in floating offshore wind. Utilizing Real Options, investors will value waiting before making investments associated with floating offshore wind. Previous literature has found that policy and regulatory risk is among the main barriers for investors (Gatzert and Kosub, 2016) and both previous literature (IRENA, 2016; Waissbein et al. 2013) and informants has encouraged an increase of policy instruments to de-risk investments in renewable energy. Whilst the risk may be too high for many investment companies, the Norwegian government may be in a strong position to facilitate clear political direction setting, and a framework for offshore wind, as suggested by Menon. Thus, the Norwegian Offshore Wind Cluster may continue to help resolve uncertainties and gather information. If a domestic market is successfully established in Norway, with a proven track record, this may help de-risk the investment decision.

Although the expense of global warming is costlier than the financial efforts to meet the 1,5 ºC target (Statkraft, 2019), who should finance it is a controversial issue. Current valuation methods seem to be adapted to a capitalist mindset; developed to invest on behalf of individuals, and not on behalf of generations. As a floating offshore wind project has particularly high construction costs, it might imply that offshore wind companies should target capital actors with longer time horizons with altruistic values while driving costs down. Capital

could be attained from "pension funds, sovereign wealth funds, family offices, and other institutional investors, as well as philanthropies, foundations, and other charitable organizations" as suggested by Gaddy et al. (2017). This thesis suggests that companies should target multiple capital actors, preferably with longer time-horizons. In addition to this, *GIEK* and *Eksportkreditt* should be acknowledged as a promising future solution to relieve investors' risk (Menon, CenSES; 2019).

7.3 Impact of COVID-19

As the oil price drops to an historic low and investments in O&G gas are predicted to fall 10% (IEA, 2020), we might expect to see an increase of O&G engagement in offshore wind activities as observed in previous research (Mäkitie et al., 2019; Hansen and Steen, 2015). The rapid external shock of the pandemic (Geels and Schot, 2010) has steered the global economy towards a recession (IEA, 2020; WindEurope, 2020b) and has without a doubt created an unstable regime (Geels, 2011). Theoretically, this may open a "window of opportunities" for the niches to emerge. Additionally, the NOK 3,6 billion "green crisis package" (Hovland, 2020) targeting development including offshore wind may be a golden opportunity for Norwegian floating wind to sprout through the surface.

The findings of this thesis suggest that neither the member companies or investor and capital actors are considerably affected by COVID-19. However, the pandemic has triggered Norwegian governmental efforts; governmental funding agencies are granted additional funds to tackle the crisis. Concurrently, *Hywind Tampen* was finally approved. Thus, COVID-19 may bring just the governmental efforts that has been lacking in the Norwegian offshore wind industry the past years.

7.4 Concluding Remarks

This section will sum up and intertwin the secondary research questions to lay a foundation to answer the main research question. This thesis reveals that the NOWC has a disadvantage when it comes to access to capital. In fact, the cluster seems to be capital intensive, where the early phase companies, in particular hardware technology companies, tend to have high capital costs. Additionally, the cluster is operating in an industry with a longer time-horizon compared to other industries. Understanding the investor mindset might help the NOWC to accommodate the numerous early-phase member companies, and better guide them towards more promising

sources of capital. Conclusively, the investor mindset seems to follow the span of a human life, and not the span of the planet's life cycles, including accelerated climate changes. On the other hand, the urgency of the COVID-19 situation appears as an advantage for the NOWC. Norwegian companies can access even more innovation grants by applying for funding to continue product development and commercialization. Other parts of the world and potential competitors may not have the same privileges, which represents a competitive advantage for companies registered in Norway. Considering the secondary research questions, the NOWC appears to consist of many young companies with high capital requirements. Thus, these companies should primarily target capital sources with longer time horizons; long term investors such as pension funds, governmental grants and other policy instruments from Norwegian and European authorities.

To conclude and to answer the primary research question; The Norwegian Offshore Wind Cluster may benefit from categorizing all member companies into the phases of the financing cycle, as this thesis has recognized trends in the different phases. To support the struggling young companies in the seed and scale-up phases. Thus, this thesis supports the existence of the "valley of death" (Gaddy et al., 2017; Gardullo, 1999), a gap between government support and venture capital (Gaddy et al., 2017). Norwegian Offshore Wind Cluster should mobilize resources to facilitate the companies operating in this gap to access capital.

Young companies may benefit from the NOWC allocating resources to educate its member companies on funding applications. The NOWC should facilitate member companies' cooperation to create track records to become attractive investment opportunities for the future. Additionally, NOWC should identify investors and capital actors with longer time horizons, nationally and internationally. In light of the COVID-19 situation, Norwegian Offshore Wind Cluster should encourage its member companies to forge now and apply for the green crisis package. Preferably, the member companies may utilize the pandemic crisis to create a window of opportunity and accelerate the green transition. Conclusively, this thesis urges the Norwegian Offshore Wind Cluster to assist young companies, particularly, to target a. governmental funding and financing agencies and b. investors and capital actors with longer time-horizons. The NOWC should aim to create a track record of success stories for floating offshore wind to emerge as the new Norwegian energy adventure.

7.5 Recommendations for the Norwegian Offshore Wind Cluster

From a business perspective, a complete mapping out of all member companies of the Norwegian Offshore Wind Cluster is encouraged to further validate this research and draw firm conclusions and facilitate member companies to target capital where it may be accessible for them. The capital strategy is encouraged to outline which sources to capital to target, corresponding to business activity and phase of financing cycle. The Norwegian Offshore Wind Cluster should mobilize resources to educate their early-phase member companies on applying for governmental funding and investor presentations. Furthermore, the NOWC are encouraged to arrange seminars with the goal to increase value chain coupling.

7.6 Limitations and Suggestions for Further Research

This master thesis used 14 semi-structured interviews as the data foundation. It is important to emphasize that the ten member companies contributing to this thesis, may be especially eager to floating offshore wind, and some answers could be biased. As the interviews have been semi-structured, not all informants have answered the exact same set of questions. If all informants answered the same questions, the results might have been slightly skewed. Most importantly, the data samples are considered *insufficient* to be representative of the Norwegian Offshore Wind Cluster, the offshore wind industry and the capital market. However, the results are strengthened by previous research and existing theories, and thus indicate valuable compositions for new knowledge.

An increasing academic focus on investments in floating offshore wind is encouraged. Particularly, theoretical frameworks and methods for valuation is encouraged to include long-term risks, such as climate change.

7.7 Personal Reflections

By conducting research on access to capital in an emerging industry, I am amazed by how many people who work with dedication to realize solutions towards a greener future. Conversations with brilliant and ambiguous minds throughout the final semester has kept me motivated and inspired me to search for professional challenges to continue working to find solutions for renewable energy technologies to emerge.

The precautious times of COVID-19 has allowed us time to reflect on a societal level; how we will our lives, and how we dream for future generations to live them. I hope to see a global

effort for change; caring for each other, and the earth, today and for the next centuries to come, without sacrificing human advancement and remarkable technology accomplishments. As for floating offshore wind, I am excited to see what the future holds for a continuously developing and dynamic emerging market. I envision an innovative industry unlocking the energy demand of tomorrow.

Specifically, my opinion is that the Norwegian government should act proactively in the unfolding COVID-19 crisis to speed up the transition to a low-carbon society. After writing this thesis, I see clear connections between market development and politics. I believe clear market regulations by the Norwegian government coupled with policy measures can spark investor interest world-wide and contribute to de-risking investments in floating offshore wind. This way, Norwegian authorities can direct capital flow towards low carbon solutions while facilitating for a potential industry adventure and securing the energy demand of tomorrow.

7.8 Postscript

On June 12th, 2020, the Minister of Petroleum and Energy, Tina Bru, declared the approval of the opening of floating wind farms on the fields *Utsira Nord* and *Sørlige Nordsjø II* (NRK, 2020). Additionally, from next year it will be possible to apply for a license for offshore wind power projects on the Norwegian continental shelf. Finally, offshore wind energy regulations are established as a part of the Marine Energy Act (2020).

Chapter 8: References

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Appendices

Appendix 1: NSD Informasjonsskriv

Informasjonskriv med samtykke i forbindelse med deltakelse i masteroppgaven "Kapitaltilgang for Norwegian Offshore Wind Cluster"

Dette er et spørsmål til deg om å delta i min masteroppgave hvor formålet er å kartlegge kapitalbehovet i Norwegian Offshore Wind Cluster (NOWC), samt forstå barrierer og muligheter for kapitalinnhenting innenfor flytende havvind. I dette skrivet får du informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål
Jeg studerer master i Energi, Miljø og Samfunn ved Universitetet i Stavanger. Jeg skriver min masteroppgave for en ekstern oppdragsgiver, Norwegian Offshore Wind Cluster. Masteroppgaven har et foreløpig forskningsspørsmål: *How should the Norwegian Offshore Wind Cluster facilitate its member companies' access to capital to accelerate growth?* Prosjektets formål er derfor kartlegge kapitalbehovet i havvindklyngen ved å intervjue medlemsbedrifter i NOWC i tillegg til investorer/kapitalaktører for å bedre forstå kapitalmarkedet.

Hvem er ansvarlig for prosjektet/masteroppgaven?
Universitetet i Stavanger, ved Samfunnsvitenskaplige Fakultet er ansvarlig for prosjektet. Min veileder er Dr. Gorm Kipperberg, ved Handelshøyskolen i Stavanger. Ekstern oppdragsgiver er Arvid Nesse, klyngeleder ved Norwegian Offshore Wind Cluster.

Hvorfor får du spørsmål om å delta?
Det er to utvalgsgrupper som deltar:

- Nøkkelpersoner i medlemsbedrifter i Norwegian Offshore Wind Cluster

Utvalget er ment til å gi et representativt bilde av medlemsbedriftene i NOWC og hvor de befinner seg i finansieringssyklusen, på tvers av teknologi og tjenester. Intervjukandidatene er utvalgt sammen med klyngeleder Arvid Nesse. Omtrent 4-12 medlemsbedrifter vil få denne forespørselen.

- Nøkkelpersoner i investorselskap/kapitalaktør

Utvalget skal representere mulige investorer/kapitalaktører i de forskjellige fasene i finansieringssyklusen. Intervjukandidatene er utvalgt sammen med klyngeleder Arvid Nesse. Omtrent 3-6 kandidater vil få denne forespørselen.

Hva innebærer det for deg å delta?
Hvis du velger å delta i prosjektet, innebærer det at du svarer på et semi-strukturelt intervju. Det vil ta deg ca. 30 minutter, og vil gjennomføres via Google Hangouts. Intervjuguiden inneholder spørsmål om kapitalbehov, offshore vind, og innvesteringer. Dine svar blir tatt opp på lydbånd.

Det er frivillig å delta
Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykke tilbake uten å oppgi noen grunn. Det vil ikke ha negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

Vi vil bare bruke opplysningene om deg til formålene vi har fortalt om i dette skrivet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Det er kun *Veileder Dr. Gorm Kipperberg, Masterstudent Julie Alexandra Vold og klyngeleder Arvid Nesse* som vil ha innsyn i dataene underveis. For å sikre at ingen uvedkommende får tilgang til dine personopplysninger vil ditt navn og virksomhet bli erstattet med en kode som lagres på egen navneliste adskilt fra øvrige data og lagret datamaterialet på ekstern server.

Hva skjer med opplysningene dine når vi avslutter masteroppgaven?
Masteroppgaven skal leveres *15.06.2020.* Alle personopplysninger blir slettet senest 01/09/2020. Veileder Dr. Gorm Kipperberg og Arvid Nesse, Klyngeleder ved Norwegian Offshore Wind Cluster vil ha tilgang til dataene underveis i masterprosjektet.

Dine rettigheter
Så lenge du kan identifiseres i datamaterialet, har du rett til: innsyn i hvilke personopplysninger som er registrert om deg, å få rettet personopplysninger om deg, få slettet personopplysninger om deg, få utlevert en kopi av dine personopplysninger (dataportabilitet), og å sende klage til personvernombudet eller Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?
Vi behandler opplysninger om deg basert på ditt samtykke. NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?
Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:
Dr. Gorm Kipperberg, gorm.kipperberg@uis.no, tlf. 51833729. Veileder ved Handelshøyskolen i UiS, fakultet for samfunnssøkonomi og finans.
Julie Alexandra Vold, julieavold@gmail.com, tlf. 48452455.
NSD – Norsk senter for forskningsdata AS, på epost (personverntjenester@nsd.no) eller tlf: 55582117.

Med vennlig hilsen

Dr. Gorm Kipperberg
Veileder

Julie Alexandra Vold
Masterstudent

Samtykkeerklæring
Jeg har mottatt og forstått informasjon om prosjektet/masteroppgaven *«Kapitaltilgang i Norwegian Offshore Wind Cluster»*, og har fått anledning til å stille spørsmål. Jeg samtykker til:

- å delta i semi-strukturert intervju
- at mine personopplysninger lagres etter prosjektslutt og deles med Arvid klyngeleder i Norwegian Offshore Wind Cluster til 01/09/2020.

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet, ca. 15. juni 2020 og slettes senest 01/09/2020.

(Signert av prosjektdeltaker, dato)

Appendix 2: Interview Guides

Norsk Intervjuguide - Medlemsbedrifter NOWC

Introduksjon:

• Innledning mellom intervjuer (Julie) og intervjukandidat (representant medlemsbedrift)
• Presentere motivasjon for oppgaven
• Forklare oppgavens bakgrunn og innhold
• Intervjukandidat vil bli oppmerksom på hvordan intervjudata skal anvendes og behandles.
• Teknisk introduksjon for gjennomførelse av intervju (Lydopptak)
• Intervjuets forventede lengde, forklare at intervjukandidat når som helst har mulighet til å avbryte

Innledende spørsmål:

1. Fortell litt om virksomheten. Hva dere driver med?
2. Hvilken fase beskriver best virksomheten? (Vise finansiering syklus med referansebedrifter)

Hoveddel:

3. Har virksomheten behov for ekstern kapital for å realisere fremtidige prosjekter? Hvorfor? Hvordan skal kapitalen anvendes? Tech/Tjenester? Hvor mye?
4. Hva mener du er den største barrieren for at din virksomhet skal lykkes?
5. Hvilke finansielle barrierer ser du i verdikjeden for offshore vind i Norge

Avsluttende spørsmål:

6. Hvilke muligheter ser du i verdikjeden for offshore vind i Norge?
7. Hva mener du må til for at det Norske leverandørsystemet/ Norwegian Offshore Wind Cluster skal lykkes?
8. Hvordan påvirker COVID-19-situasjonen din virksomhet? Driftsendringer, prioriteringer og fokus?

Norsk Intervjuguide – Investorer og Kapitalaktører

Introduksjon:

• Innledning mellom intervjuer (Julie) og intervjukandidat (representant investor)
• Presentere motivasjon for oppgaven
• Forklare oppgavens bakgrunn og innhold
• Intervjukandidat vil bli oppmerksom på hvordan intervjudata skal anvendes og behandles
• Teknisk introduksjon for gjennomførelse av intervju (Lydopptak)
• Intervjuets forventede lengde, forklare at intervjukandidat når som helst har mulighet til å avbryte

Innledende spørsmål:

1. Fortell kort om deres investeringsfilosofi.
   Hint: Hva slags type bedrifter investerer dere i? Hva er viktig for dere? Porteføljefordeling? Langsiktige/kortsiktige investeringer?
2. Hvor i finansieringssyklusen fokuserer dere ?
   (Vise finansieringssyklus med referansebedrifter)
3. Hvilke tidligere investeringer har dere gjort, hva slags fase/sektor? Hvorfor?
4. Hvor langt perspektiv har deres virksomhet på investeringer? Hvorfor?
5. Hvilken størrelse beløper kan dere typisk investere, og på hvilken verdsettelse (post-money)? Investeringer for teknologiutvikling (evt. hardware) eller kunnskap/service (evt. software)?

Hovedspørsmål:

6. Hvor mye tror du investorer/kapitalaktører er påvirket av trender/menneskers holdninger/oppmerksomhet i media?
   Hint: (Ref. Vind på land, Greta Thunberg, HitecVision/Moreld).
7. Hvordan vurderer du deres kompetanse på offshore vind? Klimaforandringer?
8. Hva skiller investeringer i flytende offshore vind fra andre investeringer?

Avsluttende spørsmål:

9. Hvilke muligheter og barrierer ser du innenfor investeringer i offshore vind?
10. Hva må til for å gjøre investeringer i offshore vind mer attraktivt? Hvem har ansvaret?

11. Tror du at din virksomhet kommer til å investere i offshore vind innen 5 år?
12. Spørsmål for å avdekke vektlegging av avkastning/klimaavtrykk: (?)
    a. Scenario A – moderat forventet avkastning – lavt klimaavtrykk
    b. Scenario B – høy forventet avkastning – negativt klimaavtrykk (noe positivt for miljøet, som CCS eller planting av trær).
13. Spørsmål for å avdekke attraktive investeringer/risiko.
    a. Scenario A – ny teknologi – høy riksiko – høy forventet avkastning
    b. Scenario B – utprøvd teknologi – medium risiko – medium forventet
14. Hvordan påvirker COVID-19-situasjonen din virksomhet? Driftsendringer, prioriteringer og fokus?

English Interview Guide - Member Companies

Introduction:

• Introduction between interviews (Julie) and interview candidate (representative member company)
• Present motivation for the task
• Explain the background and content of the assignment
• Interview candidate will be aware of how interview data should be used and processed
• Technical introduction for conducting the interview (Audio recording)
• The expected length of the interview, explain that the interview candidate has the opportunity to cancel at any time

Introductory questions:

1. Tell a little about the business. What are you doing?
2. Which phase best describes the business? (View attachments)

Main questions:

3. Does the company need external capital to realize future projects? Why? How should money be used? Tech/services? How much?
4. What possible barriers do you see in the Norwegian value chain for offshore wind?
5. What do you think is the biggest barrier to your business success?
6. What financial barriers do you see in the value chain for offshore wind in Norway?

Final questions:

6. What opportunities do you see in the value chain for offshore wind in Norway?
7. What do you think is necessary for the Norwegian supplier system / Norwegian Offshore Wind Cluster to succeed?

Final questions:

7. What do you think are possible barriers/opportunities for the Norwegian supplier system / NOWC to succeed?
8. How does the Corona situation affect your business? Operational changes, priorities, and focus?

English Interview Guide – Investors and Capital Actors

Introduction:

• Introduction between interviews (Julie) and interview candidate (representative investor)

• Present motivation for the task

• Explain the background and content of the assignment

• Interview candidate will be aware of how interview data should be used and processed

• Technical introduction for conducting the interview (Audio recording)

• The expected length of the interview, explain that the interview candidate has the opportunity to cancel at any time

Introductory questions:

1. Briefly explain their investment philosophy.

What kind of business do you invest in? What's important to you? Asset Allocation? Long-term / short-term investments?

2. Where in the funding cycle do you focus?

(View financing cycle with reference companies)

3. What previous investments have you made, what kind of phase / sector? Why?

4. How far does their business have an investment? Why?

5. What amount of money can you typically invest and at what post-money valuation? Investments for technology development (possibly hardware) or knowledge / service (possibly software)?

Main questions:

6. How much do you think investors / investors are influenced by trends / people's attitudes / media attention?

Hint: (Ref. Wind on land, Greta Thunberg, HitecVision / Moreld).

7. How do you rate their expertise in offshore wind? Climate change?

8. What differentiates investments in floating offshore wind from other investments?

Final questions:

9. What opportunities and barriers do you see in investing in offshore wind?

10. What is needed to make investment in offshore wind more attractive? Who's in charge?

11. Do you think your business will invest in offshore wind within 5 years?

12. Questions to reveal the emphasis on return / climate imprint: (?)

a. Scenario A - moderate expected return - low climate footprint

b. Scenario B - high expected return - negative climate imprint (as in positive for the climate, such as CCS or planting trees).

13. Questions to reveal attractive investments / risk.

a. Scenario A - new technology - high national risk - high expected return

b. Scenario B - proven technology - medium risk - medium expected

14. How does the COVID-19 situation affect your business? Operational changes, priorities and focus?

Appendix 3: Tabular Overview of Literature Review

This appendix contains an extensive tabular overview of the 37 sources forming the literature review. Where information is not available or applicable, the cell is marked N/A. Journal rakings are retrieved from The Norwegian Centre for Research Data (NSD, 2020). Due to the large size of the table, it is attached in landscape mode in the following five pages.

Table 4 provides an overview of how themes 1, 2 and 3 correlate to the secondary research questions.

CATEGORY NUMBER	SECONDARY RESEARCH QUESTION	THEME
1	*Is the access to capital the main barrier for growth in the NOWC?*	Barriers in the NOWC
2	*What does investors emphasize when considering offshore wind investments?*	The Investor Mindset
3	*How does the current COVID-19 situation impact the emerging market for floating offshore wind?*	Impact of COVID-19

Table 4: Overview of Themes Corresponding to Secondary Research Questions.

THEME	AUTHOR	YEAR PUBLISHED	TITLE	SOURCE TYPE	JOURNAL NAME	JOURNAL RANKING	PURPOSE	RESULT	PLACE	DATA
2	Baker and Filibeck	2014	Investment Risk Management	Book	N/A	N/A	School book introducing fundamentals of investment risk management	N/A	USA	N/A
2	Berk et al.	2013	Fundamentals of corporate finance	Book	N/A	N/A	School book introducing fundamentals of corporate finance	N/A	USA	N/A
1	BVG-Associates	2019	Opportunities in offshore wind for the Norwegian Supply Chain	Report	N/A	N/A	Review the strengths of the existing Norwegian supply chain and its synergies with offshore wind.	Diversification into a new market can be rewarding for suppliers	Norway	Assessment of 263 companies
1	CenSES	2019	Conditions for growth in the Norwegian Offshore Wind Industry	Report	N/A	N/A	Analyze the conditions for developing a Norwegian offshore wind industry	O&Gincentives can represent a barrierer to the diversification of the offshore wind industry	Norway	Survey of 97 companies, interviews and case studies.
2	Chen	2020	Investor Definition	Encyclopedia	N/A	N/A	Defines Investor	N/A	Online	N/A
2	Chong	2004	Investment Risk Management	Book	N/A	N/A	School book introducing fundamentals of investment risk management	N/A	UK	N/A
1	Fargerberg	2018	Mission (im)possible?	Journal Article	Structural change & sustainability transitions	N/A	How policies can speed up transitions	Governments play important roles in directing economic activity in favor of transitions	Denmark, Germany, Norway	Case studies in three countries
2	Faria, Barbosa	2014	Does venture capital really foster innovation?	Journal Article	Economics Letters	1	Does venture capital foster innovation?	Venture capital fosters innovation, particularly at a later stage	17 EU countries	Material from Eurostat database

3	Fjellberg	2020	Norge har fantastiske muligheter, men det haster	News Article	N/A	N/A	IRENA report points to the need for green investments	Norway has great potential, but the green shift is urgent	Norway	Review of IRENA report
2	Gaddy, Sivaram, Jones, Wayman	2017	Venture capital and cleantech: The wrong model for energy innovation	Journal Article	Energy Policy	1	Explain why venture investors decreased funding	Technology investments are capital-intensive and give lower returns	USA	Comparing early-phase cleantech investments performance from 2006 - 2011
2	Gatzert and Kosub	2016	Risks and risk management of renewable energy projects: The case of onshore and offshore wind parks	Journal Article	Renewable and Sustainable Energy Reviews	1	Expand knowledge on current risks and risk management solutions for wind park projects from an investor's perspective	Policy and regulatory risks are among the main risks from an investors perspective	Europe	Reviewing literature and survey with industry experts
1	Hansen, Steen	2015	Offshore oil and gas firms' involvement in offshore wind: Technological frames and undercurrents	Journal Article	Environmental Innovation and Societal Transitions	1	The rationale of O6G engagement with Offshore Wind	Offshore wind is used to attract human resources to O&G	Norway	74 semi-structured interviews, document studies, event participation, and a survey
2	Hellemann, Puri	2000	The interaction between product market and financing strategy: The role of venture capital	Journal Article	The review of financial studies	2	The role of venture capital	Venture capital financing is related to outcomes of start-ups.	USA	Material from Database of Silicon Valley high-tech start-ups
3	Hovland	2020	NRK: Grønn krisepakke på 3,6 milliarder kroner	News Article	N/A	N/A	The Norwegian government plans to spend NOK 3.6 billion on a green crisis package.	N/A	Norway	The Minister of Climate and Environment to NRK
3	IEA	2020	World Energy Investment 2020	Report	N/A	N/A	Present global energy investment and including the economic crisis of COVID-19	Energy investments are predicted to fall by 1/5 in 2020	Global	IEA Database
2	IRENA	2019	Future of wind. Deployment, investment, grid integration, and socio-economic aspects.	Report	N/A	N/A	Present an overview of the future of wind	Wind Power can reach 1/3 of the worlds global energy demand	Global	Data from IRENA Database
2	IRENA	2016	Unlocking renewable energy investment: The role of risk mitigation and structured finance	Report	N/A	N/A	Identifies risks and barriers limiting investment.	Presents overview of risks	Walney, Jordan, Sarulla	Case studies on an offshore wind farm, geothermal, and solar and survey material

1	Jacobsson, Karltorp	2013	Mechanisms blocking the dynamics of the European offshore wind energy innovation systems - Challenges for policy intervention	Journal Article	Energy Policy	1	Locating barriers for offshore wind power	Need for policy coordination across borders	Europe	Interviews
2	Kander	2014	5 key insights into how investors think	Online Article	N/A	N/A	Identify how investors think	Lists five insights on how investors think	Online	N/A
2	Kitzing, Juul, Drud, Boomsma	2017	A real options approach to analyse wind energy investments under different support schemes	Journal Article	Applied Energy	1	To develop a specified real options model to an offshore wind case in the Baltic Sea	A real options model for investment decisions in offshore wind projects.	Europe	Case study applying Real Options
2	Kozlova	2017	Real options valuation in renewable energy literature: Research focus, trends, and design	Journal Article	Renewable and Sustainable Energy Reviews	1	To describe contemporary academic literature devoted to renewable energy valuation with	Presents an overview of existing literature on RO	Global	Reviewing literature
1	Mäkitie, Andersen, Hanson, Normann, Thune	2018	Established sectors expediting clean technology industries? The Norwegian oil and gas sector's influence on offshore wind	Journal Article	Journal of cleaner production	2	Explore how established industry may positively contribute to cleantech industries	Structural overlaps in technology, actors, and networks have positive influences on TIS formation	Norway	Case studies (industry-level and Norway)
1	Mäkitie, Normann, Thune, Gonzalez	2019	The green flings: Norwegian oil and gas industry's engagement in offshore wind power	Journal Article	Energy Policy	1	Expand understanding of how O&G engangement in offshore wind fluctuates	The O&G industry had two peaks of offshore wind engagement	Norway	Study the engagement of the Norwegian O&G industry in OWP in the period 2007–2016
1	Mäkitie, Thune, Gonzalez	2018	From oil to wind, and back again: Resource redeployment and diversification	Book Chapter	N/A	N/A	Reviews the role of O&G firms when diversifying into intermittent energies	Early investments in offshore wind activities can result in consistent engagement in diversification	UK	Reviews O&G diversification and evolvement into offshore windactivitiess from 2007-2016

1	Menon Economics	2019	Verdiskapningspotensialet knyttet til utviklingen av en Norskbasert industry innen flytende havvind	Report	N/A	N/A	Identify the value creation potential for floating wind in Norway	1. Active home market 2. early-mover 3. clear vision from government and 4. suitable policies	Norway	Interviews with industry actors
2	Moore, Wüstenhagen	2004	Innovative and sustainable energy technologies: the role of venture capital.	Journal Article	Business Strategy and the Environment	1	Evaluate the role of financial structure in realtion to innovation and entreprenural activity	Venture capital, innovation and entrepreneurs are connected.	Switzerland	Review of a multi-year long research project
1	Nordmann, H.	2015	The role of politics in sustainable transitions: The rise and decline of offshore wind in	Journal Article	Environmental Innovation and Societal Transitions	1	How political conditions and external events influenced offshore wind in Norway	Internal activities in governments must be further researched in energy transitions.	Norway	Interviews with politicians,industry professionals and experts.
1	Normann	2017	Policy networks in energy transitions: The cases of carbon capture and storage and offshore wind in Norway.	Journal Article	Technological Forecasting and Social Change	1	Compare CCS and offshore wind , impact of policies	Policy network structure matters	Norway	Case study and interviews
1	Normann and Hanson	2015	Exploiting global renewable energy growth. Opportunities and challenges for internationalisation in the Norwegian offshore wind and solar energy industries	Report	N/A	N/A	Analyzing Norwegian potential for internationalization	There is considerable potential for Norwegian offshore wind and solar PV. Barriers for internationalization applies especially to especially smaller companies.	Norway	Survey with 151 respondents
1	Normann, Hanson	2017	The role of domestic markets in international technological innovation systems	Journal Article	Industry and Innovation	1	Explore how countries in non-leadership positions can couple onto globally developing technological innovation systems for renewable energy	The lack of a domestic market is a barrier.	Norway	Survey of 102 firms and semi-structured interviews
3	Rystad Energy	2020	COVID-19 set to wipe out global solar and wind project growth for 2020, slash new capacity from 2021	Press Release	N/A	N/A	A global outlook on COVID-19 impact on renewable energy	Growth in solar and wind will decline due to COVID-19	Global	Rystad Database

1	Menon Economics	2019	Verdiskapningspotensialet knyttet til utviklingen av en Norskbasert industry innen flytende havvind	Report	N/A	N/A	Identify the value creation potential for floating wind in Norway	1. Active home market 2. early-mover 3. clear vision from government and 4. suitable policies	Norway	Interviews with industry actors
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1	Normann and Hanson	2015	Exploiting global renewable energy growth. Opportunities and challenges for internationalisation in the Norwegian offshore wind and solar energy industries	Report	N/A	N/A	Analyzing Norwegian potential for internationalization	There is considerable potential for Norwegian offshore wind and solar PV. Barriers for internationalization applies especially to especially smaller companies.	Norway	Survey with 151 respondents
1	Normann, Hanson	2017	The role of domestic markets in international technological innovation systems	Journal Article	Industry and Innovation	1	Explore how countries in non-leadership positions can couple onto globally developing technological innovation systems for renewable energy	The lack of a domestic market is a barrier.	Norway	Survey of 102 firms and semi-structured interviews
3	Rystad Energy	2020	COVID-19 set to wipe out global solar and wind project growth for 2020, slash new capacity from 2021	Press Release	N/A	N/A	A global outlook on COVID-19 impact on renewable energy	Growth in solar and wind will decline due to COVID-19	Global	Rystad Database

Appendix 4: Data Analysis Tables

The interviews have been categorized following the structure of the interview guides. The left column follows the order of the interview guides and is sometimes added themes that typically occurred under the same question. Because the interviews are semi-structured, not all companies got exactly the same questions. Where information is not available applicable, the cell is marked N/A. The rows display the informants, numbered by a code.

Categorized Data from Member Companies

The data from the member companies are informants 1 to 5, then informants 6-10 will follow in the following extension of the table.

	Title Informant	CEO	CEO	MD	PM	MD
		1	**2**	**3**	**4**	**5**
Q 1	O&G competence	Yes	Yes	Yes	Yes	Yes
	Tech/service	Service	Tech	Tech/service	Tech	Service
Q 2	Financial cycle	Start-up	Seed/start-up	IPO	Seed	Scale-up
Q 3	Need for external capital	Yes	Yes	No	Yes	Yes
	Reported capital need	10-15 MNOK	40-60 MNOK	N/A	80-120 MNOK	1-15 MNOK
	Average of reported capital need	12,2	50	N/A	100	8
	Capital to what?	Software development	Full-scale prototype	N/A	Pilot installation	Commercializati on
	Capital category	Commercial	Pilot	N/A	Pilot	Commercial
Q 4	Barriers to company	Access to capital	Access to capital	Projects	Policy instruments, Cooperation	Access to capital
	Complex to access capital	Yes	Yes	N/A	Yes	Yes

	Investors are not interested	Yes	Yes	N/A	Yes	Yes
	Policy Instruments	N/A	N/A	Yes	Yes	Yes
Q 5	Financial Barriers NOWC	N/A	Policy instruments	Policy instruments + risk capital	Policy instruments + risk capital	Policy instruments + risk capital
	Home market argument	Yes	Yes	N/A	Yes	Yes
	O&G mindset argument	Yes	N/A	Yes	N/A	N/A
Q 6	Opportunities	N/A	N/A	Act now	N/A	Competence, cooperation
	Attitude	Optimist	Optimist	Optimist	Optimist	Optimist
Q7	NOWC success	N/A	Cooperation, policy instruments	Policy instruments	Policy instruments	Access to capital, policy instruments
Q 8	COVID-19 impacts operation	Yes	Yes	No	No	No
	impacts responses	No	No	No	No	No
	Future	Pessimist	Pessimist	Optimist	Optimist	Optimist
The mes	Lack of projects	Yes	N/A	N/A	Yes	N/A
	Lack of capital	Yes	Yes	N/A	Yes	N/A
	Lack of politics	Yes	Yes	N/A	Yes	N/A
	Policy instruments	Yes	Yes	N/A	Yes	N/A
	Investors are more interested in tech	Yes	N/A	N/A	N/A	N/A
	Innovative supplier compositions	N/A	N/A	N/A	Yes	N/A

	Title Informant	MD	CEO	CEO	CEO	CEO
		6	**7**	**8**	**9**	**10**
Q 1	O&G competence	Yes	Yes	Yes	Yes	No
	Tech/service	Tech/Service	Tech	Tech	Tech	Service
Q 2	Financial cycle	Scale-up/Venture	Start-up	Start-up/Scale-up	Scale-up	Scale-up
Q 3	Need for external capital	Yes	Yes	Yes	Yes	Yes
	Reported capital need	3-5 MNOK	9-300 MNOK	30-70 MNOK	70-100 MNOK	40-80 MNOK
	Average of reported capital need	4	154,5	50	85	60
	Capital to what?	Reconstructing	Full-scale test pool	Technology development, marketing, sales, branding, project development	Production facilities	Software development, scale-up organization
	Capital category	Commercial	Pilot	Commercial	Construction	Commercial
Q 4	Barriers to company	Large operators block smaller suppliers	Costs	Access to capital, costs, business model	Collaboration partner, The right investor	Right people
	Complex to access capital	Yes, for industry	No	No	No	No
	Investors are not interested	N/A	No	No	No	No
	Policy instruments	Yes	Yes	N/A	Yes	No
Q 5	Financial Barriers NOWC	Product development phase with no returns	Costs	Risk capital for projects abroad, risk capital loans	Policy instruments	Policy instruments
	Home market argument	N/A	Yes	N/A	Yes	N/A
	O&G mindset argument	N/A	N/A	N/A	N/A	N/A
Q 6	Opportunities	Strong value chain	Technology, competence	Maritime, offshore, finance competence, research institutions	Collaboration, GIEK	Collaboration, track record
	Attitude	Neutral	Optimist	Optimist	Optimist	Neutral
Q7	NOWC success	Cooperation: The contractors must use the small suppliers	Policy instruments	Speed dating: Introduce green investors to companies	Cooperation, policy instruments	Cooperation, policy instruments
Q 8	COVID-19 impacts operation	Yes	Yes	No	No	No

	impacts responses	No	No	No	No	No
	Future	Neutral	Optimist	Optimist	Optimist	Pessimist
The mes	Lack of projects	Yes	N/A	No	No	No
	Lack of capital	Yes	Yes	Yes	Yes	Yes
	Lack of politics	Yes	Yes	Yes	N/A	No
	Policy instruments	N/A	N/A	Yes	Yes	Yes
	Investors are more interested in tech	N/A	N/A	Yes	Yes	Yes
	Innovative supplier compositions	N/A	N/A	N/A	Yes	No

Categorized Data from Investors and Capital Actors

The following table displays investor and capital actors' responses, categorized.

		Investment Banker	**Governmental Funding Agency**	**CEO**	**Director of Funds**
		1	2	3	4
Q 1	Philosophy	N/A	Value creation and sustainability	N/A	N/A
Q 2	Phase of focus	Scale-up to IPO	Seed to scale-up	Start-up to venture	Seed to venture
	Green % goal of portfolio?	No	No	No	No
Q 3	Previous investments	N/A	N/A	N/A	N/A
Q 4	Time perspective	3-10 +	Not too long	Long	5 years
Q 5	Size investment	N/A	2-10 MNOK	1-70 MNOK	250 k - 500 k +
	Post money?	N/A	N/A	N/A	5-20 pre money
	Soft/hardware?	No preference	No preference	No preference	No preference
Q 6	Influence	Meta trends	Meta trends	Meta trends	Meta trends
Q 7	Competence Offshore Wind	Good	Good	Good	Good
	Competence Climate Change	Good	Good	Very good	Good
Q 8	Unique to offshore wind	Technology, costs	Uncertain market, no track record	International market, technology development	Uncertain market, capital intensive
Q 9	Opportunities	N/A	Marine Competence	Export	Timing
	Barriers	N/A	Costs, overconfidence	N/A	Cost
Q 10	More attractive	N/A	Track record	Government	Track record
	Responsibility	N/A	Companies	Governmental subsidies in transition phase	Companies and government

Q 11	Invest in offshore wind in 5 years?	Yes	Yes	Yes	Yes
Q 12	Returns vs. Climate imprint	Returns	Climate imprint	Climate imprint	Both
Q 13	New or tested technology	Tested	New	New	New
Q 14	Covid-19 impact responses	No	No	No	No
	Opportunity for offshore wind?	Neutral	Positive	Positive	Neutral
The mes	ESG	Yes	N/A	Yes	UNs SDG
	Attitude	Positive	Neutral	Positive	Positive

Appendix 5: Selected Quotations from Interviews

Interview Quotes from Member Companies, in Norwegian

The following sections is an excerpt from the interviews, in Norwegian. Information that may reveal privacy data, has been changed with [X].

Quotes from Informant 1, CEO Service Start-up Company

«Det er en kjempemulighet, skjønner ikke hvorfor det er gått så sent da, skal jeg være helt ærlig».

«Dette tenker jeg kan bli et nytt industrieventyr, men jeg tenker jo vi må sette i gang da».

«Min erfaring med offshore wind er at om man har noe med lengde x høyde x bredde vil folk forstå hva du holder på med, og hvis du holder på med den type teknologi vil folk nesten se på det som rakettforskning».

Quotes from Informant 2, CEO Tech Seed/Start-up Company

«Alle snakker om å få ned kostnadene, men ingen er interessert i ny teknologi som skal til for å gjøre det. Så det er liksom som festtaler det meste at det greiene, men relevansen er der vet du».

«Teknologien har modna så langt vi klarer på egen rygg og vi er nok så modne».

«Det er slik at Innovasjon Norge er et godt verktøy, og der kan du få opptil 45% i lån eller tilskudd. Må ha fatt i de andre 55%. Alt i Norge er fatta på at du har en growing business ved siden av utviklingsarbeidet ditt. Men for oppstartsbedrifter så er det jo ikke sånn. Det gappet, å få tette de 55% i de neste fasene det er jo bank, private investorer – det er de som svikter det er jo ingen equity selskaper i Norge som er interessert i å være med å finansiere en prototype.»

«Mulighetene de er der, og bedriftene de er der, og de har kompetanse - det er bare til å plukke de samarbeidspartnerne du trenger».

«På det øverste nivå så må man skape utbygginger i Norge som åpner for at nye aktører kan komme inn og så vil det gi ringvirkninger til hele leverandørsystemet – det er ingen enkelte aktører spesielt ikke når du er nede på SMB nivå som kan gjøre dette alene. Det må åpnes for. At dette her kan gjøres som en joint venture eller som en.. det må åpnes for en at det er en kapitalryggrad for å få til en utbygging med investering med en sånn type sammensetning av selskaper».

«Norwegian Offshore Wind Cluster er jo en politisk organisasjon, de bør fremme ideene om å sette sammen leverandørsystemene sammen til en totalleverandør og jobbe politisk for å få til utbygging på norsk sokkel både på bunnfast og på flytende».

Quotes from Informant 3, Managing Director IPO Tech/Service Company

«Vi har all den kunnskapen som egentlig trengs, men den største utfordringen kommer nok til å være at man drar med seg alt for mye av olje og gass hierarkiet som dreper det rent kostnadsmessige. Vi kan ikke bruke olje-regler her altså, her må det brukes sunn fornuft».

«Får vi til det her i Norge, så kan vi eksportene denne teknologien til hele verden – og det er det som er den store muligheten altså. Olje og gass - der øser de ut penger på alt mulig tull, en helt uforsvarlig måte å bruke penger på sammenliknet med offshore wind».

«For flytende vind så tror jeg aldri muligheten har vært bedre noen gang – jeg er egentlig veldig optimist jeg altså. Nå er tiden for å smi – og da skjer det. Og så må vi være raskt ute. Vi må ikke sitte å vente nå altså, nå må vi gjøre det *nå*».

Quotes from Informant 4, Project Manager Tech Seed Company

«Ja, jeg ser masse muligheter, vi ser enormt mye muligheter. Og egentlig muligheten for å gjøre det store skiftet fra olje og gass».

«Regjeringen, departementer.. lytter mye til olje og gass, eksisterende virksomheter – lytte nok til innovasjonen som kan skape nye sammensettinger».

«Etter vårt syn så er det lite finansielle løsninger. Nysnø er for langt til høyre. Det er egentlig ikke noe særlige løsninger som vi kan se for offshore vind i Norge».

«Da må man gjøre alt gjennom risikokapital med norske investorer».

«Store aktører i Norge som Equinor som har en veldig konservativ holdning til nye løsninger til nye sammensetninger sånn supplychain».

Quotes from Informant 5 – Managing Director, Service Scale-up Company

«Det virker jo som om alle disse finansieringsselskapene tror at offshore wind er noe helt nytt og at det bare skal komme nye lure ideer fra nye grundere, men det er jo et faktum at dette er en etablert virksomhet ute i verden. Det har eksistert i årevis».

«Jeg ser egentlig store muligheter, spesielt når det nå begynner å bevege seg ut mot dypere vann og røffere forhold der du krever en annen marin teknologi enn det som har vært vanlig med disse bunnfaste vindturbinene».

«I Norge har vi et godt samarbeid allerede. Det er bare spørsmål om å snu fokus, rett og slett».

«Da er jeg fryktelig frista til å si penger, da. Det er veldig lett å få penger til å utvikle ting, eller ikke veldig lett men det er relativt lett. Innovasjon Norge har en haug med løsninger, og hvis du søker og er flink til å søke så får du det til. Men når du da har utviklet det til det er nesten ferdig, da stopper kapitalstrømmen helt opp. Nesten ingen penger til sånn kommersialisering, industrialisering av det du har utviklet. Og så godt som helt umulig å få penger til markedsføring, internasjonalisering i den sammenheng. Så det mangler et finansieringsledd på veien opp til å gjøre ting helt ferdig».

Quotes from Informant 6, Managing Director, Tech/Service Scale-up/Venture Company

«Problemet er at det er så omfattende å administrere, Innovasjon Norge har sine krav, valide, Nysnø, alle har sine krav for rapportering, administrasjon – det tar jo nesten opp en stilling bare det».

«Når du kommer til utlandet og er en del av Norwegian Offshore Wind Cluster, så er det et kvalitetsstempel».

«Få en sterkere posisjon I utlandet. Bedre varemerke for offshore wind i utlandet, rett og slett. Vi har kvalitet i alt vi gjør. Men vi er jo ikke anerkjent som ledende i offshore wind».

«Operatørene og kontraktørene må bruke leverandørene. Det bør nesten være et krav. Dersom operatørene skal nyte verdiene av offshore wind-clusteret, så må leverandørene der bli brukt. De må selvsagt vise sin verdi også da, men det nytter på en måte ikke å få en stor offshore wind utbygging, si om Kværner får Utsira Nord, så få engelskmenn og hollendere jobben».

Quotes from Informant 7 –CEO Tech Start-up Company

«Myndighetene må på banen og legge til rette for at vi får varetatt og brukt den teknologien som finnes her i Norge som vi har mye brukersnitt på, det mener jo jeg er nøkkelen – og der gjør jo Norwegian Offshore Wind Cluster en ganske god jobb».

«Det nytter ikke å sovne i timen og våkne når toget er gått. Og det toget tror jeg faktisk kommer til å gå utrolig fort».

«Kanskje vi er litt for demokratiske, det stopper litt opp i steden for å gi bånn gass».

Quotes from Informant 8, CEO Tech Start-up/Scale-up Company

«Jeg ser at det burde være veldig store muligheter. Vi har jo ledende ekspertise innen ship, altså maritime virksomheter og offshore kompetanse. Innen finans og prosjektfinansiering har vi veldig stor kompetanse på maritim finansiering. Vi har forskningsinstitusjoner som har jobbet veldig mye mot dette her. Og ingeniør bedrifter og alt, så jeg føler at det er særlig innen flytende vind veldig store muligheter for norsk verdikjede fremover».

«Til syvende og sist er det enkeltbedriftene som trenger kapital fra noen».

Quotes from Informant 9, CEO Tech Scale-up Company

«Finne rett partner, når det gjelder kapital er det egentlig ikke mangel på midler til gode prosjekter, men det som er krevende er å finne rett partner (investor), rett modell og rett løsning – det er nok det mest krevende»

«Det er klart at vi må ha et hjemmemarked.. og det mangler jo finansielle instrumenter og insentiver for å få satt i gang et hjemmemarked, først og fremst. Hadde vi fått det på plass, så er det ikke vanskelig å få tak i kapital. Men et hjemmemarked er viktig.»

«Fantastiske muligheter. Vi har fokusert mye på flytende vind. Men jeg har nok tro på at Norge kan bli *den* produksjons-hubben for hele Europa når det kommer til flytende vind. Så jeg ser for meg en ti talls milliard industri for Norge».

«Det handler jo om tillitt. Sånn som dette EU-prosjektet ... det hjelper jo til å bli kjent»

«Det å få tak i sånne prosjekter, å kunne jobbe sammen det er utrolig viktig. Og så er den en sak vi har jobbet mye med, og det bør du notere deg. Og det er GIEK, lånegarantiordningen har jo ikke gjeldet flytende offshore wind på norsk sokkel , men når GIEK åpner for at flytende kan gå inn i ordningen. Og for at ordningen skal gjelde må det være minst 30% norsk eksport og det tvinger jo , eller gir et godt insentiv for norske bedrifter til å jobbe sammen for å bundle leveransene».

«NOWC er et nasjonalt varmeker som blir godt i mottatt av regjering, og virkemiddelapparat

«Ja det er helt rett, påvirker oss ikke negativt. Det gir fantastiske muligheter til å få til dette hjemmemarkedet. Sånn sett, for norsk satsning for flytende vind så hjelper covid-19».

Quotes from Informant 10, CEO Service Scale-up Company

«Konkurranse bilde, tillit i markedet, behov, ikke minst tilgang på talent. Det er veldig vanskelig å rekruttere utviklingskapasitet i [X]. Rette folk rett og slett med den rette kompetansen og rett erfaring»

«Det er nok av kapital og tilgangen vil være der hvis man lykkes da».

«Det er vanskelig å få avkastning på offshore wind i Norge sånn som strømprisen er i dag».

«Jeg tror det viktigste er at man klarer å få levert tjenester med god trackrecord».

«At det er mulighet for norsk kompetanse til å gjøre noe spennende i offshore wind. Det er helt klart».

«Her må man nok samarbeide, for det er jo så etablert allerede. Skape trackrecord».

Interview Quotes from Investors and Capital Actors, in Norwegian

The following sections is an excerpt from the interviews, in Norwegian. Information that may reveal privacy data, has been changed with [X].

Quotes from Informant 1, Renewable Energy Investment Banker

«Vi tilrettelegger for investeringer og har da en investorbase, både på gjeld og egenkapitalsiden, som har forskjellige preferanser da. Noen ønsker å investere i børsnoterte aksjer, noen ønsker å invester i private selskaper, eller for eksempel. private prosjekter som et offshore wind prosjekt typisk er»..

«Vi har historisk, fokusert mest på børsnoterte selskaper, og så har vi sett at særlig innenfor fornybar energi og det grønne skiftet så ønsker vi å hjelpe selskaper litt tidligere, slik at de får vokst. Så vi setter gjerne gode selskaper i kontakt med både vekstfond og venturefond. Såkorn og oppstart- det blir litt tidlig for oss».

«Og så ser vi at mange av de vi er i dialog med nå, i fornybar energi sektoren, de vil kanskje på sikt ønske å bli børsnotert».

«Der er det ulike miljøer som er interessert i ulike eksponeriner, så begge begger deler er like intressert så lenge – jeg tror hovedpoenget er at den underliggende driveren er hva som skjer i energimarkedet og fornybar energi som en megatrend med god underliggende vekst – det er det mange som er interessert i».

«Jeg har hatt en rekke møter med investorer som er interessert i gode fagmiljøer og organisasjonsmodeller som ikke er asset heavy da».

«Investorer ser på megatrender i markeder og i verden . Klima er en viktig megatrend som påvirker inntjeningen til selskapene – da påvirker det også investormiljø»

«kanskje se på pågående trender i samfunnet, eller oppmerksomhet i media – jeg tror ikke mediaoppslagene som sådan endrer investormandater, eller hva investorene ser etter. Men, det er viktig for investorene»

«Investorer som ikke har ESG på helt dagsorden, de sliter litt da».

«ESG er jo et begrep som favner over ganske mye, men det handler jo både om miljø men også governace, hvordan de styrer selskapet og hvis du ikke styrer selskapet godt så er sannsynligheten for god aksjonæravkastning lavere da. Så det har naturligvis blitt en større og større del av investingsbeslutningen».

«Flytende vind har jo ikke slått igjennom på samme måte som bunnfast enda, og det er litt risiko tilknyttet teknologi og hvordan du får ned kostnader raskt nok. Så det handler om å få såkalt bankability innen flytende. Og det tror vi kommer veldig kjapt men det handler om å velge – man må kanskje redusere antall teknoogier, og jobbe med å sette opp skalaprosjekter».

«Jeg ser mange muligheter. Det er veldig attraktivt; lange cashflows, politsk støtte, sikre kapitalflow, noe som gjør det attraktivt for institusjonell kapital . En vindpark tikker og går og sikrer kontaktstrøm uavhengig av mange andre faktorer i samfunnet».

«Man må ha en stor balanse, og gjerne være en større aktør, noe vi ser en trend mot – at det er en big boys game. Og så ser vi jo naturligvis at det er en yield compression at avkastningen blir lavere fordi det er god etterspørsel etter assetene».

«Det har vært veldig mange gode forutsetninger for at offshore wind skal gjøre det bra så i en ny verden, som vi ikke enda vet hvordan ser ut så kan det jo selvfølgelig være noen faktorer som er mindre optimale».

«Jeg skjønner at man sikkert skal svare B, men jeg svarer jo A for nå».

«B – det er litt sannsynlighetsberegning også. Det er jo det som er problemet med tidligfase og nye teknologier, det er det jo mange som er litt forsiktige med».
«Vi er avhengige av at beslutninger tas. Transaksjonsaktivitet er gått litt ned. Aksjemarkedet har falt og investorene er litt mer forsiktig. Generelt sett i fornybar energi og offshore wind så er det overraskende bra momentum fortsatt».

Quotes from Informant 2, Governmental Funding Agency

«Vi er opptatt av økt verdiskapning for Norske bedrifter så vi skal ha flere gode grundere, økt verdiskapning i Norge og økt fokus på næringsklynger. Det er vårt formål. Vi er opptatt av at det er bærekraft i alle prosjektene, så er det et viktig aspekt at det er noe fornybar i det».

«Det stemmer, vi skal utløse privat kapital og få demonstrert til neste steg. Vi hører nok mer under oppstart og akkurat i overgangen til vekst».

«Det er lettere å forholde seg til hardware, og det er lettere å forstå det, men i [X] har vi like mye begge deler. For oss så skiller vi ikke noe der. Men det er ganske enkelt å forstå at det er lettere å se en dingseboms enn software».

«Jeg tror de påvirkes ganske sterkt av det, både direkte og indirekte gjennom samfunnet. Jeg tror at Norske investorer er veldig oppmerksomme på hva som foregår ellers rundt om i verden. Og om de påvirkes av det? Ja helt klart. Det tror jeg».

«Men, igjen vi er mer ute etter løsningen og ikke så mye hva som forsaker klimaforandringen».

«Det er en større usikkerhet. Når man investerer i olje og gas har man en større trackrecord, man vet mer om hvordan markedet vil utarte seg og det vil man jo ikke på flytende offshore wind».

«Kostnadsnivået, Norsk teknologi er veldig, veldig bra, men den er også basert på olje og gass som er veldig kostbar. Her handler det litt om å kanskje tenkte litt annerledes i forhold til kostnadsstrukturen og hvordan man legge opp sine produkter og tjenester. Det er nok et litt annet type tankesett norske leverandører må ha når de går inn i offshore wind. Vi har en god marin mulighet, men samtidig må vi ikke bli for selvgode for at danskene og andre har gjort vind i lang, lang tid og har veldig god kompetanse på det .. og så må man gjøre noe med kostnadsnivået – for det er den største barrieren for å lykkes innen flytende offshore wind».

«Jeg tror at her må de gode konseptene som er realistiske og bærekraftige kommersielt vinne fram. Nei, her handler det om hvem som er best, raskest og har beste prosjektet raskest mulig vil kunne få dette til å fungere. Det er attraktivt fordi det er et kjempe mulighetsområde men man kan ikke sitte å vente på alle andre, man må gjøre det selv tror jeg. I større grad selskapenes

egen evne til å ta muligheten kontra det å bare satse på at staten skal ta ansvaret – det tror jeg ikke på , jeg tror ikke det er løsningen».

«A – nyere teknologi – vi er jo høyrisiko – Vi vil heller satse på det usikre»

«Det er høy risiko å tro at dette er enkelt å få til. Hvor er det skoen egentlig trykker? Vi må ikke tro at vi er verdensmestere, men heller levere verdens beste produkter».

«Jeg tror at mange av bedriftene vi er borti da – hopper over en del steg. For lav forståelse på risikofaktorene i dette. Man er veldig fokusert på det teknologiske, men det handler jo også om markedsrisikoen – og den er nok kanskje underdimensjonert».

«Vi har en eksplosjon av antall henvendelser. Det settes i gang ekstrem mange prosjekter»

Quotes from Informant 3, CEO, Investment Fund

«Vi er også interessert i hardware, da fra techsiden, gjennom [X] og [X]. Vedlikeholds aspektet er interessant for oss. Det primære er hverken hardware eller software, men kunnskap – vi ønsker å være en utvikler.»

«Jeg tror ikke nødvendigvis at det er de trendene som har utløst et positivt fokus på grønne investeringer og bærekraftige investeringer. Nå er det jo sånn at det er vel nesten ikke er et eneste fond eller investeringsselskap med respekt for seg selv som i*kke* går den veien, så nå er det kanskje i ferd med å bli litt sånn over-populert det området».

«Vi ser jo en mulighet for rene vindressurser. Volumet vår er godt. Vi har en god mulighet.
At vi kan prøve å skape noe som på sikt kan bli en eksport artikkel»

«Er det noe norske myndigheter er flinke til så er det ikke bare å finne naturressurser men også forvalte de. Det må ganske kjapt opp en forvaltningspolitikk rundt det som skal skje på sokkelen og det må legges til rette for økonomiske insentiv i en overgangsfase før det her blir finansielt bærekraftig på lik linje med for eksempel offshore beskatning og/eller direkte subsidier».

«For hele det grønne skiftet – så vil det være positivt. Nå er det jo bevist at vi klarer å holde oss sånn rimelig i vater uten de fossile utslippene»

«Når du har en akselerert negativt trend [om olje prisfall] så har den en tendens til å være er den verre å snu enn noe som er svakt nedgående»

Quotes from Informant 4, Director of Funds, Investment Fund

«Jeg tror investorene må forholde seg til trendene. Det er jo timing som er veldig viktig. Generelt, og ikke bare for oss».

«Det kan være vanskelig å investere i noe som har med hydrokarboner å gjøre. Kommer du inn i EU-apparatet for eksempel, så vil det å få finansiering opp noe med hydrokarboner det er nesten umulig».

«HightecVison med Moreld er et godt eksempel, hvor de er tvunget til å tenke mer grønt».

«Vi er også veldig opptatt at selskapene vi investerer i er bevisst fra dag en på – ikke nødvendigvis spesifikt klimaforandringer men FNs bærekraft mål, de 17 målene, at de hele tiden tenker hvordan de kan relatere sin forretningsmodell og sin idé opp mot en eller flere av disse 17 bærekrafts målene».

«Hvis vi har to selskaper å velge mellom og et er flytende vind, så ser jo vi at vi alltid vil vurdere det men vi vil jo også vite at et konsept.. en flytende installasjon har jo betydelige kostnader knyttet til seg, enorme investeringskostnader, så da må vi være rimelig sikker på at dette konseptet blir da tatt opp av tyngre kapital, eller altså de med tjukkere lommebok, større fond , banker. At de har en god finansieringsplan, det blir nok mye viktigere. For risikoen er høy».

«Jeg tror det er enorme muligheter, med at vi trenger energi og den blenden. Det er den veien det dreier. Er du for tidlig ute, skal du vente litt til. Altså, hvor fort vil det gå? For det er jo ikke tvil om at det kommer».

«Det er jo suksesshistorier da, det første prosjektet – konseptet som kan vise til god butikk – det vil definitivt være en 'eye-opener' for en rekke investeringsmiljø av de som er først da».

«Grundere og konsepthavere til myndigheter – jeg liker jo ikke hvis du lener deg for mye på en driver. Innledningsvis har det jo vært subsidiert du skal ha retningslinjer fra myndighetene. Hvis du venter på det så tror jeg det er farlig, du må på en måte tenke at dette skal lønne seg uavhengig av det».

«I en umoden eller 'trending' industri som dette kan du få hjelp litt av myndigheter og lovverk, reguleringer, men på sikt så må du stå på egne bein».

«Ikke minst at det er flinke grundere, og at det er miljø rundt det. At de kan lage et forum eller en møteplass eller ha arrangementer rettet mot dette her, er viktig» .

«Jeg ville umiddelbart sagt A, men med din 'voiceover' så... Det er nok alternativ A som regjerer i dag, men hvis du vil ha en endring ...»

«Virksomhet B er nok minst like attraktiv, og om du tenker langsiktige trender så er det jo litt avanserte analyser (som jeg ikke har peiling på) som viser at investerer du grønt... på lang sikt er det ikke bare nødvendig, men det vil bli mer attraktivt alt fra omdømme, det er viktig».

«Det er nok en del fond og investorer som ville vært mest interessert i B'en her».

«Virksomhet B er det ganske, mye mer investorkapital tilgjengelig, det vil nok være flere muligheter tilgjengelig for virksomhet B å gå å få kapital».

«A – definitivt høy risiko og ny teknologi»

«Software as a service eller en mindre komponent er lettere å få 'trackrecord' på, slik at risiko er lavere»

«Vi merker nok jo bare et høyere trykk. Økt intensitet».

«Den trenden var nok tydelig før covid-19, men den kan ha blitt akselerert ytterligere av COVID-19 det tror jeg nok [om flytende vind]».